passive components

KOA SPEER ELECTRONICS, INC.

KOA SPEER ELECTRONICS, INC.

From Concept to Reality

Our wide range of passive component solutions will help you make the leap

Whether you're designing the car of tomorrow or connecting the Internet of Things, you need cutting-edge product solutions to bring your design to fruition. At KOA Speer, we're the ideal partner to help you do just that. Our constantly expanding line of passive components will give you the solution to make your concept a reality!

Quality 1st

You expect product quality from any component that makes it into one of your designs. But in today's competitive global marketplace, there's more to the quality equation. At KOA Speer, our Quality 1st initiative reinforces our organization wide focus on serving you at the highest possible level.

Our commitment to quality in everything we do is paying off... in the past two years we've received ten major customer quality awards. We're the industry's most recognized and awarded supplier for achieving the highest product quality, on-time delivery and responsive customer service.

ISO 9001:2015 CERTIFIED IATF16949:2016 CERTIFIED

KOA SPEER... More Than Just Resistors

Resistors

Precision • Surge • Wide Terminal
High Voltage • Thin Film
High Temperature • Embedded • General Purpose
Networks • Anti-Sulfur • Fusing • Melf

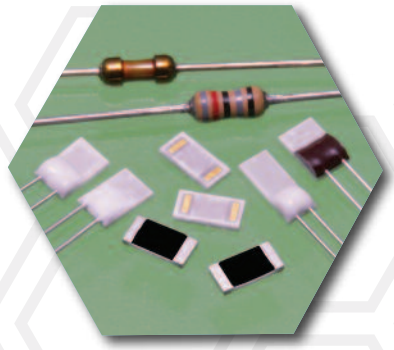
Low Resistance Current Sense/Shunts

Metal Plate • Thick Film • Power Shunt
Molded • Wide Terminal

Leaded Resistors

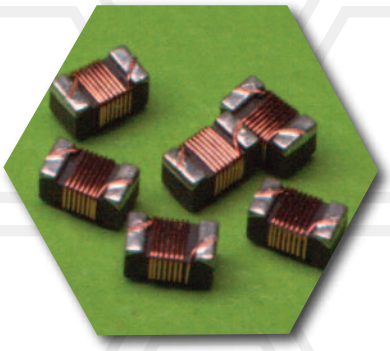
General Purpose Carbon Film
Precision Metal Film • High Voltage • Power
Wirewound • Current Sense • Networks
Fusing • Jumpers

Thermistors/ Thermal Sensors



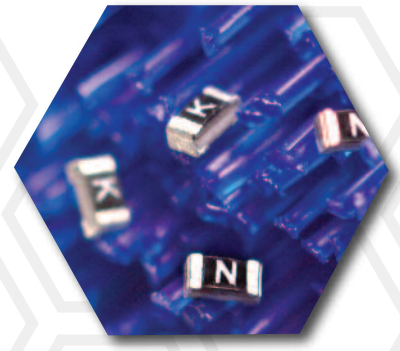
Platinum Thin Film
Thin Film Linear PTC
Thick Film Linear PTC
NTC Thermistors • PTC Thermistors

Inductors



Chip Inductors • Power Inductors

Fuses

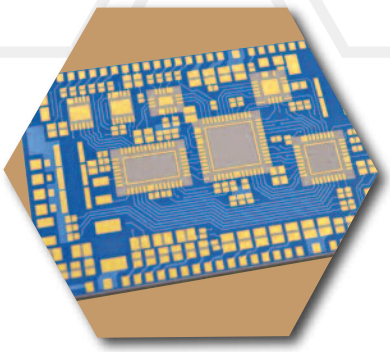


Thin Film • Automotive • Anti-Pulse
Fast Blow • Anti-Surge

Varistors

Chip Varistors • Automotive Varistors

LTCC Substrates



LTCC Substrates • Hybrid IC

Other Products

Check Terminal • Lab Kits

RoHS COMPLIANT

Current Sense Resistors Selection Guide

KOA SPEER ELECTRONICS, INC.

KOA offers complete family of Current Sense Resistors capable of sensing large to small currents with ultra-low resistance

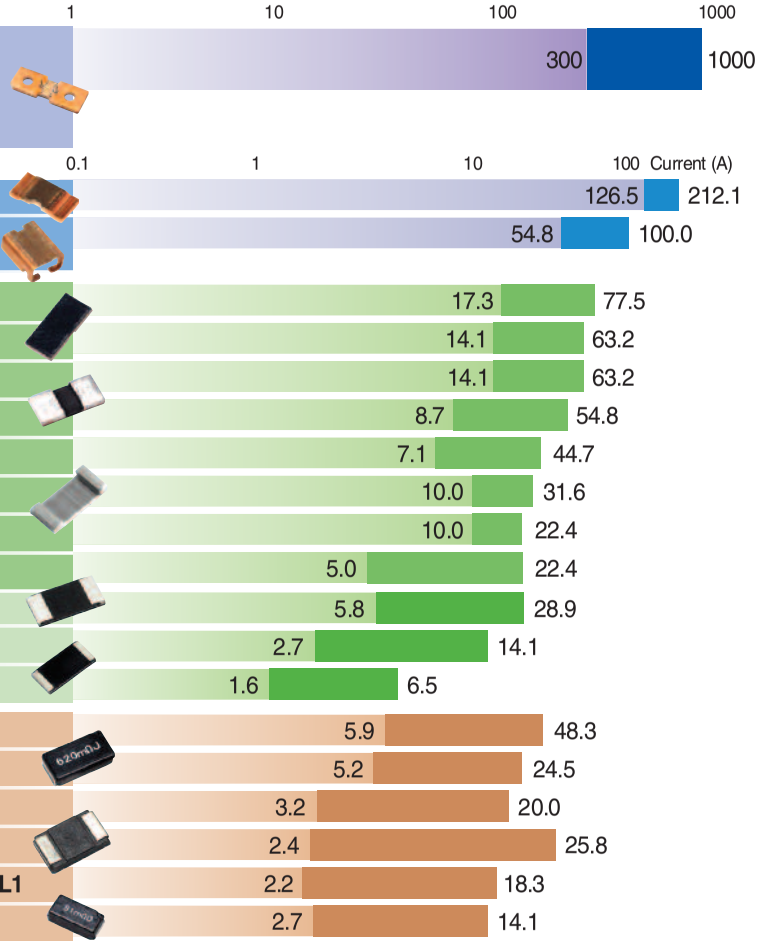
Applications: Current management sensor including charge/discharge of secondary batteries • Current control sensor of motors and DC/DC converters • Circuit protecting sensor by overcurrent detection

Current Sense Resistors

Current Ratings (A)

Specifications

		Current Ratings (A)	Resistance	Rated Power	Size	Tolerance
Large Current Shunt Resistors • Metal Plate Resistive Element • Large Current, High Precision	HSAN2P8022 HSAN2P4022 HSAN2P4015 HSBN2P8018	300 – 1000	50μΩ	50W	80x22mm 40x22mm	±5%
			100/200μΩ	36W/18W	80x18mm 40x15mm	±5%
			Resistance Range	Rated Power	Size (Inch)	Tolerance
Power Shunt Chip Resistors • Metal Plate Resistive Element • Large Current, High Precision	PSL2	126.5 – 212.1	0.2m~0.5mΩ	8W/9W	2512	±1%
	PSF4	54.8 – 100.0	0.5m/1mΩ	5W/3W	1216	±1%
Metal Plate Chip Type Low Resistance Resistors • Metal Plate Resistive Element • High Precision	TLR 3AP	17.3 – 77.5	0.5m~10mΩ	3W~5W	2512	±1%
	TLR 3AW	14.1 – 63.2	0.5m~10mΩ	2W	2512	±1%
	TLR 2HW	14.1 – 63.2	0.5m~10mΩ	2W	2010	±1%
	TLR 2BP	8.7 – 54.8	0.5m~20mΩ	3W/1.5W	1206	±1%
	TLR 2BW	7.1 – 44.7	0.5m~20mΩ	1W	1206	±1%
	TLR 2H	10.0 – 31.6	0.5m~10mΩ	1W	2010	±1%
	TLR 2A	10.0 – 22.4	2m~10mΩ	1W	0805	±1%
	TLR 2B/2BN	5.0 – 22.4	1m~20mΩ	0.5W	1206	±1%
	TLRH 3AP	5.8 – 28.9	6m~120mΩ	4~5W	2512	±1%
	TLRH 3AW	2.7 – 14.1	10m~270mΩ	2W	2512	±1%
	TLRH 2A	1.6 – 6.5	10m~100mΩ	0.25~0.5W	0805	±1%
Current Sense Chip Resistors • Metal Plate Resistive Element • Mold Package • High Reliability	SLN5	5.9 – 48.3	3m~200mΩ	7W	4527	±0.5,1,5%
	SLN3	5.2 – 24.5	5m~110mΩ	3W	4527	±0.5,1,5%
	SLN2	3.2 – 20.0	5m~200mΩ	2W	4527	±0.5,1,5%
	SL2	2.4 – 25.8	3m~360mΩ	2W	4527	±0.5,1,2,5%
	SLW1/SL1/TSL1	2.2 – 18.3	3m~200mΩ	1.5W/1W/1W	2512	±0.5,1,2,5%
	SLW07/SL07	2.7 – 14.1	5m~100mΩ	1W/0.75W	2010	±1,5%



KOA SPEER ELECTRONICS, INC.

Current Sense Resistors Selection Guide

Current Sense Resistors

Current Ratings (A)

		0.1 – 1 – 10 – 100 Current (A)	Resistance Range	Rated Power	Size (Inch)	Tolerance
Wide Terminal Flat Chip Resistors • Thick Film Resistive Element • High Power	WK73S 3A/3A3	0.41 – 17.3	10m~9.1Ω	1.5~2W/3W	0612	±0.5,1,5%
	WK73S 2H/2H2	0.33 – 14.1	10m~9.1Ω	1W/2W	1020	±0.5,1,5%
	WK73S 2B/2B15	0.29 – 12.2	10m~9.1Ω	0.75~1W/1.5W	0612	±0.5,1,5%
	WK73S 2J	0.33 – 10.0	10m~9.1Ω	1W	1218	±0.5,1,5%
	WK73S 2A	0.33 – 7.1	20m~9.1Ω	1W	0508	±0.5,1,5%
	WU73 2B/2B15	3.2 – 12.2	10m~100mΩ	1W/1.5W	0612	±1%
Low Resistance Flat Chip Resistors[*1] • Thick Film Resistive Element • High Precision	UR73V/VD 2B	2.2 – 10.0	10m~100mΩ	0.5~0.75W	1206	±1%
	UR73V/VD 2A	2.2 – 7.1	10m~100mΩ	0.5W	0805	±1%
	UR73D 3A	3.2 – 10.0	10m~100mΩ	1W	2512	±1%
	UR73D 2H	2.7 – 8.7	10m~100mΩ	0.75W	2010	±1%
	UR73/D 2B	2.2 – 7.1	10m~100mΩ	0.5W	1206	±1%
	UR73/D 2A	1.8 – 5.7	10m~100mΩ	0.33W	0805	±1%
	UR73D 1J	1.6 – 5.0	10m~100mΩ	0.25W	0603	±1%
	UR73D 1E	1.1 – 2.3	24m~100mΩ	0.125W	0402	±1%
Low Resistance Flat Chip Resistors • Thick Film Resistive Element • General-Purpose Type	SR73 W3A/W3A2	0.32 – 7.2	39m~10Ω	1W/2W	2512	±0.5,1,2,5%
	SR73 W2H	0.27 – 4.8	33m~10Ω	0.75W	2010	±0.5,1,2,5%
	SR73 2E	0.22 – 5.2	24m~10Ω	0.5~0.66W	1210	±0.5,1,2,5%
	SR73 2B	0.18 – 4.1	30m~10Ω	0.33~0.5W	1206	±0.5,1,2,5%
	SR73 2A	0.18 – 4.1	30m~10Ω	0.33~0.5W	0805	±0.5,1,2,5%
	SR73 1J	0.14 – 1.6	100m~10Ω	0.2~0.25W	0603	±0.5,1,2,5%
	SR73 1E	0.13 – 1.3	100m~10Ω	0.166W	0402	±0.5,1,2,5%
	SR73 1H	0.10 – 0.75	180m~10Ω	0.1W	0201	±0.5,1,2,5%

		0.1 – 1 – 10 – 100 Current (A)	Resistance Range	Rated Current	Size (Inch)
Large Current Chip Type Jumper • Metal Plate • Anti-Pulse	SLZ1	44.0	Max. 0.5mΩ	44A	2512
	TLRZ2B	50.0	Max. 0.2mΩ	50A	1206
	TLRZ2A	31.6	Max. 0.2mΩ	31.6A	0805
	TLRZ1J	26.0	Max. 0.2mΩ	26A	0603
	TLRZ1E	10.0	Max. 0.5mΩ	10A	0402

- This selection guide plots the current value calculated from (Power rating÷upper or lower limit of resistance). Please build the design considering heat dissipation.
- This is the guideline to select products by current value. Please confirm product specification for actual design and selecting products and use the products based on the precautions to use.
- Please confirm our catalog or delivery specification for the details of each product.

[*1] UR73/UR73D is only applied for car accessories as automotive use. Please ask us for details.

10/28/21

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KOA SPEER ELECTRONICS, INC.

Passive Components

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11/08/21

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Passive Components

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KOA SPEER ELECTRONICS, INC.

Restrictions of Hazardous Solutions

At KOA, we know taking care of the environment is important. That is why we have taken the steps to ensure we offer a product that fits your needs while adhering to global environmental regulations. In 2006, we complied with the EU's RoHS Directive, allowing us to offer products that are RoHS compliant, and in 2007 we met guidelines outlined in the IT Products Pollution Control Act for the People's Republic of China. In addition, we are now enforcing stricter chemical regulations set by Europe through watching the chemical input of our products. Our laboratory is now ISO/IEC 17025 certified, and we are constantly working to think of ways to improve our technology, such as by offering halogen-free specifications. By actively addressing our environmental impact today, you can be certain KOA will be there in your future.

EU RoHS COMPLIANT

What is EU RoHS?

The restriction of Hazardous Substances Directive (2002/95/EC), (RoHS), became effective on July 1 of 2006 requiring the usage of restriction of following six hazardous substances in the manufacture of electrical and electronic equipment placed on the market. This directive was amended on June 8 of 2011, to Recast Directive 2011/65/EU of the European Parliament and of the Council. The original directive was expired as of January 2, 2013 and replaced by a new directive (2011/65/EU) on the following day. Later, Annex II (Restricted Substances List) was amended by Commission Delegated Directive (2015/863/EU) and four phthalates were added to the restricted substances list. The followings are restricted substances and maximum concentration:

- Lead (0.1wt%)
- Mercury (0.1wt%)
- Cadmium (0.01wt%)
- Hexavalent Chromium (0.1wt%)
- Polybrominated biphenyls [PBBs] (0.1wt%)
- Polybrominated diphenyl ethers [PBDEs] (0.1wt%)
- Bis (2-ethylhexyl) phthalate [DEHP] (0.1wt%)
- Butyl benzyl phthalate [BBP] (0.1wt%)
- Dibutyl phthalate [DBP] (0.1wt%)
- Diisobutyl phthalate [DIBP] (0.1wt%)

* The percentage in parentheses show the maximum concentration value in the homogeneous material.

The restriction of applications in the annex in the directive is exempted.
KOA's products applicable with this exemption to EU RoHS2 are as follows (as of July 2019):

- Copper alloy containing up to 4% lead by weight.
- Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound.

To meet EU RoHS2, you need to choose lead (Pb) free material for termination surface material when our product has both type designation, leaded and lead free. Please contact our sales representatives for details.

Revised Chinese RoHS

(Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products)

China RoHS became effective in March 2007 and the Revised China RoHS was promulgated in January 2016 and became effective on July 1, 2016. The compliance management catalog (target products) and exemption list for the second step (inclusion restriction) were released in March 2018 and we must comply with requirements of the "evaluation system" from November 1, 2019.

For each product, we disclose the content information of the six hazardous substances directed by China RoHS. Please contact our sales representatives for details.

REACH

"Regulation concerning the Registration, Evaluation, Authorization and Restriction of Chemicals" (REACH) has been enforced on June 1 of 2007 in EU area.

This regulation is aiming at safety evaluation and risk management of chemical substances, which are required to register according to the amount if used in businesses. Substance of Very High Concern (SVHC) must be registered if it is included in article. Information on such substances is also required through supply chain.

KOA SPEER ELECTRONICS, INC.

Caution & Terms

general precautions

Precautions

All product specifications and data are subject to change without prior notice. Be sure to request and confirm the latest technical specifications before you order or use a part.

Matters common to all products

General

- For precautions in general, refer to "JEITA RCR-1001B Safety application guide on components for using electronic and electrical equipment" issued by JEITA.

Application

- Identify the application before the use of the product and contact us in advance if it involves transportation (automobiles, airplanes, trains and ships), medical equipment, space equipment, energy equipment, traffic and information facilities, which requires high reliability and its malfunction may threaten human life or property.
- Consider sufficient fail-safe design if the products are used in high-reliability applications. Ensure the safety of the whole system by using proactive and redundant circuits to avoid unsafe operation due to a single product failure.

Environment for Use

- Unless otherwise specified, these products are not to be used in special environments. Examine and confirm performance and reliability before you use KOA products in any of the following environments:
  1. Under direct sunlight, exposed to the outside or to dust.
  2. In liquids such as water, oil, organic solvent, or liquid chemicals or in areas where these liquids are used.
  3. In locations where the products are exposed to salt-water breezes or corrosive gases, including SO2, H2S, Cl2, NH3, NO2, etc.
  4. In locations with high static electricity and strong electromagnetic waves.
  5. In locations subject to condensation from dew.
  6. When the products or PCBs are sealed and coated by resin or other coating materials.
  7. In locations where the products are exposed to the fumes of lubricating oil.

Sulfuration

- Products with silver-based electrodes may increase in resistance in atmospheres containing sulfur gases (H2S, SO2, etc.) or when exposed to sulfide compounds. Take anti-sulfur measures in these environments.

Anti-pulse Characteristics

- If transient overloads such as power pulse or voltage/current surges are applied to KOA products, performance and reliability may be degraded. Contact KOA for data on antipulse characterstics and design help.
- Pay attention to discharges between terminations (arc-over) when high voltages are applied.

Storage

- Store KOA products in dust-free areas and keep them away from extreme temperatures; moisture; condensation; direct sunlight; salt-water breezes; corrosive gases such as SO2, H2S, Cl2, NH3, NO2, etc.; or fumes from lubricating oil. Use desiccants if necessary.
- Please contact KOA for conditions and length of storage.

Storage of the Products with Lead-free Termination

- Solderability may degrade faster for products with Pb-free terminals than for products with Pb-bearing terminals.

Mounting

- Avoid physical damage or shock to the products, which may happen by holding them with hard tools like pliers or tweezers or by imperfect mounting-machine alignment. This damage may affect electrical characteristics or lead to disconnection or cracking.
- If the bottom point of the mounting nozzle is too low, a product could be pushed onto the PCB, which may deteriorate electrical characteristics or lead to cracking. Decelerate the nozzle just before mounting, and mount the product after correcting PCB deformations.
- Do not use products that have fallen during mounting or that have already been removed from a PCB.
- Contact KOA if PCBs are molded or sealed by coating material after component mounting.
- Do not stack PCBs after mounting, because this may damage the components.
- The electrical characteristics of film-type resistors and sensors may be changed by electrostatic overvoltage. Keep electrostatic discharge away from components when assembling and handling by monitoring machines and human contact.
- Prevent or eliminate the introductino of ionic substances like salt, salinity, or sweat, as these substances may degrade resistance due to moisture or corrosion.

Soldering

- Perform soldering within the tempreature, time, and number of cycles specified for the product or its precautions. If a product is exposed to high temperatures for long periods of time, its color or electrical characterics may change or disconnection may occur.
- Prevent any external force from being applied to the products until solder has cooled.
- Handle carefully to prevent mechanical stresses, such as from the bending or warping of a PCB, on the solder fillet.
- Confirm that solder flux residue does not affect the product.
- Confirm that components are in place when conductive adhesive is used in place of solder.

Precautions for Soldering with Lead-free Solder

- In Pb-free soldering, temperature may be higher than in the use of eutectic solder. Confirm that soldering is acceptable under actual conditions.
- Solder fillets may lift off double-sided boards with through holes. Confirm the solder strength on actual board material before assembly.

Washing

- Confirm that solder flux residue does not remain after washing, because it may cause deterioration of moisture and corrosion resistance.
- Confirm reliability in advance when using no-clean solder, water, or a soluble agent.
- Since Pb-free solder may contain many ionic materials, use RMA type solder or flux or wash sufficiently.
- Wash thoroughly after soldering to remove ionic substances like sweat and salinity. Control the washing agent appropriately to remove all ionic substances. Consult KOA when using a washing agent such as acid, alkaline, or organic solvent other than alcohol.
- Ultrasonic washing may damage products due to vibration resonance. High hydraulic pressure may also damage products. Ask KOA in advance for washing conditions.
- Dry products thoroughly after washing.

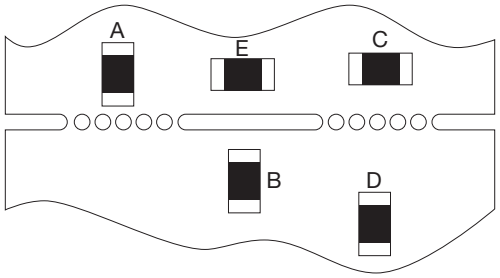
Dispose of the Products

- Observe appropriate laws and regulations for handling and disposal of products or packing materials.

The following precautions apply to surface mount devices

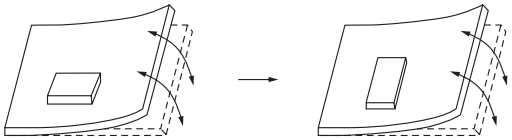
Precautions Related to PCB Bending Stress

- Arrange the long side of chip components parallel with the direction of the smaller coefficient of thermal expansion in anisotropic PCBs.
- Cracking of the solder fillet may occur with thermal cycling, because of mismatch of coefficients of thermal expansion between the board and the component. Pad size, amount of solder, and amount of heat radiating from the PCB must be designed carefully, especially with large components of 5 mm x 2.5 mm or larger.
- If products are mounted near a depaneling line, the termination or component may be damaged by large stresses during depaneling. Mount the products as shown in the following figure to minimize depaneling stress.



The level of stress on terminations A>B≠C>D>E

- Use proper layouts to avoid stress from warping, bending, or deformation of the board in order to avoid solder cracking or component damage.



Large stress Small stress

- Pay careful attention to products mounted near the edge of the board or near connectors, since stresses may happen during connection.
- Pay careful attention to layout when products are mounted near large components, when solder solidifies, it creates a stress in directions based on the large components, and cracking may occur.
- Design each land on right and left to have the same size. Different land size may change characteristics or cause cracks and tombstone effect while the solder is cooled down.

Mounting and Soldering

- Poor mounting machine adjustment may cause cracking, chipping, or alignment errors. Check and inspect the mounting machine in advance.
- Set backup pins in an appropriate layout to avoid damage to components mounted on the back of the board. Do not set these pins at nozzle positions.
- Adjust the bottom dead point of a dispenser away from the board when you apply adhesive to avoid damage to components mounted on the back of the board.
- Confirm that products solder properly if wave soldering is used.
- Pay close attention to amount of solder, since an improper amount may create a large stress on the component and cause cracking or malfunctions.

Soldering with a Soldering Iron

- Solder using a soldering iron at the temperature specified in the technical specifications or precautions for each product.
- Perform preheating as much as possible.
- Keep the tip of the soldering iron away from the body and the product terminal.
- Avoid physical damage or shock to components when using hard tools like pliers and tweezers.

The following precautions apply to through-hole devices

Mechanical Stress

- Play close attention to vibration resonance after mounting.
- Do not add additional bending or twisting stresses to the product.
- Fix large components firmly.
- When lead wires are to be bent, use a large radius of curvature to avoid excessive stress on the terminal joint. Excessive stresses may cause the lead wire to separate from the electrode cap and damage the product.
- Do not add excessive stresses to the product body when lead wires are cut or held by the mounting machine.

Temperature Rise

- Pay close attention to heat radiation and interaction with other components, since large resistors general a large amount of heat when the rated power is applied.

Higher Power Ratings

In some cases, KOA will increase the power rating for a given component. Often, the older power rating and newer power rating are both given on the specification, in order to create a transition period. During this time, the new power rating will often have a note asking for discussion with KOA.

A higher power rating is based on appropriate resistance stability, but other ratings and parameters still require attention. For example, voltage rating is based on a separate failure mechanism and will not be increased in the same ratio. In mid- and high-value resistors, power dissipation will still be kept lower than the new rating by the voltage limit. In addition, using a resistor at a higher power than its previous rating will create a greater rise in temperature on the surface of the component. This temperature rise should be checked for acceptability and to make sure that the layout does not place the resistor near a board material or component that could be damaged by greater heat.

KOA SPEER ELECTRONICS, INC.

Caution & Terms

derating curves

Introduction of the Derating Curves Based on the Terminal Part Temperature

Background

Recent studies have led to better practices for miniaturizing high-power components in high-temperature automotive environments. Applications that require high-temperature resistors have increased dramatically. Recently, derating guidelines based on the resistor's terminal temperature, such as the diagram in figure 1, have been introduced to respond to these requirements.

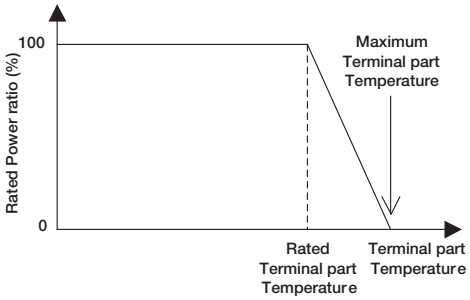


Figure 1. Derating curve based on the terminal part temperature

The derating curves based on the terminal part temperature is already used in the metal plate type ultra-low resistance value resistors for current sensing. It is because these resistors are used in sensing of large currents such as inverters and converters which the terminal part temperature rise irrelevantly from the ambient temperature because of the generated heat from the nearby switching elements or the large current applied to the copper pattern. This point of view was deployed to the general resistors as well.

Overview of the Establishment of the Derating Curves Based on Ambient Temperature

The traditional derating curve, which is based on ambient temperature, was defined by IEC and JIS during the vacuum tube era, long before the appearance of surface-mount resistors. At the time, there were no printed circuit boards, and cylindrical resistors with lead wires were held above the board by lug terminals, as shown in figure 2.

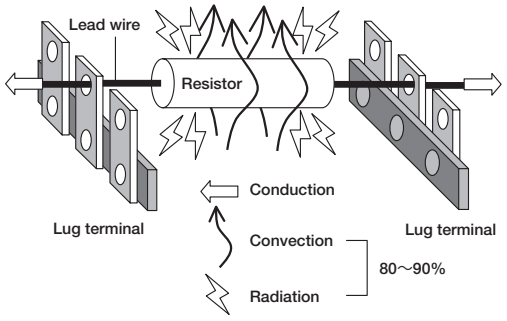


Figure 2. Heat dissipation of cylindrical resistors

Regardless of the shape of the resistor, the heat generated by its use is dissipated through three pathways. One path is conduction through solids such as the terminal. The second path is convection, usually heat transfer into the air by natural convection. The third path is radiation of infrared. Of these pathways, conduction increases with the area of solid connected the resistor. Convection and radiation increase with the total surface area of the resistor.

When cylindrical resistors with lead wires are mounted on lug terminals, the lead wire is long and thin, so the thermal resistance to conduction is high, and heat dissipation through that path is low. On the other hand, the dissipation of heat by convection and radiation is high, because the surface area of the resistor is large. Simulation shows that 80% to 90% of the heat from a cylindrical, lead-wire resistor is dissipated directly into the ambient air. The temperature of the resistor can be calculated by adding the temperature rise caused by self-heating to the ambient temperature. Because the ambient is sufficient to estimate the thermal resistance for most of the heat dissipation, the traditional derating curve was based on it.

Heat Dissipation of Surface Mount Resistors

Figure 3 shows the main heat dissipation paths for modern surface mount resistors. This type of resistor has only a small surface area, so convection and radiation have proportionally less heat dissipation. On the other hand, since the device is directly connected to the PCB pattern by a large part of the surface area, conduction will be the primary path for heat dissipation. In general, conduction through the terminal to the board represents over 90% of the heat dissipation, even when convection and radiation are presumed to be at their maximum levels. Therefore, the terminal temperature, on the main heat pathway, is the best location to monitor for controlling power dissipation.

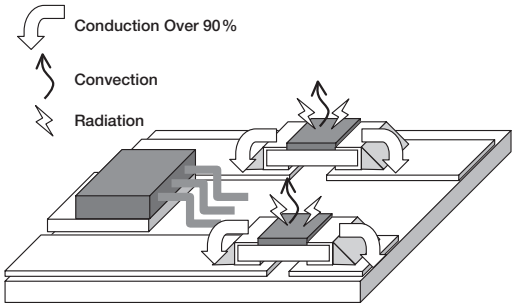


Figure 3. Heat dissipation of surface mount resistors

Derating Curve Suitable for the Surface Mount Resistor

As shown in figure 4, when a given amount of power is applied to the resistor, any given point on the resistor's surface will have the same temperature rise over the terminal temperature, regardless of ambient temperature. This is because there is very little heat dissipation from the resistor's surface to the ambient air.

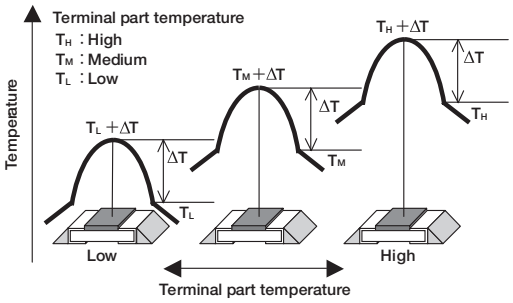


Figure 4. Contributing factor to the temperature of the surface mount resistor

However, surface temperatures at a given power will differ between different PCB designs, since the terminal temperature will be different. When resistors are mounted close to each other or other heat-generating devices, as shown in figure 5, there is a possibility that the temperature will be higher than the 70°C ambient temperature threshold used in the traditional JIS/IEC derating curve.

The traditional derating curve based on ambient temperature usually uses 70°C as the ambient temperature above which parts are to be derated. There will be no problem if resistors are used with sufficient electrical and thermal margin, but recent trends to miniaturization, high power density, and high-temperature use have reduced margins on design.

Redefining derating based on terminal temperature is a way to better represent the capabilities of the part. KOA will provide a derating curve suitable for surface mount resistors, based on testing under conditions where power rating is defined in terms of terminal temperature (as seen in terms & definitions).

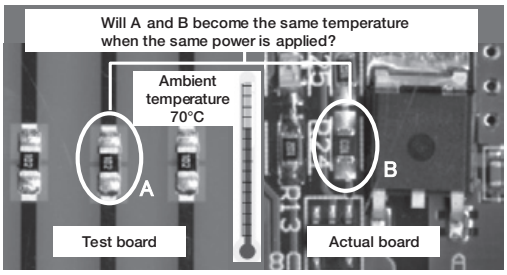


Figure 5. Temperature differs depending on the board

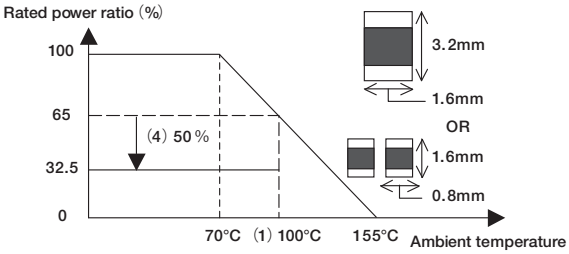
How to Use the Derating Curve Based on the Terminal Part Temperature

Here are some examples on using terminal temperature derating that lead to greater factors of safety, reduction in number of resistors, or use of a smaller component. The prior conditions will be the following (Be aware that the terminal part temperature does not always become 120°C when the ambient temperature is 100°C):

(1) Ambient temperature of the board: 100°C

(2) Terminal temperature of the surface mount resistor: 120°C

(3) Actual power load: 0.05W



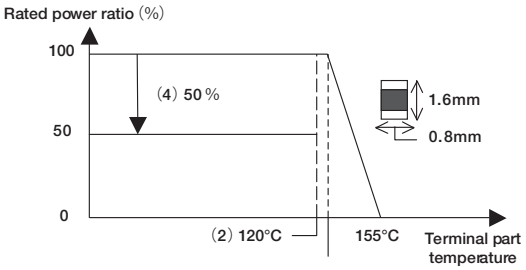
Necessary rated power= (3) 0.05/0.325=0.154W
1 piece of 2A (2012mm rated power 0.25W)
2 pieces of 1E size (1005mm rated power 0.1W)

Figure 6. Selection by the traditional derating curve

(4) Required margin of safety below rating according to designer's internal guidelines: 50%

The required power rating for the resistor using the ambient-temperature derating curve is calculated from conditions (1), (3), and (4). Figure 6 shows this result. For KOA's RK73B resistor series, one piece of 2A size, or two pieces of 1W size will be required.

However, when a resistor is selected using the terminal-temperature derating curve, which is better suited to surface-mount parts, conditions (2), (3), and (4) show that a single 1E (0402) size RK73B resistor would be sufficient.



100% until terminal part temperature is 125°C

Necessary rated power= (3) 0.05/0.5=0.1W
1 piece of 1E size (1005mm) rated power 0.1W

Figure 7. Selection using a terminal-temperature derating curve

As seen above, the number of resistors and the mounting area can be reasonably reduced by using the proper derating curve based on terminal temperature, and this will lead to cost savings.

Type	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.
SG73S 2A	0.25W	70°C	125°C
SG73P 2A	0.5W	—	100°C

Table 1. Rating column of products with 2 rated power

Derating curve suitable for the surface mount resistor

As shown in Table 1, for the surface mount resistors, there are products that have 2 rated powers for the same type in the rating column. The high rated power is basically available and applicable only to boards with adequate heat dissipation design for example multilayer boards, DCB (direct copper bonding) boards and single layer boards with wide heat dissipation area land. Therefore, the horizontal axis of the derating curve for high rated power is only defined with the terminal part temperature and please be careful that the conventional derating curve defined by the ambient temperature cannot be used in this case. For these products, "-" will be shown in the rated ambient temperature column which means "Not Applicable."

In addition, we implement load life tests for the products with high rated power by using a test board that can specially control the terminal part temperature.

In the case of Table 1, there will be 3 derating curves as shown from Figure 8 to Figure 10.

How to use each derating curve is shown as the following.

When 0.25W is the rated power

When the terminal part temperature can be measured:

The derating curve in Figure 8 can be applicable and it can be used with rated power 0.25W up to terminal part temperature 125°C. The derating curve with the horizontal axis based on the terminal part temperature supersedes the conventional derating curve with the horizontal axis based on the ambient temperature. Therefore, even when the ambient temperature exceeds 100°C, it can be used with rated power 0.25W as long as the terminal part temperature is below 125°C.

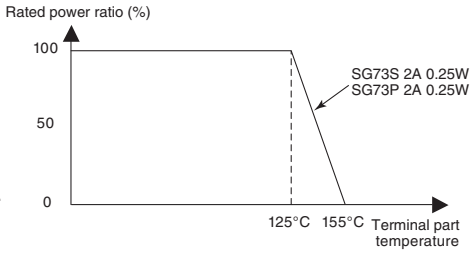


Figure 8. Derating curve of 0.25W rated power based on terminal part temperature

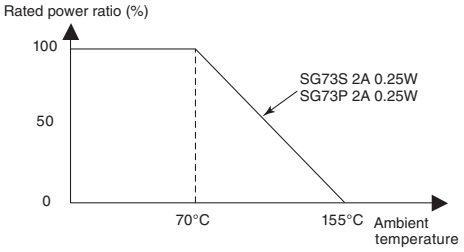


Figure 9. Derating curve of 0.25W rated power based on ambient temperature

When the terminal part temperature is not measured and only the ambient temperature is measured:

The product may be used by derating the load power from the ambient temperature 70°C according to the conventional derating curve shown in Figure 9. However, as mentioned in the past descriptions, the temperature of the resistor differs according to the wiring patterns and heat generating components nearby, even when the ambient temperature is the same, so it is not a derating method with good precision.

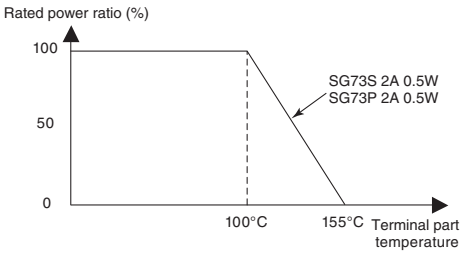


Figure 10. Derating curve of 0.5W rated power based on terminal part temperature

When 0.5W is the rated power

Managing the terminal part temperature is the requirement to apply the rated power 0.5W. Only the derating curve with the horizontal axis based on the terminal part temperature as shown in Fig.10 can be used but it can assure up to the high power. The product can be used with 0.5W if the terminal part temperature is below 100°C.

Reference: IEC TR 63091:2017 "Study for the derating curve of surface mount fixed resistors-derating curves based on the thermal part temperature."

KOA SPEER ELECTRONICS, INC.

Caution & Terms

resistors

Precautions for the Resistors

Refer to the precautions of common matters for all products in the beginning of this catalog for the matters common to all products.

General in Fixed Resistors

- When the resistors are operated in ambient temperature above the rated temperature, the power rating must be derated according to the derating curve.
- Resistors in general may emit flame, fire or smoke when overload is applied.
- Flame retardant resistors may emit smoke or appear red hot when overload is applied but are unlikely to emit flame or fire.
- When the resistors are sealed and coated by coating materials such as resin, deterioration of the resistor by thermal stress or resin may affect the characteristics. Confirm with KOA for the performance and reliability specifications in advance.

  When the resin absorbs moisture, the resistance to moisture and corrosion of the resistor may deteriorate, so be aware.
- When the resistor is coated, potted or molded by resin materials, the curing stress could cause peeling of protective coating and cracking of solder fillet, resulting in resistance change and disconnection. Do not coat nor seal the flame retardant coated resistors.
- Allow enough time for cooling after mounting metal film resistors, before washing off the flux. Residues of ionic substances may deteriorate resistances to moisture and corrosion.
- KOA can only guarantee safety when the average power is below the rated power, When power, exceeding the rated power, is applied for a short duration, please contact us with the surge voltage or current waveform for advice.
- Cylindrical film resistors have inductance due to the spiral trimming.

  Please be aware when using in a high-frequency circuit.
- The flame retardant resistors are weak against mechanical stress compared with the general resistors due to the special coating. Please do not apply impact, vibration or pinching with pliers, tweezers to the resistor body. Do not apply any external force to the protective coating until drying is fully completed after washing.

Wirewound Type Resistors

- Wirewound type resistors have inductances and parasitic capacitances resulting from the winding structure. Therefore, they could resonate when used in a high frequency circuit.

Fusing Resistors

- Confirm beforehand that the overload condition of the abnormal situations are within the fusing characteristics.
- Contact KOA in advance when excess overload above the rated voltage is continuously applied, since there is a possibility of damage accumulated in the resistor.
- The arc phenomenon may occur when high voltage is applied again after fusing by over current. Make sure to use the product below the maximum open circuit voltage.
- Contact KOA about the maximum open circuit voltage, it varies depending on the product type and resistance.
- The fusing characteristics could change when the resistors are coated, potted and molded by resin materials.

Reference

- For the basic precautions of using resistors, refer to the technical report, "JEITA RCR-2121B Safety application guide for fixed resistors for use in electronic equipment", issued by JEITA.

Terms and Definitions

Nominal Resistance
- Designed resistance value usually indicated on the resistor.

Power Rating
- Maximum allowable power at rated temperature. Some of our chip resistor arrays and networks specify the power rating for the entire package, as opposed to each element.

Rated Ambient Temperature
- Maximum ambient temperature at which the power rating may be applied continuously. The rated ambient temperature refers to the temperature around the resistor mounted inside the equipment, not to the air temperature outside the equipment.

Rated Terminal Part Temperature
- Maximum terminal part temperature of the surface mount resistor at which the power rating may be applied continuously. Includes the temperature rise by self heat generation.

Derating Curve
- Curve that expresses the relation between ambient temperature or terminal part temperature and the maximum allowable power, which is generally expressed in percentage.

Rated Voltage
- Maximum allowable D.C. or A.C. voltage, to be continuously applied to a resistor or a resistor element.

  Rated Voltage (V) = $\sqrt{\text{Rated Power (W) X Nominal Resistance Value (}\Omega\text{)}}$
  Rated voltage shall be the calculated value or max. working voltage, whichever is lower.

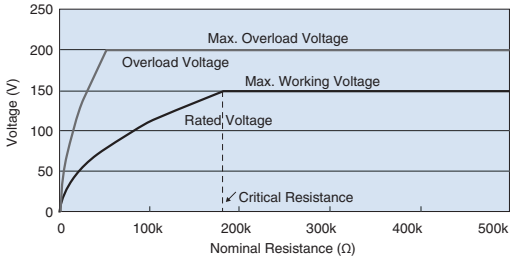
Critical Resistance
- The maximum nominal resistance value at which the rated power can be applied without exceeding the maximum working voltage. The rated voltage is equal to the max. working voltage at the critical resistance value.

Max. Working Voltage
- Maximum D.C. or A.C. voltage (rms) that can be continuously applied to the terminations of a resistor. However, the maximum value of the applicable voltage is the rated voltage at the critical resistance value or lower.

  Maximum working voltage and rated voltage are calculated D.C. voltage based on rated power. Sine wave is assumed for the A.C. voltage so the peak voltage should be $\sqrt{2}$ times the maximum working voltage. When the wave form is not a sine wave, or when the resistance value exceeds the critical resistance, please contact us for the applicable peak voltage.

Overload Voltage
- Allowable voltage which is applied for 5 sec. according to the short time overload test. Overload voltage shall be 2.5 times of rated voltage or max. overload voltage, whichever is lower.

Maximum Overload Voltage
- Largest value of overload voltage



Example of Various Voltage of RK73G 2A

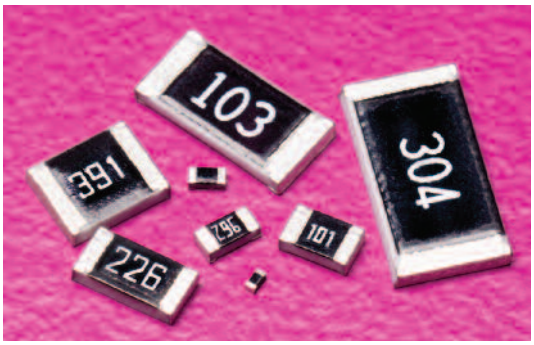
Dielectric Withstanding Voltage
- A.C. voltage (rms) that can be applied to a designated spot between the electrode and the outer coating for one minute according to the proof test.

Temperature Coefficient of Resistance (T.C.R.)
- Relative variation of resistance between two given temperatures when temperature is changed by 1K, which is calculated by the following formula.

$$\text{T.C.R. } (\times 10^{-6}/\text{K}) = \frac{R-R_0}{R_0} \times \frac{1 \times 10^6}{T-T_0}$$

R : Resistance value (Ω) at T
R_0 : Resistance value (Ω) at T_0
T : Measured test temperature (°C)
T_0 : Measured base temperature (°C)

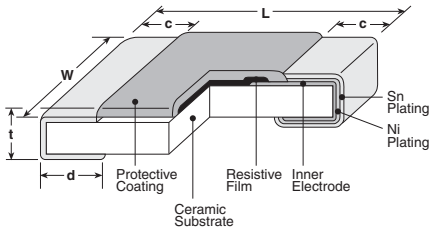
EU RoHS COMPLIANT



features

- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested: 0201 (1H), 0402 (1E), 0603 (1J), 0805 (2A), 1206 (2B), 1210 (2E), 2010 (2H/W2H), 2512 (3A/W3A/W3A2)

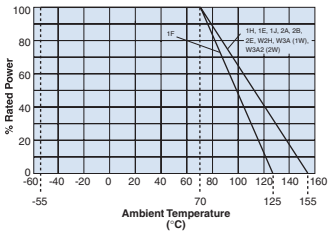
dimensions and construction

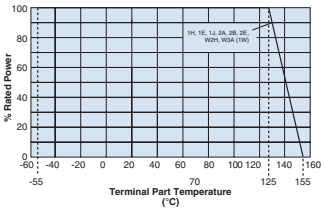


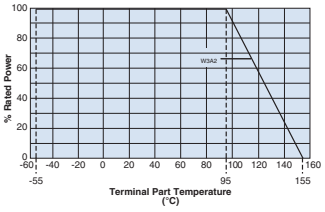
Type*1 (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1F (01005)	.015±.001 (0.4±0.02)	.007±.001 (0.2±0.02)	.004±.001 (0.10±0.03)	.004±.001 (0.11±0.03)	.005±.001 (0.13±0.02)
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
1J AT (0603)			.014±.006 (0.35±0.15)	.02±.008 (0.5±0.2)	
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2A AT (0805)			.018±.010 (0.45±0.25)	.024±.008 (0.6±0.2)	.022±.004 (0.55±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2B AT (1206)			.022±.012 (0.55±0.35)	.031±.008 (0.8±0.2)	
2E (1210)		.102±.008 (2.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)			
W2H (2010)				.026±.006 (0.65±0.15)	
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)		.016 +.008 -.004 (0.4 +0.2 -0.1)	
W3A/W3A2 (2512)				.026±.006 (0.65±0.15)	

*1 Parentheses indicate EIA package size codes.

Derating Curve







For resistors operated at an ambient temperature of 70°C or higher, the power shall be derated in accordance with the above derating curve.

When the terminal part temperature of the resistor exceeds the rated terminal part temperature shown above, the power shall be derated according to the derating curve.

Please refer to "Introduction of the derating curves based on the terminal part temperature" on the beginning of our catalog before use

ordering information

RK73B	2B		T	TD	102	J
Type	Size	Characteristics	Termination Material	Packaging	Nominal Resistance	Tolerance
	1F 1H 1E 1J 2A 2B 2E W2H W3A 2H 3A W3A2	Nil: Standard **New** A: Heat shock resistance *2	T: Sn G: Au *3 (L: Sn/Pb*4)	TX: 01005 only: 4mm width - 1mm pitch plastic embossed TBL, TCM: 01005 only: 2mm pitch pressed paper TPL: 0402 only: 2mm pitch punched paper TP: 0402, 0603 & 0805: 7" 2mm pitch punched paper TD: 0603, 0805, 1206 &1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" 4mm plastic embossed	2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	G: ±2% J: ±5%

*2 With type A only T is available as the terminal surface material.

*3 Products with gold plated electrodes are also available with 1E, 1J and 2A types (10Ω~1MΩ), so please consult with us.

*4 With type 1F, 1H, W2H, W3A, W3A2 only T is available as the terminal surface material.

The terminal surface material lead free is standard.

For further information on packaging, please refer to Appendix A

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/09/21

KOA SPEER ELECTRONICS, INC.

RK73B

general purpose 2%, 5% tolerance thick film chip resistor

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (x10^{-6}/K)	Resistance Range G±2% E-24	Resistance Range J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
RK73B1F (01005)	0.03W	70°C	—	±200	100kΩ - 1MΩ	100kΩ - 10MΩ	20V	30V	-55°C to +125°C
				±250	10Ω - 91kΩ	10Ω - 91kΩ			
				0~+300	1Ω - 9.1Ω	1Ω - 9.1Ω			
RK73B1H (0201)	0.05W		125°C	±200	10Ω - 10MΩ	10Ω - 10MΩ	25V	50V	-55°C to +155°C
				±400	—	1Ω - 9.1Ω			
RK73B1E (0402)	0.1W			±200	1Ω - 10MΩ	1Ω - 10MΩ	75V	100V	
RK73B1J (0603)	0.1W			±200	1.1kΩ - 1MΩ	1.1kΩ - 10MΩ	75V		
	0.125W			±400	—	11MΩ - 22MΩ			
RK73B2A (0805)	0.25W			±200	1Ω - 1kΩ	1Ω - 1kΩ			
				±200	1Ω - 1MΩ	1Ω - 1MΩ	150V	200V	
				±400	1.1MΩ - 10MΩ	1.1MΩ - 10MΩ			
RK73B2B (1206)	0.25W			±200	1Ω - 5.6MΩ	1Ω - 5.6MΩ	200V	400V	
				±400	6.2MΩ - 10MΩ	6.2MΩ - 22MΩ			
RK73B2E (1210)	0.50W			±200	10Ω - 5.6MΩ	1Ω - 5.6MΩ			
				±400	—	6.2MΩ - 10MΩ			
RK73BW2H/2H (2010)	0.75W			±200	10Ω - 5.6MΩ	1Ω - 5.6MΩ			
				±400	—	6.2MΩ - 22MΩ			
RK73BW3A/3A (2512)	1.0W			±200	10Ω - 5.6MΩ	1Ω - 5.6MΩ	200V	400V	
				±400	—	6.2MΩ - 22MΩ			
RK73BW3A2 (2512)	2.0W		95°C	±200	10Ω - 5.6MΩ	1Ω - 5.6MΩ	200V	400V	
				±400	—	6.2MΩ - 22MΩ			

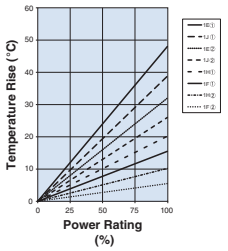
Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

If any questions arise on whether to use the "Rated Ambient Temperaute" or the "Rated Terminal Part Temperature" in your usage conditions, please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details, refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog. Temperature rise at high power will depend on PCB layout. Be sure to contact factory prior to use and monitor terminal part temperature.

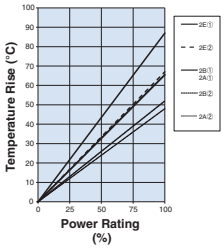
environmental applications

Temperature Rise

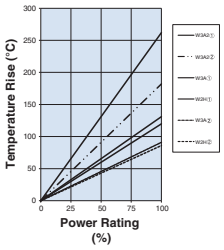
RK73B 1F-1J



RK73B 2A-2E

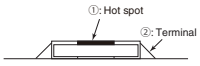


RK73B W2H-W3A2



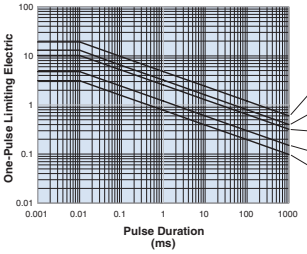
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

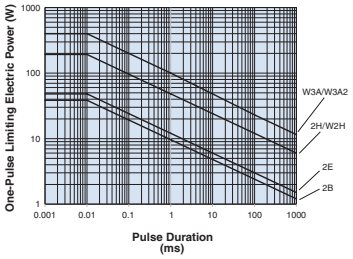


One-Pulse Limiting Electric Power

RK73B 1F-2A



RK73B 2B-W3A2



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement Δ R (%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±1%: 1F ±0.5%: Another	Rated Voltage x 2.5 for 5 seconds (1E, 2B, W3A2: Rated Voltage x 2 for 5 seconds)
Resistance to Soldering Heat	±1%: 1F~W3A2 (10Ω≤R≤1MΩ) ±3%: 1F~W3A2 (R<10Ω, R>1MΩ)	±0.5%: 1F~W3A2 (10Ω≤R≤1MΩ); ±1%: 1F~W3A2 (R<10Ω, R>1MΩ)	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1%: 1F ±0.5%: Another	±0.5%: 1F ±0.3%: Another	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: Another	±0.75%: 1J, 2A, 2B ±1.5%: 1F; ±1%: Another	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B ±3%: Another	±0.75%: 1J, 2A, 2B ±1%: Another	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.5%: 1F ±0.3%: Another	+125°C, 1000 hours: 1F; +155°C, 1000 hours: 1E, 1H, 1J, 2A, 2B, 2E, 2H/W2H, 3A/W3A/W3A2

10/19/20

KOA SPEER ELECTRONICS, INC.

RK73H

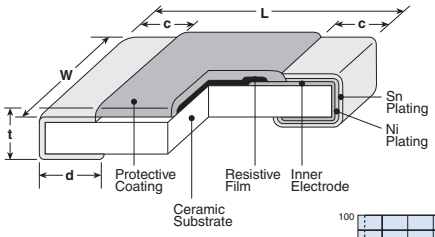
precision 0.5%, 1% tolerance thick film chip resistor

EU RoHS COMPLIANT

features

- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested: 0201 (1H), 0402 (1E), 0603 (1J), 0805 (2A), 1206 (2B), 1210 (2E), 2010 (2H/W2H), 2512 (3A/W3A/W3A2)

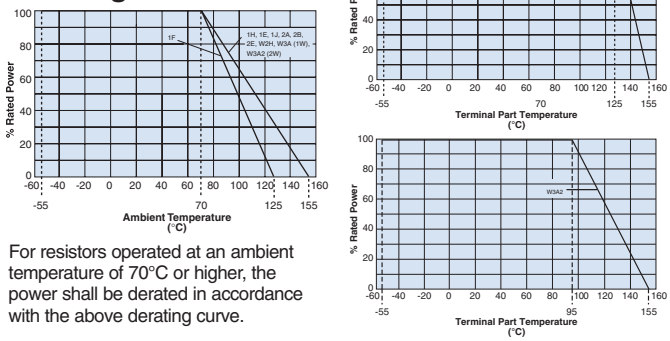
dimensions and construction



Type* (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1F (01005)	.016±.0008 (0.4±0.02)	.008±.0008 (0.2±0.02)	.004±.001 (0.1±0.03)	.004±.001 (0.11±0.03)	.005±.0008 (0.13±0.02)
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
1J AT (0603)			.014±.006 (0.35±0.15)	.02±.008 (0.5±0.2)	
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2A AT (0805)			.018±.010 (0.45±0.25)	.024±.008 (0.6±0.2)	.022±.004 (0.55±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2B AT (1206)			.022±.014 (0.55±0.35)	.031±.008 (0.8±0.2)	
2E (1210)		.102±.008 (2.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)			
W2H (2010)				.026±.006 (0.65±0.15)	
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)		.016 +.008 -.004 (0.4 +0.2 -0.1)	
W3A/W3A2 (2512)				.026±.006 (0.65±0.15)	

* Parentheses indicate EIA package size codes.

Derating Curve



For resistors operated at an ambient temperature of 70°C or higher, the power shall be derated in accordance with the above derating curve.

When the terminal part temperature of the resistor exceeds the rated terminal part temperature shown above, the power shall be derated according to the derating curve.

Please refer to "Introduction of the derating curves based on the terminal part temperature" on the beginning of our catalog before use

ordering information

RK73H	2B		T	TD	1003	F
Type	Size	Characteristics	Termination Material	Packaging	Nominal Resistance	Tolerance
	1F, 1H 1E, 1J 2A, 2B 2E W2H W3A 2H, 3A W3A2	Nil:Standard New A: Heat shock resistance *2	T: Sn G: Au *3 (L:Sn/Pb*4)	TX: 01005 only: 4mm width - 1mm pitch plastic embossed TBL, TCM: 01005 only: 2mm pitch pressed paper TPL: 0402 only: 2mm pitch punch paper TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" 4mm embossed plastic	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	D: ±0.5% F: ±1%

*2 With type A only T is available as the terminal surface material.

*3 Products with gold plated electrodes are also available with 1E, 1J and 2A types (10Ω~1MΩ), so please consult with us

*4 With type 1F, 1H, W2H, W3A, W3A2 only T is available as the terminal surface material.

The terminal surface material lead free is standard.

For further information on packaging, please refer to Appendix A

KOA SPEER ELECTRONICS, INC.

RK73H

precision 0.5%, 1% tolerance thick film chip resistor

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (x10⁻⁶/K)	Resistance Range D±0.5% E-24, E-96	Resistance Range F±1% E-24, E-96*	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
RK73H1F (01005)	0.03W	70°C	—	±200	—	100kΩ - 2MΩ*	20V	30V	-55°C to +125°C
				±250	—	10Ω - 91kΩ*			
RK73H1H (0201)	0.05W		125°C	±200	10Ω - 1MΩ	10Ω - 10MΩ*	25V	50V	-55°C to +155°C
				±400	—	1.0Ω - 9.1Ω*			
RK73H1E (0402)	0.1W			±100	10Ω - 1MΩ	10Ω - 1MΩ	75V	100V	
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 10MΩ			
RK73H1J (0603)	0.1W			±100	1.02kΩ - 1MΩ	1.02kΩ - 1MΩ	75V		
				±200	—	1.02MΩ - 10MΩ			
	0.125W			±100	10Ω - 1kΩ	10Ω - 1kΩ			
				±200	—	1.0Ω - 9.76Ω			
RK73H2A (0805)	0.25W			±100	10Ω - 1MΩ	10Ω - 1MΩ	150V	200V	
				±200	—	1.0Ω - 9.76Ω			
				±400	—	1.02MΩ - 10MΩ			
RK73H2B (1206)	0.25W			±100	10Ω - 1MΩ	10Ω - 1MΩ	200V	400V	
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ			
				±400	—	5.62MΩ - 10MΩ			
RK73H2E (1210)	0.5W			±100	10Ω - 1MΩ	10Ω - 1MΩ			
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ			
				±400	—	5.62MΩ - 10MΩ			
RK73HW2H/2H (2010)	0.75W			±100	10Ω - 1MΩ	10Ω - 1MΩ			
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ			
				±400	—	5.62MΩ - 10MΩ			
RK73HW3A/3A (2512)	1.0W			±100	10Ω - 1MΩ	10Ω - 1MΩ	200V	400V	
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ			
				±400	—	5.62MΩ - 10MΩ			
RK73HW3A2 (2512)	2.0W		95°C	±100	10Ω - 1MΩ	10Ω - 1MΩ	200V	400V	
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ			
				±400	—	5.62MΩ - 10MΩ			

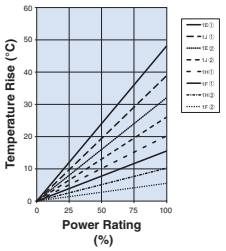
Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

*1F: E-24. 1H: 1.0~9.1, 1M~10MΩ: E-24. If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of the catalog. While using under high power, the temperature of the product may increase depending on the condition of heat dissipation from PCB. Be sure to check the terminal part temperature as well as precautions to use on delivery specification before use.

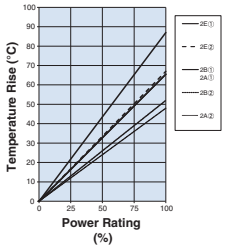
environmental applications

Temperature Rise

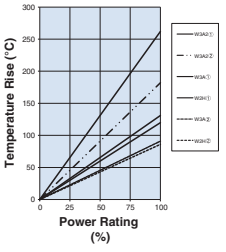
RK73H 1F-1J



RK73H 2A-2E

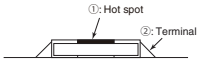


RK73H W2H-W3A2



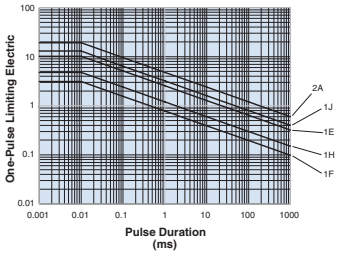
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

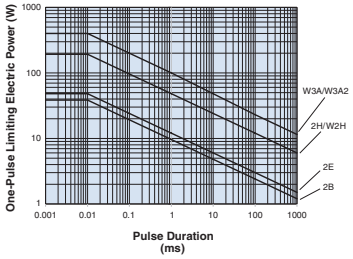


One-Pulse Limiting Electric Power

RK73H 1F-2A



RK73H 2B-W3A2



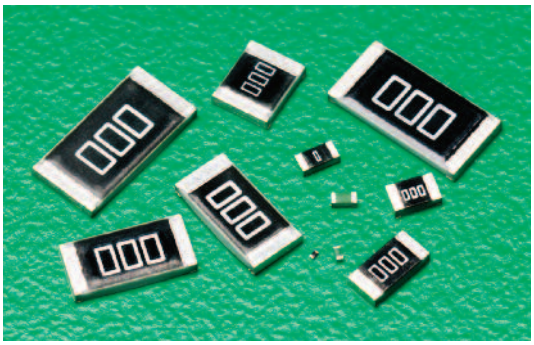
The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement Δ R (%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±1%: 1F; ±0.5%: Another	Rated Voltage x 2.5 for 5 seconds (1E, 2B, W3A2: Rated Voltage x 2 for 5 seconds)
Resistance to Soldering Heat	±1%: 1F ~ W3A2 (10Ω≤R≤1MΩ); ±3%: 1H ~ W3A2 (R<10Ω, R>1MΩ)	±0.5%: 1F ~ W3A2 (10Ω<R<1MΩ); ±1%: 1H ~ W3A2 (R<10Ω, R>1MΩ)	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1%: 1F; ±0.5% Another	±0.5%: 1F; ±0.3% Another	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: Another	±0.75%: 1J, 2A, 2B; ±1.5%:1F, ±1%: Another	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B; ±3%: Another	±0.75%: 1J, 2A, 2B; ±1%: Another	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.5%: 1F ±0.3%: Another	+125°C, 1000 hours: 1F; +155°C, 1000 hours: 1E, 1H, 1J, 2A, 2B, 2E, 2H/W2H, 3A/W3A/W3A2

10/19/20

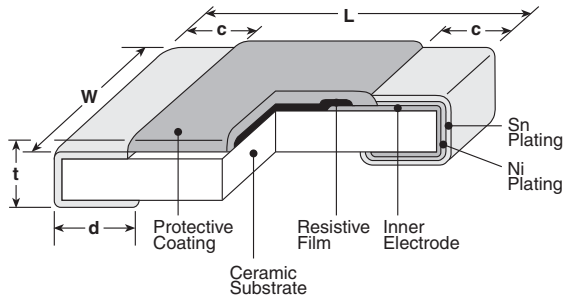
EU RoHS COMPLIANT



features

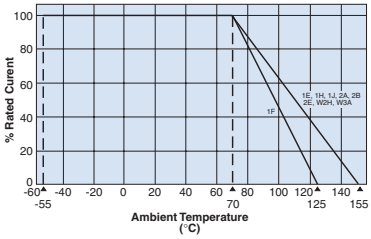
- Silver element
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested: 0201(1H), 0402(1E), 0603(1J), 0805(2A), 1206(2B), 1210(2E), 2010(2H/W2H), 2512(3A/W3A)

dimensions and construction

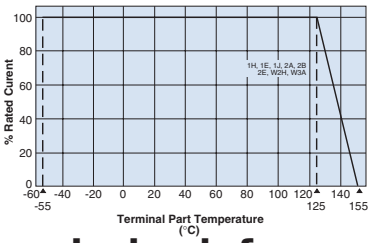


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1F (01005)	.016±.0008 (0.4±0.02)	.008±.0008 (0.2±0.02)	.004±.001 (0.10±0.03)	.004±.001 (0.11±0.03)	.005±.0008 (0.13±0.02)
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
1J AT (0603)			.014±.006 (0.35±0.15)	.02±.008 (0.5±0.2)	
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2A AT (0805)			.018±.010 (0.45±0.25)	.024±.008 (0.6±0.2)	.022±.004 (0.55±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2B AT (1206)			.022±.014 (0.55±0.35)	.031±.008 (0.8±0.2)	
2E (1210)		.102±.008 (2.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)			
W2H (2010)				.026±.006 (0.65±0.15)	
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)		.016 +.008 -.004 (0.4 +0.2 -0.1)	
W3A (2512)				.026±.006 (0.65±0.15)	

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a current rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RK73Z	2B		T	TD
Type	Size	Characterisitics	Termination Material	Packaging
	1F 2E 1H W2H 1E W3A 1J 2H 2A 3A 2B	Nil: Standard **New** A: Heat shock resistance *2	T: Sn G: Au *3 (L:Sn/Pb *4)	TX: 01005 only: 4mm width - 1mm pitch embossed plastic TBL, TCM: 01005 only: 2mm pitch pressed paper TPL, TP: 0402 only: 2mm pitch punch paper TD: 0603, 0805, 1206, 1210:7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" 4mm pitch embossed plastic

*2 With type A only T is available as the terminal surface material.

*3 Products with gold plated electrodes are also available with 1E, 1J and 2A types (10Ω~1MΩ), so please consult with us.

*4 With type 1F, 1H, W2H, W3A, W3A2 only T is available as the terminal surface material.

For further information on packaging, please refer to Appendix A

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/09/21

KOA SPEER ELECTRONICS, INC.

RK73Z

zero ohm jumper chip resistor

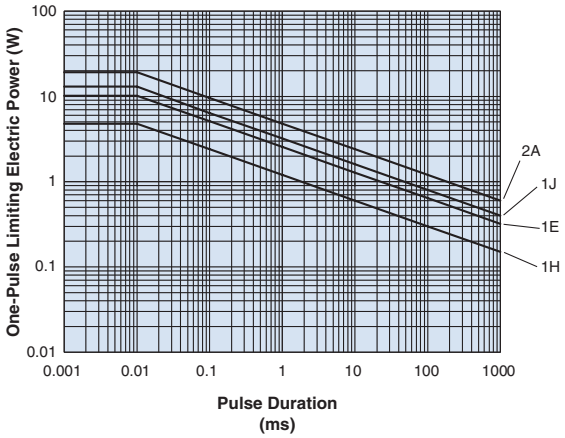
applications and ratings

Part Designation	Rated Ambient Temperature	Rated Terminal Part Temperature	Maximum Continuous Current @ 70°C	Maximum Overload Current @ 70°C (for < 1 second)	Maximum Resistance	Operating Temperature Range
RK73Z1F	70°C	—	0.5 Amps	1.0 Amp Max.	50mΩ	-55°C to +125°C
RK73Z1H		125°C	0.5 Amps	1.0 Amp Max.		-55°C to +155°C
RK73Z1E RK73Z1J			1.0 Amps	2 Amp Max.		
RK73Z2A			2.0 Amps	5 Amp Max.		
RK73Z2B RK73Z2E RK73Z2H/W2H RK73Z3A/W3A			2.0 Amps	10 Amp Max.		

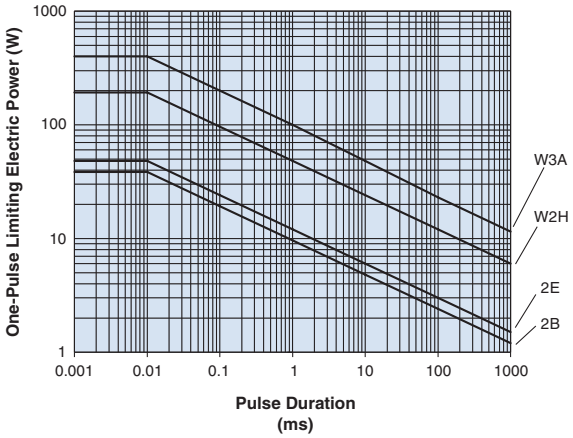
environmental applications

One-Pulse Limiting Electric Power

RK73Z 1H-2A



RK73Z 2B-W3A



Please ask us about the resistance characteristic of continuous applied pulse.
Please calculate One-Pulse Limiting Electric Power using upper limit of resistance (50mΩ or 100mΩ) for applied current.
The pulse endurance values are not assured values,so be sure to check the products on actual equipment when you use them.

Performance Characteristics

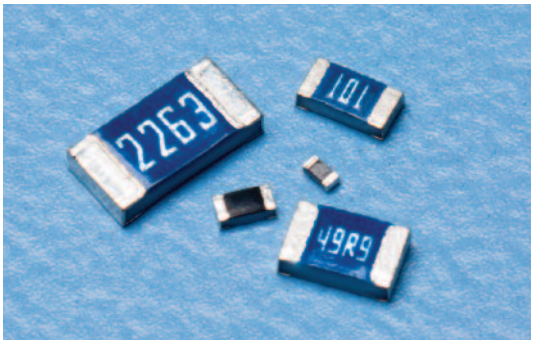
Parameter	Requirement		Test Method
	Limit	Typical	
Resistance	50mΩ Max. after the test	15mΩ Max. after the test	25°C
Overload (Short time)	50mΩ Max. after the test	18mΩ Max. after the test	Maximum overload current for 5 seconds , 1 cycle
Resistance to Solder Heat	50mΩ Max. after the test	15mΩ Max. after the test	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	50mΩ Max. after the test	15mΩ Max. after the test	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	100mΩ Max. after the test	18mΩ Max. after the test	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	100mΩ Max. after the test	18mΩ Max. after the test	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	100mΩ Max. after the test	15mΩ Max. after the test	+125°C, 1000 hours: 1F +155°C, 1000 hours: 1H, 1E, 1J, 2A, 2B, 2E, W2H/2H, W3A/3A

KOA SPEER ELECTRONICS, INC.

RK73G

thick film 0.25%, 0.5%, 1% tolerance, 50ppm/°C chip resistor

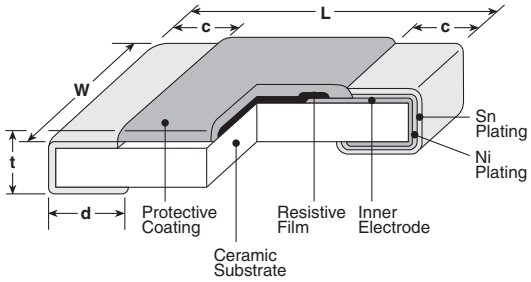
EU RoHS COMPLIANT



features

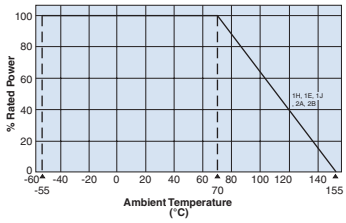
- High precision resistor with T.C.R. of ±50 ppm/°C and tolerance of ±0.25%, ±0.5% or ±1%
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction

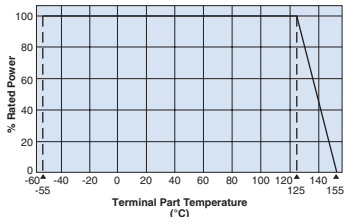


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
1J AT (0603)			.014±.006 (0.35±0.15)	.02±.008 (0.5±0.2)	
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2A AT (0805)			.018±.010 (0.45±0.25)	.024±.008 (0.6±0.2)	.022±.004 (0.55±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2B AT (1206)			.022±.014 (0.55±0.35)	.031±.008 (0.8±0.2)	

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RK73G	1J		T	TD	1003	F
Type	Size	Characteristic	Termination Material	Packaging	Nominal Resistance	Tolerance
	1H 1E 1J 2A 2B	Nil: Standard **New** A: Heat shock resistance *1	T: Sn (L:Sn/Pb*2)	TCM: 7" 2mm pitch pressed paper (15,000 pcs/reel) TPL: 0402 only: 2mm pitch punch paper TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206: 7" 4mm pitch punched paper TE: 0805, 1206: 7" 4mm embossed plastic	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	C: ±0.25% D: ±0.5% F: ±1%

*1 With type A, only T is available as the terminal surface material.
*2 With type 1H, only T is available as the terminal surface material.
The terminal surface material lead free is standard.
For further information on packaging, please refer to Appendix A

KOA SPEER ELECTRONICS, INC.

RK73G

thick film 0.25%, 0.5%, 1% tolerance, 50ppm/°C chip resistor

applications and ratings

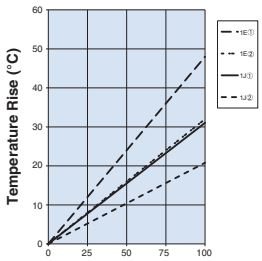
Part Designation*	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range			Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage
					New E-24, E-96 (C±0.25%)	E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)		
RK73G1H (0201)	1/20W (.05W)	70°C	125°C	±50	—	100Ω - 1MΩ**	100Ω - 1MΩ**	25V	50V
RK73G1E (0402)	1/10W (.10W)				100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	50V	100V
RK73G1J (0603)	1/10W (.10W)							75V	150V
RK73G2A (0805)	1/8W (.125W)							150V	200V
RK73G2B (1206)	1/4W (.25W)							200V	400V

Operating Temperature Range: -55°C ~ +155°C
* Parentheses indicate EIA package size codes.
** RK73G1H available in E-24 decade values only

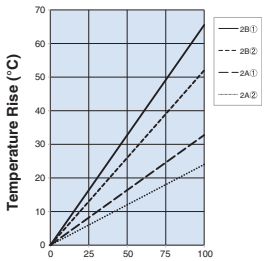
environmental applications

Temperature Rise

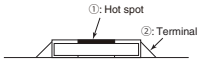
RK73G 1E-1J



RK73G 2A-2B



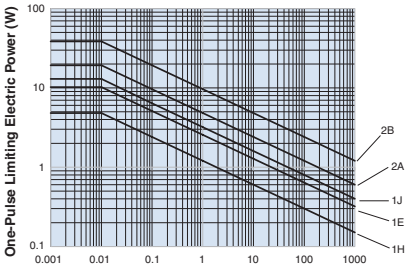
Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35µm



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

One-Pulse Limiting Electric Power

RK73G 1H-2B



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values,so be sure to check the products on actual equipment when you use them.

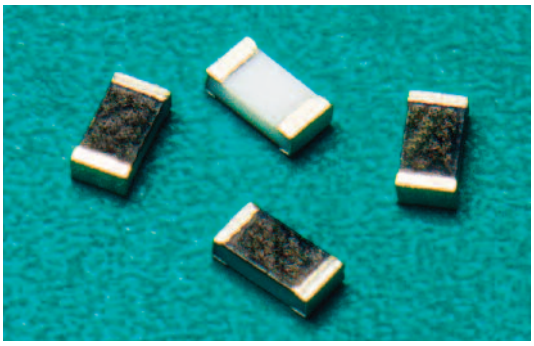
Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	1H: +25°C/+125°C, 1E, 1J, 2A, 2B: +25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.6%	Rated Voltage x 2.5 for 5 seconds (1E, 2B: Rated Voltage x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±1%: 1H, ±0.4%: 1E, 1J, 2A, 2B	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: 1H, 1E	±0.6%: 1J, 2A, 2B; ±1%: 1H, 1E	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B ±3%: 1H, 1E	±0.6%: 1J, 2A, 2B; ±1%: 1H, 1E	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.6%	+155°C, 1000 hours

For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com

10/19/20

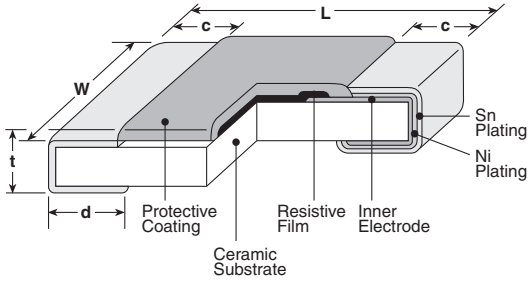
EU RoHS COMPLIANT



features

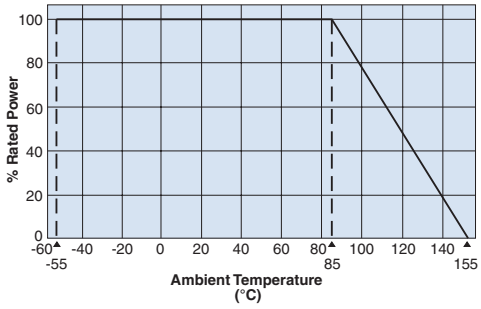
- Metal-glaze thick film resistor for surface mounting
- High precision resistor with T.C.R. ±25x10^{-6}/K and tolerance ±0.1%
- High reliability with ΔR of ±0.2% and ±0.5% in the reliability test
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction

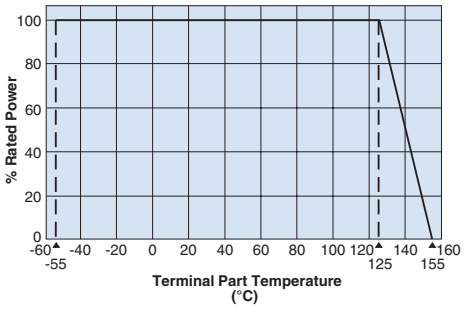


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1E (0402)	.039 $^{+.004}_{-.002}$ (1.0 $^{+0.1}_{-0.05}$)	.020±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.010 $^{+.008}_{-.004}$ (0.25 $^{+0.2}_{-0.1}$)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.008±.004 (0.2±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.010±.006 (0.25±0.15)	.012 $^{+.008}_{-.004}$ (0.3 $^{+0.2}_{-0.1}$)	.020±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.014±.006 (0.35±0.15)	.016 $^{+.008}_{-.004}$ (0.4 $^{+0.2}_{-0.1}$)	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RS73F	1J	T	TD	1002	B
Type	**Power Rating**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Tolerance**
RS73F RS73G	1E: 0.125W 1J: 0.2W 2A: 0.25W 2B: 0.33W	T: Sn	TD: 4mm pitch punched paper TPL-TP: 2mm pitch punched paper For further information on packaging, please refer to Appendix A	4 digits	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%

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KOA SPEER ELECTRONICS, INC.

RS73

high reliability chip resistors

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range*2 B±0.1% E-24, E-96	C±0.25% E-24, E-96	D±0.5% E-24, E-96	F±1% E-24, E-96	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
RS73F1E (0402)	.125W	85°C	+125°C	±25*1	300Ω - 100kΩ	300Ω - 1MΩ	300Ω - 1MΩ	300Ω - 1MΩ	75V	100V	-55°C to +155°C
RS73G1E (0402)				±50							
RS73F1J (0603)	.2W			±25*1	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	100V	150V	
RS73G1J (0603)				±50							
RS73F2A (0805)	.25W			±25*1	10Ω - 3MΩ	10Ω - 6.8MΩ	10Ω - 10MΩ	10Ω - 10MΩ	150V	300V	
RS73G2A (0805)				±50							
RS73F2B (1206)	.33W			±25*1	10Ω - 1MΩ	10Ω - 1MΩ			200V	400V	
RS73G2B (1206)				±50							

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

*1 Measurement Temperature: +25°C/+125°C. Cold T.C.R. (-55°C/+25°C) is -50~+25x10^{-6}/K

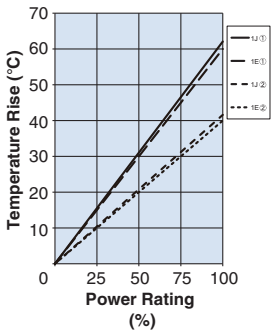
*2 Please inquire about E-192

If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves in the terminal part temperature" in the beginning of the catalog.

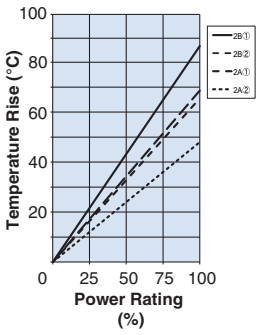
environmental applications

Temperature Rise

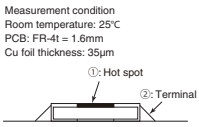
RS73 1E-1J



RS73 2A-2B

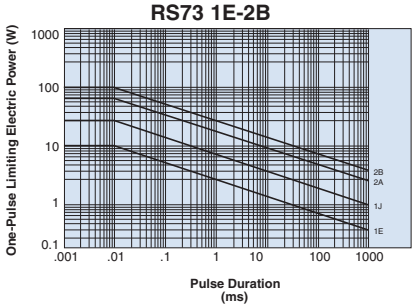


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



One-Pulse Limiting Electric Power

RS73 1E-2B



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±0.2%	±0.03%	Rated Voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±0.2%	±0.1%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.2%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤1MΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.4%: others	±0.05%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤1MΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.2%: others	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±0.2%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.4~0.5%: others	±0.04%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.08%: others	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.2%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤1MΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.4%: others	±0.05%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤1MΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.2%: others	85°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.2%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤100kΩ) ±0.4~0.5%: others	±0.1%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤100kΩ) ±0.2~0.3%: others	+155°C, 1000 hours

10/20/20

KOA SPEER ELECTRONICS, INC.

RN73H

long term precision thin (metal) film flat chip resistors (high reliability, for automotive)

EU RoHS COMPLIANT

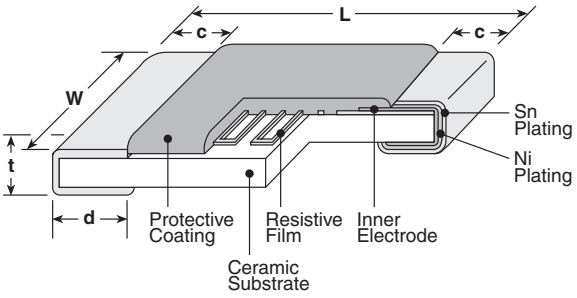
features

- AEC-Q200 Tested
- Endurance at 85°C (3,000h): ΔR of ±0.1%
- High temperature exposure: ΔR of ±0.1%
- High precision type ±5% is available
- Low current noise
- High reliability and high stability at elevated temperatures
- Improved moisture resistance by glass passivation layer
- Products meet EU RoHS requirements
- Rated ambient temperature: 85°C, rated up to +155°C
- Sulfur resistance verified according to ASTM B 809-95

applications

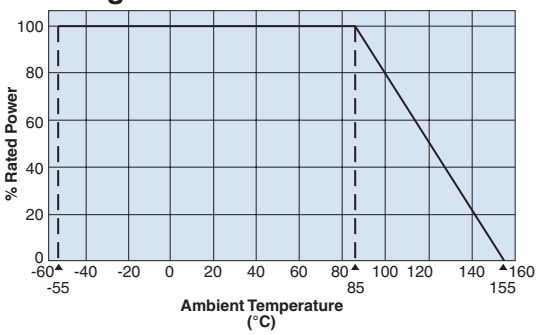
- Automotive electronics
- Industrial equipment
- Measurement equipment

dimensions and construction

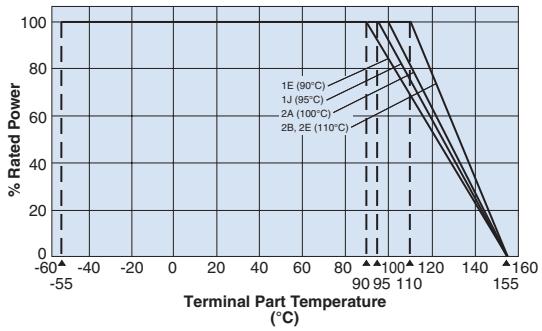


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.020±.002 (0.5±0.05)	.010±.004 (0.25±0.1)	.010 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2E (1210)		.098±.008 (2.5±0.2)			

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with derating curve. Please refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RN73H	2B	T	TD	1002	B	25
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (ppm/°C)
	1E: 0.063W 1J: 0.1W 2A: 0.125W 2B: 0.25W 2E: 0.25W	T: Sn G: Au (1E, 1J only)	TP: 0402 only: 7" 2mm pitch punched paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" embossed plastic For further information on packaging, please refer to Appendix A	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5% F: ±1.0%	05 10 25 50 100

10/20/21

KOA SPEER ELECTRONICS, INC.

RN73H

long term precision thin (metal) film flat chip resistors (high reliability, for automotive)

applications and ratings

Part Designation	Power Rating @ 85°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) E-24, E-96, E-192* (A±0.05%)	(B±0.1%)	(C±0.25%)	(D±0.5%)	(F±1.0%)	Maximum Working Voltage	Maximum Overload Voltage
RN73H1E	1/16W (.063W)	85°C	90°C	New ±5	—	220 - 10k	—	—	—	50V	100V
				±10	—	47 - 100k	47 - 100k	47 - 100k	47 - 100k		
				±25	—	47 - 300k	47 - 300k	47 - 300k	47 - 300k		
				±50	—	47 - 300k	47 - 300k	10 - 300k	10 - 300k		
RN73H1J	1/10W (.10W)	85°C	95°C	±5	100 - 59k	100 - 59k	—	—	—	75V	150V
				±10	47 - 59k	47 - 360k	47 - 360k	47 - 360k	47 - 360k		
				±25	47 - 59k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		
RN73H2A	1/8W (.125W)	85°C	100°C	±5	100 - 100k	100 - 100k	—	—	—	150V	300V
				±10	47 - 100k	47 - 1M	47 - 1M	47 - 1M	47 - 1M		
				±25	47 - 100k	15 - 1.5M	15 - 1.5M	10 - 1.5M	10 - 1.5M		
				±50	—	15 - 1.5M	15 - 1.5M	10 - 1.5M	10 - 1.5M		
				±100	—	—	—	10 - 1.5M	10 - 1.5M		
RN73H2B	1/4W (.25W)	85°C	110°C	±5	100 - 300k	100 - 300k	—	—	—	200V	400V
				±10	47 - 300k	47 - 1M	47 - 1M	47 - 1M	47 - 1M		
				±25	47 - 300k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		
RN73H2E	1/4W (.25W)	85°C	110°C	±10	100 - 510k	100 - 510k	100 - 510k	100 - 510k	100 - 510k	200V	400V
				±25	51 - 510k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		

* No marking on E-192 values Operating Temperature: -55°C to +155°C

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C: T.C.R. +5 (x10^{-6}K); +15°C/-55°C and +25°C/+155°C: other
Overload (Short time)	±0.05%	±0.01%	Rated Voltage x 2.5 or Max. overload voltage, whichever is less for 5 seconds
Resistance to Solder Heat	±0.05%*	±0.01%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.1%*	±0.02%	1E, 1J, 2A: -55°C (30 minutes), +155°C (30 minutes), 1000 cycles 2B, 2E: -55°C (30 minutes), +155°C (30 minutes), 500 cycles
Moisture Resistance	±0.1%*	±0.05%	85°C ± 2°C, 85%±5%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.1%*	±0.03%	85°C ± 2°C, 3000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.1%*	±0.05%	+155°C, 1000 hours

* Depends on resistance value, please contact KOA Speer for details.

Precautions for Use

- The properly and electrostatically measured taping materials are used for the components, but attention should be paid to the fact that there is some danger the parts absorb on the top tapes to cause a failure in the mounting and the parts are destructed by static electricity (1J, 2A, 2B, 2E: 1kV and more, 1E: 0.5kV and more at Human Body Model 100pF, 1.5kΩ) to change the resistance in the conditions of an excessive dryness or after the parts are given vibration for a long time as they are packaged on the tapes. Similarly, care should be given not to apply the excessive static electricity when mounting on the boards.
- Ionic impurities such as flux etc. that are attached to these products or those mounted onto a PCB, negatively affect their moisture resistance, corrosion resistance, etc. The flux may contain ionic substances like chlorine, acid, etc. while perspiration and saliva include ionic impurities like sodium (Na), chlorine (Cl–) etc. Therefore these kinds of ionic substances may induce electrical corrosion when they invade into the products. Either thorough washing or using RMA solder and flux are necessary since lead free solder contains ionic substances. Washing process is needed, before putting on moisture proof material in order to prevent electrical corrosion.
- The upper electrodes could be peeled off when a heat-resistant masking tape is attached to the mounted chip resistors and then detached from them. It is confirmed that the adhesiveness gets stronger due to the exposure to heat under mounting. Accordingly, we recommend the use of masking tape be refrained. If the use of heat-resistant masking tape is unavoidable, please make sure that the adhesives on the tape do not directly come in contact with the product.
- When high-pressure shower cleaning is implemented, there is a possibility of exfoliation of the top electrodes caused by the water pressure stress so please avoid the implementation.
- If the implementation is unavoidable, then please evaluate the products beforehand.

For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com

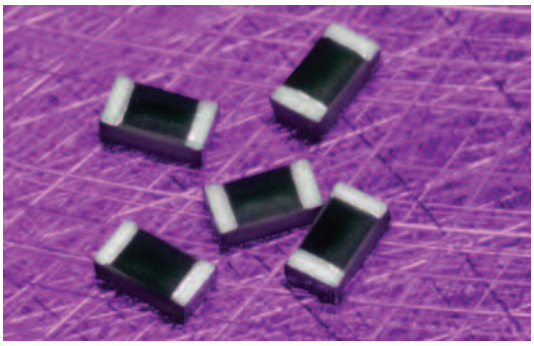
10/20/21

KOA SPEER ELECTRONICS, INC.

RN73R

precision thin (metal) film flat chip resistors (high reliability)

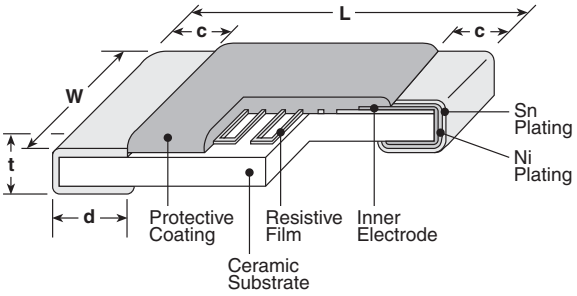
EU RoHS COMPLIANT



features

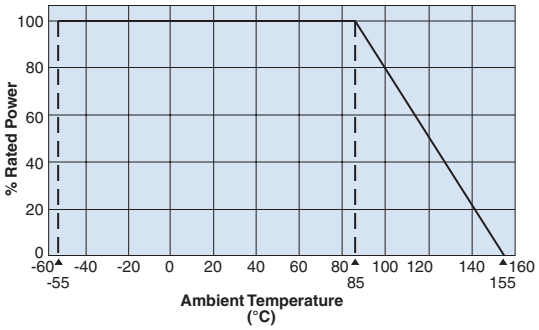
- AEC-Q200 Tested
- Endurance at 85°C (1,000h): ΔR of ±0.1%
- High temperature exposure: ΔR of ±0.25%
- High precision type ±0.05% is also available
- Low current noise
- Improved moisture resistance by high humidity protective coating
- Suitable for control circuits in various industrial equipment
- Products meet EU RoHS requirements
- Rated ambient temperature: 85°C, rated up to +155°C
- Sulfur resistance verified according to ASTM B 809-95

dimensions and construction

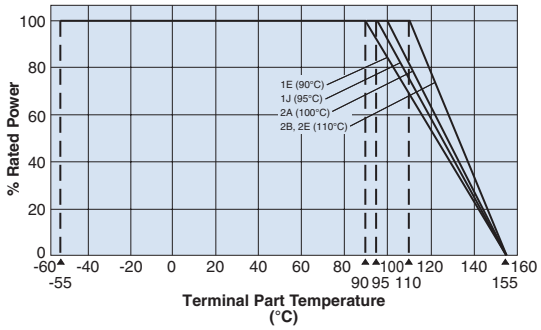


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.020±.002 (0.5±0.05)	.010±.004 (0.25±0.1)	.010 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2E (1210)	.126±.008 (3.2±0.2)	.098±.008 (2.5±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with derating curve. Please refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RN73R	2B	T	TD	1002	B	25
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (ppm/°C)
	1E: 0.063W 1J: 0.1W 2A: 0.125W 2B: 0.25W 2E: 0.25W	T: Sn	TP: 2mm pitch punched paper TD: 4mm pitch punched paper TE: 4mm pitch plastic embossed For further information on packaging, please refer to Appendix A	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5% F: ±1.0%	05 10 25 50 100

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/04/21

KOA SPEER ELECTRONICS, INC.

RN73R

precision thin (metal) film flat chip resistors (high reliability)

applications and ratings

Part Designation	Power Rating @ 85°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (x10⁻⁶/K)	Resistance Range (Ω) E-24, E-96, E-192 (A±0.05%)	(B±0.1%)	(C±0.25%)	(D±0.5%)	(F±1.0%)	Maximum Working Voltage	Maximum Overload Voltage
RN73R1E	1/16W (.063W)	85°C	90°C	±10	—	47 - 10k	47 - 10k	47 - 10k	47 - 10k	50V	100V
				±25	—	47 - 300k	47 - 300k	10 - 300k	10 - 300k		
				±50	—	47 - 300k	47 - 300k	10 - 300k	10 - 300k		
RN73R1J	1/10W (.10W)	85°C	95°C	±5	100 - 59k	100 - 59k	—	—	—	75V	150V
				±10	47 - 59k	47 - 59k	47 - 59k	47 - 59k	47 - 59k		
				±25	47 - 59k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		
RN73R2A	1/8W (.125W)	85°C	100°C	±5	100 - 100k	100 - 100k	—	—	—	150V	300V
				±10	47 - 100k	47 - 100k	47 - 100k	47 - 100k	47 - 100k		
				±25	47 - 100k	15 - 1.5M	15 - 1.5M	10 - 1.5M	10 - 1.5M		
				±50	—	15 - 1.5M	15 - 1.5M	10 - 1.5M	10 - 1.5M		
				±100	—	—	—	10 - 1.5M	10 - 1.5M		
RN73R2B	1/4W (.25W)	85°C	110°C	±5	100 - 300k	100 - 300k	—	—	—	200V	400V
				±10	47 - 300k	47 - 300k	47 - 300k	47 - 300k	47 - 300k		
				±25	47 - 300k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		
RN73R2E	1/4W (.25W)	85°C	110°C	±10	100 - 510k	100 - 510k	100 - 510k	100 - 510k	100 - 510k	200V	400V
				±25	51 - 510k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		

Operating Temperature: -55°C to +155°C

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C: T.C.R. ±5 (x10⁻⁶/K); +25°C/-55°C and +25°C/+155°C: other
Overload (Short time)	±0.05%	±0.01%	Rated Voltage x 2.5 or Max. overload voltage, whichever is less for 5 seconds
Resistance to Solder Heat	±0.05%*	±0.01%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.1%*	±0.04%	1E, 1J, 2A: -55°C (30 minutes), +155°C (30 minutes), 1000 cycles 2B, 2E: -55°C (30 minutes), +155°C (30 minutes), 500 cycles
Moisture Resistance	±0.25%	±0.07%	85°C ± 2°C, 85%±5%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.1%	±0.04%	85°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.25%	±0.10%	+155°C, 1000 hours

* Depends on resistance value, please contact KOA Speer for details.

Precautions for Use

- The properly and electrostatically measured taping materials are used for the components, but attention should be paid to the fact that there is some danger the parts absorb on the top tapes to cause a failure in the mounting and the parts are destructed by static electricity (1J, 2A, 2B: 1kV and more, 1E: 0.5kV and more at Human Body Model 100pF, 1.5kΩ) to change the resistance in the conditions of an excessive dryness or after the parts are given vibration for a long time as they are packaged on the tapes. Similarly, care should be given not to apply the excessive static electricity when mounting on the boards.
- Ionic impurities such as flux etc. that are attached to these products or those mounted onto a PCB, negatively affect their moisture resistance, corrosion resistance, etc. The flux may contain ionic substances like chlorine, acid, etc. while perspiration and saliva include ionic impurities like sodium (Na+), chlorine (Cl–) etc. Therefore these kinds of ionic substances may induce electrical corrosion when they invade into the products. Either thorough washing or using RMA solder and flux are necessary since lead free solder contains ionic substances. Washing process is needed, before putting on moisture proof material in order to prevent electrical corrosion.
- When heat-resistant masking tapes are attached to the chip resistors at the time of mounting and then detached, there is a possibility of exfoliation of the top electrodes. It is known that the heat applied in the mounting process will enhance the adhesion strength of the tape adhesive so please avoid the use. If the use of masking tapes are unavoidable, then please be sure not to attach the tape adhesives directly on the products.
  When high-pressure shower cleaning is implemented, there is a possibility of exfoliation of the top electrodes caused by the water pressure stress so please avoid the implementation. If the implementation is unavoidable, then please evaluate the products beforehand.

For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com

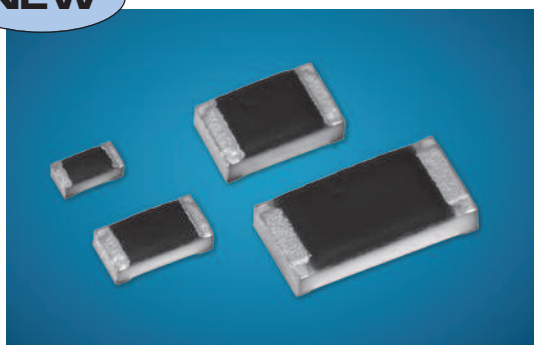
10/20/20

KOA SPEER ELECTRONICS, INC.

HSG73P

high temperature flat chip resistors

NEW

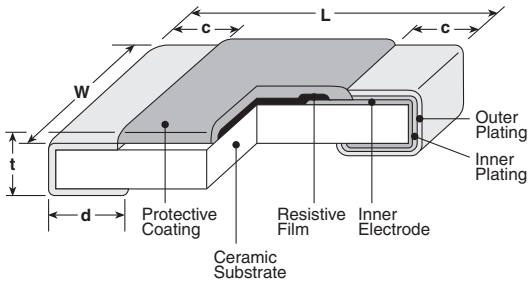


EU RoHS COMPLIANT

features

- High heat resistance that can be used even at high temperatures of 155°C or higher. The maximum operating temperature of Sn plating products compatible with solder mounting is 175°C, and Au plating products compatible with conductive glue mounting is 200°C.
- Excellent heat resistance and weather reistance are ensured by the use of metal glaze thick film
- High stability and high reliability with the triple-layer structure of electrode
- Superior to RK73 series chip resistors pulse withstanding voltage and high power
- Applicable to various kinds of automatic mounters for taping, etc
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

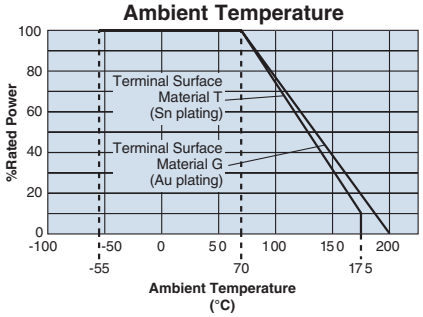
dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1E (0402)	.039 +.003 -.002 (1.0 +0.1 -0.05)	.020±.002 (0.5±0.05)	.008±.006 (0.2±0.15)	.010 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.006 (0.3±0.15)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.010 (0.4±0.25)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.022±.014 (0.55±0.35)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)

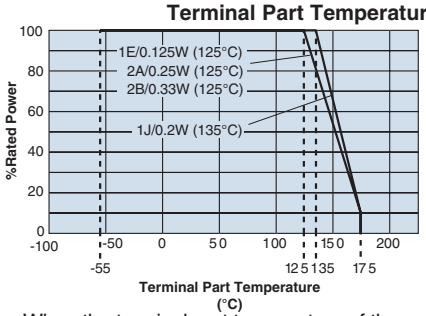
Derating Curve

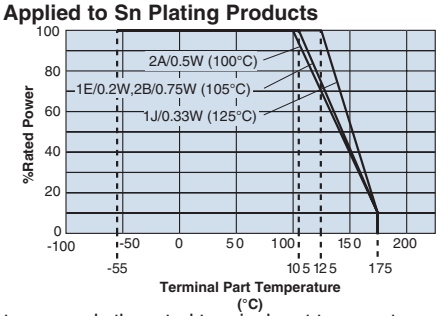
Ambient Temperature



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

Terminal Part Temperature Applied to Sn Plating Products





When the terminal part temperature of the resistor exceeds the rated terminal part temperature shown above, the power shall be derated according to the derating curve.
If you want to use at the rated power of *1, please use the derating curves based on the terminal part temperature of right side.
Please refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

HSG73P	2B	G	TD	103	J
Type	Power Rating	Terminal Surface Material	Packaging	Nominal Resistance	Tolerance
	1E: 0.125W 1J: 0.2W 2A: 0.25W 2B: 0.33W	**New** T: Sn G: Au	TP: 2mm pitch punch paper TD: 4mm pitch punched paper For further information on packaging, please refer to Appendix A	F: 4 digits J: 3 digits	F: ±1% J: ±5%

Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/20/21

KOA SPEER ELECTRONICS, INC.

HSG73P

high temperature flat chip resistors

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.		Rated Term. Part Temp.		T.C.R. ($x10^{-6}$/K) Max.	Resistance Range		Maximum Working Voltage	Maximum Overload Voltage
		Term. Surf. Material: T (Sn plating)	Term. Surf. Material: G (Au plating)	Term. Surf. Material: T (Sn plating)	Term. Surf. Material: G (Au plating)		F: ±1% E24	J: ±5% E24		
HSG73P1E (0402)	0.125W	70°C	70°C	125°C	—	±200	10Ω~1MΩ	1Ω~10MΩ	75V	100V
	0.2W*1	70°C	—	105°C	—					
HSG73P1J (0603)	0.2W	70°C	70°C	135°C	—	±200	10Ω~1MΩ	1Ω~10MΩ	150V	200V
	0.33W*1	70°C	—	125°C	—					
HSG73P2A (0805)	0.25W	70°C	70°C	125°C	—	±200	10Ω~1MΩ	1Ω~10MΩ	200V	400V
	0.5W*1	70°C	—	100°C	—					
HSG73P2B (1206)	0.33W	70°C	70°C	125°C	—	±200	10Ω~1MΩ	1Ω~10MΩ	200V	400V
	0.75W*1	70°C	—	105°C	—					

Operating Temperature Range :-55°C ~ +175°C (Terminal Surface Material: T), -55°C ~ +200°C (Terminal Surface Material: G)

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

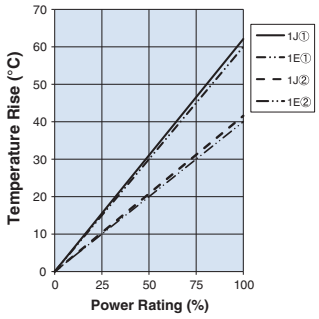
*1 If you use at the rated power, please keep the condition that the terminal of the resistor is below the rated terminal part temperature.

Please refer to the derating curves based on the terminal temperature.
If any questions arise whether to use the "Rated Ambient Temperature"or the"Rated Terminal Part Temperature"in your usage conditions, please give priority to the"Rated Terminal Part Temperature"

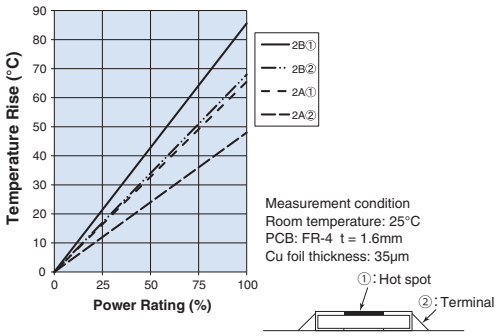
environmental applications

Temperature Rise

HSG73P 1E-1J



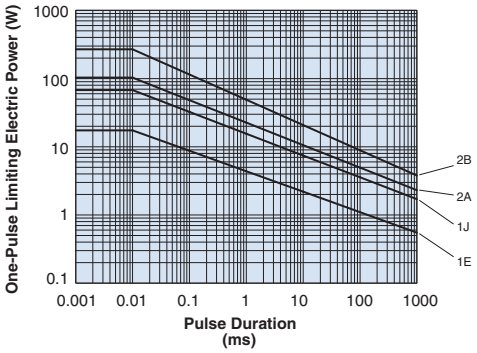
HSG73P 2A-2B



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

One-Pulse Limiting Electric Power

HSG73P 1E-2B



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse.

Performance Characteristics

Parameter	Requirement △ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C, +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2B: Rated Voltage x 2 for 5 seconds)
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: 1E	±0.75%: 1J, 2A, 2B ±1%: 1E	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B ±3%: 1E	±0.75%: 1J, 2A, 2B ±1%: 1E	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%	±0.5%	+200°C, 1000 hours (Terminal Surface Material [G]: Au plating products)
Endurance at 175°C	±1%	±0.3%	+175°C, 1000 hours, Power Rating×10% (Terminal Surface Material [T]: Sn plating products)

For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com

10/21/21

KOA SPEER ELECTRONICS, INC.

WK73R

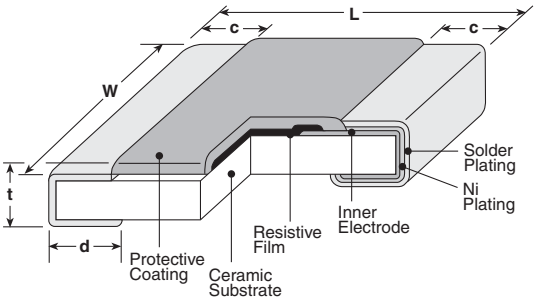
wide terminal type flat chip resistors

EU RoHS COMPLIANT

features

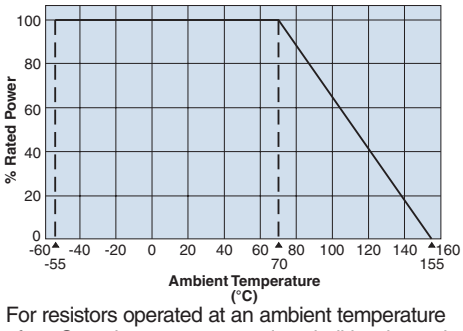
- Wide-side termination (reverse-geometry) type flat chip resistor
- High reliability and performance with T.C.R. ±100 x 10^{-6}/K, resistance tolerance ±0.5%
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



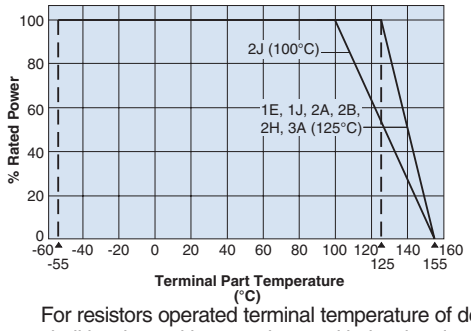
Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1E (0204)	.020±.002 (0.5±0.05)	.039±.002 (1.0±0.05)	.006±.002 (0.15±0.05)	.006±.002 (0.15±0.05)	.014±.002 (0.35±0.05)
1J (0306)	.031±.004 (0.8±0.1)	.063±.004 (1.6±0.1)	.006±.004 (0.15±0.1)	.008±.004 (0.2±0.1)	.018±.004 (0.45±0.1)
2A (0508)	.049±.006 (1.25±0.15)	.079±.006 (2.0±0.15)	.012±.008 (0.3±0.2)	.014±.008 (0.35±0.2)	.022±.004 (0.55±0.1)
2B (0612)	.063±.006 (1.6±0.15)	.126±.008 (3.2±0.2)	.012±.008 (0.3±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)
2H (1020)	.098±.006 (2.5±0.15)	.197±.006 (5.0±0.15)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	
2J (1218)	.122±.006 (3.1±0.15)	.181±.006 (4.6±0.15)	.016±.008 (0.4±0.2)		
3A (1225)	.122±.006 (3.1±0.15)	.252±.006 (6.3±0.15)	.018±.008 (0.45±0.2)		

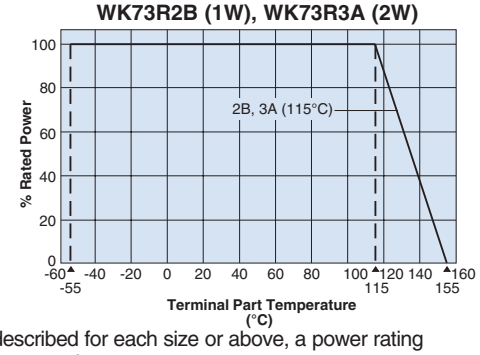
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

WK73R2B (1W), WK73R3A (2W)





For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve above.
Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.
If you want to use at rated power (*1), use derating curves based on the terminal part temperature on the right side graph.

ordering information

WK73R	2J	T	TE	33L0	F
Type	**Size**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
WK73R	1E: 0.33W 1J: 0.5W 2A: 0.75W, 1W 2B: 0.75W, 1W 2H: 1W 2J: 1W 3A: 1.5W, 2W	T: Sn	TP: 0204: 7" 2mm pitch punched paper TD: 0306, 0508, 0612: 7" 4mm pitch punched paper TE: 1020, 1218, 1225: 7" embossed plastic For further information on packaging, please refer to Appendix A	±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal. Ex: 33mΩ, 1% = 33L0	D: ±0.5% F: ±1% J: ±5%

12/17/19

KOA SPEER ELECTRONICS, INC.

WK73R

wide terminal type flat chip resistors

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) D±0.5% E-24/E-96	F±1% E-24/E-96	J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
WK73R1E	0.33W[1]	70°C	125°C	±100	—	10 -1M	10 - 1M	75V	100V	-55°C to +155°C
WK73R1J	0.5W[1]	70°C	125°C	±100	—	10 - 1M	10 - 1M	150V	200V	
WK73R2A	0.75W[1]	70°C	125°C	±100	—	20.5k - 1M	22k - 1M	200V	400V	
	1.0W[1]	70°C	125°C	±100	—	10 - 20k	10 - 20k			
WK73R2B	0.75W	70°C	125°C	±100	10 - 1M	10 - 1M	10 - 1M	200V	400V	
	1.0W[1]	70°C	115°C	±100	10 - 9.76k	10 - 9.76k	10 - 9.1k			
WK73R2H	1.0W	70°C	125°C	±100	—	10 - 430k	10 - 430k	200V	400V	
				±200	—	432k - 1M	470k - 1M			
WK73R2J	1.0W	70°C	100°C	±100	—	10 - 510k	10 - 510k	200V	400V	
				±200	—	511k - 1M	560k - 1M			
WK73R3A	1.5W	70°C	125°C	±100	—	10 - 330k	10 - 330k	200V	400V	
				±200	—	332k - 1M	360k - 1M			
	2.0W[1]	70°C	115°C	±100	—	10 - 330k	10 - 330k			
				±200	—	332k - 1M	360k - 1M			

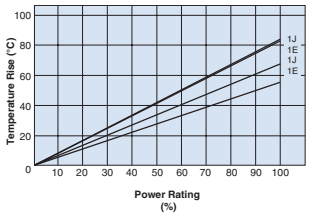
Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

[1] If you want to use at rated power use derating curves based on the terminal part temperature on the right side graph located on previous page. If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature", please give priority to the "Rated Terminal Part Temperature." For more details refer to the "Introduction of the derating curves based on the terminal part temperature" in the beginning of the catalog

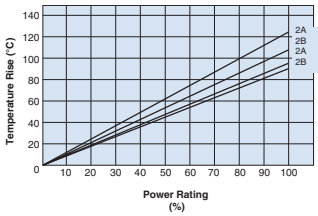
environmental applications

Temperature Rise

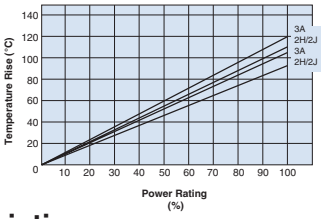
WK73R 1E-1J



WK73R 2A-2B

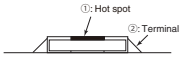


WK73R 2H-3A



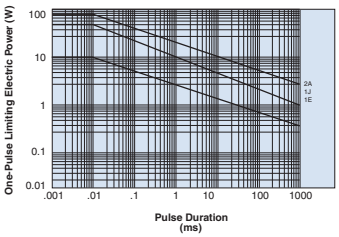
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

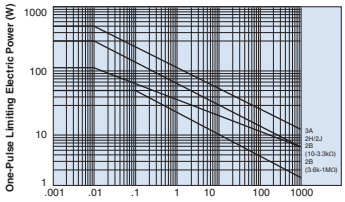


One-Pulse Limiting Electric Power

WK73R 1E-2A



WK73R 2B-3A



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	WK73R1E (0.33W), WK73R1J (0.5W), WK73R2A (0.75W, 1W)WK73R3A (2W): Rated voltage x2.0 for 5 seconds. WK73R2B, R2H, R2J, R3A: Rated voltage x2.5 for 3 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±2%	±1%	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±3%: 1E ±2%: All others	±1%: 1E ±0.2%: All others	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%: 1E ±2%: All others	±1%: 1E ±0.2%: All others	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

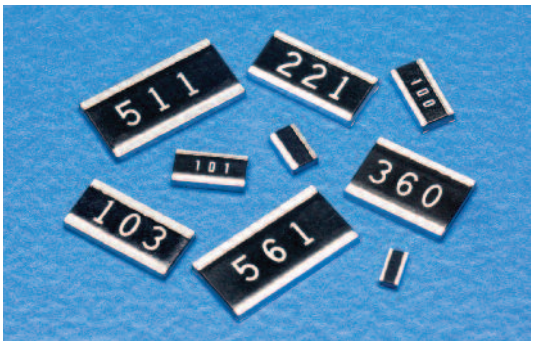
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/09/21

KOA SPEER ELECTRONICS, INC.

WK73R

higher power, wide terminal type flat chip resistors

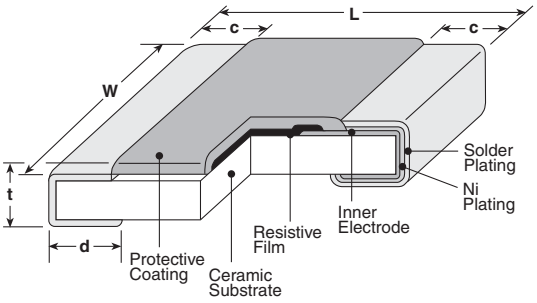
EU RoHS COMPLIANT



features

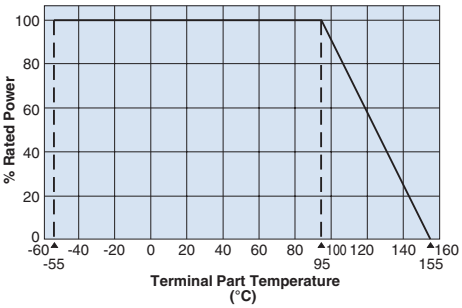
- Wide-side termination (reverse-geometry) type flat chip resistor
- High reliability and performance with T.C.R. ±100 x 10^{-6}/K, resistance tolerance ±0.5%
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
2B15 (0612)	.063±.006 (1.6±0.15)	.126±.008 (3.2±0.2)	.012±.008 (0.3±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)
2H2 (1020)	.098±.006 (2.5±0.15)	.197±.006 (5.0±0.15)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	
3A3 (1225)	.122±.006 (3.1±0.15)	.252±.006 (6.3±0.15)	.018±.008 (0.45±0.2)		

Derating Curve



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve above. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

WK73R	2H2	T	TE	1002	F
Type	**Size**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
WK73R	**New** 2B15: 0.1.5W 2H2: 2W 3A3: 3W	T: Sn	TD: 0612: 7" 4mm pitch punched paper TE: 1020, 1225: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±5%: 2 significant figures "+ 1 multiplier "R" indicates decimal on values <10Ω	D: ±0.5% F: ±1% J: ±5%

11/12/19

KOA SPEER ELECTRONICS, INC.

WK73R

higher power, wide terminal type flat chip resistors

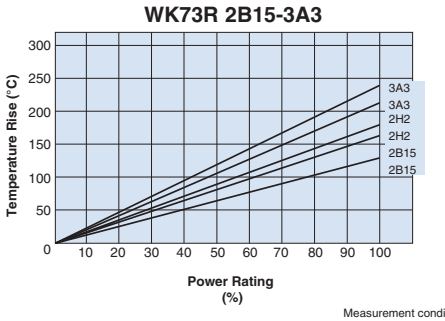
applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) D±0.5% E-24/E-96	Resistance Range (Ω) F±1% E-24/E-96	Resistance Range (Ω) J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
WK73R2B15	1.5W	70°C	95°C	±100	10 - 9.76k	10 - 9.76k	10 - 9.1k	200V	400V	-55°C to +155°C
WK73R2H2	2.0W	70°C	95°C	±100	—	10 - 430k	10 - 430k	200V	400V	
				±200	—	432k - 1M	470k - 1M			
WK73R3A3	3.0W	70°C	95°C	±100	—	10 - 330k	10 - 330k	200V	400V	
				±200	—	332k - 1M	360k - 1M			

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

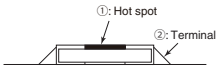
environmental applications

Temperature Rise

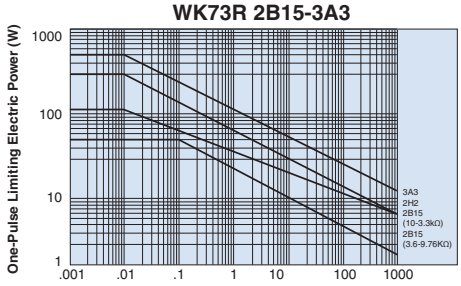


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated voltage x 2.0 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±2%	±1%	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

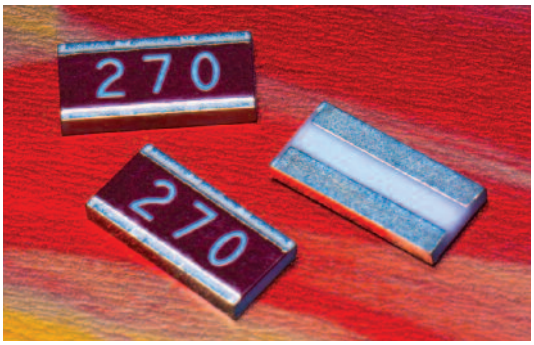
11/09/21

KOA SPEER ELECTRONICS, INC.

WG73

wide terminal type pulse power flat chip resistors (anti surge)

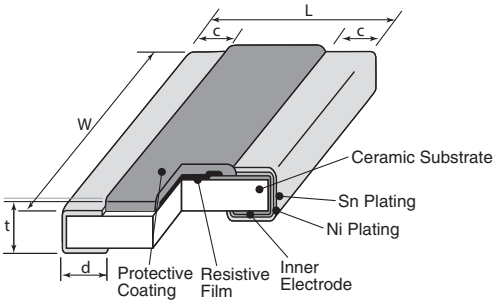
EU RoHS COMPLIANT



features

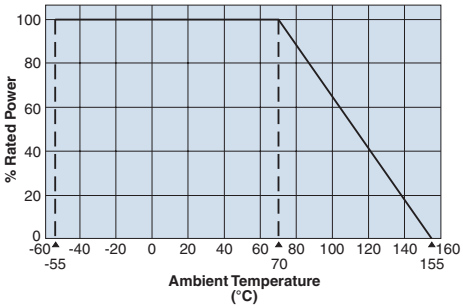
- Superior to WK73 series in pulse withstanding voltage
- Suitable for both flow and reflow solderings
- This products meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction

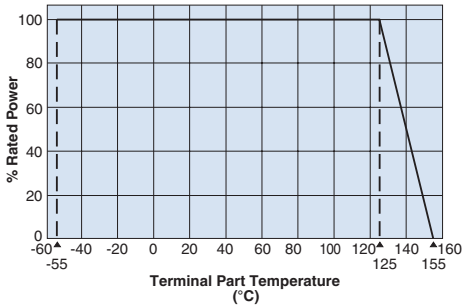


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
2B (0612)	.063± +.004 -.008 (1.6± +0.1 -0.2)	.126± +.004 -.012 (3.2± +0.1 -0.3)	.012±.008 (0.3±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)
2H (1020)	.098±.006 (2.5±0.15)	.197±.006 (5.0±0.15)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	.024±.004 (0.6±0.1)
3A (1225)	.122± +.008 -.004 (3.1± +0.2 -0.1)	.248±.006 (6.3±0.15)	.018±.008 (0.45±0.2)	.030±.006 (0.75±0.15)	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

WG73	2H	T	TE	101	K
Type	Power Rating	Termination Surface Material	Packaging	Nominal Resistance	Resistance Tolerance
	2B: 1W 2H: 1.5W 3A: 2W	T : Sn	TD: 4mm pitch punch paper TE: 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	3 digits	K: ±10% M: ±20%

10/20/20

KOA SPEER ELECTRONICS, INC.

WG73

wide terminal type pulse power flat chip resistors (anti surge)

applications and ratings

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) K±10% E-12	Resistance Range (Ω) M±20% E-12	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
WG732B	1.0W	70°C	±125°C	±100	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C
WG732H	1.5W	70°C	±125°C	±100	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C
WG733A	2.0W	70°C	±125°C	±100	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C

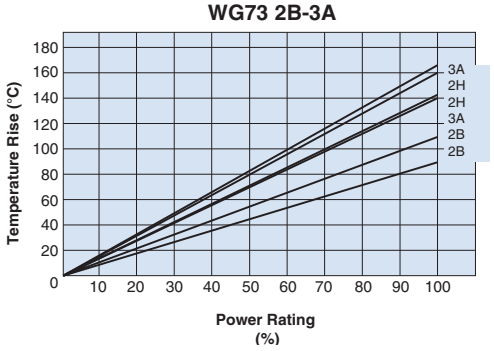
Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

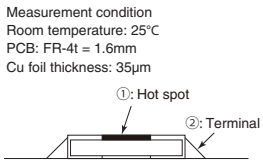
If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature" in your usage conditions, please give priority to the "Rated Terminal Part Temperature."

Prior to use and for more details, please refer to the "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog.

environmental applications

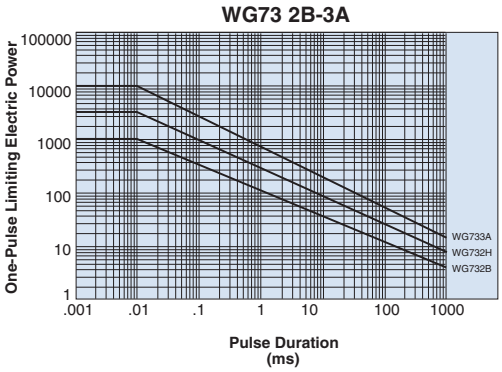
Temperature Rise





Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

One-Pulse Limiting Electric Power



Performance Characteristics

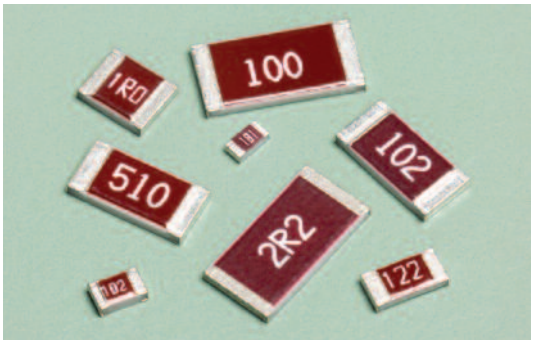
Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated voltage (DC) x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±2%	±1%	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours

KOA SPEER ELECTRONICS, INC.

SG73

anti-surge thick film chip resistor

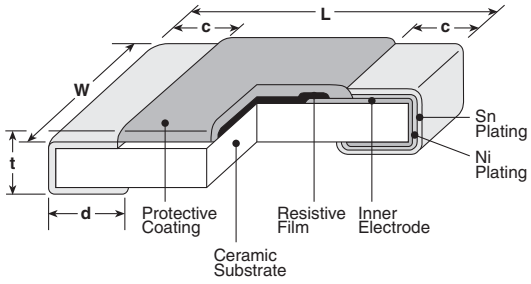
EU RoHS COMPLIANT



features

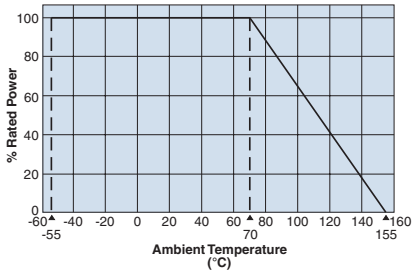
- Superior to RK73B/RK73H series in surge/pulse withstanding voltage
- Untrimmed, superior surge/pulse and ESD withstanding
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested: 0603(1J), 0805(2A), 1206(2B), 1210(2E), 2010(2H/W2H), 2512(3A/W3A)

dimensions and construction

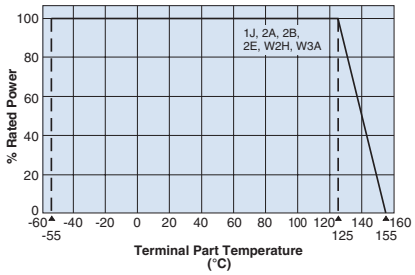


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
SG731J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG731J AT (0603)			.014±.006 (0.35±0.15)	.02±.008 (0.5±0.2)	
SG732A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
SG732A AT (0805)			.018±.010 (0.45±0.25)	.024±.008 (0.6±0.2)	.022±.004 (0.55±0.1)
SG732B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
SG732B AT (1206)			.022±.014 (0.55±0.35)	.031±.008 (0.8±0.2)	
SG732E (1210)		.102±.008 (2.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	
SG732H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)	.02±.012 (0.5±0.3)		
SG73W2H (2010)				.026±.006 (0.65±0.15)	
SG733A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)		.016 +.008 -.004 (0.4 +0.2 -0.1)	
SG73W3A (2512)				.026±.006 (0.65±0.15)	

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

SG73	2B		T	TD	102	K
Type	Size	Characteristics	Termination Material	Packaging	Nominal Resistance	Tolerance
SG73	1J 2A 2B 2E W2H W3A 2H 3A	Nil: Standard **New** A: Heat shock resistance *1	T: Sn (L: Sn/Pb*2)	TP: 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" 4mm embossed plastic	±10%, ±20%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	K: ±10% M: ±20%

*1 With type A, only T is available as the terminal surface material.

*2 With SG73 W2H, W3A only the symbol T is available as the terminal surface material.

The terminal surface material lead free is standard.

For further information on packaging, please refer to Appendix A

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 6/14/21

KOA SPEER ELECTRONICS, INC.

SG73

anti-surge thick film chip resistor

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (E-12) (K±10%, M±20%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
SG731J (0603)	0.1W	70°C	125°C	±400	1Ω - 8.2Ω	50V	100V	-55°C to +155°C
				±200	10Ω - 1MΩ			
SG732A (0805)	0.125W	70°C	125°C	±400	1Ω - 8.2Ω	150V	200V	
				±200	10Ω - 1MΩ			
SG732B (1206)	.33W	70°C	125°C	±400	1Ω - 8.2Ω	200V	400V	
				±200	10Ω - 1MΩ			
SG732E (1210)	0.5W	70°C	125°C	±400	1Ω - 8.2Ω			
				±200	10Ω - 1MΩ			
SG732H/W2H (2010)	0.75W	70°C	125°C	±400	1Ω - 8.2Ω			
				±200	10Ω - 1MΩ			
SG733A/W3A (2512)	1W	70°C	125°C	±400	1Ω - 8.2Ω			
				±200	10Ω - 1MΩ			

Parentheses indicate EIA package size codes.

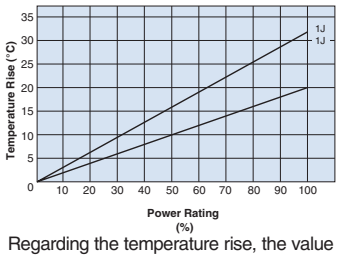
Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

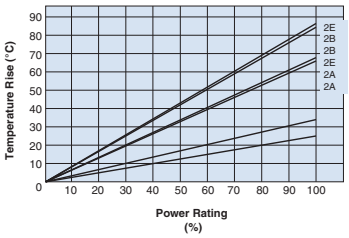
environmental applications

Temperature Rise

SG73 1J

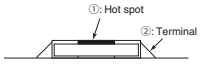


SG73 2A-2E

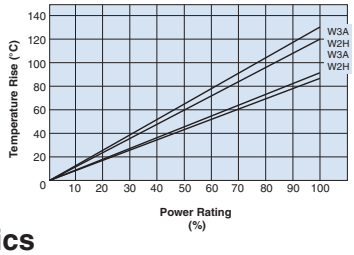


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

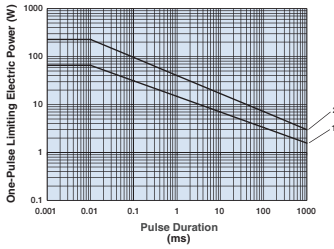


SG73 W2H-W3A



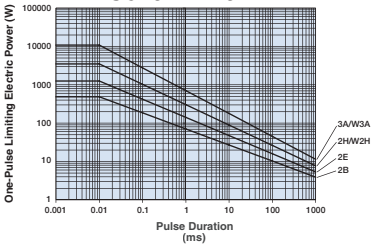
One-Pulse Limiting Electric Power

SG73 1J-2A



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

SG73 2B-W3A



Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

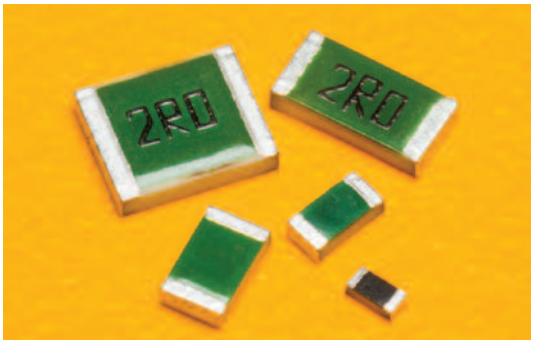
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 12/10/20

KOA SPEER ELECTRONICS, INC.

SG73P

anti-surge endured pulse power thick film chip resistor

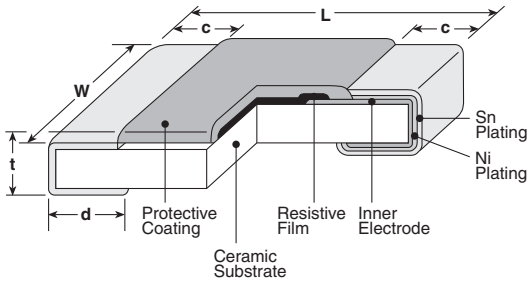
EU RoHS COMPLIANT



features

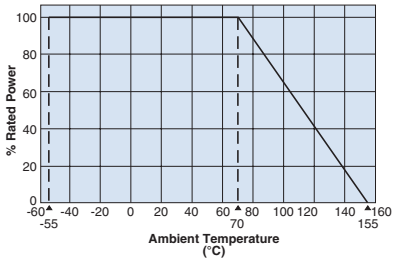
- Superior to RK73B/RK73H series in pulse withstanding voltage and high power
- Down to ±0.5% tolerance
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction

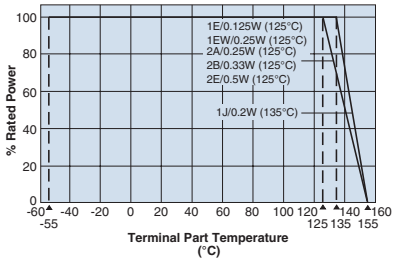


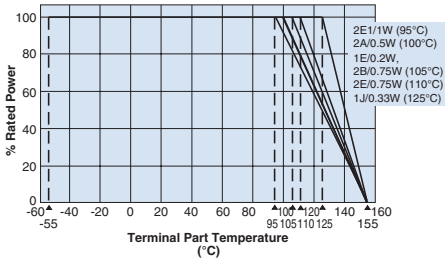
Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
SG73P1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02±.002 (0.5±0.05)	.006±.004 (0.15±0.1)	.010 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
SG73P1EW (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02±.002 (0.5±0.05)	.006±.004 (0.15±0.1)	.010 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
SG73P1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG73P1J AT (0603)			.014±.006 (0.35±0.15)	.02±.008 (0.5±0.2)	
SG73P2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
SG73P2A AT (0805)			.018±.010 (0.45±0.25)	.024±.008 (0.6±0.2)	.022±.004 (0.55±0.1)
SG73P2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
SG73P2B AT (1206)			.022±.014 (0.55±0.35)	.031±.008 (0.8±0.2)	
SG73P2E SG73P2E1 (1210)		.102±.008 (2.6±0.2)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.016 +.008 -.004 (0.4 +0.2 -0.1)	

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.





For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use. If you want to use the rated power of *2, *3, please use the derating curve based on the terminal part temperature on the right hand side.

ordering information

SG73P	2B		T	TD	102	K
Type	Size	Characterisitic	Termination Material	Packaging	Nominal Resistance	Tolerance
SG73P	1E 1EW 1J 2A 2B 2E 2E1	Nil: Standard **New** A: Heat shock resistance *1	T: Sn	TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" 4mm embossed plastic	±0.5%, ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	D: ±0.5% F: ±1% G: ±2% J: ±5%

*1 With type A, only T is available as the terminal surface material.

Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

For further information on packaging, please refer to Appendix A

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 6/23/21

KOA SPEER ELECTRONICS, INC.

SG73P

anti-surge endured pulse power thick film chip resistor

applications and ratings

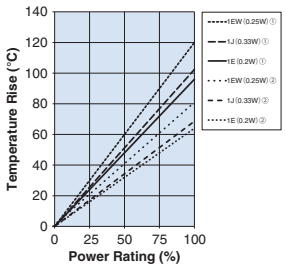
	Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) (E-24)/E-96 (D±0.5%)	(E-24)/E-96 (F±1%)	(E-24) (G±2%, J±5%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
	SG73P1E (0402)	0.125W	70°C	125°C	±200	10 - 1M	1 - 1M	1 - 10M	75V	100V	-55°C to +155°C
		0.2W*2		105°C							
NEW	SG73P1EW (0402)	0.25W*2		125°C	±100	10 - 1M	10 - 1M	10 - 1M	75V	100V	
					±200	—	1 - 9.76	1 - 9.1 1.1M - 10M			
	SG73P1J (0603)	0.2W		135°C	±100	510 - 576k	510 - 576k	510 - 560k	150V	200V	
					±100*1	10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M			
		0.33W*2		125°C	±100	510 - 576k	510 - 576k	510 - 560k			
					±100*1	10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M			
	SG73P2A (0805)	0.25W		125°C	±100	100 - 100k	100 - 100k	100 - 100k	400V	600V (800V)*3	
					±200	10 - 97.6 102k - 1M	1 - 97.6 102k - 1M	1 - 91 110k - 10M			
		0.5W*2		100°C	±100	100 - 100k	100 - 100k	100 - 100k			
					±200	10 - 97.6 102k - 1M	1 - 97.6 102k - 1M	1 - 91 110k - 10M			
	SG73P2B (1206)	0.33W		125°C	±100	300 - 1M	300 - 1M	300 - 1M	200V	400V	
					±200	10 - 294	1 - 294	1 - 270 1.2M - 10M			
		0.75W*2		105°C	±100	300 - 1M	300 - 1M	300 - 1M			
					±200	10 - 294	1 - 294	1 - 270 1.2M - 10M			
	SG73P2E (1210)	0.5W		125°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V	
		0.75W*2		110°C							
	SG73P2E1 (1210)	1.0W*2		95°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V	

Parentheses indicate EIA package size codes. *1 Cold T.C.R. (-55°C ~ +25°C) is +150 x 10^{-6}/K Rated voltage = √Power rating x resistance value or max. working voltage, whichever is lower. Please contact KOA Speer for how to handle a specific surge/pulse. If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. *2 Rated power derating applies only if permitted Terminal Part Temp is not exceeded. *3 Applies when power rating is 0.4W or lower.

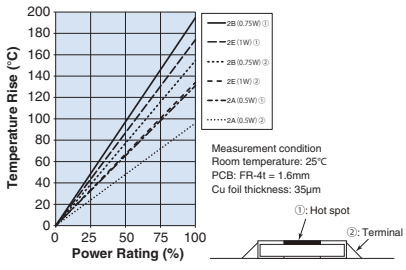
environmental applications

Temperature Rise

SG73P 1E-1J



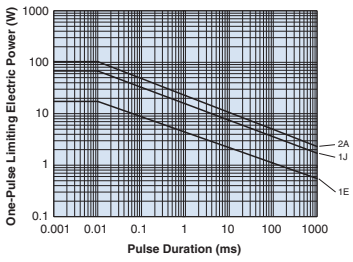
SG73P 2A-2E



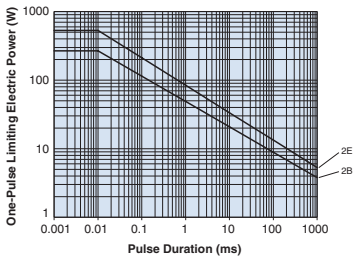
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

One-Pulse Limiting Electric Power

SG73P 1E-2A



SG73P 2B-2E



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (1EW: 0.25W; 2A: 0.4W, 0.5W; 2B: 0.75W; 2E: 0.75W; 2E1: 1W rated power x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

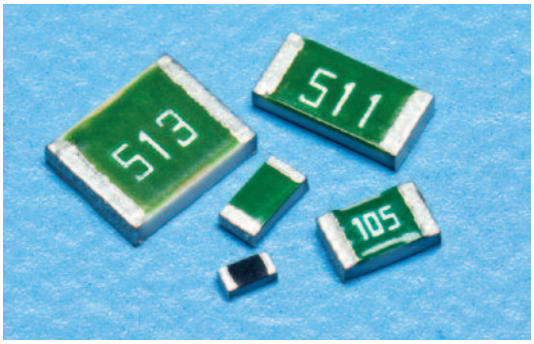
2/17/21

KOA SPEER ELECTRONICS, INC.

SG73S

anti-surge endured surge voltage thick film chip resistor

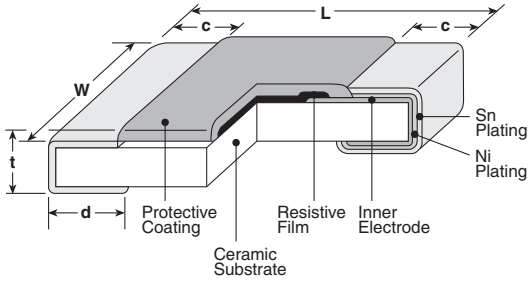
EU RoHS COMPLIANT



features

- Superior to RK73B/RK73H series in surge withstanding voltage and high power
- ESD withstanding; down to ±0.5% tolerance
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
SG73S1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02±.002 (0.5±0.05)	.006±.004 (0.15±0.1)	.010 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
SG73S1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG73S1J AT (0603)			.014±.006 (0.35±0.15)	.02±.008 (0.5±0.2)	
SG73S2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
SG73S2A AT (0805)			.018±.010 (0.45±0.25)	.024±.008 (0.6±0.2)	.022±.004 (0.55±0.1)
SG73S2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
SG73S2B AT (1203)			.022±.014 (0.55±0.35)	.031±.008 (0.8±0.2)	
SG73S2E SG73S2E1 (1210)		.102±.008 (2.6±0.2)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.016 +.008 -.004 (0.4 +0.2 -0.1)	

ordering information

SG73S	2B		T	TD	102	K
Type	**Size**	**Characteristic**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Tolerance**
SG73S	1E 1J 2A 2B 2E 2E1	Nil: Standard **New** A: Heat shock resistance *1	T: Sn	TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" 4mm embossed plastic	±0.5%, ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	D: ±0.5% F: ±1% G: ±2% J: ±5%

*1 With type A, only T is available as the terminal surface material.
Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.
For further information on packaging, please refer to Appendix A

KOA SPEER ELECTRONICS, INC.

SG73S

anti-surge endured surge voltage thick film chip resistor

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) (E-24)/E-96 (D±0.5%)	(E-24)/E-96 (F±1%)	(E-24) (G±2%, J±5%)	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
SG73S1E (0402)	0.125W	70°C	125°C	±200	10 - 1M	1 - 1M	1 - 10M	75V	100V	-55°C to +155°C
	0.2W*2		105°C							
SG73S1J (0603)	0.2W	70°C	135°C	±100	510 - 576k	510 - 576k	510 - 560k	150V	200V	
				±100*1	10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M			
	0.33W*2	70°C	125°C	±100	510 - 576k	510 - 576k	510 - 560k			
				±100*1	10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M			
SG73S2A (0805)	0.25W	70°C	125°C	±200	10 - 1M	1 - 1M	1 - 10M	400V	600V (800V)*3	
	0.5W*2		100°C							
SG73S2B (1206)	0.33W	70°C	125°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V	
	0.75W*2		105°C							
SG73S2E (1210)	0.5W	70°C	125°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V	
	0.75W*2		110°C							
SG73S2E1 (1210)	1W	70°C	95°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V	

Parentheses indicate EIA package size codes.

*1 Cold T.C.R. (-55°C ~ +25°C) is +150 x 10^{-6}/K

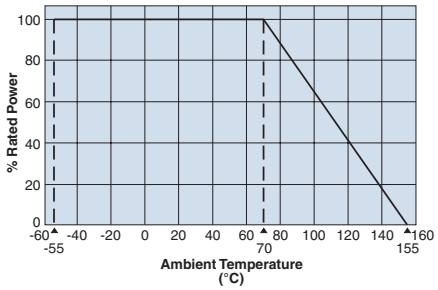
Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

Please contact KOA Speer for how to handle a specific surge/pulse

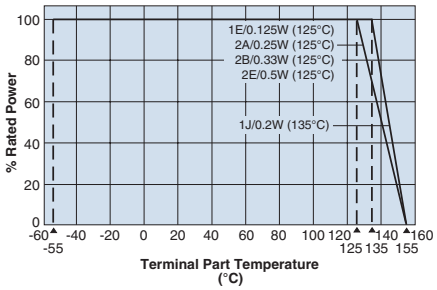
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. *2 If you want to use the rated power of *2, *3 please reference below. *3 Applies when power rating is 0.4W or lower.

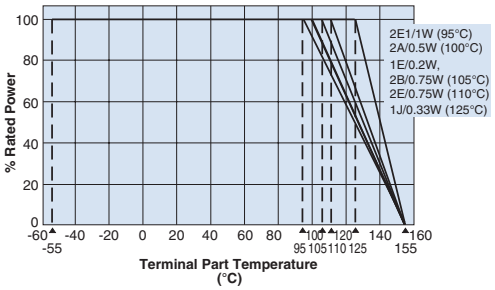
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.





For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

If you want to use the rated power of *2,*3 please use the derating curve based on the terminal part temperature on the right hand side.

Additional environmental applications can also be found at www.koaspeer.com

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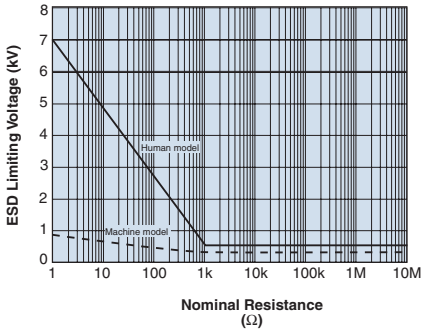
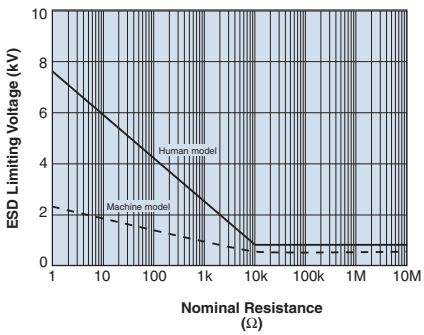
environmental applications (continued)

ESD Limiting Voltage

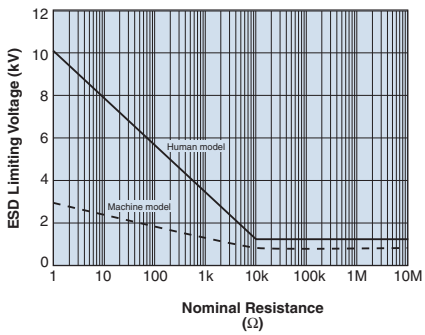
SG73S 1E



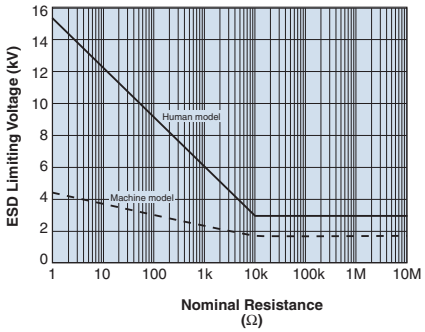
SG73S 1J



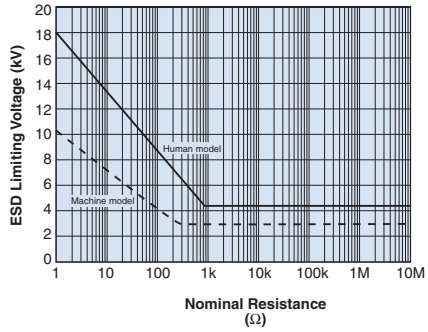
SG73S 2A



SG73S 2B

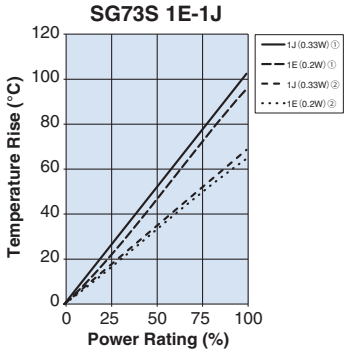


SG73S 2E, 2E1

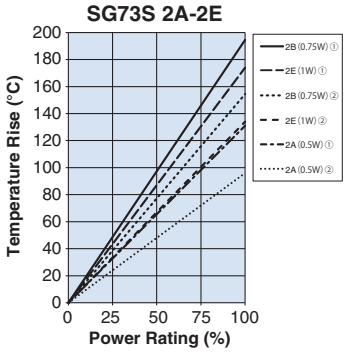


Temperature Rise

SG73S 1E-1J

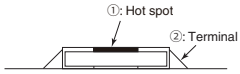


SG73S 2A-2E



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25℃
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2A: 0.4W, 0.5W; 2B: 0.75W; 2E: 0.75W; 2E1: 1W rated power x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours

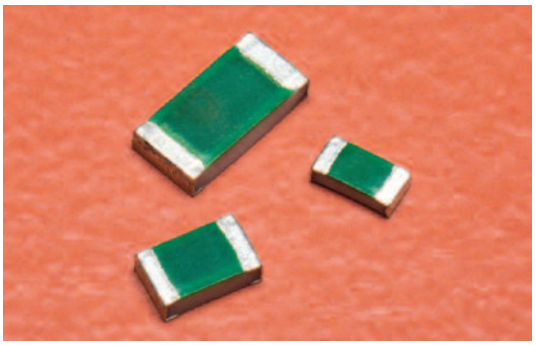
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/21/20

KOA SPEER ELECTRONICS, INC.

SG73G

endured pulse power flat chip resistors (ultra precision grade)

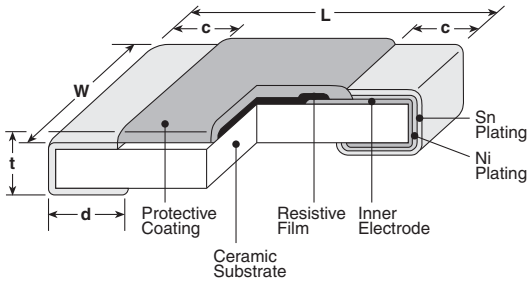
EU RoHS COMPLIANT



features

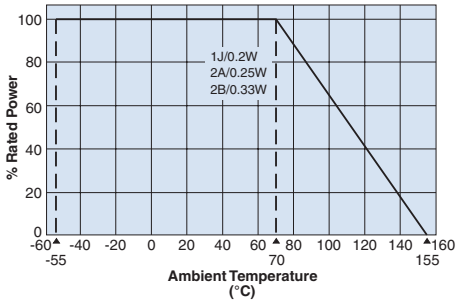
- Superior to RK73 series chip resistors in pulse withstanding voltage and high power
- High precision resistor with T.C.R. ±50x10^{-6}/K and tolerance ±0.25%, ±0.5%
- Suitable for both reflow and flow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction

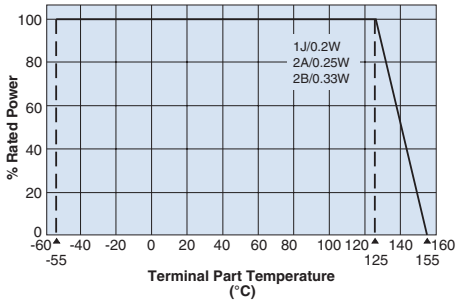


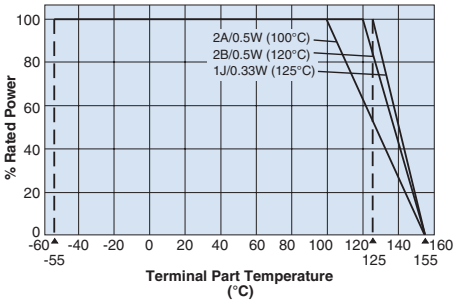
Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
SG73G1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG73G1J AT (0603)			.014±.006 (0.35±0.15)	.02±.008 (0.5±0.2)	
SG73G2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
SG73G2A AT (0805)			.018±.010 (0.45±0.25)	.024±.008 (0.6±0.2)	.022±.004 (0.55±0.1)
SG73G2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
SG73G2B AT (1206)			.022±.014 (0.55±0.35)	.031±.008 (0.8±0.2)	

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.





For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use. *1 If you want to use the rated power of *1, please use the derating curve based on the terminal part temperature on the right hand side.

ordering information

SG73G	2A		T	TD	1002	D
Type	**Power Rating**	**Characteristics**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Tolerance**
SG73G	1J: 0.33W 2A: 0.5W 2B: 0.5W	Nil: Standard **New** A:Heat shock resistance *1	T: Sn	TP: 2mm pitch punch paper TD: 4mm pitch punched paper TE: 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	D: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	C: ±0.25% D: ±0.5%

*1 With type A, only T is available as the terminal surface material. Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

6/22/21

applications and ratings

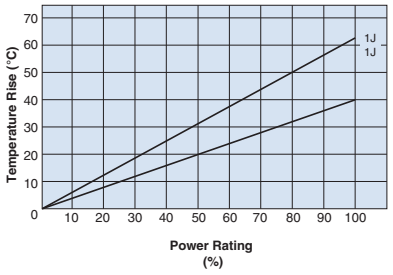
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) C±0.25%, D±0.5% E-24/E-96	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
SG73G1J (0603)	0.2W	70°C	125°C	±50	10 - 1M	150V	200V	-55°C to +155°C
	0.33W*1	—	125°C					
SG73G2A (0805)	0.25W	70°C	125°C	±50	10 - 1M	200V	400V	
	0.5W*1	—	100°C					
SG73G2B (1206)	0.33W	70°C	125°C	±50	10 - 1M	200V	400V	
	0.5W*1	—	120°C					

Parentheses indicate EIA package size codes. Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower. If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. *1 If you want to use the rated power of *1, please use the derating curve based on the terminal part temperature on the previous page.

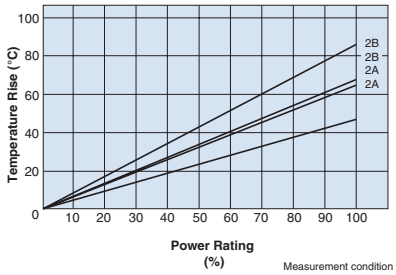
environmental applications

Temperature Rise

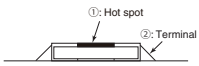
SG73G 1J



SG73G 2A-2B



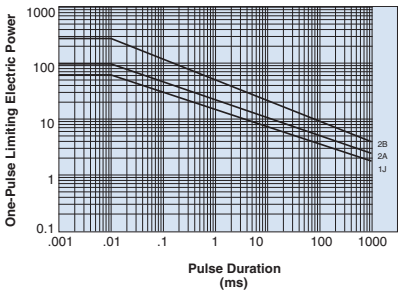
Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

One-Pulse Limiting Electric Power

SG73G 1J-2B



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2A: 0.5W rated power x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

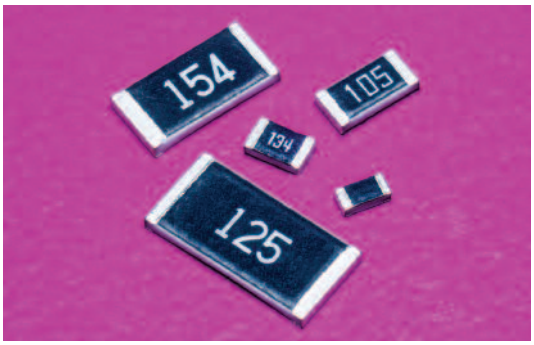
11/06/19

KOA SPEER ELECTRONICS, INC.

HV73

flat chip resistors for high voltage

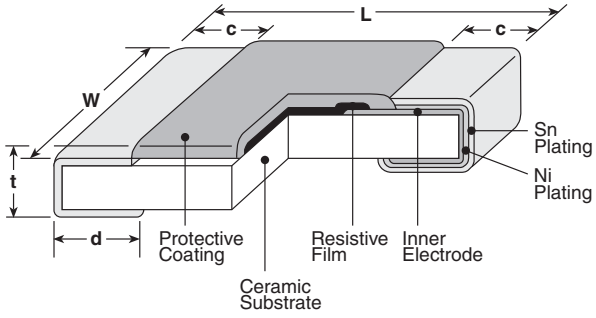
EU RoHS COMPLIANT



features

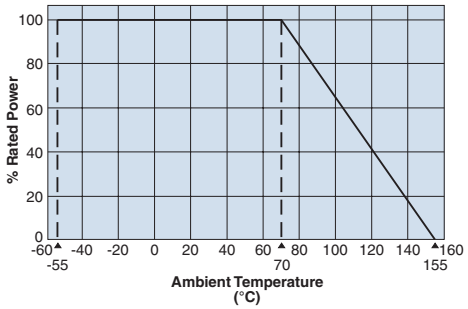
- Superior to RK73 series in maximum working voltage
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction

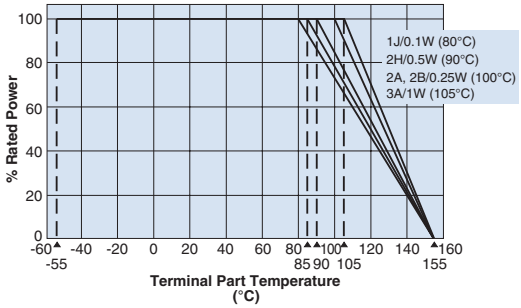


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

HV73	2B	T	TD	1004	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
	1J: 0.1W 2A: 0.25W 2B: 0.25W 2H: 0.5W 3A: 1W	T: Sn	TD: 0603, 0805, 1206: 7" 4mm pitch punched paper TE: 2010 & 2512: 7" embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures + 1 multiplier	D: ±0.5% F: ±1% G: ±2% J: ±5%

10/21/20

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) E-24/E-96 (D±0.5%)	E-24/E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)	Absolute Maximum Working Voltage	Maximum Overload Voltage (D.C.)*	Operating Temp. Range
1J	0.1W	70°C	80°C	±100**	—	10k - 10M	10k - 10M	10k - 10M	350V	500V*	-55°C to +155°C
2A	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	400V	800V*	
				±200	—	—	—	11M - 51M			
2B	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	800V	1000V*	
				±200	—	—	—	11M - 51M			
2H	0.5W	70°C	90°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	2000V (D.C.)	3000V*	
				±200	—	10.2M - 51M	11M - 51M	11M - 51M			
				±300	—	51.1M - 100M	56M - 100M	56M - 100M			
3A	1W	70°C	105°C	±100	43k - 1M	43k - 10M	43k - 10M	43k - 10M	3000V (D.C.)	4000V*	
				±200	—	10.2M - 20M	11M - 20M	11M - 51M			

* Max. overload voltage is specified by D.C. voltage

** Cold T.C.R. (-55°C ~ +25°C) of 1.02MΩ ~ 10MΩ is +200x10^{-6}/K

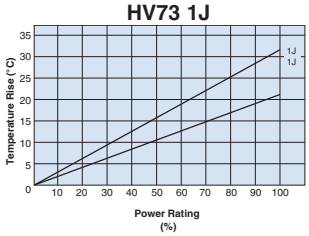
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

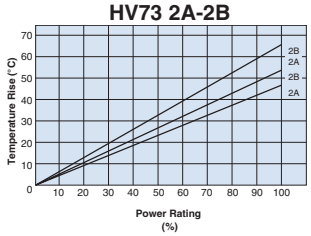
environmental applications

Temperature Rise

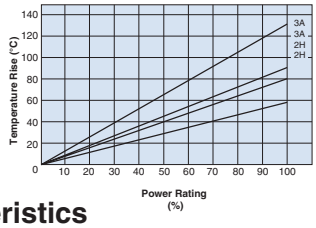
HV73 1J



HV73 2A-2B



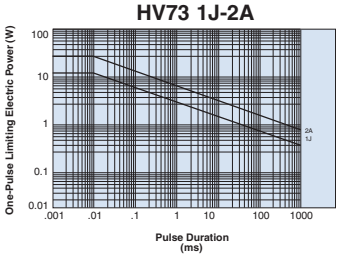
HV73 2H-3A



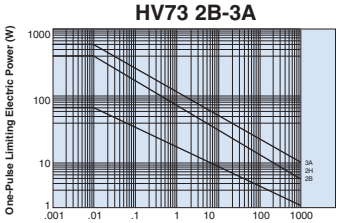
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

One-Pulse Limiting Electric Power

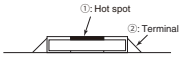
HV73 1J-2A



HV73 2B-3A



Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage (D.C.) x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%: (10kΩ≤R≤10MΩ) ±1%: (10MΩ≤R≤100MΩ)	±0.3%: (10kΩ≤R≤10MΩ) ±0.5%: (10MΩ≤R≤100MΩ)	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%	±0.3%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/06/19

KOA SPEER ELECTRONICS, INC.

HV73V

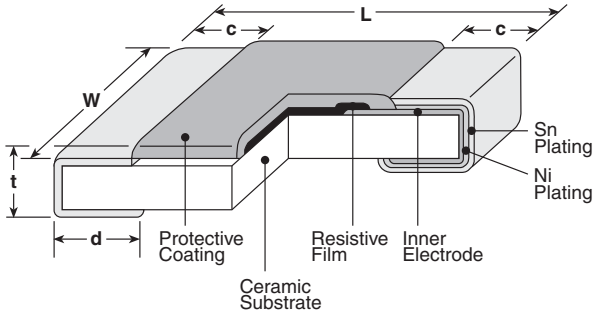
flat chip resistors for high voltage (automotive)

EU RoHS COMPLIANT

features

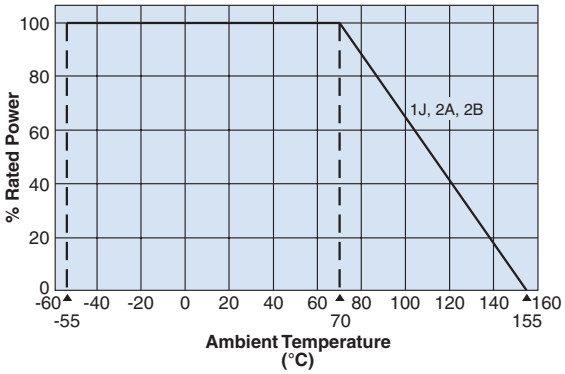
- Superior to RK73 series in maximum working voltage
- Suitable for flow and reflow solderings
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Suitable for high reliable applications like automotives
- AEC-Q200 tested

dimensions and construction

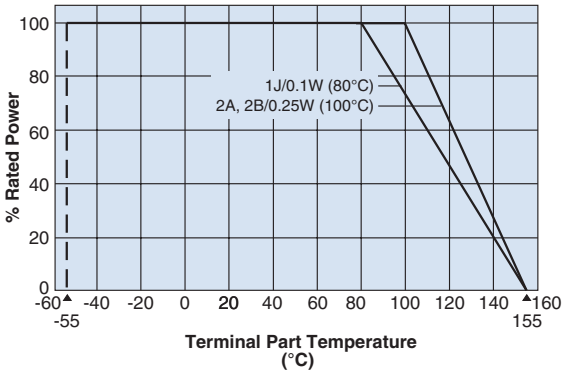


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
1J AT (0603)			.014±.006 (0.35±0.15)	.02±.008 (0.5±0.2)	
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2A AT (0805)			.018±.010 (0.45±0.25)	.024±.008 (0.6±0.2)	.022±.004 (0.55±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2B AT (1206)			.022±.014 (0.55±0.35)	.031±.008 (0.8±0.2)	

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve.
Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

HV73V	2A		T	TD	104	J
Type	**Size**	**Characteristics**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
HV73V	1J: 0.1W 2A: 0.25W 2B: 0.33W	Nil: Standard **New** A: Heat shock resistance *1	T: Sn	TD: 7" 4mm pitch punched paper TE: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures +1 multiplier	D: ±0.5% F: ±1% G: ±2% J: ±5%

*1 With type A, only T is available as the terminal surface material.

6/03/21

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) E-24/E-96 (D±0.5%)	E-24/E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)	Maximum Working Voltage	Maximum Overload Voltage (D.C.)*2	Operating Temperature Range
HV73V1J	0.1W	70°C	80°C	±100*3	—	10k - 10M	10k - 10M	10k - 10M	350V	500V*	-55°C to +155°C
HV73V2A	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	400V	800V*	
				±200	—	—	—	11M - 51M			
HV73V2B	0.33W	70°C	115°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	800V	1200V*	
				±200	—	—	—	11M - 51M			

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

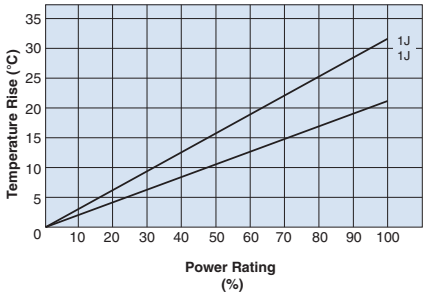
*2 Maximum Overload Voltage is specified by D.C. voltage *3 Cold T.C.R. (-55°C ~ +25°C) of 1.02MΩ ~ 10MΩ is +200x10^{-6}/K

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

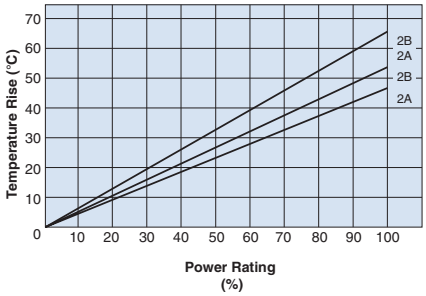
environmental applications

Temperature Rise

HV73V 1J

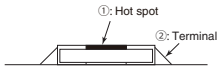


HV73V 2A-2B



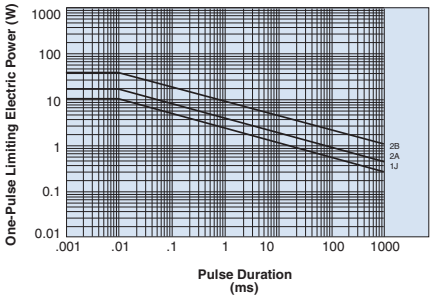
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



One-Pulse Limiting Electric Power

HV73 1J-2B



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage (D.C.) x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%: (10kΩ≤R≤10MΩ) ±1%: (11MΩ≤R≤51MΩ)	±0.3%: (10kΩ≤R≤10MΩ) ±0.5%: (11MΩ≤R≤51MΩ)	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%	±0.3%	+155°C, 1000 hours

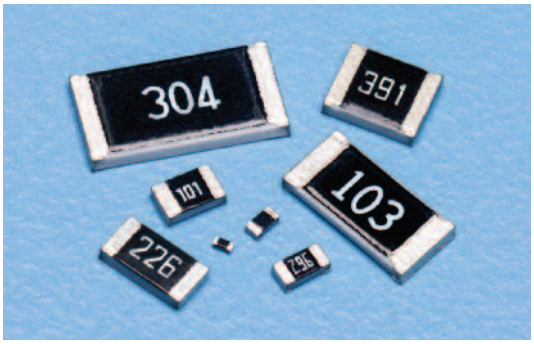
Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/20/20

KOA SPEER ELECTRONICS, INC.

RK73-RT

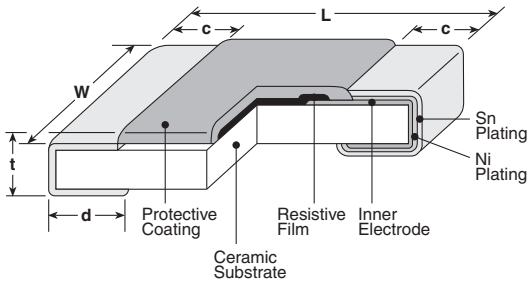
flat chip resistors (anti-sulfuration)



features

- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Excellent heat resistance and weather resistance are ensured by the use of metal glaze thick film
- High stability and high reliability with the triple-layer structure of electrode
- Suitable for both flow and reflow
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested: 0201 (1H), 0402 (1E), 0603 (1J), 0805 (2A), 1206 (2B), 1210 (2E), 2010 (W2H), 2512 (W3A)

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1F (01005)	.016±.001 (0.4±0.02)	.008±.001 (0.2±0.02)	.004±.001 (0.1±0.03)	.004±.001 (0.11±0.03)	.005±.001 (0.13±0.02)
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2E (1210)		.102±.008 (2.6±0.2)			
W2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)		.026±.006 (0.65±0.15)	
W3A/ W3A2[1] (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)			

[1] RK73Z exempt

ordering information

RK73H	2A	R	T	TD	1002	F
Type	Power Rating	Characteristic	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
RK73B RK73H RK73Z	1F 1H 1E 1J 2A 2B 2E W2H W3A W3A2	R: Anti-Sulfur	T: Sn	TX: 01005 only: 4mm width - 1mm pitch plastic embossed TBL: 01005 only: 2mm pitch pressed paper TPL: 0402 only: 2mm pitch punch paper TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210:7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" embossed plastic For further information on packaging, please refer to Appendix A	RK73B: 3 digits RK73H: 4 digits RK73Z: None	D: ±0.5% F: ±1% G: ±2% J: ±5%

11/09/21

applications and ratings

RK73B/RK73H

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range RK73H D±0.5% E24, E96	RK73H F±1% E24, E96[2]	RK73B G±2% E24	RK73B J±5% E24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
1F	0.03W	70°C	—	±200	—	100kΩ - 2MΩ[2]	100kΩ - 1MΩ	100kΩ - 10MΩ	20V	30V	-55°C to +125°C
				±250		10Ω - 91kΩ[2]	10Ω - 91kΩ	10Ω - 91kΩ			
				0 - +300		—	1Ω - 9.1Ω	1Ω - 9.1Ω			
1H	0.05W		125°C	±200	100Ω - 100kΩ	100Ω - 1MΩ	—	100 - 1M	25V	50V	-55°C to +155°C
				±300	—	10Ω - 97.6Ω		10Ω - 91Ω			
1E	0.1W			±100	100Ω - 1MΩ	10Ω - 1MΩ	—	—	75V	100V	
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ			
1J	0.1W			±100	1.02kΩ - 1MΩ	1.02kΩ - 1MΩ	—	—			
				±200	—	1.02MΩ - 10MΩ	1.1kΩ - 10MΩ	1.1kΩ - 10MΩ			
	0.125W			±100	100Ω - 1kΩ	10Ω - 1kΩ	—	—			
				±200	—	—	10Ω - 1kΩ	1Ω - 1kΩ			
2A	0.25W			±100	100Ω - 1MΩ	10Ω - 1MΩ	—	—	150V	200V	
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ			
2B	0.25W			±100	100Ω - 1MΩ	10Ω - 1MΩ	—	—	200V	400V	
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ			
2E	0.5W			±100	100Ω - 1MΩ	10Ω - 1MΩ	—	—			
				±200	—	—	10Ω - 1MΩ	1Ω - 1MΩ			
W2H	0.75W			±100	10Ω - 1MΩ	10Ω - 1MΩ	—	—			
				±200	—	1 - 9.76 1.02MΩ - 10MΩ	1Ω - 10MΩ	1Ω - 10MΩ			
W3A	1W			±100	10Ω - 1MΩ	10Ω - 1MΩ	—	—			
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ			
W3A2	2W[3]		95°C	±100	10Ω - 1MΩ	10Ω - 1MΩ	—	—			
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ			

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

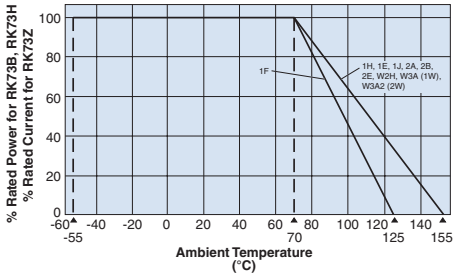
[2]The nominal resistance value for RK73H1F (F:±1%) is E24

[3] If you use at the rated power, please keep the condition that the terminal of the resistor is below the rated terminal part temperature. Please refer to the derating curves based on the terminal temperature.

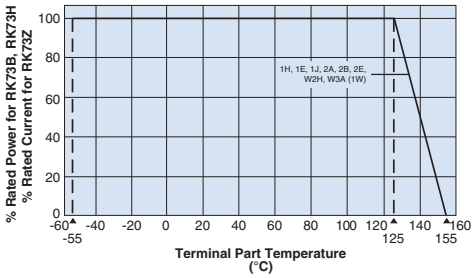
If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," in your usage conditions, please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves in the terminal part temperature" in the beginning of the catalog.
While using under high power, the temperature of the product may increase depending on the condition of heat dissipation from PCB.
Be sure to check the terminal part temperature as well as precautions to use on delivery specification before use.

Derating Curve

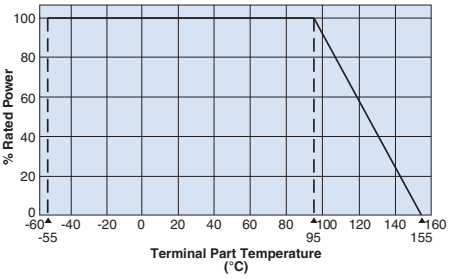
RK73B-RK73H-RK73Z-RT
Ambient Temperature



RK73B-RK73H-RK73Z-RT
Terminal Part Temperature



RK73B-RK73H-RT
Terminal Part Temperature W3A2



For resistors operated at an ambient temperature of 70°C or higher, the power (for RK73B, RK73H) or a current rating (for RK73Z) shall be derated in accordance with the above derating curve.

When the terminal part temperature of the resistor exceeds the rated terminal part temperature shown above, the power shall be derated according to the derating curve.

Please refer to "Introduction of the derating curves based on the terminal part temperature" on the beginning of our catalog before use.

6/29/20

KOA SPEER ELECTRONICS, INC.

RK73-RT

flat chip resistors (anti-sulfuration)

applications and ratings (continued)

RK73Z

Part Designation	Rated Ambient Temperature	Rated Terminal Part Temperature	Resistance	Current Rating	Maximum Surge Current	Operating Temperature Range
1H	+70°C	+125°C	100mΩ max.	0.5A	1A	-55°C to +155°C
1E			50mΩ max.	1A	2A	
1J						
2A				2A	5A	
2B					10A	
2E						
W2H						
W3A						

environmental applications

Performance Characteristics

Parameter	RK73H, RK73B Requirement ΔR ±(%+0.1Ω)		RK73Z Requirement		Test Method
	Limit	Typical	Limit	Typical	
Resistance	Within specified tolerance	—	R≤100mΩ: 1H R≤50mΩ: All others	R≤90mΩ: 1H R≤40mΩ: All others	25°C
T.C.R.	Within specified T.C.R.	—	—	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±1%: 1F ±0.8%: All others	R≤100mΩ: 1H R≤50mΩ: All others	R≤90mΩ: 1H R≤40mΩ: All others	RK73B, RK73H Rated Voltage x 2.5 for 5 seconds (1E, 2B, W3A2: Rated Voltage x 2 for 5 seconds) RK73Z: Max. overload current for 5 seconds
Resistance to Solder Heat	±1%:10Ω≤R≤1MΩ ±3%: R<10Ω, R>1MΩ	±1%: R<10Ω, R>1MΩ ±0.5%: All others	R≤100mΩ: 1H R≤50mΩ: All others	R≤90mΩ: 1H R≤40mΩ: All others	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1%: 1F ±0.5%: All others	±0.5%: 1F ±0.3%: All others	R≤100mΩ: 1H R≤50mΩ: All others	R≤90mΩ: 1H R≤40mΩ: All others	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: All others	±0.75%: 1J, 2A, 2B ±1.5%: 1F ±1%: All others	R≤150mΩ: 1H R≤100mΩ: All others	R≤100mΩ: 1H R≤50mΩ: All others	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B ±3%: All others	±0.75%: 1J, 2A, 2B ±1%: All others	R≤150mΩ: 1H R≤100mΩ: All others	R≤100mΩ: 1H R≤50mΩ: All others	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.5%	R≤150mΩ: 1H R≤100mΩ: All others	R≤100mΩ: 1H R≤50mΩ: All others	+125°C, 1000 hours: 1F; +155°C, 1000 hours: 1H, 1E, 1J, 2A, 2B, 2E, W2H, W3A
Sulfuration Test	±5%	±0.3%: 1F, 1H ±0.2%: All others	R≤150mΩ: 1H R≤100mΩ: All others	R≤100mΩ: 1H R≤50mΩ: All others	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

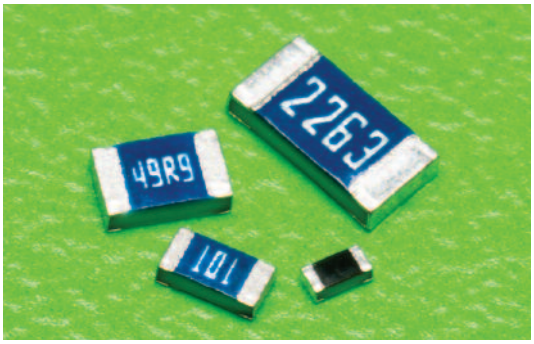
Please refer to conventional products for characteristic data such as temperature rise.

KOA SPEER ELECTRONICS, INC.

RK73G-RT

flat chip resistor (ultra precision grade, anti-sulfuration)

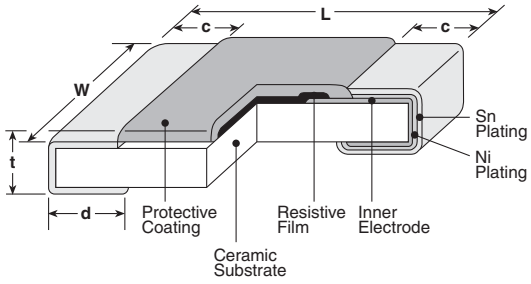
EU RoHS COMPLIANT



features

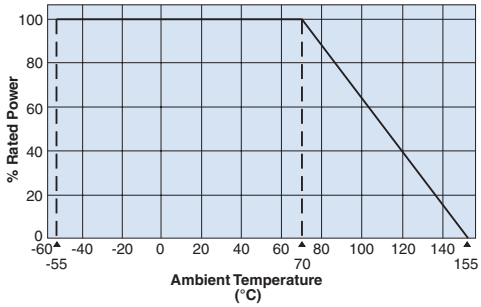
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Metal-glaze thick film resistor for surface mounting
- High precision resistor with T.C.R. ±50x10^{-6}/K and tolerace ±0.25%
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction

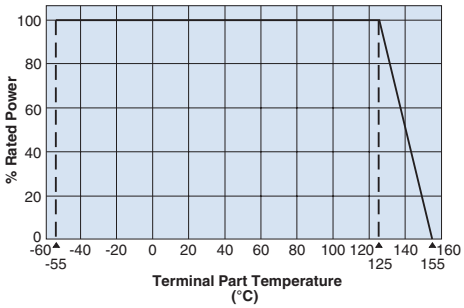


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RK73G	2A	R	T	TD	1002	D
Type	Size	Characteristic	Termination Material	Packaging	Nominal Resistance	Tolerance
	1E: 0.1W 1J: 0.1W 2A: 0.125W 2B: 0.25W	R: Anti-Sulfur	T: Sn	TPL: 0402 only: 2mm pitch punched paper TP: 0402, 0603: 7" 2mm pitch punched paper TD: 0603, 0805, 1206: 7" 4mm pitch punched paper TE: 0805, 1206: 7" 4mm plastic embossed For further information on packaging, please refer to Appendix A	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	C: ±0.25% D: ±0.5% F: ±1%

 10/22/21

KOA SPEER ELECTRONICS, INC.

RK73G-RT

flat chip resistor
(ultra precision grade, anti-sulfuration)

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range E-24, E-96 (C±0.25%)	Resistance Range E-24, E-96 (D±0.5%)	Resistance Range E-24, E-96 (F±1%)	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
RK73G1E (0402)	1/10W (.10W)	+70°C	+125°C	±50	—	30Ω - 1MΩ	30Ω - 1MΩ	50V	100V	-55°C to +155°C
RK73G1J (0603)	1/10W (.10W)				100Ω - 1MΩ			75V	150V	
RK73G2A (0805)	1/8W (.125W)							150V	200V	
RK73G2B (1206)	1/4W (.25W)							200V	400V	

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves in the terminal part temperature" in the beginning of the catalog.

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.6%	Rated Voltage x 2.5 for 5 seconds (1E, 2B: Rated Voltage x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.4%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: 1E	±0.6%: 1J, 2A, 2B; ±1%: 1E	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B ±3%: 1E	±0.6%: 1J, 2A, 2B; ±1%: 1E	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.6%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with sulfur substance 3.5% contained 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

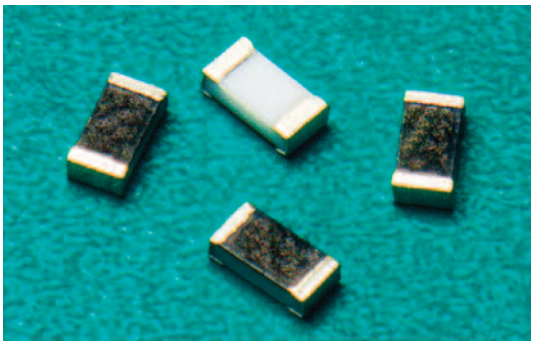
For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com

KOA SPEER ELECTRONICS, INC.

RS73-RT

high reliability chip resistors (anti-sulfuration)

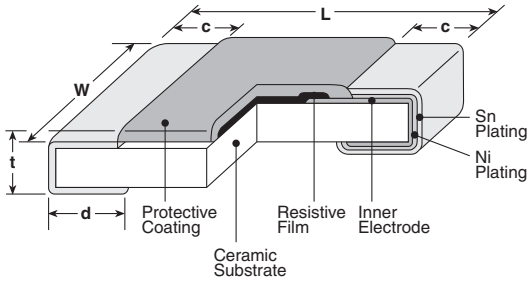
EU RoHS COMPLIANT



features

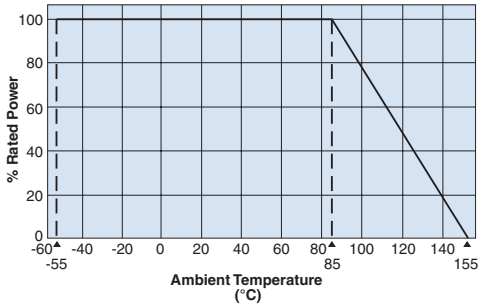
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Metal-glaze thick film resistor for surface mounting
- High precision resistor with T.C.R. down to 25 ppm and tolerance as tight as ±0.1%
- High reliability with ΔR of ±0.2% and ±0.5% in the reliability test
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction

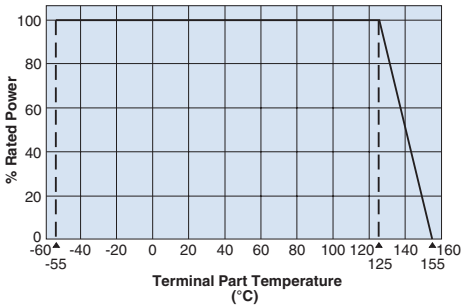


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1E (0402)	.039 $^{+.004}_{-.002}$ (1.0 $^{+0.1}_{-0.05}$)	.020±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.010 $^{+.008}_{-.004}$ (0.25 $^{+0.2}_{-0.1}$)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.008±.004 (0.2±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.010±.006 (0.25±0.15)	.012 $^{+.008}_{-.004}$ (0.3 $^{+0.2}_{-0.1}$)	.020±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.014±.006 (0.35±0.15)	.016 $^{+.008}_{-.004}$ (0.4 $^{+0.2}_{-0.1}$)	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RS73F	1J	R	T	TD	1002	B
Type	Power Rating	Characteristic	Termination Material	Packaging	Nominal Resistance	Tolerance
RS73F RS73G	1E: 0.125W 1J: 0.2W 2A: 0.25W 2B: 0.33W	R: Anti-Sulfur	T: Sn	TPL-TP: 2mm pitch punch paper TD: 4mm pitch punched paper For further information on packaging, please refer to Appendix A	4 digits	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%

10/22/21

KOA SPEER ELECTRONICS, INC.

RS73-RT

high reliability chip resistors (anti-sulfuration)

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range*2 B±0.1% E-24, E-96	C±0.25% E-24, E-96	D±0.5% E-24, E-96	F±1% E-24, E-96	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
RS73F1E (0402)	.125W	85°C	+125°C	±25*1	300Ω - 100kΩ	300Ω - 1MΩ	300Ω - 1MΩ	300Ω - 1MΩ	75V	100V	-55°C to +155°C
RS73G1E (0402)				±50							
RS73F1J (0603)	.2W			±25*1	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	100V	150V	
RS73G1J (0603)				±50							
RS73F2A (0805)	.25W			±25*1	10Ω - 3MΩ	10Ω - 6.8MΩ	10Ω - 10MΩ	10Ω - 10MΩ	150V	300V	
RS73G2A (0805)				±50							
RS73F2B (1206)	.33W			±25*1	10Ω - 1MΩ	10Ω - 1MΩ			200V	400V	
RS73G2B (1206)				±50							

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

*1 Measurement Temperature: +25°C/+125°C. Cold T.C.R. (-55°C/+25°C) is -50~+25x10^{-6}/K

*2 Please inquire about E-192

If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves in the terminal part temperature" in the beginning of the catalog.

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±0.2%	±0.03%	Rated Voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±0.2%	±0.1%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.2%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤1MΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.4%: others	±0.05%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤1MΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.2%: others	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±0.2%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.4~0.5%: others	±0.04%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.08%: others	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.2%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤1MΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.4%: others	±0.05%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤1MΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.2%: others	85°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.2%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤100kΩ) ±0.4~0.5%: others	±0.1%: 1E (300Ω≤R≤30kΩ) 1J (10Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤100kΩ) ±0.2~0.3%: others	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with sulfur substance 3.5% 105°C ± 3°C, 500hr

Please refer to conventional products for characteristic data such as temperature rise.

KOA SPEER ELECTRONICS, INC.

WK73-RT

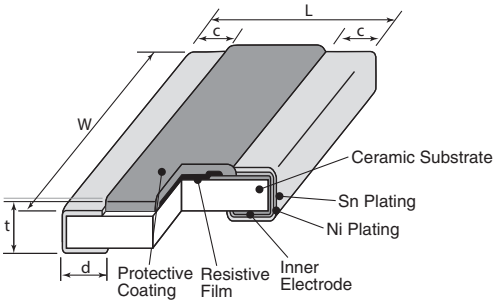
wide terminal type flat chip resistors (anti sulfuration)

EU RoHS COMPLIANT

features

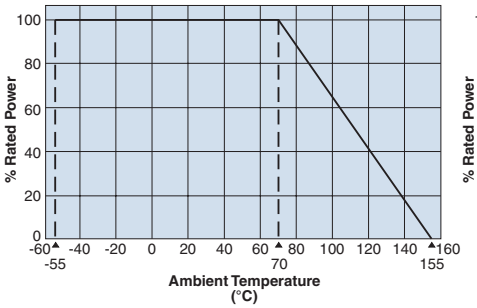
- Anti-sulfuration type, wide-side termination (reverse-geometry)type flat chip resistor
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Suitable for both flow and reflow solderings
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



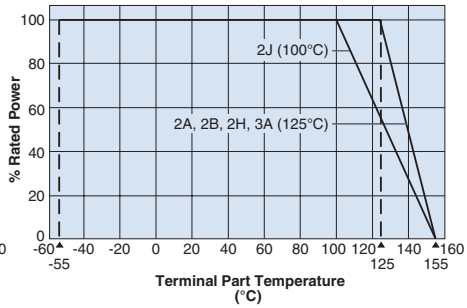
Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
2A (0508)	.049±.006 (1.25±0.15)	.079±.006 (2.0±0.15)	.012±.008 (0.3±0.2)	.014±.008 (0.35±0.2)	.022±.004 (0.55±0.1)
2B (0612)	.063±.008 (1.6±0.2)	.126±.012 (3.2±0.3)	.012±.008 (0.3±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)
2H (1020)	.098±.008 (2.5±0.2)	.197±.008 (5.0±0.2)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	
2J (1218)	.122±.008 (3.1±0.2)	.181±.008 (4.6±0.2)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	.024±.004 (0.6±0.1)
3A (1225)	.122±.004 (3.1±0.1)	.248±.006 (6.3±0.15)	.018±.008 (0.45±0.2)	.030±.006 (0.75±0.15)	

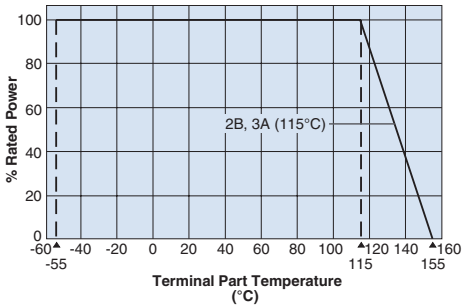
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

WK73S/R2B (1W), WK73S/R3A (2W)





For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.
Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.
When using Power Rating[1], please use the derating curves based on the terminal part temperature on the right side.

ordering information

WK73R	2B	R	T	TD	10R0	F
Type	Size	Characteristic	Termination Material	Packaging	Nominal Resistance*	Resistance Tolerance
WK73S WK73R	2A: 0.75W, 1W 2B: 0.75W, 1W 2H: 1W 2J: 1W 3A: 1.5W, 2W	R: Anti-Sulfur	T: Sn	TD: 4mm pitch punched paper TE: 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±1%: 4 digits ±5%: 3 digits	F: ±1% J: ±5%

* Resistance value, 3 digits:
1~9.1Ω, 1R0~9R1
Resistance value, 4 digits:
1~9.76Ω, 1R00~9R76

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/26/21

KOA SPEER ELECTRONICS, INC.

WK73-RT

wide terminal type flat chip resistors (anti sulfuration)

applications and ratings

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) F±1% E-24 • E-96	Resistance Range (Ω) J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
WK73S2A	1.0W[1]	70°C	125°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	-55°C to +155°C
WK73R2A	0.75W	70°C	125°C	±100	20.5k ~ 1M	22k ~ 1M			
	1.0W[1]	70°C	125°C	±100	10 ~ 20k	10 ~ 20k			
WK73S2B	0.75W	70°C	115°C	±100	1 ~ 9.76	1 ~ 9.1			
	1.0W[1]	70°C	115°C	±100	1 ~ 9.76	1 ~ 9.1			
				±150	0.3 ~ 0.976	0.3 ~ 0.91			
WK73R2B	0.75W	70°C	125°C	±100	10 ~ 9.76k	10 ~ 9.1k			
				±200	10k ~ 1M	10k ~ 1M			
	1.0W[1]	70°C	115°C	±100	10 ~ 9.76k	10 ~ 9.1k			
WK73S2H	1.0W	70°C	125°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	
				±150	0.2 ~ 0.976	0.2 ~ 0.91			
WK73R2H	1.0W	70°C	125°C	±100	10 ~ 430k	10 ~ 430k			
				±200	432k - 1M	470k - 1M			
WK73S2J	1.0W	70°C	100°C	±100	1 ~ 9.76	1~9.1	200V	400V	
WK73R2J	1.0W	70°C	100°C	±100	10 ~ 510k	10 ~ 510k			
				±200	511k ~ 1M	560k ~ 1M			
WK73S3A	1.5W	70°C	125°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	
	2.0W[1]	70°C	115°C	±100	1 ~ 9.76	1 ~ 9.1			
WK73R3A	1.5W	70°C	125°C	±100	10 ~ 330k	10 ~ 330k			
				±200	332k - 1M	360k - 1M			
	2.0W[1]	70°C	115°C	±100	10 ~ 330k	10 ~ 330k			
				±200	332k - 1M	360k - 1M			

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

[1] When using Power Rating, please use the derating curves based on the terminal part temperature on the right side of the graph located on the previous page.

If any questions should arise whether to use the “Rated Ambient Temperature” or the “Rated Terminal Part Temperature”, please give priority to the “Rated Terminal Part Temperature.” Prior to use and for more details refer to the “Introduction of the derating curves based on the terminal part temperature” in the beginning of the catalog.

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	WK732B, S2H, R2H, S2J, R2J: Rated voltage x 2.5 for 5 seconds WK73S/R2A (0.75W, 1W), WK73S/R2B (1W), WK73S/R3A (2W): Rated voltage x 2.0 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±2%	±1%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

Additional environmental applications can also be found at www.koaspeer.com

KOA SPEER ELECTRONICS, INC.

WK73-RT

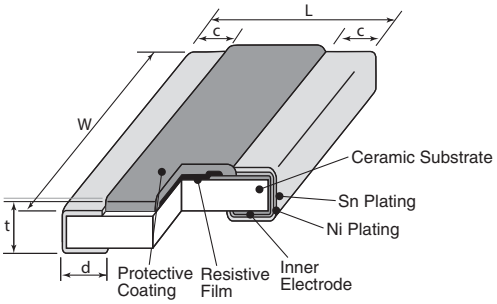
higher power, wide terminal type flat chip resistors (anti sulfuration)

EU RoHS COMPLIANT

features

- Anti-sulfuration type, wide-side termination (reverse-geometry) type flat chip resistor
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Suitable for both flow and reflow solderings
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

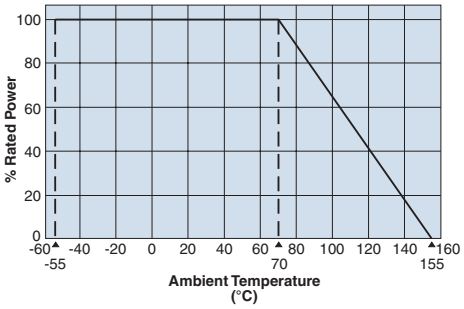
dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
2B15 (0612)	.063± $^{+.004}_{-.008}$ ($1.6\pm^{+0.1}_{-0.2}$)	.126± $^{+.004}_{-.012}$ ($3.2\pm^{+0.1}_{-0.3}$)	.012±.008 (0.3±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)
2H2 (1020)	.098± $^{+.004}_{-.008}$ ($2.5\pm^{+0.1}_{-0.2}$)	.197± $^{+.004}_{-.008}$ ($5.0\pm^{+0.1}_{-0.2}$)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	.024±.004 (0.6±0.1)
3A3 (1225)	.122± $^{+.008}_{-.004}$ ($3.1\pm^{+0.2}_{-0.1}$)	.248±.006 (6.3±0.15)	.018±.008 (0.45±0.2)	.030±.006 (0.75±0.15)	.024±.004 (0.6±0.1)

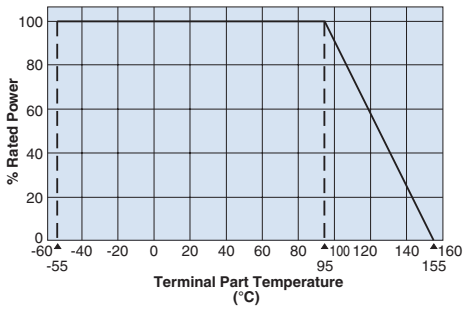
Derating Curve

Ambient Temperature



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Terminal Part Temperature



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

WK73R	2B15	R	T	TD	10R0	F
Type	**Size**	**Characteristic**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
WK73S WK73R	2B15: 1.5W 2H2: 2W 3A3: 3W	R: Anti-Sulfur	T: Sn	TD: 0612: 7" 4mm pitch punched paper TE: 1020, 1225: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω	F: ±1% J: ±5%

 10/26/21

KOA SPEER ELECTRONICS, INC.

WK73-RT

higher power, wide terminal type flat chip resistors (anti sulfuration)

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) F±1% E-24 • E-96	Resistance Range (Ω) J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
WK73S2B15	1.5W	70°C	95°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	-55°C to +155°C
				±150	0.3 ~ 0.976	0.3 ~ 0.91			
WK73R2B15	1.5W	70°C	95°C	±100	10 ~ 9.76k	10 ~ 9.1k			
WK73S2H2RT	2.0W	70°C	95°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	
				±150	0.2 ~ 0.976	0.2 ~ 0.91			
WK73R2H2RT	2.0W	70°C	95°C	±100	10 ~ 430k	10 ~ 430k			
				±200	432k - 1M	470k - 1M			
WK73S3A3RT	3.0W	70°C	95°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	
WK73R3A3RT	3.0W	70°C	95°C	±100	10 ~ 330k	10 ~ 330k			
				±200	332k - 1M	360k - 1M			

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated voltage x 2.0 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±2%	±1%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

Additional environmental applications can also be found at www.koaspeer.com

KOA SPEER ELECTRONICS, INC.

SG73-RT

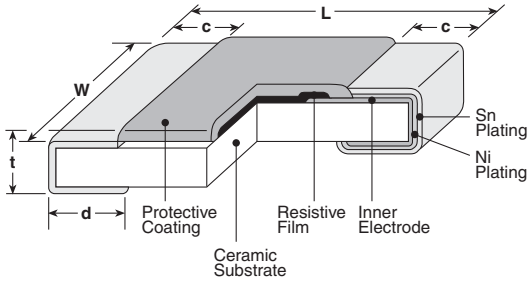
surge current flat chip resistors (anti-surge, anti-sulfuration)

EU RoHS COMPLIANT

features

- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material/pulse
- Superior to RK73 series chip resistors in pulse withstanding voltage
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
SG73 1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG73 2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
SG73 2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
SG73 2E (1210)		.102±.008 (2.6±0.2)			
SG73 W2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)		.026±.006 (0.65±0.15)	
SG73 W3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)			

ordering information

SG73	2A	R	T	TD	103	K
Type	Power Rating	Characteristic	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
SG73	1J 2A 2B 2E W2H W3A	R: Anti-Sulfur	T: Sn	TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" 4mm embossed plastic For further information on packaging, please refer to Appendix A	±10%, ±20%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	K: ±10% M: ±20%

11/09/21

KOA SPEER ELECTRONICS, INC.

SG73-RT

surge current flat chip resistors (anti-surge, anti-sulfuration)

applications and ratings

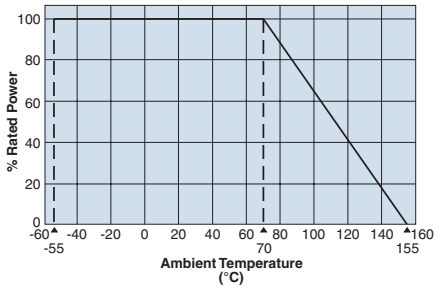
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range K: ±10% M: ±20% E-12	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
SG73 1J (0603)	0.1W	70°C	125°C	±400	1Ω - 8.2Ω	50V	100V	-55°C to +155°C
				±200	10Ω - 1MΩ			
SG73 2A (0805)	0.125W	70°C	125°C	±400	1Ω - 8.2Ω	150V	200V	
				±200	10Ω - 1MΩ			
SG73 2B (1206)	0.33W	70°C	125°C	±400	1Ω - 8.2Ω	200V	400V	
				±200	10Ω - 1MΩ			
SG73 2E (1210)	0.50W	70°C	125°C	±400	1Ω - 8.2Ω			
				±200	10Ω - 1MΩ			
SG73 W2H (2010)	0.75W	70°C	125°C	±400	1Ω - 8.2Ω			
				±200	10Ω - 1MΩ			
SG73 W3A (2512)	1W	70°C	125°C	±400	1Ω - 8.2Ω			
				±200	10Ω - 1MΩ			

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

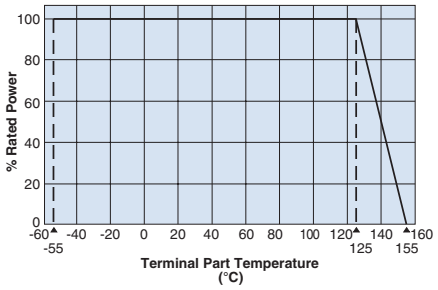
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

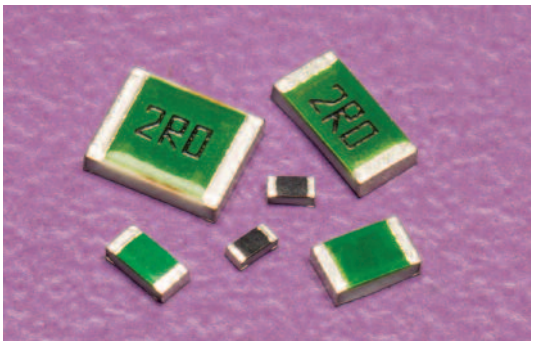
Additional environmental applications can also be found at www.koaspeer.com

12/10/20

KOA SPEER ELECTRONICS, INC.

SG73P-RT

endured pulse power flat chip resistors (anti-surge, anti-sulfuration)

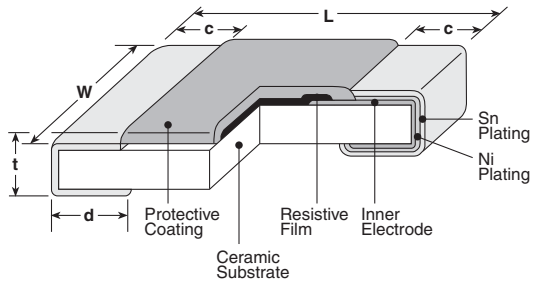


features

EU RoHS COMPLIANT

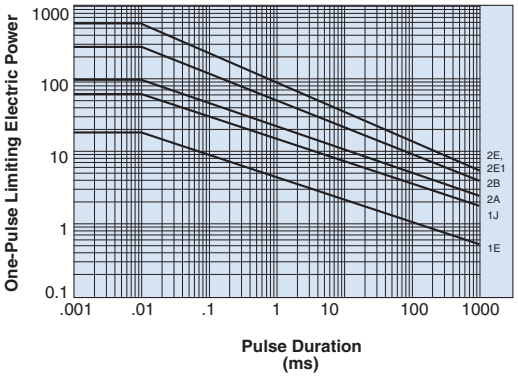
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Superior to RK73 series chip resistors in pulse withstanding voltage and high power
- SG73P (for pulse) are able to select resistance tolerance is available from ±0.5%
- Suitable for both reflow and flow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
SG73P 1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.020±.002 (0.5±0.05)	.006±.004 (0.15±0.1)	.010 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
SG73P 1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG73P 2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.020±.004 (0.5±0.1)
SG73P 2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
SG73P 2E SG73P 2E1 (1210)		.102±.008 (2.6±0.2)			

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for the resistance characterisitics of continuous applied pulse.

ordering information

SG73P	2A	R	T	TD	103	J
Type	Power Rating	Characteristic	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
SG73P	1E 1J 2A 2B 2E1	R: Anti-Sulfur	T: Sn	TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" 4mm embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	D: ±0.5% F: ±1% G: ±2% J: ±5%

 10/22/21

KOA SPEER ELECTRONICS, INC.

SG73P-RT

endured pulse power flat chip resistors (anti-surge, anti-sulfuration)

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range D: ±0.5% E-24, E-96	Resistance Range F: ±1% E-24, E-96	Resistance Range G: ±2% E-24	Resistance Range J: ±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
SG73P 1E	0.125W	70°C	125°C	±200	100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 10MΩ	1Ω - 10MΩ	75V	100V	-55°C to +155°C
	0.2W*2		105°C								
SG73P 1J	0.2W	70°C	135°C	±100*1					150V	200V	
	0.33W*2		125°C								
SG73P 2A	0.25W	70°C	125°C	±200					400V	600V (800V)*3	
	0.5W*2		100°C								
SG73P 2B	0.33W	70°C	125°C	±200					200V	400V	
	0.75W*2		105°C								
SG73P 2E	0.5W	70°C	125°C	±200							
	0.75W*2		110°C								
SG73P 2E1	1.0W*2	70°C	95°C	±200							

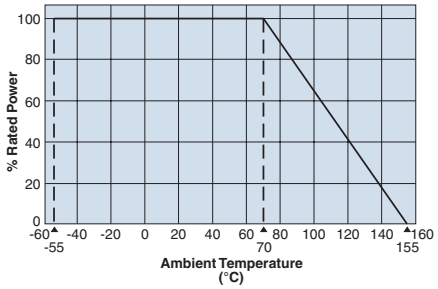
*1 Cold T.C.R. (-55°C ~ +25°C) is ±150x10^{-6}/K *2 If you want to use the rated power of *2, *3 please reference below. *3 Applies when power rating is 0.4W or lower.

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

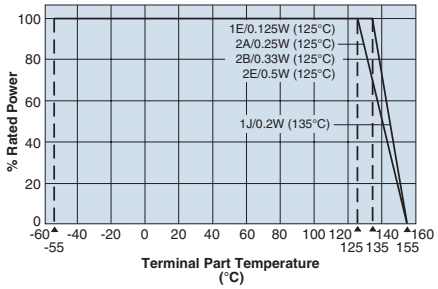
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. Also, contact KOA prior to usage and for the max. working voltage and max. overload voltage.

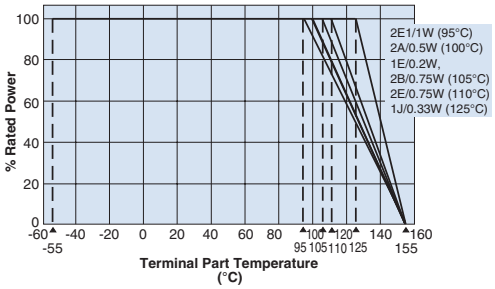
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.





For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

*2, *3 If you want to use the rated power of *2, *3 please use the derating curve based on the terminal part temperature on the right hand side.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2A: 0.4W, 0.5W; 2B: 0.75W; 2E: 0.75W; 2E1: 1W x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

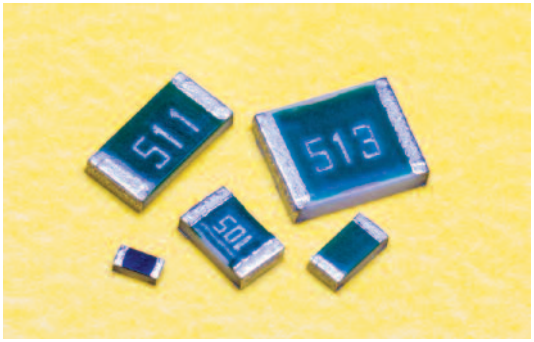
Additional environmental applications can also be found at www.koaspeer.com

3/26/20

KOA SPEER ELECTRONICS, INC.

SG73S-RT

endured surge voltage flat chip resistors (anti-surge, anti-sulfuration)

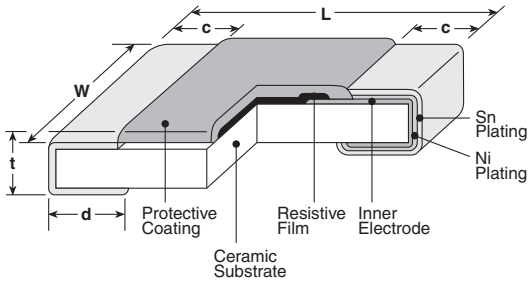


features

EU RoHS COMPLIANT

- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Superior to RK73 series chip resistors in pulse withstanding voltage and high power
- SG73S (for pulse) are able to select resistance tolerance is available from ±0.5%
- Suitable for both reflow and flow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
SG73S 1E, (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.020±.002 (0.5±0.05)	.006±.004 (0.15±0.1)	.010 +.002 -.004 (0.25 +0.05 -0.1)	.014±.002 (0.35±0.05)
SG73S 1J, (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG73S 2A, (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.020±.004 (0.5±0.1)
SG73S 2B, (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
SG73S 2E, SG73S 2E1 (1210)		.102±.008 (2.6±0.2)			

ordering information

SG73S	2A	R	T	TD	103	J
Type	**Power Rating**	**Characteristic**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
SG73S	1E 1J 2A 2B 2E 2E1	R: Anti-Sulfur	T: Sn	TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" 4mm embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	D: ±0.5% F: ±1% G: ±2% J: ±5%

10/22/21

KOA SPEER ELECTRONICS, INC.

SG73S-RT

endured surge voltage flat chip resistors (anti-surge, anti-sulfuration)

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range D: ±0.5% E-24, E-96	F: ±1% E-24, E-96	G: ±2% E-24	J: ±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
SG73S 1E	0.125W	70°C	125°C	±200	100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 10MΩ	1Ω - 10MΩ	75V	100V	-55°C to +155°C
	0.2W*2		105°C								
SG73S 1J	0.2W	70°C	135°C	±100*1					150V	200V	
	0.33W*2		125°C								
SG73S 2A	0.25W	70°C	125°C	±200					400V	600V (800V)*3	
	0.5W*2		100°C								
SG73S 2B	0.33W	70°C	125°C	±200					200V	400V	
	0.75W*2		105°C								
SG73S 2E	0.5W	70°C	125°C	±200							
	0.75W*2		110°C								
SG73S 2E1	1.0W*2	70°C	95°C	±200							

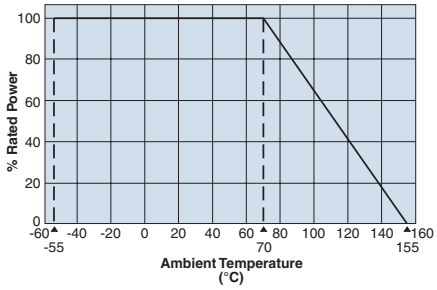
*1 Cold T.C.R. (-55°C ~ +25°C) is ±150x10^{-6}/K *2 If you want to use the rated power of *2, *3 please reference below. *3 Applies when power rating is 0.4W or lower.

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

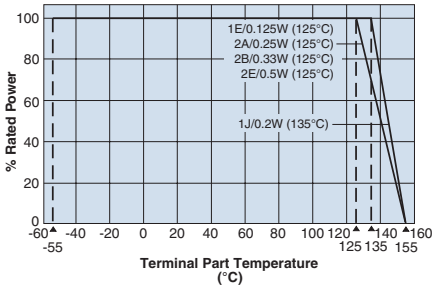
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. Also, contact KOA prior to usage and for the max. working voltage and max. overload voltage.

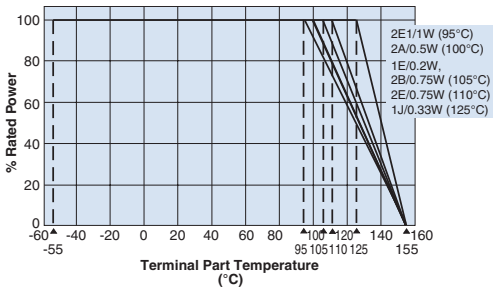
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.





For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

*2, *3 If you want to use the rated power of *2, *3, please use the derating curve based on the terminal part temperature on the right hand side.

Additional environmental applications can also be found at www.koaspeer.com

environmental applications (continued)

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2A: 0.4W, 0.5W; 2B: 0.75W; 2E: 0.75W; 2E1: 1W x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

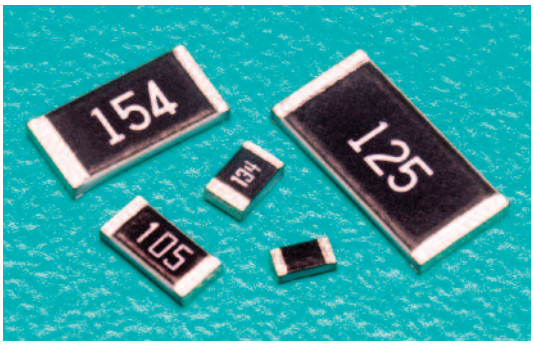
Please refer to conventional products for characteristic data such as temperature rise.

KOA SPEER ELECTRONICS, INC.

HV73-RT

flat chip resistors for high voltage (anti-sulfuration)

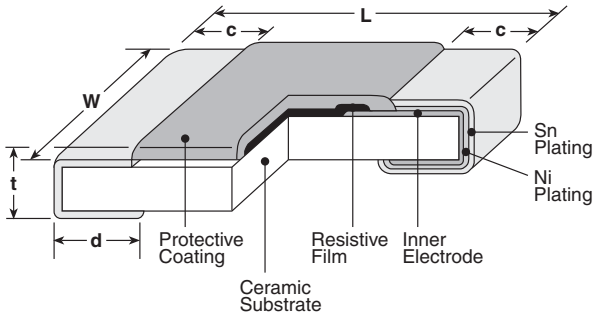
EU RoHS COMPLIANT



features

- Superior to RK73 series in maximum working voltage
- Suitable for flow and reflow solderings
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Excellent anti-sulfuration characteristics due to using high sulfuration-proof inner top electrode material

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)

ordering information

HV73	2B	R	T	TD	1004	F
Type	Size	Characteristic	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
	1J: 0.1W 2A: 0.25W 2B: 0.25W 2H: 0.5W 3A: 1W	R: Anti-Sulfur	T: Sn	TD: 7" 4mm pitch punched paper TE: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures +1 multiplier ±2%, ±5%: 2 significant figures + 1 multiplier	D: ±0.5% F: ±1% G: ±2% J: ±5%

KOA SPEER ELECTRONICS, INC.

HV73-RT

flat chip resistors for high voltage (anti-sulfuration)

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) E-24/E-96 (D±0.5%)	E-24/E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)	Maximum Working Voltage	Maximum Overload Voltage (D.C.)*	Operating Temperature Range
1J	0.1W	70°C	80°C	±100**	—	10k - 10M	10k - 10M	10k - 10M	350V	500V*	-55°C to +155°C
2A	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	400V	800V*	
				±200	—	—	—	11M - 51M			
2B	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	800V	1000V*	
				±200	—	—	—	11M - 51M			
2H	0.5W	70°C	90°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	2000V (D.C.)	3000V*	
				±200	—	—	—	11M - 51M			
3A	1W	70°C	105°C	±100	43k - 1M	43k - 10M	43k - 10M	43k - 10M	3000V (D.C.)	4000V*	
				±200	—	10.2M - 20M	11M - 20M	11M - 51M			

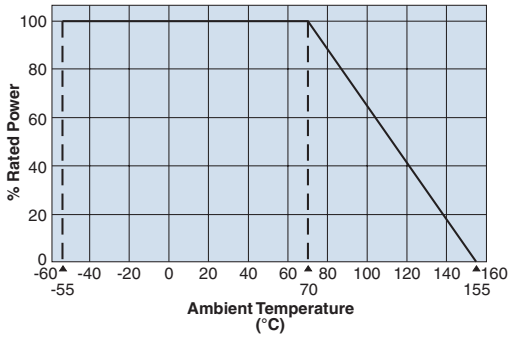
Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

* Maximum Overload Voltage is specified by D.C. voltage ** Cold T.C.R. (-55°C ~ +25°C) of 1.02MΩ ~ 10MΩ is +200x10^{-6}/K

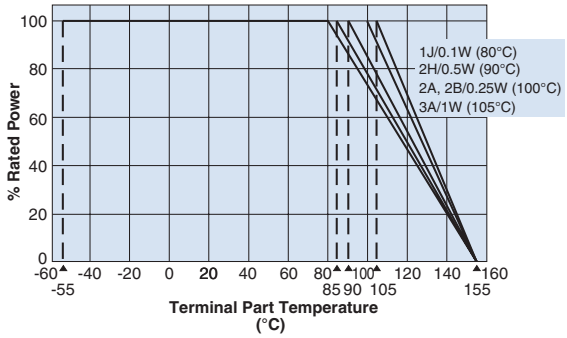
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve.
Please refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog before use.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage (D.C.) x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%: (10kΩ≤R≤10MΩ) ±1%: (11MΩ≤R≤51MΩ)	±0.3%: (10kΩ≤R≤10MΩ) ±0.5%: (11MΩ≤R≤51MΩ)	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/06/19

KOA SPEER ELECTRONICS, INC.

HV73V-RT

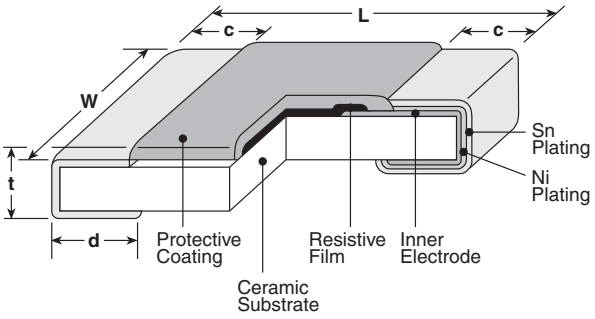
flat chip resistors for high voltage (automotive, anti sulfuration)

EU RoHS COMPLIANT

features

- Superior to RK73 series in maximum working voltage
- Suitable for flow and reflow solderings
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Suitable for high reliable applications like automotives
- AEC-Q200 tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)

ordering information

HV73V	2A	R	T	TD	104	J
Type	**Size**	**Characteristic**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
HV73V	1J: 0.1W 2A: 0.25W 2B: 0.33W	R: Anti-Sulfur	T: Sn	TD: 7" 4mm pitch punched paper For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures +1 multiplier	D: ±0.5% F: ±1% G: ±2% J: ±5%

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) E-24/E-96 (D±0.5%)	E-24/E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)	Maximum Working Voltage	Maximum Overload Voltage (D.C.)*	Operating Temperature Range
HV73V1J	0.1W	70°C	80°C	±100**	—	10k - 10M	10k - 10M	10k - 10M	350V	500V*	-55°C to +155°C
HV73V2A	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	400V	800V*	
				±200	—	—	—	11M - 51M			
HV73V2B	0.33W	70°C	115°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	800V	1200V*	
				±200	—	—	—	11M - 51M			

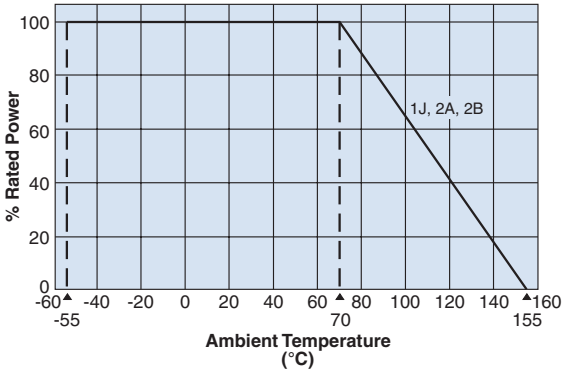
Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

* Maximum Overload Voltage is specified by D.C. voltage ** Cold T.C.R. (-55°C ~ +25°C) of 1.02MΩ ~ 10MΩ is +200x10^{-6}/K

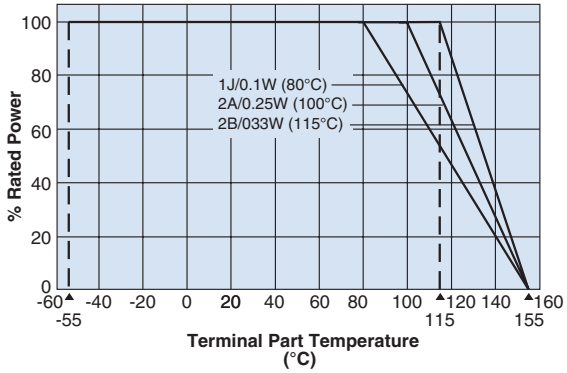
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve.
Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage (D.C.) x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%: (10kΩ≤R≤10MΩ) ±1%: (11MΩ≤R≤51MΩ)	±0.3%: (10kΩ≤R≤10MΩ) ±0.5%: (11MΩ≤R≤51MΩ)	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with sulfur substance 3.5% contained 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

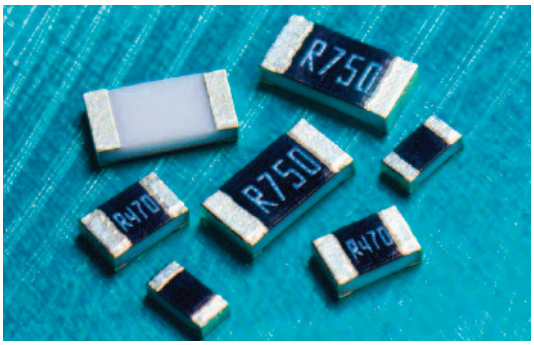
Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/22/21

KOA SPEER ELECTRONICS, INC.

SR73-RT

low resistance flat chip resistors (anti sulfuration)

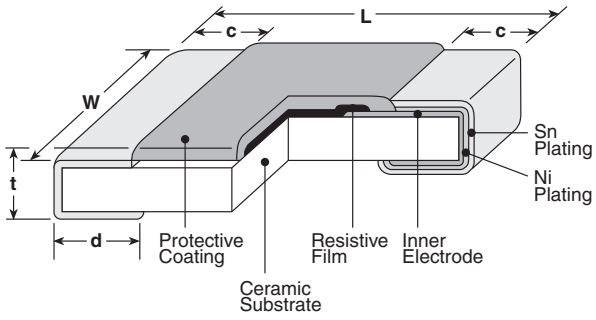


features

- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Current detecting resistors for power supply, motor circuits, etc
- High reliability and performance with resistance tolerance ±1.0, T.C.R. ±100×10^{-6}/K
- Suitable for both reflow and flow solderings
- Products with lead free termination meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

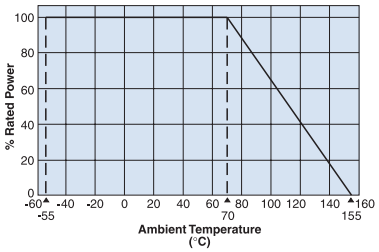
EU RoHS COMPLIANT

dimensions and construction



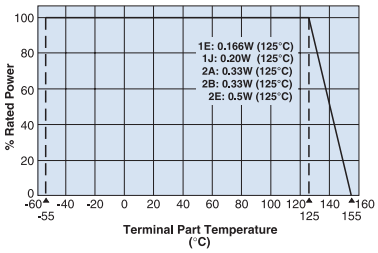
Type (Inch Size Code)	Resistance Range (Ω)	Dimensions inches (mm) L	W	c	d	t
1E (0402)	1 - 10	.039 +.004 -.002 (1.0 +0.1 -0.05)	.020 +.004 -.002 (0.5 +0.1 -0.05)	.008±.004 (0.2±0.1)	.010±.004 (0.25±0.1)	.014±.002 (0.35±0.05)
1J (0603)	0.1 - 0.43	.063±.008 (1.6±0.2)	.031 +.006 -.004 (0.8 +0.15 -0.1)	.014 +.006 -.004 (0.35 +0.15 -0.1)	.014 +.008 -.004 (0.35 +0.2 -0.1)	.018±.004 (0.45±0.1)
	0.47 - 10			.014±.004 (0.35±0.1)	.014±.004 (0.35±0.1)	
2A (0805)	0.1 - 0.43	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.02±.004 (0.5±0.1)
	0.47 - 10				.012 +.008 -.004 (0.3 +0.2 -0.1)	
2B (1206)	0.1 - 0.43	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.02 +.008 -.004 (0.5 +0.2 -0.1)	.024±.004 (0.6±0.1)
	0.47 - 10				.016 +.008 -.004 (0.4 +0.2 -0.1)	
2E (1210)	0.1 - 0.39	.126±.008 (3.2±0.2)	.102±.008 (2.6±0.2)	.02±.012 (0.5±0.3)	.02 +.008 -.004 (0.5 +0.2 -0.1)	.024±.004 (0.6±0.1)
	0.43 - 10				.016 +.008 -.004 (0.4 +0.2 -0.1)	

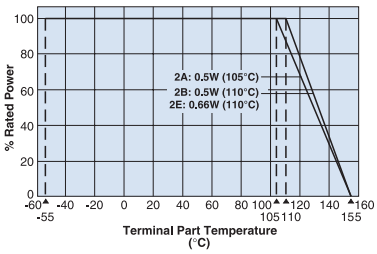
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

SR73 2A (0.5W), SR73 2B (0.5W), SR73 2E (0.66W)





For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

SR73	2B	R	T	TD	R10	J
Type	Size	Characteristic	Termination Material	Packaging	Nominal Resistance	Tolerance
	1E: 0.166W 1J: 0.2W 2A: 0.33W, 0.5W 2B: 0.33W, 0.5W 2E: 0.5W, 0.66W	R: Anti-Sulfur	T: Sn	TD: 7" 4mm pitch punch paper TP: 0402 only, 7" 2mm pitch paper TPL: 0402 only, 2mm pitch paper For further information on packaging, please refer to Appendix A	±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on values <100Ω	F: ±1% G: ±2% J: ±5%

10/26/21

applications and ratings

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range			Operating Temperature Range
					F (±1%) E-24, E-96[1]	G (±2%) E-24	J (±5%) E-24	
SR731ERT (0402)	0.166W	70°C	125°C	±200	1Ω - 10Ω	1Ω - 10Ω	1Ω - 10Ω	-55°C to +155°C
SR731JRT (0603)	0.2W	70°C	125°C	±200	0.2Ω - 10Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±300	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
SR732ART (0805)	0.33W	70°C	125°C	±100	0.47Ω - 10Ω	—	—	
				±200	0.2Ω - 0.43Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
	0.5W*	70°C	105°C	±100	0.47Ω - 10Ω	—	—	
				±200	0.2Ω - 0.43Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
SR732BRT (1206)	0.33W	70°C	125°C	±100	0.47Ω - 10Ω	—	—	
				±200	0.2Ω - 0.43Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
	0.5W*	70°C	110°C	±100	0.47Ω - 10Ω	—	—	
				±200	0.2Ω - 0.43Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
SR732ERT (1210)	0.5W	70°C	125°C	±100	0.43Ω - 10Ω	—	—	
				±200	0.2Ω - 0.39Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	—	—	0.1Ω - 0.18Ω	
	0.66W*	70°C	110°C	±100	0.43Ω - 10Ω	—	—	
				±200	0.2Ω - 0.39Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	—	—	0.1Ω - 0.18Ω	

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

[1] The nominal resistance for SR731E (F:±1%), SR731J, 2A, 2B (0.1~0.43) and SR732E (0.1~0.39) is E-24 only

* Please use the derating curve based on the terminal part temperature.
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.3%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±1%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with sulfur substance 3.5% contained, 105°C ±3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

KOA SPEER ELECTRONICS, INC.

SLR1

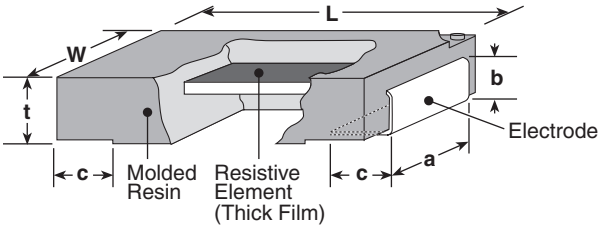
mold type resistors

EU RoHS COMPLIANT

features

- Thick film resistor protected by liquid crystal polymer resin
- Excellent heat cycle
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



Size Code	Dimensions inches (mm)					
	L	W	t	a	b	c
SLR1 (2512)	.248±.012 (6.3±0.3)	.122±.008 (3.1±0.2)	.075±.008 (1.9±0.2)	.094±.008 (2.4±0.2)	.047±.008 (1.2±0.2)	.047±.012 (1.2±0.3)

ordering information

SLR	1	T	TE	R301	F
Type	Power Rating	Terminal Surface Material	Packaging	Nominal Resistance	Resistance Tolerance
SLR	1: 1.0W	T: Sn	TE: 8mm Pitch embossed plastic TED: 8mm Pitch embossed plastic	D, F: 4 digits J: 3 digits	D: ±0.5% F: ±1% J: ±5%

Resistance Value (Ω)	3 Digits
0.33 ~ 0.91	R33 ~ R91
1 ~ 9.1	1R0 ~ 9R1

Resistance Value (Ω)	4 Digits
0.301 ~ 0.976	R301 ~ R976
1 ~ 9.76	R100 ~ 9R76

Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

For further information on packaging please refer to Appendix A.

applications and ratings

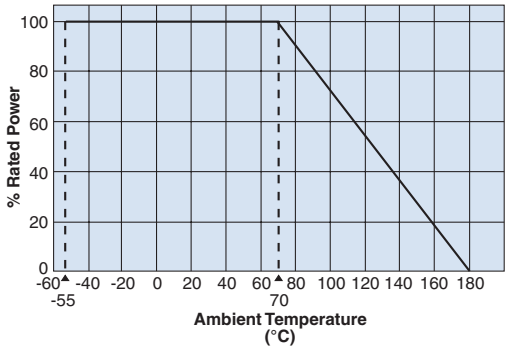
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temperature	Resistance Range (Ω) D: ±0.5% E24, E96	Resistance Range (Ω) F: ±1% E24, E96	Resistance Range (Ω) J: ±5% E24	T.C.R. ($X10^{-6}$/K)	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
SLR1	1W	70°C	90°C	301m - 1M	301m - 1M	330m - 1M	±100	200V	400V	-55°C to +180°C

Rated voltage = $\sqrt{\text{Power Rating X Resistance Value}}$ or Max. working voltage, whichever is lower

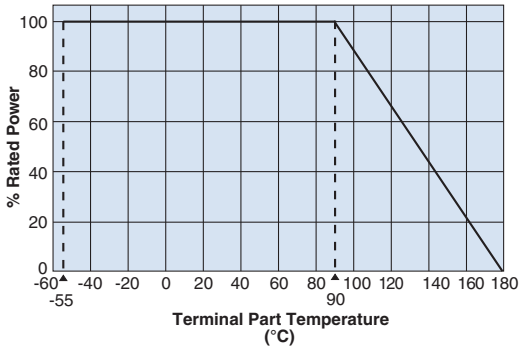
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Derating Curve



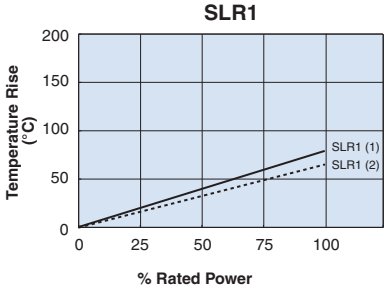
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



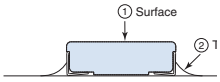
For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Temperature Rise

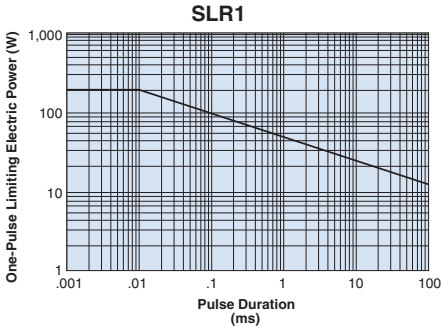


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35µm

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement Δ R ±%		Test Method
	Limit	Typical	
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±1%	±0.1%	Rated power times 5 for 5 seconds
Resistance to Solder Heat	±1%	±0.3%	260°C ± 5°C, 10 ± 1 second
Rapid Change of Temperature	±1%	±0.4%	-55°C (30 minutes), +155°C (30 minutes), 1000 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%~95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/28/20

KOA SPEER ELECTRONICS, INC.

MWS

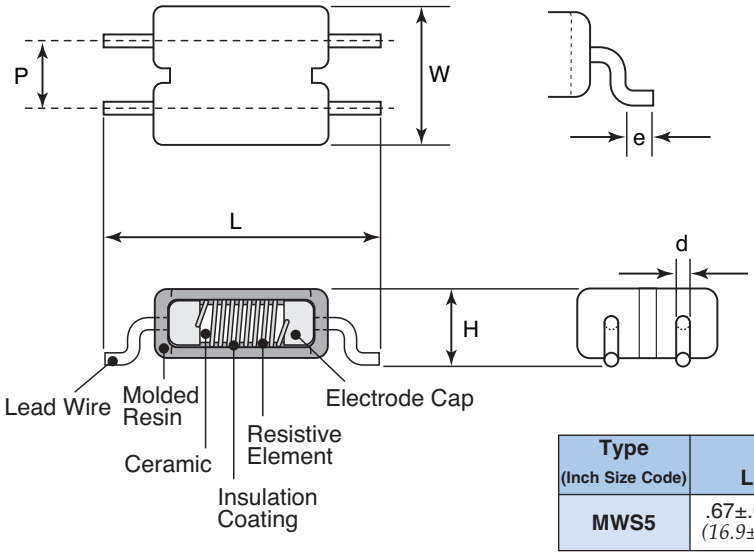
mold wirewound resistor

EU RoHS COMPLIANT

features

- Flame retardant coating (UL94 V-0)
- It has excellent pulse resistance and is suitable as a surface mount component for precharge resistance, snubber resistance, and damping resistance
- AEC-Q200 tested
- Products with EU RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)					
	L	W	H	P	e	d (Nom.)
MWS5	.67±.008 (16.9±0.2)	.34±.008 (8.6±0.2)	.19±.008 (4.8±0.2)	.17±.008 (4.2±0.2)	.06±.008 (1.4±0.2)	.03 (0.8)

ordering information

MWS	5	C	TEG	100	J
Type	Power Rating	Terminal Surface Material	Taping	Nominal Resistance	Resistance Tolerance
	5: 5W	C: SnCu	TEG: 12mm pitch plastic embossed	3 digits	J: ±5%

Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

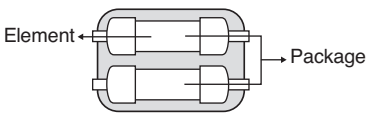
For further information on packaging, please refer to Appendix A.

applications and ratings

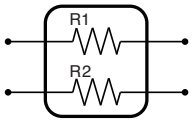
Part Designation	Power Rating		Rated Terminal Part Temperature	Resistance Range (Ω) J: ±5% (E24)	T.C.R. (x10⁻⁶/K)	Operating Temperature Range
	Package	Piece				
MWS5	5W	2.5W	+130°C	1 - 470	±200	-55°C to +200°C

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$

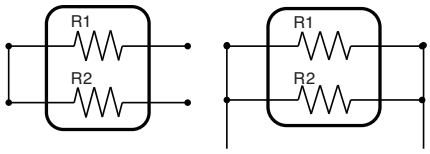
Element and Package



Equivalent Circuit (R1=R2)



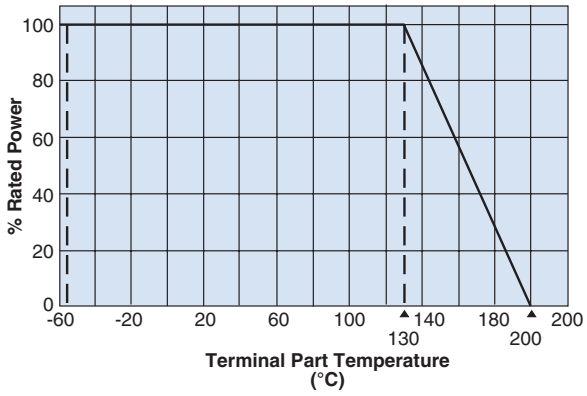
Connection Example (R1=R2)



Series Connection Parallel Connection

environmental applications

Derating Curve



When the terminal part temperature of the resistor exceeds the rated terminal part temperature shown, the power shall be derated according to the derating curve.
Please refer to"Introduction of the derating curves based on the terminal part temperature"on the beginning of our catalog before use.

Performance Characteristics

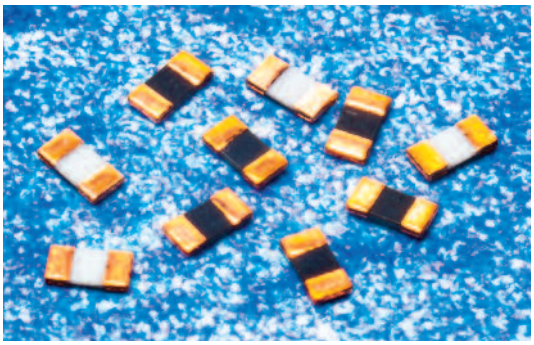
Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Rapid Change of Temperature	±2%	±0.6%	-55°C (30 minutes), +155°C (30 minutes), 1000 cycles
Overload (Short time)	±5%	±2%	Power Rating x 4, 5 seconds
Resistance to Solder Heat	±1%	±0.8%	350°C ± 10°C, 3.5 seconds or 260°C ± 5°C, 10 seconds
Moisture Resistance	±5%	±3%	Power Rating x 1/10, 85°C, 85% RH, 1000 hours
Endurance of Rated Terminal Part Temperature	±5%	±3%	130°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormaly in appearance such as disappearance of making, etc.	—	On immersing the sample in IPA for 3 minutes, the resistor surface should be lightly wiped with a dry cloth (velvet or gauze)
High Temperature Exposure	±2%	±0.3%	+155°C, 1000 hours

KOA SPEER ELECTRONICS, INC.

XR73B,XR73H,XR73Z

flat thick film resistors (for embedded substrates)

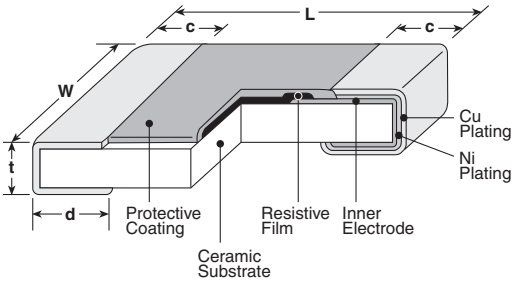
EU RoHS COMPLIANT



features

- Interlayer embedding in the multilayer substrate is applicable from the height of 0.13 to 0.14mm
- Cu via hole connection is applicable by the Cu electrode

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.009±.001 (0.23±0.03)	.009±.001 (0.23±0.03)	.005±.001 (0.13±0.02)
1E (0402)	.039±.002 (1.0±0.05)	.020±.002 (0.5±0.05)	.011±.002 (0.28±0.05)	.011±.002 (0.28±0.05)	.006±.001 (0.14±0.03)

ordering information

XR73H	1E	U	TWL	1001	F
Type	**Power Rating**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
XR73B XR73H	1H, 1E: 0.063W	U: CU	TWL: 2mm pitch plastic embossed TWA: 1mm pitch plastic embossed (1H only) For further information on packaging, please refer to Appendix A	±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	F: ±1% J: ±5%

XR73Z	1E	U	TWL
Type	**Power Rating**	**Termination Material**	**Packaging**
XR73Z	1H, 1E: 1A	U: CU	TWL: 2mm pitch plastic embossed TWA: 1mm pitch plastic embossed (1H only) For further information on packaging, please refer to Appendix A

12/15/16

KOA SPEER ELECTRONICS, INC.

XR73B,XR73H,XR73Z

flat thick film resistors (for embedded substrates)

applications and ratings

XR73B, XR73H

Part Designation	Power Rating*	Rated Ambient Temp.	T.C.R. ($\times 10^{-6}$/K) Max.	Resistance Range XR73H F: ±1% E24, E96	Resistance Range XR73B J: ±5% E24	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
1H	0.063W	70°C	±200	10Ω~1MΩ	10Ω~10MΩ	50V	100V	-55°C to +155°C
			±400	1.0Ω~9.1Ω**	1.0Ω~9.1Ω			
1E	0.063W	70°C	±100	10Ω~1MΩ	—	50V	100V	-55°C to +155°C
			±200	1.0Ω~9.76Ω 1.02MΩ~10MΩ	1.0Ω~10MΩ			

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

* The ratings will be for the surface mounted condition ** The nominal resistance value for XR73H1H (1Ω R 9.1Ω) is E24

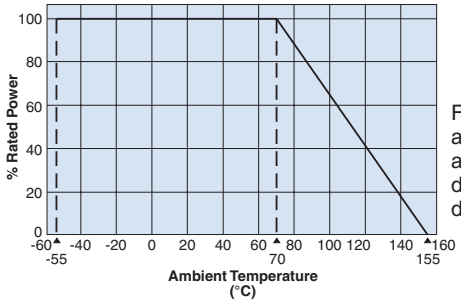
XR73Z

Part Designation	Resistance	Current Rating*	Rated Ambient Temp.	Maximum Overload Current	Operating Temp. Range
1H	50mΩ max.	1A	70°C	2A	-55°C to +155°C
1E	50mΩ max.	1A	70°C	2A	-55°C to +155°C

* The ratings will be for the surface mounted condition

environmental applications

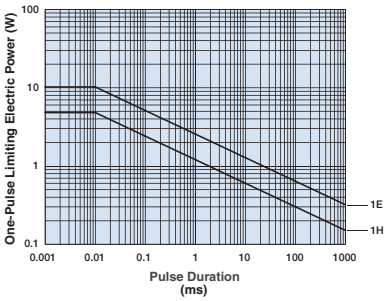
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

One-Pulse Limiting Electric Power

XR73 1H-1E



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

The pulse endurance values are not assured values,so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	XR73H, XR73B Requirement Δ R ±(%+0.05Ω) Limit	XR73H, XR73B Requirement Δ R ±(%+0.05Ω) Typical	XR73Z Requirement Limit	XR73Z Requirement Typical	Test Method
Resistance	Within specified tolerance	—	50mΩ max. after the test	15mΩ max. after the test	25°C
T.C.R.	Within specified T.C.R.	—	—	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	50mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	Rated Voltage x 2.5 for 5 seconds 1H: Rated voltage (DC) x 2 for 5 seconds
Rapid Change of Temperature	±1%	±0.5%	100mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±1.5%	100mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±1%	100mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.5%	100mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	+155°C, 1000 hours

The performance will be for the surface mounted condition.

Additional environmental applications can also be found at www.koaspeer.com

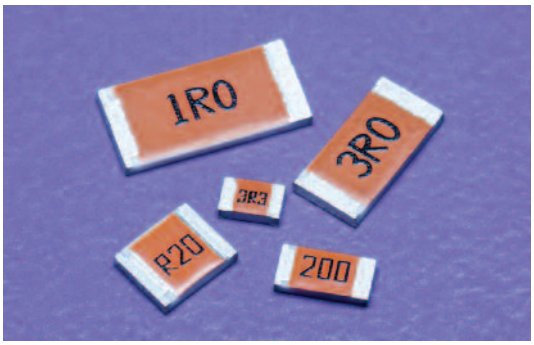
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 12/10/20

KOA SPEER ELECTRONICS, INC.

RF73

fusing flat chip resistor

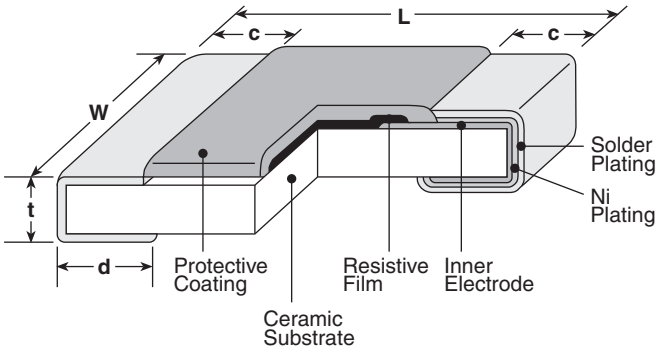
EU RoHS COMPLIANT



features

- Performs like RK73 under normal conditions
- Fuses when overloaded
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Recognized by safety standard UL1412. (0603 (1J) is not recognized)

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.02±.004 (0.5±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2E (1210)		.102±.008 (2.6±0.2)			
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)			
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)			

ordering information

RF73	2B	T	TD	100	J
Type	Size Code	Termination Material	Packaging	Nominal Resistance	Tolerance
	1J: 0603 2A: 0805 2B: 1206 2E: 1210 2H: 2010 3A: 2512	T: Sn (Other termination styles may be available, please contact factory for options)	TD: 7" 4mm pitch punch paper (0603, 0805, 1206, 1210: 5,000 pieces/reel) TE: 7" 4mm pitch embossed plastic (0805, 1206, 1210, 2010, 2512: 4,000 pieces/reel)	2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	J: ±5%

For further information on packaging, please refer to Appendix A.

10-22-20

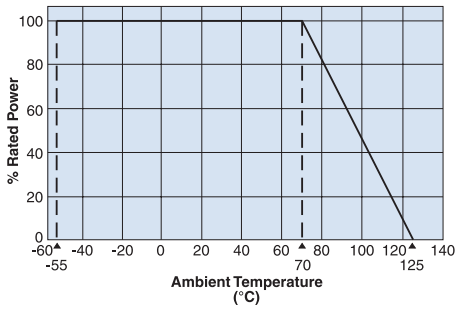
applications and ratings

Part Designation	Power Rating @ 70°C	T.C.R. (ppm/°C) Max.	Resistance Range E-24	Resistance Tolerance	Maximum Open Circuit Voltage	Fusing Characteristics Fusing Power					Fusing Time	Operating Temperature Range
RF731J	0.063W	+1000 ~ -500 (1.0Ω-3.3Ω) ±500 (3.6Ω-100Ω)	1Ω-100Ω	J: ±5%	50V	—	2.6W 1.0Ω	2.4W 1.1Ω-20Ω	2.1W 22Ω-100Ω	—	60 sec. max.	-55°C to +125°C
RF732A	0.1W	+1000 ~ -500 (0.2Ω-4.3Ω) ±500 (4.7Ω-510Ω)	0.2Ω-510Ω			3.0W 0.2Ω-0.47Ω	2.6W 0.51Ω-1.0Ω	2.4W 1.1Ω-20Ω	2.1W 22Ω-100Ω	2.0W 110Ω-510Ω		
RF732B	0.125W					3.75W 0.2Ω-0.47Ω	2.875W 0.51Ω-10Ω	2.5W 11Ω-24Ω	2.0W 27Ω-100Ω	1.75W 110Ω-510Ω		
RF732E	0.25W					4.5W 0.2Ω-0.47Ω	4.1W 0.51Ω-4.7Ω	3.5W 5.1Ω-27Ω	3.2W 30Ω-100Ω	3.0W 110Ω-510Ω		
RF732H	0.50W				100V	5.5W 0.2Ω-0.47Ω	5.0W 0.51Ω-4.7Ω	4.0W 5.1Ω-27Ω	3.5W 30Ω-100Ω	3.2W 110Ω-510Ω		
RF733A	1.0W					6.5W 0.2Ω-0.47Ω	6.0W 0.51Ω-4.7Ω	5.0W 5.1Ω-30Ω	4.5W 33Ω-100Ω	4.0W 110Ω-510Ω		

Rated ambient temperature: +70°C

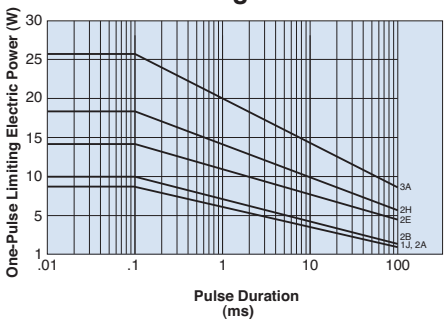
environmental applications

Derating Curve

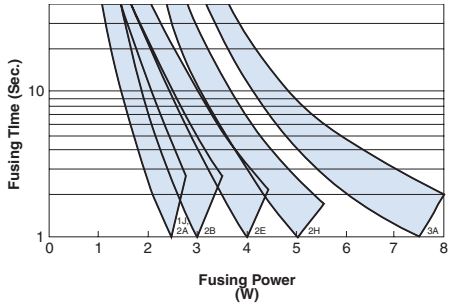


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

One-Pulse Limiting Electric Power



Example of Fusing Characteristics



Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.1Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short Time)	±5.0%	±2.0%	Rated voltage x 2 for 5 seconds (except 2E, 2H, 3A: x 1.5)
Resistance to Solder Heat	±3.0%	0.5%	260°C ± 5°C for 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%: 2A~3A ±3.0%: 1J	±0.3%: 2A~3A ±0.6%: 1J	-55°C (30 minutes)/ +125°C (30 minutes) 5 cycles
Moisture Resistance	±5.0%	±2.0%	40°C ± 2°C, 90 - 95% RH, 500 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±5.0%	±1.0%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1.0%	±0.6%	+125°C, 100 hours

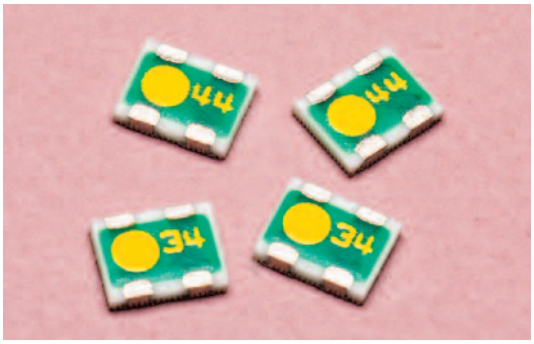
11/21/16

KOA SPEER ELECTRONICS, INC.

CNN

thin film chip networks

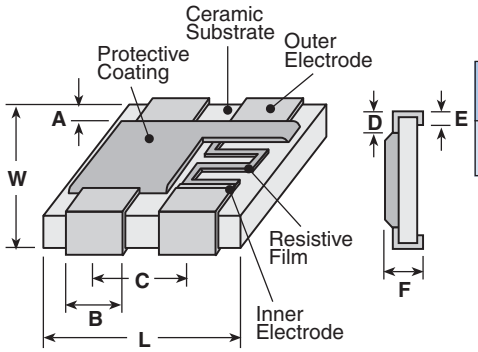
EU RoHS COMPLIANT



features

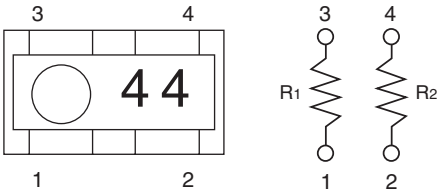
- Metal film chip network resistors
- Excellent in relative T.C.R. and relative accuracy
- Pair resistors for high precision OP-amplifiers
- As custom products, any pairs between 1kΩ and 100kΩ are available on request
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Size Code	Dimensions inches (mm)							
	A	B	C	D	E	F	L	W
CNN	.016±.012 (0.4±0.3)	.028±.006 (0.7±0.15)	.050 (1.27)	.016±.012 (0.4±0.3)	.012±.008 (0.3±0.2)	.020±.004 (0.5±0.1)	.10±.008 (2.54±0.2)	.079±.008 (2.0±0.2)

circuit schematic



	Resistance					
R1	1kΩ	1kΩ	1kΩ	10kΩ	10kΩ	100kΩ
R2	1kΩ	10kΩ	100kΩ	10kΩ	100kΩ	100kΩ

CNN: Custom products of any pairs between 1kΩ and 100kΩ are available on request

	Marking					
R1*	3	3	3	4	4	5
R2**	3	4	5	4	5	5

* First marking number ** Second marking number

ordering information

CNN	2A	2	T	TE	103/103	B	A
Type	Style	Number of Elements	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	Resistance Ratio
CNN		2	T: Sn	TE: 4 mm pitch embossed plastic	2 significant figures + multiplier	B: ±0.1% C: ±0.25%	A: 0.05% B: 0.1%

For further information on packaging, please refer to Appendix A.

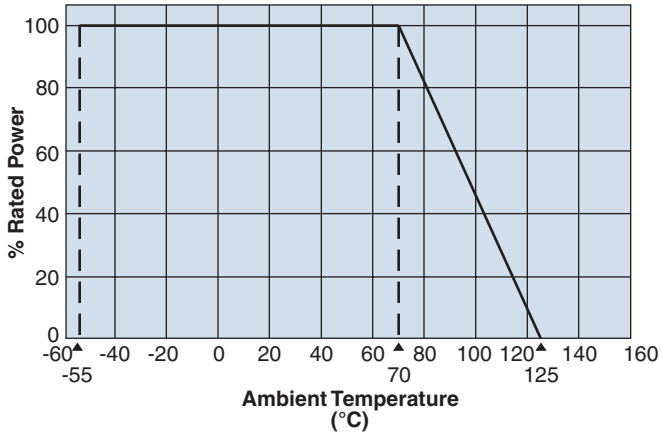
10/22/20

applications and ratings

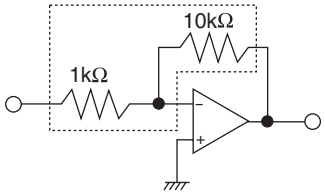
Part Designation	Power Rating w/Element	Resistance (Ω)	Resistance Tolerance		T.C.R. (ppm/°C)		Maximum Working Voltage	Maximum Overload Voltage	Rated Ambient Temperature	Operating Temperature Range
			Absolute	Relative	Absolute	Relative				
CNN	0.05	1K,10k,100k	B: ±0.1% C: ±0.25%	A: ±0.05% B: ±0.1%	±25	5	50V	100V	+70°C	-55°C to +125°C

environmental applications

Derating Curve



Application Example



Performance Characteristics

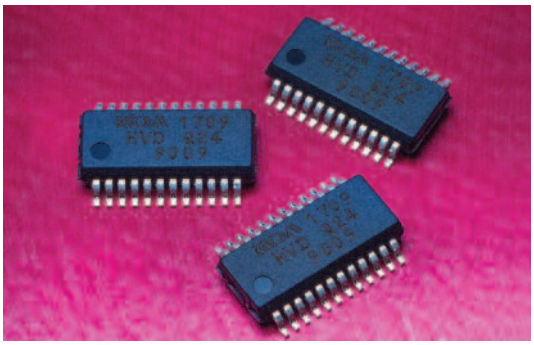
Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C, +25°C/+125°C
Overload (Short time)	±0.1%	±0.01%	Rated voltage x 2.5 or Max. overload volume, whichever is less, for 5 seconds
Resistance to Soldering Heat	±0.1%	±0.02%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.25%	±0.01%	-55°C (30 minutes), +125°C (30 minutes), 5 cycles
Moisture Resistance	±0.25%	±0.03%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±0.25%	±0.03%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.25%	±0.02%	+125°C, 100 hours

KOA SPEER ELECTRONICS, INC.

HVD

thin film network resistors for high voltage divider

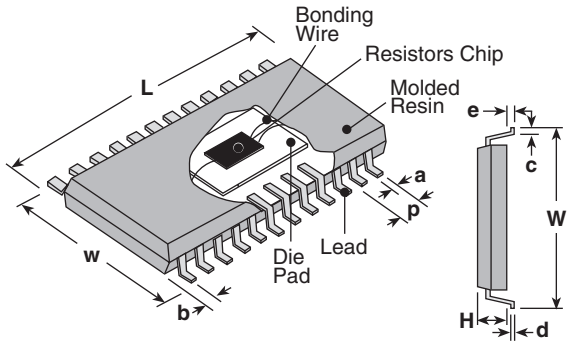
EU RoHS COMPLIANT



features

- High precision high voltage divider
- Maximum resistance value 11.5MΩ, maximum working voltage 1000V, maximum resistance ratio 1000:1
- Relative precision of pair resistors are guaranteed
- Higher integration saves board space and overall assembly costs
- Excellent reliability with standard molded IC package
- Suitable for reflow soldering
- Products meet EU RoHS requirements
- AEC-Q200 tested

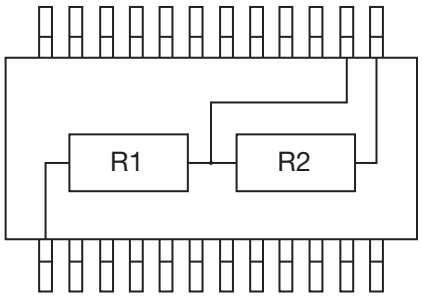
dimensions and construction



Type	Dimensions inches (mm)				
	L ±0.2	W ±0.2	w ±0.2	H ±0.2	p ±0.1
HVD	.341 (8.66)	.236 (5.99)	.150 (3.81)	.063 (1.60)	.025 (0.635)

Type	Dimensions inches (mm)				
	a ±0.1	b ±0.1	c ±0.2	d ±0.1	e ±0.1
HVD	.010 (0.25)	.033 (0.84)	.026 (0.66)	.008 (0.20)	.007 (0.18)

circuit schematic



ordering information

HVD	Q24	T	TE	9XXX
Circuit Code	Package Symbol	Termination Surface Material	Packaging	Custom Code
HVD: High Voltage Divider	Package type symbol + Number of pins	T: Sn	TE: Embossed plastic	

Contact KOA when you have a control request for environmental hazardous material other than the substance specified by EU RoHS.

For further information on packaging, please refer to Appendix A.

10/21/21

applications and ratings

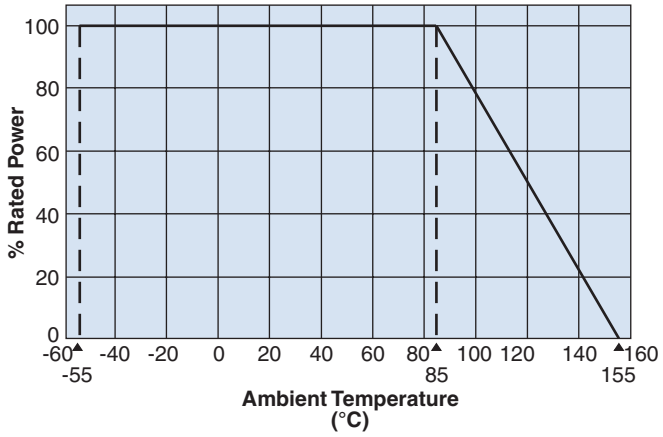
Part Designation	Power Rating	Power Rating /Resistor Element	Resistance Range Max. Resistance Ratio (1:1000) (R1+R2)/R2	Absolute Resistance Tolerance	Relative Resistance Tolerance	T.C.R. (X10^{-6}/K)	Relative T.C.R. Tracking	Rated Ambient Temperature	Operating Temperature Range
R1	1000V	250mW	0.5MΩ ~ 11.5MΩ	±0.1%, ±0.25%, ±0.5%, ±1%	0.1% 0.25% 0.5%	±25 ±50	10 25	+85°C	-55°C to +155°C
R2	15V	50mW	1.5kΩ ~ 1MΩ	—					

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

Guaranteed value differs depending on resistance value

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the derating curve.

Performance Characteristics

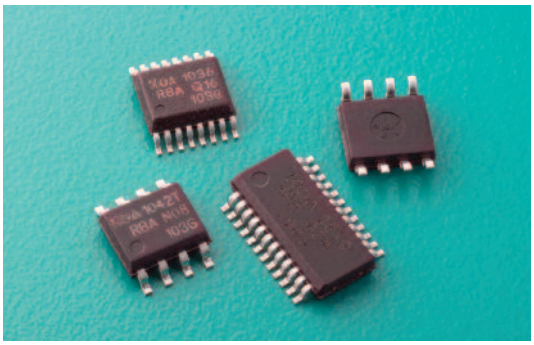
Parameter	Requirement △ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C, +25°C/+155°C
Resistance to Soldering Heat	±0.1%	±0.02%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.1%	±0.01%	-55°C (30 minutes), +155°C (30 minutes), 1000 cycles
Moisture Resistance	±0.1%	±0.02%	85°C ± 2°C, 85% ± 5% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.1%	±0.01%	85°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.1%	±0.03%	+155°C, 1000 hours

KOA SPEER ELECTRONICS, INC.

RB(X), RD(X), RTX

integrated passive components

EU RoHS COMPLIANT

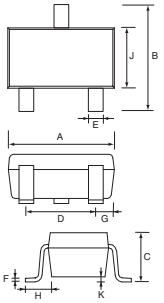


features

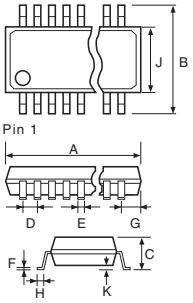
- Thin film (metal film) resistor array on silicon wafer
- Excellent resistance matching, TCR tracking and stabilities
- Custom circuits are available with flexible layout (Different resistance combinations possible)
- High integration saves board space and overall assembly costs
- Excellent reliability with standard molded IC package
- Suitable for reflow soldering
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction

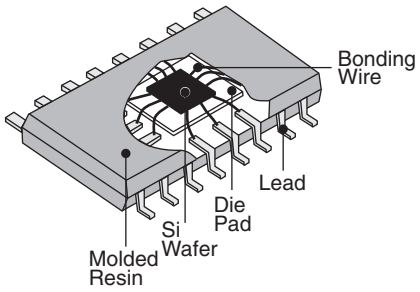
SOT-23



QSOP, SOIC-N



Package Symbol	Package	Pins	Dimensions inches (mm) A ±0.2	B ±0.2	C ±0.2	D ±0.1	E ±0.1	F ±0.1	G ±0.1	H ±0.2	J ±0.2	K ±0.1
S03	SOT-23	3	.115 (2.92)	.091 (2.3)	.037 (0.95)	.075 (1.910)	.017 (0.44)	.005 (0.13)	.020 (0.51)	.021 (0.53)	.051 (1.3)	.004 (0.11)
Q16	QSOP	16	.193 (4.90)	.236 (5.99)	.063 (1.60)	.025 (0.635)	.010 (0.25)	.008 (0.20)	.008 (0.20)	.026 (0.66)	.150 (3.81)	.007 (0.18)
Q20		20	.341 (8.66)						.058 (1.47)			
Q24		24							.033 (0.84)			
N08	SOIC-N	8	.190 (4.83)			.050 (1.27)	.016 (0.41)		.020 (0.52)			
N14		14	.341 (8.66)									
N16		16	.390 (9.91)									



ordering information

RBA, RBB

RBA	Q20	T	TEB	1002	B	E	B	T
Circuit Code	**Package Symbol**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Absolute Tolerance**	**T.C.R.**	**Relative Res. Toler.**	**T.C.R. Tracking**
RBA: Bussed resistor network RBB: High speed bussed network	Package type symbol + number of pins Q16, Q20, Q24: QSOP N08, N14, N16: SOIC narrow	T: Sn	TEB: 13" embossed plastic	B,C,D,F: 4 digits G,J: 3 digits	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% G: ±2% J: ±5%	T: ±10 E: ±25 C: ±50 H: ±100	A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% G: ±2% Blank: Not specified	Y: ±05 T: ±10 E: ±25 C: ±50 Blank: Not specified

For further information on packaging, please refer to Appendix A.

10/22/20

ordering information (continued)

RTX

RTX	S03	T	TE	7011
Circuit Code	**Package Symbol**	**Termination Material**	**Packaging**	**Custom Code**
RTX: SOT-23 Resistor network	Package type symbol + number of pins	T: Sn (L: Sn/Pb)	TE: 7" embossed plastic (RTX, RTY SOT-23 only)	

RDA, RDB

RDA	Q20	T	TEB	471J	511J	E
Circuit Code	**Package Symbol**	**Termination Material**	**Packaging**	**Nominal Resistance & Tolerance of R1**	**Nominal Resistance & Tolerance of R2**	**T.C.R.**
RDA: Dual terminator network RDB: Differential terminator network	Package type symbol + number of pins Q16, Q20: QSOP N16: SOIC narrow	T: Sn (L: Sn/Pb)	TEB: 13" embossed plastic	3 digits: G: ±2%, J: ±5%	3 digits: G: ±2%, J: ±5%	E: ±25 C: ±50 H: ±100

Specifications are limited by the circuit and resistance value. Please contact us separately.

ratings

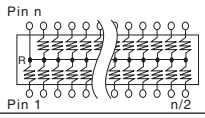
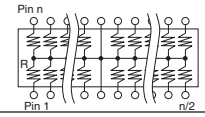
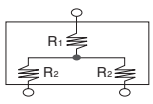
Package		QSOP			SOIC			SOT-23
Package Symbol		**Q16**	**Q20**	**Q24**	**N08**	**N14**	**N16**	**S03**
Package Power Rating		0.8W	1.0W	1.0W	0.4W	0.6W	0.8W	0.2W
Resistance Range	10Ω ~ 1kΩ	Power rating 200mW/resistor element [1]						
	1.1kΩ ~	Power rating 50mW/resistor element [1]						
Max. Working Voltage		100V						
Rated Voltage		√ Rated power x nominal resistance value, rated voltage should not exceed max. working voltage						
Rated Ambient Temp.		+70°C						
Operating Temp. Range		-55°C ~ +125°C [2]						

Above ratings are based on the thermal resistance using multi-layer circuit board (EIA/JESD51). For mounting on a mono-layer board, power derating shall be needed. Please contact us about conditions.

[1] Total power consumption of all elements should not exceed the package power rating.

[2] About operating temperature range -55°C ~ +155°C. We can provide custom devices. Please contact us.

applications and ratings

Circuit Code	Circuit Schematics	Number of Pins	T.C.R. (x10⁻⁶/K)	Resistance Range (Ω) E24 & Absolute Tolerance	
				F: ±1%	G: ±2%, J: ±5%
RBA		8, 14, 16, 20, 24	E: ±25	100 ~ 100k	100 ~ 100k
			C: ±50	51 ~ 100k	51 ~ 100k
			H: ±100	30 ~ 100k	10 ~ 100k
RBB		8, 14, 16, 20, 24	E: ±25	100 ~ 100k	100 ~ 100k
			C: ±50	51 ~ 100k	51 ~ 100k
			H: ±100	30 ~ 100k	10 ~ 100k
RTX, RTY		3(SOT- 23 only)	E: ±25	100 ~ 40k	100 ~ 40k
			C: ±50	51 ~ 40k	51 ~ 40k
			H: ±100		

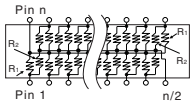
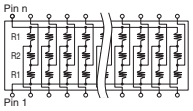
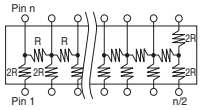
10/22/20

KOA SPEER ELECTRONICS, INC.

RB(X), RD(X), RTX

integrated passive components

applications and ratings (continued)

Circuit Code	Circuit Schematics	Number of Pins	T.C.R.	Resistance Range (Ω) E24 & Absolute Tolerance G: ±2%, J: ±5%
RDA		16, 20	E: ±25 C: ±50 H: ±100	R1= 150 ~ 10k R1: R2= 1:1 ~ 1:4
RDB		16, 20	E: ±25 C: ±50 H: ±100	R1= 150 ~ 10k R1: R2= 1:1 ~ 1:4
RLA		14, 16	H: ±100	1k ~ 30k

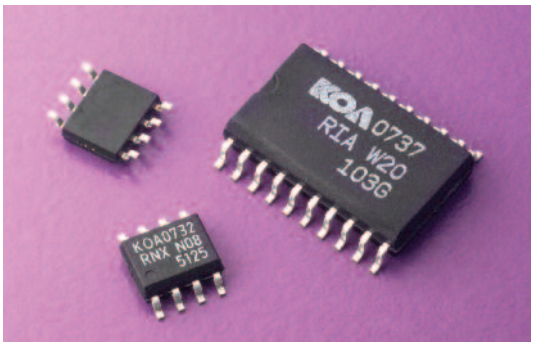
environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance		25°C
T.C.R.	Within specified T.C.R.		+25°C/-55°C, +25°C/+125°C
Resistance to Soldering Heat	±0.1% [3]	±0.05%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5% [3]	±0.05%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±0.5% [3]	±0.05%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±0.25% [3]	±0.05%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.25% [3]	±0.1%	+125°C, 1000 hours

[3] Guaranteed value differs depending on resistance values.

EU RoHS COMPLIANT



features

- High precision resistor networks
- Combination of different resistance is available for custom circuit
- TCR tracking down to 5ppm/°C
- Marking: Black body color

ordering information

RIA

RIA	Q20	T	TEB	1002	B	E	B	T
Circuit Code	**Package Symbol**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Absolute Tolerance**	**T.C.R.**	**Relative Res. Toler.**	**T.C.R. Tracking**
RIA: Isolated resistor network	Package type symbol + number of pins Q16, Q20, Q24: QSOP N08, N14, N16: SOIC narrow	T: Sn	TEB: 13" embossed plastic	4 digits	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: ±10 E: ±25 C: ±50 H: ±100	A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% G: ±2% Blank: Not specified	Y: ±05 T: ±10 E: ±25 C: ±50 Blank: Not specified

Specifications are limited by the circuit and resistance value. Please contact us separately.

RNX

RNX	Q20	T	TEB	5128
Circuit Code	**Package Symbol**	**Termination Material**	**Packaging**	**Custom Code**
RNX: Custom Resistor network	Package type symbol + number of pins	T: Sn (L: Sn/Pb)	TEB: 13" embossed plastic	

For further information on packaging, please refer to Appendix A.

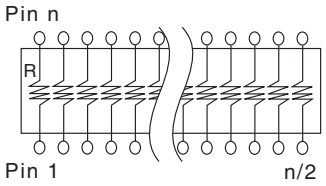
ratings

Product Code	Number of Pins	T.C.R.	Resistance Range (E24) and Resistance Tolerance					Relative Resist. Tol.	TCR Tracking
			B: ±0.1%	C: ±0.25%	D: ±0.5%	F: ±1%	G: ±2%, J: ±5%		
RIA RNX	8, 14, 16, 20, 24	T: ±10	510Ω ~ 100kΩ	510Ω ~ 100kΩ	510Ω ~ 100kΩ	510Ω ~ 100kΩ	510Ω ~ 100kΩ	0.05%, 0.1%, 0.25%, 0.5%, 1%, 2%	5, 10, 25, 50
		E: ±25			100Ω ~ 510kΩ	100Ω ~ 510kΩ	100Ω ~ 510kΩ		
		C: ±50			51Ω ~ 510kΩ	51Ω ~ 510kΩ	51Ω ~ 510kΩ		
		H: ±100				30Ω ~ 510kΩ	10Ω ~ 510kΩ		

Please ask about your custom devices and circuits (Different resistance combinations available). Depending on the circuit and package, much higher resistances are possible. For RIA20, 24 pin, highest resistance value/element is up to 100kΩ

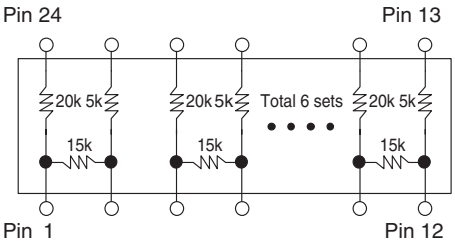
circuit schematic

RIA - High Precision Resistor Networks



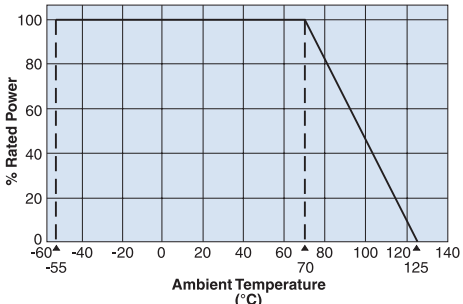
Please ask about your custom devices and circuits.

RNX - Custom High Precision Resistor Networks



environmental applications

Derating Curve



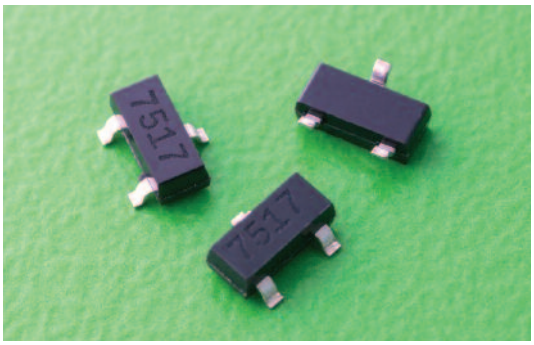
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

KOA SPEER ELECTRONICS, INC.

RTY

precision voltage divider

EU RoHS COMPLIANT



features

- Expanded flexibility of component layout
- Relative precision of pair resistors are guaranteed
- TCR tracking down to 5ppm/°C

ordering information

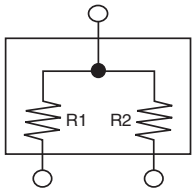
RTY	S03	T	TE	7516
Circuit Code	Package Symbol	Termination Material	Packaging	Custom Code
RTY: SOT-23 Resistor network	Package type symbol + number of pins	T: Sn	TE: 7" embossed plastic	

ratings

Product Code	T.C.R.	Resistance Range (Ω) (E24) and Resistance Tolerance					Relative Resist. Tol.	TCR Tracking
		B: ±0.1%	C: ±0.25%	D: ±0.5%	F: ±1%	G: ±2%, J: ±5%		
RTY	T: ±10	1kΩ ~ 40kΩ	1kΩ ~ 40kΩ	1kΩ ~ 40kΩ	1kΩ ~ 40kΩ	1kΩ ~ 40kΩ	0.05%, 0.1%, 0.25%, 0.5%, 1%, 2%	5, 10, 25, 50
	E: ±25	1kΩ ~ 150kΩ	1kΩ ~ 150kΩ	100Ω ~ 150kΩ	100Ω ~ 150kΩ	100Ω ~ 150kΩ		
	C: ±50			51Ω ~ 200kΩ	51Ω ~ 200kΩ	51Ω ~ 200kΩ		
	H: ±100				30Ω ~ 200kΩ	30Ω ~ 200kΩ		

Specifications are limited by the circuit and resistance value.
Please contact us separately.

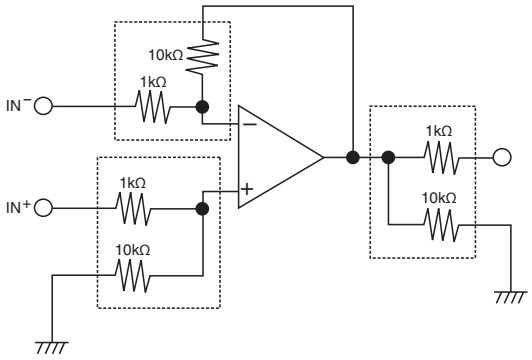
circuit schematic



ratings

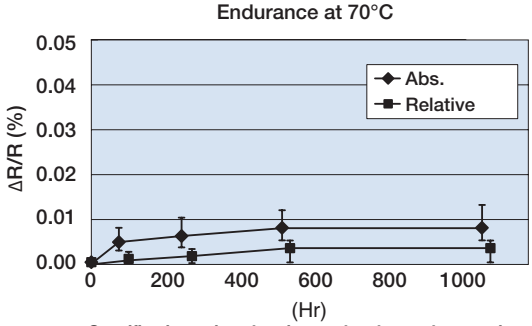
Package Symbol	Package	Number of Pins	Package Power Rating (W)
S03	SOT-23	3	0.2

example of application



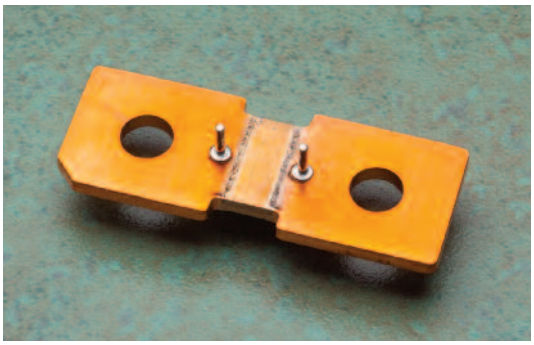
typical characteristics

Endurance at 70°C (Typical: 1kΩ, 8 resistors/package)



merit of thin film resistor networks

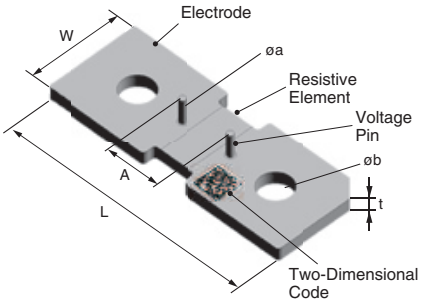
Metal thin film resistors formed by sputtering method have very similar characteristic among pair resistors. When their characteristic of T.C.R., aging, etc. for relative precision is requested, it's very suitable to apply thin film resistor networks to utilize the characteristic as above.



features

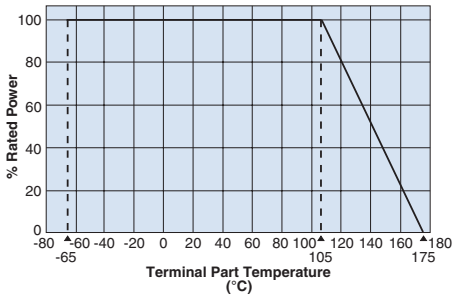
- Ultra low resistance, suitable for large current sensing
- Excellent T.C.R. achieved (50±25 x 10^{-6}/K)
- Correct electric current detection by a voltage pin is possible
- Bus bar and cable can be screwed on
- 2D code means individual resistance information
- Products meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction*1



Type (Inch Size Code)	Resistance (Ω)	Dimensions inches (mm) L	W	A	øa	øb	t
HSAN2P4022M5	50µ	1.57±.010 (40.0±0.25)	.866±.010 (22.0±0.25)	.335±.008 (8.5±0.2)	.039±.008 (1.0±0.2)	.213±.004 (5.4±0.1)	.079±.008 (2.0±0.2)
HSAN2P8022M8		3.15±.010 (80.0±0.25)				.327±.004 (8.3±0.1)	
HSAN2P4015M5	100µ	1.57±.010 (40.0±0.25)	.591±.010 (15.0±0.25)	.335±.008 (8.5±0.2)	.039±.008 (1.0±0.2)	.213±.004 (5.4±0.1)	.079±.008 (2.0±0.2)
HSBN2P8018M8		3.15±.010 (80.0±0.25)	.709±.010 (18.0±0.25)	.472±.008 (12.0±0.2)		.327±.004 (8.3±0.1)	
HSAN2P4015M5	200µ	1.57±.010 (40.0±0.25)	.591±.010 (15.0±0.25)	.335±.008 (8.5±0.2)	.039±.008 (1.0±0.2)	.213±.004 (5.4±0.1)	.039±.008 (1.0±0.2)

Derating Curve



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve above.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

HS	A	N	2P	4015
Type	Size	Surface Condition	Number of Voltage Pin	Outward Form Size
HS	A: 5mm B: 8.2mm	N: No surface treatment	0P: 0 pin 2P: 2 pin *1	4022: 50µΩ 8022: 50µΩ 4015: 100µΩ 200µΩ 8018: 100µΩ Length x Width

M5	PT	L10	J	Y
Fastening Hole	Packing Form	Nominal Resistance	Resistance Tolerance	2D Code
M5: M5 Hole M8: M8 Hole *1	PT: Tray	50U: 50µΩ L10: 100µΩ L20: 200µΩ	J: ±5%	Nil: Non code Y: With Resistance Value

*1 Standard voltage pin: ø1mm, length 4mm, Sn plating. Contact KOA factory for custom type request

Contact KOA factory when you have control request for environmental hazardous material other than the substance specified by EU RoHS

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/21/21

applications and ratings

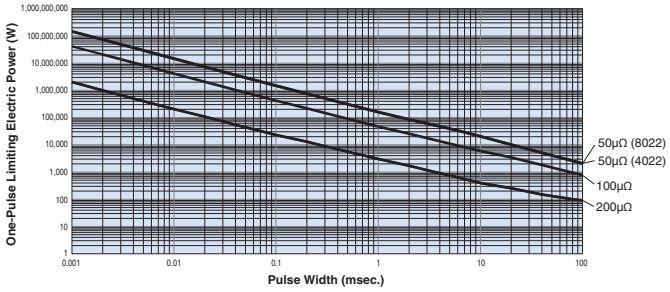
Part Designation	Power Rating*2	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω)	Rated Terminal Part Temp.	Operating Temp. Range
HS	50W (1000A)	75±50	50μ	105°C	-65°C to +175°C
	36W (600A)	50±25	100μ		
	18W (300A)		200μ		

*2 A power rating shall be guaranteed with a method shown in the item (: Performance)

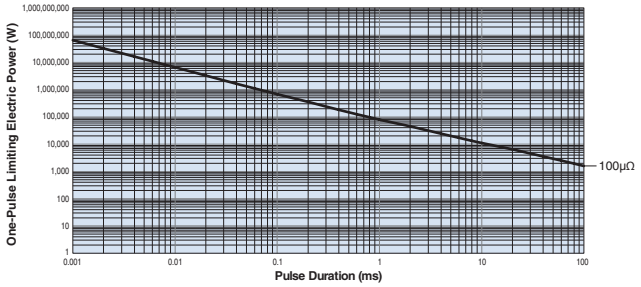
environmental applications

One-Pulse Limiting Electric Power

HSA



HSB



The maximum applicable voltage is equal to the max. overload voltage.

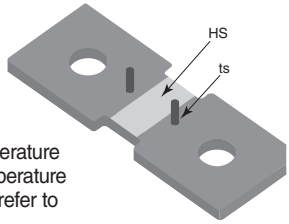
Please ask us about the resistance characteristic of continuous applied pulse.

The pulse endurance values are not assured values,so be sure to check the products on actual equipment when you use them.

Thermal Resistance

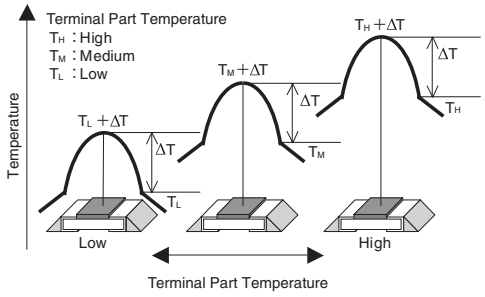
Resistance (Ω)	Rth (°C/W)
50μ	0.57
100μ	1.2
200μ	2.3

Rth=(Hs-ts)/Power



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.

The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.



Performance Characteristics

Parameter	Requirement Δ R % Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	50μΩ: +25°C/+125°C; 100μΩ, 200μΩ: +25°C/+100°C
Rapid Change of Temperature	±0.5	-0.1	-55°C (30 minutes), +150°C (30 minutes), 1000 cycles
Endurance at 105°C and Less of Terminal Part Temperature	±1	-0.1	Terminal part temperature: 105°C ± 3°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	±0.5	-0.05	-65°C, 1000 hours
High Temperature Exposure	±1	-0.4	175°C, 1000 hours

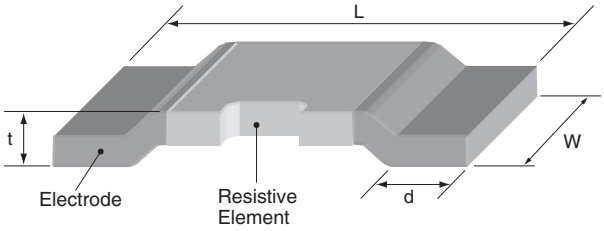
Additional environmental applications can also be found at www.koaspeer.com

10/21/21

features

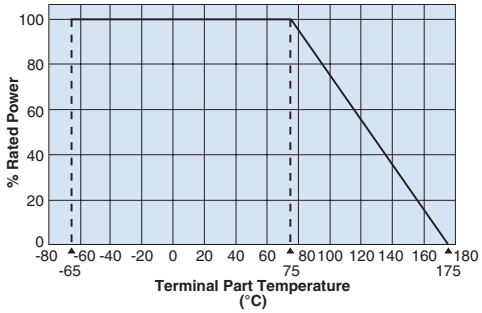
- Ultra low resistance, suitable for large current sensing
- Automatic mounting machines are applicable
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products meet EU RoHS requirements
- AEC-Q200 tested

dimensions and construction



Type (Inch Size Code)	Resist. (Ω)	Dimensions inches (mm) L	W	d	t
PSL2 (2512)	0.2m	.248±.006 (6.3±0.15)	.124±.006 (3.15±0.15)	.045±.006 (1.15±0.15)	.055±.006 (1.40±0.15)
	0.3m				.052±.006 (1.32±0.15)
	0.5m				.044±.006 (1.12±0.15)

Derating Curve



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

PS	J	2	N	TEB	L500	F
Type	Power Rating	Termination Number	Termination Material	Packaging	Nominal Resistance	Tolerance
	L: 0.2m: 9W 0.3m: 8W 0.5m: 8W		N: No surface treatment	TEB: 8mm pitch plastic embossed	4 digits: all values less than 100mΩ are expressed in mΩ with "L" as decimal Ex: 0.5mΩ - L500 1mΩ = 1L00	F: ±1%

For further information on packaging, please refer to Appendix A.

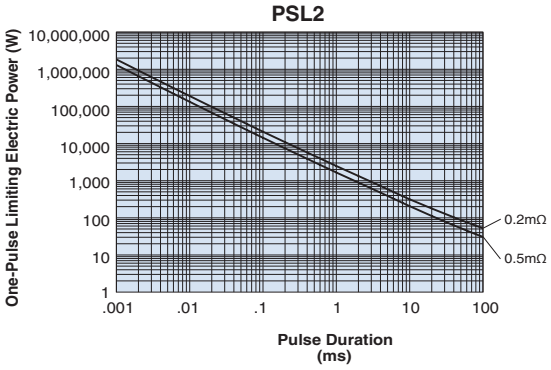
10/20/21

applications and ratings

Part Designation	Power Rating (Current Rating)	T.C.R. (ppm/°C) Max.	Resistance Range	Resistance Tolerance	Rated Terminal Part Temperature	Operating Temperature Range
PSL2	9W (212A)	250±100	0.2mΩ	F: ±1%	75°C	-65°C to +175°C
	8W (163A)	±175	0.3mΩ			
	8W (126A)	±115	0.5mΩ			

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

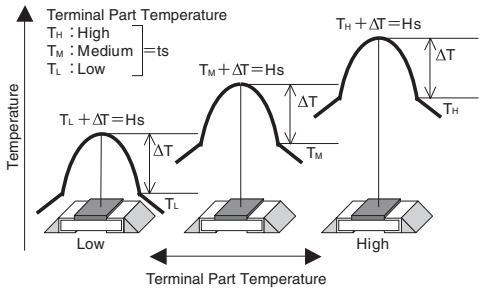
The pulse endurance values are not assured values,so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Resistance (Ω)	Rth (°C/W)
PSL2	0.2m	3.2
	0.5m	6.7

Rth=(Hs-ts)/Power

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

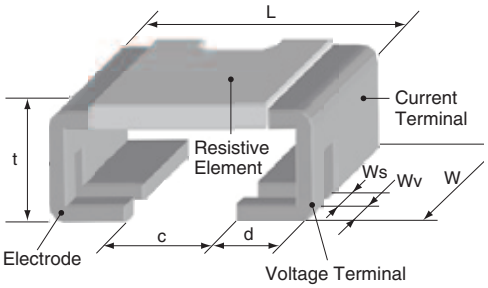
Parameter	Requirement Δ R ±% Limit	Typical	Test Method
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±0.5%	±0.1%	0.2m: 27W for 5 seconds; 0.3m, 0.5m: 24W for 5 seconds
Resistance to Solder Heat	±0.5%	±0.1%	260°C ± 5°C, 15 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.1%	-55°C (30 minutes), +150°C (30 minutes), 1,000 cycles
Moisture Resistance	±0.5%	±0.05%	85°C ± 3°C, 85% ± 3°C RH, 1000 hours, 10% Bias
Endurance at 75°C and Less of Terminal Part Temperature	±1.0%	±0.3%	Terminal part temperature: 75°C ± 3°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	±0.5%	±0.02%	-65°C, 1000 hours
High Temperature Exposure	±1%	±0.5%	+175°C, 1,000 hours

features

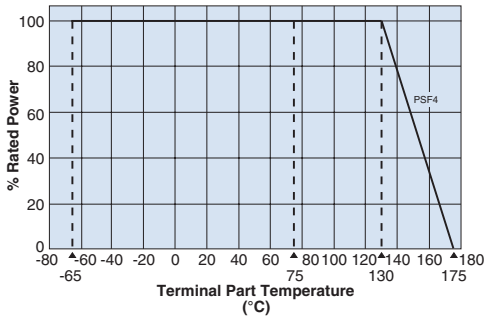
- Correcter electric current detection is possible with 4-terminal construction
- Excellent T.C.R. achieved (±50×10^{-6}/K)
- Ultra low resistance, suitable for large current sensing
- Automatic mounting machines are applicable
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products meet EU RoHS requirements
- AEC-Q200 tested

dimensions and construction

Type (Inch Size Code)	Resist. (Ω)	Dimensions inches (mm) L	W	d	c	Ws	Wv	t
PSF4 (1216)	0.5m	.118±.004 (3.0±0.1)	.150±.004 (3.8±0.1)	—	.037±.006 (0.95±0.15)	.028±.002 (0.7±0.05)	.020±.002 (0.5±0.05)	.071±.004 (1.8±0.1)
	1m							



Derating Curve



When the terminal part temperature of the resistor exceeds the rated terminal part temperature shown, the power shall be derated according to the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

PS	G	4	N	TEB	L500	F
Type	Power Rating	Termination Number	Termination Material	Packaging	Nominal Resistance	Tolerance
	F (0.5m): 5W F (1m): 3W		N: No surface treatment	TEB: Plastic embossed	4 digits: all values less than 100mΩ are expressed in mΩ with "L" as decimal Ex: 0.5mΩ - L500 1mΩ - 1L00	F: ±1%

Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

For further information on packaging, please refer to Appendix A.

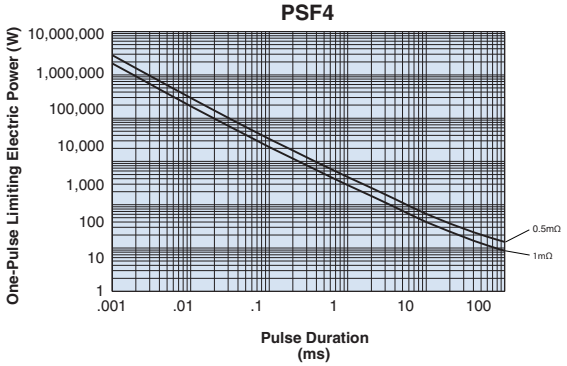
10/20/21

applications and ratings

Part Designation	Power Rating (Current Rating)	T.C.R. (ppm/°C) Max.	Resistance Range	Resistance Tolerance	Rated Terminal Part Temperature	Operating Temperature Range
PSF4	5W (100A)	±50	0.5mΩ	F: ±1%	130°C	-65°C to +175°C
	3W (54A)		1mΩ			

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

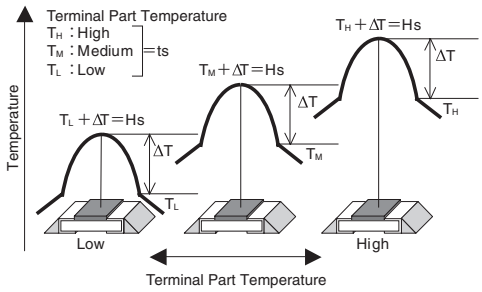
The pulse endurance values are not assured values,so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Resistance (Ω)	Rth (°C/W)
PSF4	0.5m	8
	1m	14

Rth=(Hs-ts)/Power

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement Δ R ±% Limit	Typical	Test Method
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±0.5%	±0.1%	0.5mΩ: 15W for 5 seconds; 1mΩ: 9W for 5 seconds
Resistance to Solder Heat	±0.5%	±0.1%	260°C ± 5°C, 15 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.1%	-55°C (30 minutes), +150°C (30 minutes), 1,000 cycles
Moisture Resistance	±0.5%	±0.05%	85°C ± 3°C, 85% ± 3% RH, 1000 hours, 10% Bias
Endurance at Rated Terminal Part Temperature	±1.0%	±0.5%	Terminal part temperature: 130°C ± 3°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	±0.5%	±0.01%	-65°C, 1000 hours
High Temperature Exposure	±1%	±0.6%	+175°C, 1,000 hours

TLR2A

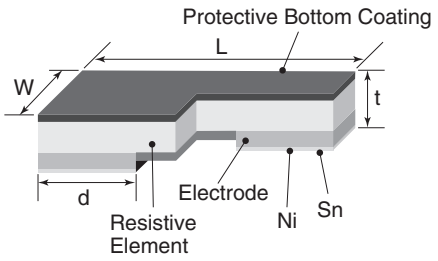
metal plate chip type low resistance resistor

EU RoHS COMPLIANT

features

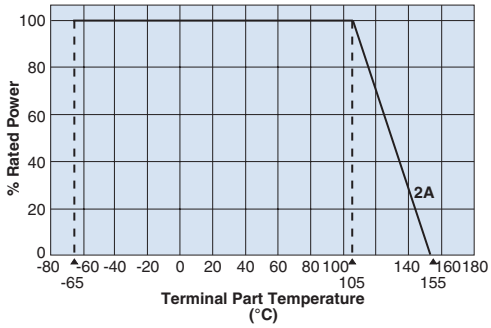
- SMD type of small size, metal plate low resistance resistor for current detection
- Low height suitable for use of small equipment such as mobile phone
- High reliability and performance with T.C.R ±100×10^{-6}/K
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products meet EU RoHS requirements
- AEC-Q200 Tested 0805 (2A)

dimensions and construction



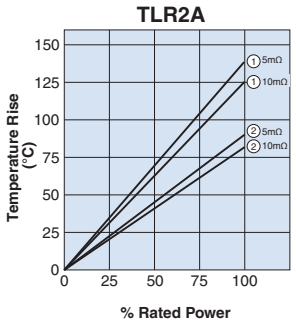
Size Code	Resistance	Dimensions inches (mm) L	W	d	t
TLR2A (0805)	2mΩ	.079±.008 (2.00±0.20)	.049±.008 (1.25±0.20)	.024±.008 (0.60±0.20)	.012±.006 (0.30±0.15)
	3mΩ			.024±.008 (0.60±0.20)	.010±.006 (0.25±0.15)
	4mΩ			.018±.008 (0.45±0.20)	
	5mΩ			.026±.008 (0.65±0.20)	.012±.006 (0.30±0.15)
	6mΩ			.022±.008 (0.55±0.20)	
	7mΩ			.020±.008 (0.50±0.20)	
	8mΩ			.020±.008 (0.50±0.20)	.016±.006 (0.26±0.15)
	9mΩ			.018±.008 (0.45±0.20)	
	10mΩ			.014±.008 (0.35±0.20)	

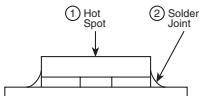
Derating Curve



For resistors operated at an ambient temperature of 105°C or above, a power rating shall be derated in accordance with the above derating curve.

Temperature Rise





For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

TLR	2A	T	TD	10L0	J
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
TLR	2A: 1W	T: Sn	TD: 7" 4mm pitch punch paper	±1%: 4 digits All values less than 0.1Ω (100m) are expressed in mΩ with "L" as decimal Ex: 1mΩ = 1L00	F: ±1%

For further information on packaging, please refer to Appendix A.

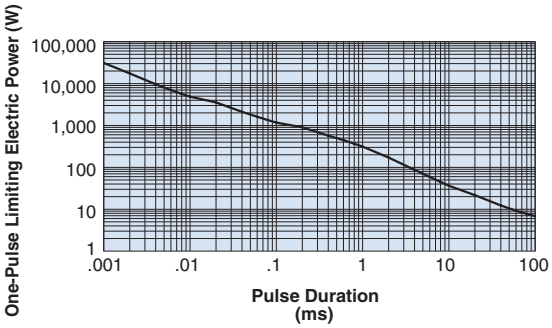
12/02/19

applications and ratings

Part Designation	Power Rating	Current Rating	T.C.R. (ppm/°C) Max.	Standard Resistance (Ω)	Resistance Tolerance	Rated Terminal Part Temperature	Connection Temperature	Operating Temperature Range
TLR2A	1W	—	±100	2m, 3m, 4m, 5m, 6m, 7m, 8m, 9m, 10m	F: ±1%	105°C	—	-65°C to +155°C

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

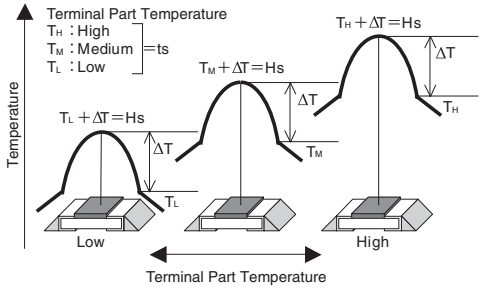
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Resistance (Ω)	Rth (°C/W)
TLR2A	2m	26.1
	10m	54.7

Rth=(Hs-ts)/Power

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement Δ R % Limit	Requirement Δ R % Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±1	±0.05	Rated power x 2.5 for 5 seconds
Resistance to Solder Heat	±1	±0.01	260°C ± 5°C, 10 ~ 12 seconds
Rapid Change of Temperature	±1	±0.2	-55°C (15 minutes), +150°C (15 minutes), 1000 cycles
Moisture Resistance	±1	±0.3	85°C, 85%RH, 1000 hours, 10% Bias
Endurance at 105°C and Less of Terminal Part Temperature	±1	±0.4	Terminal part temperature: 105°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	±1	±0.05	-65°C, 96 hours
High Temperature Exposure	±1 (2~4m, 7~10m) ±2 (5m, 6m)	±0.5 (2~4m, 7~10m) ±0.8 (5m, 6m)	155°C, 1000 hours

Note: Please contact factory for the TLRZ Performance Characteristics

KOA SPEER ELECTRONICS, INC.

TLR-2B, 2H, 3AW

metal plate current sense resistor

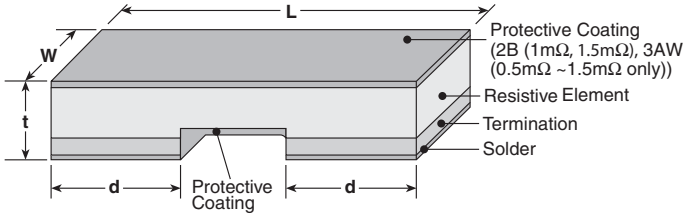
EU RoHS COMPLIANT

current sense

features

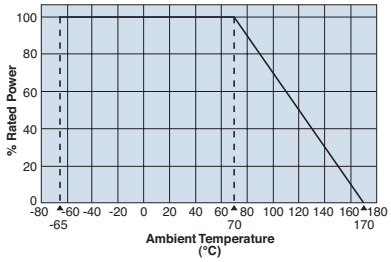
- Ultra-low TCR (+50ppm/°C) available
- Ultra low height with a thickness of 0.6mm, suitable for use of small equipment
- Excellent high-frequency characteristics
- Ultra low resistances (0.5mΩ~), suitable for large current sensing
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Tested

dimensions and construction

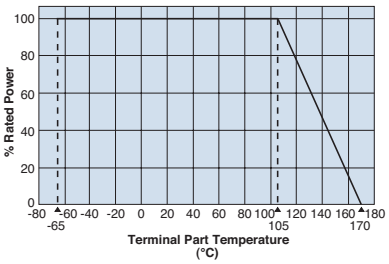


Size Code	Resistance	Dimensions inches (mm) L	W	d	t
TLR2B TLR2BN	1m 1.5m	.126±.008 (3.20±0.20)	.063±.008 (1.60±0.20)	.043±.008 (1.10±0.20)	.024±.008 (0.60±0.20)
	2m,3m,4m,5m, 6m,7m,8m,9m, 10m,11m,12m, 13m,15m,16m, 18m,20m			.020±.008 (0.50±0.20)	
TLR2H	1m	.200±.008 (5.00±0.20)	.100±.008 (2.50±0.20)	.071±.008 (1.80±0.20)	.026±.008 (0.65±0.20)
	2m - 6m			.060±.008 (1.50±0.20)	.024±.008 (0.60±0.20)
	7m - 10m			.020±.008 (0.50±0.20)	
TLR3AW	0.5mΩ	.25±.01 (6.35±0.25)	.125±.01 (3.18±0.25)	.107±.01 (2.725±0.25)	.024±.01 (0.60±0.25)
	0.68mΩ,0.75mΩ, 0.82mΩ,			.105±.01 (2.675±0.25)	
	1mΩ, 1.5mΩ, 2mΩ, 3mΩ, 4mΩ			.087±.01 (2.20±0.25)	
	5mΩ, 6mΩ, 7mΩ, 8mΩ			.047±.01 (1.20±0.25)	
	9mΩ, 10mΩ			.030±.01 (0.77±0.25)	

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

TLR	3AW	D	TE	2L00	F	75
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance	T.C.R.
	2BN: 0.5W 2B: 0.5W 2H: 1W 3AW: 2W	D: SnAgCu	TE: 7" 8mm pitch embossed plastic (3AW) TE: 7" 4mm pitch embossed plastic (2H only) TD: 7" 4mm pitch punched paper (2B only)	±1%: 4 digits All values less than 0.1Ω (100m) are expressed in mW with "L" as decimal Ex: 2mΩ = 2L00	F: ±1%	50ppm/°C 75ppm/°C Blank: 150ppm/°C

For further information on packaging, please refer to Appendix A.

11/03/21

KOA SPEER ELECTRONICS, INC.

TLR-2B, 2H, 3AW

metal plate current sense resistor

applications and ratings

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (ppm/°C) Max.*	Standard Resistance (Ω)	Resistance Tolerance	Operating Temperature Range
TLR2B	1/2W (.5W)	70°C	105°C	±50	2m,3m,4m,5m,6m,7m,8m, 9m,10m,11m,12m,13m, 15m,16m,18m,20m	F: ±1%	-65°C to +155°C** -65°C to +170°C**
				±75	1m,1.5m,2m,3m,4m,5m, 6m,7m,8m,9m,10m,11m, 12m,13m,15m,16m,18m,20m		
TLR2BN				±150	1m,1.5m,2m,3m,4m,5m, 6m,7m,8m,10m,11m, 12m,13m,15m,16m,18m,20m		
TLR2H	1W	70°C	105°C	±50	1m,2m,3m,4m,5m, 6m,7m,8m,9m,10m	F: ±1%	-65°C to +155°C** -65°C to +170°C**
				±75			
TLR3AW	2W	70°C	105°C	±50	2m,3m,4m,5m, 6m,7m,8m,9m,10m	F: ±1%	-65°C to +155°C**
				±75	0.5m,0.68m,0.75m,0.82m, 1m,1.5m,2m*,3m,4m, 5m,6m,7m,8m,9m,10m		
				±150			-65°C to +170°C**

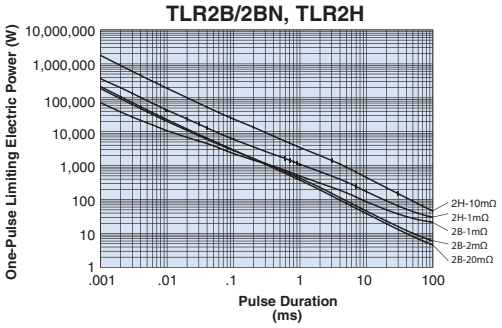
* Contact factory for 2mΩ dimensions

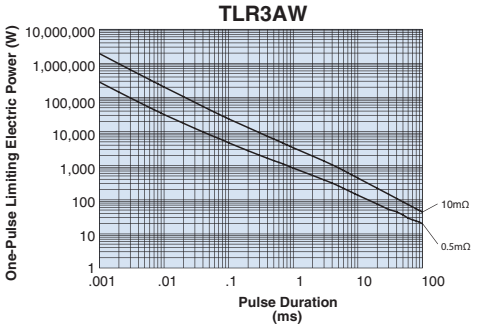
** Please reference High Temperature Performance Characteristics in the below table

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

One-Pulse Limiting Electric Power





The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

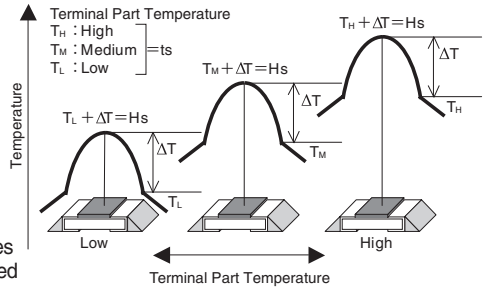
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Size	Resistance (Ω)	Rth (°C/W)
TLR	2B 2BN	1m	11.8
		2m	18.3
		20m	116
	2H	1m	17
		10m	61.1
	3AW	0.5m	6
		10m	62

Rth=(Hs-ts)/Power

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement Δ R ±% Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Resistance to Solder Heat	±0.5%	±0.3%	260°C ± 5°C, 10 seconds +2/-0 seconds
Rapid Change of Temperature	±0.5%	±0.4%	-55°C (15 minutes), +150°C (15 minutes), 1000 cycles
Moisture Resistance	±0.5%	±0.1%	MIL-STD-202, Method 106, 0% power, 7a and 7b not required
Biased Humidity	±0.5%	±0.1%	85°C ± 2°C, 85% RH, 1000 hours, 10% bias
Endurance (Ambient Temp.)	±1.0%	±0.3%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure**	±1.0%	±0.6%	±155°C (2B, 2H, 3AW), 1000 hours
	±2.0%	—	±170°C (2B, 2H, 3AW), 1000 hours

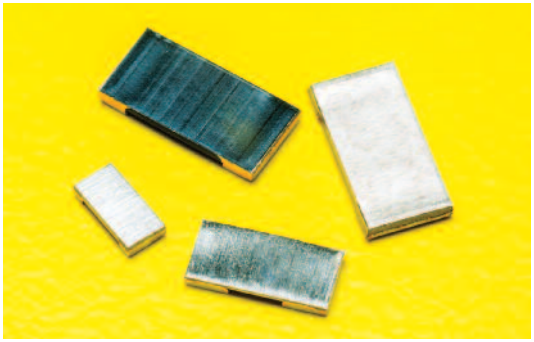
TLR-2BW, 2BP, 2HW, 3AP, 3APS

metal plate current sense resistor

KOA SPEER ELECTRONICS, INC.

EU RoHS COMPLIANT

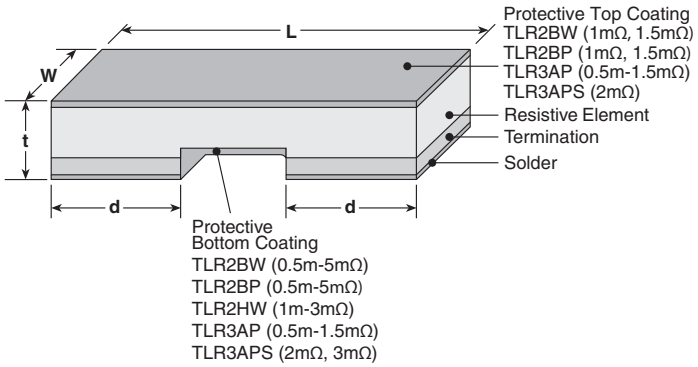
current sense



features

- Ultra-low TCR (+50ppm/°C) available
- Ultra low height with a thickness of 0.6mm, suitable for use of small equipment
- Ultra low resistances (0.5mΩ~), suitable for large current sensing
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Tested

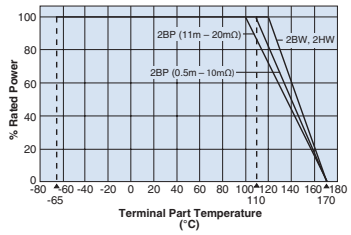
dimensions and construction



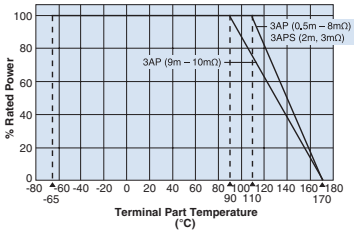
Size Code	Resistance	Dimensions inches (mm) L	W	d	t
TLR2BW	0.5mΩ	.126±.008 (3.20±0.20)	.063±.008 (1.60±0.20)	.049±.008 (1.25±0.20)	.028±.008 (0.70±0.20)
	1mΩ 1.5mΩ			.043±.008 (1.10±0.20)	.024±.008 (0.60±0.20)
	2mΩ - 20mΩ			.020±.008 (0.50±0.20)	
TLR2BP	0.5mΩ	.126±.008 (3.20±0.20)	.063±.008 (1.60±0.20)	.049±.008 (1.25±0.20)	.028±.008 (0.70±0.20)
	1mΩ, 1.5mΩ			.043±.008 (1.10±0.20)	.024±.008 (0.60±0.20)
	2mΩ - 20mΩ			.020±.008 (0.50±0.20)	
TLR2HW	0.5mΩ	.200±.008 (5.00±0.20)	.100±.008 (2.50±0.20)	.075±.008 (1.90±0.20)	.028±.008 (0.70±0.20)
	1mΩ			.071±.008 (1.80±0.20)	.026±.008 (0.65±0.20)
	1.5mΩ				.024±.008 (0.60±0.20)
	2mΩ - 6mΩ			.060±.008 (1.50±0.20)	
	7mΩ - 10mΩ			.020±.008 (0.50±0.20)	
TLR3AP	0.5mΩ	.25±.01 (6.35±0.25)	.125±.01 (3.18±0.25)	.107±.01 (2.725±0.25)	.024±.01 (0.60±0.25)
	0.68mΩ, 0.75mΩ, 0.82mΩ			.105±.01 (2.675±0.25)	
	1mΩ, 1.5mΩ, 3mΩ, 4mΩ			.087±.01 (2.20±0.25)	
	2mΩ			.098±.01 (2.50±0.25)	
	5mΩ, 6mΩ, 7mΩ, 8mΩ			.047±.01 (1.20±0.25)	
	9mΩ, 10mΩ			.030±.01 (0.77±0.25)	
TLR3APS	2mΩ, 3mΩ	.25±.01 (6.35±0.25)	.125±.01 (3.18±0.25)	.047±.01 (1.20±0.25)	.024±.01 (0.60±0.25)

Derating Curve

TLR2BW, TLR2BP, TLR2HW



TLR3AP, TLR3APS



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based in the terminal part temperature" in the beginning of our catalog before use.

ordering information

TLR	2BW	D	TD	10L0	F	75
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance	T.C.R.
	2BW: 1W 2BP: 1.5W, 3W 2HW: 2W 3AP: 3W, 5W 3APS: 3W	D: SnAgCu	TD: 7" 4mm pitch punched paper TE: 7" 4mm embossed plastic	±1%: 4 digits All values less than 0.1Ω (100m) are expressed in mW with "L" as decimal Ex: 2mΩ = 2L00	F: ±1%	50: 50ppm/°C 75: 75ppm/°C

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/03/21

KOA SPEER ELECTRONICS, INC.

TLR-2BW, 2BP, 2HW, 3AP, 3APS

metal plate current sense resistor

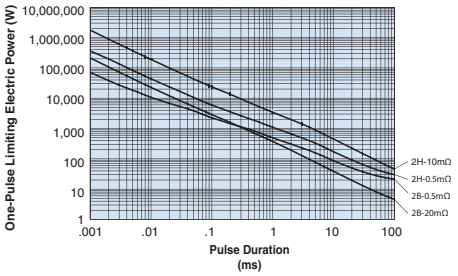
applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/°C) Max.**	Standard Resistance (Ω)	Resistance Tolerance	Rated Terminal Part Temperature	Operating Temperature Range
TLR2BW	1W	±50	2m,3m,4m,5m,6m,7m,8m, 9m,10m,11m,12m,13m, 15m,16m,18m,20m	F: ±1%	+120°C and less	-65°C to +170°C
		±75	0.5m,1m,1.5m,2m,3m,4m,5m, 6m,7m,8m,9m,10m,11m,12m, 13m,15m,16m,18m,20m			
TLR2BP	1.5W	±50	3m,4m,5m,6m,7m,8m,9m,10m	F: ±1%	+110°C and less	-65°C to +170°C
			11m,12m,13m,15m,16m,18m,20m		+100°C and less	
		±75	3m,4m,5m,6m,7m,8m,9m,10m		+110°C and less	
			11m,12m,13m,15m,16m,18m,20m		+100°C and less	
	NEW 3W	±50	2m	F: ±1%	+110°C and less	-65°C to +170°C
		±75	0.5m,1m,1.5m,2m			
TLR2HW	2W	±50	0.5m,1m,1.5m,2m,2.5m,3m, 4m,5m,6m,7m,8m,9m,10m	F: ±1%	+120°C and less	-65°C to +170°C
		±75				
TLR3AP	3W	±50	5m,6m,7m,8m,9m,10m	F: ±1%	5m ~ 8m: +110°C and less 9m, 10m: +90°C and less	-65°C to +170°C
		±75				
	5W	±50	2m,3m,4m	F: ±1%	0.5m~1m, 2m~4m: +110°C and less 1.5m: +90°C and less	-65°C to +170°C
		±75	0.5m,0.68m,0.75m,0.82m,1m,1.5m,2m,3m,4m			
TLR3APS	3W	±50, ±75	2m,3m	F: ±1%	+110°C and less	-65°C to +170°C

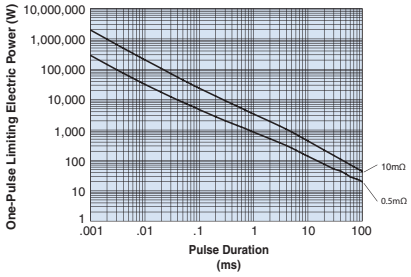
environmental applications

One-Pulse Limiting Electric Power

TLR2BW/2BP, TLR2HW



TLR3AP



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

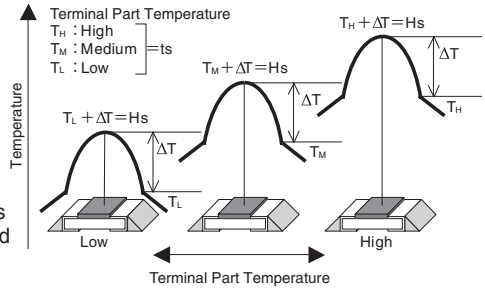
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Size	Resistance (Ω)	Rth (°C/W)
TLR	2BW	0.5m	7.2
		20m	116
	2HW	0.5m	9
		10m	61.1
	3AP	0.5m	6
		10m	62

Rth=(Hs-ts)/Power

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.

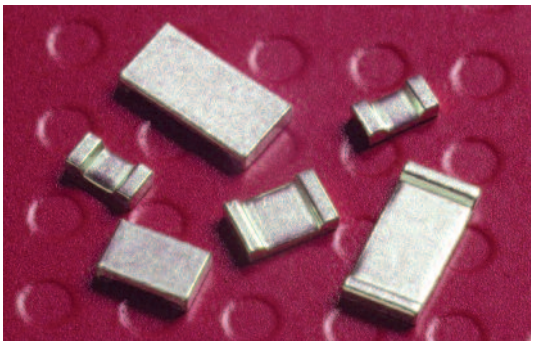


The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement Δ R ±% Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Resistance to Solder Heat	±0.5%	±0.3%	260°C ± 5°C, 10 ± 2 seconds
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (15 minutes), +150°C (15 minutes), 1000 cycles
Moisture Resistance	±0.5%	±0.1%	MIL-STD-202-106, 0% power, 7a and 7b not required
Biased Humidity	±0.5%	±0.1%	85°C ± 2°C, 85% RH, 1000 hours, 10% bias
Endurance of Rated Terminal Part Temperature	±1.0%	±0.3%	120°C ± 2°C (2BW, 2HW), 110°C ± 2°C (3AP 0.5mΩ~8mΩ) 90°C ± 2°C (3AP 9mΩ~10mΩ), 110°C±2°C (2BP 1mΩ-10mΩ) 100°C±2°C (2BP 11mΩ-20mΩ), 110°C±2°C (3APS 2mΩ, 3mΩ) 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1.0%	±0.6%	±155°C, 1000 hours
	±2.0%	±0.8%	±170°C, 1000 hours

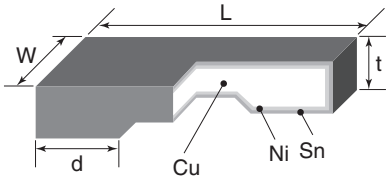
10/27/21



features

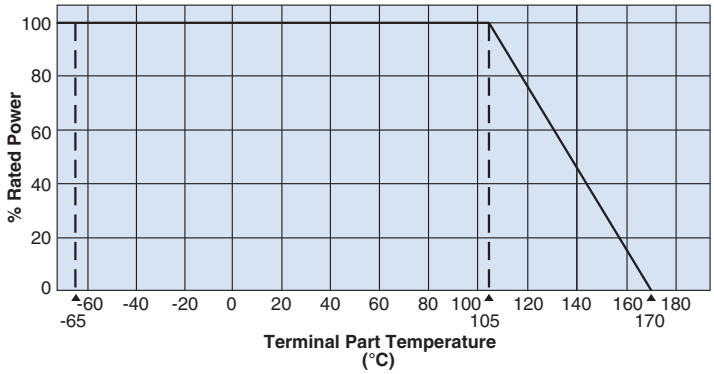
- SMD type of small size, high rated current zero ohm jumper
- Low height suitable for use of small equipment such as mobile phone
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction



Size Code	Dimensions inches (mm) L	W	d	t
TLRZ1E (0402)	.039±.004 (1.00±0.10)	.020±.004 (0.50±0.10)	.008±.004 (0.20±0.10)	.016±.002 (0.40±0.05)
TLRZ1J (0603)	.063±.004 (1.60±0.10)	.031±.004 (0.80±0.10)	.012±.004 (0.30±0.10)	.020±.002 (0.5±0.05)
TLRZ2A (0805)	.079±.004 (2.00±0.10)	.049±.004 (1.25±0.10)	.012±.004 (0.30±0.10)	
TLRZ2B (1206)	.126±.004 (3.20±0.10)	.063±.004 (1.60±0.10)	.012±.004 (0.30±0.10)	

Derating Curve



For resistors operated at an ambient temperature of 105°C or above, a power rating shall be derated in accordance with the above derating curve.

ordering information

TLRZ	1E	T	TB
Type	Current Rating	Termination Material	Packaging
TLRZ	1E: 10A 1J: 26A 2A: 31.6A 2B: 50A	T: Sn	TB: 7" pitch pressed paper (TLRZ1E only) TD: 7" 4mm pitch punch paper

For further information on packaging, please refer to Appendix A.

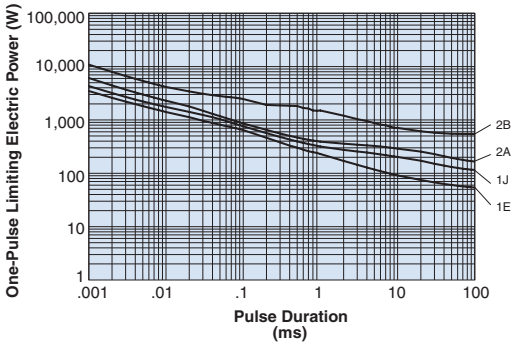
9/13/21

applications and ratings

Part Designation	Current Rating	Standard Resistance (Ω)	Rated Terminal Part Temperature	Operating Temperature Range
TLRZ1E	10A	0.5m max.	105°C and less	-65°C to +170°C
TLRZ1J	26A	0.2m max.	105°C and less	
TLRZ2A	31.6A	0.2m max.	105°C and less	
TLRZ2B	50A	0.2m max.	105°C and less	

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

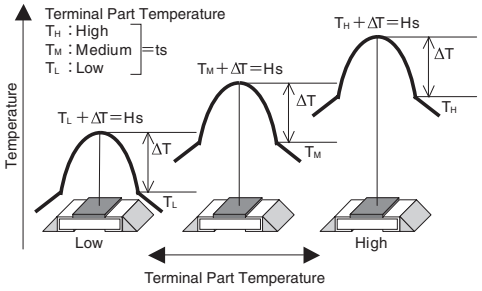
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Size	Rth
TLRZ	1E	<0.5°C/W
	1J	
	2A	
	2B	

Rth=(Hs-ts)/Power

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



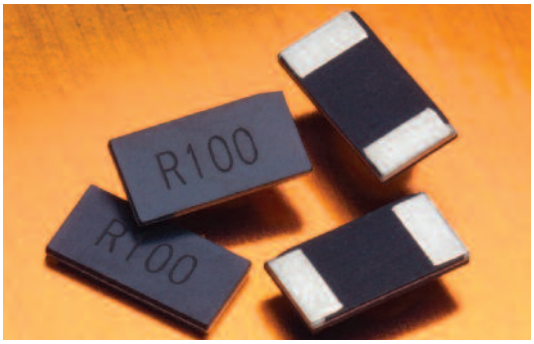
The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement (Δ R %) Limit	Typical	Test Method
Resistance	1E: Max 0.5mΩ 1J/2A/2B: Max 0.2mΩ	1E: Max 0.25mΩ 1J/2A/2B: Max 0.15mΩ	25°C
Overload (Short time)			1E: 20A; 1J/2A: 40A; 2B: 80A for 5 seconds
Resistance to Solder Heat			260°C ± 5°C, 10 ~ 12 seconds
Rapid Change of Temperature			-55°C (30 minutes), +155°C (30 minutes), 1000 cycles
Moisture Resistance			85°C, 85%RH, 1E: 1A; 1J/2A: 2A; 2B: 4A, 1000 hours
Endurance of Rated Terminal Part Temperature			Terminal part temperature: 105°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure			-65°C, 1000 hours
High Temperature Exposure			170°C, 1000 hours

Note: Please contact factory for the TLRZ Performance Characteristics

9/13/21

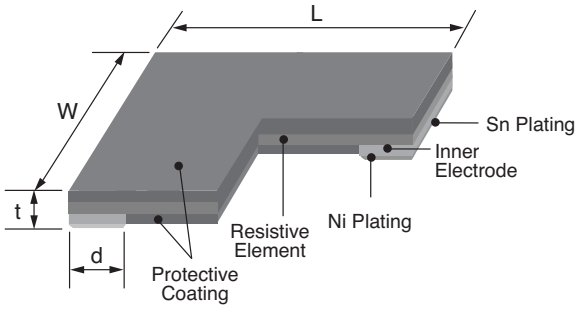


features

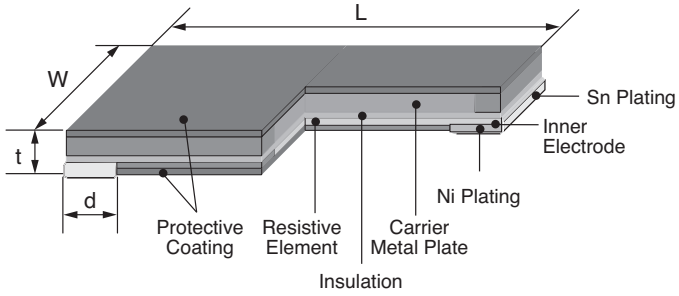
- SMD Type of small size, low resistance resistor for current detection
- Carrier metal plate inside, resistor of high radiation of heat structure (3AW, 3AP)
- High reliability and performance with low T.C.R.
- Automatic mounting machines are applicable
- Suitable for reflow soldering (2A: Not suitable for wave soldering)
- Products with lead-free terminations meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction

2A

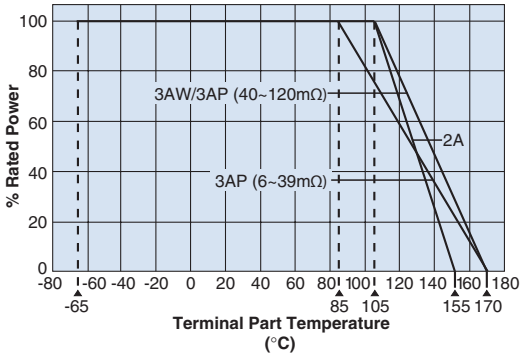


3AW



Size Code (Inch)	Resistance (Ω)	Dimensions inches (mm) L	W	d	t
TLRH 2A (0805)	12m~100m	.079±.008 (2.00±0.20)	.049±.008 (1.25±0.20)	.014±.008 (0.35±0.20)	.010±.008 (0.25±0.20)
TLRH 3AW (2512)	10m~270m	.248±.008 (6.30±0.20)	.126±.008 (3.20±0.20)	.030±.008 (0.75±0.20)	.020±.008 (0.50±0.20)
TLRH 3AP (2512)	6m~39m	.248±.008 (6.30±0.20)	.126±.008 (3.20±0.20)	.071±.008 (1.8±0.20)	.020±.008 (0.50±0.20)
	40m~120m			.051±.008 (1.3±0.20)	

Derating Curve



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

TLRH	3AW	T	TE	33L0	F
Type	Power Rating	Terminal Surface Material	Packaging	Nominal Resistance	Tolerance
	2A (12~27mΩ): 0.5W (33~50mΩ): 0.33W (56~100mΩ): 0.25W 3AW: 2.0W 3AP: (6~39mΩ): 5.0W (40~120mΩ): 4.0W	T: Sn	2A: TD: 7" 4mm pitch punched paper 3AW, 3AP: TE: 7" punched plastic	±1%: 4 digits All values less than 0.1Ω (100m) are expressed in mW with "L" as decimal Ex: 2mΩ = 2L00 2A: No marking	F: ±1%

For further information on packaging, please refer to Appendix A.

1/27/21

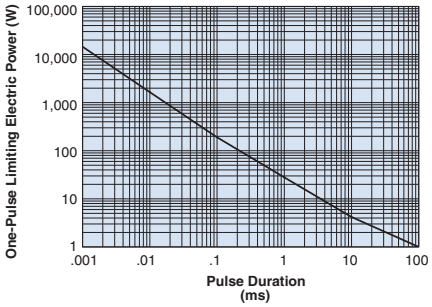
applications and ratings

Part Designation	Power Rating	T.C.R. (x10^{-6}/K)	Resistance Range (Ω) F: ±1% (E12)	Tolerance	Rated Terminal Part Temperature	Operating Temperature Range
TLRH 2A	0.25W	±75	56m~100m	F: ±1%	+105°C	-65°C~+155°C
	0.33W		33m ~ 50m			
	0.50W		12m ~ 27m			
TLRH 3AW	2.0W	±75	10m~22m			-65°C~+170°C
		±50	24m~270m			
TLRH 3AP	4.0W	±50	40m, 47m, 50m~120m			
	5.0W	±50	18m, 20m, 22m, 25m~39m		85°C	
		±75	6m, 7m, 8m, 9m, 10m, 12m			

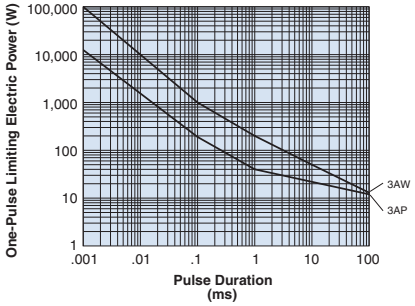
environmental applications

One-Pulse Limiting Electric Power

TLRH2A



TLRH3AW/TLRH3AP



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

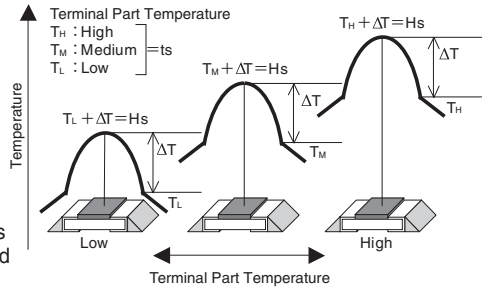
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Size	Resistance (Ω)	Rth (°C/W)
TLRH	2A	27m	123
		50m	195
		100m	280
	3AW	10m	5.2
		270m	7.4
	3AP	18m	7.4
		120m	4.1

Rth=(Hs-ts)/Power

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement Δ R% Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+100°C
Overload (Short time)	±0.5%	2A: ±0.05% 3AW,3AP: ±0.2%	2A, 3AW: Rated power x 2.5 for 5 seconds 3AP: Rated power x 8W for 5 seconds
Resistance to Soldering Heat	±0.5%	±0.1%	260°C ±5°C, 10 seconds ~ 12 seconds
Rapid Change of Temperature	±0.5%	2A: ±0.2% 3AW,3AP: ±0.1%	-55°C (15min.)/+150°C (15min.) 1000 cycles
Moisture Resistance	±0.5%	±0.1%	85°C ±2°C, 85% RH, 1000 hours, 10% Bias
Endurance at 105°C and Less of Terminal Part Temperature	±1%	2A: ±0.45% 3AW,3AP: ±0.3%	2A, 3AW, 3AP (40~120mΩ): 105°C, ±2°C; 3AP (6~39mΩ): 85°C ±2°C 1000 hours, 1.5 hours ON/0.5 hour OFF cycle
Low Temperature Exposure	±0.5%	2A: ±0.05% 3AW,3AP: ±0.02%	-65°C, 96 hours
High Temperature Exposure	±1%	2A: ±0.5% 3AW,3AP: ±0.2%	2A, 3AP: +155°C, 1000 hours (6~12mΩ) 3AW, 3AP: +170°C±3°C, 1000 hours (18~120mΩ)
	±2%	3AP: ±0.2%	3AP: +170°C±3°C, 1000 hours (6~12mΩ)

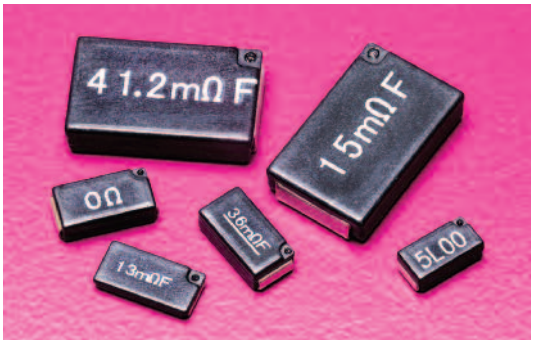
SL07, 1, 2, 3, SLN2, SLZ, TSL

surface mount molded current sense resistors

KOA SPEER ELECTRONICS, INC.

EU RoHS COMPLIANT

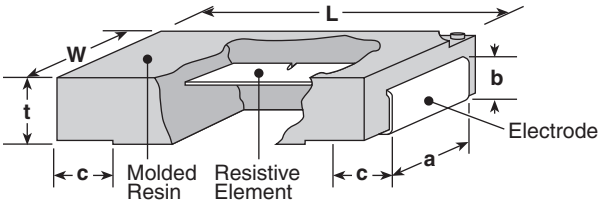
current sense



features

- Surface mount type
- Flameproof UL94V0 molded polymer case
- Excellent dimension accuracy, mountability and shock resistance
- Low profile type available (TSL)
- Super low resistance down to 3mΩ
- Resistance tolerance ±0.5% standard
- Wide range operating temperature -55°C to +180°C
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



Size Code	Dimensions inches (mm)					
	L	W	t	a	b	c
SL07 (2010)	.197±.012 (5.0±0.3)	.098±.008 (2.5±0.2)	.067±.008 (1.7±0.2)	.079±.008 (2.0±0.2)	.047±.008 (0.9±0.2)	.035±.012 (1.2±0.3)
TSL1 (2512)	.248±.012 (6.3±0.3)	.122±.008 (3.1±0.2)	.039±.008 (1.0±0.2)	.094±.008 (2.4±0.2)	.028±.008 (0.7±0.2)	.047±.012 (1.2±0.3)
SL1,SLZ1 (2512)	.248±.012 (6.3±0.3)	.122±.008 (3.1±0.2)	.075±.008 (1.9±0.2)	.094±.008 (2.4±0.2)	.047±.008 (1.2±0.2)	.047±.012 (1.2±0.3)
SL2 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.098±.008 (2.5±0.2)	.197±.008 (5.0±0.2)	.067±.008 (1.7±0.2)	.102±.02 (2.6±0.5)
SLN2 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.094±.008 (2.4±0.2)	.217±.008 (5.5±0.2)	.063±.008 (1.6±0.2)	.100±.016 (2.55±0.4)
SL3 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.098±.008 (2.5±0.2)	.197±.008 (5.0±0.2)	.067±.008 (1.7±0.2)	.102±.02 (2.6±0.5)

ordering information

SL	1	T	TE	10L0	F	75
Type	**Power Rating**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Tolerance**	**T.C.R. (x10⁻⁴/K)**
TSL SL SLN SLZ	07: 0.75W 1: 1W 2: 2W 3: 3W	T: Sn L: Sn/Pb*	TE: 7" embossed plastic For further information on packaging please refer to Appendix A	±0.5%, ±1%: 4 digits ±2%, ±5%: 3 digits All values less than 0.1Ω (100m) are expressed in mΩ with "L" as decimal Ex: 2mΩ = 2L00 0.1Ω: R100; 5mΩ: 5L0	D: ±0.5% F: ±1% G: ±2% J: ±5%	Nil: 0-150 0-200 ±75 (SLN2) ±100 ±110 ±180 50: ±50 (SL1) 75: ±75 (SL1)

* SL07 and SLN2, only the symbol T is available as the terminal surface material

4/29/20

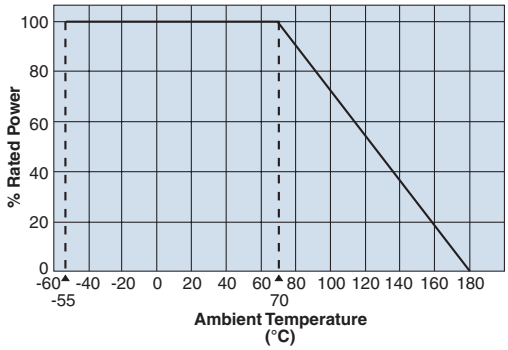
applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temperature	Resistance Range (Ω)* D: ±0.5% E24,E96***	F: ±1% E24,E96***	G: ±2% E24	J: ±5% E24	T.C.R. (ppm/°C) Max.	Operating Temp. Range
SL07	0.75W	70°C	125°C	—	5m - 100m	—	5m - 100m	0~200: R<11mΩ 0~150: R=>11mΩ	-55°C to +180°C
TSL1	1W		125°C	10m - 100m	5m - 100m	—	5m - 100m	±180: R<15mΩ ±100: R=>15mΩ	
SL1	1W		125°C	10m - 102m	5m - 102m	3m, 4m	3m - 100m	±180: R<15mΩ ±100: R=>15mΩ	
SL1 (TCR±50ppm)	1W		125°C	34.8m - 200m	34.8m - 200m	—	36m - 200m	±50ppm	
SL1 (TCR±75ppm)	1W		125°C	20m - 300m	20m - 300m	—	20m - 300m	±75ppm	
SL2	2W		125°C	10m ~ 360m	5m ~ 360m	3m, 4m	3m ~ 360m	±180: R<11mΩ ±100: R=>11mΩ	
SLN2	2W		105°C	5m - 200m	5m - 200m	—	5m - 200m	±110: R<10mΩ ±75: R=>10mΩ	
SL3	3W		125°C:R≤100mΩ 90°C:R≥110mΩ	10mΩ - 100mΩ	5mΩ - 100mΩ	—	5mΩ - 100mΩ	±180: R=<10mΩ ±100: R=>11mΩ	
SLZ1**	—		—	0.5mΩ Max.	0.5mΩ Max.	0.5mΩ Max.	0.5mΩ Max.	4000 Max.	

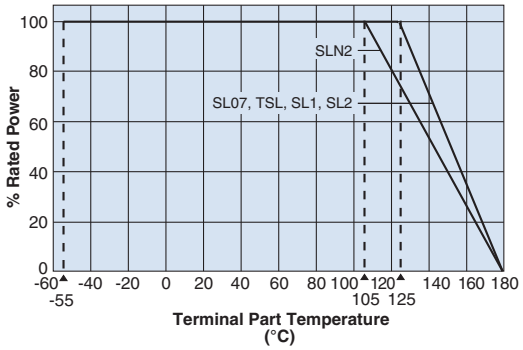
* 3m, 4m, 5m, 6m, 7m, 8m, 9m also available inside each resistance range
** SLZ1: Current rating: 44A
*** SL07 and SL1 (T.C.R.: ±50/±75 ppm, 102mΩ=<R=<200mΩ) offer only E24 series
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

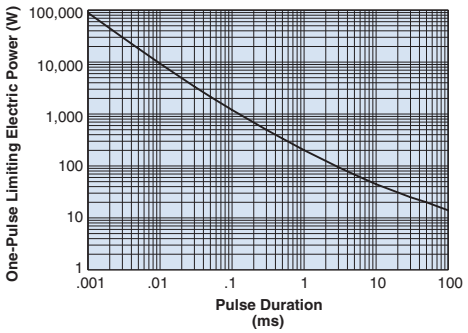


For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

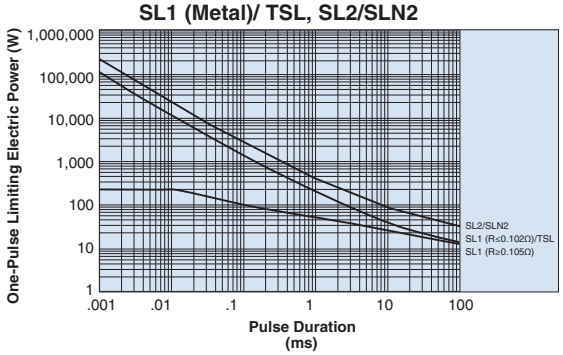
Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

One-Pulse Limiting Electric Power

SL07



SL1 (Metal)/ TSL, SL2/SLN2



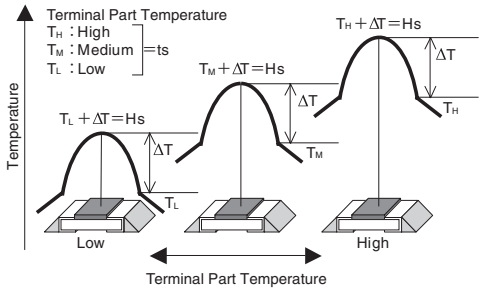
The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Resistance (Ω)	Rth (°C/W)
SL07	5m	26
	22m	48
	100m	78
SL1 TSL	5m	16
	20m	39
	100m	59
SL2	5m	16
	20m	41
	200m	55
SLN2	5m	19
	11m	24
	200m	46



The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Rth=(Hs-ts)/Power

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.

Performance Characteristics

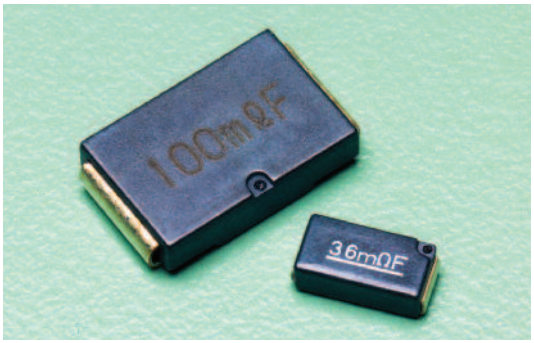
Parameter	Requirement Δ R ±% Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±1%: SL07, TSL1, SL1, SL2, SL3 ±0.5%: SLN2	±1%: SL07, TSL1, SL1, SL2, SL3 ±0.25%: SLN2	SL07: Rated power x 4 for 5 seconds, TSL1: Rated power x 2.5 for 5 seconds, SL1, SL2, SLN2, SL3: Rated power x 5 for 5 seconds, SL1 (T.C.R.: +50/+75): Rated power x4 for 5 seconds
Resistance to Solder Heat	±1%: SL07, TSL1, SL1, SL2, SL3	±1%: SL07, TSL1, SL1, SL2, SL3	260°C ± 5°C, 10 ± 1 second
	±0.5%: SLN2	±0.5%: SLN2	260°C ± 5°C, 10~12 seconds
Rapid Change of Temperature	±1%: SL07, TSL1, SL1, SL2, SL3	±0.5%: SL07, TSL1, SL1, SL2, SL3	-55°C (30 minutes), +150°C (30 minutes), 100 cycles
	±0.5%: SLN2	±0.25%: SLN2	-55°C (15 minutes), +150°C (15 minutes), 1000 cycles
Moisture Resistance	±2%: SL07, TSL1, SL1, SL2, SL3	±0.5%: SL07, TSL1, SL1, SL2, SL3	40°C ± 2°C, 90%~95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
	±0.5%: SLN2	±0.25%: SLN2	85°C ± 2°C, 85% ±3%RH, 1000 hours, Rated power x 0.1
Endurance at 70°C	±2%: SL07, TSL1, SL1, SL2, SL3 ±1%: SLN2	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	±0.5%	±0.25%	SL07, TSL1, SL1, SL2, SL3: -55°C, 1 hour; SLN2: -65°C, 24 hours

KOA SPEER ELECTRONICS, INC.

SLW07, SLW1, SLN3, SLN5

surface mount molded current sense resistors

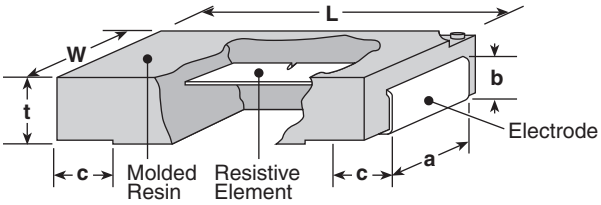
EU RoHS COMPLIANT



features

- Surface mount type
- Flameproof UL94V0 molded polymer case
- Excellent dimension accuracy, mountability and shock resistance
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



Size Code	Dimensions inches (mm)					
	L	W	t	a	b	c
SLW07 (2010)	.197±.012 (5.0±0.3)	.098±.008 (2.5±0.2)	.067±.008 (1.7±0.2)	.079±.008 (2.0±0.2)	.047±.008 (0.9±0.2)	.035±.012 (1.2±0.3)
SLW1 (2512)	.248±.012 (6.3±0.3)	.122±.008 (3.1±0.2)	.075±.008 (1.9±0.2)	.094±.008 (2.4±0.2)	.047±.008 (1.2±0.2)	.047±.012 (1.2±0.3)
SLN3 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.094±.008 (2.4±0.2)	.217±.008 (5.5±0.2)	.063±.008 (1.6±0.2)	.100±.016 (2.55±0.4)
SLN5 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.098±.008 (2.5±0.2)	.217±.008 (5.5±0.2)	.075±.008 (1.9±0.2)	.100±.016 (2.55±0.4)

ordering information

SL	1	T	TE	10L0	F	75
Type	**Size & Power Ratings**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Tolerance**	**T.C.R. ($x10^{-6}$/K)**
SL SLN	W07: 1W W1: 1.5W 3: 3W 5: 7W	T: Sn	TE: Embossed plastic TED: 10" embossed plastic (SLN3 and SLN5 only) For further information on packaging please refer to Appendix A	±0.5%, ±1%: 4 digits ±5%: 3 digits All values less than 0.1Ω (100m) are expressed in mW with "L" as decimal Ex: 2mΩ = 2L00	D: ±0.5% F: ±1% J: ±5%	Nil: 0-150 0-200 ±75 (SLN3/SLN5) ±100 ±110 ±180 50: ±50 (SLW1) 75: ±75 (SLW1)

applications and ratings

Part Designation	Power Rating	Resistance Range (Ω)* D: ±0.5% E24, E96***	F: ±1% E24, E96***	J: ±5% E24	T.C.R. (ppm/°C) Max.	Rated Terminal Part Temperature	Operating Temperature Range
SLW07	1W	—	5m - 100m		0~200: R=<10mΩ 0~150: R=>11mΩ	125°C	-55°C to +180°C
SLW1	1.5W	10m - 100m	5m - 100m	3m - 100m	±180: R=<13mΩ ±100: R=>15mΩ ±75: 20m=<R=<100mΩ ±50: 34.8m=<R=<100mΩ	120°C	
SLN3	3W	5m - 110m			±110: R<10mΩ ±75: R=>10mΩ	105°C	
SLN5	7W (5W)**	3m - 200m		—	±110: R<10mΩ ±75: R=>10mΩ	70°C (120°C)**	-65°C to +180°C

* 5m, 6m, 7m, 8m, 9mΩ also available inside resistance range

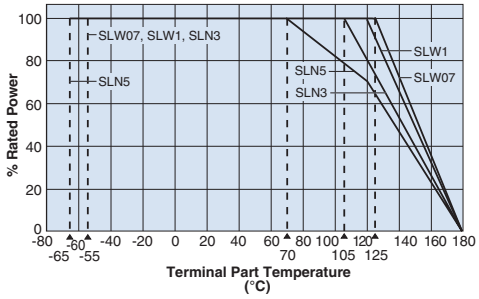
** In case the rated terminal part temperature of 120°C, the rated power shall be 5W

*** SLW07 offers only E24 series

10/20/21

environmental applications

Derating Curve

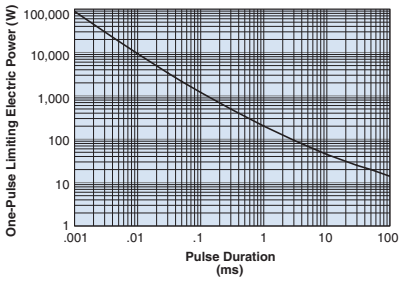


For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

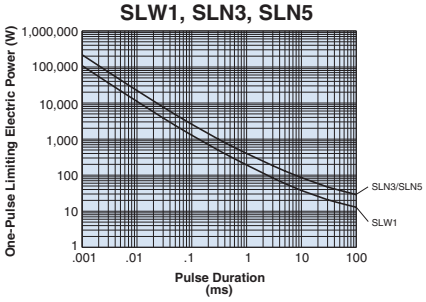
Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

One-Pulse Limiting Electric Power

SLW07



SLW1, SLN3, SLN5



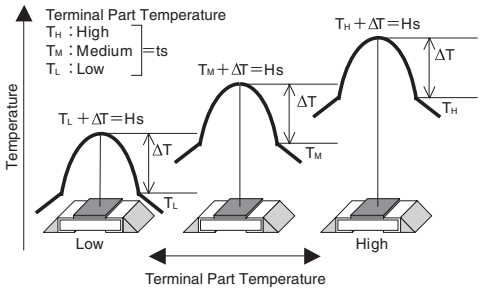
The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Resistance (Ω)	Rth (°C/W)
SLW07	5m	26
	22m	48
	100m	78
SLW1	5m	16
	20m	39
	100m	59
SLN3	5m	11
	11m	19
SLN5	5m	11
	11m	19
	200m	15



The temperature of the resistor will increase the same ⊿T from the standard terminal part temperature regardlless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Rth=(Hs-ts)/Power

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.

Performance Characteristics

Parameter	Requirement Δ R ±% Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±1%: SLW07,SLW1 ±0.5%: SLN3 ±2%: SLN5	±1%: SLW07,SLW1 ±0.25%: SLN3 ±0.5%: SLN5	SLW07: 3W for 5 seconds, SLW1: 5W for 5 seconds, SLW1 (T.C.R: ±50/±75): 4W for 5 seconds, SLN3: 10W for 5 seconds, SLN5: 15W for 5 seconds
Resistance to Solder Heat	±1%: SLW07, SLW1	±1%: SLW07, SLW1	260°C ± 5°C, 10 ± 1 second
	±0.5%: SLN3, SLN5	±0.5%: SLN3, SLN5	260°C ± 5°C, 10~12 seconds
Rapid Change of Temperature	±1%: SLW07, SLW1	±0.5%: SLW07, SLW1	-55°C (30 minutes), +150°C (30 minutes), 100 cycles
	±0.5%: SLN3, SLN5	±0.3%: SLN3, SLN5	-55°C (15 minutes), +150°C (15 minutes), 1000 cycles
Moisture Resistance	±2%: SLW07, SLW1	±1%: SLW07, SLW1	40°C ± 2°C, 90%~95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
	±0.5%: SLN3, SLN5	±0.35%: SLN3, SLN5	SLN3: 85°C ± 2°C, 85% RH, 1000 hours, 0.3W SLN5: 85°C ± 2°C, 85% RH, 1000 hours, 0.7W
Endurance of Rated Terminal Part Temperature	±2%	±1% ±1.2%: SLN5	Terminal part temperature: 125°C (SLW07), 120 °C (SLW1, SLN5: 5W), 105°C (SLN3), 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle, 70°C (SLN5: 7W)
Low Temperature Exposure	±0.5%	±0.25%	SLW07, SLW1: -55°C, 1 hour; SLN3, SLN5: -65°C, 24 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/23/20

KOA SPEER ELECTRONICS, INC.

WK73S

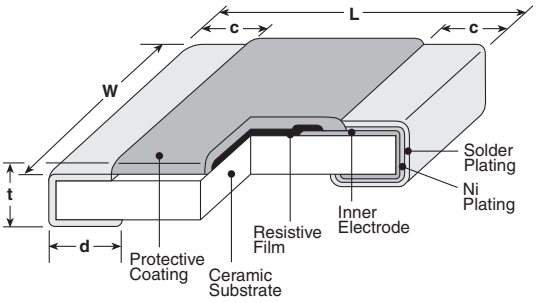
wide terminal type flat chip resistors

EU RoHS COMPLIANT

features

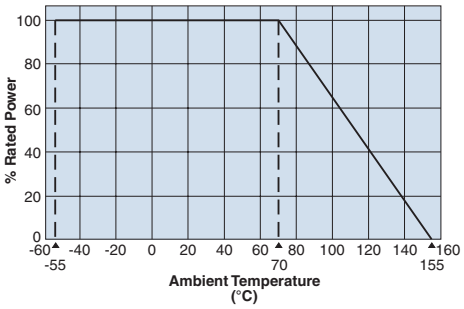
- Wide-side termination (reverse-geometry) type flat chip resistor
- High reliability and performance with T.C.R. ±100 x 10^{-6}/K, resistance tolerance ±0.5%
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction

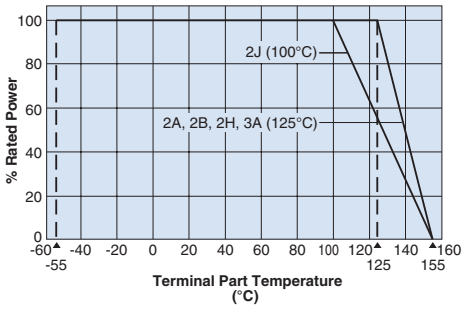


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
2A (0508)	.049±.006 (1.25±0.15)	.079±.006 (2.0±0.15)	.012±.008 (0.3±0.2)	.014±.008 (0.35±0.2)	.022±.004 (0.55±0.1)
2B (0612)	.063±.006 (1.6±0.15)	.126±.008 (3.2±0.2)	.012±.008 (0.3±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)
2H (1020)	.098±.006 (2.5±0.15)	.197±.006 (5.0±0.15)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	
2J (1218)	.122±.006 (3.1±0.15)	.181±.006 (4.6±0.15)	.016±.008 (0.4±0.2)		
3A (1225)	.122±.006 (3.1±0.15)	.252±.006 (6.3±0.15)	.018±.008 (0.45±0.2)		

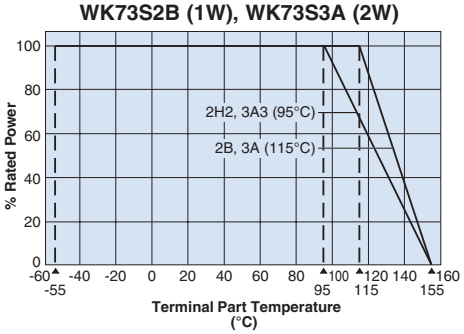
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



WK73S2B (1W), WK73S3A (2W)



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve above.
Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.
If you want to use at rated power (*1), use derating curves based on the terminal part temperature on the right side graph.

ordering information

WK73S	2J	T	TE	33L0	F
Type	**Size**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
WK73S	2A: 1W 2B: 0.75W, 1W 2H: 1W 2J: 1W 3A: 1.5W, 2W	T: Sn	TD: 0508, 0612: 7" 4mm pitch punched paper TE: 1020, 1218, 1225: 7" embossed plastic For further information on packaging, please refer to Appendix A	±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal. Ex: 33mΩ, 1% = 33L0	D: ±0.5% F: ±1% J: ±5%

10-26-20

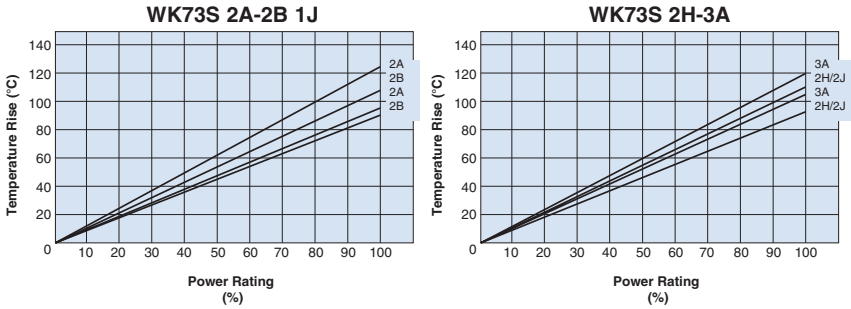
applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10⁻⁶/K)	Resistance Range (Ω) D±0.5% E-24/E-96	F±1% E-24/E-96	J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
WK73S2A	1.0W[1]	70°C	125°C	±100	—	1 - 9.76	1 - 9.1	200V	400V	-55°C to +155°C
				0~+200	—	30m - 976m	30m - 910m			
				0~+300	—	20m - 29.4m	20m - 27m			
WK73S2B	0.75W	70°C	125°C	±800	—	—	10m - 27m	200V	400V	
				±200	—	30m - 422m	30m - 390m			
				±100	430m - 9.76	430m - 9.76	430m - 9.1			
	1.0W[1]	70°C	115°C	±800	—	—	10m - 27m			
				±200	—	30m - 422m	30m - 390m			
				±100	430m - 9.76	430m - 9.76	430m - 9.1			
WK73S2H	1.0W	70°C	125°C	±800	—	—	10m - 24m	200V	400V	
				±200	—	27m - 215m	27m - 200m			
				±100	—	220m - 9.76	220m - 9.1			
WK73S2J	1.0W	70°C	100°C	±800	—	—	10m - 30m	200V	400V	
				±200	—	33m - 237m	33m - 220m			
				±100	—	240m - 9.76	240m - 9.1			
WK73S3A	1.5W	70°C	125°C	±800	—	—	10m - 20m	200V	400V	
				±300	—	22m - 32.4m	22m - 30m			
				±200	—	33m - 357m	33m - 330m			
				±100	—	360m - 9.76	360m - 9.1			
	2.0W[1]	70°C	115°C	±800	—	—	10m - 20m			
				±300	—	22m - 32.4m	22m - 30m			
				±200	—	33m - 357m	33m - 330m			
				±100	—	360m - 9.76	360m - 9.1			

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$

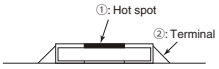
[1] If you want to use at rated power use derating curves based on the terminal part temperature on the right side graph located on previous page.
If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature", please give priority to the "Rated Terminal Part Temperature." For more details refer to the "Introduction of the derating curves based on the terminal part temperature" in the beginning of the catalog

Temperature Rise

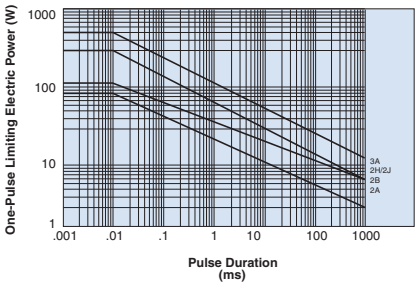


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25℃
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	WK73S2A (1W), WK73S2B (1W), WK73S3A (2W): Rated voltage x2.0 for 5 seconds. WK7S2B, S2H, S2J, S3A: Rated voltage x2.5 for 3 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±2%	±1%	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%: WK73S (±5%) ±1%: all others	±0.5%: WK73S (±5%) ±0.2%: all others	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 12/10/20

KOA SPEER ELECTRONICS, INC.

WK73S

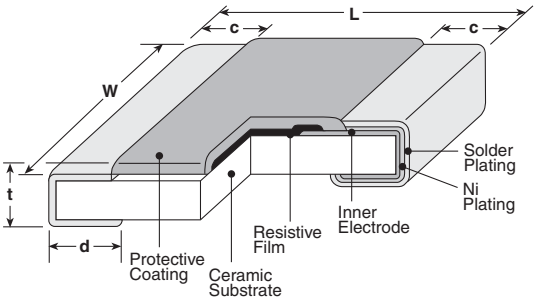
higher power, wide terminal type flat chip resistors

EU RoHS COMPLIANT

features

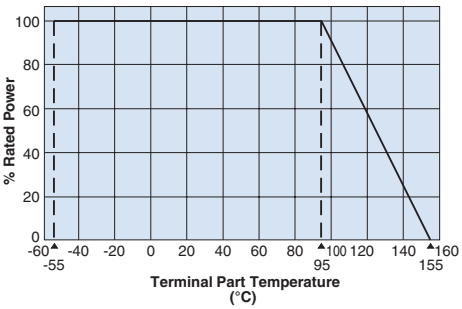
- Wide-side termination (reverse-geometry) type flat chip resistor
- High reliability and performance with T.C.R. ±100 x 10^{-6}/K, resistance tolerance ±1%
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
2B15 (0612)	.063±.006 (1.6±0.15)	.126±.008 (3.2±0.2)	.012±.008 (0.3±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)
2H2 (1020)	.098±.006 (2.5±0.15)	.197±.006 (5.0±0.15)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	
3A3 (1225)	.122±.006 (3.1±0.15)	.252±.006 (6.3±0.15)	.018±.008 (0.45±0.2)		

Derating Curve



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve above. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

WK73S	2H2	T	TE	33L0	F
Type	**Size**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
WK73S	2B15: 1.5W 2H2: 2W 3A3: 3W	T: Sn	TD: 0612: 7" 4mm pitch punched paper TE: 1020, 1225: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal. Ex: 33mΩ, 1% = 33L0	D: ±0.5% F: ±1% J: ±5%

applications and ratings

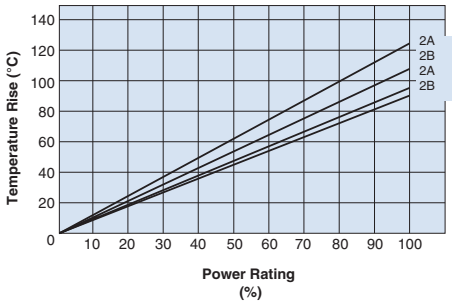
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) D±0.5% E-24/E-96	Resistance Range (Ω) F±1% E-24/E-96	Resistance Range (Ω) J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
WK73S2B15	1.5W	70°C	95°C	±100	430m - 9.76	430m - 9.76	430m - 9.1	200V	400V	-55°C to +155°C
				±200	—	30m - 422m	30m - 390m			
				±800	—	—	10m - 27m			
WK73S2H2	2.0W[1]	70°C	95°C	±100	—	220m - 9.76	220m - 9.1	200V	400V	
				±200	—	27m - 215m	27m - 200m			
				±800	—	—	10m - 24m			
WK73S3A3	3.0W	70°C	95°C	±100	—	360m - 9.76	360m - 9.1	200V	400V	
				±200	—	33m - 357m	33m - 330m			
				±300	—	22m - 32.4m	22m - 30m			
				±800	—	—	10m - 20m			

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$

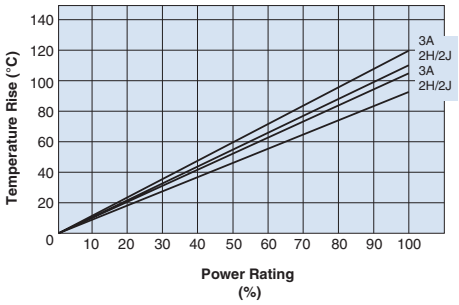
environmental applications

Temperature Rise

WK73S 2A-2B 1J

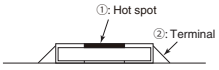


WK73S 2H-3A



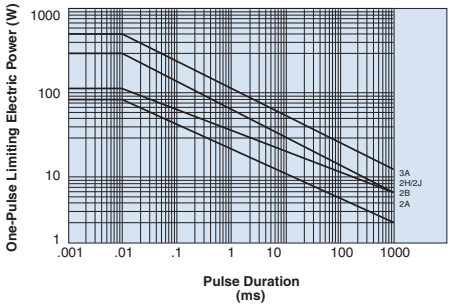
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



One-Pulse Limiting Electric Power

WK73S 2A-3A



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated voltage x 2.0 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±2%	±1%	-55°C (30 minutes)/ +125°C (30 minutes), 1000 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%: J (±5%) ±1%: all others	±0.5%: J (±5%) ±0.2%: all others	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 12/10/20

KOA SPEER ELECTRONICS, INC.

WU73

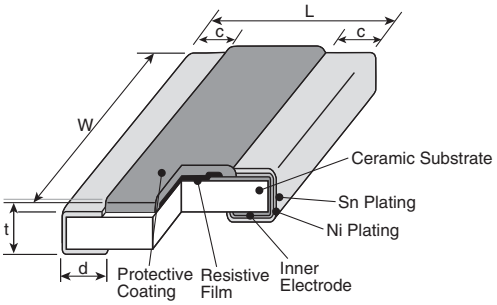
wide terminal type low resistance, low T.C.R flat chip resistors

EU RoHS COMPLIANT

features

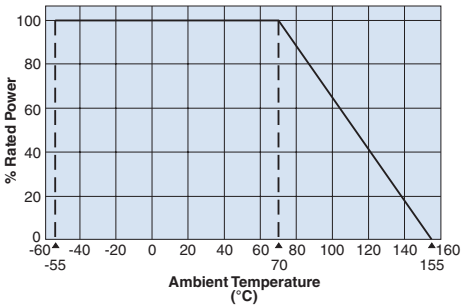
- Wide terminal type flat chip resistor
- High reliability and performance with T.C.R. ±75 x 10^{-6}/K, resistance tolerance ±1%
- Suitable for flow and reflow solderings
- This product meets EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction

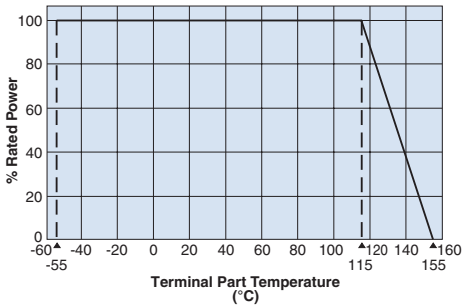


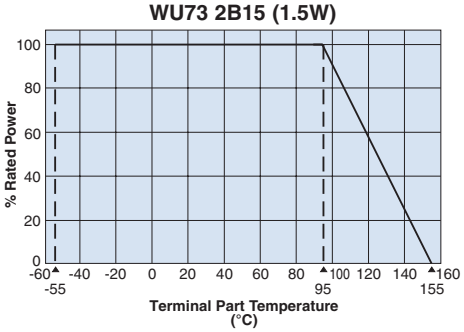
Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
2B (0612)	.063±.006 (1.6±0.15)	.126± +.004 -.012 (3.2± +0.1 -0.3)	.016±.008 (0.4±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)
2B15 (0612)	.063±.006 (1.6±0.15)	.126± +.004 -.012 (3.2± +0.1 -0.3)	.016±.008 (0.4±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, the power rating shall be derated in accordance with the above derating curve.





For resistors operated at a terminal part temperature of described for each size or above, the power rating shall be derated in accordance with the above derating curve.
Please refer to the "Introduction of the derating curves based on terminal part temperature" in the beginning of the catalog.

ordering information

WU73	2B	T	TD	10L0	F
Type	**Size**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**
WU73	2B: 1W 2B15: 1.5W	T : Sn	TD: 7" 4mm pitch punched paper For further information on packaging, please refer to Appendix A	4 digits: all values less than 100mΩ are expressed in mΩ with "L" as decimal. Ex: 10mΩ = 10L0	F: ±1%

7/19/19

applications and ratings

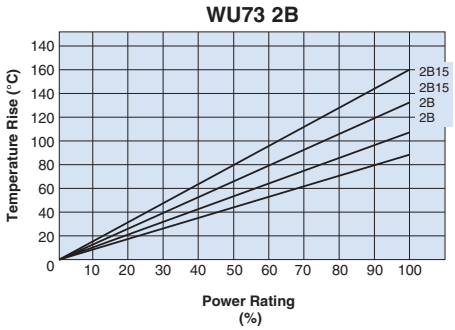
Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) E-24, 25m, 50m	Resistance Tolerance	Operating Temperature Range
WU732B	1.0W	70°C	115°C	±100	10m~12m	F: ±1%	-55°C to +155°C
				±75	13m~27m		
				±100	30m~100m		
WU732B15	1.5W	70°C	95°C	±100	10m~12m	F: ±1%	-55°C to +155°C
				±75	13m~27m		
				±100	30m~100m		

Rated voltage = $\sqrt{\text{Power rating x resistance value}}$

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

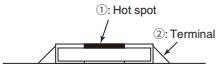
environmental applications

Temperature Rise

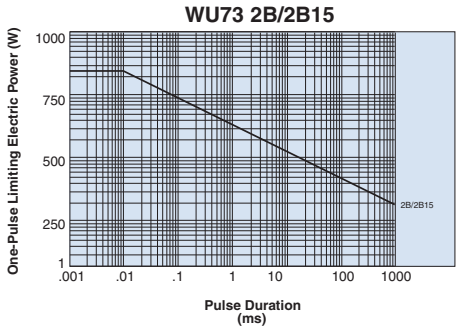


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated Voltage x 2 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±2%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±2%	±0.1%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.1%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

KOA SPEER ELECTRONICS, INC.

UR73V

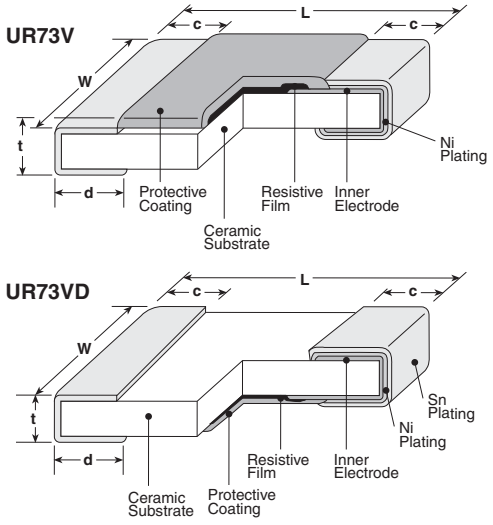
low resistance, low T.C.R. flat chip resistor

EU RoHS COMPLIANT

features

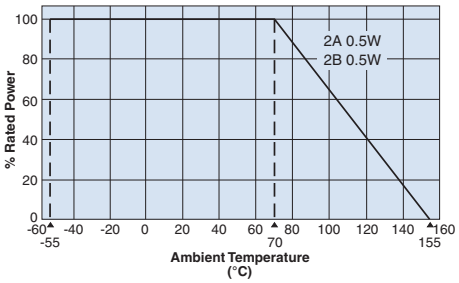
- Current detecting resistors for power supplies, motor circuits, etc.
- Low resistance (100mΩ or under) and high accuracy (±1%) for current detection
- High reliability and performance with T.C.R. ±75x10^{-6}/K
- Suitable for flow and reflow solderings
- Products will meet EU RoHS requirements
- AEC-Q200 tested

dimensions and construction

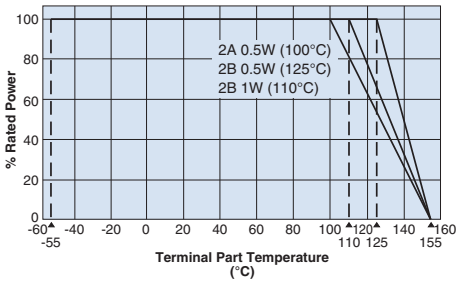


Size Code	Resistance Range (Ω)	Dimensions inches (mm) L	W	c	d	t
UR73VD 2A (0805)	10m~16m	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.028±.008 (0.7±0.2)	.024±.004 (0.6±0.1)
	18m~36m				.024±.008 (0.6±0.2)	
UR73V 2A (0805)	39m~100m	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.016±.008 (0.4±0.2)	.024±.004 (0.6±0.1)
UR73VD 2B (1206)	10m~13m	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.016±.012 (0.4±0.3)	.049±.008 (1.25±0.2)	.024±.004 (0.6±0.1)
	15m~16m				.045±.008 (1.15±0.2)	
	18m~20m				.043±.008 (1.1±0.2)	
	22m~27m				.039±.008 (1.0±0.2)	
UR73V 2B (1206)	30m~33m	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.039±.012 (1.0±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
	36m~39m			.035±.012 (0.9±0.3)		
	43m~100m			.026±.012 (0.65±0.3)		

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, the power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, the power rating shall be derated in accordance with the above derating curve.
Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog prior use.

ordering information

UR73V	2B	T	TD	30L0	F
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
UR73V UR73VD: Face-down	2A: 0.5W 2B: 0.5W 2B: 1W	T: Sn	TD: 4mm pitch punch paper	"R" indicates decimal on values = 100mΩ Ex: R100 = 100mΩ "L" indicates decimal on values <100mΩ Ex: 10L0 = 10mΩ	F: ±1%

For further information on packaging, please refer to Appendix A.

10/26/20

applications and ratings

Part Designation	Power* Rating	Rated Ambient Temperature	Rated Terminal Temperature	T.C.R. ($X10^{-6}$/K)	Resistance Range (Ω) E24 & 25m, 50m	Resistance Tolerance	Operating Temperature Range
UR73V 2A	0.5W	70°C	100°C	±75	39m~100m	F: ±1%	-55°C to +155°C
UR73VD 2A	0.5W	70°C	100°C	±75	15m~36m		
				0~+150	12m~13m		
				0~+250	10m~11m		
UR73V 2B	0.5W	70°C	125°C	±75	33m~75m		
				±100	30m, 82m~100m		
	1W**	70°C	95°C	±75	33m~75m		
				±100	30m, 82m~100m		
UR73VD 2B	0.5W	70°C	125°C	0~+250	10m~11m		
				±75	12m~27m		
	1W**	70°C	95°C	0~+250	10m, 11m		
				±75	12m~27m		

* Rated voltage = $\sqrt{\text{Power Rating X Resistance Value}}$

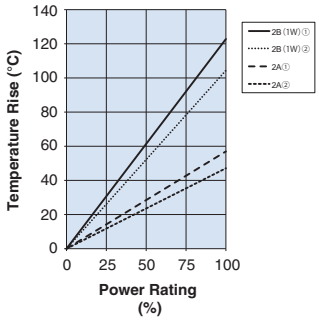
** Please keep the resistor operating according to the derating curve of the terminal part temperature based on the specified power rating.

If any questions should arise whether to use the “Rated Ambient Temperature” or the “Rated Terminal Part Temperature,” please give priority to the “Rated Terminal Part Temperature.” Prior to use and for more details refer to “Introduction of the derating curves on the terminal part temperature” in the beginning of the catalog.

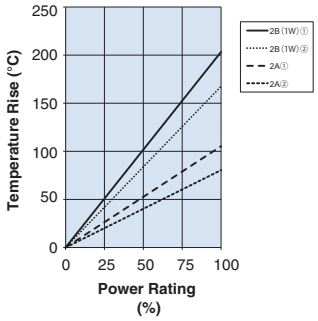
environmental applications

Temperature Rise

UR73VD 2A-2B

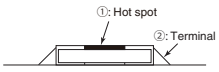


UR73V 2A-2B

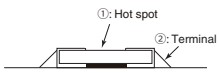


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

UR73V
Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35µm

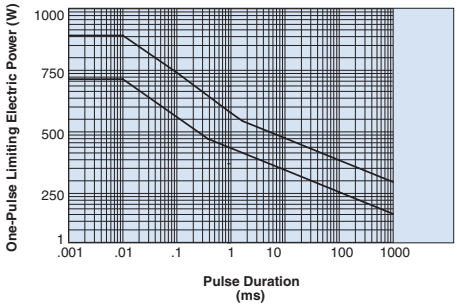


UR73VD
Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35µm



One-Pulse Limiting Electric Power

UR73V/UR73VD 2A-2B



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.3%	260°C ± 5°C, 10 ± 1 second
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±1%	40°C ± 2°C, 90%~95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours

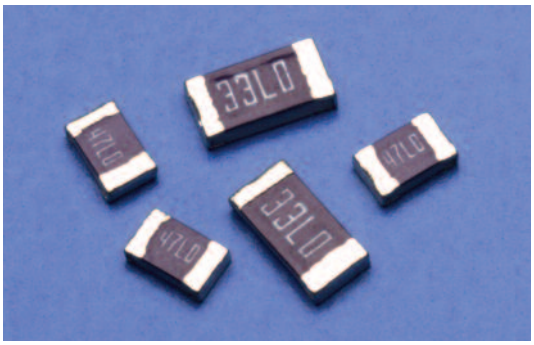
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 12/10/20

KOA SPEER ELECTRONICS, INC.

UR73

current sensing chip resistor

EU RoHS COMPLIANT

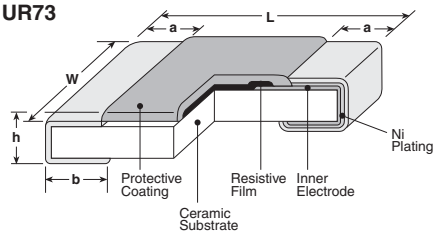


features

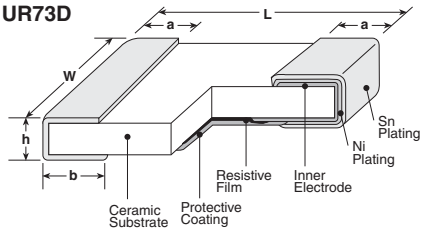
- Very low resistance, high precision reliability
- Utilization of thick film
- Low T.C.R. achieved (±100 ppm/°C)
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction

UR73

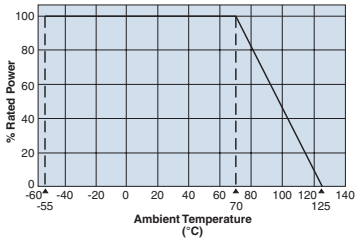


UR73D

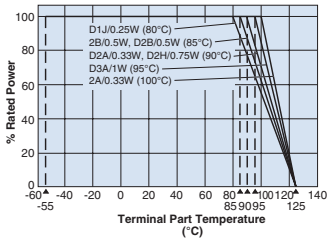


Size Code	Resistance Range (Ω)	Dimensions inches (mm) L	W	h	a	b
D1E (0402)	24m ~ 100m	.039 +.004 -.002 (1.0 +0.1 -0.05)	.020 +.004 -.002 (0.5 +0.1 -0.05)	.016±.002 (0.4±0.05)	.010±.004 (0.25±0.1)	.012±.004 (0.3±0.1)
D1J (0603)	10m ~ 27m	.063±.008 (1.6±0.2)	.031 +.005 -.004 (0.8 +0.15 -0.1)	.02±.004 (0.5±0.1)	.014±.004 (0.35±0.1)	.022±.004 (0.55±0.1)
	30m ~ 100m					.014±.004 (0.35±0.1)
D2A (0805)	10m ~ 16m	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.022±.004 (0.55±0.1)	.016±.008 (0.4±0.2)	.024±.008 (0.6±0.2)
	18m ~ 30m					.02±.008 (0.5±0.2)
2A (0805)	33m ~ 100m	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.02±.004 (0.55±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)
D2B (1206)	10m ~ 16m	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.024±.004 (0.6±0.1)	.020±.008 (0.5±0.2)	.039±.008 (1.0±0.2)
	18m ~ 27m					.031±.008 (0.8±0.2)
2B (1206)	30m ~ 100m	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.024±.004 (0.6±0.1)	.020±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)
D2H (2010)	10m ~ 30m	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)	.026±.004 (0.65±0.1)	.026±.012 (0.65±0.3)	.063±.012 (1.6±0.3)
	33m ~ 100m					.026±.012 (0.65±0.3)
D3A (2512)	10m ~ 30m	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)	.024±.004 (0.6±0.1)	.031±.012 (0.8±0.3)	.079±.012 (2.0±0.3)
	33m ~ 100m					.031±.012 (0.8±0.3)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog prior use.

ordering information

UR73	2A	T	TD	R100	F
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
UR73 UR73D	1E: 0.125W 1J: 0.25W 2A: 0.33W 2B: 0.5W 2H: 0.75W 3A: 1W	T: Sn	TP: 2mm pitch punch paper (1E) TD: 7" punched paper tape (1J, 2A, 2B) TE: 7" embossed plastic (2H, 3A)	"R" indicates decimal on values = 100mΩ Ex: R100 = 100mΩ "L" indicates decimal on values <100mΩ Ex: 10L0 = 10mΩ	F: ±1%

For further information on packaging, please refer to Appendix A.

10/26/20

applications and ratings

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range F (±1%) E-24, 25mΩ, 50mΩ	Operating Temperature Range
UR73D1E	1/8W (.125W)	70°C	—	±100	30mΩ - 100mΩ	-55°C to +125°C
				±500	24mΩ - 27mΩ	
UR73D1J	1/4W (.25W)	70°C	80°C	±100	47mΩ - 100mΩ	
				±200	30mΩ - 43mΩ	
				±300	10mΩ - 27mΩ	
UR73D2A	1/3W (.33W)	70°C	90°C	±250	10mΩ - 30mΩ	
UR732A	1/3W (.33W)	70°C	100°C	±100	47mΩ - 100mΩ	
				±250	33mΩ - 43mΩ	
UR73D2B	1/2W (.5W)	70°C	85°C	±200	10mΩ - 27mΩ	
UR732B	1/2W (.5W)	70°C	85°C	±100	47mΩ - 100mΩ	
				±200	30mΩ - 43mΩ	
UR73D2H	3/4W (.75W)	70°C	90°C	±250	10mΩ - 30mΩ	
				±100	33mΩ - 100mΩ	
UR73D3A	1W (1W)	70°C	95°C	±250	10mΩ - 30mΩ	
				±100	33mΩ - 100mΩ	

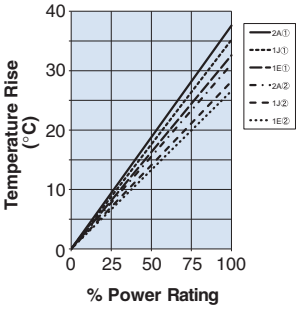
Rated voltage = $\sqrt{P \cdot R}$

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

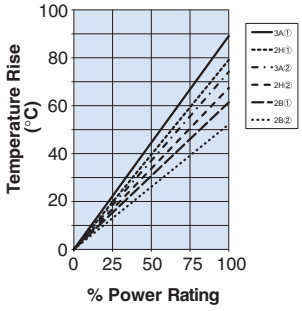
environmental applications

Temperature Rise

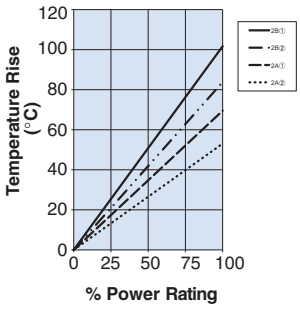
UR73VD 1E-2A



UR73VD 2B-3A

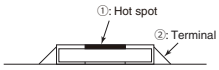


UR73 2A-2B

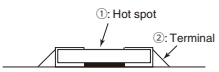


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

UR73
Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



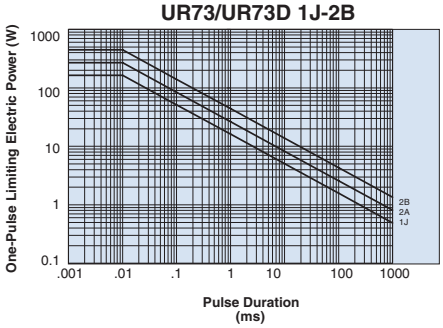
UR73D
Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



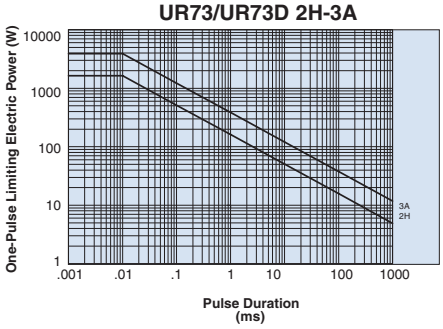
The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

One-Pulse Limiting Electric Power

UR73/UR73D 1J-2B



UR73/UR73D 2H-3A



Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.3%	260°C ± 5°C, 10 ± 1 second
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±1%	40°C ± 2°C, 90%~95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+125°C, 1000 hours

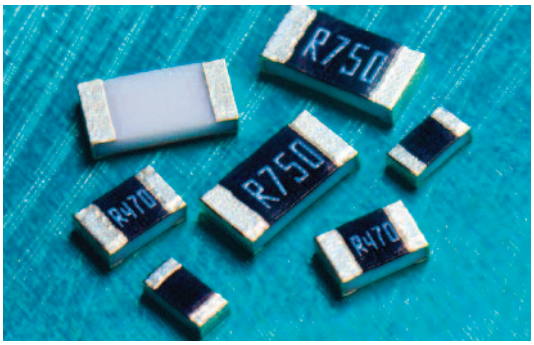
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/26/20

KOA SPEER ELECTRONICS, INC.

SR73

lo-ohm 0.5%, 1%, 2%, 5% tolerance thick film current sense resistor

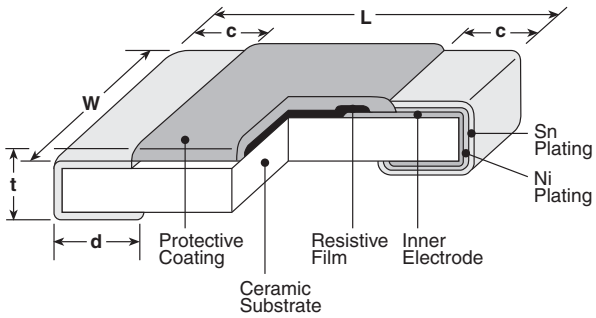
EU RoHS COMPLIANT



features

- Current detecting resistors for power supply, motor circuits, etc.
- High reliability and performance with resistance tolerance ±0.5%, T.C.R. ±100 x 10^{-6} /K
- Suitable for both reflow and flow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested: 0402 (1E), 0603 (1J), 0805 (2A), 1206 (2B), 1210 (2E), 2010 (2H/W2H), 2512 (3A/W3A)

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -0.05)	.02 +.004 -.002 (0.5 +0.1 -0.05)	.01±.004 (0.25±0.1)	.01±.004 (0.25±0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031 +.006 -.004 (0.8 +0.15 -0.1)	.014±.004 (0.35±0.1)	.014±.004 (0.35±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)
2E (1210)		.102±.008 (2.6±0.2)			
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)			
W2H (2010)				.026±.006 (0.65±0.15)	
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)		.016 +.008 -.004 (0.4 +0.2 -0.1)	
W3A (2512)				.026±.006 (0.65±0.15)	

ordering information

SR73	2B	T	TD	1R00	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
	1H 1E 1J 2A 2B 2E 2H W2H 3A W3A	T: Sn L: SnPb (1E, 1J, 2A, 2B, 2E) G: Au (1J, 2A, 2B: 0.1Ω - 10Ω, F: ±1%, J: ±5% - contact factory)	TCM: 15,000 pcs/reel, 2mm pitch press paper TPL: 0402 only: 2mm pitch punch paper TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" 4mm embossed plastic For further information on packaging, please refer to Appendix A	±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal Example: 20mΩ = 20L (3-digit)	D: ±0.5% F: ±1% G: ±2% J: ±5%

applications and ratings

Part Designation*	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range			
					E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)**	E-24 (G±2%)	E-24 (J±5%)
SR731H (0201)	0.1W	70°C	—	0 ~ +400	—	1Ω - 10Ω**	—	0.27Ω - 10Ω
				0 ~ +500		—		0.18Ω - 0.24Ω
SR731E (0402)	1/6W (.166W)	70°C	125°C	±200	—	0.51Ω - 10Ω**	0.51Ω - 10Ω	0.51Ω - 10Ω
				±300	—	0.2Ω - 0.47Ω**	0.2Ω - 0.47Ω	0.2Ω - 0.47Ω
				±500	—	0.1Ω - 0.18Ω**	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω
SR731J (0603)	1/5W (.2W)	70°C	125°C	±200	—	1.02Ω - 10Ω	1.1Ω - 10Ω	1.1Ω - 10Ω
	1/4W (.25W)	70°C	125°C	±200	—	0.1Ω - 1Ω	0.1Ω - 1Ω	0.1Ω - 1Ω
SR732A (0805)	1/3W (.33W)	70°C	125°C	±100	0.15Ω - 10Ω	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.051Ω - 0.091Ω
				±800	—	—	—	0.030Ω - 0.047Ω
	1/2W (.5W[1])	70°C	105°C	±100	0.15Ω - 10Ω	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.051Ω - 0.091Ω
				±800	—	—	—	0.030Ω - 0.047Ω
SR732B (1206)	1/3W (.33W)	70°C	125°C	±100	0.15Ω - 10Ω	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.056Ω - 0.091Ω
				±800	—	—	—	0.030Ω - 0.051Ω
	1/2W (.5W[1])	70°C	110°C	±100	0.15Ω - 10Ω	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.056Ω - 0.091Ω
				±800	—	—	—	0.030Ω - 0.051Ω
SR732E (1210)	1/2W (.5W)	70°C	125°C	±100	—	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.047Ω - 10Ω
				±500	—	—	—	0.036Ω - 0.043Ω
				±1000	—	—	—	0.024Ω - 0.033Ω
	2/3W (.66W[1])	70°C	110°C	±100	—	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.047Ω - 10Ω
				±500	—	—	—	0.036Ω - 0.043Ω
				±1000	—	—	—	0.024Ω - 0.033Ω
SR732H/W2H (2010)	3/4W (.75W)	70°C	125°C	±100	—	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.056Ω - 0.091Ω
				±800	—	—	—	0.033Ω - 0.051Ω
SR733A/W3A (2512)	1W	70°C	125°C	±100	—	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.056Ω - 0.091Ω
				±800	—	—	—	0.039Ω - 0.051Ω

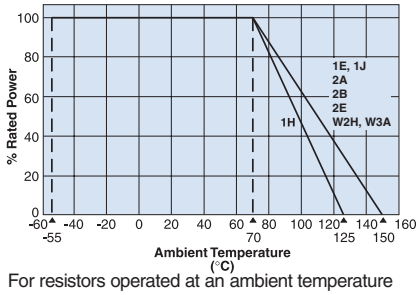
* Parentheses indicate EIA package size codes. ** 1H, 1E (F: ±1%) E-24 values only. Operating Temp: -55C to +125°C (SR731H only), -55°C to +150°C

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

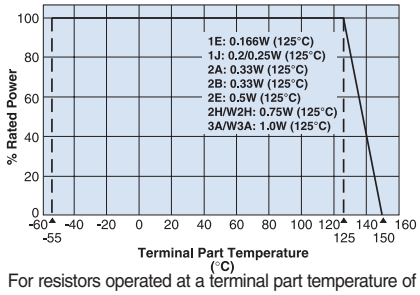
[1] Prior to use, refer to the "Higher Power Ratings" in the beginning of catalog. Rated voltage = $\sqrt{\text{Power rating x resistance value}}$ or max. working voltage, whichever is lower

environmental applications

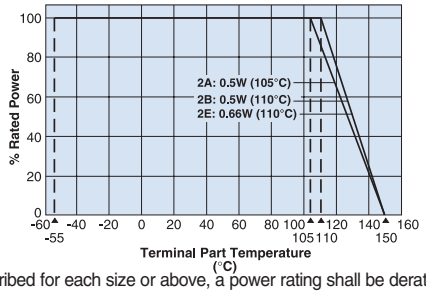
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



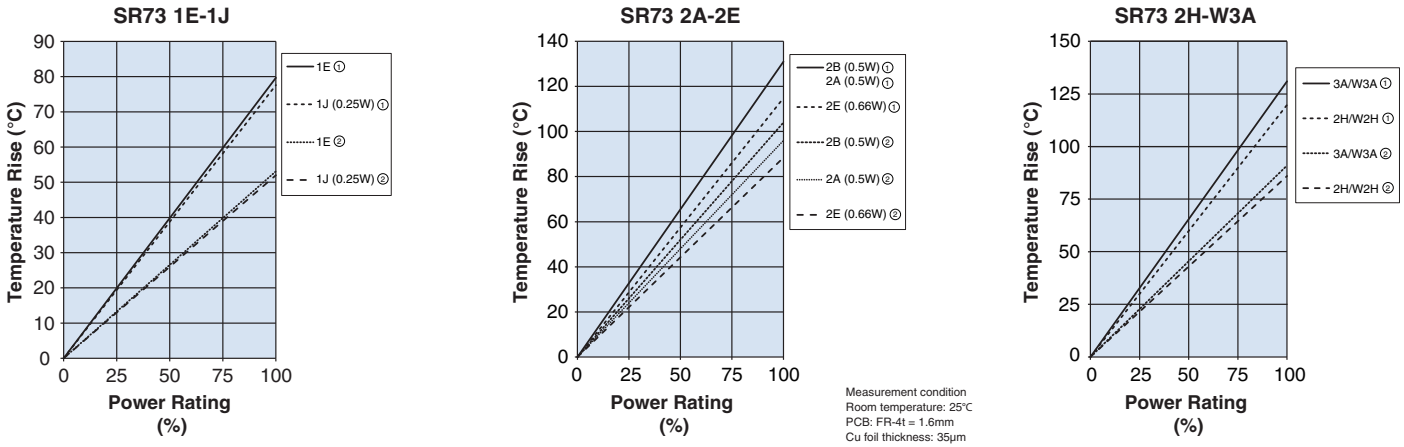
SR73 2A (0.5W), SR73 2B (0.5W), SR73 2E (0.66W)



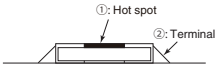
For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" on the beginning of our catalog before use.

Temperature Rise

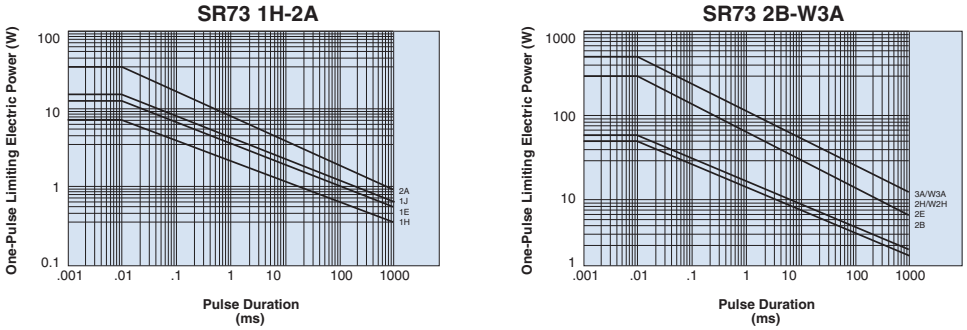


Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35µm



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

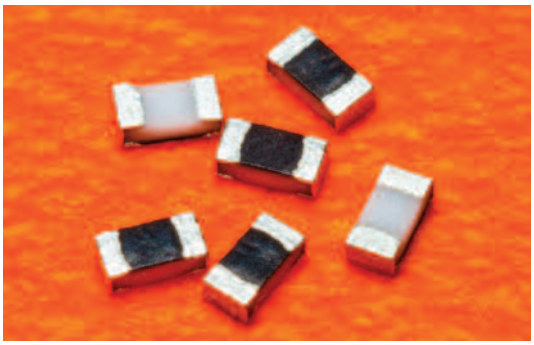
One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

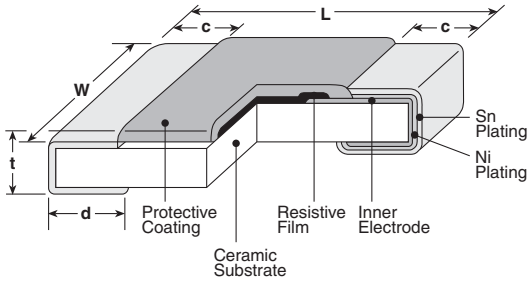
Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	1H: ±3%, 1E~W3A: ±1%	1H: ±0.75% 1E~W3A: ±0.3%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1%	±0.3%	-40°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	1H: ±3% 1E~W3A: ±2%	±1%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	1H: ±3% 1E~W3A: ±2%	±1%	70°C ± 2°C or rated terminal part temperature ±2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	1H: +125°C, 1000 hours; 1E, 1J, 2A, 2B, 2E, 2H/W2H, 3A/W3A:+150°C, 1000 hours



features

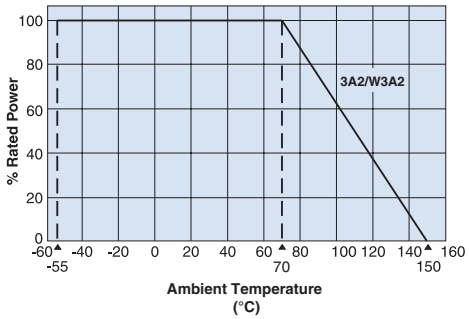
- Current detecting resistors for power supply, motor circuits, etc.
- Suitable for both reflow and flow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Tested

dimensions and construction

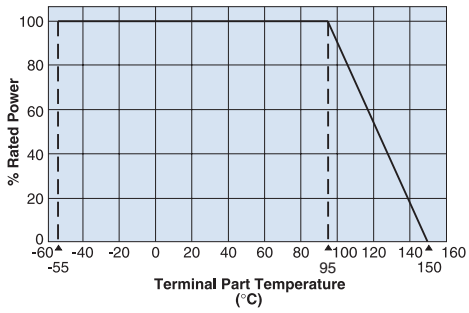


Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
3A2 (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)	.02±.012 (0.5±0.3)	.016 $^{+.008}_{-.004}$ ($0.4\ ^{+0.2}_{-0.1}$)	.024±.004 (0.6±0.1)
W3A2 (2512)				.026±.006 (0.65±0.15)	

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, the power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

SR73	3A2	T	TE	1R00	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
	3A2 W3A2	T: Sn	TE: 7" embossed plastic For further information on packaging, please refer to Appendix A	±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal Example: 20mΩ = 20L (3-digit)	F: ±1% G: ±2% J: ±5%

 12/02/20

applications and ratings

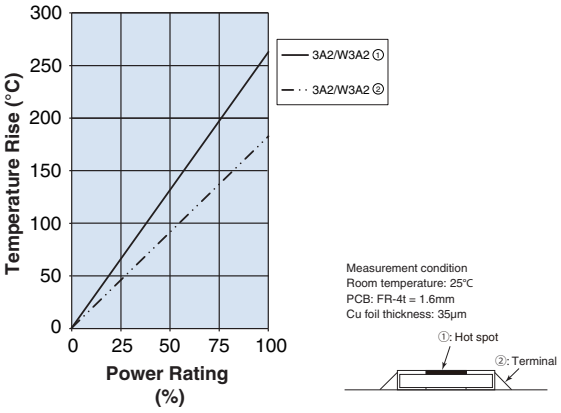
Part Designation*	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range			
					E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)
SR733A2/W3A2 (2512)	2W	70°C	95°C	±100	—	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.056Ω - 0.091Ω
				±800	—	—	—	0.039Ω - 0.051Ω

* Parentheses indicate EIA package size codes. Operating Temp: -55°C to +150°C
Prior to use and for more details refer to “Introduction of the derating curves on the terminal part temperature” in the beginning of the catalog.

environmental applications

Temperature Rise

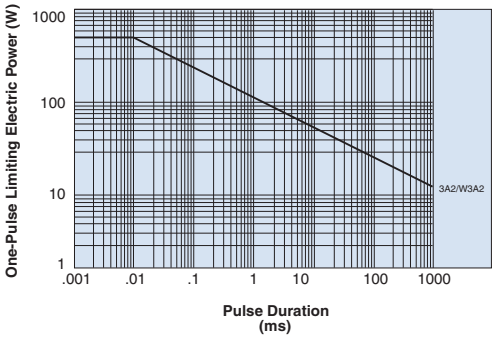
SR73 3A2/W3A2



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

One-Pulse Limiting Electric Power

SR73 3A2/W3A2



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

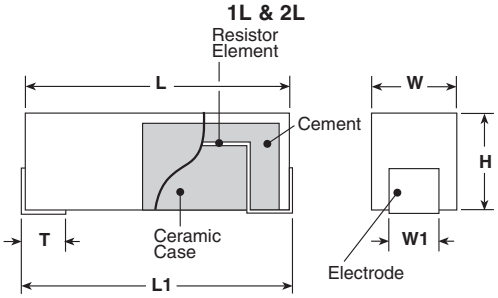
Performance Characteristics

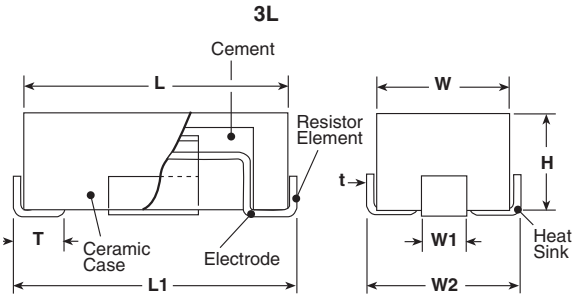
Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated voltage x 2.0 for 5 seconds
Resistance to Solder Heat	±1%	±0.3%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1%	±0.3%	-40°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±1%	40°C ± 2°C , 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±1%	70°C ± 2°C or rated terminal part temperature ±2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+150°C, 1000 hours

features

- Suitable to detect large current due to ultra low resistances
- Flame retardant resistor in a ceramic case
- All custom-made products
- Automatic mounting is available
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction





Size Code	Dimensions inches (mm)							
	L	L1	W	W2	H	W1	t	T
1L	.512±.019 (13±0.5)	.551±.039 (14±1.0)	.217±.019 (5.5±0.5)	—	.205±.019 (5.2±0.5)	.118±.012 (3.0±0.03)	—	.098±.039 (2.5±1.0)
2L	.709±.019 (18±0.5)	.748±.039 (19±1.0)	.248±.019 (6.3±0.5)	—	.236±.006 (6.0±0.5)		—	.118±.039 (3.0±1.0)
3L		.760±.039 (19.3±1.0)	.323±.019 (8.2±0.5)	.362 (9.2)			.012 (0.3)	

ordering information

BLR	1L	N	TE	50L	J
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
	1L: 1W 2L: 2W 3L: 15W	N: No surface treatment	TE: 7" embossed plastic 1, 2: 1,000 pieces/reel 3: 750 pieces/reel	3 digits All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal Ex: 2mΩ = 2L0	J: ±5% K: ±10%

For further information on packaging, please refer to Appendix A.

11/26/16

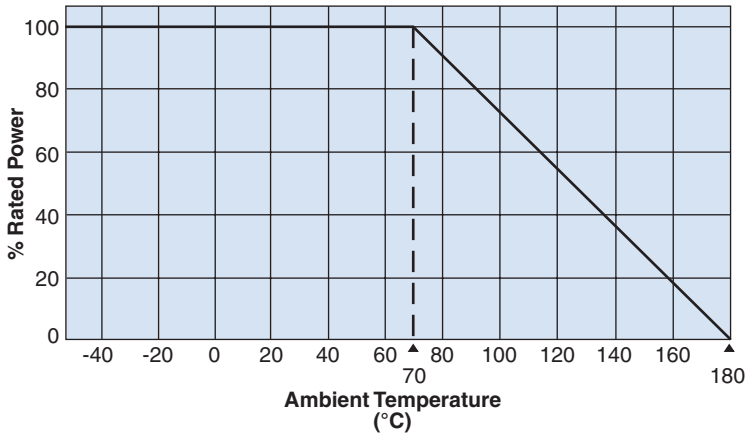
applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/°C) Max.	Resistance Range*	Resistance Tolerance	Rated Ambient Temperature	Operating Temperature Range
BLR1L	1W	±100	25m, 50mΩ	J: ±5% K: ±10%	+70°C	-40°C to +180°C
BLR2L	2W		8m, 12m, 13m, 16m, 17.5m, 20m, 22m, 25mΩ			
BLR3L	15W**					

* Please consult with us in advance about resistance value for custom-made products
** It is assumed to be used on aluminum circuit board

environmental applications

Derating Curve



Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified value	—	+25°C/+125°C
Cold Resistance	±5.0%	±2.0%	-55°C, 1000 hours
Heat Resistance	±5.0%	±2.0%	+125°C, 1000 hours
Moisture Resistance	±5.0%	±2.0%	40°C ± 2°C, Power rating x 1/10, 90% - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Load Life	±5.0%	±2.0%	70°C ± 2°C, 1000 hours 1.5 hr ON, 0.5 hr OFF cycle

LR72A, B, C

metal plate current sense resistors

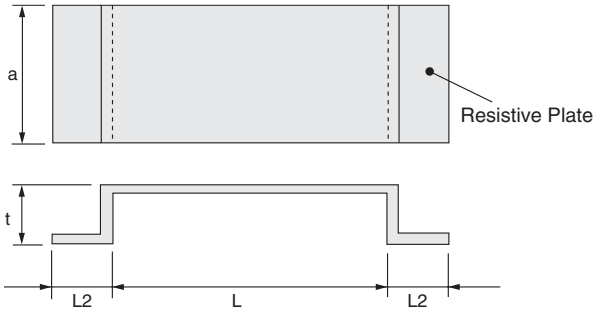
EU RoHS COMPLIANT

features

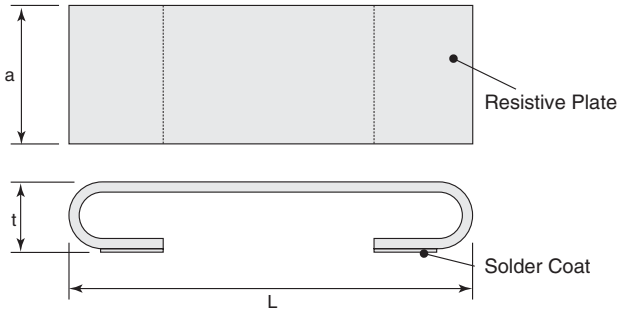
- Superior thermal expansion cycling
- Inductance less than 10nH
- Solderable pads (60/40 SnPb plate)
- Lead flexible for thermal expansion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction

LR72A
LR72B



LR72C



Size Code	Dimensions inches (mm)			
	L	L2 $^{+0.1}_{-.02}$	W	t
LR72A	.39±.004 (10.0±0.1)	.079 (2.0)	.20±.008 (5.2±0.2)	.079 (2 Max.)
LR72B	.39±.004 (10.0±0.1)	.079 (2.0)	.118±.008 (3.0±0.2)	.079 (2 Max.)
LR72C	.44±.016 (11.2±0.4)	—	.126±.016 (3.2±0.4)	.137±.016 (3.5±0.4)

ordering information

LR72	A	D	TED	2L5	J
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
	A B C	D: SnAgCu (LR72C only) N: CuNi (non-presolder) (LR72A, B only)	TED: LR72A LR72B TEB: LR72C	2mΩ: 2L5 "L" indicates the decimal in milliohms	J: ±5%

For further information on packaging, please refer to Appendix A.

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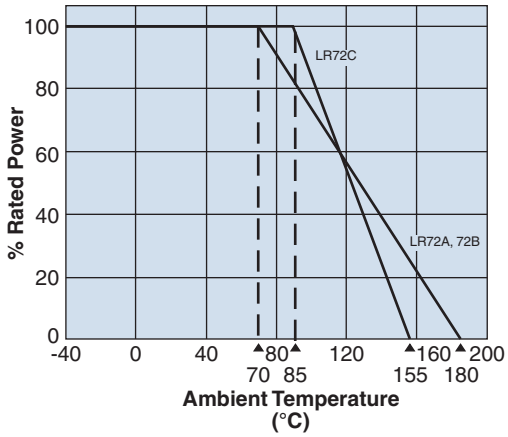
applications and ratings

Part Designation	Power Rating*	T.C.R. (ppm/°C) Max.	Standard Resistance**	Resistance Tolerance	Rated Ambient Temperature	Operating Temperature Range
LR72A	1/2W	±100	2.5mΩ, 5mΩ, 8mΩ	J: ±5%	+70°C	-40°C to +180°C
LR72B	1/4W		3mΩ			
LR72C	1W	±350	2mΩ, 3mΩ		+85°C	-40°C to +155°C

* Rated power in case of glass epoxy resin (FR-4) is used for the substrate material
** Please contact factory for custom made resistance values

environmental applications

Derating Curve

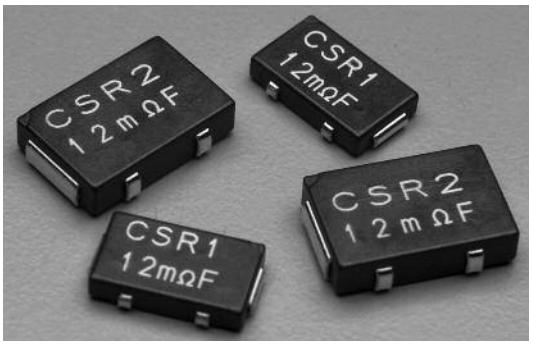


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

Parameter	Requirement Δ R ±% Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Resistance to Soldering Heat	±2.0%	±1.6%	350°C ± 10°C, 3 seconds
Moisture Resistance	±5.0%	±4.5%	Power rating x 1/10, 40°C, 90% - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±5.0%	±4.5%	Rated voltage 70°C, 1000 hours 1.5 hr ON, 0.5 hr OFF cycle

EU RoHS COMPLIANT

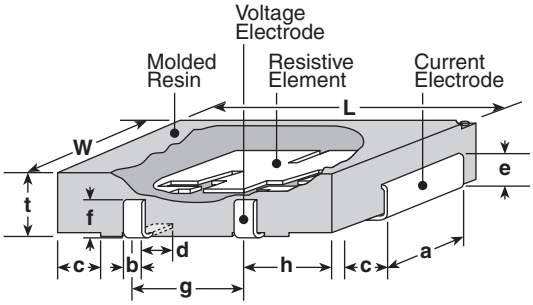


features

- Extremely low resistance and high precision tolerance
- Low T.C.R. achieved (±50ppm/°C)
- Flameproof UL94V0
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction

Size Code	Dimensions inches (mm)										
	L	W	t	a	b	c	d	e	f	g	h
CSR1	.425±.02 (10.8±0.5)	.244±.012 (6.2±0.3)	.083±.008 (2.1±0.2)	.118±.012 (3.0±0.3)	.031±.008 (0.8±0.2)	.055±.02 (1.4±0.5)	.047±.02 (1.2±0.5)	.051±.012 (1.3±0.3)	.051±.012 (1.3±0.3)	.197±.004 (5.0±0.1)	.098±.004 (2.5±0.1)
CSR2	.504±.02 (12.8±0.5)	.323±.012 (8.2±0.3)	.122±.008 (3.1±0.2)	.197±.012 (5.0±0.3)	.039±.008 (1.0±0.2)	.079±.02 (2.0±0.5)	.079±.02 (2.0±0.5)	.087±.012 (2.2±0.3)	.087±.012 (2.2±0.3)	.236±.004 (6.0±0.1)	.118±.004 (3.0±0.1)



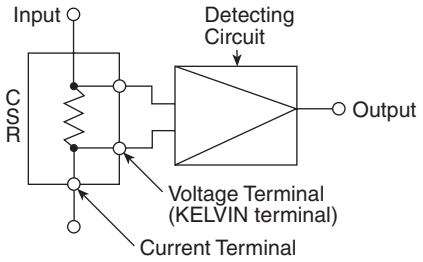
ordering information

CSR	1	T	TED	10L0	F
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
	1: 1W 2: 2W	T: Sn	TED: CSR1 TEB: CSR2 (1,000 pieces/reel)	In milliohms: 3 significant figures "L" indicates decimal point	D: ±0.5% F: ±1%

For further information on packaging, please refer to Appendix A.

10/26/20

typical circuit schematic

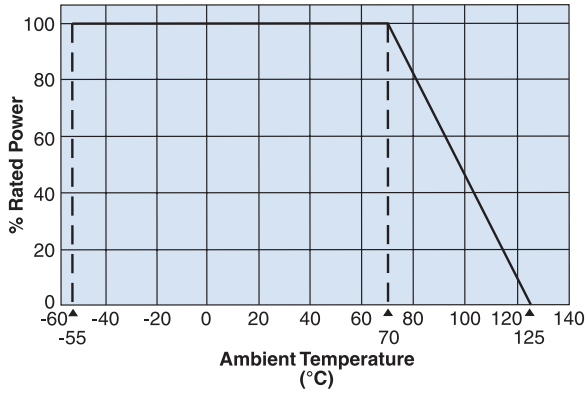


applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/°C) Max.	Resistance Range E-12	Resistance Tolerance	Rated Ambient Temperature	Operating Temperature Range
CSR1	1W	±50	5mΩ - 50mΩ	D: ±0.5%,F: ±1%	+70°C	-55°C to +125°C
CSR2	2W			F: ±1%		

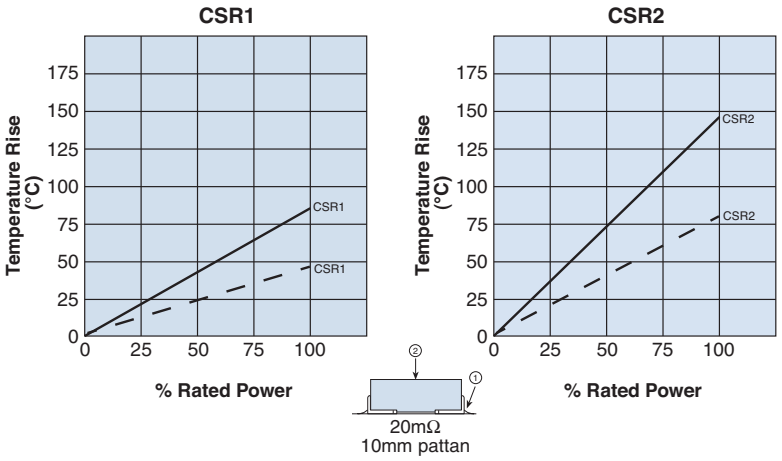
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Surface Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.

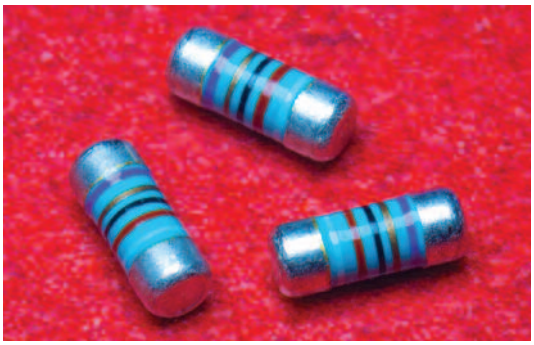
Performance Characteristics

Parameter	Requirement ΔR ±% Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short Time)	±1.0%	±1.0%	Rated power x 5 for 5 seconds
Resistance to Solder Heat	±1.0%	±1.0%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1.0%	±0.5%	-55°C (30 minutes), +125°C (30 minutes), 500 cycles
Moisture Resistance	±2.0%	±0.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±1.0%	±0.5%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	±0.5%	±0.25%	-55°C, 1 hour
High Temperature Exposure	±0.5%	±0.25%	+125°C, 100 hours

RN41, RD41, CC

melf type resistors

EU RoHS COMPLIANT

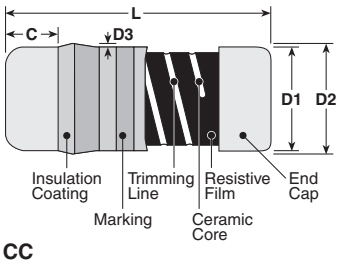


features

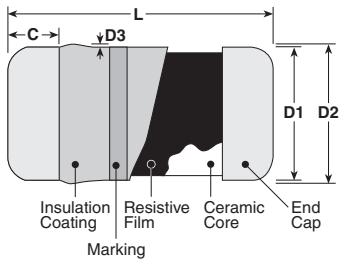
- Free direction for mounting due to cylindrical design
- High precision products (Resistance tolerance ±0.1% and T.C.R.±25×10^{-6}/K) available (RN41)
- The electrode strength is firm
- The noise characteristics are excellent
- Suitable for reflow, flow and iron soldering
- Products meet EU RoHS requirements
- AEC-Q200 tested (RN41 2ES/3AS, CC 12M/25)

dimensions and construction

RN41, RD41



CC



Type (Inch/DIN Size Code)	Dimensions inches (mm) L	C	D1	D2 (max.)	D3 (max.)
2ES (1406/0204)	.138±.008 (3.5±0.2)	.02 ~ .035 (0.5 ~ 0.9)	.055±.004 (1.4±0.1)	.061 (1.55)	.004 (0.1)
CC12M (1406/0204)	.138±.008 (3.5±0.2)	.02 ~ .035 (0.5 ~ 0.9)	.055±.004 (1.4±0.1)	.061 (1.55)	.004 (0.1)
2E (2309/0207)	.232±.008 (5.9±0.2)	.02 (0.5 min.)	.087±.004 (2.2±0.1)	.094 (2.4)	.006 (0.15)
3AS (2309/0207)	.232±.008 (5.9±0.2)	.02 (0.5 min.)	.087±.004 (2.2±0.1)	.094 (2.4)	.006 (0.15)
CC25 (2309/0207)	.232±.008 (5.9±0.2)	.02 (0.5 min.)	.087±.004 (2.2±0.1)	.094 (2.4)	.006 (0.15)

ordering information

RN41	2ES	T	TE	1001	F	50*
Type	**Size**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Tolerance**	**T.C.R. (ppm/°C)**
RN41 RD41	2ES: 0.25W, 0.4W 2E: 0.25W 3AS: 1W	T: Sn	TE: 7" embossed plastic (2ES - 3,000 pieces/reel) (2E, 3AS - 1,500 pieces/reel)	±2%, ±5%: 2 significant figures + 1 multiplier. "R" indicates decimal on values <10Ω ±0.1%, ±0.25%, ±0.5%, ±1%: 3 significant figures + 1 multiplier. "R" indicates decimal on values <100Ω	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% G: ±2% J: ±5%	25: ±25 50: ±50 Nil: RD41

* T.C.R. noted for RN41 only

CC12M	T	TE
Type	**Termination Material**	**Packaging**
CC12M CC25	T: Sn	TE: 7" embossed plastic

For further information on packaging, please refer to Appendix A.

11/23/20

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)						Max. Working Voltage	Max. Overload Voltage
					E-24, E-96 (B±0.1%)	E-24, E-96 (C±0.25%)	E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)		
RN412ES	1/4W (.25W)	70°C	90°C	±25	43-511k	100-100k	100-604k	—		—	200V	400V
		70°C	90°C	±50	—	—	—	1-5.11M		0.22-0.91		
RN412ES	2/5W (.4W)*1*2	—	90°C	±50	—	—	—	1-5.11M		0.22-0.91	200V	400V
RN413AS	1W*1*2	70°C	—	±50	—	—	—	1-1M		0.22-0.91	400V	600V
RD412ES	1/4W (.25W)	70°C	—	—*3	—	—	—	—	2.2 - 1.0M	2.2 - 1.0M	200V	400V
RD412E	1/4W (.25W)	70°C	—	—*3	—	—	—	—	1.0 - 2.2M	1.0 - 2.2M	300V	600V

Rated voltage = $\sqrt{\text{Power Rating X Resistance Value}}$ or Maximum Working Voltage, whichever is lower
Operating Temperature Range: -55°C to +155°C

*1 A power rating is guaranteed at the terminal part temperature
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

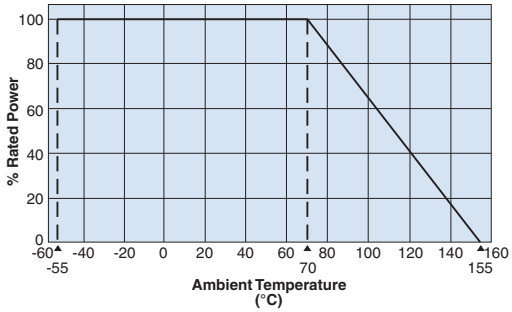
*2 A power rating shall be guaranteed with a method shown in the Performance Characteristics. Please contact factory prior to use.

*3 Please contact factory for T.C.R. of RD41

Part Designation	Current Rating	Rated Ambient Temp.	Maximum Resistance
CC12M	2A	+70°C	20 mΩ or less
CC25	5A		

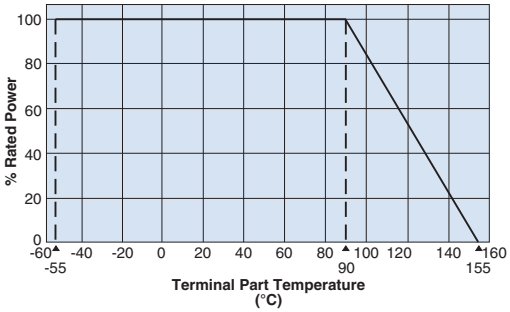
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Please contact us about CC series' derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Performance Characteristics

Parameter	Type	Requirement Δ R ±(%+0.05Ω)*4 Limit	Typical	Test Method
Resistance	RN41 RD41	Within specified tolerance	—	25°C
T.C.R.	RN41 RD41	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	RN41	2ES: Test Group D	±0.3%	Rated voltage x 2.5 for 5 seconds or Max. overload voltage, whichever is lower, for 5 seconds
	RD41	±1%	±0.5%	
Intermittent Overload	RD41	±1%	—	Rated voltage x 4 or Max. intermittent overload voltage, whichever is lower, 10,000 cycles
Resistance to Soldering Heat	RN41	2ES: Test Group D	—	260°C ± 5°C, 10 seconds ± 1 second
	RD41	±1%	±0.5%	
Rapid Change of Temperature	RN41	2ES: Test Group D	—	-55°C (30 minutes), +125°C (30 minutes), 5 cycles
	RD41	±1%	±0.75%	
Moisture Resistance	RN41	2ES: Test Group C	—	40°C ± 2°C, 90 ~ 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
	RD41	±5%	±2.5%	
Endurance at 70°C	RN41	2ES: Test Group A	—	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
	RD41	±2%	±1%	
Low Temperature Exposure	RD41	±1%	±0.75%	-55°C, 1 hour
High Temperature Exposure	RN41	2ES: Test Group C	±0.75%	155°C, 2 hours RN41: 2ES, 3AS: 155°C, 1000 hours
	RD41	±2%	±1%	

*4 Performance requirement for RN41 3AS are different from above, so consult with KOA about the detail.

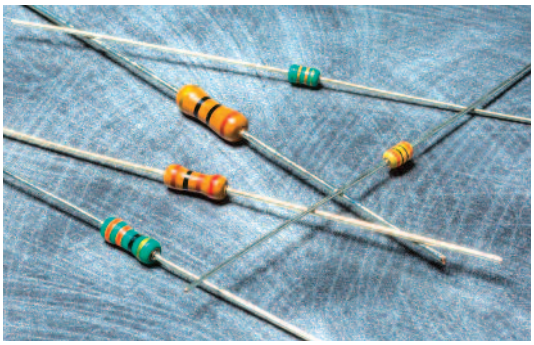
CC

Parameter	Requirement Δ Real R Limit	Typical	Test Method
Resistance	20mΩ Max. after the test	7.5mΩ Max. after the test	25°C
Resistance to Solder Heat			260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature			-55°C (30 minutes), +125°C (30 minutes), 5 cycles
Moisture Resistance			40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C			70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle

*Stability Class

Stability Class	Resistance Range	Limit Resistance Changing Attests (Test Group) A	B	C	D
0.25	10~332kΩ	±(0.25 + 0.05Ω)	±(0.50 + 0.05Ω)	±(0.25 + 0.05Ω)	±(0.05 + 0.05Ω)
0.5	1~<10Ω			±(0.50 + 0.05Ω)	±(0.10 + 0.05Ω)
1	0.22~<1Ω			±(1.00 + 0.05Ω)	±(0.25 + 0.05Ω)
2	>332kΩ~5.11MΩ	±(0.50 + 0.05Ω)	±(1.00 + 0.05Ω)	±(2.00 + 0.05Ω)	±(0.50 + 0.05Ω)

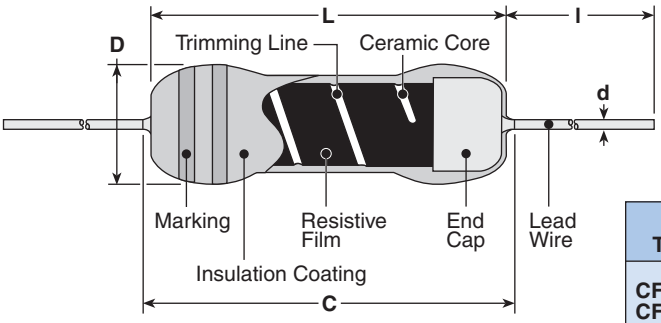
EU RoHS COMPLIANT



features

- Flameproof coating is available (specify “CFP”)
- Reduced body size (specify “CFS/CFPS”)
- Suitable for automatic machine insertion
- Stronger in pulse resistance than chip resistors of the same type
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type	Dimensions inches (mm) L	C (max.)	D	d (nom.)	l** Standard	l** Long
CFS1/4 CFPS1/4	.126±.008 (3.2±0.2)	.134 (3.4)	.067 +.008 -.004 (1.7 +0.2 -0.1)	.018 (0.45)	.551 Min.* (14.0 Min.)	.787 Min.*** (20.0 Min.)
CF1/4 CFP1/4	.240± +.028 -.02 (6.1± +0.7 -0.5)	.280 (7.1)	.092±.012 (2.3±0.3)	.024 (0.6)		
CFS1/2 CFPS1/2	.248±.02 (6.3±0.5)	.280 (7.1)	.112± +.012 -.026 (2.85± +0.3 -0.65)	.024 (0.6)	.787 Min. (20.0 Min.)	—
CFB1/2 CFPB1/2	.354±.039 (9.0±1.0)	.433 (11.0)	.138±.02 (3.5±0.5)	.028 (0.7)		

* Forming code S is applied for bulk type.
** Lead length changes depending on taping and forming type.
*** Long type is custom-made

ordering information

CF	1/4	C	T52	R	103	J
Type	**Power Rating**	**Termination Material**	**Taping and Forming**	**Packaging**	**Nominal Resistance**	**Tolerance**
CF CFP	S1/4: 0.25W 1/4: 0.25W S1/2: 0.5W B1/2: 0.5W	C: SnCu	Axial: T26, T52, L52 Radial: VT, MT, MHT, VTP, VTE U Forming: U, UCL M Forming: M5, M10, M12.5 L Forming: L10, L12.5 S Forming: S	A: Ammo R: Reel	2 significant figures + 1 multiplier “R” indicates decimal on value <10Ω	G: ±2% J: ±5%

For further information on packaging, please refer to Appendix C.

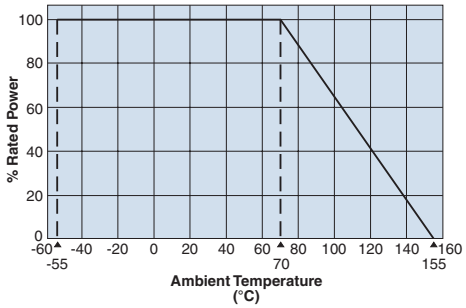
applications and ratings

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C) +350 to -450	0 to -700	0 to -1000	0 to -1300	Resistance Range E-24 (G±2%)	Resistance Range E-24 (J±5%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage
CFS1/4	0.25W	300V	2.2Ω - 47kΩ	51kΩ - 100kΩ	110kΩ - 330kΩ	360kΩ - 1MΩ	10Ω - 330kΩ	2.2Ω - 1MΩ	250V	500V
CFPS1/4							10Ω - 100kΩ	2.2Ω - 1MΩ		
CF1/4		500V	2.2Ω - 100kΩ	110kΩ - 330kΩ	360kΩ - 1MΩ	1.1MΩ - 5.1MΩ	10Ω - 1MΩ	2.2Ω - 5.1MΩ	300V	600V
CFP1/4						—		2.2Ω - 1MΩ		
CFS1/2	0.50W	700V	1.0Ω - 91kΩ	100kΩ - 1MΩ	1.1MΩ - 2.2MΩ	2.4MΩ - 5.1MΩ		1.0Ω - 5.1MΩ	350V	700V
CFPS1/2			2.2Ω - 91kΩ		—	—		2.2Ω - 1MΩ		
CFB1/2	0.50W	700V	2.2Ω - 100kΩ	110kΩ - 1MΩ	1.1MΩ - 2.2MΩ	2.4MΩ - 5.1MΩ		2.2Ω - 5.1MΩ	400V	800V
CFPB1/2	0.50W	700V	2.2Ω - 100kΩ	110kΩ - 1MΩ	—	—		2.2Ω - 1MΩ	400V	800V

Operating temperature: -55°C ~ +155°C

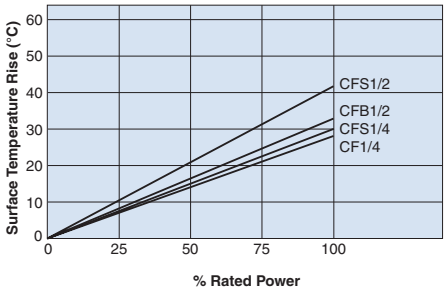
environmental applications

Derating Curve

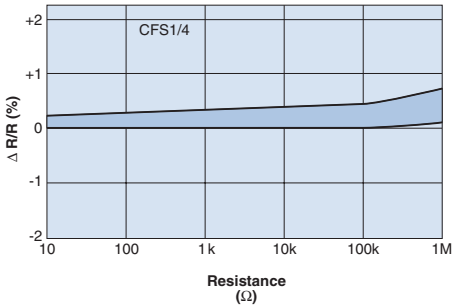


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Surface Temperature Rise



Load Life @ 70°C, 1000 Hr



Performance Characteristics

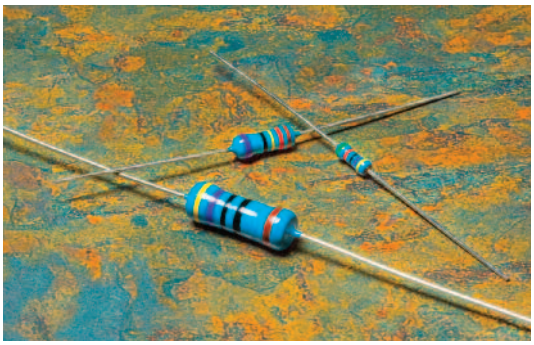
Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	Measuring points are at 10mm ±1mm from the end cap.
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±1%	±0.5%	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is lower
Resistance to Solder Heat	±1%	±0.5%	260°C ±5°C, 10 seconds ± 1 second, 350°C ± 10°C, 3.5 seconds ± 0.5 second
Terminal Strength	No lead-coming off and loose terminals	—	Twist 360°C, 5 times
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +125°C (30 minutes), 5 cycles
Moisture Resistance	±5%	±2.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±1.5%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent (CFP & CFPS only)	No abnormality in appearance. Marking shall be easily legible.	—	Ultrasonic washing with Isopropyl alcohol for 2 minutes. Power: 0.3W/cm², f: 28kHz, temp: 35°C±5°C
Flame Retardant (CFP & CFPS only)	No evidence of flaming or self-flaming	—	Flame test: The test flame shall be applied and removed for each 15 seconds respectively to repeat the cycle 5 times. Overload flame retardant: AC Voltage corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1 minute until disconnection occurs. However the applied voltage shall not exceed 4 times the maximum operating voltage.

10/28/30

MF, MFS, RK

general purpose metal film leaded resistor

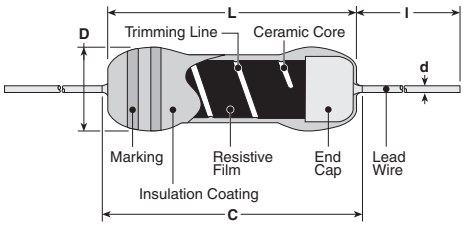
EU RoHS COMPLIANT



features

- Semi-precision metal film resistors
- Meets requirements of MIL-R-22684
- Suitable for automatic machine insertion
- MFS two times the power rating of the standard body type
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Tested: MF1/4, MFS1/4, MFS1/2

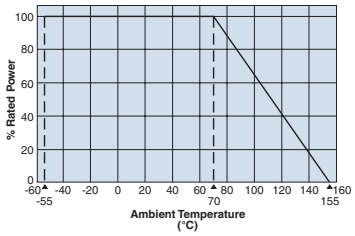
dimensions and construction



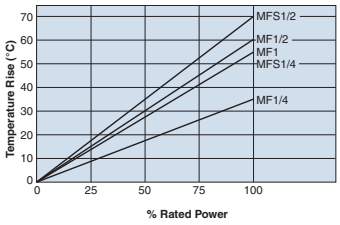
Type	Dimensions inches (mm) L (ref.)	C (max.)	D	d (nom.)	l*
MFS1/4	.126 +.02 -.008 (3.2 +0.5 -0.2)	.133 (3.4)	.066 +.016 -.004 (1.7 +0.4 -0.1)	.018 (0.45)	1.10±.118 (28.0±3.0)
MF1/4	.248±.02 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)	
MFS1/2	.248±.02 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)	
MF1/2C MF1/2D	.354±.04 (9.0±1.0)	.437 (11.1)	.138 +.016 -.02 (3.5 +0.4 -0.5)	.024 (0.6)	1.10 +.012 -.016 (28.0 +3.0 -4.0)
MF1/2L	.354±.04 (9.0±1.0)	.437 (11.1)	.138±.016 (3.5±0.4)	.024/.031 (0.6)/(0.8)	1.10±.118 (28.0±3.0)
MF1	.610±.02 (15.5±0.5)	.721 (18.3)	.217±.04 (5.5±1.0)	.031 (0.8)	1.50 +.012 -.016 (38.0 +3.0 -5.0)
RK1/4	.248±.02 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)	0.94 min. (24.0 min.)
RK1/2	.374±.04 (9.5±1.0)	.437 (11.1)	.138±.016 (3.5±0.4)	.024 (0.6)	
RK1	.610±.04 (15.5±1.0)	.720 (18.3)	.217±.02 (5.5±0.5)	.031 (0.8)	1.50±.118 (38.0±3.0)

* Lead length changes depending on taping and forming.

Derating Curve



Surface Temperature Rise



ordering information

MF	1/4	L	C	T52	8	R	R20	J
Type	**Power Rating**	**T.C.R.**	**Termination Material**	**Taping and Forming**	**Lead Diameter**	**Packaging**	**Nominal Resistance**	**Tolerance**
MF MFS RK	1/4: 0.25W 1/2: 0.50W 1: 1W	E: ±25 C: ±50 D: ±100 L: ±200 G: ±250 B: ±350	C: SnCu	1/4: T26, T52, VT, VTP, VTE, MT, M, U, M10, M12.5 1/2: T26, T52, VTP, VTE, M12.5, M15 1: T521	MF1/2L: T52 & Bulk Only: 6: 0.6mm 8: 0.8mm Blank: All others sizes & packaging	A: Ammo R: Reel	+2%: 2 significant figures + 1 multiplier +0.5%,+1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% G: ±2% J: ±5%

For further information on packaging, please refer to Appendix C.

applications and ratings

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C)	Resistance Range (Ω) (B±0.1%) E-96	(C±0.25%) E-96	(D±0.5%) E-24 E-192	(F±1.0%) E-24 E-96	(G±2.0%) E-24	(J±5.0%) E-24	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temperature Range
MFS1/4C	0.25W	300V	C: ±50	—	—	49.9 - 562k	10 - 1M	—	—	250V	500V	-55°C to +155°C
MFS1/4D			D: ±100									

12/19/19

applications and ratings (continued)

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C)	Resistance Range (Ω) (B±0.1%) E-96	(C±0.25%) E-96	(D±0.5%) E-24 E-192	(F±1.0%) E-24 E-96	(G±2.0%) E-24	(J±5.0%) E-24	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temperature Range
MF1/4C	0.25W	500V	C: ±50	—	—	10- 2.21M	10 - 2.21M	—	—	250V	500V	-55°C to +155°C
MF1/4D			D: ±100	—	—							
MF1/4L			L: ±200	—	—	—	1.0 - 10	0.51 - 10				
MFS1/2C	0.50W	500V	C: ±50	—	—	10 - 1M	10 - 2.21M	10 - 2.2M	—	350V	700V	
MFS1/2D			D: ±100									
MF1/2C	0.50W	700V	C: ±50	—	—	10 - 5.05M	10 - 4.99M	—	—	350V	700V	
MF1/2D			D: ±100	—	—		10 - 5.11M					
MF1/2L			L: ±200	—	—	—	1.0 - 10	0.51 - 10Ω				
MF1C	1W	700V	C: ±50	5.1 - 2.0M	5.1 - 2.49M	5.1 - 5.11M	1.0 - 6.81M	—	—	350V	700V	
MF1D			D: ±100	—	—							
MF1E			E: ±25	5.1 - 2.0M	5.1 - 2.49M	5.1 - 4.64M	1.0 - 5.11M	—	—			
RK1/4D	0.25W	500V	D: ±100	—	—	—	3.09M - 25M	—	—	500V	700V	
RK1/4L			L: ±200	—	—	—	—	3.3M - 33M	3.3M - 33M			
RK1/4B			B: ±350	—	—	—	100k - 25M	100k - 33M	100k - 33M			
RK1/2D	0.50W	700V	D: ±100	—	—	—	5.11M - 33M	—	—	700V	1000V	
RK1/2L			L: ±200	—	—	—	—	6.2M - 33M	6.2M - 33M			
RK1/2B			B: ±350	—	—	—	100k - 35M	100k - 51M	100k - 51M			
RK1BC	1W	1000V	B: ±350	—	—	—	100k - 51M	100k - 100M	100k - 100M	1000V	1500V	
RK1/2G*	0.50W	700V	G: ±250	—	—	—	—	—	1M - 12M	350V	700V	

* Discharge path resistor

environmental applications

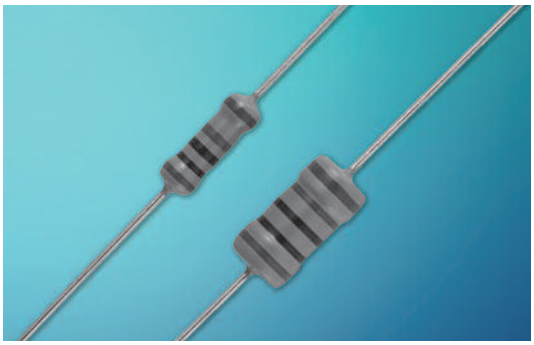
Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	Room temperature, +100°C, RK: +25°C/+125°C
Overload (Short Time)	RK: ±1%, RK1/2G: ±2.5% MF: ±0.5%	RK: ±0.6%, RK1/2G: ±1% MF: ±0.3%	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is less; MFS1/2: Rated voltage x 2 or max. overload voltage for 5 seconds, whichever is less
Resistance to Solder Heat	RK: ±1%; RK1/2G: ±5%; MFS: ±0.75%; MF1/4, MFS1/2, MF1/2: ±0.5%,	RK: ±0.5%; RK1/2G: ±1% MFS1/4: ±0.4%; MF1/4, MFS1/2, MF1/2: ±0.25%	260°C ± 5°C, 10 seconds ± 1 second or 350°C ± 10°C, 3.5 seconds ± 0.5 second
Dielectric Withstanding Voltage	No breakdown	—	1 minute
Insulation Resistance	Not less than 10,000MΩ	—	100V, 1 minute
Rapid Change of Temperature	RK,MF: ±1%; RK1/2G: ±5%	MF: ±0.3%; RK: ±0.5%, RK1/2G: ±1%	-55°C (30 minutes), +155°C (30 minutes), 5 cycles
Moisture Resistance	RK: ±5%; RK1/2G: ±10%; MFS1/4: ±1.5%; MF1/4, MFS1/2, MF1/2: ±1%	RK: ±2%; RK1/2G: ±5%; MFS1/4: ±1%; MF1/4, MFS1/2, MF1/2: ±0.75%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	RK: ±5%; RK1/2G: ±10%; MFS1/4: ±1.5%; MF1/4, MFS1/2, MF1/2: ±1%	RK: ±2%; RK1/2G: ±5%; MFS1/4: ±1%; MF1/4, MFS1/2, MF1/2: ±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible	—	The resistor shall be immersed for 5 seconds in IPA
Impulse	No such abnormalities as short-circuit, burnout, breakdown, etc.	—	Discharge from 1000pF capacitor 50 pulses. Internal 2.5 seconds. Charge voltage: 1.25kV (RK1/4), 2.5kV (RK1/2) and 6kV (RK1)

SN 3A/3D

coat-insulated fixed metal film resistors

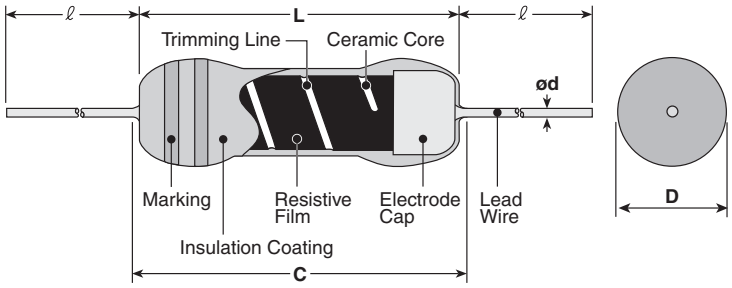
EU RoHS COMPLIANT



features

- High precision and low T.C.R. metal film resistor
- Excellent stability for a long time
- Products meet EU RoHS requirements

dimensions and construction



Type	Dimensions inches (mm)				
	L	C (max.)	D	d (nom.)	ℓ
SN3A	.555±.08 (14.1±2.0)	.720 (18.3)	.189±.039 (4.8±1.0)	.039 (1.0)	1.50±.118 (38±3)
SN3D	.650±.08 (16.5±2.0)	.846 (21.5)	.331±.039 (8.4±1.0)	.039 (1.0)	

ordering information

SN	3A	D	C	1002	F
Type	Power Rating	T.C.R. (x10⁻⁶/K)	Termination Surface Material	Nominal Resistance	Resistance Tolerance
	3A: 1W 3D: 2W	C: ±50 D: ±100 L: ±200	C: SnCu	D, F: 4 digits G: 3 digits	D: ±0.5% F: ±1% G: ±2%

Contact KOA when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

For further information on packaging, please refer to Appendix C.

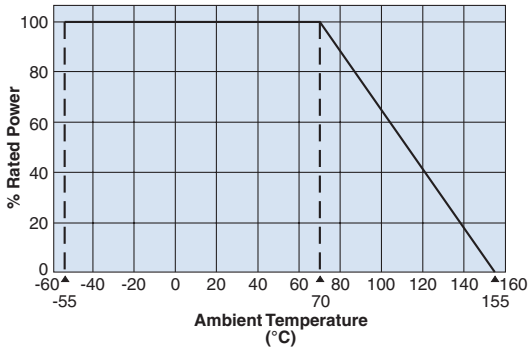
applications and ratings

Part Designation	Power Rating	T.C.R. (x10^{-6}/K)	Resistance Range (Ω) D: ±0.5% E24, E192	F: ±1% E24, E96	G: ±2% E24	Maximum Working Voltage	Maximum Overload Voltage	Dielectric Withstanding Voltage	Rated Ambient Temp.	Operating Temp. Range
SN3ACC	1W	C: ±50	—	10 - 1M	—	500V	1000V	1000V	+70°C	-55°C to +155°C
SN3ADC		D: ±100	10 - 1M	10 - 1M	10 - 1M					
SN3ALC		L: ±200	—	4.99 - 10	1 - 10					
SN3DDC	2W	D: ±100	10 - 1.5M	10 - 1.5M	10 - 1.5M					
SN3DLC		L: ±200	—	—	5.1 - 10					

Rated voltage = $\sqrt{\text{Power Rating x Resistance Value}}$ or Max. working voltage, whichever is lower.

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

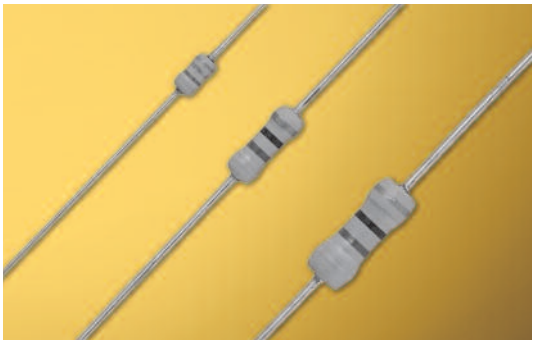
Performance Characteristics

Parameter	Requirement ∆ R ±(% + 0.05Ω) Limit	Test Method
Resistance	Within specified tolerance	25°C
T.C.R.	Within specified T.C.R.	+25°C/+125°C
Overload (Short time)	±0.5%	Rated voltage x 2.5 or max. overload voltage, whichever is lower, for 5 seconds
Resistance to Solder Heat	±0.25%	260°C ±5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	-55°C (30 minutes)/+155°C (30 minutes), 5 cycles
Moisture Resistance	±1%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON/0.5 hr OFF cycle
Endurance at 70°C	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON/0.5 hr OFF cycle

SNF

coat-insulated metal film fixed resistors

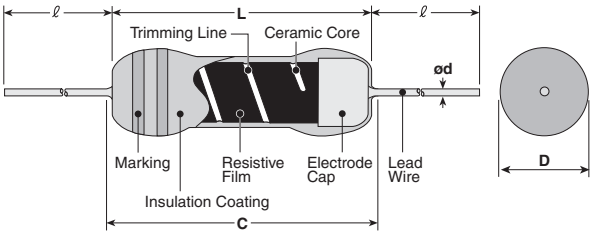
EU RoHS COMPLIANT



features

- Flame retardant coating (Equivalent to UL94 V-0)
- Automatic insertion is applicable
- Various types of formings are available
- Products meet EU RoHS requirements

dimensions and construction



Type	Dimensions inches (mm) L	C (max.)	D	d (nom.)	ℓ*** Standard	ℓ*** Long
SNF2C	.126±.008 (3.2±0.2)	.134 (3.4)	.067 +.008 -.004 (1.7 +0.2 -0.1)	.018 (0.45)	.551 Min.* (14.0 Min.)	.787 Min.** (20.0 Min.)
SNF2E	.240±.02 (6.1±0.5)	.280 (7.1)	.092±.012 (2.3±0.3)	.024 (0.6)		
SNF2H	.354±.039 (9.0±1.0)	.433 (11.0)	.138±.02 (3.5±0.5)	.028 (0.7)	.787 Min. (20.0 Min.)	—

* Forming code S is applied for bulk type.
** Long type is custom-made
*** Lead length changes depending on taping and forming type

ordering information

SNF	2E	C	T52	A	100	F
Type	Power Rating	Termination Surface Material	Taping & Forming	Packaging	Nominal Resistance	Resistance Tolerance
	2C: 0.25W 2E: 0.25W 2H: 0.5W	C: SnCu	S: Standard Nil: Long SNF2CC: S, Nil, T26, T52. M5F SNF2EC: S, Nil, T26, T52, M10F, M12.5R SNF2HC: Nil, T52, M12.5K, M15K	A: Ammo R: Reel Nil: Box	3 digits	J: ±5%

Contact KOA when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

For further information on packaging, please refer to Appendix C.

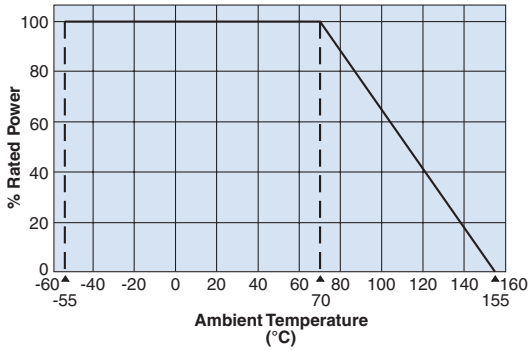
applications and ratings

Part Designation	Power Rating	Resistance Range (Ω) J: ±5% E24	T.C.R. (x10^{-6}/K)	Maximum Working Voltage	Maximum Overload Voltage	Dielectric Withstanding Voltage	Rated Ambient Temp.	Operating Temp. Range
SNF2CC	0.25W	0.47 - 9.1	+350 - -450	$E = \sqrt{PxR}$	Ex2.5	300V	+70°C	-55°C to +155°C
SNF2EC		0.47 - 100				500V		
SNF2HC	0.50W					700V		

Rated voltage = $\sqrt{\text{Power Rating x Resistance Value}}$

environmental applications

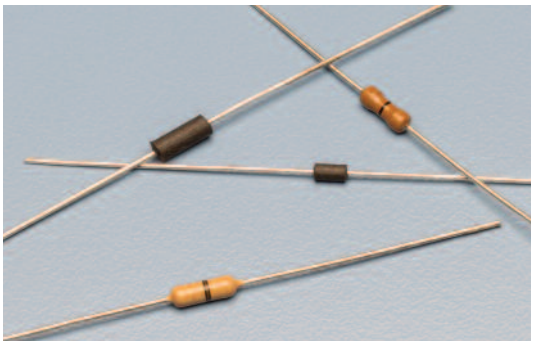
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

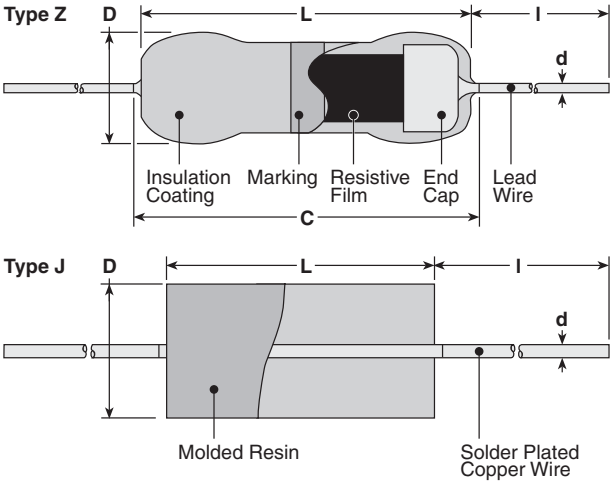
Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±1%	±0.5%	Rated voltage x 2.5 or max. overload voltage, whichever is lower, for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ±5°C, 10 seconds ± 1 second, 350°C ± 10°C, 3.5 seconds ± 0.5 second
Terminal Strength	No lead-coming off and loose terminals	—	Twist 360°C, 5 times
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes)/ +125°C (30 minutes), 5 cycles
Moisture Resistance	±5%	±2.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON/0.5 hr OFF cycle
Endurance at 70°C	±3%	±1.5%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	—	Ultrasonic washing with Isopropyl alcohol for 2 minutes. Power: 0.3W/cm^2, f: 28kHz, Temp: 35°C±5°C
Flame Retardant	No evidence of flaming or self-flaming	—	Flame test: The test flame shall be applied and removed for each 15 seconds respectively to repeat the cycle 5 times. Overload flame retardant: AC Voltage corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1 minute until disconnection occurs. However the applied voltage shall not exceed 4 times the maximum operating voltage.



features

- Type Z are conformal coated
- Type J are molded
- Suitable for automatic machine insertion
- Size compatible with 1/8, 1/4 and 1/2 watt resistors
- Marking: Type Z are tan color, single black band identifier
  Type J are black, no marking
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type	Dimensions inches (mm)				l[1]	
	L (ref.)[1]	C (max.)	D	d (nom.)	Standard	Long
Z16	.126±.008 (3.2±0.2)	.134 (3.4)	.067 +.008 -.004 (1.7 +0.2 -0.1)	.018 (0.45)	.551 Min.[2] (14.0 Min.)	.787 Min.[3] (20.0 Min.)
Z25	.240±.02 (6.1±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)		
Z25Y	.228 (5.8)		.087 +.016 -.008 (2.2 +0.4 -0.2)		1.18 +.118 -.16 (30.0 +3.0 -4.0)	—
J1/6Z	.134 +.004 -.008 (3.4 +0.1 -0.2)	—	.067±.008 (1.7±0.2)	.020 (0.5)	1.18±.118 (30.0±3.0)	
J1/4Z	.256±.02 (6.5±0.5)	—	.091 +0 -.012 (2.3 +0 -0.3)	.024 (0.6)		

[1] Lead length changes depending on taping and forming type.
[2] Forming code S is applied for bulk type.
[3] Long type is custom-made.

ordering information

Z16	C	T52	A
Type	Termination Material	Taping and Forming	Packaging
Z16 Z25 Z25Y J1/4Z J1/6Z	C: SnCu	T26, T52	A: Ammo R: Reel

For further information on packaging, please refer to Appendix C.

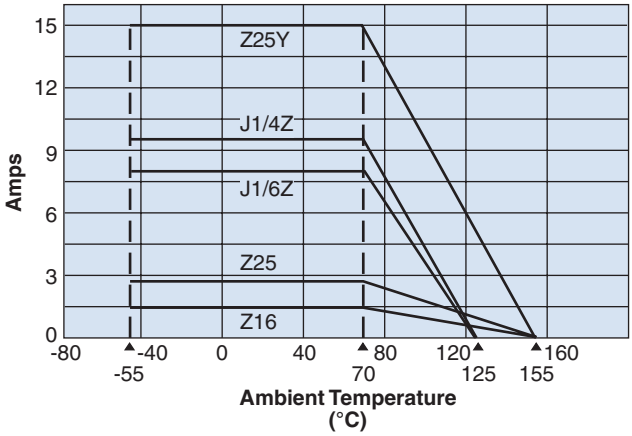
applications and ratings

Part Designation	Maximum Amperage	Minimum Dielectric Withstanding Voltage	Resistance	Rated Ambient Temperature	Operating Temperature Range
Z16	1.5A	300V	20mΩ or less	+70°C	-55°C to +155°C
Z25	2.5A	500V			
Z25Y	15A	500V			

Part Designation	Maximum Allowable Current	Rated Ambient Temperature	Operating Temperature Range
J1/6ZC	8A	+70°C	-55°C to +125°C
J1/4ZC	10A		

environmental applications

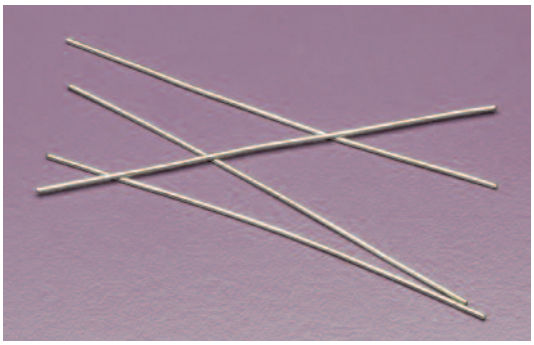
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

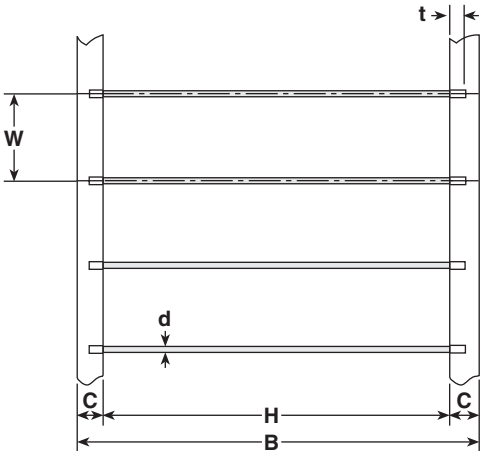
Parameter	Requirement	Test Method JIS C5201-1
Resistance	Less than 20mΩ	Measuring points are 10mm ± 1mm from the end cap
Resistance to Solder Heat		260°C ± 5°C, 10 seconds ± 1 second, 350°C ± 10°C, 3.5 seconds ± 0.5 second
Terminal Strength	No mechanical damages	(Pulling Test) Z16: 5N, 30 seconds, Z25: 10N, 30 seconds (Twist Test) 360°, 5 times (Bending Test) 5N, 90°, 2 times (Z16: 2.5N)
Rapid Change of Temperature	Less than 20mΩ	-55°C (30 minutes)/+125°C (30 minutes), 5 cycles
Moisture Resistance		40°C ±2°C, 90-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance @ 70°C		70°C ±2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Solvent Resistance	No visible damages to protective coating and marking	Isopropyl alcohol with ultrasonic cleansing for 2 minutes Power: 0.3W/cm², f: 28kHz, Temperature: 35°C ± 5°C



features

- Suitable for automatic machine insertion
- No rating
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



T52 Type	Dimensions inches (mm) H	B	C	W	t (max.)	d nominal
JL5	2.05±.039 (52.0±1.0)	2.54±.039 (64.5±1.0)	.244±.02 (6.2±0.5)	.2±.015 (5.08±0.38)	.098 (2.5)	.02 (0.5)
JL6						.024 (0.6)
JL8						.031 (0.8)

T26 Type	Dimensions inches (mm) H	B	C	W	t (max.)	d nominal
JL5	1.02 $^{+.039}_{-.0}$ (26.0 $^{+1}_{-0}$)	1.54±.039 (39.0±1.0)	.244±.02 (6.2±0.5)	.1972±.02 (5.0±0.5)	.098 (2.5)	.02 (0.5)
JL6						.024 (0.6)
JL8						.031 (0.8)

applications and ratings

Part Designation	Maximum Resistance	Maximum Current Ratings
JL5	10mΩ	8 Amps
JL6		10 Amps
JL8		12 Amps

ordering information

JL	8	C	T52	A
Type	Nominal Diameter	Termination Material	Taping and Forming	Packaging
	5 (24 gauge) 6 (22 gauge) 8 (20 gauge)	C: SnCu (Other termination styles available, contact factory for options)	T26, T52	A: Ammo

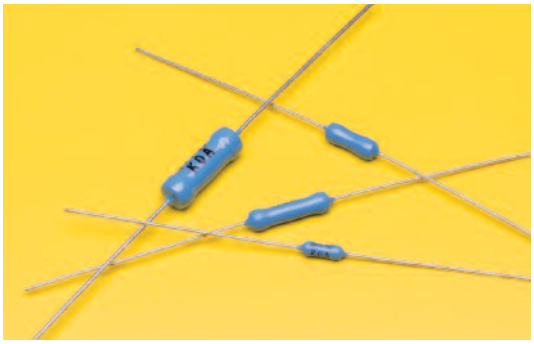
For further information on packaging, please refer to Appendix C.

KOA SPEER ELECTRONICS, INC.

RNS

MIL approved metal film leaded resistor

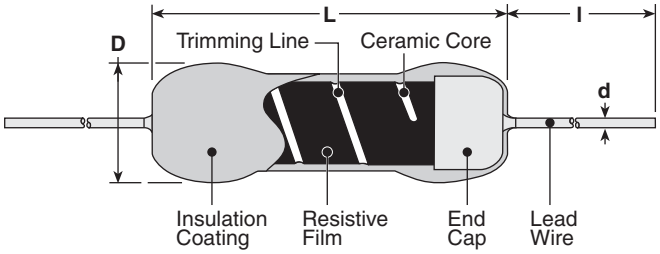
EU RoHS COMPLIANT



features

- Suitable for automatic machine insertion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Tested: RNS1 only
- Excellent long term stability in resistance values

dimensions and construction



Type	Dimensions inches (mm)			
	L (ref.)	D	d	l*
RNS1/8	.250±.04 (6.35±1)	.091±.02 (2.3±0.5)	.024 (0.6)	1.496 (38)
RNS1/4	.374±.04 (9.5±1)	.138±.02 (3.5±0.5)		
RNS1/2	.531±.04 (13.5±1)	.138±.02 (3.5±0.5)		
RNS1	.610±.04 (15.5±1)	.216±.02 (5.5±0.5)	.031 (0.8)	

* Lead length changes depending on taping and forming type.

ordering information

RNS	1/8	E	C	T52	R	1001	F
Type	Power Rating	T.C.R.	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
	1/8: 0.125W 1/4: 0.25W 1/2: 0.5W 1: 1W	Y: ±5 T: ±10 E: ±25 C: ±50	C: SnCu	1/8: T26, T52 1/4, 1/2: T52 1: T521	A: Ammo R: Reel	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1.0%

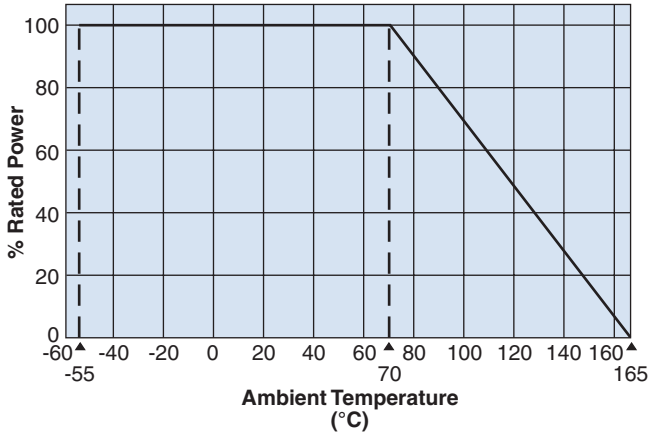
For further information on packaging, please refer to Appendix C.

applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/°C) Max.	Resistance Range E-24, E-192 (B±0.1%)	Resistance Range E-24, E-192 (C±0.25%)	Resistance Range E-24, E-192 (D±0.5%)	Resistance Range E-24, E-96 (F±1.0%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Minimum Dielectric Withstanding Voltage	Rated Ambient Temp.	Operating Temp. Range
RNS1/8	0.125W	Y: ±5	100Ω - 100kΩ	100Ω - 100kΩ	100Ω - 100kΩ	100Ω - 100kΩ	200V	400V	500V	+70°C	-25°C to +85°C
		T: ±10	100Ω - 200kΩ	100Ω - 200kΩ	100Ω - 200kΩ	100Ω - 200kΩ					
		E: ±25	5.1Ω - 750kΩ	5.1Ω - 1.62MΩ	0.2Ω - 2MΩ	0.2Ω - 2MΩ					-55°C to +165°C
		C: ±50	5.1Ω - 750kΩ	5.1Ω - 1.62MΩ	0.2Ω - 2MΩ	0.2Ω - 2MΩ					
RNS1/4	0.25W	E: ±25	5.1Ω - 1MΩ	5.1Ω - 2MΩ	0.2Ω - 2MΩ	0.2Ω - 2MΩ	250V	500V	700V		
		C: ±50	5.1Ω - 1.5MΩ	5.1Ω - 2MΩ	0.2Ω - 5.1MΩ	0.2Ω - 5.1MΩ					
RNS1/2	0.50W	E: ±25	5.1Ω - 1.5MΩ	5.1Ω - 2MΩ	0.2Ω - 2.4MΩ	0.2Ω - 4.7MΩ	300V	600V	700V		
		C: ±50	5.1Ω - 2MΩ	5.1Ω - 2.4MΩ	0.2Ω - 5.1MΩ	0.2Ω - 5.1MΩ					
RNS1	1W	E: ±25	5.1Ω - 2MΩ	5.1Ω - 2.4MΩ	0.2Ω - 5.1MΩ	0.2Ω - 5.1MΩ	350V	700V	1000V		
		C: ±50	5.1Ω - 2.4MΩ	5.1Ω - 2.4MΩ	0.2Ω - 5.1MΩ	0.2Ω - 6.8MΩ					

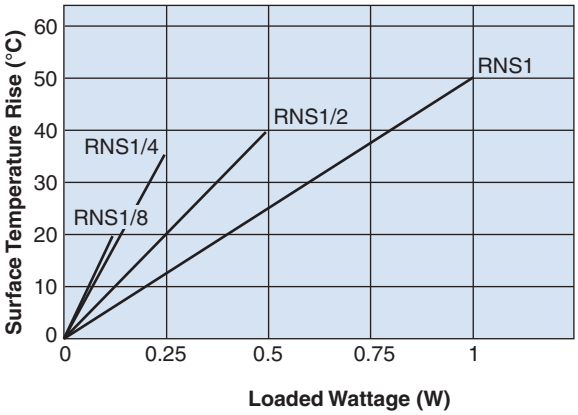
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Surface Temperature Rise



Performance Characteristics

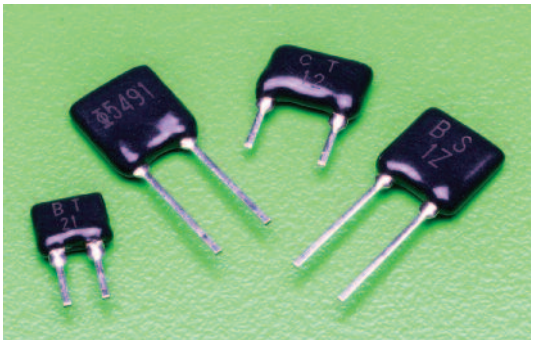
Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	Y, T: +25°C/+65°C; E, C: +25°C/+125°C
Overload (Short time)	±0.25%	±0.15%	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is lower
Resistance to Solder Heat	±0.2%	±0.075%	350°C ± 10°C, 3.5 seconds ± 0.5 second
Rapid Change of Temperature	±0.2%	±0.075%	-55°C (30 minutes), +85°C (30 minutes), 5 cycles
Moisture Resistance	±0.75%	±0.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±0.5%	±0.35%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle

KOA SPEER ELECTRONICS, INC.

MRS

plate-shaped high precision metal film resistor

EU RoHS COMPLIANT

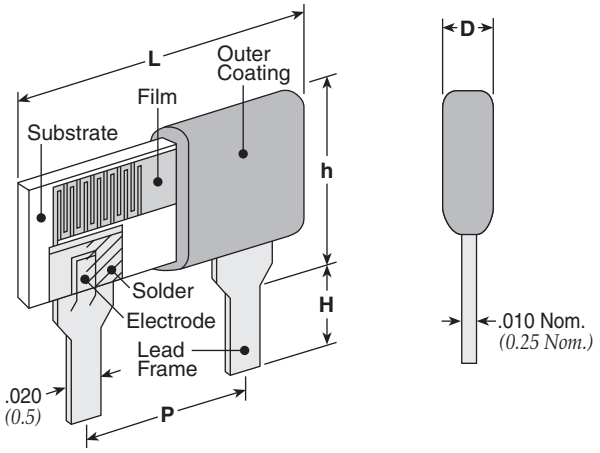


features

- Ultra precision T.C.R. up to ±2.5 ppm/°C, tolerance to ±0.01%
- Wide resistance range from 10Ω to 1MΩ
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

leaded resistors

dimensions and construction



Type	Dimensions inches (mm)				
	L (max.)	D (max.)	P	H	h (max.)
MRS1/8	.220 (5.6)	.098 (2.5)	.100±.008 (2.54±0.2)	.118±.02 (3.0±0.5)	.244 (6.2)
MRS1/4	.295 (7.5)		.200±.008 (5.08±0.2)		
MRS1/3			.150±.008 (3.81±0.2)	.315±.079 (8.0±2.0)	.354 (9.0)

ordering information

Lead Free

MRS	1/3	S	D	1002	T
Product Code	Size	T.C.R. (ppm)	Terminal Surface Material	Nominal Resistance	Resistance Tolerance
	1/8: 0.125W 1/4: 0.25W 1/3: 0.3W	S: ±2.5 Y: ±5 T: ±10 E: ±25	D: SnAgCu	3 significant figures + 1 multiplier "R" indicates decimal on values <100Ω	T: ±0.01% Q: ±0.02% A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5%

2/27/20

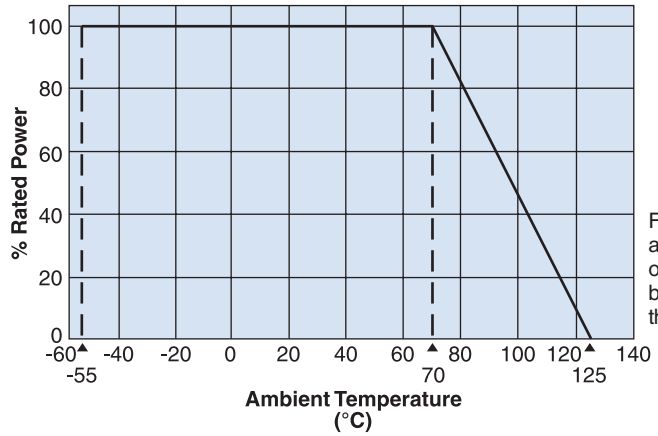
applications and ratings

Type	Power Rating	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)						Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Rated Ambient Temperature	Operating Temperature Range
			T: ±.01% E96	Q: ±.02% E96	A: ±.05%	B: ±.1%	C: ±.25%	D: ±.5%				
					E24/E96 & 25, 50 *10^n							
MRS1/8	0.125W	Y: ±5	—	—	100-250k	100-250k	100-250k	100-250k	200V	400	+70°C	-55°C to +125°C
		T: ±10	—	—	100-250k	100-510k	30-510k	30-510k				
		E: ±25	—	—	100-250k	100-510k	10-510k	10-510k				
MRS1/4	0.25W	Y: ±5	—	—	100-510k	100-510k	100-510k	100-510k	250V	500		
		T: ±10	—	—	100-510k	100-1M	30-1M	30-1M				
		E: ±25	—	—	100-510k	100-1M	10-1M	10-1M				
MRS1/3	0.3W	S: ±2.5	100-100k	30.1-100k	30.1-100k	30.1-100k	—	—	200V			
		Y: ±5	100-100k	30.1-100k	10-100k	10-100k	—	—				
		T: ±10	100-100k	30.1-100k	10-100k	10-100k	—	—				

* MRS1/3 is available only in E96 series.

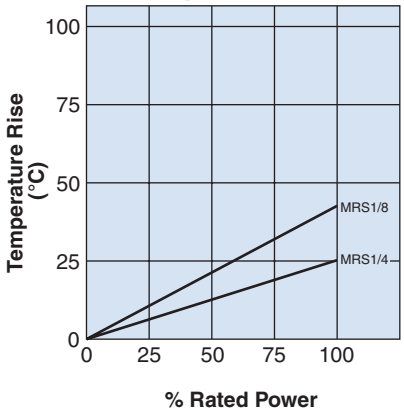
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with this derating curve.

Surface Temperature Rise



Performance Characteristics

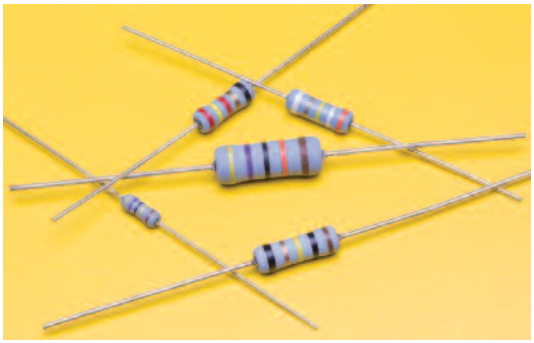
Parameter	Requirement Δ R ±(% + 0.05Ω)	Test Method
Resistance	Within specified tolerance	25°C
T.C.R.	Within specified T.C.R.	+25°C/+65°C
Overload (Short time)	±0.05%	Rated voltage x 2.5 or max. overload voltage whichever is lower, for 5 seconds
Resistance to Soldering Heat	±0.1%: MRS1/8, 1/4 ±0.05%: MRS1/3	350°C ± 10°C, 3.5 seconds ± 0.5 second
Rapid Change of Temperature	±0.1%: MRS1/8, 1/4 ±0.05%: MRS1/3	MRS1/8, 1/4: -55 +0-5°C (30 minutes), +125 +3-0°C (30 minutes), 5 cycles MRS1/3: -55 +0-5°C (30 minutes), +125 +3-0°C (30 minutes), 50 cycles
Dielectric Withstanding Voltage	±0.5%: MRS1/8, 1/4 ±0.05%: MRS1/3	500V (a.c.) for 1 minute between terminals and coatings
Endurance at 70°C	±0.1%: MRS1/8, 1/4 ±0.05%: MRS1/3	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Moisture Resistance	±0.1%: MRS1/8, 1/4 ±0.05%: MRS1/3	40°C ± 2°C, 90 ~ 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Insulation Resistance	10,000MΩ and more	500V (d.c.) for 1 minute
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	Soaking in 2-propanol of +20°C~25°C for 180 seconds ± 10 seconds

KOA SPEER ELECTRONICS, INC.

RCR

anti-surge power type leaded resistor

EU RoHS COMPLIANT

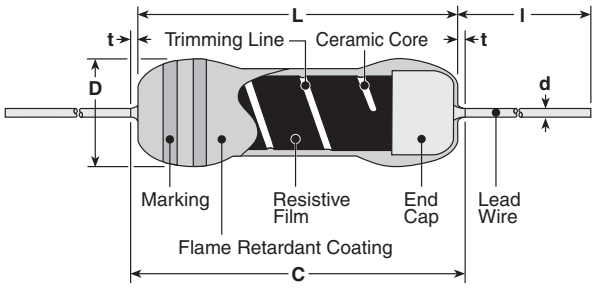


features

- Excellent anti-surge characteristics
- Stable characteristics of moisture resistance up to high resistance range
- RCR50 +(1MΩ - 12MΩ), RCR50EN (1MΩ - 12MΩ) and RCR60 (1MΩ - 12MΩ) are discharge resistors recognized by UL1676 and c-UL(CSA-C22.2 No.1-M94)
- RCR25EN (100kΩ~33MΩ), RCR50EN (100kΩ - 33MΩ) and RCR60 (100kΩ - 56MΩ) is approved by EN6234-68-1 G.10 safety
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Surface mount style “N” forming is suitable for automatic mounting

leaded resistors

dimensions and construction



* Lead length changes depending on taping and forming.

Type	Dimensions inches (mm) L	C (max.)	t (max.)	D	d (nom.)	l*
RCR16	.126±.008 (3.2±0.2)	.134 (3.4)	—	.067 +.008 -.004 (1.7 +0.2 -0.1)	.018 (0.45)	.787 Min. (20.0 Min.)
RCR25 RCR25EN	.248±.02 (6.3±0.5)	.28 (7.1)	—	.098±.02 (2.5±0.5)	.024 (0.6)	
RCR50(+) RCR50EN	.374±.039 (9.5±1.0)	—	.118 (3.0)	.138±.016 (3.5±0.4)	.028 (0.7)	
RCR60	.374 +.039 -.004 (9.5 +1.0 -0.2)					
RCR75	.472±.039 (12±1.0)	—	.118 (3.0)	.157±.02 (4.0±0.5)	.031 (0.8)	
RCR100	.610±.039 (15.5±1.0)	—	.118 (3.0)	.236 +.039 -.016 (6.0 +1.0 -0.4)	.031 (0.8)	

ordering information

RCR	50	EN	C	T52	A	105	J
Type	**Power Rating**	**Safety Appr. Marking**	**Termination Material**	**Taping and Forming**	**Packaging**	**Nominal Resistance**	**Tolerance**
RCR	16: 0.25W 25: 0.25W 50: 0.5W 60: 1W 75: 2W 100: 3W	RCR50+: + RCR25EN, RCR50EN: EN Blank: Others	C: SnCu	RCR16: T26, T52 RCR25, RCR25EN: T26, T52 RCR50(+, EN): T52 RCR60: T52 RCR75: T52 RCR100: T521, T631 L, M, N Forming	A: Ammo R: Reel TEB: Plastic embossed: N forming	2 significant figures + 1 multiplier for ±5% 3 significant figures + 1 multiplier for ±1%	F: ±1% J: ±5%

applications and ratings

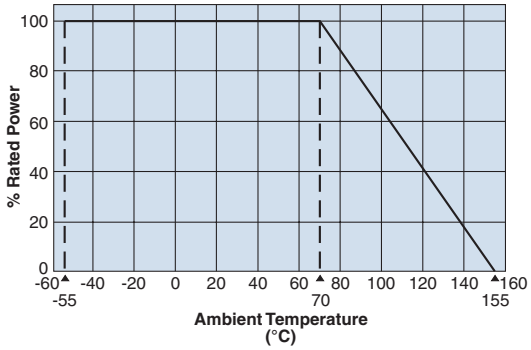
Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	Resistance Range E-24, E-96 (F±1%)	Resistance Range E-24 (J±5%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temperature Range
RCR16	0.25W	300V	100kΩ - 5.1MΩ	100kΩ - 5.1MΩ	500V	1000V	-55°C to +155°C
RCR25 RCR25EN		700V	100kΩ - 9.1MΩ	100kΩ - 33MΩ	DC 1600V AC 1150V	DC 2000V AC 1500V	
RCR50	0.5W		3.3Ω - 910kΩ	3.3Ω - 910kΩ	2000V	2500V	
				13MΩ - 33MΩ			
RCR50+			1MΩ - 9.1MΩ	1MΩ - 12MΩ			
RCR50EN			100kΩ - 9.1MΩ	100kΩ - 33MΩ			
RCR60	1.0W		100kΩ - 9.1MΩ	100kΩ - 56MΩ	4000V	5000V	
RCR75	2.0W		100kΩ - 9.1MΩ	100kΩ - 100MΩ	5000V		
RCR100	3.0W	1000V	100kΩ - 9.1MΩ	100kΩ - 51MΩ			

For further information on packaging, please refer to Appendix C.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/29/18

environmental applications

Derating Curve

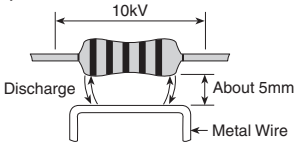


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Notice of Surge Load

Surge withstanding load voltage for the resistors cannot be guaranteed when the undermentioned 4 items get to a remarkable overload in comparison with the conditions shown by surge withstanding voltage in Anti-surge characteristics. Please contact KOA in advance if such a case is anticipated.

1. Peak voltage to be applied
2. Pulse width
3. Conditions of protecting insulation around the resistor
4. Situation of proximity conductivity object



For example: In the figure, a metal wire is placed less than 5mm away from the resistor body, there is such a case that causes an electric discharge by a surge load 10kV and then destroys the outer coating.

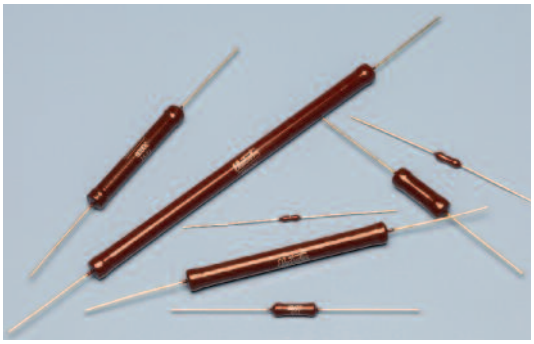
Approvals Awarded

Type	UL1676 & c-UL (CSA-C22.2 No.1-M94)	EN62368-1 G.10
RCR25EN	—	❍
RCR50+	❍(1MΩ~12MΩ)	—
RCR50EN		❍
RCR60		❍

Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	Measuring points are 10mm ± 1mm from the end cap
T.C.R.	Type / T.C.R. / Resistance Range: RCR16: ±200ppm/°C: 100kΩ - 5.1MΩ RCR25 (EN): ±350ppm/°C: 100kΩ - 33MΩ RCR50 (+): ±500ppm/°C: 3.3Ω - 91kΩ RCR50 (+): ±350ppm/°C: 100kΩ - 33MΩ RCR50EN: ±350ppm/°C: 100kΩ - 33MΩ RCR60: ±350ppm/°C: 100kΩ - 56MΩ RCR75: ±350ppm/°C: 100kΩ - 100MΩ RCR100: ±200ppm/°C: 100KΩ - 51MΩ	—	+25°C/+125°C
Overload	1%	0.5%	Rated voltage x 2.5 or maximum overload voltage for 5 seconds, whichever is less
Resistance to Solder Heat	1%	0.5%	260°C ± 5°C, 10 seconds ± 1 second or 350°C ± 10°C, 3.5 seconds ± 0.5 seconds
Terminal Strength	No mechanical damage	—	Twist 360°, 5 times
Rapid Change of Temperature	1%	0.5%	-55°C (30 minutes)/+155°C (30 minutes), 5 cycles
Moisture Resistance	5%	2.5%	40°C ± 2°C, 90-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle RCR16, 25, 50 (+), 60: W; RCR75, 100: Wx0.1
Endurance @ 70°C	5%	2.5%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No visible damage to protective coating and marking	—	Isopropyl alcohol with ultrasonic washing, 2 minutes Power: 0.3W/cm², f: 28kHz, Temperature: 35°C ± 5°C
Surge Withstanding	10%	2.5%	Discharge test: 2kV - 10kV, 0.01μF capacitor discharge pulse, 10 times (1 pulse/5 seconds maximum) Type / RCR16 / RCR25 RCR25EN / RCR50, RCR50+ / RCR50EN, RCR60, RCR75, RCR100 Applied Voltage / 2kV / 3kV / 3.3Ω - 6.2Ω: 10kV; 6.8Ω - 10Ω: 7kV; 11Ω - 9.1kΩ: 5kV; 10kΩ - 91kΩ: 7kV; 100kΩ - 33MΩ: 10kV / 10kV
EN60065 Test (RCR50EN, RCR60 only)	20%	—	Discharge test: 10kV, 1000pF capacitor discharge pulse, 50 times (1 pulse/5 seconds maximum)

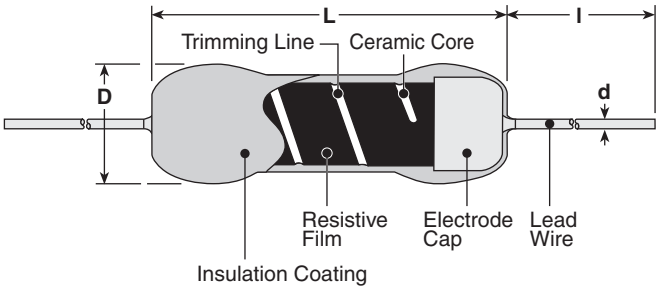
EU RoHS COMPLIANT



features

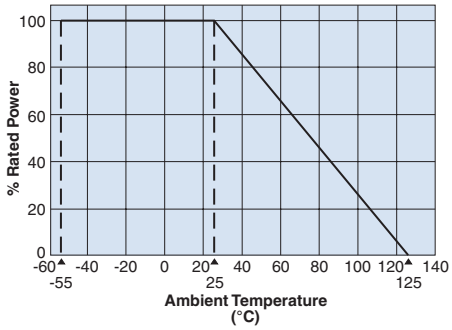
- Miniature construction can endure to high voltage and high power
- Excellent in anti-surge characteristics
- Wide resistance range of 500kΩ - 10GΩ and small T.C.R.
- Product meets EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in resistor element and brass cap.

dimensions and construction



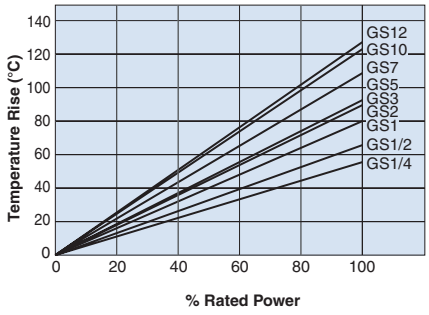
Type	Dimensions inches (mm) L	D	d (Nominal)	l
GS 1/4	.248±.039 (6.3±1.0)	.091±.020 (2.3±0.5)	.026 (0.65)	1.50±.118 (38.0±3.0)
GS 1/2	.374±.039 (9.5±1.0)	.138±.024 (3.5±0.6)	.031 (0.8)	
GS 1	.591±.059 (15.0±1.5)	.177±.039 (4.5±1.0)		
GS 2	.945±.059 (24.0±1.5)	.311±.039 (7.9±1.0)	.039 (1.0)	
GS 3	2.05±.079 (52.0±2.0)			
GS 5	2.99±.079 (76.0±2.0)			
GS 7	3.82±.118 (97.0±3.0)			
GS 10	4.61±.118 (117.0±3.0)			
GS 12	5.39±.118 (137.0±3.0)			

Derating Curve



For resistors operated at an ambient temperature of 25°C or above, a power rating shall be derated in accordance with the above derating curve.

Surface Temperature Rise



ordering information

GS	1/2	L	C	106	J
Type	Power Rating	T.C.R.	Termination Surface Material	Nominal Resistance	Resistance Tolerance
	1/4: 0.25W 1/2: 0.5W 1: 1W 2: 2W 3: 3W 5: 5W 7: 7W 10: 10W 12: 12W	D: ±100 L: ±200	C: SnCu	±2%, ±5%, ±10%: 2 significant figures + 1 multiplier ±0.5%, ±1%: 3 significant figures + 1 multiplier	D: ±0.5% F: ±1% G: ±2% J: ±5% K: ±10%

For further information on packaging, please refer to Appendix C.

10/28/21

applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) E-24 & 25, 50x10^n (D±0.5%)	(F±1%)	(G±2%)	(J±5%)	(K±10%)	Max. Working Voltage	Max. Overload Voltage	Impulse Withstand Voltage	Rated Ambient Temperature	Operating Temperature Range
GS1/4	0.25W	D: ±100	500K-20M	500K -100M	500K-100M	500K-100M	500K-100M	0.5kV	1kV	1.25kV	+25°C	-55°C to +125°C
		L: ±200										
GS1/2	0.5W	D: ±100	500K-50M		500K-200M	500K-200M	500K-200M	1kV	2kV	2.5kV		
		L: ±200			500K-500M	500K-500M	500K-500M					
GS1	1W	D: ±100			500K-500M	500K-500M	500K-500M	3kV	4.5kV	6kV		
		L: ±200			500K-1G	500K-5G	500K-5G					
GS2	2W	D: ±100			500K-500M	500K-500M	500K-500M	5kV	7.5kV	10kV		
		L: ±200			500K-1G	500K-5G	500K-5G					
GS3	3W	D: ±100			500K-500M	500K-500M	500K-500M	15kV	20kV	30kV		
		L: ±200			500K-1G	500K-10G	500K-10G					
GS5	5W	D: ±100			500K-500M	500K-500M	500K-500M	20kV	30kV	40kV		
		L: ±200			500K-1G	500K-10G	500K-10G					
GS7	7W	D: ±100	1M-50M	1M-100M	1M-500M	1M-500M	1M-500M	30kV	40kV	50kV		
		L: ±200	500K-50M	500K-100M	500K-1G	500K-10G	500K-10G					
GS10	10W	D: ±100	1M-50M	1M-100M	1M-500M	1M-500M	1M-500M	35kV	50kV	60kV		
		L: ±200	500K-50M	500K-100M	500K-1G	500K-10G	500K-10G					
GS12	12W	D: ±100	1M-50M	1M-100M	1M-500M	1M-500M	1M-500M	40kV	60kV	70kV		
		L: ±200	500K-50M	500K-100M	500K-1G	500K-10G	500K-10G					

environmental applications

Performance Characteristics

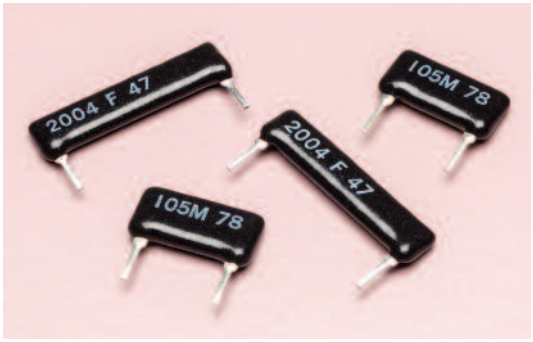
Parameter	Requirement Δ R ±%	Test Method
Resistance	Within regulated tolerance	25°C
T.C.R.	Within specified T.C.R.	+25°C/125°C
Overload (Short time)	2%: TCR 200x10^{-6}/K 0.5%: TCR 100x10^{-6}/K	Rated voltage x 2.5 (GS1/4, GS1/2), rated voltage x 2 (GS1-GS12) or Max. overload voltage, whichever is lower for 5 seconds
Resistance to Solder Heat	2%: TCR 200x10^{-6}/K 0.5%: TCR 100x10^{-6}/K	350°C ± 10°C, 3 seconds ± 0.5 seconds or 260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	2%: TCR 200x10^{-6}/K 0.5%: TCR 100x10^{-6}/K	-55°C (30 minutes)/ +125°C (30 minutes), 5 cycles
Moisture Resistance	5%: TCR 200x10^{-6}/K 2%: TCR 100x10^{-6}/K	40°C, 90% - 95%RH, 1000h
Endurance @ 25°C	3%: TCR 200x10^{-6}/K 2%: TCR 100x10^{-6}/K	25°C, 1000 hours 1.5 hr ON/0.5 hr OFF cycle
Voltage Coefficient	±50x10^{-6}/V: TCR 200x10^{-6}/K ±10x10^{-6}/V: TCR 100x10^{-6}/K	GS1/4, 1/2 only, Rated voltage or max. working voltage, whichever is lower and 1/10 of its voltage
Voltage Characteristics	5%: TCR 200x10^{-6}/K 3%: TCR 100x10^{-6}/K	GS1 - 12, Rated voltage or max. working voltage, whichever is lower and 1/10 of its voltage
Resistance to Solvent	No evidence of damage to protective coating and marking	Soaking in IPA for 1 minute and brushing 10 times -3 cycles - liquid temperature 25°C ±5°C
Impulse Withstand Voltage	No abnormality in appearance and flash-over	An impulse voltage shall be applied 5 times at an interval of 1 minute

KOA SPEER ELECTRONICS, INC.

RK92

thick film resistors for high voltage

EU RoHS COMPLIANT

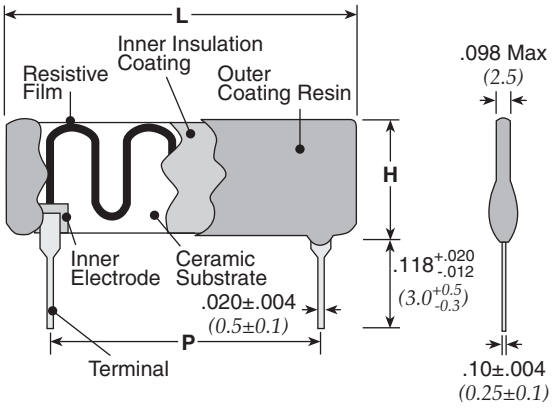


features

- High resistance resistors for high voltage circuits
- Thin SIP shape
- The flame retardant coats corresponding to UL94V-0 are used
- Thick film resistors (RuO_2) ensure high stabilities in life and change in aging
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

leaded resistors

dimensions and construction



Type	Max. Working Voltage Symbol	Dimensions inches (mm) L (Max.)	H (Max.)	P
4L	Nil	.500 (12.7)	.200 (5.08)	.4±.008 (10.16±0.2)
5L	Nil	.602 (15.3)		.5±.008 (12.7±0.2)
6L	Nil	.701 (17.8)		.6±.008 (15.24±0.2)
3C	Nil or 4	.425 (10.8)	.256 (6.5)	.3±.008 (7.62±0.2)
4C	5	.524 (13.3)		.4±.008 (10.16±0.2)
5C	Nil or 6	.622 (15.8)		.5±.008 (12.7±0.2)
6C	7	.724 (18.4)		.6±.008 (15.24±0.2)
7C	Nil or 8	.823 (20.9)		.7±.008 (17.78±0.2)
8C	Nil or 9	.925 (23.5)		.8±.008 (20.32±0.2)
9C	Nil	1.02 (26.0)		.9±.008 (22.86±0.2)
11X	Nil	1.22 (31.0)	.394 (10.0)	1.1±.008 (27.94±0.2)
18X	Nil	1.93 (48.9)		1.8±.008 (45.72±0.2)
18D	Nil	1.93 (48.9)	.520 (13.2)	1.8±.008 (45.72±0.2)

ordering information

RK92	–	3C	4	D	1004	F	50
Type	Dash	Style	Max. Working Voltage Symbol	Termination Surface Material	Nominal Resistance	Resistance Tolerance	T.C.R. (X10⁻⁶/K)
RK92 (Standard)		4L 5L 6L 3C 5C 7C 8C 9C 11X 18X 18D	Nil	D: SnAgCu (L: Sn/Pb)	F: 4 digits G, J, K, M: 3 digits	F: ±1% G: ±2% J: ±5% K: ±10% M: ±20%	Nil
							100
RK92 (Presison)		18D	Nil	D: SnAgCu	D, F: 4 digits	D: ±0.5% F: ±1%	100
		3C	4 (kV)				50
		4C	5 (kV)				
		5C	6 (kV)				
		6C	7 (kV)				
		7C	8 (kV)				
		8C	9 (kV)				

4/09/21

applications and ratings

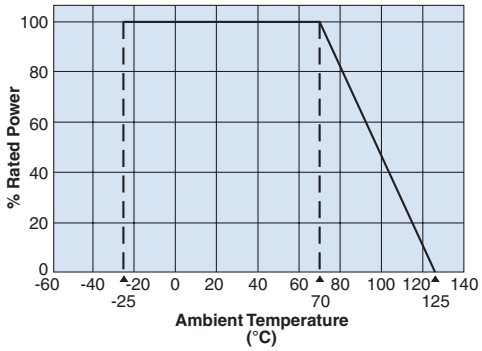
Part Designation	Max. Working Voltage Symbol	Power Rating	Resistance Range (Ω) E-12 • 2x10ⁿ • 3x10ⁿ • 4x10ⁿ • 5x10ⁿ						T.C.R. (ppm/°C) Max.	Maximum Working Voltage	Rated Ambient Temp.	Operating Temp. Range
			D: ±0.5%	F: ±1%	G: ±2%	J: ±5%	K: ±10%	M: ±20%				
4L	Nil	0.5W	—	2M - 10M	2M - 10M	—	—	—	±300	1kV	+70°C	-40°C to +125°C
5L	Nil	0.5W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		10kV		
6L	Nil	0.6W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		10kV		
3C	Nil	0.5W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		7kV		
5C	Nil	0.75W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		10kV		
7C	Nil	0.85W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G				
8C	Nil	1.0W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G				
9C	Nil	1.1W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G				
11X	Nil	1.7W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G				
18X	Nil	2.7W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		15kV		
18D	Nil	4W	1M - 100M	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G	±100			
3C	4	0.5W	1M - 100M	1M - 100M	—	—	—	—	±50	4kV		
4C	5	0.6W	1M - 100M	1M - 100M	—	—	—	—		5kV		
5C	6	0.75W	1M - 150M	1M - 150M	—	—	—	—		6kV		
6C	7	0.8W	1M - 150M	1M - 150M	—	—	—	—		7kV		
7C	8	0.85W	1M - 200M	1M - 200M	—	—	—	—		8kV		
8C	9	1W	1M - 200M	1M - 200M	—	—	—	—		9kV		

Rated voltage = $\sqrt{\text{Power Rating X Resistance Value}}$ or Max. working voltage, whichever is lower

Please contact factory for other values that are not listed above.

environmental applications

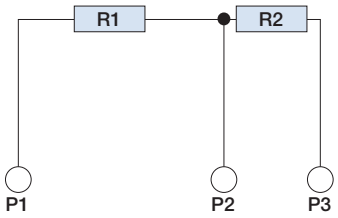
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

3 Terminal Product

Circuit Schematics



Performance Characteristics

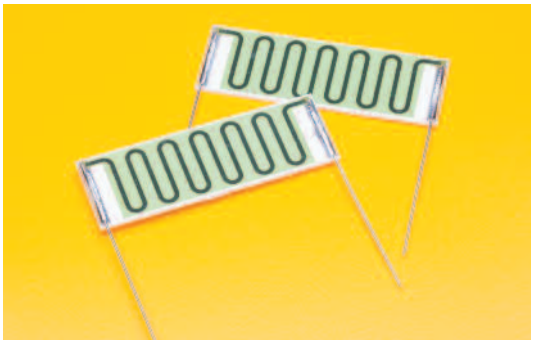
Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified tolerance	—	+25°C/+125°C
Resistance to Solder Heat	1%	0.5%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	1%	0.5%	-40°C (30 minutes)/ +125°C (30 minutes) 5 cycles
Moisture Resistance	5%	3%	40°C ± 2°C, 90 - 95% RH, 1000 hours
Endurance @ 70°C	5%	3%	Room temperature 1000 hours, Rated voltage

KOA SPEER ELECTRONICS, INC.

RK92-L

thick film resistors for high voltage

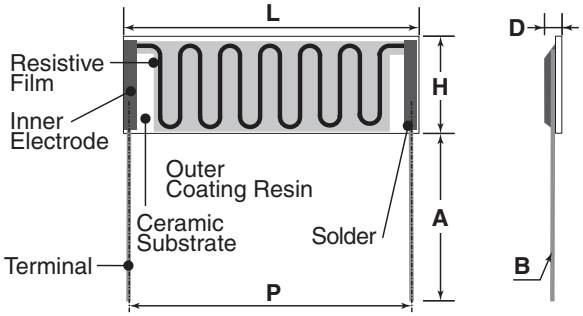
EU RoHS COMPLIANT



features

- Resistors excellent in overload capability
- Thin SIP shape
- Thick film resistors (RuO_2) ensure high stabilities in life and change in aging
- Meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction



Type	Dimensions inches (mm)					
	L (Max.)	H (Max.)	P	D (Max.)	A	øB (Nom.)
18FL	1.91 (48.5)	.650 (16.5)	1.77±.039 (45.0±1.0)	.098 (2.5)	1.18±.039 (30.0±1.0)	.026 (0.65)

ordering information

RK92	–	18FL	4W	D	305	K
Type	Dash	Style	Power Rating	Termination Material	Nominal Resistance	Resistance Tolerance
RK92		18FL	4W	D: SnAgCu	3 Digits	K: ±10%

4/09/21

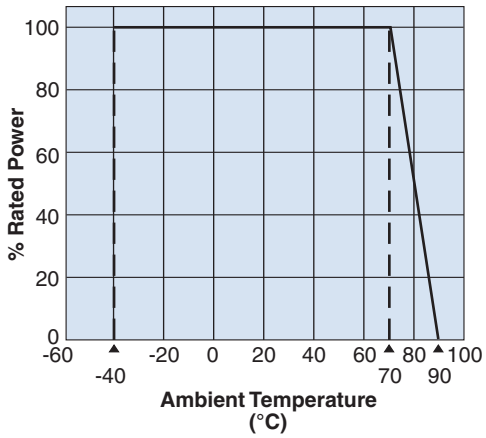
applications and ratings

Part Designation	Power Rating	Resistance Range (Ω) K: ±10%	T.C.R. (X10⁻⁶/K)	Rated Ambient Temperature	Operating Temperature Range
18FL	4W	1.2M ~ 16M (1.2M, 3M, 4M, 5M, 8M, 12M, 16M)	±300	+70°C	-40°C to +90°C

Rated voltage = $\sqrt{\text{Power Rating X Resistance Value}}$

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

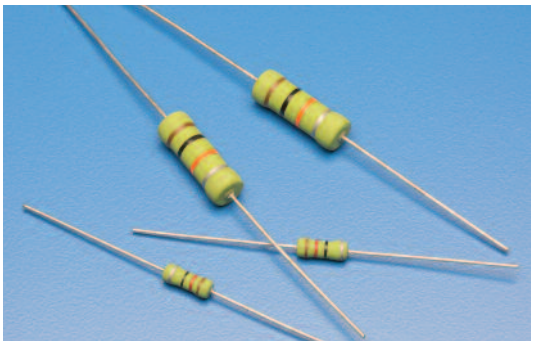
Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Temperature Cycling	2%	1.0%	-40°C (30 minutes)/ +130°C (30 minutes) 10 cycles
Endurance	3%	1.5%	Insulating oil 1000 hours, Rated voltage

KOA SPEER ELECTRONICS, INC.

PCF

ceramic resistors for anti pulse surge

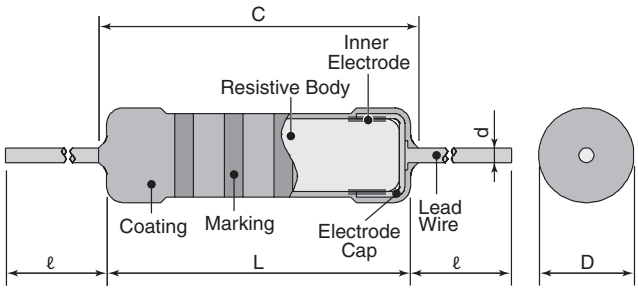
EU RoHS COMPLIANT



features

- KOA original bulk ceramic resistors
- Coated with UL94V0 flameproof material
- Excellent in anti-pulse characteristics
- Non-inductive resistors
- Products with lead-free terminations meet EU RoHS requirements
- Higher reliability against disconnection compared to wirewound resistors and film resistors
- AEC-Q200 Tested

dimensions and construction



Type	Dimensions inches (mm) L	C (max.)	D	d (nom.)	l*
PCF1/2	.354±.039 (9.0±1.0)	.437 (11.1)	.138±.02 (3.5±0.5)	.028 (0.7)	1.18±.118 (30.0±3.0)
PCF1	0.65±.039 (16.5±1.0)	.748 (19.0)	.217±.039 (5.5±1.0)	.031 (0.8)	1.50±.118 (38.0±3.0)
PCF2	.748±.039 (19.0±1.0)	.886 (22.5)	.276±.039 (7.0±1.0)		

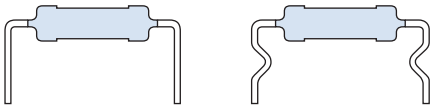
* Lead length changes depending on taping type

ordering information

PCF	1	C	T631	R	103	K
Type	Power Rating	Termination Material	Taping	Packaging	Nominal Resistance	Tolerance
PCF	1/2: 0.5W 1: 1W 2: 2W	C: SnCu	1/2: T52 1: T631 2: T631	R: Reel	2 significant figures + 1 multiplier	K: ±10% M: ±20%

taping

Type	Axial Taping T52	T631
PCF1/2	○	—
PCF1	—	○
PCF2	—	○



Contact us for lead forming details.

For further information on packaging, please refer to Appendix C.

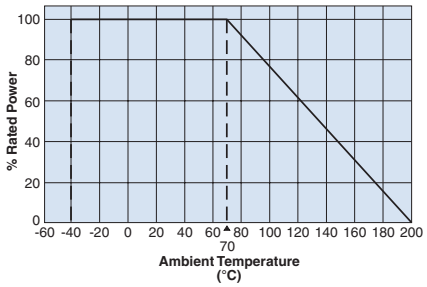
applications and ratings

Part Designation	Power Rating @ 70°C	Resistance Range (Ω) K: ±10% E-12	Resistance Range (Ω) M: ±20% E-6	T.C.R. (x10^{-6}/K)	Maximum Working Voltage	Maximum Overload Voltage	Dielectric Withstanding Voltage	Rated Ambient Temp.	Operating Temp. Range
PCF1/2	0.5W	4.7 - 100K	4.7 - 100K	-500 ~ -1300: 3.3Ω≤R<10Ω -600 ~ -1500: 10Ω≤R<100Ω	200V	400V	500V	+70°C	-40°C to +200°C
PCF1	1.0W	3.3 - 390K	3.3 - 390K	-700 ~ -1800: 100Ω≤R<1kΩ -900 ~ -1900: 1kΩ≤R<100kΩ	300V	600V			
PCF2	2.0W			-900 ~ -2000: 100kΩ≤R<200kΩ -900 ~ -2200: 200kΩ≤R≤390kΩ	400V	800V	700V		

Rated Voltage = $\sqrt{\text{Power Rating x Resistance Value}}$ or Maximum Working Voltage, whichever is lower.

environmental applications

Derating Curve

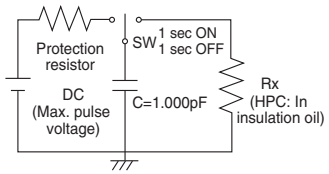


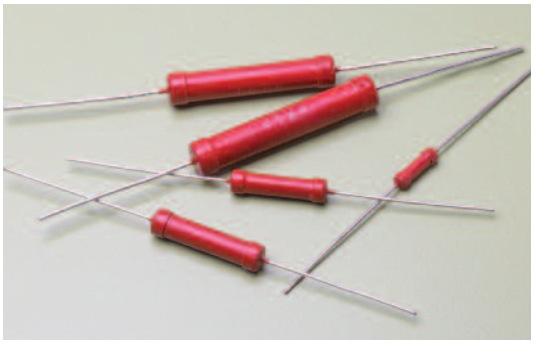
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Requirement Δ R ±(% + 0.05Ω) Typical	Test Method
Resistance	Within regulated to tolerance	—	Resistance: Measurement voltage 3.3Ω=<R<10Ω: 0.3V 10Ω=<R<100Ω: 1.0V 100Ω=<R=<390kΩ: 3.0V 25°C
T.C.R	-500~-1300:3.3Ω≤R<10Ω -600~-1500:10Ω≤R<100Ω -700~-1800:100Ω≤R<1kΩ -900~-1900:1kΩ≤R<100kΩ -900~-2000:100kΩ≤R<200kΩ -900~-2200:200kΩ≤R≤390kΩ	—	+25°C/-40°C, +25°C/+75°C and +25°C/+125°C
Voltage Coefficient (Apply for over 1kΩ)	0~-0.2%/V	—	Rated voltage and rated voltage x 10%
Overload	2%	0.4%	Rated voltage x 2.5 or maximum overload voltage for 5s, whichever less
Resistance to pulse	Refer to the table on the right	—	The resistor mounted to the test circuit as below is applied with high voltage impulse 10,000 cycles.
Resistance to soldering heat	2%	0.8%	350°C±10°C, 3.5s±0.5s
Rapid change of temperature	2%	0.4%	-40°C (30 min.)/+85°C (30 min.), 5 cycles
Moisture resistance	5%	0.6%	40°C±2°C, 90%~95%RH, 1000 hours, 1.5h ON/0, 5h OFF cycles
Load life	5%	0.4%	70°C±2°C, 1000h, 1.5h ON/0, 5h OFF cycles
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	—	Dipping in IPA or Xylene for 3 minutes and leaving for 10 minutes after removing drops, then brushing 10 times.

Type	Test Voltage	Performance Requirements Δ R ±(% + 0.05Ω)
PCF1/2	10kV:4.7Ω≤R<10kΩ	5
	10kV:10kΩ≤R<33kΩ	10
	10kV:33kΩ≤R<100kΩ	25
	4kV:10kΩ≤R<100kΩ	5
PCF1	14kV:3.3Ω≤R<30kΩ	5
	14kV:30kΩ≤R<390kΩ	10
	7kV:30kΩ≤R<390kΩ	5
PCF2	20kV:3.3Ω≤R<10kΩ	5
	20kV:10kΩ≤R<390kΩ	10
	11kV:10kΩ≤R<390kΩ	5

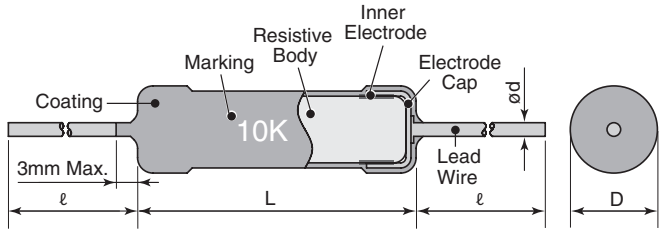




features

- KOA original bulk ceramic resistors
- Excellent in anti-pulse characteristics
- Higher reliability against disconnection compared to wirewound resistors and film resistors
- Products with lead-free terminations meet EU RoHS requirements
- Non-inductive resistors
- AEC-Q200 Tested

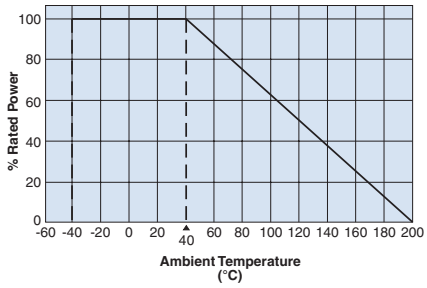
dimensions and construction



Type	Dimensions inches (mm) L	D	d (nom.)	l*
HPC1/2	.433±.039 (11.0±2.0)	.138±.039 (3.5±1.0)	.031 (0.8)	1.50±.118 (38.0±3.0)
HPC1	0.630±.039 (16.0±2.0)	.177±.039 (4.5±1.0)		
HPC2	.827±.039 (21.0±2.0)	.197±.039 (5.0±1.0)		
HPC3	1.02±.039 (26.0±2.0)	.236±.039 (6.0±1.0)		
HPC4	1.50±.039 (38.0±2.0)	.276±.039 (7.0±1.0)	.039 (1.0)	
HPC5	1.73±.039 (44.0±2.0)	.295±.039 (7.5±1.0)		

* Lead length changes depending on taping type

Derating Curve



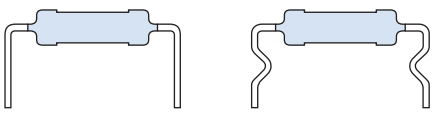
For resistors operated at an ambient temperature of 40°C or above, a power rating shall be derated in accordance with the derating curve.

ordering information

HPC	1/2	C	T631	R	103	K
Type	Power Rating	Termination Material	Taping	Packaging	Nominal Resistance	Tolerance
HPC	1/2: 0.5W 1: 1W 2: 2W 3: 3W 4: 4W 5: 5W	C: SnCu	1/2: T52 1: T631	A: Ammo R: Reel	2 significant figures + 1 multiplier	K: ±10% M: ±20%

taping

Type	Axial Taping T52	T631
HPC1/2	○	—
HPC1	—	○



Contact us for lead forming details.

For further information on packaging, please refer to Appendix C.

10/28/20

applications and ratings

Part Designation	Power Rating @ 40°C	Resistance Range (Ω) K: ±10% E-12	Resistance Range (Ω) M: ±20% E-6	T.C.R. (x10⁻⁶/K)	Maximum Working Voltage	Maximum Overload Voltage	Rated Ambient Temp.	Operating Temp. Range
HPC1/2	0.5W	10 - 390K	3.3 - 330K	-500 ~ -1300: 3.3Ω≤R<10Ω -600 ~ -1500: 10Ω≤R<100Ω -700 ~ -1800: 100Ω≤R<1kΩ -900 ~ -1900: 1kΩ≤R<100kΩ -900 ~ -2000: 100kΩ≤R<200kΩ -900 ~ -2200: 200kΩ≤R≤390kΩ	200V	400V	+40°C	-40°C to +200°C
HPC1	1.0W				300V	600V		
HPC2	2.0W				400V	800V		
HPC3	3.0W				450V	900V		
HPC4	4.0W				500V	1000V		
HPC5	5.0W				550V	1100V		

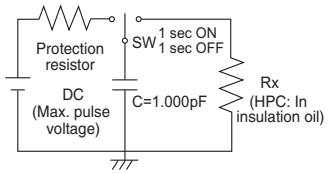
Rated voltage = $\sqrt{\text{Power Rating X Resistance Value}}$ or Max. working voltage, whichever is lower

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Requirement Δ R ±(% + 0.05Ω) Typical	Test Method
Resistance	Within regulated to tolerance	—	Resistance: Measurement voltage 3.3Ω=<R<10Ω: 0.3V 10Ω=<R<100Ω: 1.0V 100Ω=<R=<390kΩ: 3.0V 25°C
T.C.R	-500~-1300:3.3Ω≤R<10Ω -600~-1500:10Ω≤R<100Ω -700~-1800:100Ω≤R<1kΩ -900~-1900:1kΩ≤R<100kΩ -900~-2000:100kΩ≤R<200kΩ -900~-2200:200kΩ≤R≤390kΩ	—	+25°C/-40°C and +25°C/+125°C
Voltage Coefficient (Apply for over 1kΩ)	0~-0.2%/V (HPC1/2) 0~-0.1%/V (HPC1) 0~-0.05%/V (HPC2,3,4,5)	—	Rated voltage and rated voltage x 10%
Overload	2%	0.4%	Rated voltage x 2.5 or maximum overload voltage for 5s, whichever less
Resistance to pulse	Refer to the table on the right	—	The resistor mounted to the test circuit as below is applied with high voltage impulse 10,000 cycles.
Resistance to soldering heat	2%	0.8%	350°C±10°C, 3.5s±0.5s
Rapid change of temperature	2%	0.4%	-40°C(30min.)/+85°C(30min.), 5 cycles
Moisture resistance	5%	0.6%	40°C±2°C, 90%~95%RH, 1000 hours, 1.5h ON/0, 5h OFF cycles
Load life	5%	0.4%	40°C±2°C, 1000h, 1.5h ON/0, 5h OFF cycles
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	—	Dipping in IPA or Xylene for 3 minutes and leaving for 10 minutes after removing drops, then brushing 10 times.
High Temperature Exposure	5%	1.7%	+200°C, 1000 hours

Type	Test Voltage	Performance Requirements Δ R ±(% + 0.05Ω)
HPC1/2	8kV:3.3Ω≤R<30kΩ	5
	8kV:30kΩ≤R<390kΩ	10
	5kV:30kΩ≤R<390kΩ	5
HPC1	15kV:3.3Ω≤R<30kΩ	5
	15kV:30kΩ≤R<390kΩ	10
	7kV:30kΩ≤R<390kΩ	5
HPC2	25kV:3.3Ω≤R<30kΩ	5
	25kV:30kΩ≤R<390kΩ	10
	15kV:30kΩ≤R<390kΩ	5
HPC3 HPC4 HPC5	25kV	5



CPCN

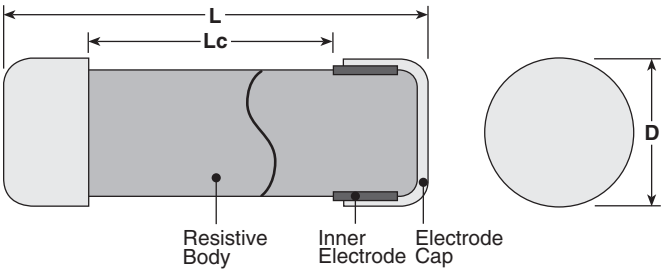
fixed ceramic melf resistor

EU RoHS COMPLIANT

features

- Suitable for noise suppression of engine ignition system
- Reliable in pulse/transient applications
- Products meet EU RoHS requirements

dimensions and construction



Size Code	Dimensions inches (mm) L	Lc (min.)	D	Cap Material
CPCN1/2	.421±.02 (10.7±0.5)	.213 (5.4)	.138±.004 (3.5±0.1)	Fe(Ni/Cu plating)
CPCN1	.63±.024 (16.0±0.6)	.378 (9.6)	.187±.012 (4.75±0.3)	
CPCN2N	.720±.024 (18.3±0.6)	.452 (11.5)	.187±.012 (4.75±0.3)	
CPCN2NS	.720±.024 (18.3±0.6)	.452 (11.5)	.187±.012 (4.75±0.3)	SUS304
CPCN3	.720±.024 (18.3±0.6)	.394 (10.0)	.283±.012 (7.2±0.3)	Fe(Sn/Cu plating)

ordering information

CPCN	2N	S	502	M
Type	Power Rating Symbol	Cap Material Symbol	Nominal Resistance	Tolerance
	1/2: 0.5W 1: 1.0W 2N: 1.5W 3: 2.0W	S: SUS304 Nil: Fe (plating)	2 significant figures + 1 multiplier	M: ±20%

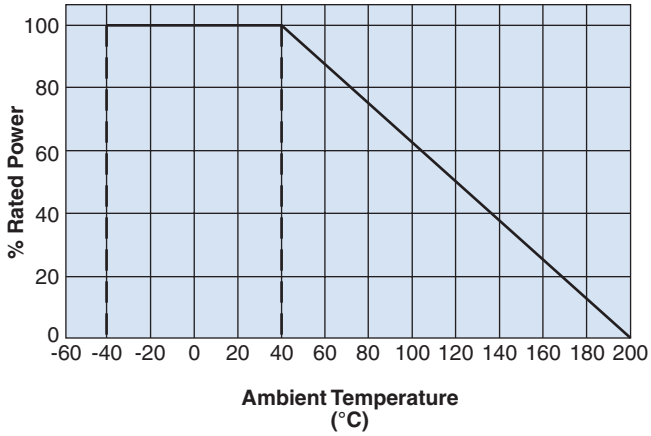
applications and ratings

Type	Power Rating	Nominal Resistance	Resistance Tolerance	T.C.R. (ppm/°C)	Maximum Working Voltage	Maximum Overload Voltage	Rated Ambient Temperature	Operating Temperature Range
CPCN1/2	0.5W	1kΩ, 5kΩ, 10kΩ, 15kΩ	M: ±20%	-1200±300	86V	215V	+40°C	-40°C to +200°C
CPCN1	1.0W				122V	305V		
CPCN2N CPCN2NS	1.5W	1kΩ, 2kΩ, 5kΩ, 10kΩ, 15kΩ			150V	375V		
CPCN3	2.0W	15kΩ			173V	432V		

Rated Voltage = $\sqrt{\text{Power Rating x Resistance Value}}$ or Maximum Working Voltage, whichever is lower.

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 40°C or higher, the power rating shall be derated in accordance with this derating curve.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	Resistance: 1kΩ, 2kΩ, 5kΩ — Measurement Voltage: 10V; Resistance: 10kΩ, 15kΩ — Measurement Voltage: 30V; 25°C
T.C.R.	-1200±300ppm/°C	—	+25°C/-40°C and +25°C/+125°C
Voltage Coefficient	0 ~ -0.2%/V	—	Rated voltage and rated voltage x 10%
Overload	2	0.3	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is less
Load Life at High Voltage Pulse	30	—	Continuous 250h high voltage pulse on the test circuit (Refer to JIS D5111) CPCN1/2, CPCN1 in insulation oil
Resistor Body Strength	No mechanical damages	—	Type: CPCN1/2 — Holding Distance: 5.0 ± 0.2mm; Type: CPCN1 — Holding Distance: 9.0 ± 0.3mm; Type: CPCN2N/2NS — Holding Distance: 12.3 ± 0.3mm; Time: 10 seconds; Force: 98N (10kgf); Type: CPCN3 — Force: 490N (50kgf)
Rapid Change of Temperature	5.0	—	-55°C (15 minutes), +155°C (15 minutes), 500 cycles
Moisture Resistance	5.0	0.9	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Load Life	5.0	0.7	40°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Operation	5.0	0.7	-40°C, 24 hours
High Temperature Exposure	5.0	2.0	+200°C, 1000 hours

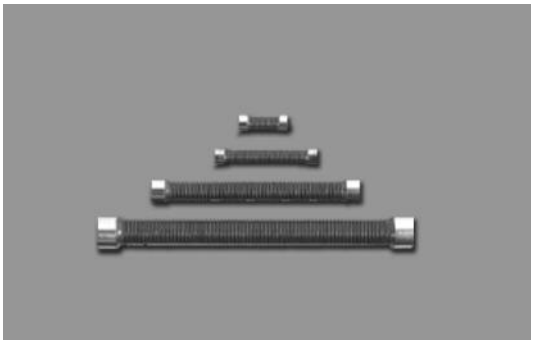
The resistance measurement before and after the examination should be performed in room temperature with difference ±1°C.

PSN, PV, PSO, PN, PWW, PAP

high voltage power resistors

KOA SPEER ELECTRONICS, INC.

EU RoHS COMPLIANT



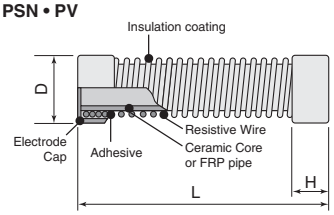
features

- PSO is made completely moisture preventive to be PSN that can be used under high moisture environment
- PN is a non-inductive type and can be used for high frequency
- PWW resistors, which are non-inductive wirewound resistors for high voltage with resistance wires wound on insulation pipes
- PAP resistors are non-inductive wirewound resistors with inductance less than PWW, can be used for pulse wave measurement, impulse generators, etc. and have the same dimensions as PWW resistors

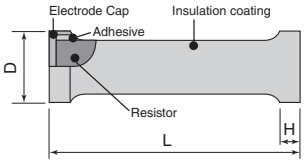
leaded resistors

dimensions and construction

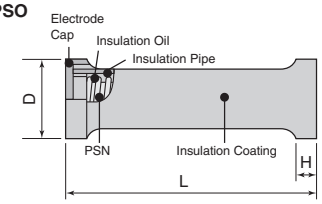
PSN • PV



PN, PWW, PAP



PSO



Size Code	Dimensions (mm) L	D±0.5	H (Nominal)	Weight (g)
PSN-0.5	50±2	17.5	10	20
PSN-1	100±2			30
PSN-2	200±2	24	15	85
PSN-3	300±2	33	20	250
PSN-4	400±3	45		600
PSN-5	500±3	62	25	800
PSN-6	1000±5			1350
PV-0.5	80±2	9.5	8	12
PV-1	150±2			23
PV-2		17.5	10	45
PV-5	250±2	24	15	105
PV-8		33	20	220
PSO-0.5	55±5	28	10	120
PSO-1	105±5			150
PSO-2	205±5	38		370

Size Code	Dimensions (mm) L	D±0.5	H (Nominal)	Weight (g)
PSO-3	320±5	46	20	760
PSO-4	420±5	65		1900
PSO-5	530±5	80	25	3500
PSO-6	1050±5			6200
PN-0.5	50±2	17	8	25
PN-1	100±2		12	55
PN-2	200±2			80
PN-3	300±2			100
PN-4	400±2			125
PWW-3, PAP-3	300±2	33	20	310 • 250
PWW-4, PAP-4	400±3	45		660 • 510
PWW-5, PAP-5	500±3	62	25	1330 • 960
PWW-6, PAP-6	1000±5			2700 • 1850

ordering information

PSN RoHS

PSN	0.5	CP	F	A	105	J
Product Code	Power Rating	Cap	RoHS	Holder	Nominal Resistance	Resistance Tolerance
	0.5 : 2W 1 : 5W 2 : 10W 3 : 25W 4 : 50W 5 : 125W 6 : 250W	C M CP		Nil: No Holder A B	3 digits	J : ±5% K : ±10% M : ±20%

PSO RoHS

PSO	0.5	C	F	105	J
Product Code	Power Rating	Cap	RoHS	Nominal Resistance	Resistance Tolerance
	1 : 4W 2 : 8W 3 : 20W 4 : 40W 5 : 100W 6 : 200W	C		3 digits	J : ±5% K : ±10% M : ±20%

10/27/21

PSN, PV, PSO, PN, PWW, PAP

high voltage power resistors

ordering information

PV RoHS

PV	0.5	CP	F	A	105	J
Product Code	Power Rating	Cap	RoHS	Holder	Nominal Resistance	Resistance Tolerance
	0.5 : 2W 1 : 4W 2 : 7W 5 : 12W 8 : 20W	C M CP		Nil: No Holder A B	3 digits	J : ±5% K : ±10% M : ±20%

PN RoHS

PN	0.5	CP	F	105	J
Product Code	Power Rating	Cap	RoHS	Nominal Resistance	Resistance Tolerance
	0.5 : 1.5W 1 : 3W 2 : 6W 3 : 9W 4 : 12W	C M CP		3 digits	J : ±5% K : ±10% M : ±20%

PWW, PAP RoHS

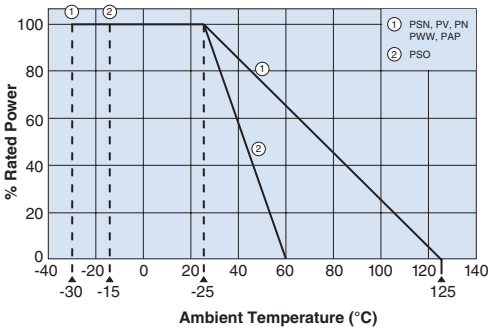
PWW	3	M	F	A	102	J
Product Code	Power Rating	Cap	RoHS	Holder	Nominal Resistance	Resistance Tolerance
PWW PAP	3 : 25W 4 : 50W 5 : 100W 6 : 200W	M		Nil: No Holder A B	3 digits	J : ±5% K : ±10% M : ±20%

applications and ratings

Part Designation	Power Rating (W)	Resistance Range (Ω) J: ±5% K: ±10% M: ±20% (E24)	T.C.R. (x10^{-6}/K)	Maximum Working Voltage	Impulse Withstand Voltage	Energy Rating 1 time/ 5 min.	Operating Temperature Range	Inductance (μH) Maximum
PSN-0.5	2	500~500M	±1500: +25°C/-15°C ±1000: +25°C/+85°C (R<1GΩ) ±3000 (R≥1GΩ)	15kV	20kV	50J	-30°C~+125°C	17.5
PSN-1	5	1k~1G		30kV	40kV	125J		
PSN-2	10	2k~2G		60kV	80kV	400J		24
PSN-3	25	3k~3G		90kV	120kV	1.8kJ		33
PSN-4	50	4k~4G		120kV	160kV	4.0kJ		45
PSN-5	125	5k~5G		150kV	200kV	9.0kJ		62
PSN-6	250	6k~6G		300kV	400kV	20.0kJ		
PV-0.5	2	500~500M		24kV	32kV	45J		9.5
PV-1	4	1k~1G		45kV	60kV	90J		
PV-2	7	1.5k~1.5G				270J		17.5
PV-5	12	2.5k~2.5G		75kV	100kV	650J		24
PV-8	20	2.5k~2.5G				950J		33
PSO-1	4	1k~1G		30kV	40kV	100J	-15°C~+60°C	28
PSO-2	8	2k~2G		60kV	80kV	320J		38
PSO-3	20	3k~3G		90kV	120kV	1.5kJ		46
PSO-4	40	4k~4G		120kV	160kV	3.2kJ		65
PSO-5	100	5k~5G		150kV	200kV	7.2kJ		80
PSO-6	200	6k~6G		300kV	400kV	16.0kJ		
PN-0.5	1.5	50~500k		—	20kV	35J	-30°C~+125°C	17
PN-1	3	100~1M		—	40kV	70J		
PN-2	6	200~2M		—	80kV	130J		
PN-3	9	300~3M		—	120kV	200J		
PN-4	12	400~4M		—	160kV	270J		
PWW-3	25	10~800	±200	—	120kV	2kJ~5kJ		33
PWW-4	50	15~1.5k			160kV	4kJ~12kJ		45
PWW-5	100	25~2.5k			200kV	7kJ~20kJ		62
PWW-6	200	50~5k			400kV	14kJ~40kJ		62
PAP-3	25	10~400			120kV	1kJ~2kJ		33
PAP-4	50	10~800			160kV	1.5kJ~4kJ		45
PAP-5	100	15~1k			200kV	3.5kJ~10kJ		62
PAP-6	200	25~2k			400kV	7kJ~25kJ		62

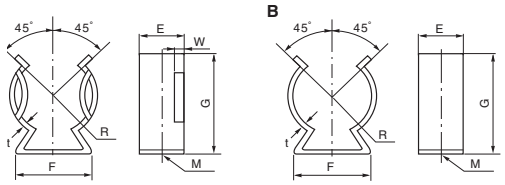
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 25°C or above, a power rating shall be rated in accordance with the above derating table.

Holder Dimensions (mm)



Type	R	E	F	G	M	t	W
PSN-0.5, PSN-1, PV-2	8.5	11	16	24	ø4.2	0.8	1.5±0.5
PSN-2, PV-5	11.5	15	18	32		1.0	
PSN-3, PV-8, PWW-3, PAP-3	16	18	24	40	ø6.5		1.5±1.0
PSN-4, PWW-4, PAP-4	22	20	36	59		1.5	2.0±1.0
PSN-5, 6, PWW-5, 6, PAP-5, 6	30	25	46	74		1.5	

Performance Characteristics

Parameter	Requirements Δ R±%	Test Method	
Resistance	Within specified tolerance	25°C	
T.C.R.	Within specified T.C.R.	R<1GΩ	PSN: ±1500 : +25°C/-15°C
			PSN: ±1000 : +25°C/+85°C
		R≥1GΩ	PSN: ±3000 : +25°C/-15°C, +25°C/+85°C
Rapid Change of Temperature	5%	-30°C (30 minutes)/+85°C (30 minutes) 5 cycles Except for PSN	
Voltage Characteristics	3%	Rated voltage or max. working voltage, whichever is lower and 1/10 of its voltage	
Moisture Resistance	5% : R<100MΩ	40°C, 90%~95%RH, 250 hours	
	10%: R≥100MΩ		
Endurance at 25°C	5% : R<100MΩ	25°C, 500 hours	
	10%: R≥100MΩ	25°C, 500 hours, Continuous load	

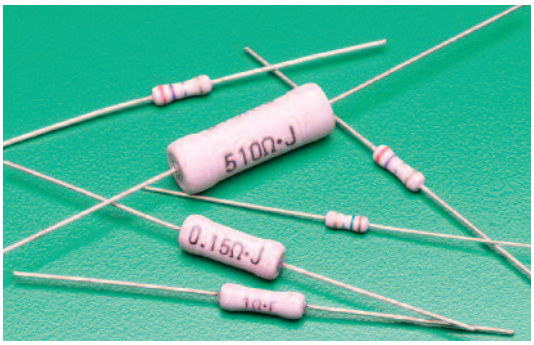
Cap Dimensions (mm)

Cap Shape	C		M				MS				CP		C			
Type	D	d	D	M	K	A	D	M	K	A	d	ℓ	D	M	ℓ_1	ℓ_2
PSN-05;PSN-1;PV-2	17.5	7	17.5	3	2	7	—	—	—	—	1.0	90	—	—	—	—
PSN-2;PV-5	24	12	24	4	2	10	—	—	—	—	1.2	120	—	—	—	—
PSN-3;PV-8,PWW-3;PAP-3	33	14	33	5	4	14	—	—	—	—	—	—	—	—	—	—
PSN-4;PWW-4;PAP-4	—	—	45	6	4	16	45	8	4	16	—	—	—	—	—	—
PSN-5,6;PWW-5,6;PAP-5,6	—	—	62	8	7	26	62	10	7	37	—	—	—	—	—	—
PV-0.5;PV-1	9.5	Without hole	—	—	—	—	—	—	—	—	0.9	90	—	—	—	—
PN-0.5	17	Without hole	—	—	—	—	—	—	—	—	1.0	90	—	—	—	—
PN-1	—	—	17	4	—	—	—	—	—	—	1.0	90	—	—	—	—
PN-2~PN-4	—	—	17	4	—	—	—	—	—	—	1.2	120	—	—	—	—
PSO-05,1	—	—	—	—	—	—	—	—	—	—	—	—	28	4	8	—
PSO-2	—	—	—	—	—	—	—	—	—	—	—	—	38	6	10	—
PSO-3	—	—	—	—	—	—	—	—	—	—	—	—	46	8	—	15
PSO-4	—	—	—	—	—	—	—	—	—	—	—	—	65	10	—	20
PSO-5,6	—	—	—	—	—	—	—	—	—	—	—	—	80	12	—	25

MOS

reduced size metal oxide power type leaded resistor

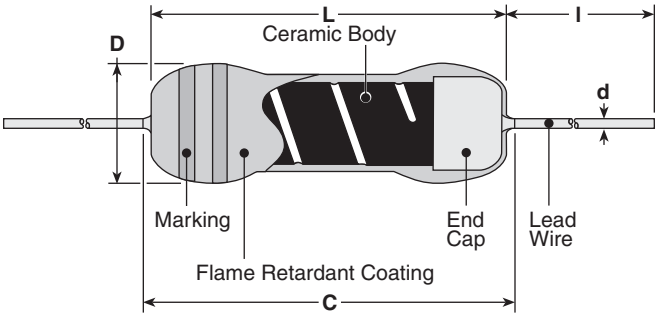
EU RoHS COMPLIANT



features

- Small size power type resistor
- Coated with UL94V0 equivalent flameproof material
- Suitable for automatic machine insertion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- Surface mount style “N” forming is suitable for automatic mounting

dimensions and construction



Type	Dimensions inches (mm) L	C (max.)	D	d (nom.)[1]	l*
MOS1/2 MOSX1/2	.244±.02 (6.2±0.5)	.280 (7.1)	.098±.02 (2.5±0.5)	.024 (0.6)	.945 Min. (24.0 Min.)
MOS1 MOSX1	.354±.039 (9.0±1.0)	.437 (11.1)	.118±.02 (3.0±0.5)	.024/.031 (0.6)/(0.8)	
MOS2 MOSX2	.472±.039 (12.0±1.0)	.591 (15.0)	.157±.02 (4.0±0.5)	.031 (0.8)	
MOS3 MOSX3	.610±.039 (15.5±1.0)	.709 (18.0)	.236±.039 (6.0±1.0)		1.18±.118 (30.0±3.0)
MOS5 MOSX5	.965±.039 (24.5±1.0)	1.10 (28.0)	.354±.039 (9.0±1.0)		1.50±.118 (38.0±3.0)

* Lead length changes depending on taping and forming type.
[1] Ex. MOS1C, 1CT52, 1CT526 = 0.6MM
MOS1C8, 1CT528 = 0.8MM

ordering information

MOS	1	C	T52	8	A	103	J
Type	Power Rating	Termination Material	Taping and Forming	Lead Diameter	Packaging	Nominal Resistance	Tolerance
MOS MOSX	1/2: 0.5W 1: 1W 2: 2W 3: 3W 5: 5W	C: SnCu	Axial: T26, T52, T521, T631 Stand-off Axial: L52, L521, L631 Radial: VTP, VTE, GT, GT4, VTF L, U, M, N Forming	MOS(X)1: T52 & Bulk Only: 6: 0.6mm 8: 0.8mm Blank: All others sizes & packaging	A: Ammo R: Reel TEB, TEG: Plastic embossed (N forming)	±2%, ±5%: 2 significant figures + 1 multiplier “R” indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier “R” indicates decimal on value <100Ω	F: ±1% G: ±2% J: ±5%

For further information on packaging, please refer to Appendix C.

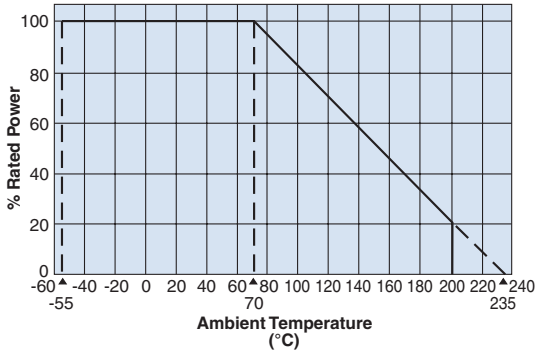
applications and ratings

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C) Max.	Resistance Range			Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temperature Range
				E-24, E-96* (F±1%)	E-24* (G±2%)	E-24 (J±5%)			
MOS1/2	0.5W	400V	±300	10Ω - 47kΩ	10Ω - 47kΩ	10Ω - 47kΩ	$E = \sqrt{P \times R}$	600V	-55°C to +200°C
MOS1	1.0W	500V		10Ω - 68kΩ	10Ω - 68kΩ	10Ω - 100kΩ			
MOS2	2.0W			10Ω - 100kΩ	10Ω - 100kΩ		350V	700V	
MOS3	3.0W	700V		—					
MOS5	5.0W	800V					500V	1000V	
MOSX1/2	0.5W	400V		1Ω - 9.1Ω	0.22Ω - 9.1Ω	0.1Ω - 9.1Ω	$E = \sqrt{P \times R}$	E x 2.5	
MOSX1	1.0W	500V							
MOSX2	2.0W								
MOSX3	3.0W	700V		—	0.22Ω - 9.1Ω				
MOSX5	5.0W	800V							

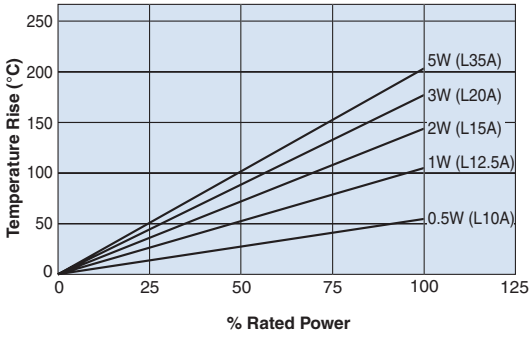
* Please consult when there is a demand of the resistance besides the 1% and 2% range.

environmental applications

Derating Curve



Surface Temperature Rise



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

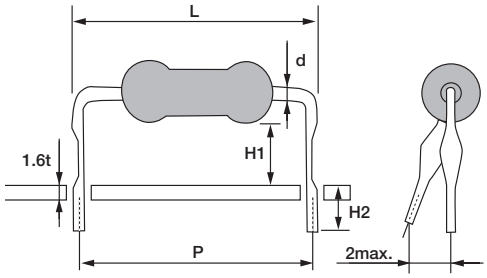
Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	Measuring points are at 10mm ±1mm from the end cap.
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±(2% +0.1Ω)	±1%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ± 5°C, 10 seconds ± 1 second, 350°C ± 10°C, 3.5 seconds ± 5 seconds
Terminal Strength	No lead-coming off and loose terminals	—	Twist 360°C, 5 times
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +155°C (30 minutes), 5 cycles
Moisture Resistance	±(5%+0.1Ω)	±2.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±(5%+0.1Ω)	±2.5%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible	—	Ultrasonic washing with isopropyl alcohol for 2 minutes. Power: 0.3W/cm³, f: 28kHz, Temp: 35°C ±5°C
Flame Retardant	No evidence of flaming or self-flaming	—	Flame test: the test flame shall be applied and removed for each 15 seconds respectively to repeat the cycle 5 times. Overload flame retardant: AC voltage corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1 minute until disconnection occurs. However the applied voltage shall not exceed the value of 4 times of the maximum operating voltage

10/28/20

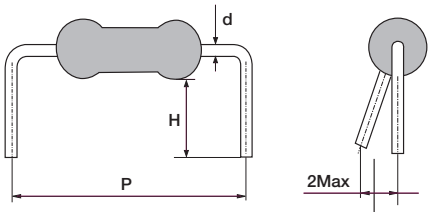
secondary processed products

L Forming



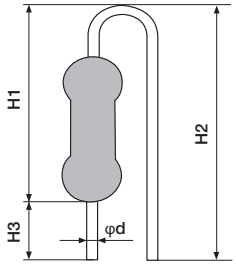
Type	Dimensions millimeters P	H1	H2	d (Nom.)	L max.	Substrate Hole Dia.
1/2CL10A	10.0±1.0	5.3±1.0	4.0	0.6		ø0.8
1CL12.5A	12.5±1.0	7.0±1.0		0.8		ø1.0
1CL15A	15.0±1.0	6.5±1.0			17.5	
2CL15A		7.0±1.0				
2CL15F		4.5±1.0				
2CL20A	20.0±1.0	9.0±1.0				
2CL20D		4.8±1.0				
3CL20A		8.0±1.0				
3CL20C		10.0±1.0				
3CL20T		4.0±1.0				
3CL25A	25.0±1.0	7.0±1.0				
3CL30A	30.0±1.0	7.0±1.0				
5CL30A		8.5±1.0				
5CL35A	35.0±1.0	5.5±1.0				

M Forming



Type	Dimensions millimeters P	H	d (Nom.)	Substrate Hole Dia.
1/2CM10C	10.0±1.0	3.5±1.0	0.6	ø0.8
1/2CM10F	10.0±1.0	5.0±1.0	0.6	
1CM12.5C	12.5±1.0	3.5±1.0	0.8	ø1.0
1CM12.5D	12.5±1.0	4.0±1.0	0.8	
1CM15F	15.0±1.0	5.0±1.0	0.8	
1CM15J	15.0±1.0	6.3±1.0	0.8	
1CM15S	15.0±1.0	11.0±1.0	0.8	
2CM15C	15.0±1.0	3.5±1.0	0.8	
2CM15E	15.0±1.0	4.5±1.0	0.8	
2CM20D	20.0±1.0	4.0±1.0	0.8	
2CM20U	20.0±1.0	13.5±1.0	0.8	
3CM20E	20.0±1.0	4.6±1.0	0.8	
3CM26E	26.0±1.0	4.7±1.0	0.8	
5CM30U	30.0±1.0	13.0±1.0	0.8	

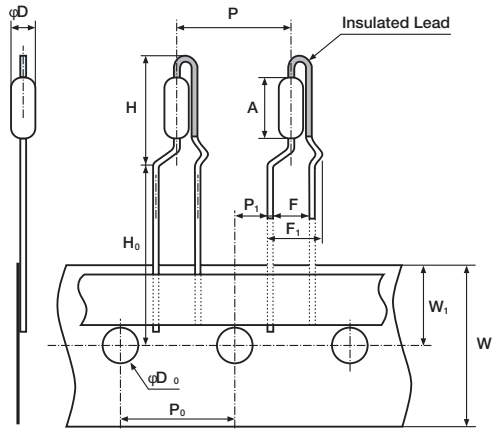
UCL Forming



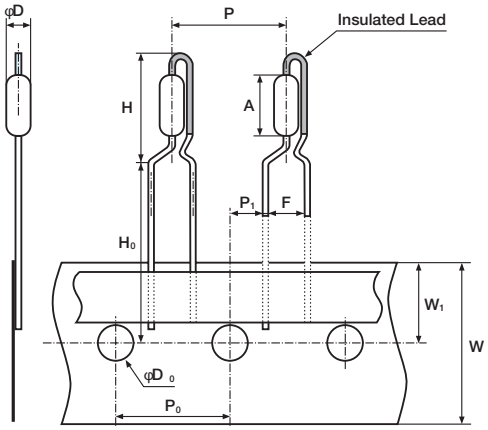
Type	Dimensions millimeters H1	H2	H3	d (Nom.)	Insertion Pitch	Substrate Hole Dia.
1CUCL	13.0±1.0	17.0 max.	3.5±1.0	0.8	5.0	ø1.0
2CUCL	14.5±1.0	18.5 max.	3.5±1.0			
3CUCL	20.0 max.	22.0±1.0	4.0±1.0			

secondary processed products (continued)

VTF Radial Taping

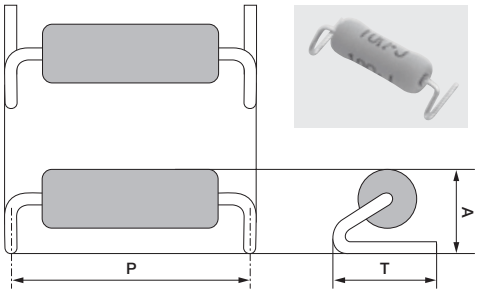


VTP Radial Taping



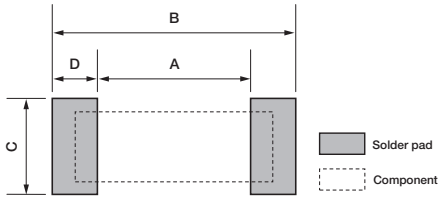
Type	1/2C VTP	1C VTP	2C VTP	2C VTF
A	6.2±0.5	9.0±1.0	12.0±1.0	12.0±1.0
øD	2.5±0.5	3.0±0.5	4.0±0.5	4.0±0.5
d (Nom.)	0.6	0.6	0.65	0.8
F	5.0±0.5	5.0±0.5	5.0±0.5	5.0±0.5
F1	—	—	—	7.3 max.
H	13 max.	16 max.	22.5 max.	22.5 max.
H0	16.0+1.0/-0	16.0+1.0/-0	16.0+1.0/-0	16.0+1.0/-0
P	12.7±1.0	12.7±1.0	12.7±1.0	12.7±1.0
P0	12.7±0.3	12.7±0.3	12.7±0.3	12.7±0.3
P1	3.85±0.7	3.85±0.7	3.85±0.7	3.85±0.7
W	18.0±0.5	18.0±0.5	18.0±0.5	18.0±0.5
W1	9.0±0.5	9.0±0.5	9.0±0.5	9.0±0.5
øD0	4.0±0.2	4.0±0.2	4.0±0.2	4.0±0.2
Substrate Hole Dia.	ø0.8	ø0.8	ø0.8	ø1.0

N Forming



Type	1C N14.5TEB	2C N17TEB	3C N20TEG
P±1	14.5	17.0	20.0
T±0.5	5.0	6.0	7.5±1.0
A±0.5	4.8	5.8	6.5
d (Nom.)	0.8	0.8	0.8

UCL Forming

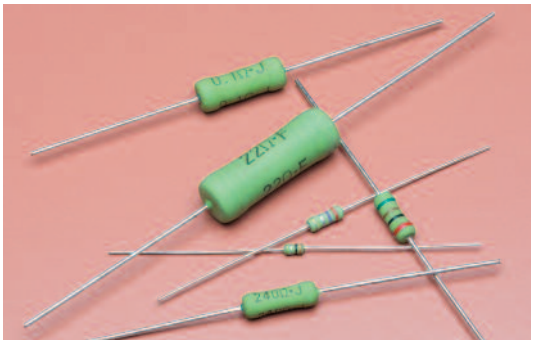


Type	1C N14.5TEB	2C N17TEB	3C N20TEG
A	12.5	14.6	17.6
B	16.5	19.4	22.4
C	7.0	8.0	9.5
D	2.0	2.4	2.4

leaded resistors

11/09/15

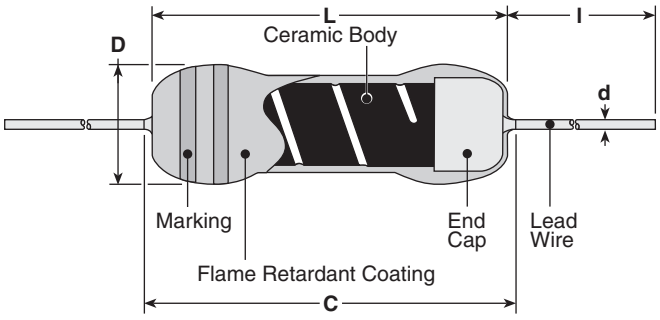
EU RoHS COMPLIANT



features

- Fixed metal film resistor available (specify “SPRX”)
- Flameproof silicone coating equivalent to (UL94V0)
- High reliability performance
- Suitable for automatic machine insertion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- Surface mount style “N” forming is suitable for automatic mounting

dimensions and construction



Type	Dimensions inches (mm) L	C (max.)	D	d nominal	l*
SPR1/4 SPRX1/4	.13±.012 (3.3±0.3)	.138 (3.5)	.067±.012 (1.7±0.3)	.018 (0.45)	.787 Min. (20.0 Min.)
SPR1/2 SPRX1/2	.244±.02 (6.2±0.5)	.280 (7.1)	.098±.02 (2.5±0.5)	.024 (0.6)	.945 Min. (24.0 Min.)
SPR1 SPRX1	.354±.039 (9.0±1.0)	.437 (11.1)	.138±.02 (3.5±0.5)	.031 (0.8)	
SPR2 SPRX2	.472±.039 (12.0±1.0)	.591 (15.0)	.165±.031 (4.2±0.8)		
SPR3 SPRX3	.610±.039 (15.5±1.0)	.709 (18.0)	.236±.039 (6.0±1.0)		1.18±.118 (30.0±3.0)
SPR5 SPRX5	.965±.039 (24.5±1.0)	1.10 (28.0)	.354±.039 (9.0±1.0)		1.50±.118 (38.0±3.0)

* Lead length changes depending on taping and forming type.

ordering information

SPR	1/2	C	T52	R	103	J
Type	Power Rating	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
SPR SPRX	1/4: 0.25W 1/2: 0.5W 1: 1W 2: 2W 3: 3W 5: 5W	C: SnCu	Axial: T26, T52, T521, T631 Stand-off Axial: L52, L521, L631 Radial: VT, VTP, VTE, GT, VTF L, U, M, N Forming	A: Ammo R: Reel TEB: Embossed plastic (N forming)	±2%, ±5%: 2 significant figures + 1 multiplier “R” indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier “R” indicates decimal on value <100Ω	F: ±1% G: ±2% J: ±5%

For further information on packaging, please refer to Appendix C.

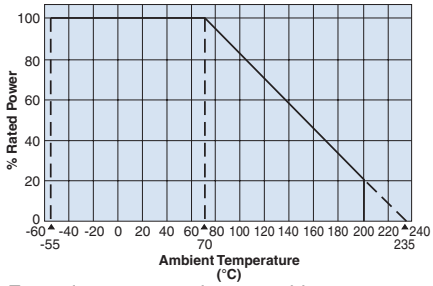
applications and ratings

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C)	Resistance Range E-24* (F±1%, G±2%)	Resistance Range E-24* (G±2%)	Resistance Range E-24 (J±5%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage
SPR1/4	0.25W	300V	±350	—	—	2.2Ω - 10KΩ	E = √P x R	500V
SPR1/2	0.5W	500V		10Ω - 91KΩ	10Ω - 91KΩ	2.2Ω - 91KΩ		800V
SPR1	1W							1000V
SPR2	2W	700V						
SPR3	3W						500V	
SPR5	5W	800V		10Ω - 100KΩ	10Ω - 100KΩ	2.2Ω - 110KΩ	600V	1200V
SPRX1/4	0.25W	300V		—	—	0.1Ω - 2.0Ω	E = √P x R	E x 2.5
SPRX1/2	0.5W	500V		1.0Ω - 2.0Ω	0.22Ω - 2.0Ω			
SPRX1	1W							
SPRX2	2W	700V						
SPRX3	3W			—	—			
SPRX5	5W	800V						

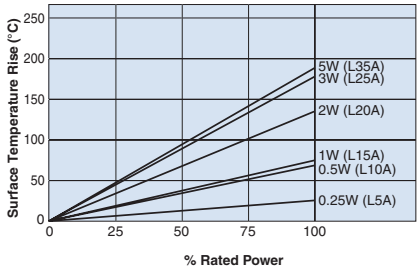
* Please consult when there is a demand of the resistance besides the 1% and 2% range.
Rated Ambient Temperature: +70°C Operating Temperature Range: -55°C to +200°C

environmental applications

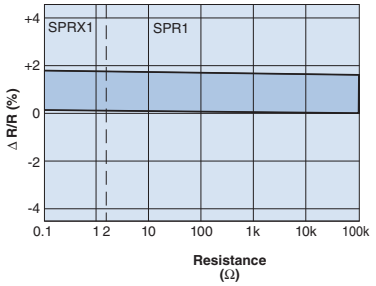
Derating Curve



Surface Temperature Rise



Load Life @ 70°C, 1000 Hr



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

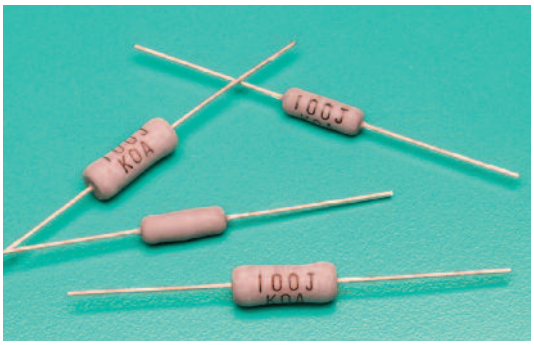
Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	Measuring points are at 10mm ±1mm from the end cap.
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±(1%+0.1Ω)	±0.5%	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is lower
Resistance to Solder Heat	±1%	±0.5%	260°C ±5°C, 10 seconds ± 1 second
Terminal Strength	No lead-coming off and loose terminals	—	Twist 360°C, 5 times
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +155°C (30 minutes), 5 cycles
Moisture Resistance	±(3%+0.1Ω):1/4W-2W ±(5%+0.1Ω):3W,5W	1.5: 1/4W-2W 2.5: 3W, 5W	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±(3%+0.1Ω):1/4W-2W ±(5%+0.1Ω):3W,5W	1.5: 1/4W-2W 2.5: 3W, 5W	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible	—	Ultrasonic washing with isopropyl alcohol for 2 minutes. Power: 0.3W/cm³, f: 28kHz, Temp: 35°C ±5°C
Flame Retardant	No evidence of flaming or self-flaming	—	Flame test: the test flame shall be applied and removed for each 15 seconds respectively to repeat the cycle 5 times. Overload flame retardant: power (AC) corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1 minute until disconnection occurs. However the applied voltage shall not exceed the value of 4 times of the maximum operating voltage

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 12/01/19

CWFS

coat-insulated wirewound resistors (with fusing function)

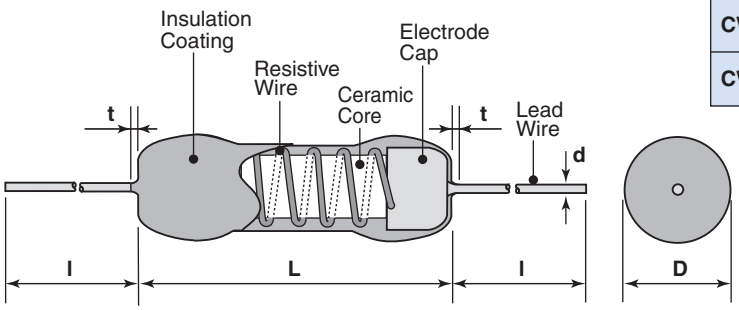
EU RoHS COMPLIANT



features

- Flameproof retardant coating (equivalent to UL94-V-0)
- Fail-safe mains fusing at AC 250V (CWFS23: 4.7Ω~9.1Ω: AC200V)
- Products with lead-free terminations meet EU RoHS

dimensions and construction



Type	Dimensions inches (mm)				
	L	D	l	d (nom.)	t (max.)
CWFS23	.472±.039 (12.0±1.0)	.157±.039 (4.0±1.0)	1.18±.118 (30.0±3.0)	.031 (0.8)	.118 (3.0)
CWFS35	.591±.039 (15.0±1.0)	.236±.039 (6.0±1.0)	1.18±.118 (30.0±3.0)	.031 (0.8)	.118 (3.0)

ordering information

CWF	S	23	C	T52	A	100	J
Product Code	Type	Power Rating	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
	S: Safety Fusing	23: 3W 35: 5W	C: SnCu	23: T52 35: T521	A: Ammo	J: 3 digits	J: ±5%

Contact KOA when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

For further information on packaging, please refer to Appendix C.

Lead length changes depending on taping and forming type.

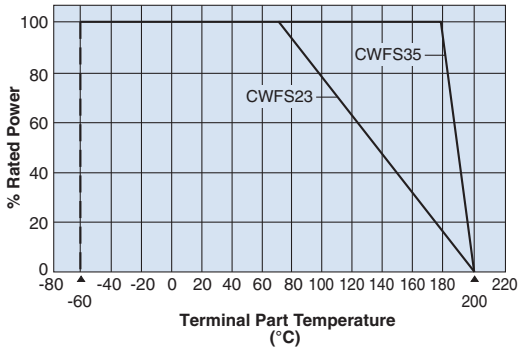
applications and ratings

Part Designation	Power Rating	Rated Terminal Part Temperature	Resistance Range E-24 (J±5%)	Fusing Characteristics		T.C.R. ($x10^{-6}$/K)	Operating Temperature Range
				Fusing Power	Fusing Time		
CWFS23	3	+120°C	4.7Ω - 100Ω	90W	30 Sec Max.	±100	-55°C to +200°C
CWFS35	5	+180°C	4.7Ω - 100Ω	150W	30 Sec Max.	±100	

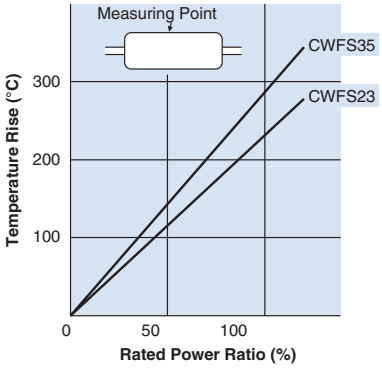
Rated voltage= $\sqrt{\text{Power Rating} \times \text{Resistance value}}$

environmental applications

Derating Curve



Temperature Rise (Ref.)



Fixing Board t=1.2 Material: Glass Epoxy Board

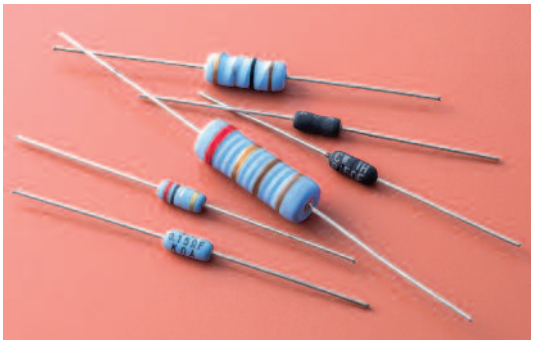
Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	±100X10^{-6}/K	—	+25°C/-55°C and +25°C/+125°C
Melt Time	30 seconds	4 seconds	Power rating x 30
Overload (Short Time)	5%	2%	Rated rating x 10, 5 seconds
Resistance to Solder Heat	1%	0.8%	350°C ± 10°C for 3.5 seconds or 260°C ± 5°C for 10 seconds
Moisture Resistance	5%	4%	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance of Rated Terminal Part Temperature	5%	3%	CWFS23: 120°C ± 2°C; CWFS35: 180°C ± 2°C 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormaly in appearance such as disappearance of making, etc.	—	On immersing the sample in IPA for 3 min., the resistor surface should be lightly wiped with a dry cloth (velvet or gauze)

KOA SPEER ELECTRONICS, INC.

CW, CWP, CWH

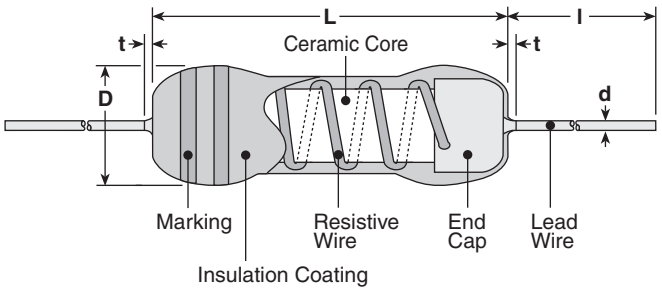
coat-insulated, precision coat-insulated and miniature wirewound leaded resistors



features

- Flameproof silicone coating equivalent (UL94V0)
- CWH resistors meet MIL-PRF-26 (U characteristics)
- CWH high precision resistors with T.C.R. less than ±20x10^{-6}/K
- Suitable for automatic machine insertion
- Various types of formings are available
- Excellent in pulse characteristic
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- CW1SS has UL1412 approval (File No. E320246)
- Surface mount style “N” forming is suitable for automatic mounting CW, CWP

dimensions and construction



Type	Dimensions inches (mm) L	t (max.)	D	d (nom.)	l*
CW1/4	.13±.012 (3.3±0.3)	.02 (0.5)	.075±.012 (1.9±0.3)	.018 (0.45)	1.18±.118 (30.0±3.0)
CW1/2	.256±.039 (6.5±1.0)	.039 (1.0)	.098±.039 (2.5±1.0)	.024 (0.6)	
CW1	.354±.039 (9.0±1.0)	.118 (3.0)	.138±.039 (3.5±1.0)	.031 (0.8)	
CW1X			$.138^{+.006}_{-0}$ $(3.5^{+1.5}_{-0})$		
CW1P			.138±.039 (3.5±1.0)		
CW2	.472±.039 (12.0±1.0)		.157±.039 (4.0±1.0)		
CW2X			$.157^{+.006}_{-0}$ $(4.0^{+1.5}_{-0})$		
CW2P			.157±.039 (4.0±1.0)		
CW3	.591±.039 (15.0±1.0)		.236±.039 (6.0±1.0)		
CW3X			$.236^{+.006}_{-0}$ $(6.0^{+1.5}_{-0})$		
CW3P			.236±.039 (6.0±1.0)		
CW5	.945±.006 (24.0±1.5)		.354±.006 (9.0±1.5)		1.50±.118 (38.0±3.0)
CW1S	.256±.039 (6.5±1.0)	.039 (1.0)	.098±.039 (2.5±1.0)	.024 (0.6)	1.18±.118 (30.0±3.0)
CW1SS					
CW1H	.354±.039 (9.0±1.0)	.118 (3.0)	.138±.039 (3.5±1.0)	.031 (0.8)	1.18±.118 (30.0±3.0)
CW2H	.472±.039 (12.0±1.0)		.157±.039 (4.0±1.0)		
CW3H	.591±.039 (15.0±1.0)		.236±.039 (6.0±1.0)		

* Lead length changes depending on taping and forming type.

KOA SPEER ELECTRONICS, INC.

CW, CWP, CWH

coat-insulated, precision coat-insulated and miniature wirewound leaded resistors

ordering information

CW	1/2	P	C	T52	A	103	F
Type	Power Rating	Style	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
	1/4: 0.25W 1/2: 0.5W 1: 1W 2: 2W 3: 3W 5: 5W	H: Stability Nil: Power P: Precision S: Small X: Power SS: Small type, UL Approved	C: SnCu	Axial: T26, T52, T521, T631 Stand-off Axial: L52A, L52B Radial: VTP*, GT L forming: L12.5A, L15A, L20A, L25A N forming: N17, N20	A: Ammo R: Reel TEB: TEG: Embossed plastic (N forming) Nil: Box	±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	C: ±0.25% D: ±0.5% F: ±1% G: ±2% J: ±5% K: ±10%

For further information on packaging, please refer to Appendix C.
Contact us when you have control request for environmental hazardous material other than the substance specified by the EU RoHS

* VTP: Applicable to 0.47Ω or over for CW1, CW1P only

applications and ratings

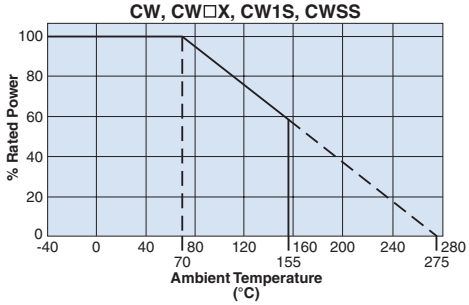
Part Designation	Power Rating	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) E-24, E-96 (C±0.25%)	E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)	E-24 (K±10%)	Rated Ambient Temperature	Operating Temperature Range
CW1/4	0.25W	±250	—	—	—	—	0.47 - 15	0.47 - 15	+70°C	-40°C to +155°C
CW1/2	0.5W						0.1 - 100	0.1 - 100		
CW1	1.0W					0.1 - 390	0.1 - 390	—		
CW2	2.0W					0.1 - 390	0.1 - 390			
CW3	3.0W					0.1 - 390	0.1 - 390			
CW5	5.0W					0.1 - 390	0.1 - 390			
CW1X	1.0W	±500	—	—	—	—	0.01 - 0.091	0.01 - 0.091		
CW2X	2.0W						0.01 - 0.091	0.01 - 0.091		
CW3X	3.0W						0.01 - 0.091	0.01 - 0.091		
CW1S	1.0W	±250	—	—	—	—	0.1 - 100	0.1 - 100		
CW1SS	1.0W	±100	—	—	—	—	10	—		
CW1P	1.0W	±90: R≥10Ω ±50: R<10Ω	1 - 100	0.47 - 220	0.1 - 430	—	—	—	+25°C	
CW2P	2.0W		1 - 390	0.47 - 390	0.1 - 390					
CW3P	3.0W		1 - 390	0.47 - 390	0.1 - 390					
CW1H	1.0W	±20: R≥10Ω ±50: R<10Ω	—	0.47 - 220	0.1 - 430	—	—	—	+25°C	-55°C to +275°C
CW2H	2.0W			0.47 - 750	0.1 - 2k					
CW3H	3.0W			0.47 - 1k	0.1 - 3k					

CW_H: Max. Working Voltage: E= $\sqrt{(PxR)}$ CW_H: Max. Overload Voltage: E= $\sqrt{(PxRx5)}$

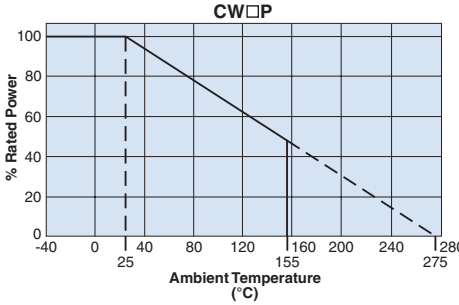
environmental applications

Derating Curve

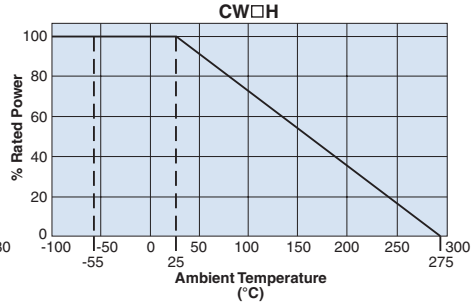
CW, CW□X, CW1S, CWSS



CW□P



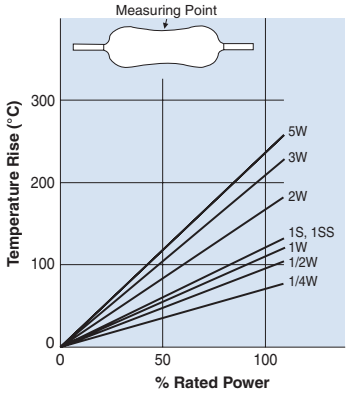
CW□H



For resistors operated at an ambient temperature of 25°C or above, a power rating shall be derated in accordance with the above derating curve.

environmental applications

Surface Temperature Rise



Fixing board: t=1.2
Material: Glass epoxy board

Performance Characteristics

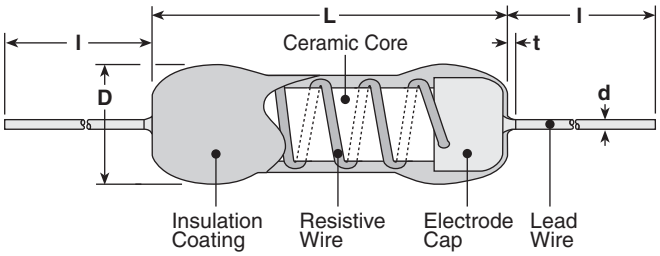
Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	CW: +25°C/+125°C CW□P: +25°C/-40°C and +25°C/+155°C CW□H: +25°C/-55°C and +25°C/+125°C
Overload (Short Time)	1%: CW, CWX; 0.5%: CW□P; 2%: CW1S, CW1SS 0.2%: CW□P(R<10Ω)*, CW□H	0.8%: CW, CW□X; 0.4: CW□P 1.8%: CW1S, CW1SS 0.18%:CW□P(R<10Ω) 0.15%: CW□H	CW,CW□X,CW1S,CW1SS: Power rating x 10 for 5 seconds CW□P: Power rating x 6.25 for 5 seconds CW□P (R<10Ω), CW□H: Power rating x 5 for 5 seconds
Resistance to Solder Heat	1%: CW, CW1S, CW1SS, CW□X; 0.5%: CW□P; 0.2%: CW□P (R<10Ω)*, CW□H	0.8%: CW, CW1S, CW1SS, CW□X; 0.4%: CW□P; 0.18%: CW□P (R<10Ω); 0.15%: CW□H	350°C ± 10°C, 3 seconds ± 0.5 second 260°C ± 5°C, 10 seconds ± 1 second
Moisture Resistance	5%: CW, CW1S, CW□X 2%: CW□P 0.5%: CW□P (R<10Ω)*	4%: CW, CW1S, CW□X 1.6%: CW□P 0.45%: CW□P (R<10Ω)	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance @ 70°C	5%: CW, CW1S, CW1SS, CW□X; 2%: CW□P 0.5%: CW□P (R<10Ω)*	4%: CW, CW1S, CW1SS, CW□X; 1.6%: CW□P 0.45%: CW□P (R<10Ω)	70°C, 1000 hours (CW, CW□X, CW1S, CW1SS), 25°C, 1000 hours (CW□P) 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormality in appearance such as disappearance of markings, etc.	—	After immersing the sample in IPA for 3 min., the resistor surface should be lightly wiped with a dry cloth (velvet or gauze)
Low Temperature	0.2%: CW□H	0.15%: CW□H	-65°C, 24 hours
High Temperature	0.5%: CW□H	0.45%: CW□H	+275°C, 250 hours
Thunder Surge	3%: CW1SS	—	Combination wave, +1.5kV 20 seconds 3 cycles
Load Life	0.5%: CW□H	0.45%: CW□H	-25°C, power rating, 1.5 hr ON, 0.5 hr OFF 2000 hours

* Refer to MIL-PRF-26G standard

features

- Resistors meeting MIL-R-26E (U and V characteristics) and surface temperature (hot spot) 350°C max.
- Resistors with a wide range of 0.1Ω ~ 62kΩ, covering applications from precision to power
- RW☐N type resistors are non-inductive wound and can be used in high frequency applications.
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type	Dimensions inches (mm) L	D	d (nom.)	l
RW1/2, RW1/2N	.315±.039 (8.0±1.0)	.138$^{+.039}_{-0}$ (1.6$^{+1.0}_{-0}$)	.020 (0.5)	1.50±.118 (38.0±3.0)
RW1, RW1N	.413±.039 (10.5±1.0)	.106±.039 (2.7±1.0)		
RW2, RW2N	.512±.039 (13.0±1.0)	.205±.039 (5.2±1.0)	.031 (0.8)	
RW3, RW3N	.650±.039 (16.5±1.0)	.252±.039 (6.4±1.0)	.039 (1.0)	
RW5, RW5N	.866±.039 (22±1.0)	.307±.059 (7.8±1.5)		
RW7, RW7N	1.24±.039 (31.5±1.0)			
RW10, RW10N	1.81±.059 (46.0±1.5)	.366±.089 (9.3±1.5)		

ordering information

Pb Free Type

RW	1/2	N	T	103	J
Type	Power Rating	Winding Method	Termination Material	Nominal Resistance	Tolerance
	1/2: 0.5W 1: 1W 2: 2W 3: 3W 5: 5W 7: 7W 10: 10W	Nil: Standard winding N: Non-inductive winding	T: Sn	±3%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±0.5%, ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	D: ±0.5% F: ±1% H: ±3% J: ±5%

Packaging quantity:
RW1/2 ~ RW1: 1,000 pieces
RW2 ~ RW7: 500 pieces
RW10: 300 pieces

11/21/17

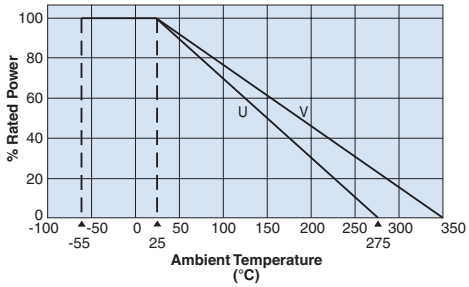
applications and ratings

Part Designation	Power Rating U	Power Rating V	Resistance Range (Ω) D±0.5% (E24 • E96 25x10ⁿ•50x10ⁿ)	Resistance Range (Ω) F±1% (E24 • E96 25x10ⁿ•50x10ⁿ)	Resistance Range (Ω) H±3% (E24 & 25x10ⁿ•50x10ⁿ)	Resistance Range (Ω) J±5% (E24 & 25x10ⁿ•50x10ⁿ)	T.C.R. (ppm/°C)	Max. Working Voltage	Max. Overload Voltage
RW1/2	0.5W	—	10 - 2.61k	10 - 2.61k	0.47 - 2.7k	0.47 - 2.7k	+20/-50: R≥10Ω +50/-70: 1Ω≤R<10Ω +400/-90: R<1Ω	80V	150V
RW1/2N			—	10 - 2.37k	10 - 2.4k	10 - 2.4k			
RW1	1.0W	—	1 - 5.11k	1 - 5.11k	0.1 - 5.1k	0.1 - 5.1k		130V	300V
RW1N			—	10 - 3.74k	10 - 3.6k	10 - 3.6k			
RW2	2.0W	3.0W	1 - 10k	1 - 10k	0.1 - 10k	0.1 - 10k		140V	500V
RW2N			—	15 - 10k	10 - 10k	10 - 10k			
RW3	3.0W	5.0W	1 - 15k	1 - 15k	0.1 - 15k	0.1 - 15k		200V	600V
RW3N			—	15 - 15k	15 - 15k	15 - 15k			
RW5	5.0W	7.0W	1 - 30.1k	1 - 30.1k	0.1 - 30k	0.1 - 30k		400V	700V
RW5N			—	20 - 29.4k	20 - 30k	20 - 30k			
RW7	7.0W	10W	1 - 45.3k	1 - 45.3k	0.1 - 47k	0.1 - 47k		600V	800V
RW7N			—	36 - 44.2k	36 - 43k	36 - 43k			
RW10	10W	14W	1 - 60.4k	1 - 60.4k	0.1 - 62k	0.1 - 62k		1000V	1500V
RW10N			—	62 - 49.9k	62 - 51k	62 - 51k			

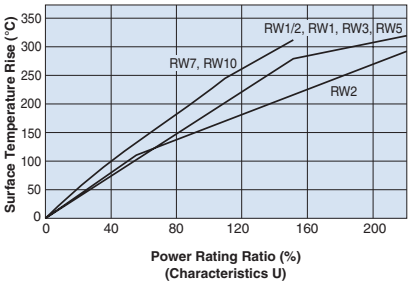
Operating Temperature Range: Characteristic U: -55°C ~ +275°C, V: -55°C ~ +350°C

environmental applications

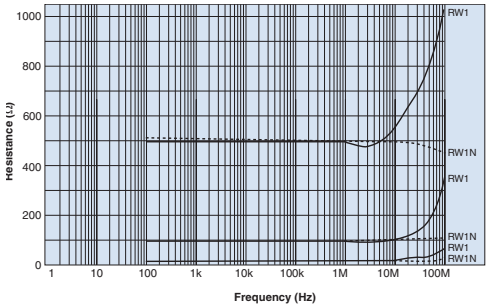
Derating Curve



Surface Temperature Rise



Frequency Characteristics



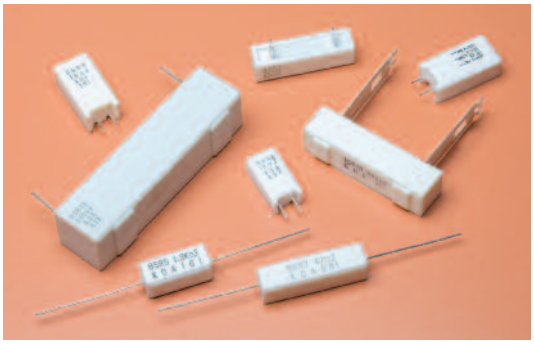
Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.05Ω)	Test Method
Resistance	Within regulated tolerance	25°C
T.C.R.	Within specified T.C.R.	+25°C/-55°C, +25°C/+125°C
Overload (Short time)	0.2%: U	Rated power x 5 or Max. overload voltage, whichever is lower for 5 seconds
	2%: V	Rated power x 10 or Max. overload voltage, whichever is lower for 5 seconds
Resistance to Solder Heat	0.1%	350°C ± 10°C, 3 seconds ± 0.5 seconds or 260°C ± 5°C, 10 seconds ± 1 second
Moisture Resistance	0.2%: U 2%: V	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON/0.5 hr OFF cycle
Endurance @ 25°C	0.5%: U 3%: V	25°C, 2000 hours 1.5 hr ON/0.5 hr OFF cycle
High Temperature Exposure	0.2%: U	275^{+5}_{-0} °C, 250 hours
	2%: V	350^{+5}_{-0} °C, 250 hours

KOA SPEER ELECTRONICS, INC.

BGR, BWR, BSR

rectangular type wirewound resistors with glass core
rectangular type wirewound resistors with ceramic core
rectangular type metal oxide film resistors



features

- High power resistor
- Use flame-retardant insulated ceramic case
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Excellent with anti-pulse and inrush current

EU RoHS COMPLIANT

leaded resistors

applications and ratings

Type	Power Rating	Resistance Range (Ω) E24				Style & Weight (g/1 piece)													
		F±1%	G±2%	J±5%	K±10%	S	N	E	P	X	Y	YS	Z	H	Q	HA	HB	QA	QB
BWR1	1W	1~56	0.22~75	0.1~75	—	1.3	—	—	—	—	—	—	—	—	—	—	—	—	—
BWR2	2W	1~160	0.22~200	0.1~200	—	2.1	3.9	—	—	—	—	—	—	—	—	—	—	—	—
BWR3	3W	1~300	0.22~390	0.1~390	—	3.9	5.9	—	—	—	—	—	—	—	—	—	—	—	—
BWR5	5W	1~300	0.22~390	0.1~390	—	5.1	7.2	5.7	5.6	—	—	—	—	—	—	—	—	—	—
BWR7	7W	1~360	0.22~390	0.1~390	—	7.5	10.8	—	—	—	—	—	—	—	—	—	—	—	—
BWR10	10W	1~390	0.22~390	0.1~390	—	10.2	15.0	—	—	—	—	—	—	—	—	—	—	—	—
BWR15	15W	1~390	0.22~390	0.1~390	—	18.8	—	—	—	—	—	—	—	—	—	—	—	—	—
BWR20	20W	1~390	0.22~390	0.1~390	—	23.3	—	—	—	—	—	—	—	—	—	—	—	—	—
BGR5	5W	—	—	10~390	0.39~9.1	—	—	—	—	6.1	7.6	6.6	7.6	—	6.2	—	—	—	—
BGR7	7W	—	—	10~390	0.39~9.1	—	—	—	—	8.2	9.1	7.8	9.1	—	7.8	—	—	—	—
BGR10	10W	—	—	10~390	0.39~9.1	—	—	—	—	11.0	12.4	10.4	11.4	9.9	10.7	13.6	—	14.5	—
BGR15	15W	—	—	10~390	0.51~9.1	—	—	—	—	18.8	—	—	20.5	18.4	18.6	24.4	27.5	24.6	27.7
BGR20	20W	—	—	10~390	0.51~9.1	—	—	—	—	22.3	—	—	24.0	21.9	22.1	27.9	31.0	28.1	31.3
BGR30	30W	—	—	10~390	2.2~9.1	—	—	—	—	—	—	—	—	59.3	59.6	73.9	73.5	74.2	73.8
BGR40	40W	—	—	10~390	2.2~9.1	—	—	—	—	—	—	—	—	70.4	70.6	85.0	84.6	85.2	84.8
BSR2	2W	—	—	430~13k	—	2.1	3.8	—	—	—	—	—	—	—	—	—	—	—	—
BSR3	3W	—	—	430~27k	—	3.9	5.9	—	—	—	—	—	—	—	—	—	—	—	—
BSR5	5W	—	—	430~51k	—	5.1	7.2	5.7	—	6.1	7.6	6.6	7.6	—	6.2	—	—	—	—
BSR7	7W	—	—	430~56k	—	7.4	10.8	—	—	8.2	9.1	7.8	9.1	—	7.8	—	—	—	—
BSR10	10W	—	—	430~75k	—	10.2	15.0	—	—	11.0	12.4	10.4	11.4	10.9	10.7	13.7	—	14.5	—
BSR15	15W	—	—	430~56k	—	18.8	—	—	—	18.5	—	—	20.5	18.4	18.6	24.4	27.5	24.6	27.7
BSR20	20W	—	—	430~56k	—	23.3	—	—	—	22.0	—	—	24.0	21.9	22.1	27.9	31.0	28.1	31.3

Type	Power Rating	Max. Working Voltage (V)		Max. Overload Voltage (V)		T.C.R. (x10⁻⁶/K)			Rated Ambient Temperature	Operating Temperature Range
		BSR	BGR,BWR	BSR	BGR,BWR	BWR	BSR	BGR		
BWR1	1W	—	E=√P•R	—	E=√P•R•10	±100	—	—	+70°C	-40°C to +155°C
B□R2	2W	250		500			±300			
B□R3	3W	300		600						
B□R5	5W	350		700				±250		
B□R7	7W	500		1000						
B□R10	10W	700		1400						
B□R15	15W	700		1400					+25°C	
B□R20	20W	750		1500						
BGR30	30W	—		—		—	—			
BGR40	40W	—		—						

Rated voltage= √Power Rating × Resistance value or Max. working voltage, whichever is lower.
□ Represents the space to designate product type via character G, W, or S.
Please consult with us in advance about custom-made products.

BGR, BWR, BSR

rectangular type wirewound resistors with glass core
rectangular type wirewound resistors with ceramic core
rectangular type metal oxide film resistors

ordering information

BWR	3	C	N	100	J
Type	**Power Rating**	**Termination[1] Material**	**Style**	**Nominal Resistance**	**Tolerance**
BGR: Wirewound (glass core) BWR: Wirewound (ceramic core) BSR: Metal oxide film	See table	C: SnCu T: Sn	Blank: S style[2] N: N style E: E style P: P style X: X style Y: Y style YS: YS style Z: Z style H: H style Q: Q style HA: HA style HB: HB style QA: QA style QB: QB style	+1%: 3 significant figures + 1 multiplier "R" indicates decimal on values <100Ω +2%, +5%, +10%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω	F: ±1% G: ±2% J: ±5% K: ±10%

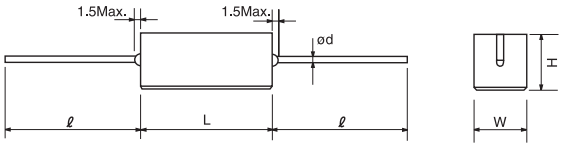
[1] Lead-Free plated terminal symbols.
C (SnCu) N, E, S and P styles
T (Sn) X, Y, YS, Z, H, and Q styles

[2] No indication on style means S style.

Contact us if you have a request for environmentally hazardous materials other than the substance specified by EU RoHS.

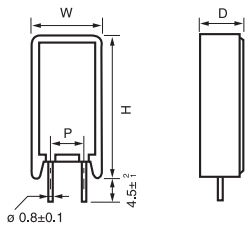
dimensions and construction

S Style

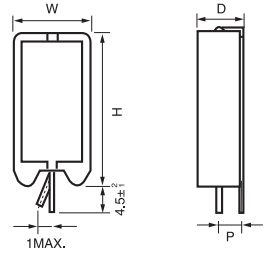


Type	Dimensions millimeters L	W	H	ℓ	d
BWR1C	13.0±1.0	5.5±1.0	5.5±1.0	30.0±3.0	0.6±0.1
BWR2C, BSR2C	18.0±1.5	6.3±1.0	6.3±1.0	35.0±3.0	0.8±0.1
BWR3C, BSR3C	22.0±1.5	8.0±1.0	8.0±1.0		
BWR5C, BSR5C		9.5±1.0	9.5±1.0		
BWR7C, BSR7C	35.0±1.5				
BWR10C, BSR10C	48.0±1.5				
BWR15C, BSR15C		12.5±1.2	12.5±1.2		
BWR20C, BSR20C	63.5±1.5	12.5±1.5	12.5±1.5		

N Style



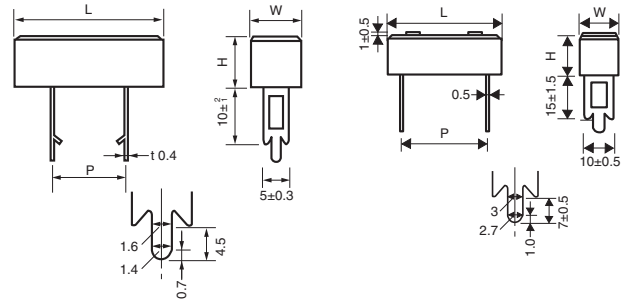
E Style



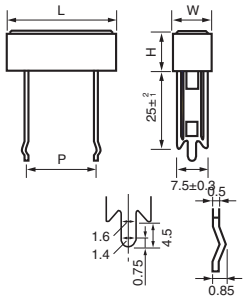
Type	Dimensions millimeters W±1	D±1	H±1.5	P +2 -1
BWR2CN, BSR2CN	11	7	20.5	5
BWR3CN, BSR3CN	12	8	25	
BWR5CN, BSR5CN	13	9	25.5	
BWR7CN, BSR7CN			38.5	
BWR10CN, BSR10CN	16	12	35	7.5
BWR5CE, BSR5CE	9.5	9.5	23.5	5

dimensions and construction (continued)

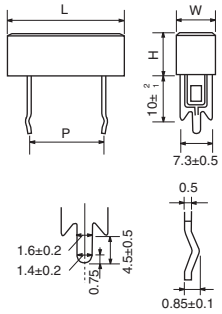
X Style (5W, 7W, 10W) (15W, 20W)



Y Style

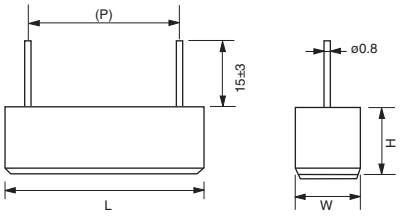


YS Style



Type	Dimensions millimeters			
	L±1.5	W±1.0	H±1.0	P±1.5
BGR5TX, BSR5TX, BGR5TY, BSR5TY, BGR5TYS, BSR5TYS	27	9.5	9.5	15
BGR7TX, BSR7TX, BGR7TY, BSR7TY, BGR7TYS, BSR7TYS	35			22.5
BGR10TX, BSR10TX, BGR10TY, BSR10TY, BGR10TYS, BSR10TYS	48			35
BGR15TX, BSR15TX		12.5	12.5	32.5
BGR20TX, BSR20TX	63.5			47.5

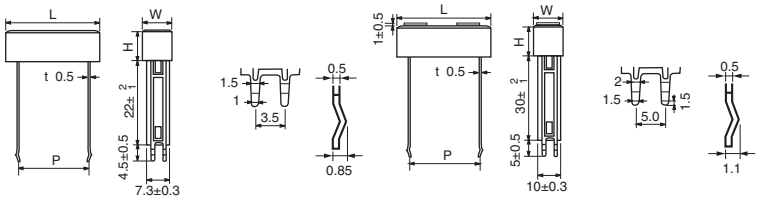
P Style



Type	Dimensions millimeters			
	L	W	H	(P)
BWR5CP	23.0±1.5	9.5±1.5	9.5±1.5	20

Parenthesized dimensions are for reference.
Please refrain from using these parts as a board-insertion type.
* Soldering only does not allow enough joint strength.
Additional fixation is recommended.

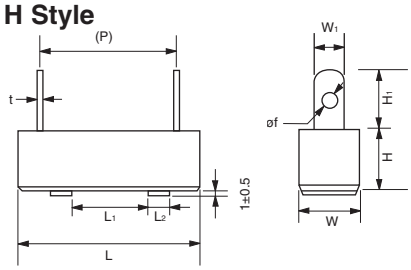
Z Style (5W, 7W, 10W) (15W, 20W)



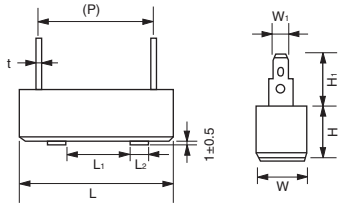
Type	Dimensions millimeters			
	L±1.5	W±1.0	H±1.0	P
BGR5TZ, BSR5TZ	27	9.5	9.5	15 +6 -2
BGR7TZ, BSR7TZ	35			22.5 +6 -2
BGR10TZ, BSR10TZ	48			35 +6 -2
BGR15TZ, BSR15TZ		12.5	12.5	32.5 +4 -0
BGR20TZ, BSR20TZ	63.5			47.5 +4 -0

dimensions and construction (continued)

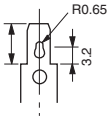
H Style



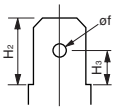
Q Style



(15W, 20W)



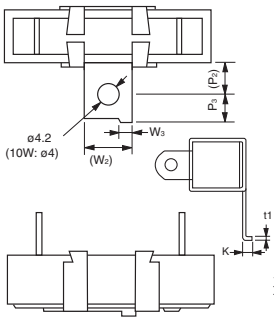
(5W, 7W, 10W, 30W, 40W)



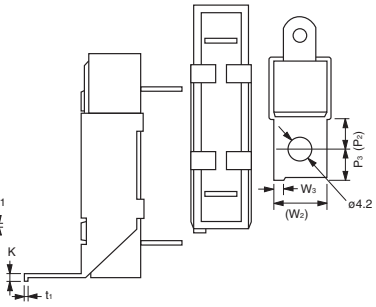
Type	Dimensions millimeters											
	L	L_1	L_2	W	W_1	H	H_1	H_2	(H_3)	(P)	t	(øf)
BGR10TH, BSR10TH	48±1.5	25±1.0	4.5	9.5±1.0	5.0	9.5±1.0	7.0±1.0	—	—	35	0.4	2.0
BGR15TH, BSR15TH			7.0	12.5±1.2	6.0	12.5±1.2	8.5±1.0			34.5	0.5	2.5
BGR20TH, BSR20TH	63.5±2									49.5		
BGR30TH	75±2.5	40±1.2	10.0	19.0±1.5	7.5	19.0±1.5	11.0±1.0			56		3.0
BGR40TH	90±2.5									71		
BGR5TQ, BSR5TQ	27±1.5	—	—	9.5±1.0	4.75	9.5±1.0	10.5±1.0	6.5	3.3	15.0	0.5	2.2
BGR7TQ, BSR7TQ	35±1.5									22.5		
BGR10TQ, BSR10TQ	48±1.5	25±1.0	4.5							35.0		
BGR15TQ, BSR15TQ			7.0	12.5±1.2		12.5±1.2	13.0±1.0	6.35	—	34.5		—
BGR20TQ, BSR20TQ	63.5±2									49.5		
BGR30TQ	75±2.5	40±1.2	10.0	19.0±1.5	6.3	19.0±1.5	12.0±1.0	8.0	4.1	56	0.8	1.7
BGR40TQ	90±2.5									71		

Parenthesized dimensions are for reference.

HA, QA Style



HB, QB Style



Type	Dimensions millimeters					
	(P_2)	P_3	(W_2)	W_3	K	t_1
BGR10THA, BSR10THA, BGR10TQA, BSR10TQA	8.0	6.0±1.0	12.0	3.0±0.3	2.8±0.3	0.6
BGR15THA, BSR15THA, BGR15TQA, BGR15THB, BSR15THB, BGR15TQB, BSR15TQA, BSR15TQB					3.0±0.3	0.8
BR20THA, BSR20THA, BGR20TQA BGR20THB, BSR20THB, BGR20TQB, BSR20TQA, BSR20TQB						
BGR30THA, BGR30THB, BGR30TQA, BGR30TQB	10.0	8.0±1.0	18.0	3.0±0.3		
BGR40THA, BRG40THB, BGR40TQA, BGR40TQB						

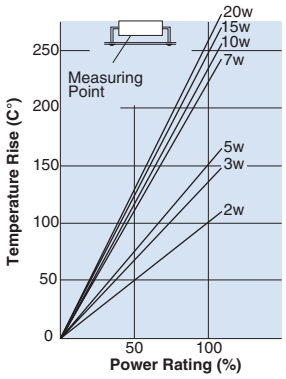
Parenthesized dimensions are for reference.

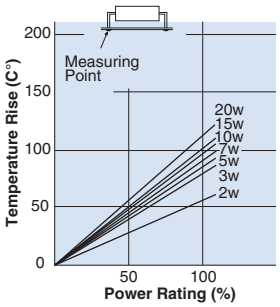
BGR, BWR, BSR

rectangular type wirewound resistors with glass core
rectangular type wirewound resistors with ceramic core
rectangular type metal oxide film resistors

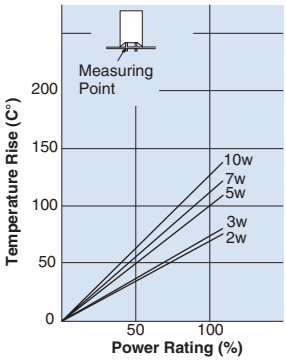
Temperature Rise

S Style

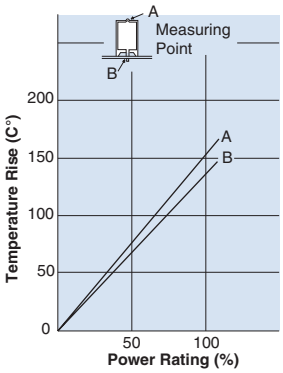




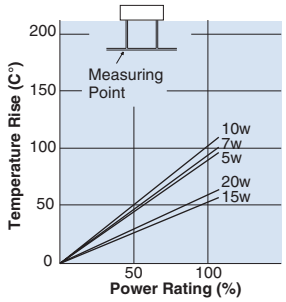
N Style



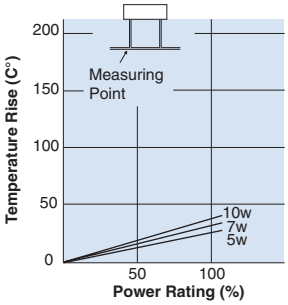
E Style



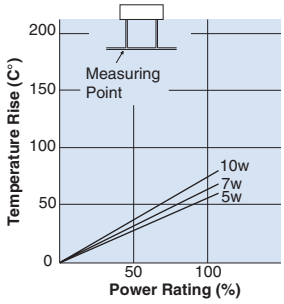
X Style



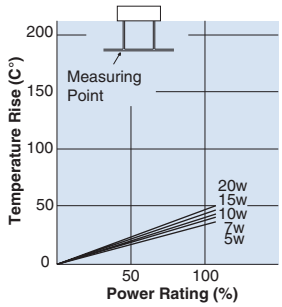
Y Style



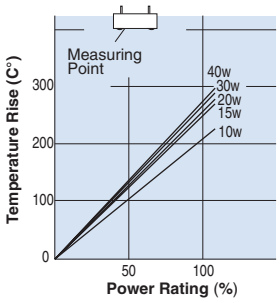
YS Style



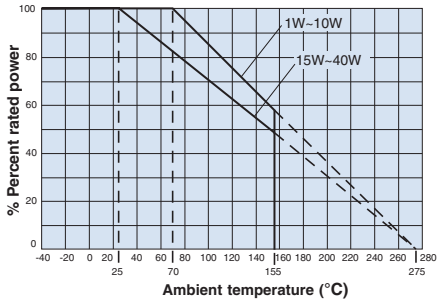
Z Style



H, Q Style



Derating Curve



environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±% Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Resistance to Solder Heat	1%: BWR, BSR 2%: BGR	0.8%: BWR 1.7%: BGR 0.9%: BSR	350°C ± 10°C for 3.5 seconds
Moisture Resistance	3%: BWR, BGR 5%: BSR	2.4%: BWR 2.55%: BGR 4.5%: BSR	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance @ 25°C or 70°C	3%: BWR 5%: BGR, BSR	2.4%: BWR 4.25%: BGR 4.5%: BSR	Rated voltage, 25°C or 70°C, 1000 hours, 1.5 hours ON/ 0.5 hours OFF cycle

6/26/20

KOA SPEER ELECTRONICS, INC.

BGRV, BWRV, BSRV

BGRV: rectangular type wirewound resistors with glass core (for automotive)
BWRV: rectangular type wirewound resistors with ceramic core (for automotive)
BSRV: rectangular type metal oxide film resistors (for automotive)

features

EU RoHS COMPLIANT

- High power resistors
- Uses flame-retardant insulated ceramic case
- Excellent in anti-pulse and inrush current
- Suitable for high reliability applications like automotive
- AEC-Q200 tested
- Products meet EU RoHS requirements

applications and ratings

Type	Power Rating	Pulse Energy Capacity (J)*	Resistance Range (Ω) E24		Style & Weight (g/1pcs)					
			J±5%	K±10%	S**	N**	Q	QA	QC	QE
BWRV3	3W	11	1~390	—	3.9	5.9	—	—	—	—
BWRV5	5W	17	1~390	—	5.1	7.2	—	—	—	—
BWRV7	7W	52	1~390	—	7.5	10.8	—	—	—	—
BWRV10	10W	100	1~390	—	10.2	15.0	—	—	—	—
BWRV15	15W	100	1~390	—	18.8	—	—	—	—	—
BWRV20	20W	180	1~390	—	23.3	—	—	—	—	—
BWRV40	40W	549	4.3~220	—	—	—	93.5	—	—	—
BGRV5	5W	16	10~390	5.1~9.1	—	—	6.2	—	—	—
BGRV7	7W	31	10~390	5.1~9.1	—	—	7.9	—	—	—
BGRV10	10W	60	10~390	5.1~9.1	—	—	10.7	14.5	—	—
BGRV15	15W	60	10~390	5.1~9.1	—	—	18.6	24.6	—	—
BGRV20	20W	95	10~390	5.1~9.1	—	—	22.1	28.1	—	—
BGRV30	30W	161	10~390	5.1~9.1	—	—	59.6	72.4	84.6	73.9
BGRV30TQW			10~100	5.1~9.1	—	—				
BGRV40	40W	226	10~390	5.1~9.1	—	—	70.6	85.2	95.6	84.9
BGRV40TQW			10~100	5.1~9.1	—	—				
BSRV3	3W	—	430~27k	—	3.9	5.9	—	—	—	—
BSRV5	5W	—	430~51k	—	5.1	7.2	6.2	—	—	—
BSRV7	7W	—	430~56k	—	7.5	10.8	7.9	—	—	—
BSRV10	10W	—	430~75k	—	10.2	15.0	10.7	14.5	—	—
BSRV15	15W	—	430~56k	—	18.8	—	18.6	24.6	—	—
BSRV20	20W	—	430~56k	—	23.3	—	22.1	28.1	—	—

* Average value between 10Ω~100Ω

** S Style and N Style lead terminal products are not compatible with the AEC-Q200 vibration test by only soldered PCB mounting. When using the product, please take into account vibration measures such as fixing the product with silicone resin.

Type	Power Rating	Rated Ambient Temperature	Max. Working Voltage (V)			Max. Overload Voltage (V)			T.C.R. (x10⁻⁶/K)			Operating Temperature Range
			BGRV	BWRV	BSRV	BGRV	BWRV	BSRV	BGRV	BWRV	BSRV	
B□RV3	3W	+70°C	—	$E=\sqrt{P•R}$	300	—	$E=\sqrt{P•R•10}$	600	—	±250	±300	-40°C to +155°C
B□RV5	5W		$E=\sqrt{P•R}$		350	$E=\sqrt{P•R•10}$		700	±250			
B□RV7	7W				500			1000				
B□RV10	10W				700			1400				
B□RV15	15W	+25°C			700			1400				
B□RV20	20W				750			1500				
BGRV30	30W			—	—		—	—		—	—	
BGRV40	40W											
BWRV40	40W		—	$E=\sqrt{P•R}$		—	$E=\sqrt{P•R•10}$		—	±250		

Rated voltage= $\sqrt{\text{Power Rating} \times \text{Resistance value}}$ or Max. working voltage, whichever is lower.
Please consult with us in advance about custom-made products.

KOA SPEER ELECTRONICS, INC.

BGRV, BWRV, BSRV

BGRV: rectangular type wirewound resistors with glass core (for automotive)
BWRV: rectangular type wirewound resistors with ceramic core (for automotive)
BSRV: rectangular type metal oxide film resistors (for automotive)

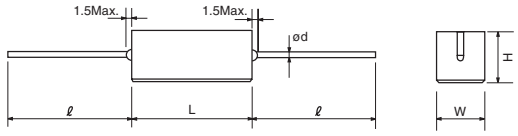
ordering information

BGRV	30	T	Q		A	300	J
Type	**Power Rating**	**Termination[1] Surface Material**	**Style[2]**	**Dimensional Accuracy[3]**	**Mounting Bracket**	**Nominal Resistance**	**Resistance Tolerance**
BGRV: Wirewound (glass core) BWRV: Wirewound (ceramic core) BSRV: Metal oxide film	See table	C: SnCu T: Sn	Nil: S style N: N style Q: Q style	Nil: Standard W: High precision	Nil: None A: A style C: C style E: E style	3 digits	J: ±5% K: ±10%

[1] Lead-Free plated terminal symbols. C (SnCu): S, N styles T(Sn): Q styles
[2] No indication on style means S style.
Contact us if you have a request for environmentally hazardous materials other than the substance specified by EU RoHS.

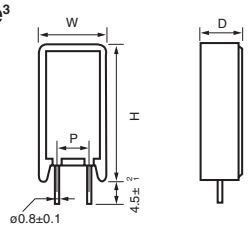
dimensions and construction

S Style[3]



Type	Dimensions millimeters L	W	H	ℓ	d
BWRV3C, BSRV3C	22±1.5	8±1.0	8±1.0	35±3	0.8±0.1
BWRV5C, BSRV5C		9.5±1.0	9.5±1.0		
BWRV7C, BSRV7C	35±1.5				
BWRV10C, BSRV10C	48±1.5				
BWRV15C, BSRV15C		12.5±1.2	12.5±1.2		
BWRV20C, BSRV20C	63.5±1.5				

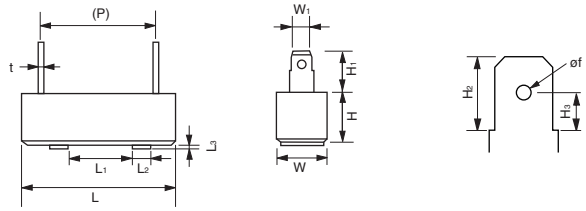
N Style[3]



Type	Dimensions millimeters W	D	H	P
BWRV3CN, BSRV3CN	12±1.0	8±1.0	25±1.5	5 +2 -1
BWRV5CN, BSRV5CN	13±1.0	9±1.0	25.5±1.5	
BWRV7CN, BSRV7CN			38.5±1.5	
BWRV10CN, BSRV10CN	16±1.0	12±1.0	35±1.5	7.5 +2 -1

[3] S Style and N Style lead terminal products are not compatible with the AEC-Q200 vibration test only by soldered PCB mounting.
When using the product, please take into account vibration measures such as fixing the product with silicone resin.

Q Style



Type	Dimensions millimeters L	L_1	L_2	L_3	W	W_1	H	H_1	H_2	(H_3)	(P)	t	(øf)
BGRV5TQ, BSRV5TQ	27±1.5	—	—	—	9.5±1.0	4.75±0.1	9.5±1.0	10.5±1.0	6.5±0.2	3.3	(15.0)	0.5±0.05	2.2
BGRV7TQ, BSRV7TQ	35±1.5										(22.5)		
BGRV10TQ, BSRV10TQ	48±1.5	25±1.0	4.5	1.0±0.5							(35.0)		
BGRV15TQ, BSRV15TQ			7		12.5±1.2		12.5±1.5	13.0±1.0	6.35±0.2	3.15	(34.5)	0.8±0.08	1.4
BGRV20TQ, BSRV20TQ	63.5±2										(49.5)		
BGRV30TQ	75±1.0	40±1.0	10		19.0±1.0	6.3±0.1	19.0±1.0	12.0±1.0	8.0±0.2	4.1	(56.0)		1.7
BGRV30TQW[4]	75±0.5	40±0.5			19.0±0.5		19.0±0.5				56±0.5		
BGRV40TQ	90±1.0	40±1.0			19.0±1.0		19.0±1.0				(71.0)		
BGRV40TQW[4]	90±0.5	40±0.5			19.0±0.5		19.0±0.5				71±0.5		
BWRV40TQ	91±1.0				20.0±0.5		20.0±0.5						

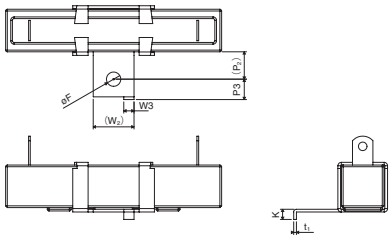
[4] High-precision products
Parenthesized dimensions are for reference.

BGRV, BWRV, BSRV

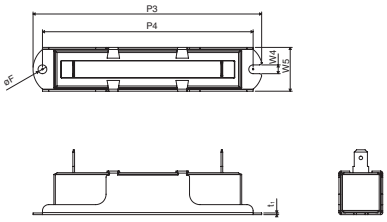
BGRV: rectangular type wirewound resistors with glass core (for automotive)
BWRV: rectangular type wirewound resistors with ceramic core (for automotive)
BSRV: rectangular type metal oxide film resistors (for automotive)

dimensions and construction (continued)

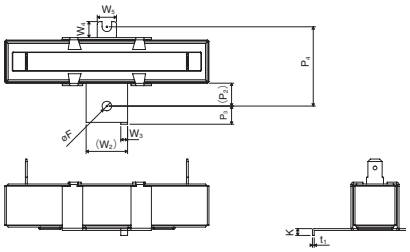
QA Style



QC Style NEW



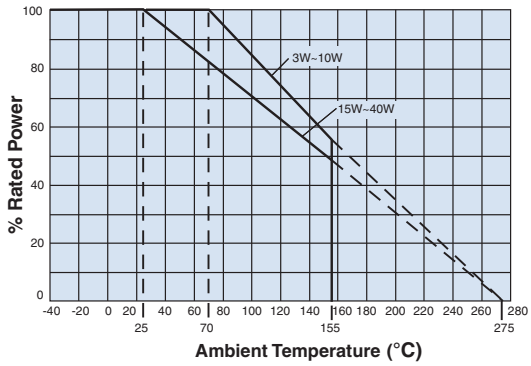
QE Style NEW



Type	Dimensions millimeters									
	(P_2)	P_3	P_4	(W_2)	W_3	(W_4)	(W_5)	K	t_1	øF
BGRV10TQA, BSRV10TQA	8.0	6.0±1.0	—	12.0	3.0±0.3	—	—	2.8±0.3	0.6	4.0
BGRV15TQA, BSRV15TQA								3.0±0.3	0.8	4.2
BGRV20TQA, BSRV20TQA										
BGRV30TQC, BGRV30TQWC	—	110±1.0	101±1.0	—	—	4.2	21.0	—		
BGRV40TQC, BGRV40TQWC										
BGRV30TQE, BGRV30TQWE	10.0	8.0±1.0	35.0±1.0	18.0	3.0±0.3	7.0	8.5	3.0±0.3		
BGRV40TQE, BGRV40TQWE										

Parenthesized dimensions are for reference.

Derating Curve



environmental applications

Performance Characteristics

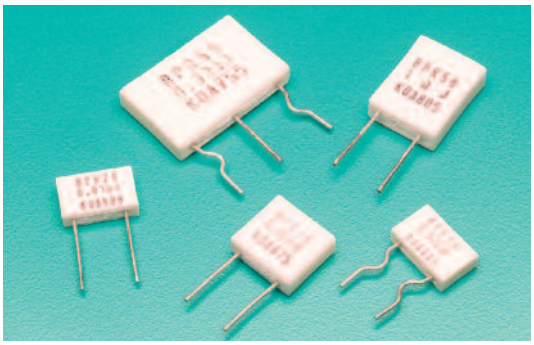
Parameter	Requirement Δ R ±%		Test Method
	Limit	Typical	
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Resistance to Soldering Heat	1%: BWRV, BSRV 2%: BGRV	0.5%: BWRV, BSRV 1.0%: BGRV	350°C ± 10°C for 3.5 seconds
Moisture Resistance	3%: BWRV, BGRV 5%: BSRV	2.0%: BWRV, BGRV 2.5%: BSRV	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance @ 25°C or 70°C	3%: BWRV 5%: BGRV, BSRV	2.0%: BWRV 2.5%: BGRV, BSRV	25°C or 70°C, rated voltage, 1000 hours, 1.5 hours ON, 0.5 hours OFF cycle

KOA SPEER ELECTRONICS, INC.

BPR

rectangular type metal plate resistors

EU RoHS COMPLIANT

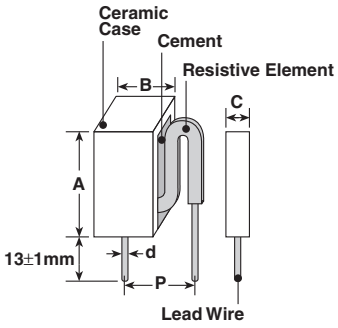


features

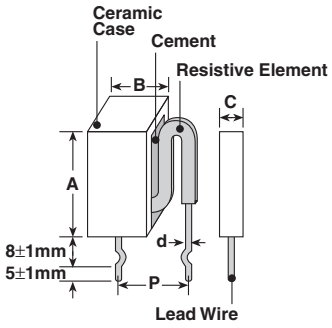
- Power type current detecting resistors
- Flame retardant resistors in ceramic case
- Automatic insertion for a 5mm pitch between terminals is applicable (26 type, 58 type)
- Low inductance
- Space saving
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction

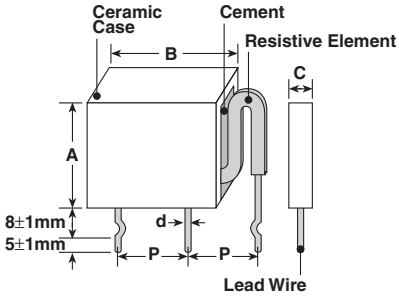
Single Straight Style



Single Forming Style

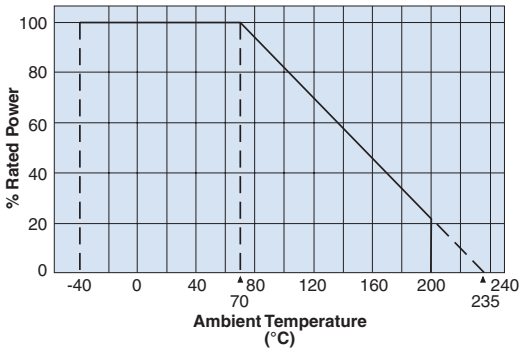


Twin Style



Size Code	Dimensions inches (mm) A	B	C	d	P
BPR26	.335±.04 (8.5±1.0)	.512±.04 (13.0±1.0)	.157±.04 (4.0±1.0)	.024±.004 (0.6±0.1)	.354±.04 (9.0±1.0)
BPR28	.335±.04 (8.5±1.0)	.512±.04 (13.0±1.0)	.157±.04 (4.0±1.0)	.031±.004 (0.8±0.1)	.354±.04 (9.0±1.0)
BPR38	.512±.04 (13.0±1.0)	.551±.04 (14.0±1.0)	.197±.04 (5.0±1.0)	.031±.004 (0.8±0.1)	.354±.04 (9.0±1.0)
BPR58	.709±.04 (18.0±1.0)	.551±.04 (14.0±1.0)		.031±.004 (0.8±0.1)	.354±.04 (9.0±1.0)
BPR108	.669±.06 (17.0±1.5)	1.02±.06 (26.0±1.5)		.031±.004 (0.8±0.1)	.787±.04 (20.0±1.0)
BPR55	.669±.06 (17.0±1.5)	1.02±.06 (26.0±1.5)		.031±.004 (0.8±0.1)	.394±.04 (10.0±1.0)
BPR77	.787±.07 (20.0±1.8)	1.02±.06 (26.0±1.5)		.031±.004 (0.8±0.1)	.394±.04 (10.0±1.0)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

ordering information

BPR	5	8	C	F	R10	J
Type	Power Rating	Lead Wire Diameter	Termination Material	Packaging	Nominal Resistance	Tolerance
	2: 2W 3: 3W 5: 5W	6: ø0.6mm 8: ø0.8mm	C: SnCu	Blank: Straight lead (9.0mm pitch) F: Forming (9.0mm pitch) FT: Radial taping (BPR26FT, BPR58FT only, 5.0mm pitch)	2 significant figures +1 multiplier. "R" indicates decimal on value <10Ω. All values less than 0.1Ω are expressed in mΩ with "L" as decimal. Ex: 20mΩ - 20L	J: ±5% K: ±10%
	10: 10W	8: ø0.8mm				
	55: 5W+5W 77: 7W+7W	Blank				

For further information on packaging, please refer to Appendix C.

2/10/21

applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/°C) Max.	Resistance Range		Rated Ambient Temperature	Operating Temperature Range
			J: ±5% (E12)	K: ±10% (E12)		
BPR26	2W	±350*	0.01Ω 0.1Ω - 0.68Ω	0.01Ω - 0.68Ω	+70°C	-40°C to +200°C
BPR28	2W					
BPR38	3W					
BPR58	5W		0.01Ω, 0.1Ω - 1.0Ω	0.01Ω - 1.0Ω		
BPR108	10W		—	0.05Ω, 0.1Ω - 1.0Ω		
BPR55	5W+5W		0.05Ω, 0.1Ω 0.22Ω - 0.47Ω	0.03Ω - 0.47Ω		
BPR77	7W+7W					

* Application range: The straight style of 0.018Ω or over

standard resistance

Resistance	26, 28		38		58		108		55		77	
	J: ±5%	K: ±10%	J: ±5%	K: ±10%	J: ±5%	K: ±10%	J: ±5%	K: ±10%	J: ±5%	K: ±10%	J: ±5%	K: ±10%
0.01	❍	❍	❍	❍	❍	❍	—	—	—	—	—	—
0.012		❍		❍		❍	—	—	—	—	—	—
0.015		❍		❍		❍	—	—	—	—	—	—
0.018		❍		❍		❍	—	—	—	—	—	—
0.02*		❍		❍		❍	—	—				
0.022		❍		❍		❍	—	—				
0.027		❍		❍		❍	—	—				
0.03*		❍		❍		❍	—	—		❍		
0.033		❍		❍		❍	—	—				
0.039		❍		❍		❍	—	—				
0.04*		❍		❍		❍						
0.047		❍		❍		❍						
0.05*		❍		❍		❍		❍	❍	❍		❍
0.068		❍		❍		❍						
0.082		❍		❍		❍						
0.1	❍	❍	❍	❍	❍	❍		❍	❍	❍		❍
0.12	❍	❍	❍	❍	❍	❍				❍		
0.15	❍	❍	❍	❍	❍	❍		❍		❍		
0.18	❍	❍	❍	❍	❍	❍		❍		❍		
0.22	❍	❍	❍	❍	❍	❍		❍	❍	❍	❍	❍
0.27	❍	❍	❍	❍	❍	❍		❍	❍	❍		
0.33	❍	❍	❍	❍	❍	❍			❍	❍	❍	❍
0.39	❍	❍	❍	❍	❍	❍			❍	❍		
0.47	❍	❍	❍	❍	❍	❍			❍	❍		
0.56	❍	❍	❍	❍	❍	❍						
0.68	❍	❍	❍	❍	❍	❍			—	—	—	—
0.82					❍	❍			—	—	—	—
1.00					❍	❍		❍	—	—	—	—

❍ : Available Blank : Please consult — : Not available * Non standard E-12 Decade Value

environmental applications

Performance Characteristics

Parameter	Requirement Δ R% Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C (Measurement position: 10mm under from the case)
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C (Application range: the straight style of 0.018Ω over)
Overload (Short time)	±2.0%	±1.0%	Rated power x 2.5 for 5 seconds (Application range: 0.05Ω & over)
Resistance to Solder Heat	±2.0%	±1.0%	260°C ± 5°C, 10 seconds ± 1 second
Moisture Resistance	±5.0%	±3.0%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±5.0%	±3.0%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±3.0%	±2.0%	+125°C, 100 hours
Resistance to Solvent	No evidence of damage to protective coating and marking	—	After immersing the sample in I.P.A for 60 seconds ± 10 seconds, the resistor surface should be rubbed with absorbent cotton 10 times

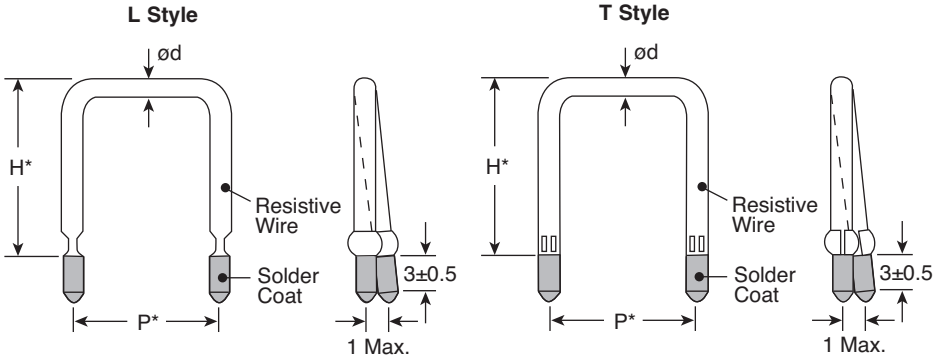
 12/12/19

EU RoHS COMPLIANT

features

- The super low resistance (3mΩ ~) is suitable for high power current detection
- Pitches and heights adjustable according to mounting conditions
- All custom-made products
- Easy soldering
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction



* Please consult with factory about dimensions "P" and "H"
T style is applied for the diameter of ø 2.3 or above

ordering information

LR	09	D	L	10	20L	J
Type	Symbol	Termination Material	Style	Insertion Pitch	Nominal Resistance	Resistance Tolerance
	06~20: L-Style 23~29: T-Style	D: SnAgCu N: No surface treatment	L (06~20) T (23~29)	Insertion Pitch	3 digits	H: ±3% J: ±5%

12/27/13

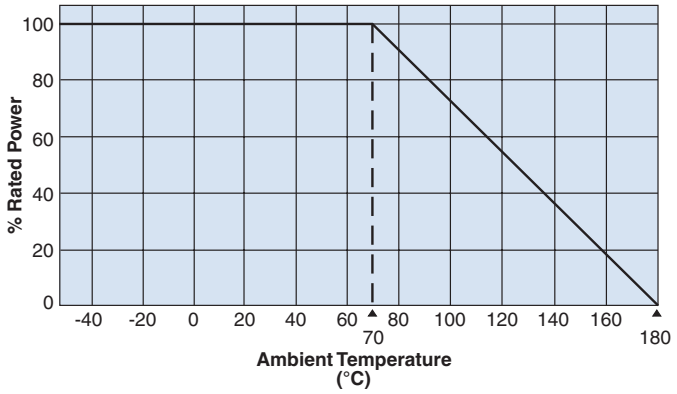
applications and ratings

Part Designation	Symbol	ød Diameter (mm)	Maximum Current Rating (A)	Resistance Range	Resistance Tolerance	T.C.R. (ppm/°C) Max.	Rated Ambient Temperature	Operating Temperature Range
LR06D	06	0.6	3.0	50mΩ - 100mΩ	H: ±3% J: ±5%	±100	+70°C	-40°C to +180°C
LR07D	07	0.7	4.0	30mΩ - 70mΩ				
LR08D	08	0.8	4.5	28mΩ - 50mΩ				
LR09D	09	0.9	5.0	20mΩ - 40mΩ				
LR10D	10	1.0	5.5	15mΩ - 30mΩ				
LR11D	11	1.1	6.0	15mΩ - 20mΩ				
LR12D	12	1.2	7.0	10mΩ - 20mΩ				
LR13D	13	1.3	7.5	10mΩ - 20mΩ				
LR14D	14	1.4	8.0	10mΩ - 20mΩ				
LR15D	15	1.5	9.0	10mΩ - 20mΩ				
LR16D	16	1.6	9.5	10mΩ - 15mΩ				
LR18D	18	1.8	11	5mΩ - 10mΩ				
LR20D	20	2.0	12	5mΩ - 10mΩ				
LR23D	23	2.3	14	3mΩ - 10mΩ				
LR26D	26	2.6	18	3mΩ - 5mΩ				
LR29D	29	2.9	21	3mΩ - 5mΩ				

* Other diameters and resistances are also available on request

environmental applications

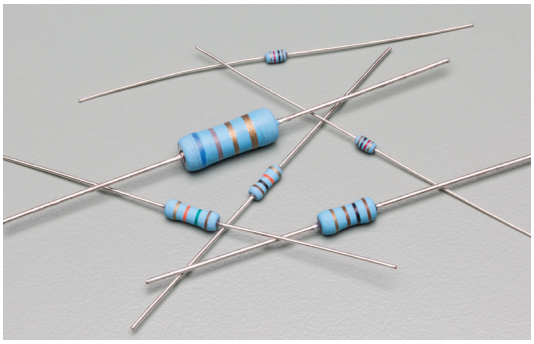
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

Parameter	Requirement Δ R ±% Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Resistance to Soldering Heat	±2.0%	±1.6%	350°C ± 10°C, 3 seconds
Moisture Resistance	±3.0%	±2.7%	Power rating x 1/10, 40°C, 90% - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±5.0%	±3.0%	Rated voltage, 70°C, 1000 hours 1.5 hr ON, 0.5 hr OFF cycle

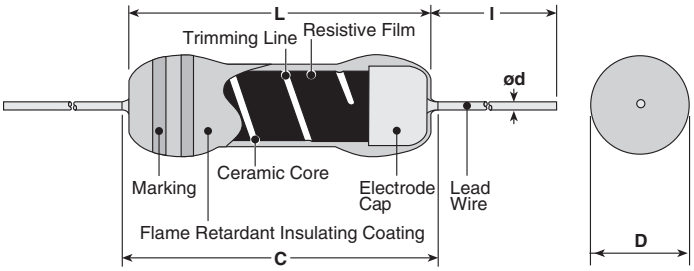


features

- Functions as a resistor in normal condition
- Quick fusing protects circuit from excessive overload at an abnormal time
- Flame-retardant coating equivalent to UL94 V-0
- Products meet EU RoHS requirements

EU RoHS COMPLIANT

dimensions and construction



Type	Dimensions inches (mm)				
	L	C Max.	D	d (Nominal)	l*
RF16	.125±.008 (3.2±0.2)	.134 (3.4)	.461 $^{+.010}_{-0}$ (1.7 $^{+.25}_{-0}$)	.018 (0.45)	1.18±.118 (30±3)
RF25	.248±.020 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)	
RF50	.335±.020 (8.5±0.5)	.374 (9.5)	.118±.012 (3.0±0.3)		
RF1	.354±.039 (9.0±1.0)	.437 (11.1)	.138±.020 (3.5±0.5)	.031 (0.8)	
RF2	.610±.039 (15.5±1.0)	.709 (18.0)	.236±.039 (6.0±1.0)		

* Lead length changes depending on taping and forming type.

ordering information

RF	25	C	T52	A	100	J
Product Code	Power Rating	Terminal Surface Material	Taping & Forming	Packaging	Nominal Resistance	Resistance Tolerance
	16: 0.17W 25: 0.25W 50: 0.5W 1: 1W 2: 2W	C: SnCu	T26, T52, T521, T631, MHT, VTP, VTE, VT, GT L, M Forming	A: Ammo R: Reel	3 digits	J: ±5%

ratings

Type	Power Rating	Resistance Range E24 J: ±5%	Fusing Characteristics							T.C.R. ×10^{-6}/K	Dielectric Withstanding Voltage
			Fusing Power						Fusing Time		
RF16C	0.17W	1.0 - 1k	—	—	—	3W 1Ω - 4.7Ω	2.5W 5.1Ω - 1kΩ	—	60 sec Max.	±1000: R≤4.7Ω ±350: R≥5.1Ω	250V
RF25C	0.25W	0.1 - 10k	10W 0.1 - 0.18Ω	7.5W 0.2 - 0.43Ω	6.25W 0.47 - 0.91Ω	—	3.75W 1Ω - 4.7Ω 2.4kΩ - 10kΩ	3W 5.1Ω - 2.2kΩ	30 sec Max.		
RF50C	0.5W	0.1 - 15k	—	—	12.5W 0.1 - 0.43Ω	—	7.5W 0.47Ω - 2Ω 1.1kΩ - 15kΩ	6W 2.2Ω - 1kΩ			300V
RF1C	1W	0.1 - 10k	—	30W 0.1 - 0.18Ω	25W 0.2 - 0.43Ω	—	15W 0.47Ω - 2Ω 1.1kΩ - 10kΩ	12W 2.2Ω - 1kΩ			350V
RF2C	2W	1.0 - 3k	—	—	—	36W 1Ω - 3.6Ω	30W 1.1kΩ - 3kΩ	24W 3.9Ω - 1kΩ			600V

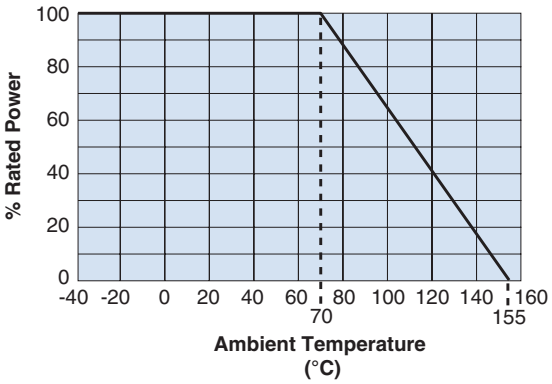
Rated Ambient Temperature: +70°C
Operating Temperature Range: –40 – +155°C

Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance value}}$

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/21/17

environmental applications

Derating Curve

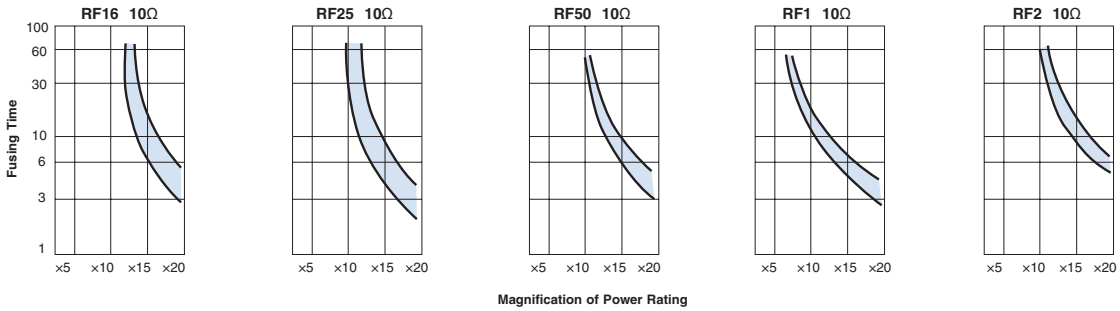


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with derating curve on the left.

Performance Characteristics

Test Items	Performance Requirements ΔR± (% +0.05Ω)		Test Methods
	Limit	Typical	
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short Time)	1%	0.5%	Rated voltage × 2.5 for 5 seconds
Resistance to Soldering Heat	1%	0.5%	350°C ± 10°C, 3.5s ± 0.5s or 260°C ± 5°C, 10s ± 1s
Rapid Change of Temperature	1%	0.5%	–40°C (30 min.)/ +85°C (30 min.) 5 cycles
Moisture Resistance	5%	2.5%	40°C ±2°C, 90% - 95% RH, 1000 hours 1.5h ON/0.5h OFF cycle
Endurance at 70°C	5%	2.5%	70°C ± 2°C, 1000 hours 1.5h ON/0.5h OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	—	The resistor shall be immersed in IPA for 30 sec.
Flame retardant	No evidence of flaming or self-flaming.	—	Flame test : The test flame shall be applied and removed for each 15 sec respsctively to repeat the cycle 5 times. Overload flame retardant: AC Voltage corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1min. until disconnection occurs.

Fusing Characteristics

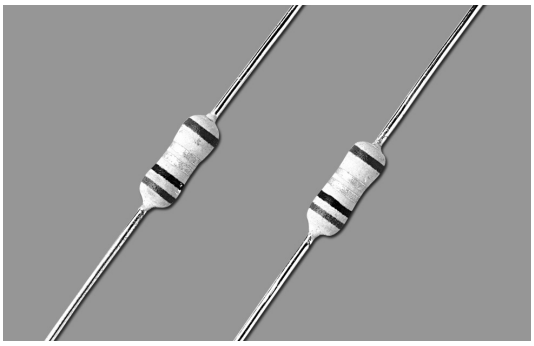


KOA SPEER ELECTRONICS, INC.

RF25CC

coat-insulated fusing resistors (constant current fusing type)

EU RoHS COMPLIANT

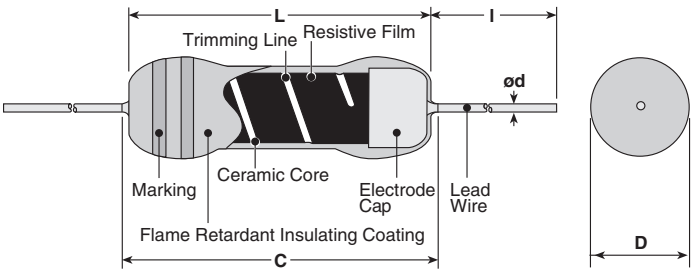


features

- Fuse within 60 seconds in case of over-current
- Constant current fusing type
- Fuse at low magnification at 5 times or 10 times of power rating
- Flame-retardant coating equivalent to UL94 V-0
- Products meet EU RoHS requirements

leaded resistors

dimensions and construction



Type	Dimensions inches (mm)				
	L	C Max.	D	d (Nominal)	l*
RF25CC	.248±.020 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)	1.18±.118 (30±3)

* Lead length changes depending on taping and forming type.

ordering information

RF	25	C	C	T52	A	R68	K
Product Code	Power Rating	Terminal Surface Material	Constant Current Fusing Type	Taping & Forming	Packaging	Nominal Resistance	Resistance Tolerance
	25: 0.25W	C:SnCu		T26, T52, VTP, VTE, L10A, M10X	A: Ammo R: Reel	3 digits	K:±10%

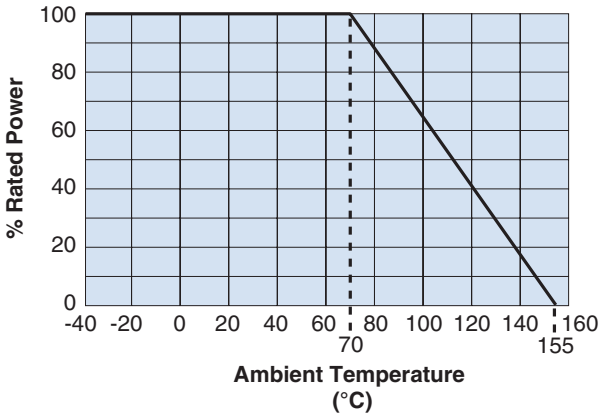
applications and ratings

Power Rating	Resistance Range(Ω) (E-24)	Resistance Tolerance	Fusing Characteristics			Dielectric Withstanding Voltage	Taping & Q'ty/AMMO (pcs)	
			Fusing Power		Fusing Time		T26A	T52A
0.25W	0.1 - 0.91	K: ±10%	2.5W 0.1Ω	1.25W 0.11Ω - 0.91Ω	60 sec Max.	250V	2,000	2,000

Rated Ambient Temperature: +70°C
Operating Temperature Range: -40°C - +155°C
Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance value}}$

environmental applications

Derating Curve

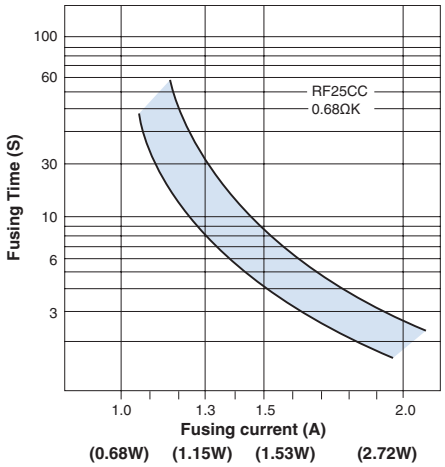


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with derating curve on the left.

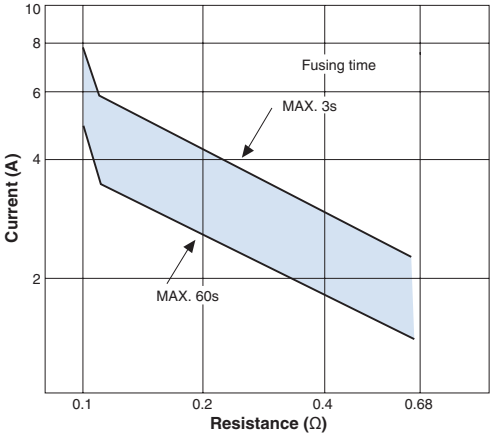
Performance Characteristics

Test Items	Performance Requirements ΔR± (% +0.05Ω)		Test Methods
	Limit	Typical	
Resistance	Within specified tolerance	—	25°C
Resistance to Soldering Heat	5%	2.5%	350°C ± 10°C, 3.5s ± 0.5s or 260°C ± 5°C, 10s ± 1s
Humidity	5%	2.5%	40°C ± 2°C, 90% - 95%RH, 1000h No Load
Endurance at 70°C	5%	2.5%	70°C±2°C, 1000h 1.5h ON/0.5h OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	—	The resistor shall be immersed in IPA for 30 sec.
Flame retardant	No evidence of flaming or self-flaming.	—	Flame test: The test flame shall be applied and removed for each 15 sec respectively to repeat the cycle 5 times. Overload flame retardant: AC Voltage corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1min. until dis-connection occurs.

Fusing Characteristics



I-R Characteristics



KOA SPEER ELECTRONICS, INC.

RK92D

thick film resistors for high voltage (high-precision high voltage divider)

NEW

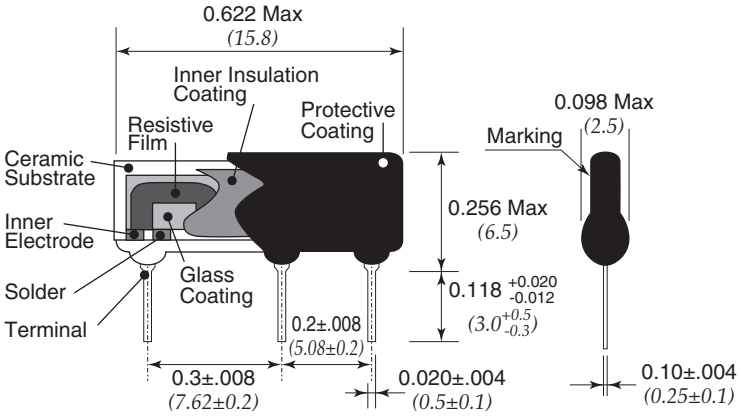
EU RoHS COMPLIANT

features

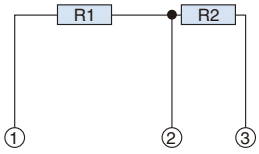
- High-precision high voltage divider for high voltage circuits
- Thin SIP shape
- The flame retardant coats corresponding to UL94V-0 are used
- Higher relative accuracy of resistance value is possible with one package
- Thick film resistors (RuO_2) ensure high stabilities in life and change in aging
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

leaded resistors

dimensions and construction



Style	Weight (1000 pcs)
RK92D32C4D	297g



ordering information

	RK92	D	3	2	C	4	Manufacturing Serial Number (Internal circuit is indicated by A00)	D	754/622	F
	Product Code	Type	Terminal Pitch 1	Terminal Pitch 2	Height Symbol	Voltage Symbol		Terminal Symbol	Resistance Symbol	Resistance Tolerance
	RK92 (Standard)	D	3	2	C	4	Nil	D	(R1+R2)/R2	F
Ex.*	RK92 (Custom)	D	8	2	C	Nil	A00	D	Nil	Nil

* Please contact factory for the outline method and circuit diagram of custom products.

11/03/21

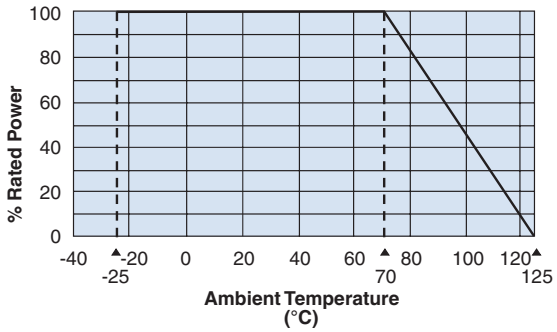
applications and ratings

Part Designation	Max. Working Voltage Symbol	Nominal Resist.	Power Rating		Resistance (Ω)		Resist. Tolerance (R1)	Relative Resist. Ratio		T.C.R. (×10⁻⁶/K)		Max. Working Voltage	Rated Ambient Temp.	Operating Temp. Range
			R1	R2	R1 E24	R2		R1/R2	Tolerance	Absolute	Relative			
32C	4	754/622	0.5W	0.2W	750k	6.25k	F: ±1%	120	±0.2%	±100	±50	4kV	+70°C	-40°C to +125°C
		205/103			2M	10k		200						
		136/263			13M	26k		500						
		336/333			33M	33k		1000						

Please contact factory for other values that are not listed above.

environmental applications

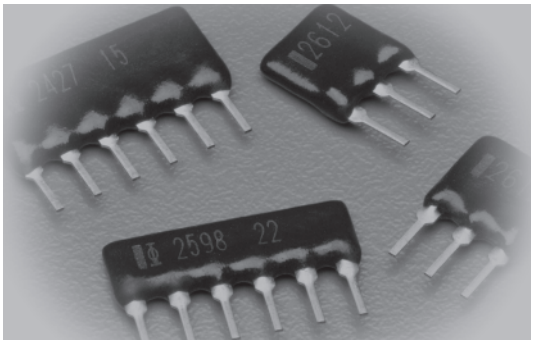
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

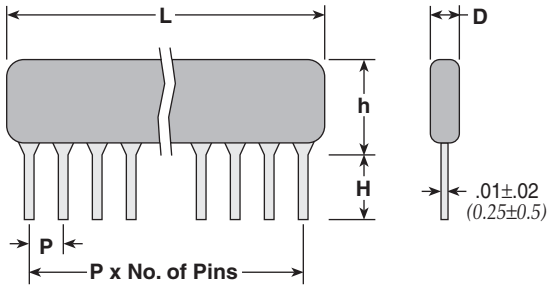
Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Resistance to Solder Heat	±0.5%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.2%	-40°C (30 minutes)/ +125°C (30 minutes) 5 cycles
Moisture Resistance	±2%	±1%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance	±2%	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle



features

- Custom design network
- Ultra-precision performance for precision analog circuits
- Tolerance to ±0.1%, matching to 0.05%
- T.C.R. to ±25ppm/°C, tracking to 2ppm/°C
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction



Type	Dimensions inches (mm)				
	L (max.)	D (max.)	P	H	h (max.)
MRPL03	.335 (8.5)	.098 (2.5)	.100±.008 (2.54±0.2)	.118±.02 (3.0±0.5)	.256 (6.5)
MRPA03					.335 (8.5)

ordering information

MRP	L03	E	A	D	103/103	B	A
Type	Size	T.C.R. (ppm/°C)	T.C.R. Tracking	Termination Material	Resistance Value	Tolerance	Tolerance Ratio
	L03 A03	E: ±25 C: ±50	A: 2 Y: 5 T: 10	D: SnAgCu	3 significant figures/ 3 significant figures	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1.0%	E: 0.025% A: 0.05% B: 0.1% C: 0.25% D: 0.5%

custom circuit ordering information

MRP	KxxxxD
Type	Custom Code
	Factory will assign

applications and ratings

Ratings

Type	Power Rating (mW)		Absolute T.C.R.	T.C.R. Tracking	Resistance Range*	Resistance Tolerance	Maximum Working Voltage	Maximum Overload Voltage	Rated Ambient Temperature	Operating Temperature Range
	Element	Package								
MRPL03 MRPA03	100	200	E: ±25 C: ±50	A: 2 (R2/R1≤10) Y: 5 T: 10	50-100kΩ	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	100V	200V	+70°C	-55°C to +125°C

* Resistance combination for R1, R2 is standardized to 200/20k, 1k/1k, 1k/2k, 1k/4k, 1k/9k, 1k/10k, 1k/20k, 10k/10k, 10k/100k, 50k/50k, 100k/100k

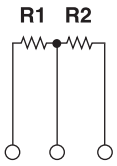
 11/15/17

applications and ratings (continued)

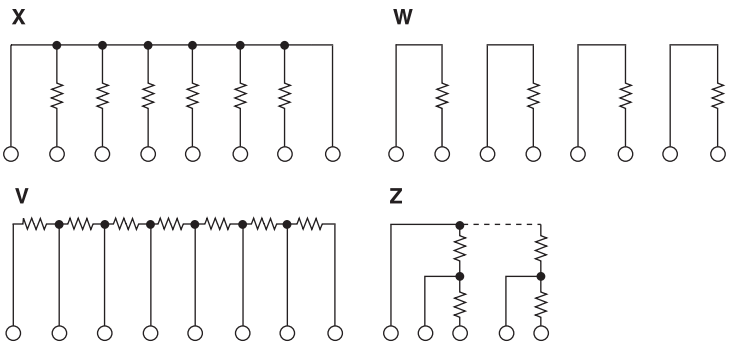
Resistance Range

		Resistance Ratio Tolerance				
		E: 0.025%	A: 0.05%	B: 0.1%	C: 0.25%	D: 0.5%
Absolute Resistance Tolerance	B: ±0.1%	50Ω - 100kΩ	50Ω - 100kΩ	50Ω - 100kΩ	—	—
	C: ±0.25%	50Ω - 100kΩ	50Ω - 100kΩ	50Ω - 100kΩ	50Ω - 100kΩ	—
	D: ±0.5%	50Ω - 100kΩ	50Ω - 100kΩ	50Ω - 100kΩ	50Ω - 100kΩ	50Ω - 100kΩ
	F: ±1%	50Ω - 100kΩ	50Ω - 100kΩ	50Ω - 100kΩ	50Ω - 100kΩ	50Ω - 100kΩ
R1/R2 Relative Resistance Ratio		100 max.	100 max.	150 max.	150 max.	150 max.

standard circuit schematic



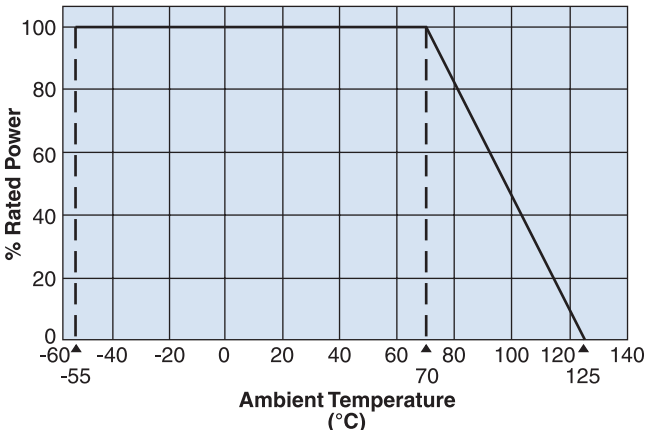
custom circuit schematics



(Examples only. Contact factory for other custom layout requests.)

environmental applications

Derating Curve



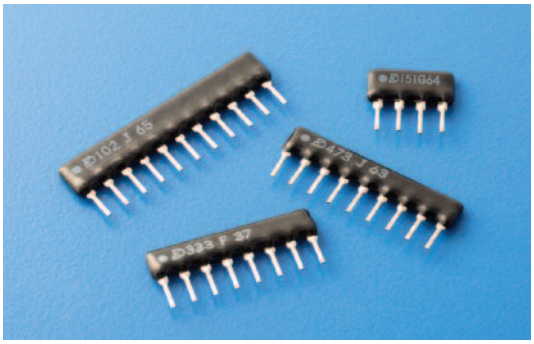
Performance Characteristics

Parameter	Requirement	Test Method
Resistance	Within specified tolerance	25°C
T.C.R.	Within specified T.C.R.	+25°C/+65°C
Overload (Short Time)	±0.05%	Rated voltage x 2.5 or max. overload voltage, whichever is lower, 5 seconds
Resistance to Soldering Heat	±0.1%	+350°C ± 10°C, 3.5 seconds ± 0.5 seconds
Rapid Change of Temperature	±0.1%	-55 +0/-5°C (30 min.), +125 +3/-0°C (30 min.) 5 cycles
Moisture Resistance	±0.1%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±0.1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvents	No abnormality in outer coating and markings	Soaking in 2-propanol of +20°C ~ +25°C for 180 seconds ± 10 seconds
Insulation Resistance	10,000MΩ or above	500V (d.c.) for 1 minute between terminals and coatings
Withstanding Voltage	±0.5%	500V (a.c.) for 1 minute between terminals and coatings

RKC, RKH, RKL

thick film SIP resistors

EU RoHS COMPLIANT

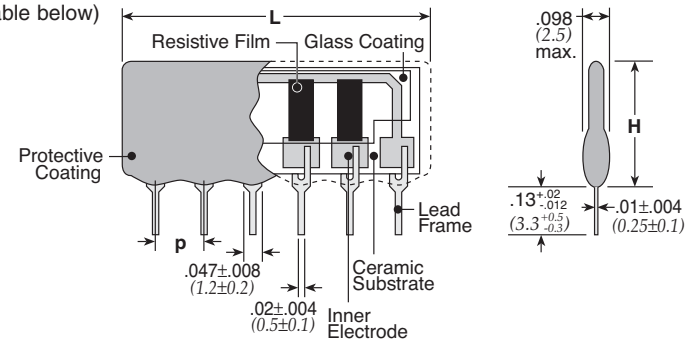


features

- Various types of standard circuits in different sizes and power are available. (Seated height 0.20" (5.08mm), 0.26" (6.5mm), 0.42" (10.7mm) Max.)
- Higher temperature soldering of the leads prevents terminals from loosening during board assembly
- For automatic insertion machines, stick magazines (the tip of lead terminal is cut to a V shape) and taping packages (TBA: All leads taping, TPA, TUA: 3 leads taping) are applicable.
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction

(See table below)



Size Code			Number of Pins 3	4	5	6	7	8	9	10	11	12	13	14	15	16	Dimen. in. (mm) H max.	p
RKL		L	8.20	10.16	12.70	15.24	17.78	20.32	22.86	25.40	27.94	30.48	—	—	—	—	.200 (5.08)	.100±.008 (2.54±0.2)
	W	B,A,R circuit	250	375	500	625	750	875	1000	1050	1150	1250	—	—	—	—		
		C,T,E circuit	—	—	500	—	750	—	1000	—	1150	—	—	—	—	—		
		D circuit	—	—	375	500	625	750	875	1000	1125	1250	—	—	—	—		
		S Circuit	—	400	—	600	—	800	—	1000	—	1200	—	—	—	—		
RKC (2.54 pitch)		L	8.20	10.8	13.2	15.8	18.3	20.9	23.4	25.9	28.5	31.0	33.6	36.1	38.7	41.3	.256 (6.5)	.100±.008 (2.54±0.2)
	W	B,A,R circuit	250	375	500	625	750	875	1000	1050	1150	1250	1350	1450	1500	1550		
		C,T,E circuit	—	—	500	—	750	—	1000	—	1150	—	1350	—	—	—		
		D circuit	—	—	375	500	625	750	875	1000	1125	1250	1350	1450	—	—		
		S Circuit	—	500	—	750	—	1000	—	1050	—	1250	—	1450	—	—		
RKH		L	—	10.8	13.3	15.8	18.3	20.9	23.4	25.9	28.5	31.0	33.6	—	—	—	.421 (10.7)	.100±.008 (2.54±0.2)
	W	B,A,R circuit	—	525	700	875	1050	1250	1400	1500	1600	1700	1800	—	—	—		
		C,T,E circuit	—	—	700	—	1050	—	1400	—	1600	—	1800	—	—	—		
		D circuit	—	—	700	875	1050	1250	1400	1500	1600	1700	—	—	—	—		
		S Circuit	—	500	—	1050	—	1400	—	1500	—	1700	—	—	—	—		
RKC (1.8 pitch)		L	—	10.2	10.8	12.7	15.5	15.8	17.8	20.4	20.9	23.5	25.4	28.5	—	—	.256 (6.5)	.071±.006 (1.8±0.15)
		W	—	300	400	500	580	650	720	760	820	850	880	900	—	—		

L= L dimension (mm) max. W= Wattage/Package (mW) max.

ordering information

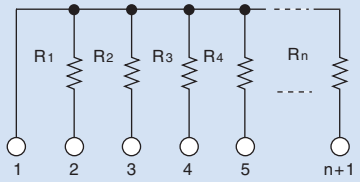
RKC	8	B	S[*1]	D	STP	103	F
Type	**Number of Resistors**	**Circuit Symbol**	**1.8mm Symbol**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Tolerance**
RKC RKH RKL	3 - 16	B, S, C, D, A, T, E, R RKC: L, K	RKC only	D: SnAgCu (Other termination styles available, contact factory for options)	STP, STB TPA: (4-9 pins) or TUA (10 pins) taping (3 leads) TBA: (4-10 pins) taping (all leads)	2 significant figures + 1 multiplier for ±2% & ±5% 3 significant figures + 1 multiplier for ±1% R1/R2 3 digits/3 digits	F: ±1% G: ±2% J: ±5% R circuit: ±2%, ±5% only

For further information on packaging, please refer to Appendix C.

[*1] The symbol "S" showing 1.8 pitch is added to the type designation after the circuit symbol.

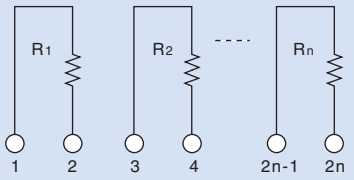
circuit schematics

B circuit



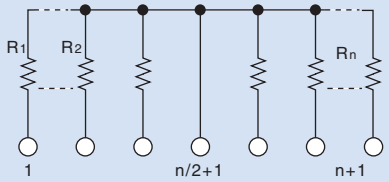
R1=R2=R3=R4=.....=Rn
n: number of elements
Example: RKC8B 103 J
RKL8B 472 J
RKH8B 332 J

S circuit



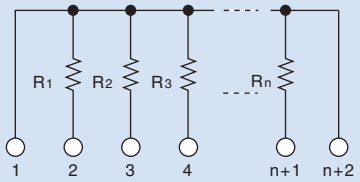
R1=R2=.....=Rn
n: number of elements
Example: RKC4S 103 J
RKL4S 472 J
RKH4S 332 J

C circuit



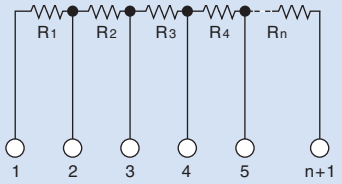
R1=R2=R3=R4=.....=Rn
n: number of elements
Example: RKC8C 103 J
RKL8C 472 J
RKH8C 332 J

D circuit



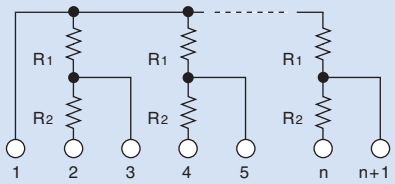
R1=R2=R3=.....=Rn
n: number of elements
Example: RKC8D 103 J
RKL8D 472 J
RKH8D 332 J

A circuit



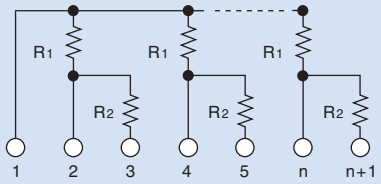
R1=R2=R3=R4=.....=Rn
n: number of elements
Example: RKC8A 103 J
RKL8A 472 J
RKH8A 332 J

T circuit



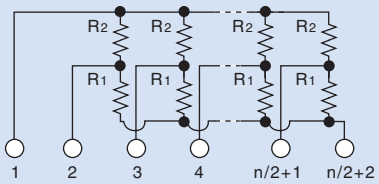
R1=R2 or R1≠R2
n: number of elements
Example: RKC8T 103/103 J
RKL8T 103/103 J
RKH8T 103/103 J

E circuit



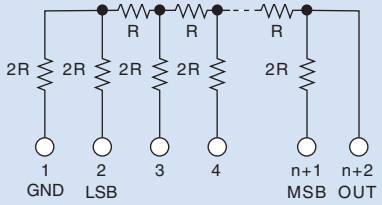
R1=R2 or R1≠R2
n: number of elements
Example: RKC8E 103/103 J
RKL8E 103/103 J
RKH8E 103/103 J

R circuit



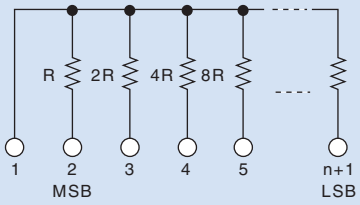
R1=R2 or R1≠R2
n: number of elements
Example: RKC16R 331/471 J
RKL16R 331/471 J
RKH16R 331/471 J

L circuit



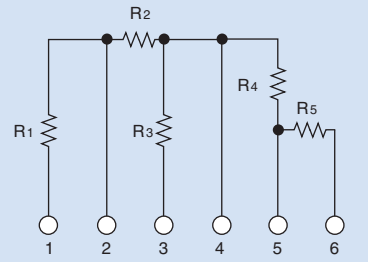
n: number of elements
Example: RKC5L 253

K circuit

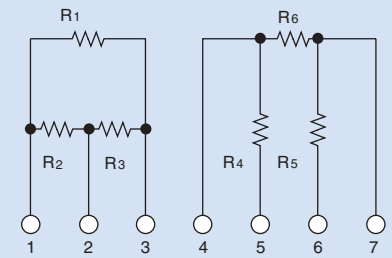


n: number of elements
Example: RKC4K 102

Example of custom circuit



Example of custom circuit



applications and ratings

Part Designation	Circuit Symbol	Number of Pins	Power Rating/ Element	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)	Resistance Tolerance	Maximum Working Voltage	Rated Ambient Temperature	Operating Temperature Range
RKC	B	3-16	125mW	±200	22-2.2M (E24)	F: ±1% G: ±2% J: ±5%	200V	+70°C	-55°C to +155°C
	C	5-13							
	D	5-14							
	A	4-14							
	T	5-13							
	E	5-13							
	S	4-14	250mW						
	R	4-16	125mW		100-100k (E24)	G: ±2% J: ±5%			
	L	6-10	20mW	±200	R=2.5k, 5k 10k, 25k 50k, 100k	±1/2LSB (Bit Error)	20V	+70°C	-55°C to +125°C
	K	5-9	40mW		R1(MSB):100 Min Rn(LSB):1M Max	±1/2LSB (Bit Error)			
RKL	B	3-12	125mW	±200	22-1M (E24)	F: ±1% G: ±2% J: ±5%	100V	+70°C	-55°C to +125°C
	C	5-11							
	D	5-12							
	A	3-12							
	T	5-11							
	E	5-11							
	S	4-12	200mW						
	R	4-11	125mW		100-100k (E24)	G: ±2% J: ±5%			
RKH	B	4-13	250mW	±200	56-2.2M (E24)	F: ±1% G: ±2% J: ±5%	250V	+70°C	-55°C to +155°C
	C	5-13							
	D	5-12							
	A	4-12							
	T	5-13							
	E	5-13							
	S	4-12	500mW						
	R	5-11	250mW		100-100k (E24)	G: ±2% J: ±5%			
M-	RKL	3-12	100mW 125mW 250mW 500mW 1000mW	±100 ±150 ±200	10-10M	±0.5% ±1% ±2% ±5%	100V	+70°C	-55°C to +125°C
	RKC (1.8 pitch)	4-14					50V		
	RKC (2.54 pitch)	3-16					200V		
	RKH	4-13					250V		

Rated voltage = $\sqrt{\text{power rating X resistance value}}$ or max. working voltage, whichever is lower.

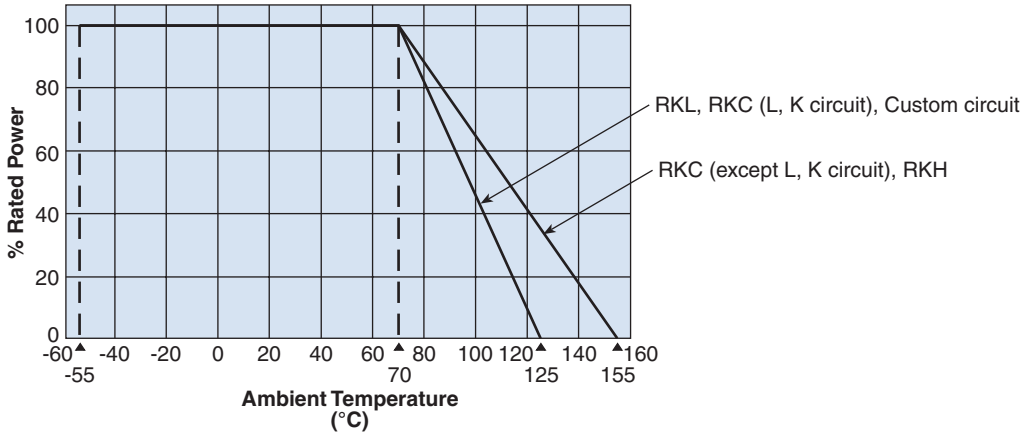
weight (g/1000 pcs)

	Number of Pins						
	3	4	5	6	7	8	9
RKL	147	185	228	271	314	357	400
RKC	160	217	273	330	387	444	501
RKH	—	416	511	606	701	796	891

	Number of Pins						
	10	11	12	13	14	15	16
RKL	443	486	529	—	—	—	—
RKC	558	615	672	728	785	842	893
RKH	986	1081	1176	1271	—	—	—

environmental applications

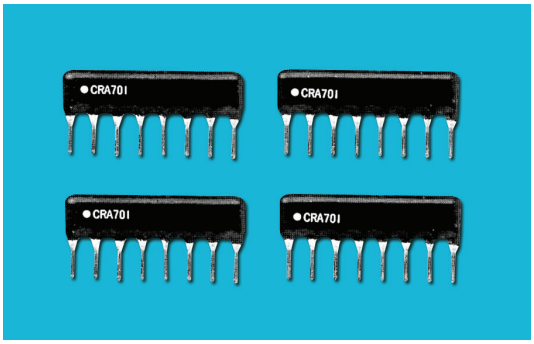
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C, +25°C/+125°C (RKL) +25°C/-55°C, +25°C/+155°C (RKC, RKH)
Overload (Short time)	±0.5%	±0.25%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±0.5%	±0.25%	260°C ± 5°C, 10 seconds ± 1 second
Temperature Cycling	±0.5%	±0.25%	-40°C (30 minutes), +85°C (30 minutes), 5 cycles
Moisture Resistance	±2.0%	±1.0%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2.0%	±1.0%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle

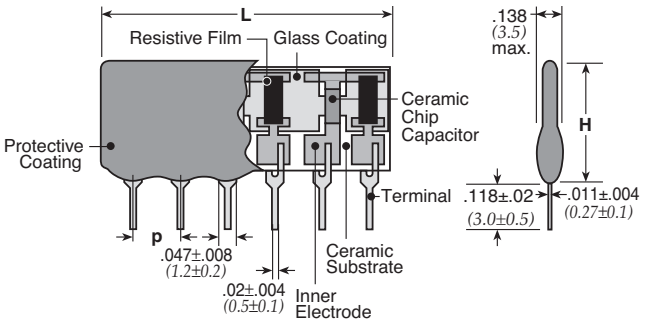


features

- Metal glaze resistors (RuO2) provide lifetime stability
- Free from short circuit, unexpected solder melting and terminal disconnection due to the high temperature solder used to connect terminals
- Capable of reducing the numbers of parts and part insertions
- Custom orders are available
- Products with lead-free termination meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass

EU RoHS COMPLIANT

dimensions and construction



Type	Dimensions inches (mm)			
	Number of Pins	L	H	p
CRA ☐	5 – 9	.100xP+.024 (2.54×P+0.6)	.256 (6.5)	.100 (2.54)
CRB ☐	5 – 10			
CRC ☐	5 – 13			
CRD ☐	5 – 13			
CRE ☐	6 – 14			
CRF ☐	5 – 13			

☐= Number of pins

ordering information

CR	E	6	01	D
Product Code	Circuit Symbol	Number of Cells	KOA Reference Number	Terminal Surface Material
	A B C D E F M	4 – 8 (CRA) 3 – 8 (CRB) 2 – 6 (CRC, CRD CRE, CRF) Nil (CRM)		D: SnAgCu Nil: Sn/Pb

ratings

Parameter	Resistor	Capacitor
Max. Operating Voltage	50V	
Constant Range	10Ω – 1MΩ	10pF – 0.1μF
T.C.	±200×10^{-6}/K	CH, B, R*
Tolerance	±5% (J)	±5% (J) ±10% (K) ±20% (M) –20% – +80% (Z)
Operating Temp. Range	–25°C – +85°C	
Storage Temp. Range	–55°C – +125°C	

* Refer to T.C. chart to the right

T.C. Type	T.C.			
	Reference Temp.	Temp. Range	Capacitance Change or Temp. Coefficient	Operating Temp.
CH	20°C	20°C~125°C	0±60ppm/°C	-55°C~125°C
B	20°C	-25°C~85°C	±10%	-25°C~85°C
R	20°C	-55°C~125°C	±15%	-55°C~125°C

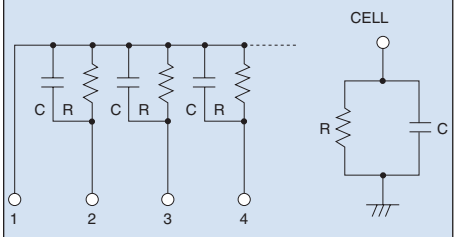
maximum wattage/package

	Number of Pins				
	5	6	7	8	9
mW/Package	500	625	750	875	1000

	Number of Pins				
	10	11	12	13	14
mW/Package	1050	1150	1250	1350	1450

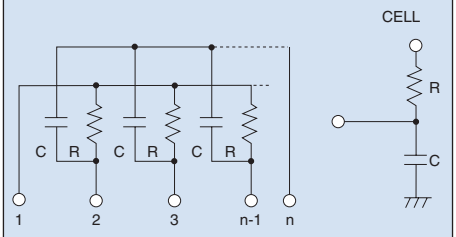
circuit schematics

CRA



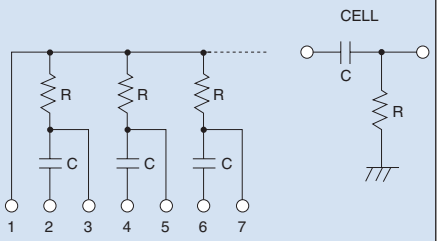
No.of cells 4 – 8

CRB



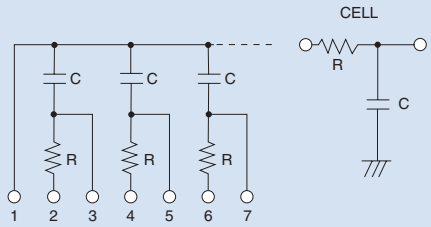
No.of cells 3 – 8

CRC



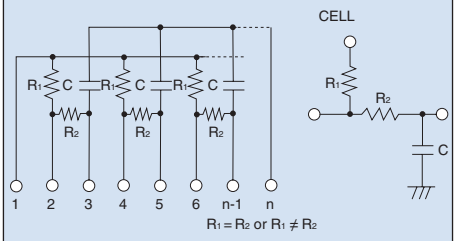
No.of cells 2 – 6

CRD



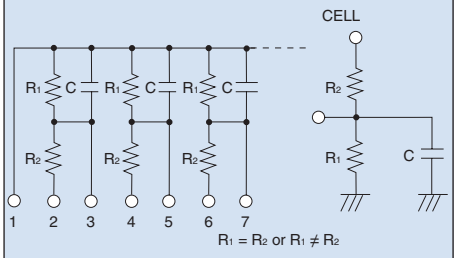
No.of cells 2 – 6

CRE



No.of cells 2 – 6

CRF



No.of cells 2 – 6

When ordering the CR series, please indicate the following items shown below:

For circuit code A – F, please indicate the following items:
Resistance
Capacitance
Operating voltage
Capacitance tolerance
T.C.

For circuit code M, please add the following items:
Circuit schematics
Pin layout
Dimensions
Conditions for use
Resistor (Power rating, Tolerance, T.C.R.)

Precautions for the Thermal Sensors

Refer to the precautions of common matters for all products in the beginning of this catalog.

Particulars Common to Thermal Sensors

- Excessive voltage such as ESD, could damage thermal sensors.
- Water drops from condensation or impure substances that adheres between the electrode wires may cause insulation deficiency and lower the resistance value of the thermal sensors. Be aware when using this product.
- Avoid sudden changes in temperature to maintain the accuracy of the thermal sensors.
- Some of the thermal sensors use special temperature sensing films. Contact us if the sensors are constantly operated under high temperature environment.
- It is necessary to suppress self heating in the design to maintain accuracy of the thermal sensor if rated temperature is set.

Platinum Thin-Film Thermal Sensors

- Welding is recommended to connect the lead wires of SDT101B, SDT310P, SDT310MTM, SDT310AP, SDT310HCTP and SDT310VASP since they are heat resistant lead wires. Select the flux for stainless-steel when soldering. Wash the flux with hot water after the soldering to remove the residue completely.
- The 3-wire or 4-wire method is recommended for implementing high precision temperature measuring for both SDT101 and SDT310 series.
- When molded or placed in a metal tube filled with resin, the resistance value may change depending on the kind of resins used.

Terms and Definitions

Platinum Thin Film Thermal Chip Sensors

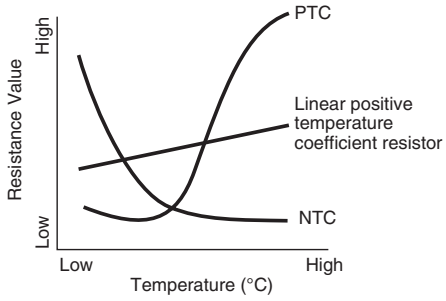
- Also known as a platinum resistance temperature detector, an electronic component whose resistance value changes with temperature as determined by standards.
- It uses a platinum thin film as a resistor and has excellent environmental resistance, and its resistance value rises almost linearly as the temperature rises.

Linear Positive Temperature Coefficient Resistor

- Unlike the platinum thin film thermal chip sensors, there are many types of resistance value changes with temperature, and there are many types of resistance values, and the resistance value changes with temperature.
- The resistance value change range is narrow compared to the thermistors but the linearity is high.

Thermistor

- Thermally sensitive resistors, constructed from temperature sensitive semi-conductive materials, with predictable, large variation in resistance due to change in temperature. There are two kinds of thermistors characterized by resistance change.
- PTC (Positive Temperature Coefficient): Resistance increases with a rise in temperature.
- NTC (Negative Temperature Coefficient): Resistance decreases with a rise in temperature.



Thermal Time Constant

- Time needed for a sensor's temperature to change 63.2% when the ambient temperature of a sensor is rapidly changed by a condition in which self heat generation can be ignored.

Thermal Dissipation Constant

- The necessary power which is needed to increase the temperature of the element 1℃ by self heating and is expressed with the following formula:

$\delta(W/°C) = W/(T1-T)$

W : Electrical input power (W)
T : Standard Temperature (℃)
T1 : Self heating temperature generated by applied power (°C)

Self-Heating Coefficient

- Self-heating coefficient expressed in °C/mW is values measured at temperature: °C in flowing oil with a velocity >0.2m/s, which is value of elements and vary with connecting or fixing methods.

Temperature Coefficient of Resistance (T.C.R.)

- Relative variation of resistance between two given temperatures when temperature is changed by 1K, which is calculated by the following formula.

$$\text{T.C.R. (ppm/°C)} \frac{R-R_0}{R_0} \times \frac{1}{T-T_0} \times 10^6$$

R : Resistance value (Ω) at T
R0 : Resistance value (Ω) at T_0
T : Measured test temperature (°C)
T0 : Measured base temperature (°C)

Specified Current

- The electricity which it is charged with in the element is moved to the range that rise in temperature due to a self-heat generation can be ignored. Ordinarily recommended measuring currents are 1mA for 100Ω and 0.1mA for 500Ω.

Rated Power

- The maximum wattage which can be continuously applied to a resistor at the rated ambient temperature.

Critical Resistance Value

- The maximum nominal resistance value at which the rated power can be applied without exceeding the maximum working voltage.
- The rated voltage is equal to the maximum working voltage at the critical resistance value.

Maximum Working Voltage

- Maximum D.C. or A.C. voltage that can be continuously applied to a resistor or a thermosensor. However, the maximum value of the applicable voltage is the rated voltage at the critical resistance value or lower.

Overload Voltage

- Allowable voltage which is applied for 5 sec. according to the short time overload test. Overload voltage shall be 2.5 times of rated voltage or max. overload voltage, whichever is lower.

Rated Ambient Temperature

- Maximum ambient temperature at which the power rating may be applied continuously. The rated ambient temperature refers to the temperature around the resistor mounted inside the equipment, not to the air temperature outside the equipment.

Derating Curve

- Plot that expresses the relation between ambient temperature and the maximum allowable power, which is generally expressed in percentage.

External Conductor

- A conductor connected to a temperature sensor that is located outside of the protective body.

Internal Conductor

- A conductor connected to a temperature sensor that is located inside of the protective body.

Resistance-Temperature Characteristic of a Thermistor (NTC)

- The relationship between a zero load resistance and a temperature or a temperature range. It can be expressed using the following formula:

$R = R0 \exp\{B(1/T-1/T_0)\}$

R : Resistance Value at Temperature T (K)
R0 : Resistance Value at Temperature T_0 (K)
B : B Constants T (K)=t (°C)+273.15

B Constant of a Thermistor (NTC)

- Size of change in the resistance between any two temperatures within a specified range is calculated using the following formula:

$$B\,(K) = \frac{\ln R - \ln R_1}{1/T - 1/T_1}$$

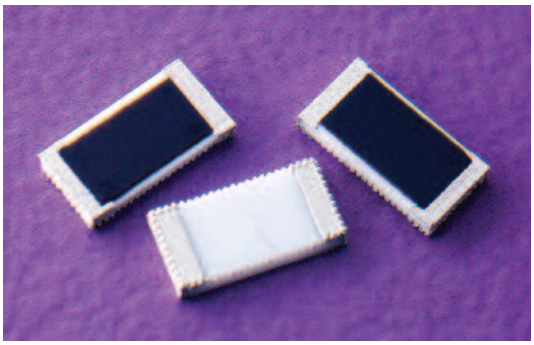
R : Resistance Value in T (K)
R_1 : Resistance Value in T_1 (K)
T : Standard Temperature (K)
T_1 : Regulated Temperature (K)

KOA SPEER ELECTRONICS, INC.

SDT73H, SDT73S

platinum thin film thermal chip sensors

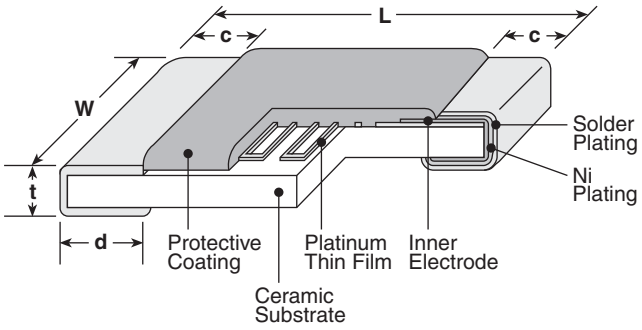
EU RoHS COMPLIANT



features

- SMD platinum thin film thermal sensors
- T.C.R. is in accordance to JIS-DIN standards IEC
- Suitable for temperature control in various industrial equipment
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.02±.012 (0.5±0.3)	.02±.006 (0.5±0.15)

ordering information

SDT73H	2B	T	TE	100	F	385
Type	**Size Code**	**Termination Material**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**	**T.C.R. (x 10⁻⁶/K)**
SDT73H 2B SDT73S 2B	2B: 3.2x1.6mm	T: Sn	TEK: 4mm pitch plastic embossed (1,000 pieces/reel) TE: 4mm pitch plastic embossed (5,000 pieces/reel)	100: 100Ω 500: 500Ω SDT73S: 100Ω	C: ±0.2% F: ±1% SDT73S: F: ±1%	385: +3850

applications and ratings

Part Designation	Resistance @ 0°C	Resistor Tolerance[1]	Thermal Time Constant[2]	Thermal Dissipation Constant[2]	T.C.R. (ppm/°C)[3]	T.C.R. Tolerance (ppm/°C)	Specified Current[5]	Operating Temperature Range
SDT73H 2B	100Ω 500Ω	C: ±0.2% F: ±1%	6.5 seconds	2.4mW/°C	3850	±50	1mA Max.: 100Ω 0.1mA Max.: 500Ω	-55°C to +155°C
SDT73S 2B	100Ω	F: ±1%						-55°C to +250°C[4]

[1] Please consult with us about the products equivalent to class B of JIS.

[2] Thermal time constant and thermal dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods. Thermal dissipation constant is approx. 4mW/°C under the surface mounting condition.

[3] T.C.R. Measuring Temperature:0℃/+100℃

[4] When always using a SDT73S, 200°C or less is recommended.

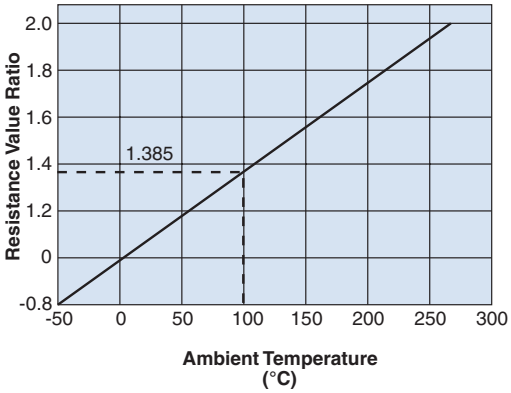
[5] The electricity which it is charged with in the element is moved to the range that rise in temperature due to a self-heat generation can be ignored. Ordinarily recommended measuring currents are 1mA for 100Ω and 0.1mA for 500Ω.

For further information on packaging, please refer to Appendix A.

12/10/20

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

-55°C~0°C :$R_T=R_0\{1+C_1T+C_2T^2+C_3(T-100)T^3\}$

0°C~+250°C :$R_T=R_0(1+C_1T+C_2T^2)$

R_T : Resistance value at T°C

R_0 : Resistance value at 0°C

T : Ambient temperature(°C)

Constants C_1, C_2, C_3:

$C_1=3.9083\times10^{-3}$ °C^{-1}

$C_2=-5.775\times10^{-7}$ °C^{-2}

$C_3=-4.183\times10^{-12}$ °C^{-4}

Pt100 Resistance - Temperature Characteristics (JIS C 1604-1997)

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	80.31	79.91	79.51	79.11	78.72	78.32	—	—	—	—
-40	84.27	83.87	83.48	83.08	82.69	82.29	81.89	81.50	81.10	80.70
-30	88.22	87.83	87.43	87.04	86.64	86.25	85.85	85.46	85.06	84.67
-20	92.16	91.77	91.37	90.98	90.59	90.19	89.80	89.40	89.01	88.62
-10	96.09	95.69	95.30	94.91	94.52	94.12	93.73	93.34	92.95	92.55
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48
	0	1	2	3	4	5	6	7	8	9
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
150	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68
160	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40
170	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11
180	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.43	171.80
190	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49
200	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16
210	179.53	179.89	180.26	180.63	180.99	181.36	181.72	182.09	182.46	182.82
220	183.19	183.55	183.92	184.28	184.65	185.01	185.38	185.74	186.11	186.47
230	186.84	187.20	187.56	187.93	188.29	188.66	189.02	189.38	189.75	190.11
240	190.47	190.84	191.20	191.56	191.92	192.29	192.65	193.01	193.37	193.74
250	194.10	–	–	–	–	–	–	–	–	–

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105℃, read the value in the column where 100℃ in the vertical axis and 5℃ in the horizontal axis cross. The value will be 140.40Ω. The value for 500Ωat 0℃ will be the value obtained by multiplying the resistance value in this table by 5.

Performance Characteristics

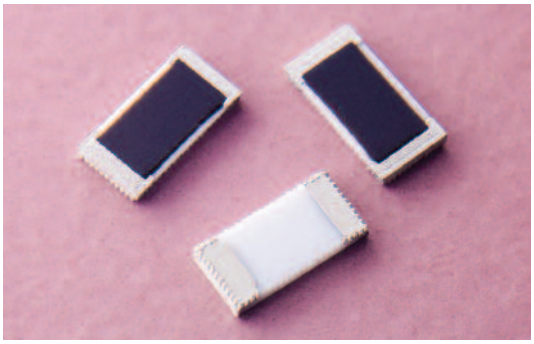
Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	0°C
T.C.R.	Within specified T.C.R.	3850±10ppm/°C	0°C/ +100°C
Insulation Resistance	100MΩ or more	—	d.c. 100V
Dielectric Withstanding Voltage	±0.5%	-0.019%	a.c. 100V, 60 seconds - 70 seconds
Resistance to Solder Heat	±0.5%	-0.004%	260°C for 10 seconds
Rapid Change of Temperature	±0.5%	-0.033% (SDT73H) -0.048% (SDT73S)	-55°C (30 minutes)/ +25°C (2 - 3 minutes)/ +155°C (30 minutes)/ +25°C (2 - 3 minutes), 10 cycles
Moisture Resistance	±0.5%	-0.016%	40°C, 90 - 95% RH, 1000 hours, 1mA, 1.5 hr ON, 0.5 hr OFF cycle
Normal Temperature Load Life	±0.5%	-0.010%	20°C ± 10°C, 1000 hours, 1mA continuous turning on electricity
High Temperature Load Life	±0.5%	-0.017% (SDT73H) -0.020% (SDT73S)	+155°C, 1000 hours (SDT73H), +250°C, 1000 hours (SDT73S) 1mA continuous turning on electricity
High Temperature Exposure	±0.5%	-0.022% (SDT73H) -0.023% (SDT73S)	+155°C, 1000 hours (SDT73H), +250°C, 1000 hours (SDT73S)
Low Temperature Exposure	±0.5%	-0.029%	-55°C, 1000 hours

KOA SPEER ELECTRONICS, INC.

SDT73V

platinum thin film thermal chip sensors (for automotive)

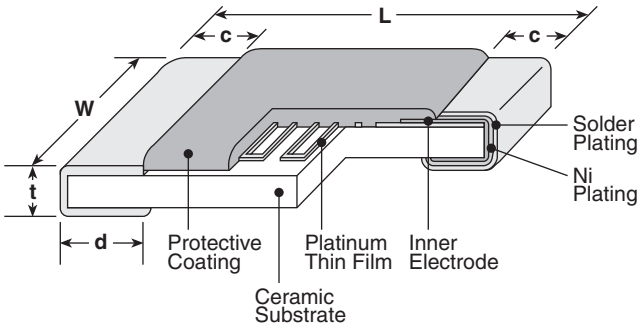
EU RoHS COMPLIANT



features

- SMD platinum thin film thermal sensors
- T.C.R. is in accordance to JIS-DIN IEC standards
- The evaluation based on AEC-Q200 has been examined
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS
- AEC-Q200 Tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.02±.012 (0.5±0.3)	.02±.006 (0.5±0.15)

ordering information

SDT73V	2B	T	TE	100	F	385
Type	Size Code	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (x 10^{-6}/K)
	2B: 3.2x1.6mm	T: Sn	TEK: 4mm pitch plastic embossed (1,000 pieces/reel) TE: 4mm pitch plastic embossed (5,000 pieces/reel)	100: 100Ω 500: 500Ω	C: ±0.2% F: ±1%	385: +3850

applications and ratings

Part Designation	Resistance @ 0°C	Resistor Tolerance*	Thermal Time Constant**	Thermal Dissipation Constant**	T.C.R. (ppm/°C)	T.C.R. Tolerance (ppm/°C)	Specified Current	Operating Temperature Range
SDT73V 2B	100Ω 500Ω	C: ±0.2% F: ±1%	6.5 seconds	2.4mW/°C	3850	±50	1mA Max.: 100Ω 0.1mA Max.: 500Ω	-55°C to +155°C

* Please consult with us about the products equivalent to class B of JIS.

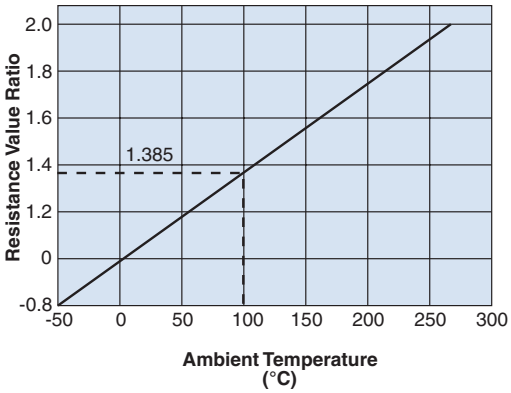
** Thermal time constant and thermal dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods. Thermal dissipation constant is approx. 4mW/°C under the surface mounting condition.

For further information on packaging, please refer to Appendix A.

12/10/20

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

-55°C~0°C :$R_T=R_0\{1+C_1T+C_2T^2+C_3(T-100)T^3\}$

0°C~+155°C :$R_T=R_0(1+C_1T+C_2T^2)$

R_T : Resistance value at T°C

R_0 : Resistance value at 0°C

T : Ambient temperature(°C)

Constants C_1, C_2, C_3:

$C_1=3.9083\times10^{-3}$ °C^{-1}

$C_2=-5.775\times10^{-7}$ °C^{-2}

$C_3=-4.183\times10^{-12}$ °C^{-4}

Pt100 Resistance - Temperature Characteristic (JIS C 1604-1997)

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	80.31	79.91	79.51	79.11	78.72	78.32	—	—	—	—
-40	84.27	83.87	83.48	83.08	82.69	82.29	81.89	81.50	81.10	80.70
-30	88.22	87.83	87.43	87.04	86.64	86.25	85.85	85.46	85.06	84.67
-20	92.16	91.77	91.37	90.98	90.59	90.19	89.80	89.40	89.01	88.62
-10	96.09	95.69	95.30	94.91	94.52	94.12	93.73	93.34	92.95	92.55
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48
	0	1	2	3	4	5	6	7	8	9
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
150	157.33	157.70	158.07	158.45	158.82	159.19	—	—	—	—

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 140.40Ω. The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5.

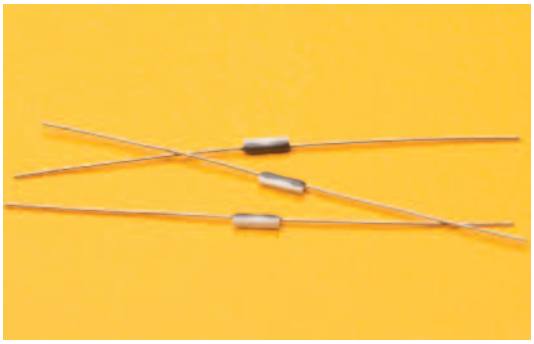
thermal sensors

Performance Characteristics

Parameter	Requirement △ R ±(%+0.05Ω) Limit	Typical	Test Method
High Temperature Exposure	±0.5%	-0.022%	+155°C, 1000 hours
Rapid Change of Temperature	±0.5%	-0.058%	-55°C (30 minutes)/ +25°C (2 - 3 minutes)/ +155°C (30 minutes)/ +25°C (2 - 3 minutes), 1000 cycles
Moisture Resistance	±0.5%	-0.041%	25°C, -65°C (90 - 100% RH), t= 24 hours/cycle. Unpowered. It is carried out 10 times.
Moisture Resistance	±0.5%	-0.016%	85°C, 85% RH, 1000 hours, 1mA, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Load Life	±0.5%	-0.017%	155°C, 1000 hours, 1mA continuous turning on electricity
Mechanical Shock	±0.5%	-0.001%	100gs Maximum, 6Dms (Standard), 12.3 feet/second
Vibration	±0.5%	-0.009%	Test from 10-2000Hz, 5g's for 20 minutes, 12 cycles each of 3 orientations
Resistance to Solder Heat	±0.5%	-0.004%	260°C for 10 seconds
Thermal Shock	±0.5%	-0.032%	-55°C (15 minutes)/ +155°C (15 minutes), 300 cycles
Solderability	95% Coverage Min.	—	235°C±5°C, 3 seconds ± 0.5 seconds
Terminal Strength	±0.5%	-0.011%	1.8kg force is kept on the samples for 60 seconds

SDT310VASP

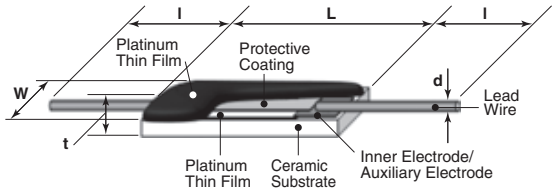
small type platinum thin film thermal sensors (small heater element)



features

- Small as quarter volume of conventional type. 3.2 second thermal time constant.
- Excellent heat-resistance
- Applies axial lead type suitable to use as heater element
- Products with lead-free terminations meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction



Type	Dimensions inches (mm)				
	W	L	t	d (Nom.)	l
SDT310VASP	.016 $^{+.006}_{-.004}$ (0.4 $^{+0.15}_{-0.1}$)	.079±.004 (2.0±0.10)	.026 max. (0.65 max.)	.006±.002 (ø0.15±0.05)	.394±.079 (10±2.0)

ordering information

SDT310V	AS	P	K	20	F	25
Type	Style	Terminal Surface Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (x 10^{-6}/K)
		P: Pt clad	K: Chip Tray	20: 20Ω	F: ±1	25: ±25 x 10^{-6}/K

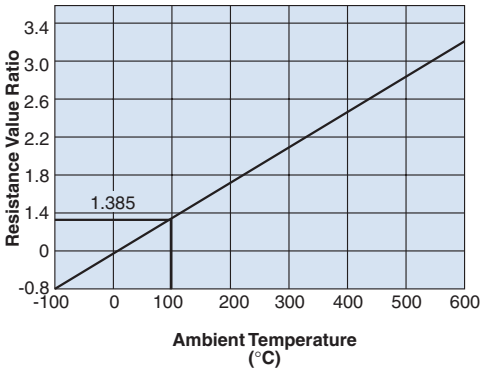
applications and ratings

Part Designation	Nominal R. Value at 0°C	R. Value Tolerance (%) at 0°C	T.C.R. x 10^{-6}/K*	Thermal Time Constant**	Maximum Current	Power Rating	Operating Temperature Range
SDT310VASP	20Ω	±1%	3850±25	3.2 seconds in stationary air	90mA Max.	0.5W	-55°C to +600°C

* T.C.R. measuring temperature: 0°C/+100°C.
** Thermal time constant is value measured in stationary air and is typical value ,which are values of elements and vary with connecting or fixing methods.
*** Temperature of the device including a self-heating.

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

-55°C~0°C :$R_T=R_0\{1+C_1T+C_2T^2+C_3(T-100)T^3\}$

0°C~+400°C :$R_T=R_0(1+C_1T+C_2T^2)$

R_T : Resistance value at T°C

R_0 : Resistance value at 0°C

T : Ambient temperature(°C)

Constants C_1, C_2, C_3:

$C_1=3.9083\times10^{-3}\,°C^{-1}$

$C_2=-5.775\times10^{-7}\,°C^{-2}$

$C_3=-4.183\times10^{-12}\,°C^{-4}$

Pt100 Resistance - Temperature Characteristic 20 at 0°C

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	16.06	15.98	15.90	15.82	15.74	15.66	–	–	–	–
–40	16.85	16.77	16.70	16.62	16.54	16.46	16.38	16.30	16.22	16.14
–30	17.64	17.57	17.49	17.41	17.33	17.25	17.17	17.09	17.01	16.93
–20	18.43	18.35	18.27	18.20	18.12	18.04	17.96	17.88	17.80	17.72
–10	19.22	19.14	19.06	18.98	18.90	18.82	18.75	18.67	18.59	18.51
0	20.00	19.92	19.84	19.77	19.69	19.61	19.53	19.45	19.37	19.30
	0	1	2	3	4	5	6	7	8	9
0	20.00	20.08	20.16	20.23	20.31	20.39	20.47	20.55	20.62	20.70
10	20.78	20.86	20.94	21.01	21.09	21.17	21.25	21.33	21.40	21.48
20	21.56	21.64	21.71	21.79	21.87	21.95	22.02	22.10	22.18	22.26
30	22.33	22.41	22.49	22.57	22.64	22.72	22.80	22.88	22.95	23.03
40	23.11	23.19	23.26	23.34	23.42	23.49	23.57	23.65	23.73	23.80
50	23.88	23.96	24.03	24.11	24.19	24.26	24.34	24.42	24.49	24.57
60	24.65	24.73	24.80	24.88	24.96	25.03	25.11	25.19	25.26	25.34
70	25.42	25.49	25.57	25.64	25.72	25.80	25.87	25.95	26.03	26.10
80	26.18	26.26	26.33	26.41	26.48	26.56	26.64	26.71	26.79	26.87
90	26.94	27.02	27.09	27.17	27.25	27.32	27.40	27.47	27.55	27.63
100	27.70	27.78	27.85	27.93	28.00	28.08	28.16	28.23	28.31	28.38
110	28.46	28.53	28.61	28.69	28.76	28.84	28.91	28.99	29.06	29.14
120	29.21	29.29	29.36	29.44	29.51	29.59	29.67	29.74	29.82	29.89
130	29.97	30.04	30.12	30.19	30.27	30.34	30.42	30.49	30.57	30.64
140	30.72	30.79	30.87	30.94	31.02	31.09	31.17	31.24	31.32	31.39
150	31.47	31.54	31.61	31.69	31.76	31.84	31.91	31.99	32.06	32.14
160	32.21	32.29	32.36	32.43	32.51	32.58	32.66	32.73	32.81	32.88
170	32.95	33.03	33.10	33.18	33.25	33.33	33.40	33.47	33.55	33.62
180	33.70	33.77	33.84	33.92	33.99	34.07	34.14	34.21	34.29	34.36
190	34.43	34.51	34.58	34.66	34.73	34.80	34.88	34.95	35.02	35.10
200	35.17	35.24	35.32	35.39	35.47	35.54	35.61	35.69	35.76	35.83
210	35.91	35.98	36.05	36.13	36.20	36.27	36.34	36.42	36.49	36.56
220	36.64	36.71	36.78	36.86	36.93	37.00	37.08	37.15	37.22	37.29
230	37.37	37.44	37.51	37.59	37.66	37.73	37.80	37.88	37.95	38.02
240	38.19	38.17	38.24	38.31	38.38	38.46	38.53	38.60	38.67	38.75
250	38.82	38.89	38.96	39.04	39.11	39.18	39.25	39.33	39.40	39.47
260	39.54	39.61	39.69	39.76	39.83	39.90	39.97	40.05	40.12	40.19
270	40.26	40.33	40.41	40.48	40.55	40.62	40.69	40.77	40.84	40.91
280	40.98	41.05	41.12	41.20	41.27	41.34	41.41	41.48	41.55	41.63
290	41.70	41.77	41.84	41.91	41.98	42.05	42.13	42.20	42.27	42.34
300	42.41	42.48	42.55	42.62	42.70	42.77	42.84	42.91	42.98	43.05
310	43.12	43.19	43.26	43.33	43.41	43.48	43.55	43.62	43.69	43.76
320	43.83	43.90	43.97	44.04	44.11	44.18	44.25	44.33	44.40	44.47
330	44.54	44.61	44.68	44.75	44.82	44.89	44.96	45.03	45.10	45.17
340	45.24	45.31	45.38	45.45	45.52	45.59	45.66	45.73	45.80	45.87
350	45.94	46.01	46.08	46.15	46.22	46.29	46.36	46.43	46.50	46.57
360	46.64	46.71	46.78	46.85	46.92	46.99	47.06	47.13	47.20	47.27
370	47.34	47.41	47.48	47.55	47.62	47.69	47.76	47.83	47.90	47.97
380	48.04	48.10	48.17	48.24	48.31	48.38	48.45	48.52	48.59	48.66
390	48.73	48.80	48.87	48.94	49.00	49.07	49.14	49.21	49.28	49.35
400	49.42	49.49	49.56	49.63	49.69	49.76	49.83	49.90	49.97	50.04
410	50.11	50.18	50.24	50.31	50.38	50.45	50.52	50.59	50.66	50.72
420	50.79	50.86	50.93	51.00	51.07	51.13	51.20	51.27	51.34	51.41
430	51.48	51.54	51.61	51.68	51.75	51.82	51.88	51.95	52.02	52.09
440	52.16	52.22	52.29	52.36	52.43	52.50	52.56	52.63	52.70	52.77

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 28.08Ω.

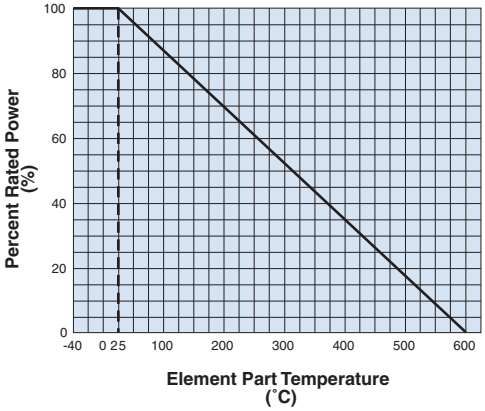
environmental applications (continued)

Pt100 Resistance - Temperature Characteristic 20 at 0°C

Temperature (°C)	0	1	2	3	4	5	6	7	8	9
450	52.84	52.90	52.97	53.04	53.11	53.17	53.24	53.31	53.38	53.44
460	53.51	53.58	53.65	53.71	53.78	53.85	53.92	53.98	54.05	54.12
470	54.19	54.25	54.32	54.39	54.46	54.52	54.59	54.66	54.72	54.79
480	54.86	54.93	54.99	55.06	55.13	55.19	55.26	55.33	55.39	55.46
490	55.53	55.60	55.66	55.73	55.80	55.86	55.93	56.00	56.06	56.13
500	56.20	56.26	56.33	56.40	56.46	56.53	56.59	56.66	56.73	56.79
510	56.86	56.93	56.99	57.06	57.13	57.19	57.26	57.32	57.39	57.46
520	57.52	57.59	57.66	57.72	57.79	57.85	57.92	57.99	58.05	58.12
530	58.18	58.25	58.32	58.38	58.45	58.51	58.58	58.64	58.71	58.78
540	58.84	58.91	58.97	59.04	59.10	59.17	59.24	59.30	59.37	59.43
550	59.50	59.56	59.63	59.69	59.76	59.82	59.89	59.96	60.02	60.09
560	60.15	60.22	60.28	60.35	60.41	60.48	60.54	60.61	60.67	60.74
570	60.80	60.87	60.93	61.00	61.06	61.13	61.19	61.26	61.32	61.39
580	61.45	61.52	61.58	61.65	61.71	61.77	61.84	61.90	61.97	62.03
590	62.10	62.16	62.23	62.29	62.36	62.42	62.48	62.55	62.61	62.68
600	62.74	–	–	–	–	–	–	–	–	–

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 28.08Ω.

Derating Curve



For sensors operated at an element part temperature of 25°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

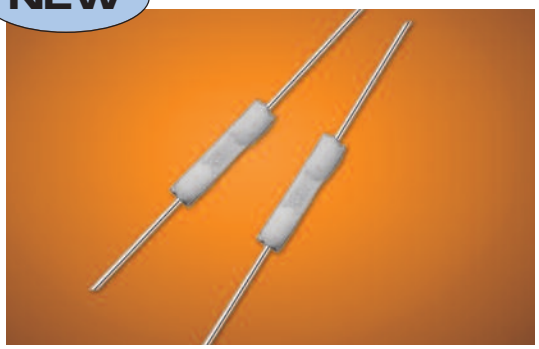
Parameter	Requirement Δ R (%+0.05Ω)	Test Method
Resistance	Within specified tolerance	0°C
T.C.R.	Within specified T.C.R.	0°C/ +100°C
Rapid Change of Temperature	±0.5%	-55°C (30 minutes)/ +200°C (30 minutes) 1000 cycles
Moisture Resistance	±0.5%	85°C ± 2°C, 85% RH, 1000 hours, 10mA, 1.5 hr ON, 0.5 hr OFF cycle
Normal Temperature Load Life	±0.5%	25°C ± 10°C, 1000 hours, 90mA, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Load Life	±0.5%	125°C, 1000 hours, 85mA continuous turning on electricity
Mechanical Shock	±0.5%	100g's maximum, 6Dms (standard), 12.3ft/s
Vibration	±0.5%	Test from 10-2000hz 20g's for 20 minutes, 12 cycles each of 3 orientations
Component Strength	600g and more	Pull test

KOA SPEER ELECTRONICS, INC.

SDT310VASP2

small type platinum thin film thermal sensors (small heater element)

NEW

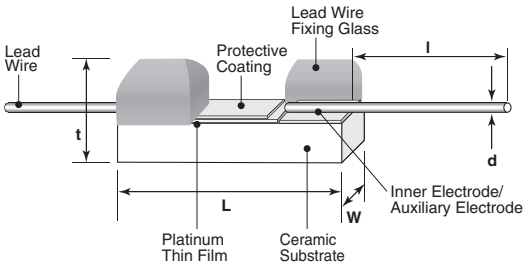


EU RoHS COMPLIANT

features

- Achieves a thermal time constant of 2.3-seconds due to volume reduction
- Excellent heat-resistance
- Applies axial lead type suitable to use as heater element
- Products with lead-free terminations meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction



Type	Dimensions inches (mm)				
	W	L	t	l	d
SDT310VASP2	.016 $^{+.006}_{-.004}$ (0.4 $^{+0.15}_{-0.1}$)	.079±.004 (2.0±0.10)	.026 max. (0.65 max.)	.394±.079 (10±2.0)	.005±.002 (ø0.12±0.05)

ordering information

SDT310V	AS	P	2	K	20	F	40
Type	Style	Terminal Surface Material	Generation	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. Tolerance
		P: Pt clad		K: Chip Tray B: Bulk	20: 20Ω	F: ±1	40: ±40 x 10^{-6}/K

applications and ratings

Part Designation	Resistance (Ω at 0°C)	Resistance Tolerance (%)	T.C.R. x 10^{-6}/K*1	Thermal Time Constant*2 (s)	Maximum Current (mA)	Power Rating (mW)	Operating Temperature Range*3
SDT310VASP2	20Ω	±1%	3850±40	2.3	76	336	-55°C to +600°C

*1 T.C.R. measuring temperature: 0°C/+100°C.
*2 Thermal time constant is value measured in stationary air and is typical value ,which are values of elements and vary with connecting or fixing methods.
*3 Temperature of the device including a self-heating.

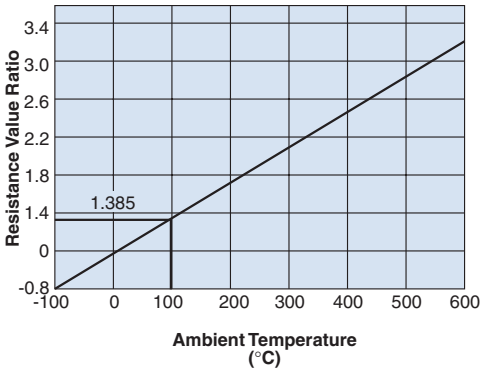
10/21/21

SDT310VASP2

small type platinum thin film thermal sensors (small heater element)

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

-55°C~0°C :$R_T=R_0\{1+C_1T+C_2T^2+C_3(T-100)T^3\}$

0°C~+400°C :$R_T=R_0(1+C_1T+C_2T^2)$

R_T : Resistance value at T°C

R_0 : Resistance value at 0°C

T : Ambient temperature(°C)

Constants C_1, C_2, C_3:

$C_1=3.908\times10^{-3}\,°C^{-1}$

$C_2=-5.775\times10^{-7}\,°C^{-2}$

$C_3=-4.183\times10^{-12}\,°C^{-4}$

Pt20 Resistance - Temperature Characteristic 20 at 0°C

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	16.06	15.98	15.90	15.82	15.74	15.66	–	–	–	–
–40	16.85	16.77	16.70	16.62	16.54	16.46	16.38	16.30	16.22	16.14
–30	17.64	17.57	17.49	17.41	17.33	17.25	17.17	17.09	17.01	16.93
–20	18.43	18.35	18.27	18.20	18.12	18.04	17.96	17.88	17.80	17.72
–10	19.22	19.14	19.06	18.98	18.90	18.82	18.75	18.67	18.59	18.51
0	20.00	19.92	19.84	19.77	19.69	19.61	19.53	19.45	19.37	19.30
	0	1	2	3	4	5	6	7	8	9
0	20.00	20.08	20.16	20.23	20.31	20.39	20.47	20.55	20.62	20.70
10	20.78	20.86	20.94	21.01	21.09	21.17	21.25	21.33	21.40	21.48
20	21.56	21.64	21.71	21.79	21.87	21.95	22.02	22.10	22.18	22.26
30	22.33	22.41	22.49	22.57	22.64	22.72	22.80	22.88	22.95	23.03
40	23.11	23.19	23.26	23.34	23.42	23.49	23.57	23.65	23.73	23.80
50	23.88	23.96	24.03	24.11	24.19	24.26	24.34	24.42	24.49	24.57
60	24.65	24.73	24.80	24.88	24.96	25.03	25.11	25.19	25.26	25.34
70	25.42	25.49	25.57	25.64	25.72	25.80	25.87	25.95	26.03	26.10
80	26.18	26.26	26.33	26.41	26.48	26.56	26.64	26.71	26.79	26.87
90	26.94	27.02	27.09	27.17	27.25	27.32	27.40	27.47	27.55	27.63
100	27.70	27.78	27.85	27.93	28.00	28.08	28.16	28.23	28.31	28.38
110	28.46	28.53	28.61	28.69	28.76	28.84	28.91	28.99	29.06	29.14
120	29.21	29.29	29.36	29.44	29.51	29.59	29.67	29.74	29.82	29.89
130	29.97	30.04	30.12	30.19	30.27	30.34	30.42	30.49	30.57	30.64
140	30.72	30.79	30.87	30.94	31.02	31.09	31.17	31.24	31.32	31.39
150	31.47	31.54	31.61	31.69	31.76	31.84	31.91	31.99	32.06	32.14
160	32.21	32.29	32.36	32.43	32.51	32.58	32.66	32.73	32.81	32.88
170	32.95	33.03	33.10	33.18	33.25	33.33	33.40	33.47	33.55	33.62
180	33.70	33.77	33.84	33.92	33.99	34.07	34.14	34.21	34.29	34.36
190	34.43	34.51	34.58	34.66	34.73	34.80	34.88	34.95	35.02	35.10
200	35.17	35.24	35.32	35.39	35.47	35.54	35.61	35.69	35.76	35.83
210	35.91	35.98	36.05	36.13	36.20	36.27	36.34	36.42	36.49	36.56
220	36.64	36.71	36.78	36.86	36.93	37.00	37.08	37.15	37.22	37.29
230	37.37	37.44	37.51	37.59	37.66	37.73	37.80	37.88	37.95	38.02
240	38.19	38.17	38.24	38.31	38.38	38.46	38.53	38.60	38.67	38.75
250	38.82	38.89	38.96	39.04	39.11	39.18	39.25	39.33	39.40	39.47
260	39.54	39.61	39.69	39.76	39.83	39.90	39.97	40.05	40.12	40.19
270	40.26	40.33	40.41	40.48	40.55	40.62	40.69	40.77	40.84	40.91
280	40.98	41.05	41.12	41.20	41.27	41.34	41.41	41.48	41.55	41.63
290	41.70	41.77	41.84	41.91	41.98	42.05	42.13	42.20	42.27	42.34
300	42.41	42.48	42.55	42.62	42.70	42.77	42.84	42.91	42.98	43.05
310	43.12	43.19	43.26	43.33	43.41	43.48	43.55	43.62	43.69	43.76
320	43.83	43.90	43.97	44.04	44.11	44.18	44.25	44.33	44.40	44.47
330	44.54	44.61	44.68	44.75	44.82	44.89	44.96	45.03	45.10	45.17
340	45.24	45.31	45.38	45.45	45.52	45.59	45.66	45.73	45.80	45.87
350	45.94	46.01	46.08	46.15	46.22	46.29	46.36	46.43	46.50	46.57
360	46.64	46.71	46.78	46.85	46.92	46.99	47.06	47.13	47.20	47.27
370	47.34	47.41	47.48	47.55	47.62	47.69	47.76	47.83	47.90	47.97
380	48.04	48.10	48.17	48.24	48.31	48.38	48.45	48.52	48.59	48.66
390	48.73	48.80	48.87	48.94	49.00	49.07	49.14	49.21	49.28	49.35
400	49.42	49.49	49.56	49.63	49.69	49.76	49.83	49.90	49.97	50.04
410	50.11	50.18	50.24	50.31	50.38	50.45	50.52	50.59	50.66	50.72
420	50.79	50.86	50.93	51.00	51.07	51.13	51.20	51.27	51.34	51.41
430	51.48	51.54	51.61	51.68	51.75	51.82	51.88	51.95	52.02	52.09
440	52.16	52.22	52.29	52.36	52.43	52.50	52.56	52.63	52.70	52.77

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 28.08Ω.

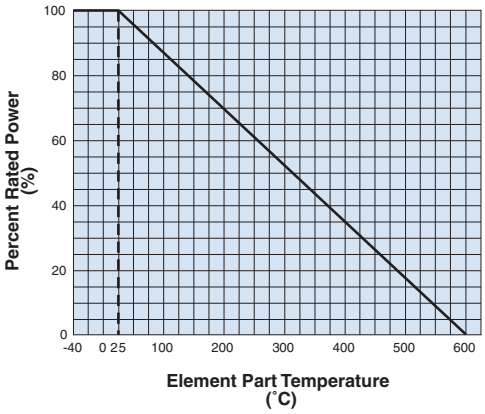
environmental applications (continued)

Pt20 Resistance - Temperature Characteristic 20 at 0°C

Temperature (°C)	0	1	2	3	4	5	6	7	8	9
450	52.84	52.90	52.97	53.04	53.11	53.17	53.24	53.31	53.38	53.44
460	53.51	53.58	53.65	53.71	53.78	53.85	53.92	53.98	54.05	54.12
470	54.19	54.25	54.32	54.39	54.46	54.52	54.59	54.66	54.72	54.79
480	54.86	54.93	54.99	55.06	55.13	55.19	55.26	55.33	55.39	55.46
490	55.53	55.60	55.66	55.73	55.80	55.86	55.93	56.00	56.06	56.13
500	56.20	56.26	56.33	56.40	56.46	56.53	56.59	56.66	56.73	56.79
510	56.86	56.93	56.99	57.06	57.13	57.19	57.26	57.32	57.39	57.46
520	57.52	57.59	57.66	57.72	57.79	57.85	57.92	57.99	58.05	58.12
530	58.18	58.25	58.32	58.38	58.45	58.51	58.58	58.64	58.71	58.78
540	58.84	58.91	58.97	59.04	59.10	59.17	59.24	59.30	59.37	59.43
550	59.50	59.56	59.63	59.69	59.76	59.82	59.89	59.96	60.02	60.09
560	60.15	60.22	60.28	60.35	60.41	60.48	60.54	60.61	60.67	60.74
570	60.80	60.87	60.93	61.00	61.06	61.13	61.19	61.26	61.32	61.39
580	61.45	61.52	61.58	61.65	61.71	61.77	61.84	61.90	61.97	62.03
590	62.10	62.16	62.23	62.29	62.36	62.42	62.48	62.55	62.61	62.68
600	62.74	–	–	–	–	–	–	–	–	–

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 28.08Ω.

Derating Curve



For sensors operated at an element part temperature of 25°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

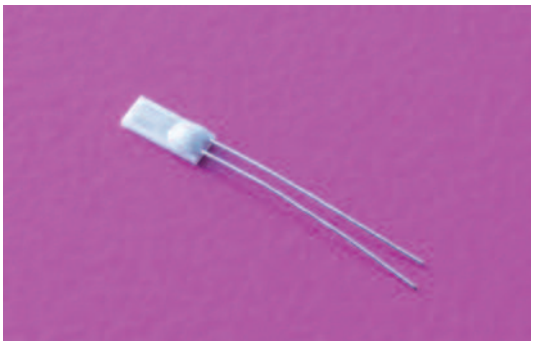
Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	0°C
T.C.R.	Within specified T.C.R.	—	0°C/ +100°C
Rapid Change of Temperature	±0.5%	-0.15%	-55°C (30 minutes)/ +200°C (30 minutes) 1000 cycles
Moisture Resistance	±0.5%	-0.12%	85°C ± 2°C, 85% RH, 1000 hours, 10mA, 1.5 hr ON, 0.5 hr OFF cycle
Normal Temperature Load Life	±0.5%	±0.10%	25°C ± 10°C, 1000 hours, 76mA, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Load Life	±0.5%	±0.11%	125°C, 1000 hours, 73mA continuous turning on electricity
Mechanical Shock	±0.5%	±0.04%	100g's maximum, 6Dms (standard), 12.3ft/s
Vibration	±0.5%	-0.03%	Test from 10-1900hz 30g's for 20 minutes, 12 cycles each of 3 orientations
Component Strength	400g and more	—	Pull test

KOA SPEER ELECTRONICS, INC.

SDT310HCTP

small type platinum thin film thermal sensors (narrow)

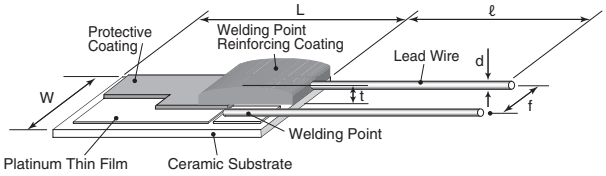
EU RoHS COMPLIANT



features

- Characteristics are equivalent with IEC 60751-2008, JISC 1604-2013
- Small package of 1.2mm x 3mm with 100Ω resistance
- Products meet RoHS requirements. RoHS regulation is not intended for Pb-glass contained in glass.

dimensions and construction



Type	Dimensions inches (mm)					
	W	L	t	f (Nom.)	d	l
SDT310HCTP	.047±.004 (1.2±0.10)	.118±.004 (3.0±0.10)	.043 max. (1.1 max.)	.002 (0.5)	.006±.002 (0.15±0.05)	.315 (8)

ordering information

SDT310	H	CT	P	100	A	3850
Type	Size Code	Operating Temperature	Terminal Surface Material	Nominal Resistance	Class	T.C.R. (x 10-6/K)
	H: H style	CT: -55°C~400°C	P: Pt clad wire	100: 100Ω	A: F0.15 B: F0.3	

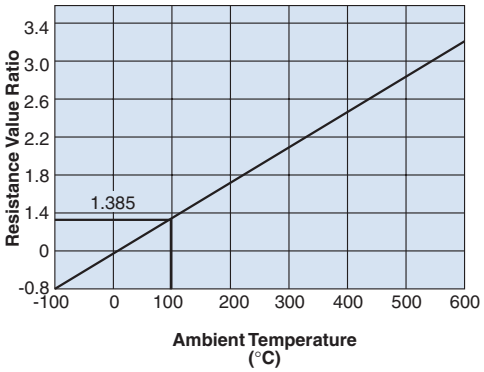
applications and ratings

Part Designation	Resistance (Ω at 0°C)	Tolerance Class IEC 60751-2008 / JIS C 1604-2013	Tolerance Class IEC 60751-2008 / JIS C 1604-1997	Tolerance	R. Value Tolerance (%)	T.C.R. (x10-6/K)**	Thermal Time*** Constant (s)	Self-heating Coefficient (°C/mW)****	Specified Current***** (mA) max.	Temperature Range (C°)
SDT310HCTP	100	F0.15	Class A	±(0.15+0.002 [t])*	±0.059	3850	2.8	0.09	1	-55 ~ +300
		F0.3	Class B	±(0.3+0.005 [t])*	±0.12					-55 ~ +400

* [t] is a measuring temperature indicated at ℃ that is not related to marking · –.
** T.C.R. Mesuring Temperature : 0℃/+100℃.
*** Thermal time constant is value measured in stationary air and is typical value, which is value of element and vary with connecting or fixing methods.
**** Self-heating coefficient expressed in ℃/mW is values measured at temperature : 0℃ in flowing oil with a velocity >0.2m/s, which is value of elements and vary with connecting or fixing methods.
***** Specified current is a current value that is used at reliability test under the condition of self heat-generation that can be disregarded. Recommended measuring currents 1mA for 100Ω.

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

-55°C~0°C :$R_T=R_0\{1+C_1T+C_2T^2+C_3(T-100)T^3\}$

0°C~+400°C :$R_T=R_0(1+C_1T+C_2T^2)$

R_T : Resistance value at T°C

R_0 : Resistance value at 0°C

T : Ambient temperature(°C)

Constants C_1, C_2, C_3:

$C_1=3.908\times10^{-3}\,°C^{-1}$

$C_2=-5.775\times10^{-7}\,°C^{-2}$

$C_3=-4.183\times10^{-12}\,°C^{-4}$

Pt100 Resistance - Temperature Characteristic (JISC 1604-2013) 100 at 0°C

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	80.31	79.91	79.51	79.11	78.72	78.32	—	—	—	—
-40	84.27	83.87	83.48	83.08	82.69	82.29	81.89	81.50	81.10	80.70
-30	88.22	87.83	87.43	87.04	86.64	86.25	85.85	85.46	85.06	84.67
-20	92.16	91.77	91.37	90.98	90.59	90.19	89.80	89.40	89.01	88.62
-10	96.09	95.69	95.30	94.91	94.52	94.12	93.73	93.34	92.95	92.55
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48
	0	1	2	3	4	5	6	7	8	9
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
150	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68
160	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40
170	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11
180	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.43	171.80
190	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49
200	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16
210	179.53	179.89	180.26	180.63	180.99	181.36	181.72	182.09	182.46	182.82
220	183.19	183.55	183.92	184.28	184.65	185.01	185.38	185.74	186.11	186.47
230	186.84	187.20	187.56	187.93	188.29	188.66	189.02	189.38	189.75	190.11
240	190.47	190.84	191.20	191.56	191.92	192.29	192.65	193.01	193.37	193.74
250	194.10	194.46	194.82	195.18	195.55	195.91	196.27	196.63	196.99	197.35
260	197.71	198.07	198.43	198.79	199.15	199.51	199.87	200.23	200.59	200.95
270	201.31	201.67	202.03	202.39	202.75	203.11	203.47	203.83	204.19	204.55
280	204.90	205.26	205.62	205.98	206.34	206.70	207.05	207.41	207.77	208.13
290	208.48	208.84	209.20	209.56	209.91	210.27	210.63	210.98	211.34	211.70
300	212.05	212.41	212.76	213.12	213.48	213.83	214.19	214.54	214.90	215.25
310	215.61	215.96	216.32	216.67	217.03	217.38	217.74	218.09	218.44	218.80
320	219.15	219.51	219.86	220.21	220.57	220.92	221.27	221.63	221.98	222.33
330	222.68	223.04	223.39	223.74	224.09	224.45	224.80	225.15	225.50	225.85
340	226.21	226.56	226.91	227.26	227.61	227.96	228.31	228.66	229.02	229.37
350	229.72	230.07	230.42	230.77	231.12	231.47	231.82	232.17	232.52	232.87
360	233.21	233.56	233.91	234.26	234.61	234.96	235.31	235.66	236.00	236.35
370	236.70	237.05	237.40	237.74	238.09	238.44	238.79	239.13	239.48	239.83
380	240.18	240.52	240.87	241.22	241.56	241.91	242.26	242.60	242.95	243.29
390	243.64	243.99	244.33	244.68	245.02	245.37	245.71	246.06	246.40	246.75
400	247.09	247.44	247.78	248.13	248.47	248.81	249.16	249.50	249.85	250.19

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 140.40Ω.

environmental applications (continued)

Performance Characteristics

Parameter	Requirement Δ R ±(%) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	0°C
T.C.R.	Within specified T.C.R.	—	0°C/ +100°C
Insulation Resistance	100MΩ or more	—	d.c. 100V
Dielectric Withstanding Voltage	±0.06%	-0.003%	a.c. 100V, 60 seconds - 70 seconds
Rapid Change of Temperature	±0.06 (F0.15 at 300°C)	-0.002%	-55°C (30 minutes)/ +25°C (2 - 3 minutes)/ +300°C or +400°C (30 minutes)/ +25°C (2 - 3 minutes), 10 cycles
	±0.12 (F0.3 at 400°C)	+0.013%	
Moisture Resistance	±0.06%	-0.002%	60°C ± 2°C, 90 - 95% RH, 1000 hours, 1mA, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Load Life	±0.06 (F0.15 at 300°C)	-0.016%	300°C or 400°C, 1000 hours, 1mA continuous turning on electricity
	±0.12 (F0.3 at 400°C)	-0.022%	
High Temperature Exposure	±0.06 (F0.15 at 300°C)	+0.004%	+300°C or +400°C, 1000 hours
	±0.12 (F0.3 at 400°C)	+0.014%	
Low Temperature Exposure	±0.06%	+0.010%	-55°C, 1000 hours

KOA SPEER ELECTRONICS, INC.

SDT310

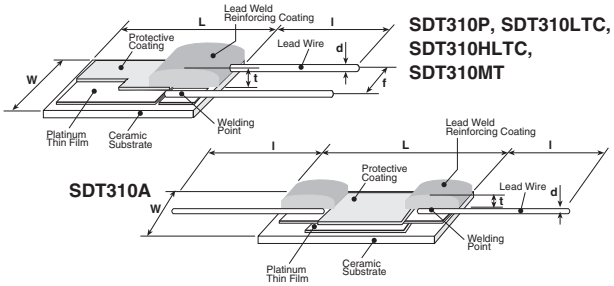
small type platinum thin film thermal sensors

EU RoHS COMPLIANT

features

- T.C.R. is in accordance to JIS-DIN IEC standards
- The small package with a real ability of 1kΩ resistance
- Thermal time constant is improved with the small package
- Products with lead-free terminations meet EU RoHS requirements. Pb located in glass material, electrode and resistor element is exempt per Annex 1, exemption 5 of EU directive 2005/95/EC.

dimensions and construction



Type	Dimensions inches (mm) L	W	t	f	d (Nom.)	l
SDT310AP	.118±.010 (3.0±0.25)	.031±.008 (0.8±0.2)	.047 max. (1.2 max.)	—	.008±.002 (ø0.2±0.05)	.315±.079 (8±2)
SDT310LTC		.079±.010 (2.0±0.25)		.043±.010 (1.1±0.25)		.394 +.179 -.079 (10 +5 -2)
SDT310P						.315±.079 (8±2)
SDT310MTM						
SDT310HLTC	.197±.004 (5.0±0.10)	.047±.004 (1.2±0.10)	.043 max. (1.1 max.)	.012±.004 (0.3±0.10)		.394 +.179 -.079 (10 +5 -2)

ordering information

SDT310	2B	LT	C	100	B	3850
Type	Size Code	Temperature Range	Terminal Surface Temperature	Nominal Resistance	Class	T.C.R. (x 10⁻⁶/K)
	Nil: Standard A H	LT: -55°C~+155°C Nil: -55°C~+400°C MT: -55°C~+650°C	C: SnCu (SDT310LT, SDT310HLT) P: Pt clad wire (SDT310, SDT310A) M: PtIr (SDT310MT)	100: 100Ω 500: 500Ω 1K: 1kΩ 10: 10Ω (SDT310AP)	A: ±(0.15+0.002[t]) B: ±(0.3+0.005[t]) C: ±(1.0+0.01[t]) K: ±10%(SDT310A)	

applications and ratings

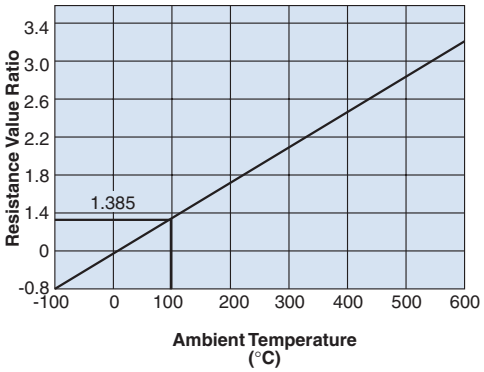
Part Designation	Resistance Range @ 0°C	Tolerance Class (°C)	Resistance Tolerance	Thermal Time Constant**	Thermal Dissipation Constant**	T.C.R. (ppm/°C)*	Specified Current***	Operating Temperature Range
SDT310LTC	100Ω, 500Ω, 1kΩ	A:±(0.15+0.002 [t])	±0.059%	7 seconds in stationary air	0.9mW/°C	3850	10Ω, 100Ω 1mA Max. 500Ω, 1KΩ 0.1mA Max.	-55°C to +155°C
		B:±(0.3+0.005 [t])	±0.12%					
		C:±(1.0+0.01 [t])	±0.39%					
SDT310P	100Ω, 500Ω, 1kΩ	A:±(0.15+0.002 [t])	±0.059%					-55°C to +400°C
		B:±(0.3+0.005 [t])	±0.12%					
		C:±(1.0+0.01 [t])	±0.39%					-55°C to +650°C
SDT310MTM	100Ω	B:±(0.3+0.005 [t])	±0.12%					
		C:±(1.0+0.01 [t])	±0.39%					
SDT310HLTC	1kΩ	A:±(0.15+0.002 [t])	±0.059%	2.8 seconds in stationary air	1.0mW/°C			-55°C to +155°C
		B:±(0.3+0.005 [t])	±0.12%					
		C:±(1.0+0.01 [t])	±0.39%					
SDT310AP	10Ω	—	±10%	6 seconds in stationary air	1.0mW/°C	3850±2%		-55°C to +400°C

* T.C.R. measuring temperature: 0°C/+100°C.
** Thermal time constant and thermal dissipation constant are values measured in stationary air and are typical values, which are values of elements and vary with connecting or fixing methods.
*** The electricity which it is charged with in the element is moved to the range that rise in temperature due to a self-heat generation can be ignored. Recommended measuring currents are 1mA for 100Ω and 0.1mA for 500Ω or 1kΩ. SDT310AP can be used as hot-film sensor. Maximum specified current is 100mA when using under self-heating condition.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/20/18

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

-55°C~0°C :$R_T=R_0\{1+C_1T+C_2T^2+C_3(T-100)T^3\}$

0°C~+650°C :$R_T=R_0(1+C_1T+C_2T^2)$

R_T : Resistance value at T°C

R_0 : Resistance value at 0°C

T : Ambient temperature(°C)

Constants C_1, C_2, C_3:

$C_1=3.9083\times10^{-3}\,°C^{-1}$

$C_2=-5.775\times10^{-7}\,°C^{-2}$

$C_3=-4.183\times10^{-12}\,°C^{-4}$

Pt100 Resistance - Temperature Characteristic (JIS C1604-1997) 100 at 0°C

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	80.31	79.91	79.51	79.11	78.72	78.32	—	—	—	—
-40	84.27	83.87	83.48	83.08	82.69	82.29	81.89	81.50	81.10	80.70
-30	88.22	87.83	87.43	87.04	86.64	86.25	85.85	85.46	85.06	84.67
-20	92.16	91.77	91.37	90.98	90.59	90.19	89.80	89.40	89.01	88.62
-10	96.09	95.69	95.30	94.91	94.52	94.12	93.73	93.34	92.95	92.55
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48
	0	1	2	3	4	5	6	7	8	9
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
150	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68
160	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40
170	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11
180	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.43	171.80
190	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49
200	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16
210	179.53	179.89	180.26	180.63	180.99	181.36	181.72	182.09	182.46	182.82
220	183.19	183.55	183.92	184.28	184.65	185.01	185.38	185.74	186.11	186.47
230	186.84	187.20	187.56	187.93	188.29	188.66	189.02	189.38	189.75	190.11
240	190.47	190.84	191.20	191.56	191.92	192.29	192.65	193.01	193.37	193.74
250	194.10	194.46	194.82	195.18	195.55	195.91	196.27	196.63	196.99	197.35
260	197.71	198.07	198.43	198.79	199.15	199.51	199.87	200.23	200.59	200.95
270	201.31	201.67	202.03	202.39	202.75	203.11	203.47	203.83	204.19	204.55
280	204.90	205.26	205.62	205.98	206.34	206.70	207.05	207.41	207.77	208.13
290	208.48	208.84	209.20	209.56	209.91	210.27	210.63	210.98	211.34	211.70
300	212.05	212.41	212.76	213.12	213.48	213.83	214.19	214.54	214.90	215.25
310	215.61	215.96	216.32	216.67	217.03	217.38	217.74	218.09	218.44	218.80
320	219.15	219.51	219.86	220.21	220.57	220.92	221.27	221.63	221.98	222.33
330	222.68	223.04	223.39	223.74	224.09	224.45	224.80	225.15	225.50	225.85
340	226.21	226.56	226.91	227.26	227.61	227.96	228.31	228.66	229.02	229.37
350	229.72	230.07	230.42	230.77	231.12	231.47	231.82	232.17	232.52	232.87
360	233.21	233.56	233.91	234.26	234.61	234.96	235.31	235.66	236.00	236.35
370	236.70	237.05	237.40	237.74	238.09	238.44	238.79	239.13	239.48	239.83
380	240.18	240.52	240.87	241.22	241.56	241.91	242.26	242.60	242.95	243.29
390	243.64	243.99	244.33	244.68	245.02	245.37	245.71	246.06	246.40	246.75
400	247.09	247.44	247.78	248.13	248.47	248.81	249.16	249.50	249.85	250.19
410	250.53	250.88	251.22	251.56	251.91	252.25	252.59	252.93	253.28	253.62
420	253.96	254.30	254.65	254.99	255.33	255.67	256.01	256.35	256.70	257.04
430	257.38	257.72	258.06	258.40	258.74	259.08	259.42	259.76	260.10	260.44
440	260.78	261.12	261.46	261.80	262.14	262.48	262.82	263.16	263.50	263.84

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 140.40Ω. The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5. Similarly, the value for 1KΩ at 0°C will be the value obtained by multiplying the resistance value by 10.

environmental applications (continued)

Pt100 Resistance - Temperature Characteristic (JIS C1604-1997)
100 at 0°C

Temperature (°C)	0	1	2	3	4	5	6	7	8	9
450	264.18	264.52	264.86	265.20	265.53	265.87	266.21	266.55	266.89	267.22
460	267.56	267.90	268.24	268.57	268.91	269.25	269.59	269.92	270.26	270.60
470	270.93	271.27	271.61	271.94	272.28	272.61	272.95	273.29	273.62	273.96
480	274.29	274.63	274.96	275.30	275.63	275.97	276.30	276.64	276.97	277.31
490	277.64	277.98	278.31	278.64	278.98	279.31	279.64	279.98	280.31	280.64
500	280.98	281.31	281.64	281.98	282.31	282.64	282.97	283.31	283.64	283.97
510	284.30	284.63	284.97	285.30	285.63	285.96	286.29	286.62	286.95	287.29
520	287.62	287.95	288.28	288.61	288.94	289.27	289.60	289.93	290.26	290.59
530	290.92	291.25	291.58	291.91	292.24	292.56	292.89	293.22	293.55	293.88
540	294.21	294.54	294.86	295.19	295.52	295.85	296.18	296.50	296.83	297.16
550	297.49	297.81	298.14	298.47	298.80	299.12	299.45	299.78	300.10	300.43
560	300.75	301.08	301.41	301.73	302.06	302.38	302.71	303.03	303.36	303.69
570	304.01	304.34	304.66	304.98	305.31	305.63	305.96	306.28	306.61	306.93
580	307.25	307.58	307.90	308.23	308.55	308.87	309.20	309.52	309.84	310.16
590	310.49	310.81	311.13	311.45	311.78	312.10	312.42	312.74	313.06	313.39
600	313.71	314.03	314.35	314.67	314.99	315.31	315.64	315.96	316.28	316.60
610	316.92	317.24	317.56	317.88	318.20	318.52	318.84	319.16	319.48	319.80
620	320.12	320.43	320.75	321.07	321.39	321.71	322.03	322.35	322.67	322.98
630	323.30	323.62	323.94	324.26	324.57	324.89	325.21	325.53	325.84	326.16
640	326.48	326.79	327.11	327.43	327.74	328.06	328.38	328.69	329.01	329.32

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 140.40Ω. The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5. Similarly, the value for 1KΩ at 0°C will be the value obtained by multiplying the resistance value by 10.

Performance Characteristics

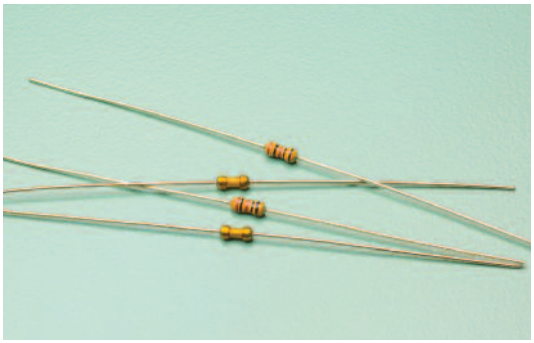
Parameter	Requirement Δ R (%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	0°C
T.C.R.	Within specified T.C.R.	—	0°C/ +100°C
Insulation Resistance	100MΩ or more	—	d.c. 100V
Dielectric Withstanding Voltage	±0.12%	±0.010%	a.c. 100V, 60 seconds - 70 seconds
Resistance to Solder Heat	±0.5%	±0.014%	350°C for 3.5 seconds
Rapid Change of Temperature	±0.12%	-0.026%	-55°C (30 minutes)/ +25°C (2 - 3 minutes)/ +155°C (30 minutes)/ +25°C (2 - 3 minutes), 10 cycles (SDT310LTC, SDT310HLTC); -55°C (30 minutes)/ +25°C (2 - 3 minutes)/ +400°C (30 minutes)/ +25°C (2 - 3 minutes), 10 cycles (SDT310P, SDT310A); +25°C (30 minutes)/ +650°C (30 minutes) 10 cycles (SDT310MTM)
Moisture Resistance	±0.5%	-0.004%	60°C ± 2°C, 90 - 95% RH, 1000 hours, 1mA, 1.5 hr ON, 0.5 hr OFF cycle
Normal Temperature Load Life	±0.5%	-0.017%	20°C ± 10°C, 1000 hours, 1mA continuous turning on electricity
High Temperature Load Life	±0.5%	-0.022%	155°C ± 2°C (SDT310LTC, SDT310HLTC), 400°C ± 8°C (SDT310P, SDT310AP), 1000 hours, 650°C ± 13°C (SDT310MTM), 250 hours, 1mA continuous turning on electricity
High Temperature Exposure	±0.12%, ±0.5% (SDT310MTM)	-0.027%, -0.060% (SDT310MTM)	+155°C (SDT310LTC, SDT310HLTC), +400°C (SDT310P, SDT310AP), +650°C (SDT310MTM), 250 hours
Low Temperature Exposure	±0.12%	-0.036%	-55°C, 250 hours

 12/19/17

SDT101

platinum thin film thermal sensors

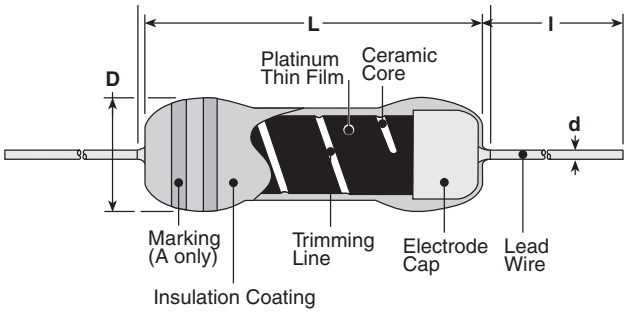
EU RoHS COMPLIANT



features

- SDT101SA is ultra-compact sensor element and offers 1kΩ
- Simple structure for lead forming
- STD101A and SDT101SA can be easily soldered
- Ideal for low directivity heat flow sensor elements
- Stable characteristics even in use for a long time with an excellent environment resistance
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Tested (SDT101B 500Ω only)

dimensions and construction



Type	Dimensions inches (mm)				
	L	C	D	d (Nom.)	l
SDT101A	.157±.031 (4.0±0.8)	—	.063±.008 (1.6±0.2)	.016±.003 (0.4±0.08)	1.18±.118 (30±3)
SDT101SA	—	.157±.031 (4.0±0.8)	.063±.008 (1.6±0.2)	.016±.003 (0.4±0.08)	1.18±.118 (30±3)
SDT101B	.157±.031 (4.0±0.8)	—	.059±.008 (1.5±0.2)	.016±.003 (0.4±0.08)	1.18±.118 (30±3)

ordering information

SDT101	A	X	C	T26	A	100	D	F
Type	**Temperature Range**	**Reference Temperature***	**Terminal Surface Material**	**Taping**	**Packaging**	**Nominal Resistance**	**Resistance Tolerance**	**T.C.R. Tolerance**
SDT101 SDT101S	A: -55°C~+150°C B: -55°C~+300°C	X: 0°C	C: SnCu (A, SA only) N: Ni (B only)	Nil: Bulk T26: 26mm taping (A only) T52: 52mm taping	Nil: Bulk A: AMMO (A only) R: Reel (B only)	10: 10Ω 100: 100Ω 500: 500Ω 1K: 1000Ω (SA only)	D: ±0.5% F: ±1% G: ±2% (SA only)	F: ±1% G: ±2%

* There is also a product that has a standard temperature of 25°C (symbol: Y) for custom support.
(However, the temperature coefficient of resistance is measured at 0°C/100°C.) Please contact us.
Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.
For further information on taping, please refer to Appendix C on the back pages.

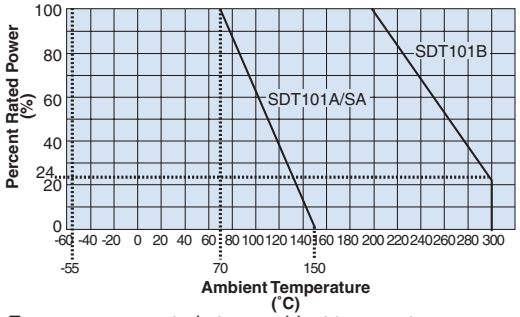
applications and ratings

	Part Designation	Power Rating @ 70°C*	Thermal Time Constant*	Thermal Dissipation Constant*	Resistance Range	Resistance Tolerance	T.C.R. (ppm/°C)	T.C.R. Tolerance (ppm/°C)	Rated Ambient Temperature	Operating Temperature Range
	SDT101A	0.125W	6 seconds	2.8mW/°C	10Ω, 100Ω, 500Ω	D: ±0.5% F: ±1%	3500	F: ±1% G: ±2%	+70°C	-55°C to +150°C
NEW	SDT101SA				1000Ω	G: ±2%		G: ±2%		
	SDT101B		9 seconds	1.8mW/°C	10Ω, 100Ω, 500Ω	D: ±0.5% F: ±1%		F: ±1% G: ±2%	+200°C	-55°C to +300°C

* Thermal time constant and thermal dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods. T.C.R. measuring temperature: 0°C/+100°C

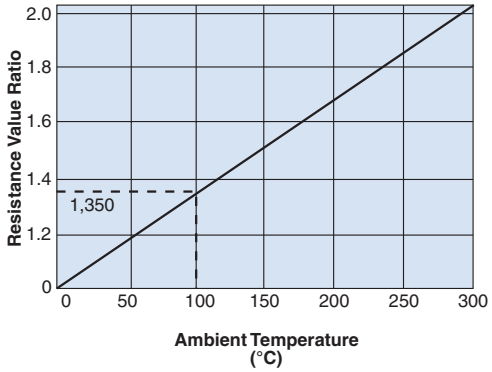
environmental applications

Derating Curve



For sensors operated at an ambient temperature or above, a power rating shall be derated in accordance with the above derating curve.

Example of Temperature Characteristics of Resistance



Approximate Expression for Resistance-Temperature Characteristics

R_T: Resistance value at T°C
R_0: Resistance value at 0°C
T: Ambient temperature (°C)
Constants C_1, C_2:
C_1=0.356297x10^{-2} C_2=0.617945x10^{-6}

Resistance - Temperature Characteristic (Typical Value)

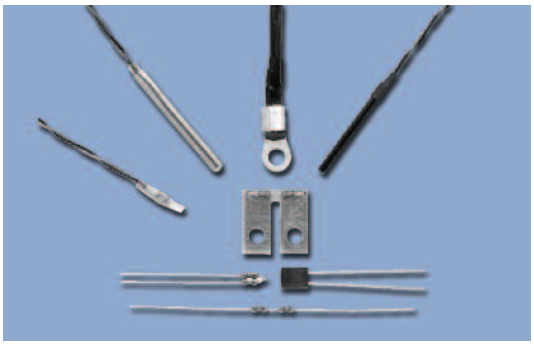
Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	82.04	81.67	81.31	80.94	80.58	80.22	—	—	—	—
-40	85.66	85.29	84.93	84.57	84.21	83.85	83.49	83.12	82.76	82.40
-30	89.26	88.90	88.54	88.18	87.82	87.46	87.10	86.74	86.38	86.02
-20	92.85	92.49	92.13	91.78	91.42	91.06	90.70	90.34	89.98	89.62
-10	96.43	96.07	95.72	95.36	95.00	94.64	94.29	93.93	93.57	93.21
0	100.00	99.64	99.29	98.93	98.57	98.22	97.86	97.50	97.15	96.79
	0	1	2	3	4	5	6	7	8	9
0	100.00	100.36	100.71	101.07	101.42	101.78	102.13	102.49	102.85	103.20
10	103.56	103.91	104.26	104.62	104.97	105.33	105.68	106.04	106.39	106.74
20	107.10	107.45	107.81	108.16	108.51	108.87	109.22	109.57	109.92	110.28
30	110.63	110.98	111.33	111.69	112.04	112.39	112.74	113.09	113.44	113.80
40	114.15	114.50	114.85	115.20	115.55	115.90	116.25	116.60	116.95	117.30
50	117.65	118.00	118.35	118.70	119.05	119.40	119.75	120.10	120.45	120.80
60	121.15	121.50	121.84	122.19	122.54	122.89	123.24	123.59	123.93	124.28
70	124.63	124.98	125.32	125.67	126.02	126.37	126.71	127.06	127.41	127.75
80	128.10	128.44	128.79	129.14	129.48	129.83	130.17	130.52	130.86	131.21
90	131.56	131.90	132.25	132.59	132.93	133.28	133.62	133.97	134.31	134.66
100	135.00	135.34	135.69	136.03	136.37	136.72	137.06	137.40	137.75	138.09
110	138.43	138.77	139.12	139.46	139.80	140.14	140.49	140.83	141.17	141.51
120	141.85	142.19	142.53	142.88	143.22	143.56	143.90	144.24	144.58	144.92
130	145.26	145.60	145.94	146.28	146.62	146.96	147.30	147.64	147.98	148.32
140	148.65	148.99	149.33	149.67	150.01	150.35	150.69	151.02	151.36	151.70
150	152.04	152.38	152.71	153.05	153.39	153.72	154.06	154.40	154.74	155.07
160	155.41	155.74	156.08	156.42	156.75	157.09	157.43	157.76	158.10	158.43
170	158.77	159.10	159.44	159.77	160.11	160.44	160.78	161.11	161.44	161.78
180	162.11	162.45	162.78	163.11	163.45	163.78	164.11	164.45	164.78	165.11
190	165.45	165.78	166.11	166.44	166.78	167.11	167.44	167.77	168.10	168.44
200	168.77	169.10	169.43	169.76	170.09	170.42	170.76	171.09	171.42	171.75
210	172.08	172.41	172.74	173.07	173.40	173.73	174.06	174.39	174.72	175.04
220	175.37	175.70	176.03	176.36	176.69	177.02	177.35	177.67	178.00	178.33
230	178.99	178.99	179.31	179.64	179.97	180.30	180.62	180.95	181.28	181.60
240	181.93	182.26	182.58	182.91	183.24	183.56	183.89	184.21	184.54	184.87
250	185.19	185.52	185.84	186.17	186.49	186.82	187.14	187.47	187.79	188.11
260	188.44	188.76	189.09	189.41	189.73	190.06	190.38	190.70	191.03	191.35
270	191.67	192.00	192.32	192.64	192.96	193.29	193.61	193.93	194.25	194.57
280	194.90	195.22	195.54	195.86	196.18	196.50	196.82	197.14	197.47	197.79
290	198.11	198.43	198.75	199.07	199.39	199.71	200.03	200.35	200.67	200.99
300	201.31	—	—	—	—	—	—	—	—	—

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 136.72Ω. The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5. Similarly, the value for 10Ω at 0°C will be the value obtained by dividing the resistance value by 10.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	0°C
T.C.R.	Within specified T.C.R.	—	0°C/ +100°C
Overload (Short Time)	±0.5%	±0.2%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat (SDT101A)	±0.3%	±0.1%	350°C, 1 second (SDT101A/SA)
Rapid Change of Temperature	±0.5%	±0.2%	-55°C (30 minutes)/ +25°C (10 minutes)/ +150°C (30 minutes)/ +25°C (10 minutes), 5 cycles
Moisture Resistance	±1%	±0.3%	80°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±1%	±0.2%	70°C ± 3°C (SDT101A/SA), 200°C ± 3°C (SDT101B), 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.7%	+150°C (SDT101A/SA), +300°C (SDT101B), 1000 hours
Shelf Life	±0.3%	±0.1%	Left for 1 year on shelf in natural condition

RoHS COMPLIANT



features

- All ST-series thermal sensors are custom-made products. ST-series thermal sensors are designed in various shapes in accordance with your application using a platinum thin-film thermal sensor (SDT101, SDT310 series) as an element. Shapes of sensor parts can be designed flexibly to meet your shapes and dimensional needs, from simple resin mold parts to sensor parts sealed in metal protective tubes made of SUS316.

ordering information

ST3000 Series

ST	31050201	F	A	X	1K	B	D
Type	Type Number	Pb Free Symbol	Element Type	Reference Temperature*	Nominal Resistance**	Resistance Tolerance**	T.C.R. Tolerance**
			A: SDT101	X: 0°C	100: 100Ω 500: 500Ω 1K: 1kΩ	B: ±0.1% C: ±0.2% D: ±0.5% F: ±1%	D: ±0.5% F: ±1% G: ±2%

ST8100 Series

ST	8102201	F	B	X	1K	B
Type	Type Number	Pb Free Symbol	Element Type	Reference Temperature	Nominal Resistance**	Class**
			B: SDT310LTC C: SDT310P	X: 0°C	100: 100Ω 500: 500Ω 1K: 1kΩ	B: ±(0.3+0.005 [t]) C: ±(1.0+0.01 [t])

* ST3000 series products with a reference temperature of 25°C (T.C.R. will be calculated between 0°C/100°C.) are also available. Contact us.

**These are specified for inner element only. Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

applications and ratings

Part Designation	Element	Resistance Value at 0°C	Class: Tolerance to Measuring Temperature	Resistance Tolerance	T.C.R. (x 10^{-6}/K)	T.C.R. Tolerance (ppm/°C)
ST3000	SDT101A SDT101B	100Ω 500Ω 1kΩ	—	B: ±0.1% C: ±0.2% D: ±0.5% F: ±1%	3500	D: ±0.5% F: ±1% G: ±2%
ST8100	SDT310LTC SDT310P	100Ω 500Ω 1kΩ	B: ±(0.3+0.005[t]) C: ±(1.0+0.01[t])	—	3850	—

ST3000 Series, 1kΩ, resistance tolerance B • C are produced in pair of SDT101Series. The combination of ST3000 series, resistance tolerance B-T.C.R. and tolerance D is equivalent to class B of SDT310 tolerance to the measuring temperature.

In the above table specification there are restrictions on manufacturing range depending on part number. Please refer to the Performance list.

environmental applications

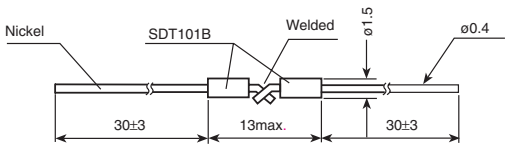
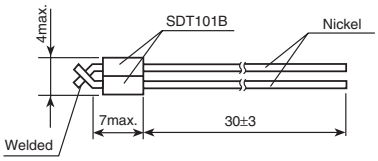
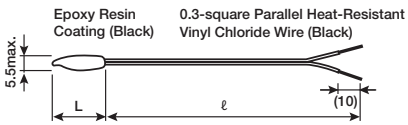
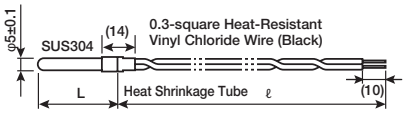
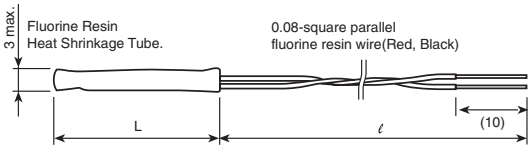
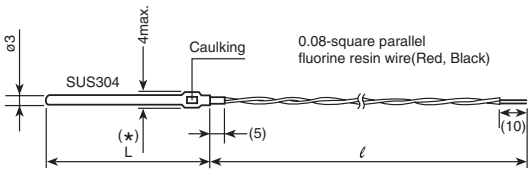
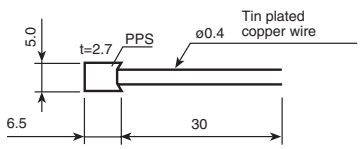
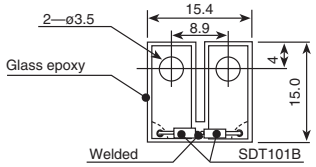
Example of	Material
Processing Protective Tubes	PPS
	Epoxy resin coating
	Fluorine resin shrinkage tube
	Polyimide
	SUS304
	SUS316
	Cu

Example of	Material
Processing External Conductors	Polyurethane coated wire
	Parallel heat-resistant vinyl chloride wire
	Fluorine resin coated wire
	Form
	2-wire system
	3-wire, 4-wire system
	Shielded wire

Example of	Form
Processing of Terminals	Processing of connecting terminals
Others	Mounting on printed circuit board

environmental applications

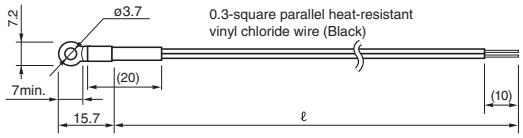
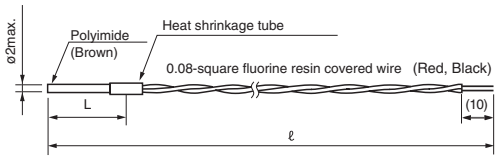
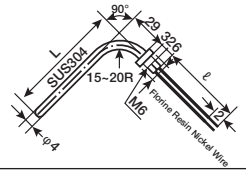
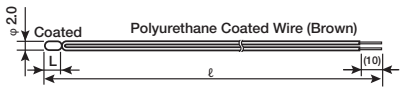
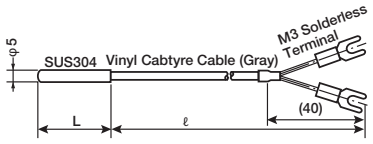
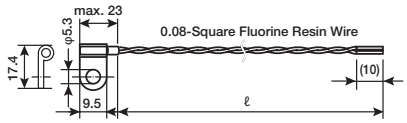
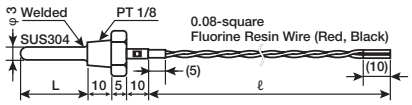
Performance Characteristics - ST3000 series (A part extract)

Shape Unit: mm	Product Number	L (mm)	ℓ (m)	Measurement Temp. Range
	31011 Lead wire without solder plating	—	—	-50°C ~ +300°C
	31012 Lead wire with solder plating	—	—	-40°C ~ +120°C
	31021 Lead wire without solder plating	—	—	-50°C ~ +300°C
	31022 Lead wire with solder plating	—	—	-40°C ~ +120°C
	31030201	30 max.	0.1	-40°C ~ +100°C
	31030205		0.5	
	31030210		1.0	
	31030230		3.0	
	31040301	35	0.1	-40°C ~ +100°C
	31040305		0.5	
	31040310		1.0	
	31040330		3.0	
	31050201	23 max.	0.1	-40°C ~ +220°C
	31050205		0.5	
	31050210		1.0	
	31050230		3.0	
 * For product of resistance 1kΩ or product of resistance tolerance B, C, L=50mm is only available.	31060301	30	0.1	-40°C ~ +220°C
	31060305		0.5	
	31060310		1.0	
	31060330		3.0	
	31060501	50	0.1	
	31060505		0.5	
	31060510		1.0	
	31060530		3.0	
	3201	—	—	-20°C ~ +120°C
	3202	—	—	-40°C ~ +140°C

 11/21/18

environmental applications (continued)

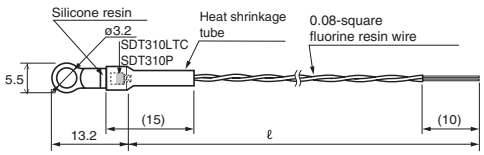
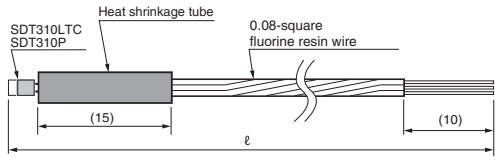
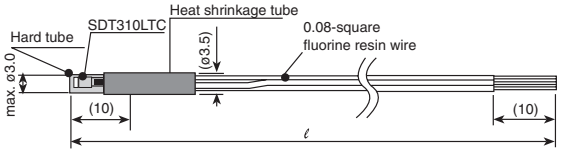
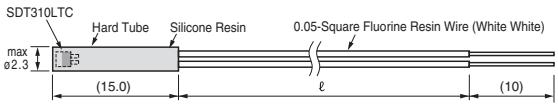
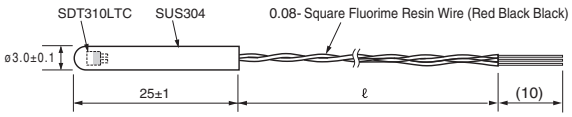
Performance Characteristics - ST3000 series (A part extract)

Shape Unit: mm	Product Number	L (mm)	ℓ (m)	Measurement Temp. Range
 * With the round terminals fixed, handle the wire without applying tensile stress or bending stress.	32050001	—	0.1	-20°C ~ +80°C
	32050005		0.5	
	32050010		1.0	
	32050030		3.0	
	32090201	24	0.1	-40°C ~ +120°C
	32090205		0.5	
	32090210		1.0	
	32090230		3.0	
	32120907	90	0.7	-40°C ~ +300°C Only top of protective tubes
	32121207	120	0.7	
	32121707	175	0.7	
	32121202	120	0.2	
 Products with resistance value 1K or resistance tolerance B, C are not manufactured	33010004	(8)	0.4	-20°C ~ +80°C
	33040305	35	0.5	-40°C ~ +60°C
	33040310		1.0	
	33040330		3.0	
	33060001	—	0.1	-20°C ~ +120°C
	33060005		0.5	
	33060010		1.0	
	33060030		3.0	
	33110305	30	0.5	-40°C ~ +220°C
	33110310		1.0	
	33110330		3.0	

thermal sensors

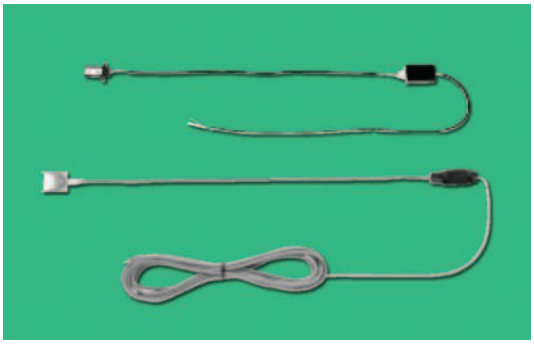
environmental applications (continued)

Performance Characteristics - ST8100 series

Shape Unit: mm	Product Number	Lead Wire Number	ℓ (m)	Measurement Temp. Range
 2 wire: Red Black 3 wire: Red Black Black	8102201	2	0.1	SDT310LTC: -40°C ~ +105°C SDT310P: -40°C ~ +200°C
	8102205		0.5	
	8102210		1.0	
	8102301	3	0.1	
	8102305		0.5	
	8102310		1.0	
 2 wire: Red Black 3 wire: Red Black Black	8103201	2	0.1	SDT310LTC: -40°C ~ +105°C SDT310P: -40°C ~ +200°C
	8103205		0.5	
	8103210		1.0	
	8103301	3	0.1	
	8103305		0.5	
	8103310		1.0	
 2 wire: Red Black 3 wire: Red Black Black	8104201	2	0.1	SDT310LTC Only: -40°C ~ +105°C
	8104205		0.5	
	8104210		1.0	
	8104301	3	0.1	
	8104305		0.5	
	8104310		1.0	
	8106201	2	0.1	SDT310LTC Only: -40°C ~ +125°C
	8106205		0.5	
	8106210		1.0	
	8107301	3	0.1	SDT310LTC Only: -40°C ~ +150°C
	8107305		0.5	
	8107310		1.0	

guarantee of product

The guaranteed term of the product is one year after delivery. However, when trouble occurs during the guaranteed term because of our responsibility, the product is exchanged or is repaired. We guarantee the product itself, any damages caused by this product shall be excused.



features

- The platinum thin-film thermal sensor realizes high and long-term stability
- The small platinum thin-film thermal sensor and an even temperature differential operating circuit ensure a quick response
- The built-in temperature compensation circuit assures correct values regardless of air temperature. The air velocity sensor and air velocity temperature compensation sensor are sensors with the same characteristics to enable correct temperature compensation
- Products have no rotating mechanism and are resistant to vibrations
- Products are compact and light, and are easy to be installed in equipment

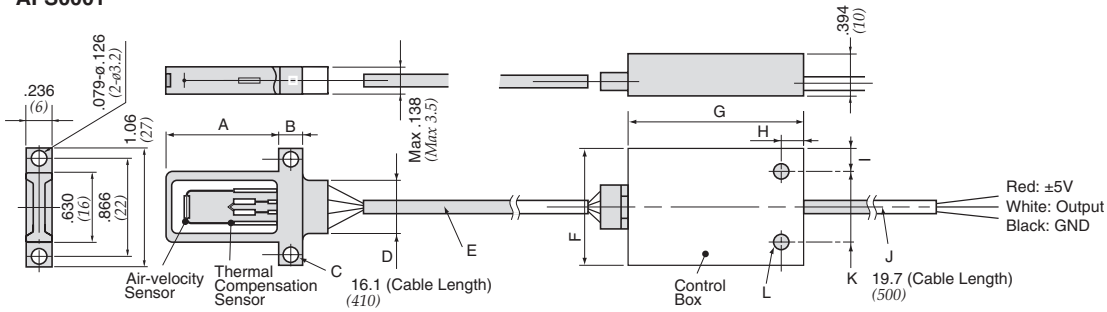
dimensions and construction

Size	Dimensions inches (mm)											
	A	B	C	D	E	F	G	H	I	J	K	L
AFS0001	.984 (25)	.197 (5)	2-ø.126 (2-ø3.2)	.512 (13)	ø.118 (ø3)	.984 (25)	1.57 (40)	.217 (5.5)	.177 (4.5)	ø.118 (ø3)	.630 (16)	2-ø.126 (2-ø3.2)

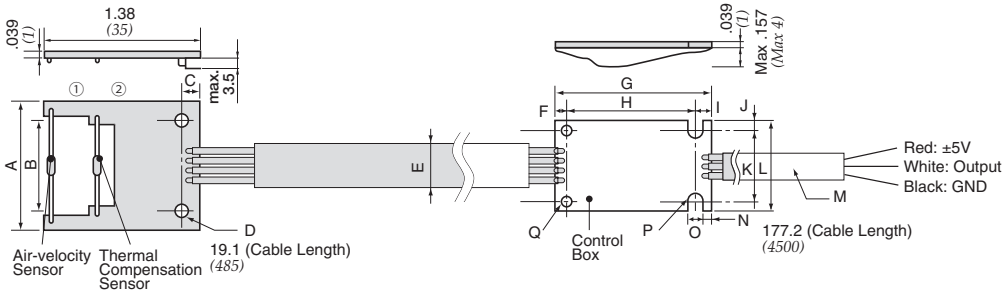
Size	Dimensions inches (mm)																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
AFS0002	1.10 (28)	.787 (20)	.157 (4)	2-ø.126 (2-ø3.2)	.394 (10)	.118 (3)	1.38 (35)	1.12 (28.5)	.138 (3.5)	.079 (2)	.630 (16)	.787 (20)	.197 (ø5)	.069 (1.76)	ø.126 (3.2)	R.126 (R3.2)	2-ø.079 (2-ø2.0)

Units: inches (mm)

AFS0001



AFS0002



ordering information

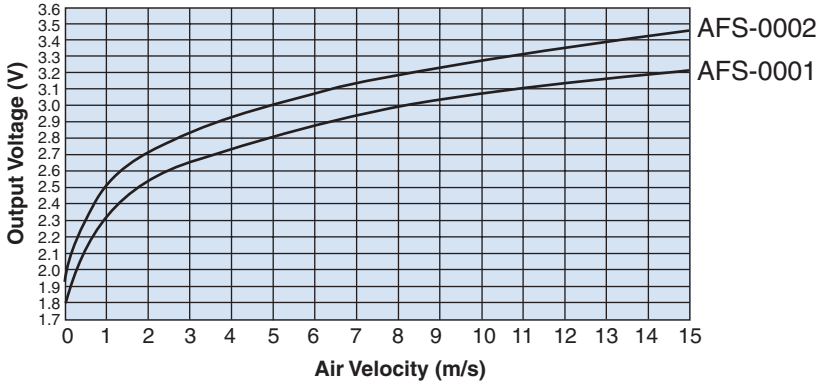
AFS	–	0001
Type		Type Number
		0001 0002

applications and ratings

Test Items	AFS-0001	AFS-0002	Remarks
Detection Object	Clean air, ordinary pressure		
Detection Range (m/s)	0 - 15		
Detection Accuracy (m/s)	±0.3%	±0.5%	0.5 - 1.0 (less than 1.0) m/s
	±0.5%	±0.7%	1.0 - 4.0 (less than 4.0) m/s
	—	±2.0%	4.0 - 12 (less than 12) m/s
	—	±3.0%	12 - 15 m/s
	±1.5%	—	4.0 - 15 m/s
Power Supply Voltage (V)	5.0 ± 0.25		
Current Consumption (A)	0.2 maximum		Start-up time is excluded
Output Voltage (V)	1.8 - 3.2	1.9 - 3.5	Non-linear analog (see Output Characteristics Diagram)
Output Impedance (Ω)	100 typical		
Start-up Time (S)	15 typical		
Operating Temperature Range (°C)	0 - +60		
Operating Humidity Range (%RH)	30 - 85		Dew condensation not allowed
Storage Temperature Range (°C)	-10 - +70		
Storage Humidity Range (%RH)	30 - 85		Dew condensation not allowed
Temperature Compensation Range (°C)	0 - +60		

environmental applications

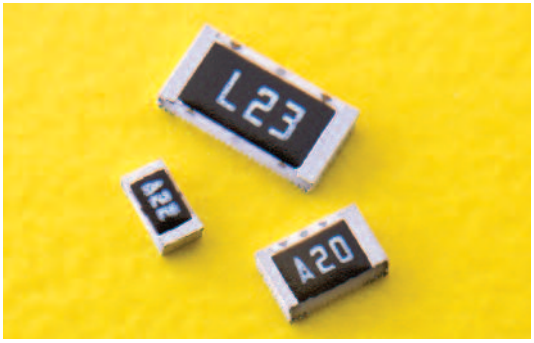
Output Characteristics Diagram



LP73

thin film resistance thermal chip sensor

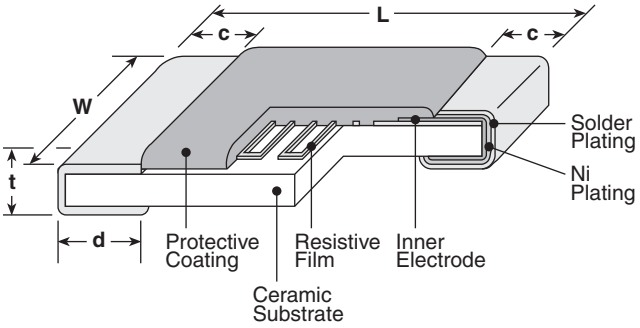
EU RoHS COMPLIANT



features

- Thin film thermal sensors of SMD type
- Resistance tolerance ±1%, a wide range of TCRs +3000x10^{-6}/K~+5000x10^{-6}/K with the standard products
- Suitable for control of temperatures in various industrial equipment
- Suitable for both flow and reflow soldering
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.008 (0.8±0.2)	.012±.008 (0.3±0.2)	.012±.008 (0.3±0.2)	.02±.004 (0.5±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.016±.008 (0.4±0.2)	.02±.006 (0.5±0.15)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.02±.012 (0.5±0.3)	.02±.006 (0.5±0.15)

ordering information

LP73	2B	T	TE	103	J	3600
Product Code	Size Code	Termination Material	Packaging	Resistance Value	Tolerance	T.C.R.
	1J: 0603 2A: 0805 2B: 1206	T: Sn	TE: 4mm embossed pitch plastic (5,000 pieces/reel)	2 significant figures + 1 multiplier 3 digits	F: ±1% G: ±2% J: ±5%	

applications and ratings

Part Designation	Power Rating	Thermal Time Constant (sec.)*	Thermal Dissipation Constant (mW/°C)*	Rated Ambient Temp.	Operating Temp. Range
LP731J	0.016W	2	1.2	+70°C	-55°C to +125°C
LP732A	0.031W	4	1.8		
LP732B	0.063W	6.5	2.4		

* Thermal Time Constant and Dissipation Constant are reference values, which are values of elements and vary with connecting or fixing methods.

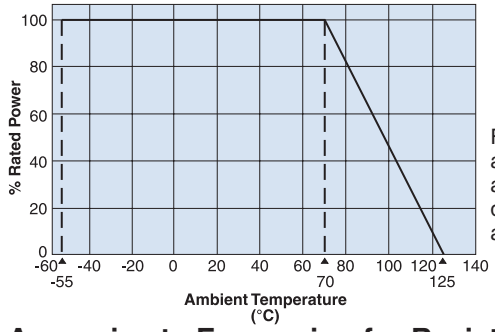
For further information on packaging, please refer to Appendix A.

applications and ratings (continued)

T.C.R. (ppm/°C) Max.	T.C.R. Tolerance	Resistance Range E-24			Resistance Tolerance
		1J	2A	2B	
3000	±5%	100Ω-1kΩ	100Ω - 2kΩ	100Ω - 10kΩ	F: ±1%, G: ±2% J: ±5%
3300					
3600		100Ω-300Ω			G: ±2%, J: ±5%
		330Ω-1kΩ			F: ±1% G: ±2% J: ±5%
4000		100Ω - 1kΩ			
4500					
5000					

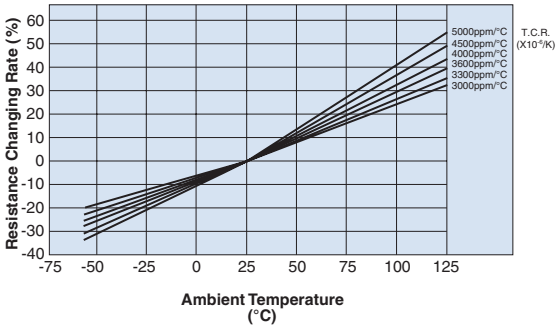
environmental applications

Derating Curve



For sensors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

T.C.R. ($x10^{-6}$/K)	C_0	C_1	C_2
3000	0.931258	0.00265213	3.90112×10^{-6}
3300	0.924355	0.00292569	4.00516×10^{-6}
3600	0.916356	0.00323714	4.34428×10^{-6}
4000	0.907039	0.00361006	4.33457×10^{-6}
4500	0.897412	0.00395222	6.05201×10^{-6}
5000	0.886014	0.00437224	7.48809×10^{-6}

(Values are not guaranteed but typical)

$R_T=R_{25}\ (C_0+C_1T+C_2T^2)$

R_T: Resistance value at T°C
R_{25}: Resistance value at 25°C
T: Ambient temperature (°C)
C_0, C_1, C_2: Constants

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+65°C
Overload	±0.5%	±0.3%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±0.5%	±0.3%	260°C ± 5°C, 10 seconds + 1 second/- 0 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes),+25°C (2-3 minutes), +125°C (30 minutes), +25°C (2-3 minutes), 5 cycles
Moisture Resistance	±2.0%	±1.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hours ON, 0.5 hours OFF cycle
Endurance at 70°C	±2.0%	±1.5%	70°C ± 2°C, 1000 hours, 1.5 hours ON, 0.5 hours OFF cycle

Confirming resistance drift is recommended since this product has a tendency to have bigger resistance change than general flat chip over 70°C.
Please pay attention not to be applied ESD, it may cause of resistance change.

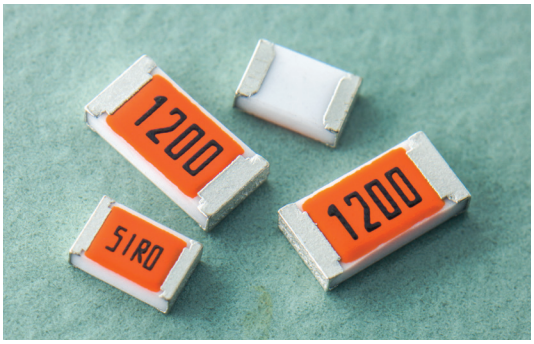
Actual Value (Out of Guarantee)

Test Items	Reference	Test Method
High Temperature Exposure	±8.0%	125°C, 1000 hours
ESD	500V	Human model, 100 pF 1.5 kΩ

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 1/02/14

LT73V

linear positive temperature coefficient flat chip resistors (for automotive)

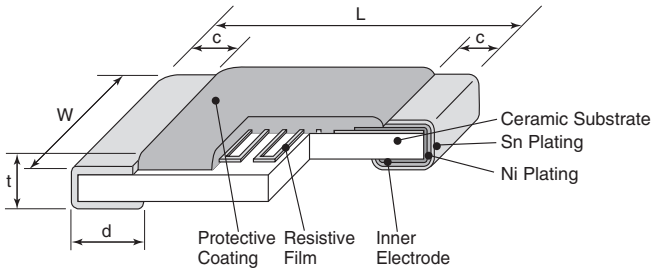


features

- SMD thin film resistors with thermo-perceptivity
- Various TCRs +150 - +4500×10^{-6}/K are available
- Operating temperature range -155°C
  Rated ambient temperature: 85°C
- Products meet EU RoHS requirements
- AEC-Q200 Tested

EU RoHS COMPLIANT

dimensions and construction



Type	Dimensions inches (mm)				
	L	W	c	d	t
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.012 $^{+.008}_{-.004}$ ($0.3\ ^{+0.2}_{-0.1}$)	.020±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.020±.012 (0.5±0.3)	.016 $^{+.008}_{-.004}$ ($0.4\ ^{+0.2}_{-0.1}$)	.024±.004 (0.6±0.1)

ordering information

LT73V	2B	T	TD	102	J	0900
Type	Power Rating	Termination Material	Taping	Nominal Resistance	Resistance Tolerance	T.C.R. (×10^{-6}/K)
	2A:0.1W 2B:0.125W	T:Sn	TD:4mm pitch paper TE:4mm pitch plastic embossed	3 digits	G:±2% J:±5%	4 digits

For further information on packaging, please refer to Appendix A.

applications and ratings

Type	Power Rating	Max. Working Voltage	Max. Overload Voltage	Thermal Time Constant*	Thermal Dissipation Constant*	Rated Ambient Temperature	Operating Temperature Range	Taping & Q'ty/Reel (pcs)	
								TD	TE
2A	0.1W	50V	100V	1.0s	1.37mW/°C	+85°C	–55°C - +155°C	5,000	4,000
2B	0.125W	75V	150V	1.5s	1.47mW/°C			5,000	4,000

* Thermal time constant and dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods.

T.C.R. (×10^{-6}/K)	T.C.R. Tolerance	(Ω) Resistance Range (E24)		Resistance Tolerance
		2A	2B	
150, 250, 350, 450, 500	±100×10^{-6}/K	2k - 15k	2k - 22k	G: ±2%
600, 700, 800, 900	±150×10^{-6}/K	1k - 8.2k	1k - 15k	J: ±5%
1000, 1200, 1400	±15%	1k - 6.8k	1k - 8.2k	
1600, 1800		510 - 4.7k	1k - 6.8k	
2000, 2200, 2400	±10%	510 - 4.7k	510 - 6.8k	
2600, 2800, 3000		510 - 3k	510 - 6.2k	
3300, 3600, 3900				
4200		100 - 1k	100 - 2k	
4500		51 - 510	51 - 510	

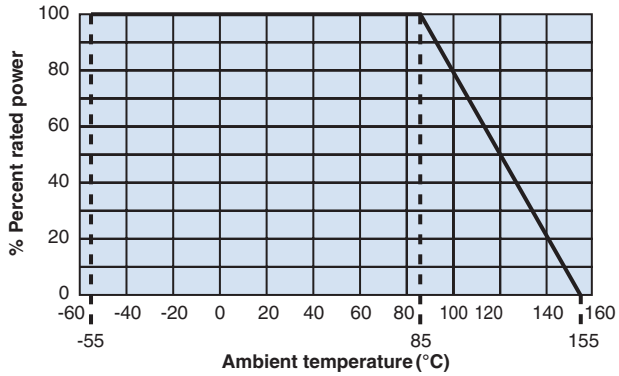
T.C.R. Measuring Temperature: +25°C - +75°C

Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance value}}$ or Max. working voltage, whichever is lower.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 10/26/21

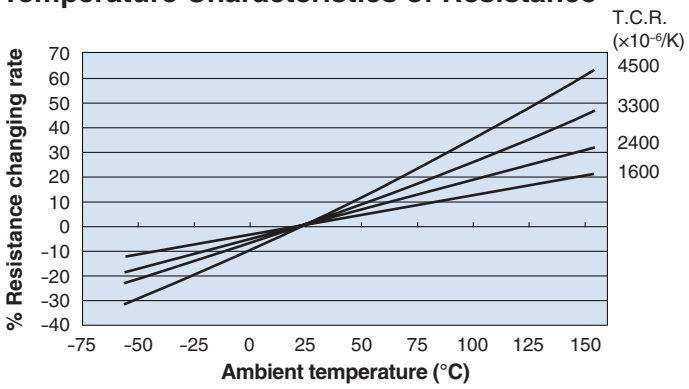
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the above derating curve.

Temperature Characteristics of Resistance



Approximate Expression for Resistance- Temperature Characteristics

Values are not guaranteed but typical.

$R_T=R_{25}\ (C_0+C_1T+C_2T^2)$

R_T: T°C
R_{25}: 25°C
T: (°C)
C_0, C_1, C_2:

R_T: Resistance value at T°C
R_{25}: Resistance value at 25°C
T: Ambient temperature (°C)
C_0, C_1, C_2: Constants

T.C.R. (×10⁻⁶/K)	C_0	C_1	C_2
3000	0.9288	0.0028	1.9983×10^{-6}
3300	0.9232	0.0030	2.9980×10^{-6}
3600	0.9175	0.0032	4.0000×10^{-6}
3900	0.9099	0.0035	4.0064×10^{-6}
4200	0.9026	0.0038	3.9964×10^{-6}
4500	0.8948	0.0041	4.0064×10^{-6}

Performance Characteristics

Parameters	Performance Requirements ΔR±(%+0.05Ω)		Test Methods
	Limit	Typical	
Resistance	Within specified tolerance	–	25°C
T.C.R.	Within specified T.C.R.	–	+25°C/+75°C
Overload (Short Time)	1%	0.02%	Rated voltage × 2.5 or Max. overload Vol., whichever is lower, for 5 seconds
Resistance to Soldering Heat	1%	0.10%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	2% : TCR≤+3300 5% : TCR≥+3600	0.53% 2.59%	–55°C (30min.)/+155°C (30min.), 1000 cycles
Moisture Resistance	3%	0.15%	85°C ± 2°C, 85% ± 5% RH, 1/10 rated power, 1.5h ON/0.5h OFF cycle. 1000 hours
Endurance at 85°C	2% : TCR≤+3300 5% : TCR≥+3600	0.30% 0.76%	85°C ± 2°C, 1000 hours 1.5h ON/0.5h OFF cycle.
High Temperature Load Life	2% : TCR≤+3300 5% : TCR≥+3600	0.40% 2.17%	125°C, Rated voltage, 1000 hours
High temperature Exposure	2% : TCR≤+3300 5% : TCR≥+3600	0.81% 3.20%	155°C, 1000h
Low Temperature Exposure	2%	–0.10%	–55°C, 1000h

Please pay attention not to be applied ESD, it may cause of resistance change.

Actual Value (Out of guarantee)

Test Items	Reference	Test Methods
ESD	500V	Human Body Model, 100pF, 1.5kΩ

KOA SPEER ELECTRONICS, INC.

LT73

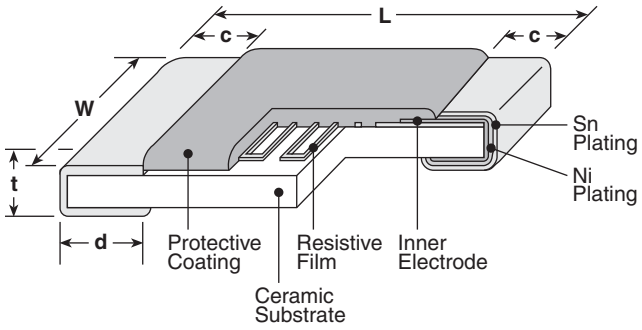
linear positive tempco thermistor

EU RoHS COMPLIANT

features

- Anti-leaching nickel barrier terminations
- Twenty-five specifiable temperature characteristics
- SMD thin film resistor with thermo-perceptivity
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.008 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)

ordering information

LT73	2B	T	TD	101	J	1000
Type	Size Code	Termination Material	Packaging	Resistance Value	Tolerance	T.C.R.
	2A: 0805 2B: 1206	T: Sn	TD: 7" paper taping (5,000 pieces/reel) TE: 7" embossed plastic (4,000 pieces/reel)	2 significant figures + 1 multiplier	G: ±2% J: ±5%	

applications and ratings

Part Designation	Power Rating	Maximum Working Voltage	Maximum Overload Voltage	Thermal Time Constant	Thermal Dissipation Constant	Rated Ambient Temperature	Operating Temperature Range
LT732A	0.1W	50V	100V	1.0s	1.37mW/°C	+70°C	-40°C to +125°C
LT322B	0.125W	75V	150V	1.5s	1.47mW/°C		

Thermal time constant and dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods.

For further information on packaging, please refer to Appendix A.

10/26/21

applications and ratings

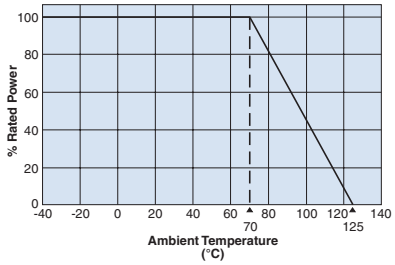
T.C.R. ($x10^{-6}$/K)	T.C.R. Tolerance	Resistance Range E-24		Resistance Tolerance
		LT732A	LT732B	
150, 250, 350, 450, 500	±100x10^{-6}/K	2kΩ - 24kΩ	2kΩ - 51kΩ	G: ±2%
600, 700, 800, 900	±150x10^{-6}/K	1kΩ - 20kΩ	1kΩ - 43kΩ	J: ±5%
1000, 1200, 1400	±15%	1kΩ - 13kΩ	1kΩ - 27kΩ	
1600, 1800		510Ω - 4.7kΩ	1kΩ - 10kΩ	
2000, 2200, 2400	±10%	510Ω - 4.7kΩ	510Ω - 9.1kΩ	
2600, 2800, 3000		510Ω - 3.0kΩ	510Ω - 6.2kΩ	
3300, 3600, 3900		510Ω - 3.0kΩ	510Ω - 6.2kΩ	
4200		100Ω - 1kΩ	100Ω - 2kΩ	
4500		51Ω - 510Ω	51Ω - 510Ω	

T.C.R. Measuring Temperature: +25°C ~ +75°C

Rated voltage = $\sqrt{\text{Power Rating x Resistance value}}$ or Max. working voltage, whichever is lower.

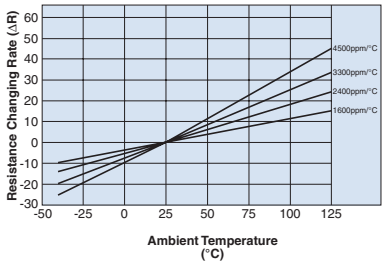
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Examples of Temperature Characteristics of Resistance



Approximate Expression for Resistance-Temperature Characteristics

Values are not guaranteed but typical.

$R_T=R_{25}(C_0+C_1T+C_2T^2)$ R_T: T°C R_T: Resistance value at T°C

R_{25}: 25°C R_{25}: Resistance value at 25°C

T: (°C) T: Ambient temperature (°C)

C_0, C_1, C_2: C_0, C_1, C_2: Constants

T.C.R. ($x10^{-6}$/K)	C_0	C_1	C_2
3000	0.9288	0.0028	1.9983 x 10^{-6}
3300	0.9232	0.0030	2.9980 x 10^{-6}
3600	0.9175	0.0032	4.0000 x 10^{-6}
3900	0.9099	0.0035	4.0064 x 10^{-6}
4200	0.9026	0.0038	3.9964 x 10^{-6}
4500	0.8948	0.0041	4.0064 x 10^{-6}

Performance Characteristics

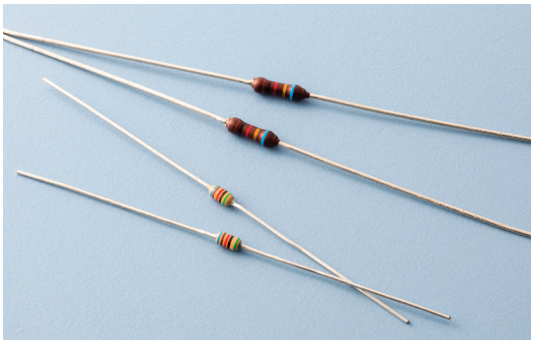
Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+75°C
Overload (Short time)	±1.0%	±0.23%	Rated voltage x 2.5 or maximum overload volume for 5 seconds, whichever is lower
Resistance to Solder Heat	±1.0%	±0.1%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1.0%	±0.1%	-40°C (30 minutes)/ +125°C (30 minutes), 5 cycles
Moisture Resistance	±3.0%	±0.54%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3.0%	±0.62%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle

Confirming resistance drift is recommended since this product has a tendency to have bigger resistance change than general flat chip over 70°C.
Please pay attention not to be applied ESD, it may cause of resistance change.

Actual Value (Out of Guarantee)

Test Items	Reference	Test Method
Low Temperature Exposure	±0.05%	-40°C, 45 minutes
High Temperature Exposure	±0.6%	125°C, 1000 hours
ESD	500V	Human Body Model, 100 pF 1.5 kΩ

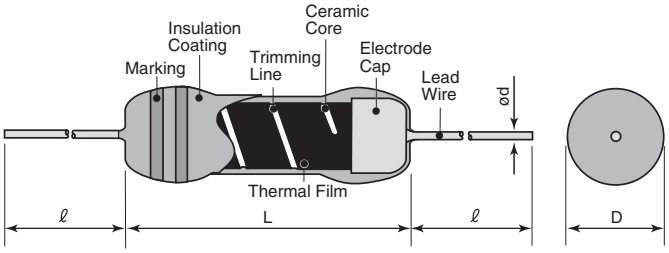
3/16/17



features

- LP series is thin-film thermal sensors and accomodates resistance tolerance ±1% and high T.C.R. +5000×10^{-6}/K with the standard products
- Suitable for control of temperatures for various industrial equipment
- Products meet EU RoHS requirements

dimensions and construction



Type	Dimensions inches (mm)			
	L	D	d (Nom.)	l
LP 1/16	.138$^{+.008}_{-.016}$ (3.5$^{+0.2}_{-0.4}$)	.067±.008 (1.7±0.2)	.020±.002 (0.5±0.05)	1.18±.118 (30±3)
LP 1/8	.25±.031 (6.35±0.8)	.090±.008 (2.3±0.2)	.026±.002 (0.65±0.05)	1.50±.118 (38±3)

ordering information

LP	1/8	C	T26	A	103	J	362
Product Code	Power Rating	Termination Surface Material	Taping	Packaging	Nominal Resistance	Resistance Tolerance	Symbol of T.C.R.
	1/16: 0.063W 1/8: 0.125W	C: SnCu	Nil: Bulk T26: 26mm Taping T52: 52mm Taping	Nil: Bulk A: AMMO	3 digits	F: ±1% G: ±2% J: ±5%	3 digits 151: 150 362: 3600

applications and ratings

Type	Power Rating	Thermal Time Constant	Thermal Dissipation Constant*	Rated Ambient Temperature	Operating Temperature Range
LP1/16C	0.063W	8s	2.5mW/°C	+70°C	–55°C–150°C
LP1/8C	0.125W	14s	4.5mW/°C		

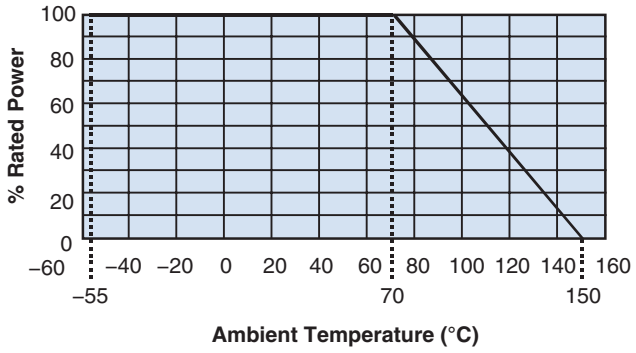
* Thermal time constant and dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods.

T.C.R. (×10^{-6}/K)	T.C.R. Tolerance	(Ω) Resistance Range (E24 & 2.5, 5.0×10^{n})					
		LP1/16			LP1/8		
		F:±1%	G:±2%	J:±5%	F:±1%	G:±2%	J:±5%
150, 250, 350	±50×10^{-6}/K	–	150–10k	150–10k	–	150–51k0	150–51k0
450			150–30k	150–30k		150–100k	150–100k
550, 650, 750, 850	±10%						
950, 1000, 1200							
1400, 1600, 1800							
2000, 2200, 2400							
2500	±5%	100–30k	10–30k	1–30k	100–100k	10–100k	1–100k
3000		100–10k	10–10k	1–10k			
3300							
3600					100–51k	10–51k	1–51k
4000, 4500, 5000					100–20k	10–20k	1–20k

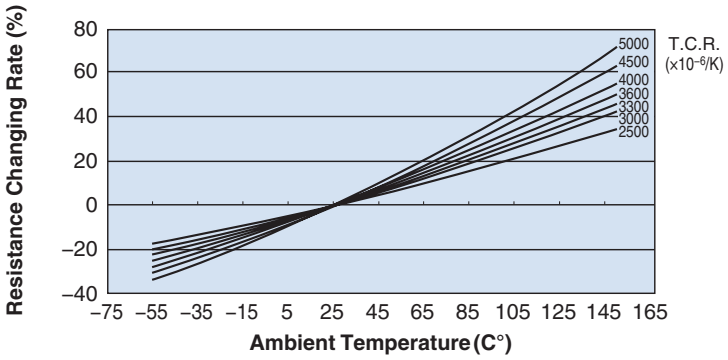
T.C.R. Measuring Temperature: +25°C/+65°C. T.C.R. is guaranteed by random inspections.

environmental applications

Derating Curve



Examples of Temp. Characteristics of Resistance



Approximate Expression for Resistance- Temperature Characteristics

Values are not guaranteed but typical.

$R_T=R_{25}\ (C_0+C_1T+C_2T^2)$

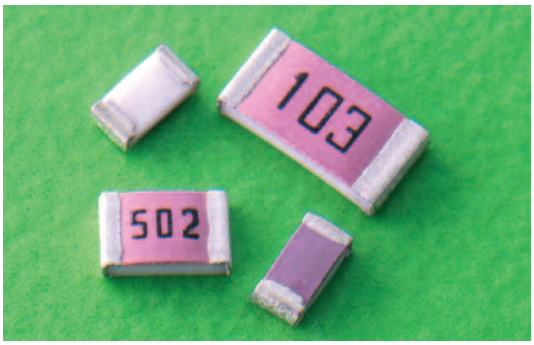
R_T: T°C
R_{25}: 25°C
T: (°C)
C_0, C_1, C_2:

R_T: Resistance value at T°C
R_{25}: Resistance value at 25°C
T: Ambient temperature (°C)
C_0, C_1, C_2: Constants

T.C.R. (×10⁻⁶/K)	C_0	C_1	C_2
3000	0.931258	0.00265213	3.90112×10^{-6}
3300	0.924355	0.00292569	4.00516×10^{-6}
3600	0.916356	0.00323714	4.34428×10^{-6}
4000	0.907039	0.00361006	4.33457×10^{-6}
4500	0.897412	0.00395222	6.05201×10^{-6}
5000	0.886014	0.00437224	7.48809×10^{-6}

Performance Characteristics

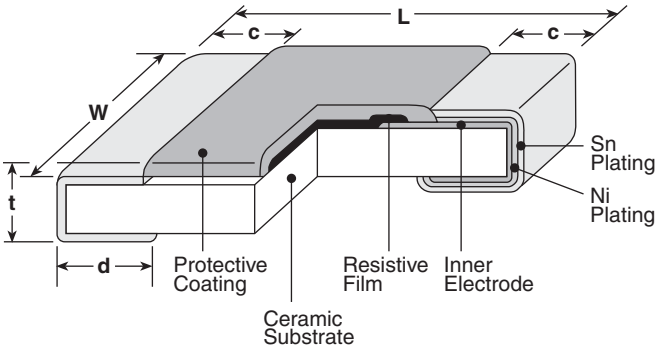
Test Items	Performance Requirements ΔR± (%+0.05Ω)		Test Methods
	Limit	Typical	
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+65°C
Overload (Short time)	0.5%	0.2%	Rated voltage × 2.5 for 5 seconds
Resistance to Soldering Heat	0.5%	0.2%	350°C±10°C, 1 second
Rapid Change of Temperature	0.5%	0.2%	–55°C (30min.) /+25°C (10min.)/ +150°C (30min.)/+25°C (10min.) 5 cycles
Moisture Resistance	2%	0.3%	40°C±2°C, 90%–95%RH,1000h 1.5h ON/0.5h OFF cycle
Endurance at 70°C	2%	0.5%	70°C±3°C, 1000h 1.5h ON/0.5h OFF cycle



features

- Twelve standard resistance values
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.02±.004 (0.5±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -0.1)	.02 +.008 -.004 (0.5 +0.2 -0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.008 (0.5±0.3)	.016 +.008 -.004 (0.4 +0.2 -0.1)	.024±.004 (0.6±0.1)

ordering information

NT73	2A	T	TD	103	K	3800	J
Type	Size Code	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	B Constant Nominal	B Constant Tolerance
	1J: 0603 2A: 0805 2B: 1206	T: Sn (Other termination styles may be available, please contact factory for options)	TD: 7" paper tape (5,000 pieces/reel)	2 significant figures + 1 multiplier	J: ±5% K: ±10% L: ±15%	3200 3500 3700 3800 3950 4100	H: ±3% J: ±5% K: ±10%

applications and ratings

Part Designation	Resistance @ 25°C	Resistance Tolerance	B Constant @ 25°C/75°C	B Constant Tolerance	Power Rating (mW)	Operating Temperature Range
NT731J	6.8kΩ	J: ±5% K: ±10%	3500K	±10%	5	-55°C to +125°C
	10kΩ		3800K	±5%		
	15kΩ		3700K	±3%		
	10kΩ		3800K	±5%		
	20kΩ					
	22kΩ					
	30kΩ					
	33kΩ					
	47kΩ					
	68kΩ					
	100kΩ					
	47kΩ		4100K	±3%		
NT732A	1kΩ	K: ±10% L: ±15%	3200K	±10%	5	
	2kΩ		3500K			
	2.2kΩ					
	2.4kΩ					
	3.3kΩ	J: ±5%; K: ±10% L: ±15%		±5%		
	4.7kΩ					
	5kΩ					

For further information on packaging, please refer to Appendix A.

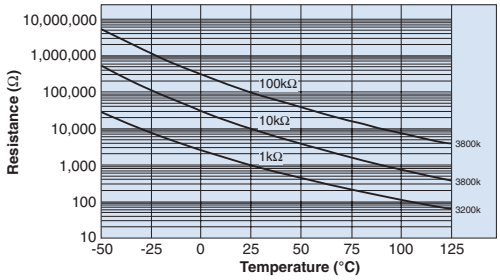
applications and ratings (continued)

Part Designation	Resistance @ 25°C	Resistance Tolerance	B Constant @ 25°C/75°C	B Constant Tolerance	Power Rating (mW)	Operating Temperature Range
NT732A	6.8kΩ	K:±10%; L: ±15%	3800K	±10%	5	-55°C to +125°C
	10kΩ	J: ±5% K: ±10% L: ±15%	3500K	±5%		
	15kΩ					
	10kΩ		3800K			
	20kΩ					
	22kΩ					
	30kΩ					
	33kΩ					
	47kΩ					
	68kΩ					
	100kΩ					
	150kΩ					
	50kΩ		3950K			
	10kΩ		4100K	±3%		
	15kΩ					
	20kΩ					
	22kΩ					
	30kΩ					
	33kΩ					
	47kΩ					
	68kΩ					
	100kΩ					
	150kΩ					
NT732B	1kΩ	K: ±10% L: ±15%	3200K	±10%	5	
	2.2kΩ		3500K			
	3.3kΩ					
	4.7kΩ					
	6.8kΩ					
	10kΩ	J: ±5% K: ±10% L: ±15%	3800K	±5%		
	22kΩ					
	33kΩ					
	47kΩ					
	68kΩ					
	100kΩ					

Thermal dissipation constant - in the atmosphere - (reference) 1J: 2.0mW/°C, 2A: 2.8mW/°C, 2B: 3.0mW/°C

environmental applications

Temperature Characteristics



RT/R25 Ratio vs. B Constant

Resistance	1k	5k	10k	100k	10k	Resistance	1k	5k	10k	100k	10k
B Constant	3200K	3500K	3700K	3800K	4100K	B Constant	3200K	3500K	3700K	3800K	4100K
Temp. (°C)		k	k	k	k	Temp. (°C)		k	k	k	k
-55	38770	273.24	638.23	7692.5	1203.1	40	604.07	2.8809	5.5500	54.959	5.1999
-50	28840	197.67	465.81	5414.6	820.76	45	515.10	2.4202	4.6100	45.484	4.2349
-45	21706	144.85	343.25	3864.5	568.09	50	441.00	2.0421	3.8500	37.823	3.4692
-40	16517	107.43	255.22	2794.3	398.57	55	379.00	1.7302	3.2300	31.594	2.8585
-35	12698	80.577	191.37	2045.2	283.20	60	326.90	1.4718	2.7200	26.506	2.3682
-30	9857.0	61.077	144.64	1514.1	203.64	65	282.95	1.2568	2.3100	22.330	1.9721
-25	7721.2	46.759	110.13	1133.0	148.07	70	245.72	1.0771	1.9700	18.886	1.6504
-20	6100.5	36.137	83.710	856.49	108.37	75	214.08	0.92637	1.6800	16.035	1.3877
-15	4858.7	28.173	64.190	653.63	80.182	80	187.08	0.79937	1.4500	13.663	1.1724
-10	3899.0	22.147	49.640	503.31	59.943	85	163.96	0.69199	1.2500	11.682	0.99491
-5	3151.3	17.546	38.680	390.86	45.252	90	144.11	0.60087	1.0800	10.022	0.84926
0	2564.2	14.004	30.370	305.97	34.478	95	127.00	0.52329	0.94000	8.6257	0.72802
5	2099.9	11.256	23.970	241.34	26.473	100	112.21	0.45701	0.82000	7.4466	0.62662
10	1730.0	9.1063	19.070	191.73	20.506	105	99.377	0.40016	0.72000	6.4466	0.54156
15	1433.5	7.4135	15.270	153.36	16.016	110	88.224	0.35129	0.63000	5.5968	0.46982
20	1194.2	6.0712	12.320	123.46	12.608	115	78.501	0.30915	0.56000	4.8721	0.40906
25	1000.0	5.0000	10.000	100.00	10.000	120	70.004	0.27272	0.49000	4.2523	0.35741
30	841.48	4.1398	8.1700	81.470	7.9880	125	62.558	0.24114	0.44000	3.7207	0.31332
35	711.39	3.4451	6.7100	66.739	6.4242						

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
B Constant	Within specified tolerance	—	+25°C/+75°C
Resistance to Solder Heat	Other: ±1%, ±2%:1kΩ	Other: ±0.5%, ±1%:1kΩ	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±3.0%	±1.3%	-55°C (30 minutes),+125°C (30 minutes), 50 cycles
Moisture Resistance	±3.0%	±1.1%	40°C ± 2°C, 90 - 95% RH, 1000 hours
Load Life	±3.0%	±2.5%	80°C ± 2°C, DC5mW, 1000 hours
High Temperature Exposure	±3.0%	±1.6%	80°C, 1000 hours

Confirming resistance drift is recommended since this product has a tendency to have bigger resistance change than general flat chip over 80°C.
Please pay attention not to be applied ESD, it may cause of resistance change.

Actual Value (Out of Guarantee)

Test Items	Reference	Test Method
High Temperature Exposure	±7.0%	125°C, 1000 hours
ESD	500V	Human model, 100 pF 1.5 kΩ

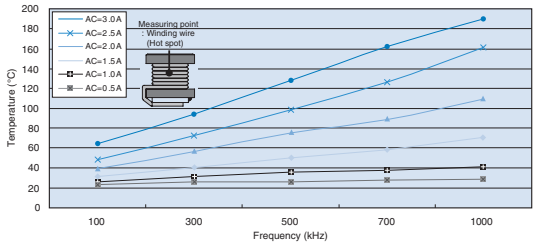
12/12/19

Precautions for the Inductors

Refer to the precautions of common matters for all products in the beginning of this catalog for the matters common to all products.

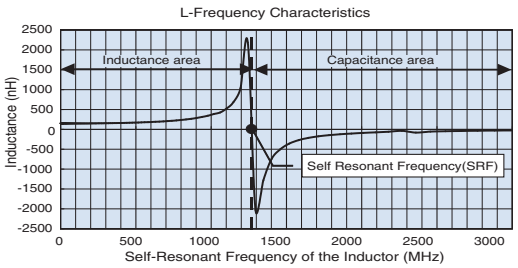
Inductors in General

- Characteristics such as the inductance, Q value etc. are frequency dependent.
- The stress from resin coating and molding can result in change of inductance.
- Since the inductors use ceramic materials, chipping and crack can occur. Please be careful when handling. Excessive vibration and impact could destroy the parts.
- Keep magnetic tweezers and other magnets away from the inductors to avoid change of inductance caused by magnetization. Do not press the wire wound part of the chip inductor with sharp objects.
- The inductance could decrease according to magnetic saturation when the inductor is used exceeding the allowable current. There is also a possibility of disconnection and short-circuit or emitting smoke and ignition caused by the heat generation of the inductor.
- There is a risk of disconnection when excessive current (inrush current) is applied. Change of the characteristics may occur by the magnetization of the core when excessive current is applied to a DC circuit.
- When the parts are used at high-frequency, the heat generation will be larger and the part temperature will be higher compared with DC or low-frequency. This is caused by increasing iron loss and copper loss. Please be careful not to exceed the operating temperature rise by high frequency. Ex. LPC4045



Ex. LPC4045 temperature rise by high frequency

- The electrical characteristics change from the variation of frequency of the parts. When the part is used above the frequency band of the SRF (self-resonant frequency), it will function as a capacitor. Please do not use the parts above the SRF.



Mounting

- Some of the inductors have magnetic polarity to which attention should be paid when mounting.
- The inductance and Q values of a non-magnetically-shielded inductor could change from magnetic coupling affected by other components, chassis, patterns, etc. When mounting in high density, check the characteristic in advance with the actual equipment. Additionally, take care of the positioning of the components since closely mounted inductors may cause magnetic coupling. Do not place large magnetic materials like audio speakers, etc. near the inductors.
- Do not expose the inductors to the heat radiation from other high temperature parts.

Reference

- For basic precautions, please refer to the Technical report of JEITA RCR-2501C Safety application guide for inductors for use in electronic equipment.

Terms and Definitions

Nominal Inductance

- Inductance that the inductor is designed to have and generally indicated on the body.

Q Value (Quality factor)

- A coefficient that shows the quality of the inductors. It is calculated from the following formula shown below.

$$Q = \frac{wL}{R}$$

w = Angular Frequency (w-2 π F)
L = Inductance
R = Resistance

Self-Resonant Frequency

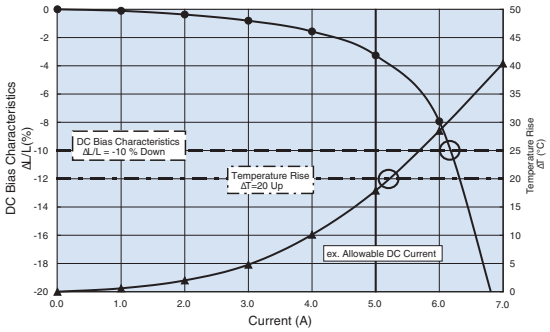
- Frequency that resonance occurs by the distribution capacity and inductance of the inductor.

DC Resistance Value

- Resistance value at DC.

Allowable DC Current

- Upper limit of the current which is set to assure the safe use of the inductor.
- It is defined as the smaller DC current value of either the DC superposition or the surface temperature rise characteristics.
- DC superposition characteristic is a phenomenon which occurs when the inductors, made with magnetic materials such as ferrite, have a large DC current applied. When this occurs, the inductance drops because of the magnetic saturation.
- The plot below shows the relationship between the DC superposition and the surface temperature rise..



Iron Loss

- Electrical energy that is lost when the wire wound magnetic material is magnetized by the applied AC. It is calculated by the sum of hysteretic loss and eddy-current loss.

Copper Loss

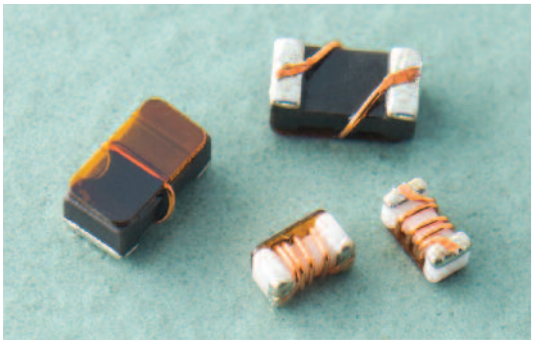
- Energy that is transformed into Joule heat by the resistance of the wound wire. The Copper loss increases in the high frequency band from the skin effect.

KOA SPEER ELECTRONICS, INC.

KQC

high current inductor

EU RoHS COMPLIANT

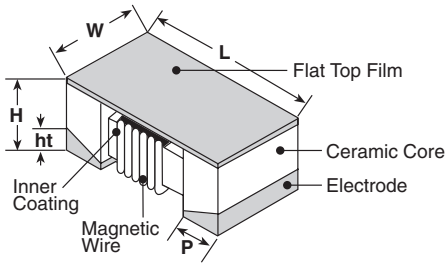


features

- Low DC resistance and high allowable DC current
- Low profile style 0.027 inches (0.7mm) typical
- Suitable for reflow soldering
- Products with lead-free terminations meet EU RoHS requirements

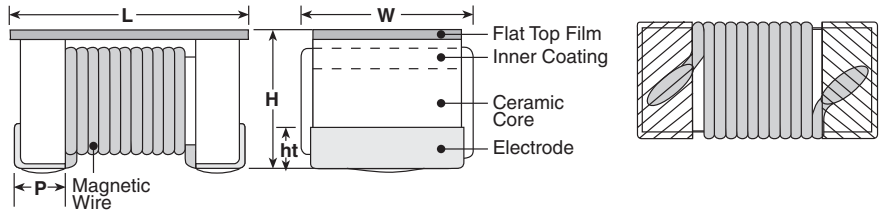
dimensions and construction

0402, 0603

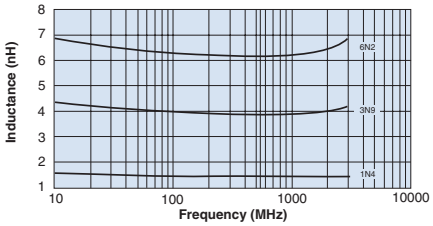


Size Code	Dimensions inches (mm)				
	L	W	H	Ht	P
0402	.039±.004 (1.0±0.1)	.020±.004 (0.5±0.1)	.022±.004 (0.55±0.1)	.006±.004 (0.15±0.1)	.008±.004 (0.2±0.1)
0603	.063±.004 (1.6±0.1)	.041±.008 (1.05±0.2)	.028±.004 (0.7±0.1)	.008±.006 (0.2±0.15)	.015±.004 (0.37±0.1)

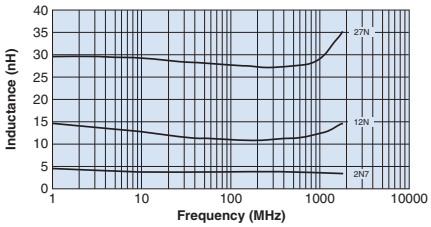
0603



L-Frequency Characteristics - 0402

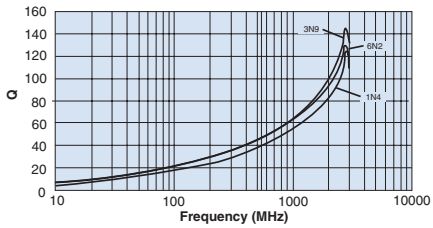


L-Frequency Characteristics - 0603

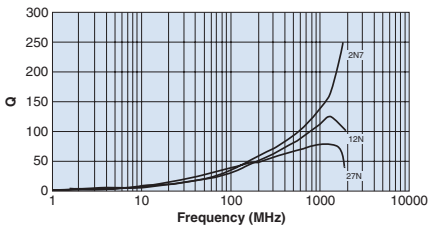


Test equipment:
Agilent 4991 A Impedance analyzer (KQC0402)
Agilent 4291 A Impedance analyzer (KQC0603)

Q-Frequency Characteristics - 0402



Q-Frequency Characteristics - 0603



ordering information

KQC	0603	T	TE	12N	J
Type	Size Code	Termination Material	Packaging	Nominal Inductance	Tolerance
	0402 0603	T: Sn	TP: 2mm pitch paper (0402: 10,000 pieces/reel) TE: 4mm pitch embossed plastic (0603: 2,000 pieces/reel) TD: 4mm pitch paper (0402: 2,000 pieces/reel)	3 digits 10N: 10nH 1N2: 1.2nH	B: ±0.1nH C: ±0.2nH G: ±2% J: ±5%

For further information on packaging, please refer to Appendix A.

11/30/17

applications and ratings

Part Designation	Nominal Inductance (nH)	L Measuring Frequency	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (GHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (A)
KQC0402T**1N4*	1.4	250	B: ±0.1nH	25	250	11.0	0.019	1.40
KQC0402T**1N5*	1.5							
KQC0402T**1N6*	1.6					10.0		
KQC0402T**1N7*	1.7					9.6		
KQC0402T**2N5*	2.5		C: ±0.2nH	27		8.5	0.028	1.20
KQC0402T**2N7*	2.7					8.0		
KQC0402T**3N0*	3.0			29		7.2		
KQC0402T**3N3*	3.3					6.6		
KQC0402T**3N9*	3.9					7.3	0.036	1.00
KQC0402T**4N3*	4.3			30		7.0		
KQC0402T**4N7*	4.7					6.6		
KQC0402T**6N2*	6.2					5.6	0.045	0.90
KQC0603TTE1N2*	1.2	250	J: ±5%	18	250	6.0	0.020	2.25
KQC0603TTE2N7*	2.7			35			0.025	2.00
KQC0603TTE4N7*	4.7						0.035	1.80
KQC0603TTE5N6*	5.6					5.5		
KQC0603TTE7N5*	7.5						0.045	1.50
KQC0603TTE8N2*	8.2					4.0		
KQC0603TTE10N*	10		G: ±2% J: ±5%			3.0	0.065	1.25
KQC0603TTE12N*	12						0.055	1.40
KQC0603TTE15N*	15						0.065	1.25
KQC0603TTE18N*	18					2.5	0.090	1.20
KQC0603TTE22N*	22						0.100	1.10
KQC0603TTE27N*	27						0.120	1.00

* Add tolerance character (B, C, J, G) ** Add packaging character (TD, TP)

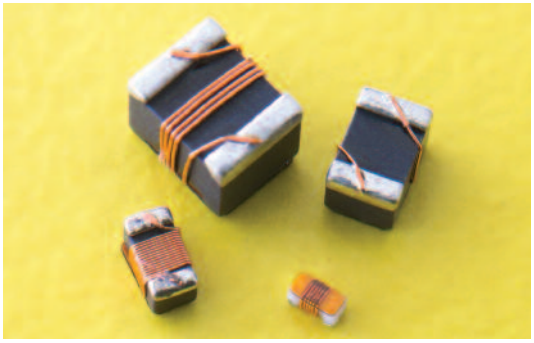
Operating Temperature Range: -40°C ~ +125°C

The operating temperature range of the coil (ambient temperature + self heating) must remain at +125°C or less

environmental applications

Performance Characteristics

Parameter	Requirements Maximum ΔL/L Limit	ΔQ/Q Typical	Test Method
Resistance to Soldering Heat	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±1.2% Δ Q/Q: ±2.7%	260°C ± 5°C, 10s ± 1s
Rapid Change of Temperature	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±1.9% Δ Q/Q: ±3.9%	-40°C (30min.)/ +125°C (30min.) 100 cycles
Low Temperature Exposure	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±2.0% Δ Q/Q: ±4.1%	-40°C ± 2°C, 1000h
High Temperature Exposure	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±1.8% Δ Q/Q: ±3.3%	125°C ± 2°C, 1000h
Moisture Exposure	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±1.7% Δ Q/Q: ±3.3%	40°C ± 2°C, 90%~95%RH, 1000h
Resistance to Solvent	No damage and marking shall remain legible	—	Accordance with MIL-STD 202F Method 215

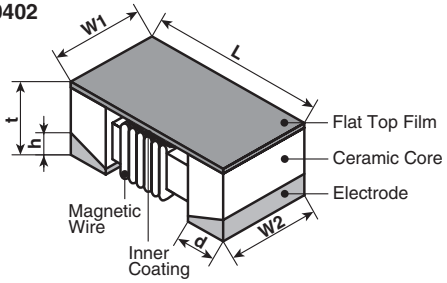


features

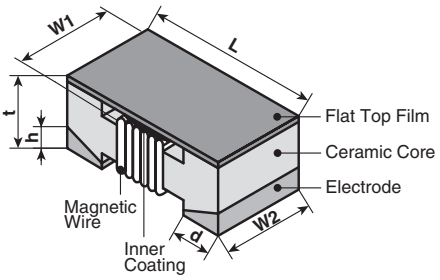
- Surface mount
- Operating temperature: -40°C ~ +125°C
- Flat top suitable for high speed pick-and-place components
- Excellent high frequency applications
- High Q factors and self-resonant frequency values
- Products with lead-free terminations meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction

0402



0603, 0805, 1008



Size Code	Dimensions inches (mm)					
	L	W1	W2	t	h	d
KQT0402	.039±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.02±.004 (0.5±0.1)	.022±.004 (0.55±0.1)	.006±.004 (0.15±0.1)	.01±.004 (0.25±0.1)
KQ0603	.063±.004 (1.6±0.1)	.039±.004 (1.0±0.1)	.033±.004 (0.85±0.1)	.035±.004 (0.9±0.1)	.01±.006 (0.25±0.15)	.014±.004 (0.35±0.1)
KQ0805	.079±.008 (2.0±0.2)	.059±.008 (1.5±0.2) (3.3nH-390nH) .063±.008 (1.6±0.2) (470nH-820nH)	.053±.004 (1.35±0.1)	.051±.008 (1.3±0.2)	.016±.006 (0.40±0.15)	.018±.004 (0.45±0.1)
KQ1008	.098±.008 (2.5±0.2)	.087±.008 (2.2±0.2)	.079±.004 (2.0±0.1)	.071 $^{+.008}_{-0}$ (1.8 $^{+0.2}_{-0}$)	.018±.006 (0.45±0.15)	.018±.004 (0.45±0.1)

ordering information

KQ	1008	T	TE	10N	J
Type	**Size Code**	**Termination Material**	**Packaging**	**Nominal Inductance**	**Tolerance**
KQ KQT	0402 0603 0805 1008	T: Sn	TP: 2mm pitch paper (0402: 10,000 pieces/reel) TD: 7" paper tape (0402: 2,000 pieces/reel) TE: 7" embossed plastic (0603, 0805, 1008: 2,000 pieces/reel)	3 digits: 10N: 10nH R10: 0.1µH 1R0: 1.0µH	B: ±0.1nH C: ±0.2nH G: ±2% H: ±3% J: ±5% K: ±10% M: ±20%

For further information on packaging, please refer to Appendix A.

applications and ratings

Part Designation	Marking	Nominal Inductance (nH)	L Measuring Frequency (MHz)	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)
KQT0402T**1N0*	—	1.0	250	B: ±0.1nH C: ±0.2nH	16	250	11000	0.045	1360
KQT0402T**1N9*		1.9					9600	0.070	1040
KQT0402T**2N0*		2.0			19				
KQT0402T**2N2*		2.2							960
KQT0402T**2N4*		2.4			18		8000	0.068	
KQT0402T**2N7*		2.7			17			0.120	700
KQT0402T**3N3*		3.3		H: ±3% J: ±5% K: ±10%	19		7200	0.066	840
KQT0402T**3N6*		3.6							
KQT0402T**3N9*		3.9							
KQT0402T**4N3*		4.3			18		6000	0.091	800
KQT0402T**4N7*		4.7							
KQT0402T**5N1*		5.1			20		5800	0.083	
KQT0402T**5N6*		5.6							760
KQT0402T**6N2*		6.2							
KQT0402T**6N8*		6.8					4800	0.086	680
KQT0402T**7N5*		7.5			22		5800	0.104	
KQT0402T**8N2*		8.2					4400		
KQT0402T**8N7*		8.7			20		4200	0.150	650
KQT0402T**9N0*		9.0			22		4160	0.104	680
KQT0402T**9N5*		9.5			20		4000	0.150	650
KQT0402T**10N*		10			21		3900	0.195	480
KQT0402T**11N*		11			24		3680	0.120	640
KQT0402T**12N*		12					3600		
KQT0402T**13N*		13					3450	0.180	560
KQT0402T**15N*		15					3280	0.172	
KQT0402T**16N*		16					3100	0.200	
KQT0402T**18N*		18			25			0.230	500
KQT0402T**19N*		19			24		3040	0.202	480
KQT0402T**20N*		20			25		3000	0.250	450
KQT0402T**22N*		22					2800	0.323	400
KQT0402T**23N*		23			24		2720	0.214	
KQT0402T**24N*		24			25		2700	0.322	
KQT0402T**27N*		27			24		2480	0.298	
KQT0402T**30N*		30			25		2400	0.354	
KQT0402T**33N*		33			24			0.393	
KQT0402T**34N*		34						0.550	340
KQT0402T**36N*		36					2320	0.560	320
KQT0402T**39N*		39			25		2300	0.550	300
KQT0402T**40N*		40			24		2240	0.620	320
KQT0402T**43N*		43			25		2200	0.810	300
KQT0402T**47N*		47			20		2100	0.830	150
KQT0402T**51N*		51			25			0.835	240
KQT0402T**56N*		56					2800	1.170	200
KQT0402T**68N*		68			22		2000	1.120	
KQT0402T**82N*		82					1800	1.810	140
KQT0402T**R10*		100					1600	2.090	130
KQT0402T**R12*		120					1500	2.320	120

* Add tolerance character (B, C, G, H, J, K, M)
** Add packaging code

applications and ratings (continued)

Part Designation	Marking	Nominal Inductance (nH)	L Measuring Frequency (MHz)	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)
KQ0603TTE1N6*	C	1.6	250	J: ±5% K: ±10%	24	250	12500	0.03	700
KQ0603TTE1N8*	0	1.8			16			0.045	
KQ0603TTE3N3*	X	3.3			22		6900	0.055	
KQ0603TTE3N6*	E	3.6						0.063	
KQ0603TTE3N9*	1	3.9						0.08	
KQ0603TTE4N3*	F	4.3					5900	0.063	
KQ0603TTE4N7*	G	4.7			20		5800	0.116	
KQ0603TTE5N1*	Y	5.1						0.115	
KQ0603TTE6N8*	2	6.8		G: ±2% J: ±5% K: ±10%	27			0.11	
KQ0603TTE7N5*	H	7.5			28		4800	0.106	
KQ0603TTE8N2*	A	8.2						0.12	
KQ0603TTE8N7*	J	8.7					4600	0.109	
KQ0603TTE9N5*	B	9.5					4800	0.125	
KQ0603TTE10N*	3	10			31			0.13	
KQ0603TTE11N*	K	11			33		4000	0.086	
KQ0603TTE12N*	4	12			35			0.13	
KQ0603TTE15N*	5	15						0.17	
KQ0603TTE16N*	L	16			34		3300	0.104	
KQ0603TTE18N*	6	18			35		3100	0.17	
KQ0603TTE22N*	7	22			38		3000	0.19	
KQ0603TTE23N*	S	23			37		2700	0.15	
KQ0603TTE24N*	M	24					2650	0.135	
KQ0603TTE27N*	8	27			40		2800	0.22	600
KQ0603TTE30N*	N	30			37		2250	0.144	
KQ0603TTE33N*	9	33			40		2300	0.22	
KQ0603TTE36N*	P	36			38		2080	0.25	
KQ0603TTE39N*	0	39			40		2200		
KQ0603TTE43N*	Q	43			39		2000	0.28	
KQ0603TTE47N*	1	47	200		38	200			
KQ0603TTE51N*	T	51					1900	0.30	
KQ0603TTE56N*	2	56						0.31	
KQ0603TTE68N*	3	68			37		1700	0.34	
KQ0603TTE72N*	4	72	150		34	150		0.49	400
KQ0603TTE82N*	5	82						0.54	
KQ0603TTER10*	6	100					1400	0.58	
KQ0603TTER11*	7	110			32		1350	0.61	300
KQ0603TTER12*	8	120					1300	0.65	
KQ0603TTER15*	9	150					1400	1.4	160
KQ0603TTER18*	0	180	100		25	100	1300	2.2	140
KQ0603TTER20*	U	200					1200	2.3	130
KQ0603TTER21*	V	210							
KQ0603TTER22*	1	220						2.5	120
KQ0603TTER25*	W	250			24		1000	2.4	
KQ0603TTER27*	2	270					900	2.3	170
KQ0603TTER30*	X	300					840	3.17	110
KQ0603TTER33*	3	330			30		800	3.0	100
KQ0603TTER39*	4	390					700	3.7	80
KQ0603TTER47*	5	470	50	J: ±5% K: ±10%		50	640	1.21	190
KQ0603TTER51*	V	510					610	1.26	170
KQ0603TTER56*	6	560					560	2.09	130
KQ0603TTER62*	W	620					590	1.89	150

* Add tolerance character (B, C, G, H, J, K, M)

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applications and ratings (continued)

Part Designation	Marking	Nominal Inductance (nH)	L Measuring Frequency (MHz)	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)
KQ0603TTER68*	7	680	50	J: ±5% K: ±10%	30	50	540	1.97	140
KQ0603TTER72*	C	720					530	2.04	130
KQ0603TTER75*	X	750							
KQ0603TTER82*	8	820					490	3.09	110
KQ0603TTER91*	Y	910					480	2.95	120
KQ0603TTE1R0*	9	1000					440	5.13	90
KQ0603TTE1R2*	0	1200					400	5.45	80
KQ0805TTE3N3*	0	3.3	250	J: ±5% K: ±10%	50	1500	6000	0.08	600
KQ0805TTE6N8*	1	6.8				1000	5500	0.11	
KQ0805TTE8N2*	2	8.2					4700	0.12	
KQ0805TTE12N*	3	12		G: ±2% J: ±5% K: ±10%		500	4000	0.15	
KQ0805TTE15N*	4	15					3400	0.17	
KQ0805TTE18N*	5	18					3300	0.20	
KQ0805TTE20N*	Y	20			55		2600	0.22	500
KQ0805TTE22N*	6	22							
KQ0805TTE27N*	7	27					2500	0.25	
KQ0805TTE33N*	8	33			60		2050	0.27	
KQ0805TTE39N*	9	39					2000	0.29	
KQ0805TTE43N*	4	43	200				1650	0.34	
KQ0805TTE47N*	0	47						0.31	
KQ0805TTE56N*	1	56					1550	0.34	
KQ0805TTE68N*	2	68					1450	0.38	
KQ0805TTE82N*	3	82	150		65		1300	0.42	400
KQ0805TTER10*	4	100					1200	0.46	
KQ0805TTER12*	5	120			50	250	1100	0.51	
KQ0805TTER15*	6	150	100				920	0.56	
KQ0805TTER16*	H	160					870	0.64	
KQ0805TTER17*	J	170							
KQ0805TTER18*	7	180							
KQ0805TTER19*	D	190					850	0.70	
KQ0805TTER20*	E	200							
KQ0805TTER21*	F	210							
KQ0805TTER22*	8	220							
KQ0805TTER23*	K	230			48		650	1.0	350
KQ0805TTER24*	L	240							
KQ0805TTER25*	G	250							
KQ0805TTER27*	9	270							
KQ0805TTER33*	0	330					600	1.4	310
KQ0805TTER39*	1	390					560	1.5	290
KQ0805TTER47*	2	470	50	J: ±5% K: ±10%	33	100	375	1.76	250
KQ0805TTER56*	3	560	25		23	50	340	1.9	230
KQ0805TTER68*	4	680					188	2.2	190
KQ0805TTER72*	A	720					200	2.3	
KQ0805TTER82*	5	820					215	2.35	180
KQ1008TTE10N*	10N	10	50	J: ±5% K: ±10% M:±20%	50	500	4100	0.08	1000
KQ1008TTE12N*	12N	12					3300	0.09	
KQ1008TTE15N*	15N	15					3000	0.10	
KQ1008TTE18N*	18N	18				350	2500	0.11	
KQ1008TTE22N*	22N	22			55		2400	0.12	
KQ1008TTE27N*	27N	27					1600	0.13	
KQ1008TTE33N*	33N	33			60		1600	0.14	

* Add tolerance character (C, G, H, J, K, M)

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/30/17

applications and ratings (continued)

Part Designation	Marking	Nominal Inductance (nH)	L Measuring Frequency (MHz)	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)
KQ1008TTE39N*	39N	39	50	J: ±5%,K:±10% M:±20%	60	350	1500	0.15	1000
KQ1008TTE47N*	47N	47			65			0.16	
KQ1008TTE56N*	56N	56					1300	0.18	
KQ1008TTE68N*	68N	68						0.20	
KQ1008TTE82N*	82N	82			60		1000	0.22	
KQ1008TTER10*	R10	100	25	G: ±2% J: ±5% K: ±10%				0.56	650
KQ1008TTER12*	R12	120					950	0.63	
KQ1008TTER15*	R15	150			45	100	850	0.70	580
KQ1008TTER18*	R18	180					750	0.77	620
KQ1008TTER22*	R22	220					700	0.84	500
KQ1008TTER27*	R27	270					600	0.91	500
KQ1008TTER33*	R33	330					570	1.05	450
KQ1008TTER39*	R39	390					500	1.12	470
KQ1008TTER47*	R47	470					450	1.19	
KQ1008TTER56*	R56	560					415	1.33	400
KQ1008TTER62*	R62	620					375	1.40	300
KQ1008TTER68*	R68	680						1.47	400
KQ1008TTER75*	R75	750					360	1.54	360
KQ1008TTER82*	R82	820					350	1.61	400
KQ1008TTER91*	R91	910			35	50	320	1.68	380
KQ1008TTE1R0*	1R0	1000					290	1.75	370
KQ1008TTE1R2*	1R2	1200	7.9				250	1.6	310
KQ1008TTE1R5*	1R5	1500			28		200	1.7	300
KQ1008TTE1R8*	1R8	1800					160	1.9	270
KQ1008TTE2R2*	2R2	2200						2.2	250
KQ1008TTE2R7*	2R7	2700			22	25	140	2.3	
KQ1008TTE3R3*	3R3	3300					110	2.7	230
KQ1008TTE3R9*	3R9	3900			20		100	2.8	
KQ1008TTE4R7*	4R7	4700					90	3.1	210
KQ1008TTE5R6*	5R6	5600			15	7.9	80	2.5	240
KQ1008TTE6R8*	6R8	6800					70	2.8	200
KQ1008TTE8R2*	8R2	8200					65	3.0	170
KQ1008TTE100*	100	10000					60	3.4	150

* Add tolerance character (C, G, H, J, K, M)

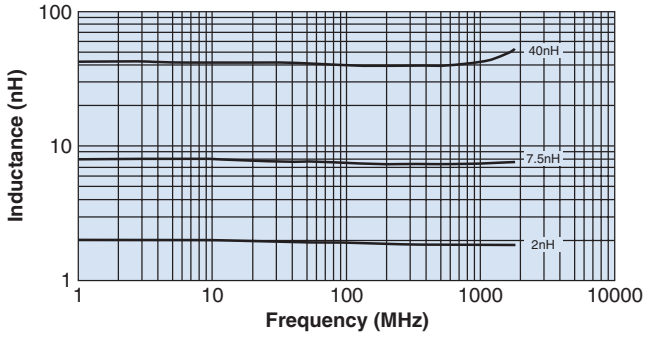
Operating Temperature Range: -40°C ~ +125°C

The operating temperature range of the coil (ambient temperature + self heating) must remain at +125°C or less

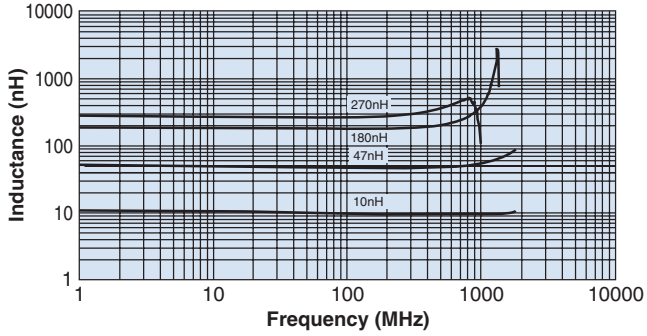
environmental applications

L-Frequency Characteristics

KQT0402



KQ0603

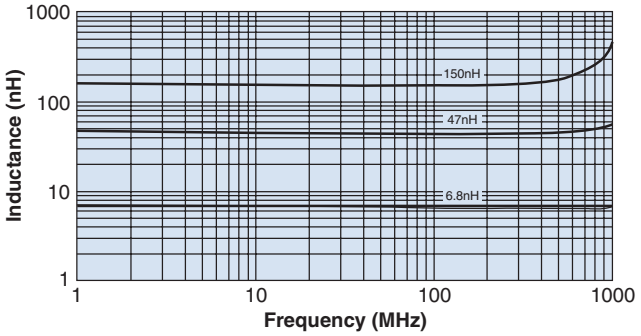


 12/19/17

environmental applications (continued)

L-Frequency Characteristics

KQ0805



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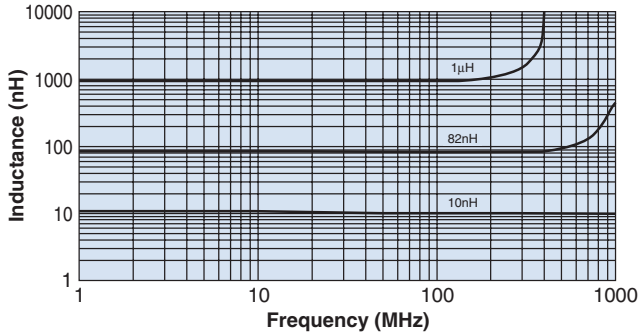
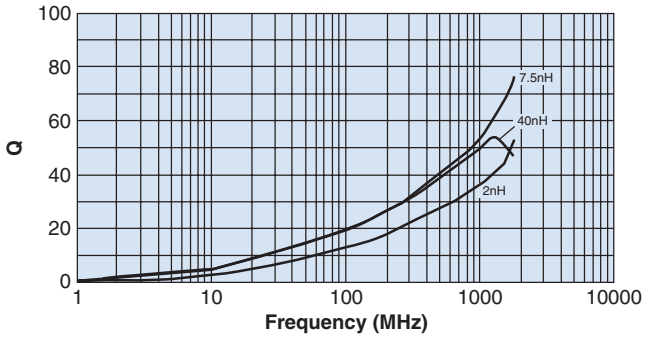


Q-Frequency Characteristics

KQT0402



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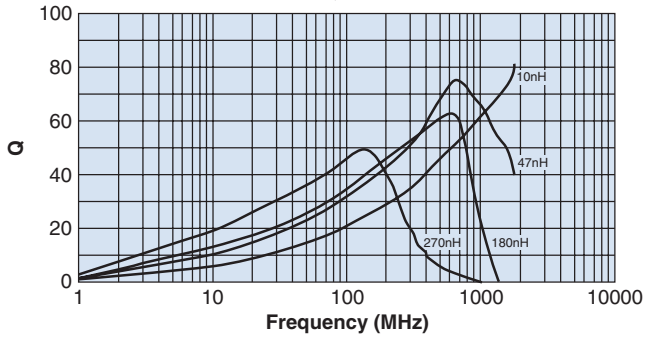

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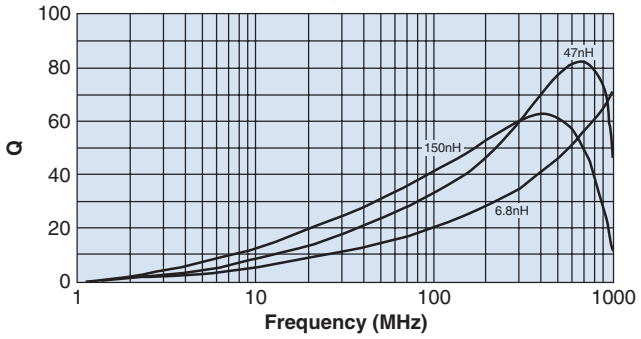

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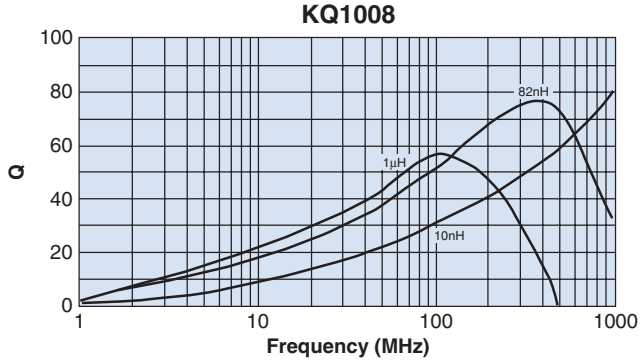


Test equipment: HP4291A impedance analyzer

Performance Characteristics

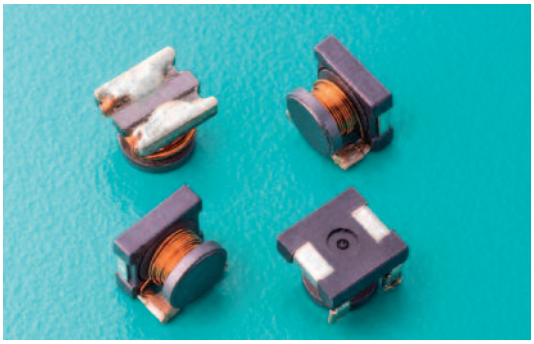
Parameter	Requirements Maximum Limit	Δ L/L Δ Q/Q Typical	Test Method
Resistance to Soldering Heat	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±2.7% Δ Q/Q: ±6.6%	260°C ± 5°C, 10s ± 1s
Rapid Change of Temperature	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±2.1% Δ Q/Q: ±5.3%	-40°C (30min.)/ +125°C (30min.) 100 cycles
Low Temperature Exposure	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±1.8% Δ Q/Q: ±2.8%	-40°C ± 2°C, 1000h
High Temperature Exposure	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±1.8% Δ Q/Q: ±5.3%	125°C ± 2°C, 1000h
Moisture Exposure	No significant abnormality in appearance Δ L/L: ±5%, Δ Q/Q: ±10%	Δ L/L: ±0.9% Δ Q/Q: ±6.9%	40°C ± 2°C, 90%~95%RH, 1000h
Resistance to Solvent	No damage and marking shall remain legible	—	Accordance with MIL-STD 202F Method 215

LPC4045, LPC4235, LPC4545

power chip inductor

KOA SPEER ELECTRONICS, INC.

EU RoHS COMPLIANT

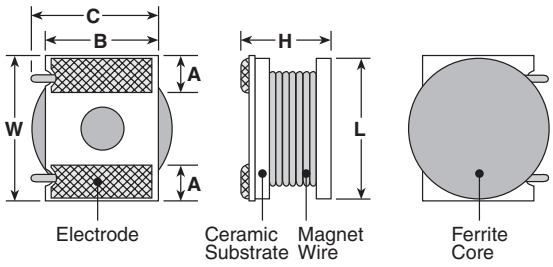


features

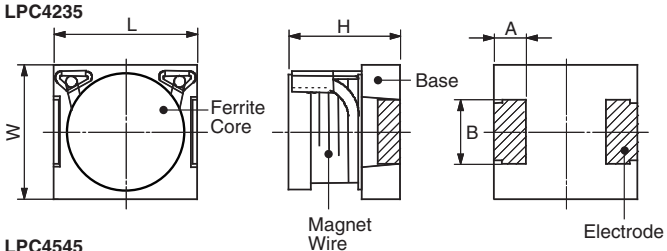
- Low DC resistance and high allowable current are realized by the original construction and wiring technology
- Automatic surface mounting is applicable
- Excellent solderability and endurance environment
- Suitable for reflow soldering
- Products meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction

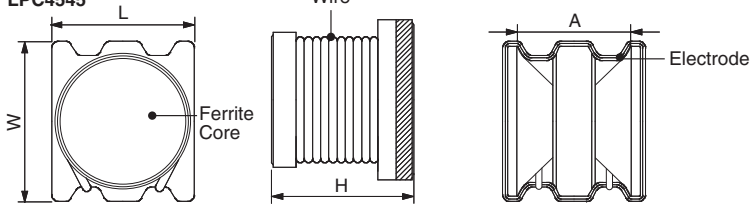
LPC4045



LPC4235



LPC4545



Size	Dimensions inches (mm)					
	L	W	H Max.	A	B	C
4045	ø.157±.008 (ø4.0±0.2)	.177±.008 (4.5±0.2)	.169±.009 (4.3±0.2)	.039±.112 (1.0±0.3)	.118±.008 (3.0±0.2)	.138 (3.5)
4235	.177±.008 (4.5±0.2)	.165±.008 (4.2±0.2)	.138 Max. (3.5 Max.)	.039±.008 (1.0±0.2)	.079±.008 (2.0±0.2)	—
4545	.161±.012 (4.1±0.3)	.181±.016 (4.6±0.4)	.181 Max. (4.6 Max.)	.126±.012 (3.2±0.3)	—	—

ordering information

LPC	4235	T	TM	221	K
Type	Size	Termination Material	Packaging	Nominal Inductance	Tolerance
	4045 4235 4545	A: SnAg (4045 only) T: Sn (4235 only) C: Sn/Cu (4545 only)	TM: taping (4235) TE: taping (4545) TED: taping (4045)	3 digits 221: 220µH	K: ±10% M:±20%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/20/18

applications and ratings

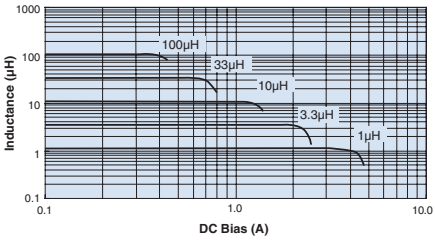
Part Designation	Nominal Inductance (µH)	Inductance Tolerance	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (Amps)
LPC4045ATED1R0M	1.0	M: ±20%	90.0	0.015	3.10
LPC4045ATED1R5M	1.5		70.0	0.020	2.80
LPC4045ATED2R2M	2.2		55.0	0.023	2.50
LPC4045ATED3R3M	3.3		45.0	0.044	1.80
LPC4045ATED4R7M	4.7		35.0	0.062	1.45
LPC4045ATED6R8M	6.8		25.0	0.075	1.30
LPC4045ATED100K	10	K: ±10%	23.5	0.10	1.02
LPC4045ATED150K	15		18.5	0.15	0.84
LPC4045ATED220K	22		14.0	0.21	0.70
LPC4045ATED330K	33		12.0	0.41	0.52
LPC4045ATED470K	47		10.5	0.52	0.46
LPC4045ATED680K	68		8.0	0.67	0.40
LPC4045ATED101K	100		6.3	0.92	0.28
LPC4045ATED151K	150		5.2	1.80	0.25
LPC4045ATED221K	220		3.9	2.25	0.18
LPC4045ATED331K	330		3.0	4.27	0.15
LPC4045ATED471K	470		2.7	5.23	0.14
LPC4045ATED681K	680		2.2	6.67	0.12
LPC4235TTM R82M	0.82	M: ±20%	146.6	0.017	3.34
LPC4235TTM 1R0M	1.0		125.1	0.020	3.27
LPC4235TTM 1R2M	1.2		114.7	0.023	3.10
LPC4235TTM 1R5M	1.5		101.4	0.031	2.53
LPC4235TTM 2R2M	2.2		78.8	0.039	2.28
LPC4235TTM 3R3M	3.3		66.7	0.070	1.63
LPC4235TTM 4R7M	4.7		52.0	0.090	1.44
LPC4235TTM 6R8M	6.8		43.5	0.109	1.29
LPC4235TTM 100K	10	K: ±10%	33.5	0.190	0.91
LPC4235TTM 150K	15		29.1	0.230	0.87
LPC4235TTM 220K	22		21.7	0.366	0.69
LPC4235TTM 330K	33		13.9	0.542	0.52
LPC4235TTM 470K	47		12.0	0.688	0.47
LPC4235TTM 680K	68		12.7	1.30	0.34
LPC4235TTM 101K	100		10.4	1.66	0.31
LPC4235TTM 151K	150		7.5	2.96	0.22
LPC4235TTM 221K	220		6.7	3.77	0.20
LPC4545CTE 1R0M	1.0	M: ±20%	90.0	0.015	3.66
LPC4545CTE 1R5M	1.5		65.0	0.02	3.21
LPC4545CTE 2R2M	2.2		50.0	0.023	2.96
LPC4545CTE 3R3M	3.3		40.0	0.044	2.19
LPC4545CTE 4R7M	4.7		35.0	0.062	1.81
LPC4545CTE 6R8M	6.8		25.0	0.075	1.60
LPC4545CTE 100K	10	K: ±10%	23.0	0.1	1.43
LPC4545CTE 150K	15		15.0	0.15	1.04
LPC4545CTE 220K	22		13.0	0.21	0.88
LPC4545CTE 330K	33		10.0	0.41	0.60
LPC4545CTE 470K	47		9.0	0.52	0.53
LPC4545CTE 680K	68		7.5	0.67	0.49
LPC4545CTE 101K	100		5.5	0.92	0.41
LPC4545CTE 151K	150		5.0	1.8	0.29
LPC4545CTE 221K	220		4.0	2.25	0.26
LPC4545CTE 331K	330		2.5	4.27	0.19
LPC4545CTE 471K	470		2.0	5.23	0.17
LPC4545CTE 681K	680		1.8	6.67	0.15
LPC4545CTE 152K	1500		1.3	17.04	0.10
LPC4545CTE 222K	2200		0.9	35.0	0.07

Allowable current is a DC Current which causes initial inductance to decrease by 10%. Or coil temperature to rise by 40°C, whichever is smaller
Operating Temperature Range: -40°C ~ +125°C LPC4235: Test Report +155°C is available
The operating temperature range of the coil (ambient temperature + self heating) must remain at +125°C or less

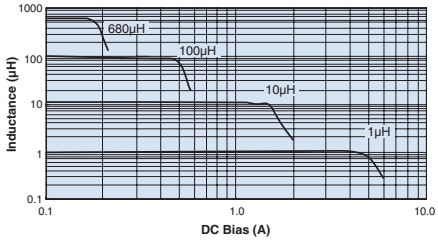
environmental applications

DC Bias Characteristics

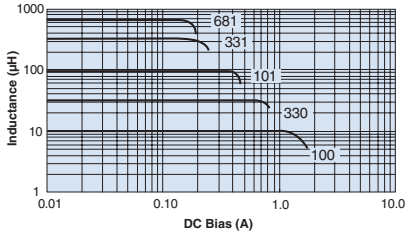
LPC4235



LPC4545

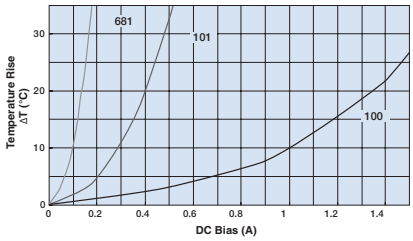


LPC4045

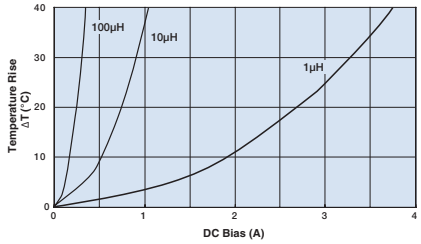


Surface Temperature Rise

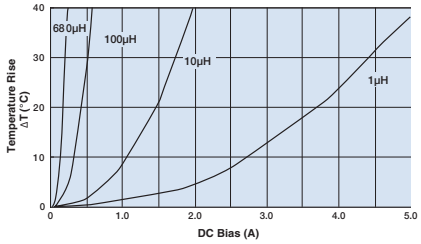
LPC4045



LPC4235



LPC4545



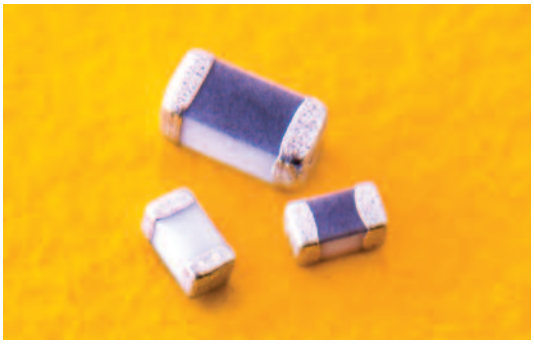
Performance Characteristics

Parameter	Performance Requirements ΔL/L		Test Method		
	Limit	Typical	LPC4045	LPC4235	LPC4545
Rapid Change of Temperature	±5%	±1.3%	-40°C (30 minutes)/ +85°C (30 minutes), 100 cycles	-40°C (30 minutes)/ +125°C (30 minutes), 100 cycles	-40°C (30 minutes)/ +125°C (30 minutes), 100 cycles
Low Temperature Exposure	±5%	±1.3%	-40°C, 500 hours	-40°C ± 2°C, 500 hours	-40°C, 1000 hours
High Temperature Exposure	±5%	±1.3%	+85°C, 500 hours	+125°C ± 2°C, 500 hours	+125°C ± 2°C, 1000 hours
Moisture Exposure	±5%	±1.6%	+40°C ± 2°C, 90 - 95% RH, 500 hours	+40°C ± 2°C, 90 - 95% RH, 500 hours	+85°C, 8 5% RH, 1000 hours

Surface Temperature Rise graphs and additional environmental applications can be found at www.koaspeer.com

12/12/19

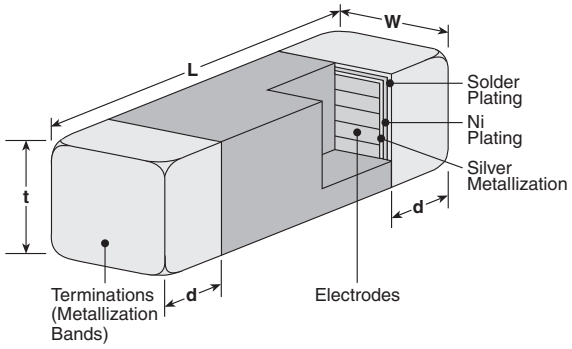
EU RoHS COMPLIANT



features

- Monolithic structure provides high reliability in a wide temperature and humidity range
- High quality ceramic material and unique manufacturing process provides high Q at high frequency
- Nickel barrier with solder overcoat for excellent solderability
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction



Size Code	Dimensions inches (mm)			
	L	W	t	d
1E (0402)	.039±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.02±.004 (0.5±0.1)	.01±.004 (0.25±0.1)
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.012±.008 (0.3±0.20)

ordering information

MHL	1E	C	T	TP	3N9	S
Type	Size Code	Material	Termination Material	Packaging	Nominal Inductance	Tolerance
	1E 1J	Permeability Code: C	T: Sn	TP: 7" paper tape 2 mm pitch (1E only - 10,000 pieces/reel) TD: 7" paper tape (1J - 4,000 pieces/reel)	3N9 = 3.9nH R10 = 100nH	S: ±0.3nH J: ±5%

For further information on packaging, please refer to Appendix A.

applications and ratings

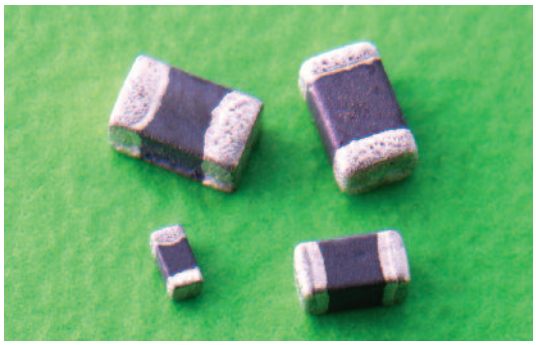
Part Designation	Inductance L (nH)	Inductance Tolerance	Q Minimum (100MHz)	Self Resonant Frequency Typical (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range**
MHL1ECTTP1N0*	1.0	S: ±0.3nH	8	10000	0.12	300	-55°C to +125°C
MHL1ECTTP1N2*	1.2						
MHL1ECTTP2N2*	2.2			6000	0.16		
MHL1ECTTP3N3*	3.3				0.19		
MHL1ECTTP3N9*	3.9			4000	0.22		
MHL1ECTTP4N7*	4.7				0.24		
MHL1ECTTP5N6*	5.6				0.27		

7/17/17

applications and ratings (continued)

Part Designation	Inductance L (nH)	Inductance Tolerance	Q Minimum (100MHz)	Self Resonant Frequency Typical (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range**
MHL1ECTTP6N8*	6.8	J: ±5%	8	3900	0.32	300	-55°C to +125°C
MHL1ECTTP8N2*	8.2			3500	0.37		
MHL1ECTTP10N*	10			3200	0.42		
MHL1ECTTP12N*	12			2600	0.50		
MHL1ECTTP15N*	15			2300	0.55		
MHL1ECTTP18N*	18			2000	0.65		
MHL1ECTTP22N*	22			1600	0.8		
MHL1ECTTP27N*	27			1400	0.9		
MHL1ECTTP39N*	39			1100	1.2	200	
MHL1ECTTP47N*	47			900	1.3		
MHL1ECTTP56N*	56			750	1.4		
MHL1ECTTP82N*	82			600	1.6	100	
MHL1ECTTPR10*	100				2.0		
MHL1JCTTD1N5*	1.5	S: ±0.3nH	8	6000	0.10	600	-55°C to +125°C
MHL1JCTTD1N8*	1.8						
MHL1JCTTD2N2*	2.2						
MHL1JCTTD2N7*	2.7						
MHL1JCTTD3N3*	3.3		10	5200	0.13		
MHL1JCTTD3N9*	3.9			5000	0.15		
MHL1JCTTD4N7*	4.7			4000	0.20		
MHL1JCTTD5N6*	5.6				0.23	600	
MHL1JCTTD6N8*	6.8	J: ±5%			0.25		
MHL1JCTTD8N2*	8.2			3500	0.28		
MHL1JCTTD10N*	10		12	3200	0.30		
MHL1JCTTD12N*	12			2600	0.35		
MHL1JCTTD15N*	15			2300	0.40		
MHL1JCTTD18N*	18			2000	0.45		
MHL1JCTTD22N*	22			1600	0.50		
MHL1JCTTD27N*	27			1400	0.55		
MHL1JCTTD33N*	33			1200	0.60		
MHL1JCTTD39N*	39			1100	0.65	500	
MHL1JCTTD47N*	47			900	0.70		
MHL1JCTTD68N*	68			700	0.80	400	
MHL1JCTTD82N*	82			600	1.0	300	
MHL1JCTTDR12*	120		8***	500	1.3		
MHL1JCTTDR15*	150				1.7	250	
MHL1JCTTDR22*	220			400	2.0		

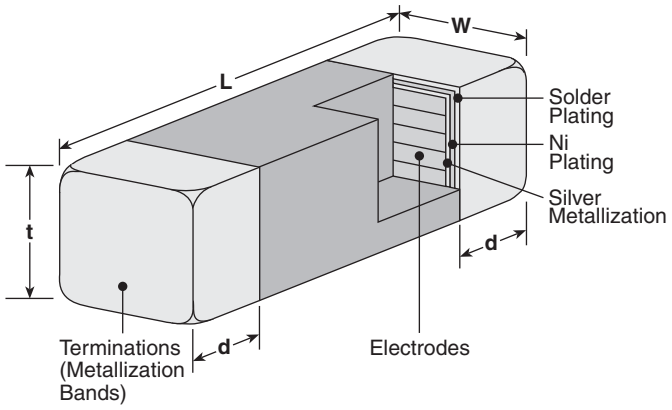
*Add tolerance character (S, J)
** The operating temperature range of the coil (ambient temperature + self heating) must remain at +125°C or less
*** 50MHz



features

- Designed to reduce noise at high frequencies
- Standard EIA packages: 1E, 1J, 2A, 2B
- Nickel barrier with solder overcoat for excellent solderability
- Marking: Black body color with no marking
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)			
	L	W	t	d
1E (0402)	.039±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.02±.004 (0.5±0.1)	.01±.004 (0.25±0.1)
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.014±.006 (0.36±0.15)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.035±.008 (0.9±0.2)	.020±.012 (0.51±0.30)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.043±.008 (1.1±0.2)	.020±.012 (0.51±0.30)

ordering information

CZB	1E	G	T	TP	100	P
Type	Size	Permeability Code	Termination Material	Packaging	Impedance	Tolerance
	1E 1J 2A 2B	F G S	T: Sn	TP: 7" paper tape (1E only - 10,000 pieces/reel) TD: 7" paper tape (1J, 2A - 4,000 pieces/reel) TE: 7" embossed plastic (2B - 3,000 pieces/reel)	2 significant figures + 1 multiplier	P: ±25%

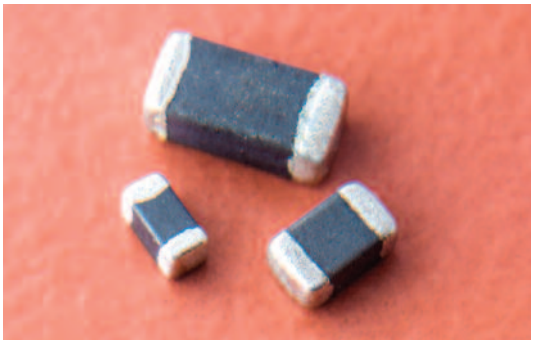
For further information on packaging, please refer to Appendix A.

applications and ratings

Part Designation	Impedance @ 100MHz † (Ω)	DC Resistance Maximum †† (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range
CZB1EGTTP100P	10	0.05	600	-55°C to +125°C
CZB1EGTTP700P	70	0.40	350	
CZB1EGTTP121P	120	0.50	300	
CZB1EGTTP221P	220	0.70	200	
CZB1EGTTP301P	300	0.80		
CZB1EGTTP601P	600	1.00	150	
CZB1EGTTP102P	1000	1.50	100	
CZB1JGTTD300P	30	0.10	600	-55°C to +125°C
CZB1JGTTD600P	60	0.20		
CZB1JGTTD800P	80			
CZB1JGTTD101P	100	0.25	400	
CZB1JGTTD121P	120			
CZB1JGTTD141P	140	0.30		
CZB1JGTTD221P	220			
CZB1JGTTD301P	300	0.35	300	
CZB1JGTTD451P	450	0.40		
CZB1JGTTD601P	600	0.45		
CZB1JGTTD102P	1000	0.60	250	
CZB1JGTTD152P	1500	0.70	150	
CZB1JGTTD202P	2000	1.20		
CZB2AFTTD500P	50	0.10	800	-55°C to +125°C
CZB2AGTTD101P	100	0.15	600	
CZB2AGTTD121P	120	0.25		
CZB2AGTTD301P	300	0.30	400	
CZB2AGTTD601P	600			
CZB2AGTTD601PV	600	0.25	500	
CZB2AGTTD102P	1000	0.40	300	
CZB2BFTTE190P	19	0.05	800	-55°C to +125°C
CZB2BFTTE300P	30	0.10		
CZB2BFTTE600P	60		600	
CZB2BFTTE800P	80	0.20		
CZB2BFTTE101P	100	0.20		
CZB2BFTTE121P	120	0.15		
CZB2BFTTE201P	200	0.20	500	
CZB2BFTTE301P	300	0.30		
CZB2BFTTE601P	600	0.40	400	

† Impedance test method: HP4291A
†† DCR test method: Keithley 580

For complete environmental specifications, please refer to www.koaspeer.com



features

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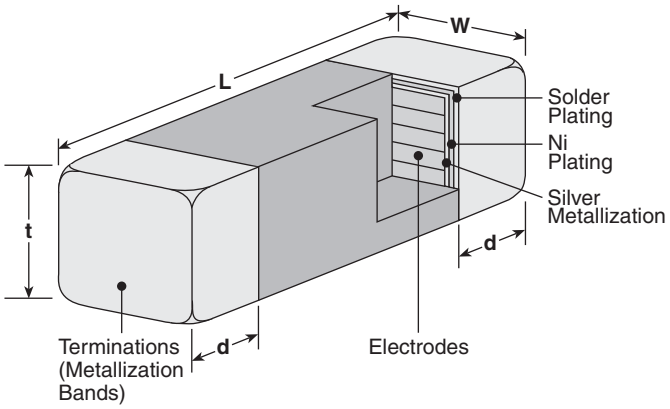
- Marking: Black body color with no marking
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)			
	L	W	t	d
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.014±.006 (0.36±0.15)
2A (0805)	.079±.008 (2.0±0.2)	.047±.008 (1.20±0.2)	.035±.008 (0.9±0.2)	.02±.012 (0.51±0.30)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.043±.008 (1.1±0.2)	.02±.012 (0.51±0.30)

ordering information

CZP	2A	F	T	TD	300	P
Type	Size	Permeability Code	Termination Material	Packaging	Impedance	Tolerance
	1J 2A 2B	F P	T: Sn	TD: 7" paper tape (1J, 2A - 4,000 pieces/reel) TE: 7" embossed plastic (2B - 3,000 pieces/reel)	2 significant figures + 1 multiplier	P: ±25%

For further information on packaging, please refer to Appendix A.

applications and ratings

Part Designation	Impedance @ 100MHz (Ω)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range
CZP1JFTTD300P	30	0.03	3000	-55°C to +125°C
CZP1JFTTD600P	60	0.04		
CZP1JFTTD121P	120	0.10	2000	
CZP1JFTTD181P	180			
CZP1JFTTD221P	220			
CZP1JFTTD301P	300			
CZP1JFTTD601P	600	0.20	1000	
CZP2AFTTD300P	30	0.015	4000	-55°C to +125°C
CZP2AFTTD600P	60	0.04	3000	
CZP2AFTTD800P	80			
CZP2AFTTD221P	220	0.05		
CZP2AFTTD301P	300	0.15	2000	
CZP2AFTTD601P	600	0.20		
CZP2AFTTD102P	1000		1000	
CZP2BFTTE190P	19	0.02	4000	-55°C to +125°C
CZP2BFTTE300P	30			
CZP2BFTTE500P	50	0.025		
CZP2BFTTE800P	80	0.03	3000	
CZP2BFTTE101P	100	0.08	2500	
CZP2BFTTE121P	120			
CZP2BFTTE601P	600	0.20	1000	
CZP2BPTTE600P	60	0.02	6000	
CZP2BPTTE101P	100	0.03	3000	
CZP2BPTTE121P	120	0.04		
CZP2BPTTE601P	600	0.10	1500	

For complete environmental specifications, please refer to www.koaspeer.com

Precautions for the Fusing Components

Refer to the precautions in the beginning part of this catalog for the matters common to all products.

Safety Standards

- KOA's fuse components comply with the following safety standards:

U.S.A.	UL (Underwriters Laboratories Inc.) UL248
CANADA	CSA (Canadian Standards Association) C22.2 No.248 c-UL (Underwriters Laboratories Inc.) UL248 *c-UL is equivalent to CSA in recognition
INTERNATIONAL	IEC (International Electrotechnical Commission) 60127-1, -4
JAPAN	Electrical Appliances and Materials Safety Act (PSE) Class-B

Rated Current

- Specified amperage that conforms to safety standards, such as fusing time. This is not to be confused with the steady-state (stationary) current, which is calculated using the following equation:

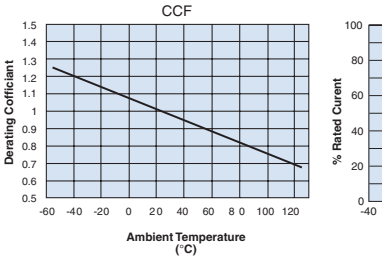
  Stationary Current ≤ Rated Current x Stationary Derating Coefficient x Ambient Temperature Derating

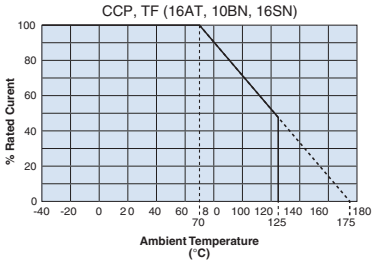
  The table below indicates deratings for each type of products.

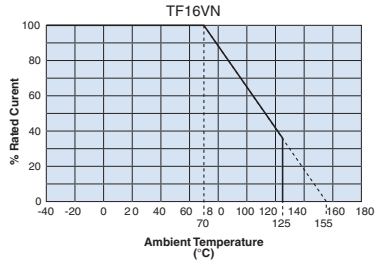
Type	Stationary Derating Coefficient
CCF1N, CCF1F	0.7
TF16AT	0.75
TF10BN, TF16SN, TF16VN	1.0
CCP2B, CCP2E	1.0

Deratings for Ambient Temperatures

The following Deratings for Ambient Temperatures are required:







- Ambient Temperature Derating values are found on product datasheets.
- If the current waveform is a repeated pulse or AC waveform, the peak current shall be both the rated current and stationary current. Do not use the effective value of the current waveform.

Rated Voltage

- A rated voltage indicates the voltage that does not run through electrodes after the fuse blows. In case of exceeding the rated voltage, the circuit voltage should be applied at voltage not higher than the rated voltage because the current may run again or may break the elements.

Interrupting Capacity

- Maximum current and voltage that can be interrupted when an abnormal situation arises. Make sure beforehand that voltage and current at the time of abnormality occurring in the circuit are within the interrupting capacity.

Type	Fusing Current	Fusing Time
CCF1N (0.4~10)	Rated Current x 2 or Over	1 second
CCP2B	Rated Current x 2 or Over	1 second
CCP2E	Rated Current x 2.5 or Over	1 second
CCP2E H	Rated Current x 2 or Over	1 second
TF16SN	Rated Current x 2 or Over	1 second
TF10BN	Rated Current x 2 or Over	5 seconds
TF16AT	Rated Current x 2 or Over	5 seconds
TF16VN	Rated Current x 2.5 or Over	5 seconds
CCF1N (12, 15)	Rated Current x 2 or Over	60s second
CCF1F	Rated Current x 2 or Over	120 seconds

Fusing Current

- Minimum current needed to break fusing element. Refer to the following list to quickly interrupt if an abnormal current occurred in the circuit:

  If fusing time is within 1 second or greater, the variance in the fusing time is largely affected by the surroundings (temperature, mounting pad dimensions, substrate material, etc.). Verification should be made with an actual circuit.

Anti-Surge Characteristics

Be careful of the short time over current (inrush current, reversible current at motor-lock etc.) that is generated in the circuit.

- Inrush current will differ according to the ambient temperature and the charging/discharging condition of the capacitor etc. Check the current wave form with the condition which will be the maximum current.
- When components that are highly dependent on temperatures such as thermistors are used within the circuit, check the current wave form with the condition which will be the maximum current.
- Set the sampling frequency at a level which the peak current can be detected when measuring the surge current with a digital oscilloscope.
- Generally, current probes are used for current measurement. When shunt resistors are used, be sure to use the lowest resistance value as possible according to the impedance in the circuit.

Operation Check

- Before you decide which fuse product you use, please mount the selected fuse on actual device and confirm that rush current and surge current have enough margin and that the product has performance that enables it to interrupt the abnormal current quickly.

Soldering

- This product is suitable both for reflow-soldering and for flowsoldering, but excessive heat may cause an open-circuit and change its characteristics.
- The part shall be soldered at the maximum temperature of 260°C or less.
- If a soldering iron is used, it shall be at 350°C or less and should be soldered in a short time. Further, pay attention that the products are not touched directly by the top of the iron. It may cause disconnection or characteristic change.

Placement

- Please confirm sufficiently the evaluation of reliability and use those that have small contractile stress at a resin stiffening time. By contractile stress at the resin stiffening time, fuses might be broken, resistance value may be changed and disconnection might occur in case of resin coating/potting or molded sealing. There is a possibility that heat may fill the surrounding of the fuses by shielding and may cause the fusing characteristics to change so, please check with the actual circuit.
- The fusing characteristics may change when there are components that generate heat around the fuses. Keep fuses away from those parts.

Storage

- Avoid storing components under the condition of high temperature/high humidity (40°C/70%RH or more) which may deteriorate solderability.
- Also avoid direct sun light which may deteriorate solderability and induce changes in taping strength.se parts.

Parts Selection

- If you have any questions about fuse selection, please do not hesitate contacting us.

Reference

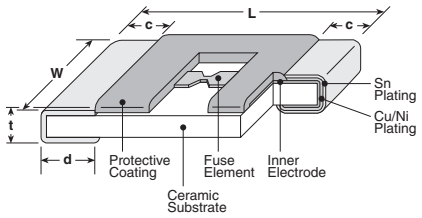
- For basic precautions, refer to JEITA technical report "JEITA RCR-4800 Safety application guide on fuse for use in electronic and electrical equipment".

EU RoHS COMPLIANT

features

- Small, lightweight design
- Special manufacturing method stabilizing fusing characteristics and occupying less area
- Low power consumption and less voltage drop due to low internal resistance
- Suitable for overcurrent protection of circuit block in electronic devices
- Suitable for flow and reflow soldering
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	c	d	t
TF10BN (0402)	.04±.004 (1.0±0.1)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01±.004 (0.25±0.1)	.015±.002 (0.4±0.05)
TF16AT (0603)	.063±.004 (1.6±0.1)	.031±.003 (0.8±0.08)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.002 (0.45±0.05)
TF16SN (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.015+ .004 -.002 (0.4+ .1 -.05)

ordering information

TF	16S	N	1.25	T	TE
Type	Size	Fusing Characteristic	Rated Current	Termination Material	Packaging
	10B: 1.0x0.5mm 16A: 1.6x0.8mm 16S: 1.6x0.8mm	N: Normal blow T: Anti pulse (16A only)	Reference rating chart	T: Sn	TB: 2mm pitch punched paper (TF10BN only, 10,000 pieces/reel) TD: 4mm pitch punched paper (TF16 only, 5,000 pieces/reel)

applications and ratings

Part Designation	Marking	Rated Current	Fusing Time	Internal R. Maximum (mΩ)	Rated Voltage	Rated Ambient Temperature	Operating Temperature Range
TF10BN0.20	A	0.20A	Open within 5 sec. at 200% rated current (Refer to Fusing Characteristics graph)	1990	DC 32V	+70°C	-55°C to +125°C
TF10BN0.25	C	0.25A		1270			
TF10BN0.315	D	0.315A		850			
TF10BN0.50	F	0.50A		320			
TF10BN0.63	I	0.63A		200			
TF10BN0.80	K	0.80A		135			
TF10BN1.00	L	1.00A		115			
TF10BN1.25	M	1.25A		90			
TF10BN1.60	N	1.60A		58			
TF10BN2.00	S	2.00A		42			
TF10BN2.50	T	2.50A		35			
TF10BN3.00	V	3.00A		30			
NEW TF10BN3.50	R	3.50A		27			
TF10BN4.00	X	4.00A		23			
TF10BN5.00	Y	5.00A		19			
TF16AT0.25	C	0.25A	Open within 5 sec. at 200% rated current (Refer to Fusing Characteristics graph)	498	DC 32V	+70°C	-55°C to +125°C
TF16AT0.315	D	0.315A		384			
TF16AT0.50	F	0.50A		198			
TF16AT0.63	I	0.63A		143			
TF16AT0.80	K	0.80A		120			
TF16AT1.00	L	1.00A		94			
TF16AT1.25	M	1.25A		73			
TF16AT1.60	N	1.60A		59			
TF16AT2.00	S	2.00A		42			
TF16AT2.50	T	2.50A		32			

For further information on packaging, please refer to Appendix A.

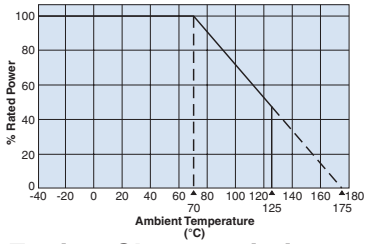
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 7/11/19

applications and ratings (continued)

Part Designation	Marking	Rated Current	Fusing Time	Internal R. Maximum (mΩ)	Rated Voltage	Rated Ambient Temperature	Operating Temperature Range
TF16AT3.15	U	3.15A	Open within 5 sec. at 200% rated current (Refer to Fusing Characteristics graph)	24	32V	+70°C	-55°C to +125°C
TF16AT4.00	X	4.00A		17			
TF16AT5.00	Y	5.00A		14			
TF16SN0.20	A	0.20A	Open within 1 sec. at 200% rated current (Refer to Fusing Characteristics graph)	1500	32V	+70°C	-40°C to +125°C
TF16SN0.25	C	0.25A		960			
TF16SN0.315	D	0.315A		600			
TF16SN0.40	H	0.40A		440			
TF16SN0.50	F	0.50A		300			
TF16SN0.63	I	0.63A		190			
TF16SN0.70	J	0.70A		170			
TF16SN0.80	K	0.80A		135			
TF16SN1.00	L	1.00A		103			
TF16SN1.25	M	1.25A		78			
TF16SN1.60	N	1.60A		58			
TF16SN2.00	S	2.00A		47			
TF16SN2.50	T	2.50A		38			
TF16SN3.15	U	3.15A		28			

environmental applications

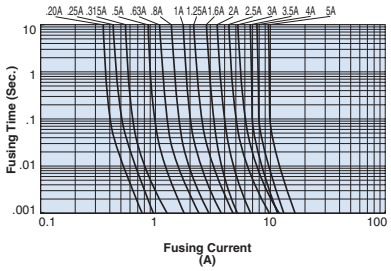
Derating Curve

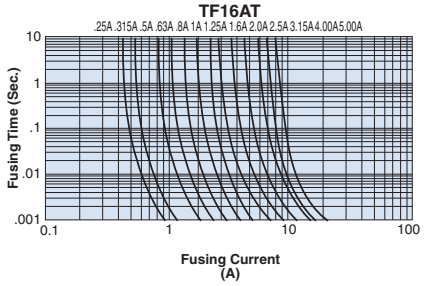


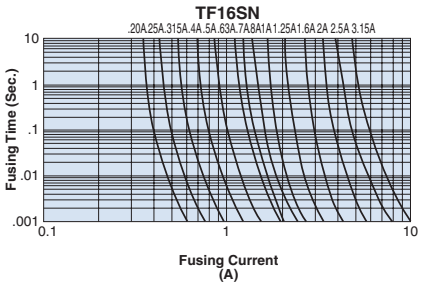
Stationary Current: Regard the peak of stationary current waveform as stationary current value when the stationary current is repeated pulse.

Temperature Derating: Rated current needs to be derated if used at an ambient temperature 70℃ or above. Refer to the derating coefficient on the left figure.

Fusing Characteristics







Performance Characteristics

Parameter	Requirement		Test Method
	Limit	Typical	
Fusing Characteristics	Within 1 second (16SN) Within 5 seconds (10BN, 16AT)	—	200% of rated voltage shall be carried (@25°C)
Bending Test	No mechanical damages	—	Distance between holding points: 90mm, Bending: 3mm, 1 time (BN, AT), 2mm, 1 time (SN)
Resistance to Solder Heat	±10%	±4.5% (16SN) ±5% (10BN, 16AT)	260°C ± 5°C, 10 seconds ± 0.5^{+1}_{-0} second
Solderability	95% coverage minimum	—	245°C ± 3°C, 3 seconds ± 0.5 second
Load Life	±10%	±4.5%(16SN) ±5% (10BN, 16AT)	70°C ± 2°C, 1000 hours, rated current x 100%, 1.5 hr ON, 0.5 hr OFF cycle
Load Life Moisture	±10%	±3% (10BN) ±4.5% (16SN), 5% (16AT)	40°C ± 2°C, 90 - 95% RH, 1000 hours, rated current x 100% (10BN, 16SN), x 75% (16AT), 1.5 hr ON, 0.5 hr OFF cycle
Rapid Change of Temperature	±10%	±4% (16SN) ±5% (10BN, 16AT)	16SN: -40°C ± 2°C (30 minutes), 10BN, 16AT: -55°C ± 2°C, +125°C (30 minutes), 10 cycles
Resistance to Solvent	No evidence of damages to protective coating and marking	—	Conforming to MIL-STD-202F
Residual Resistance	10kΩ and more	—	Measure DC resistance after fusing

 5/31/19

KOA SPEER ELECTRONICS, INC.

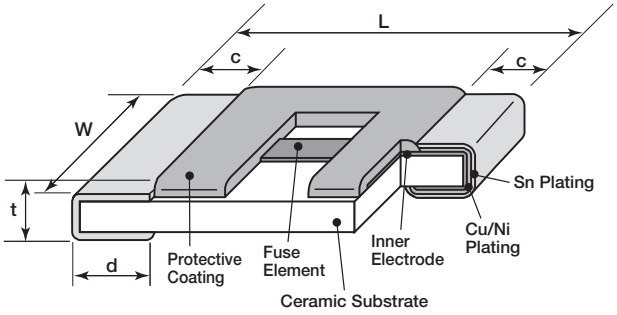
TF16VN

chip current fuses for automotive

features

- Small and light chip current fuses for the secondary circuit
- Temperature cycle (-55°C ~ 125°C), 1000 cycle
- Original construction and manufacturing method stabilize fusing characteristics
- Suitable for overcurrent protection of circuit block in small electronic devices
- Suitable for reflow solderings
- Products meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction



Type	Dimensions inches (mm)				
	L	W	c	d	t
TF16VN (0603)	.063±.004 (1.6±0.1)	.031±.004 (0.8±0.1)	.014±.004 (0.35±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)

ordering information

TF	16V	N	2.50	D	T	TD
Product Code	Size	Fusing Characteristics	Rated Current	Rated Voltage	Terminal Surface Material	Taping
	16V: 1.6 x 0.8mm	N: Normal blow		Nil: DC 32V D: DC 125V DC 70V DC 50V	T: Sn	TD: 4mm pitch punch paper

For further information on packaging, please refer to Appendix A.

ratings

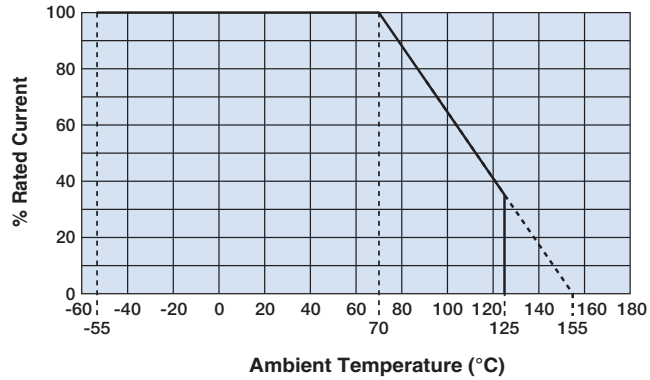
Type	Marking	Rated Current	Fusing Time	Internal R. (mΩ)Max.	Rated Voltage	Rated Ambient Temp.	Operating Temperature Range
TF16VN0.40	H	0.40A	Open within 5 sec. at 250% rated current. Refer to the graph of fusing characteristics.	760	DC 32V (DC125V)	+70°C	–55°C ~ 125°C
TF16VN0.50	F	0.50A		520			
TF16VN0.63	I	0.63A		370	DC 32V (DC70V)		
TF16VN0.80	K	0.80A		200			
TF16VN1.00	L	1.00A		160			
TF16VN1.25	M	1.25A		130			
TF16VN1.60	N	1.60A		100			
TF16VN2.00	S	2.00A		80			
TF16VN2.50	T	2.50A		60			
TF16VN3.15	U	3.15A		40	DC 32V (DC50V)		

High rated voltage products (DC 125V: 0.4A to 0.5A, DC 70V: 0.63A to 2.5A, DC 50V: 3.15A) are available. Please ask KOA sales.

circuit protection

environmental applications

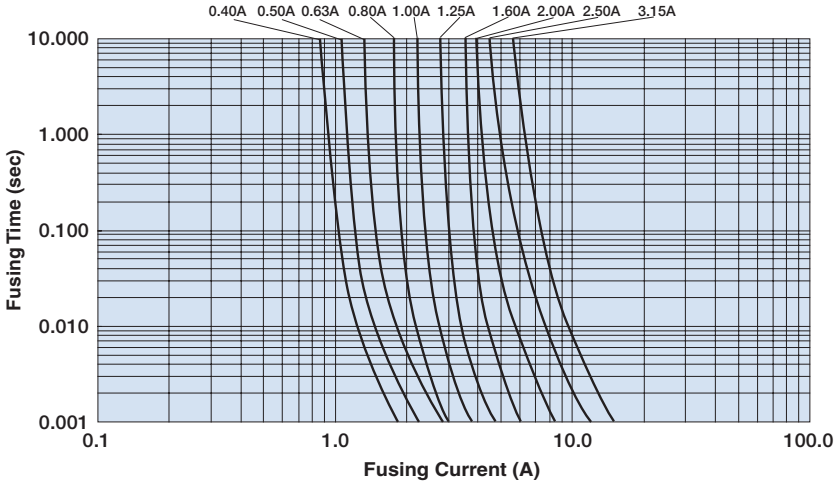
Derating Curve



Stationary current: Regard the peak of stationary current waveform as stationary current value when the stationary current is repeated pulse.

Temperature Derating: Rated Current needs to be derated if used at an ambient temperature of 70°C or more. Refer to the derating coefficient on the left figure.

Fusing Characteristics (Average Fusing Time)



Performance Characteristics

Test Items	Performance Requirements ΔR±%		Test Methods
	Limit	Typical	
Fusing Characteristics	Within 5 seconds	—	250% of rated current shall be carried (@25°C)
Bending Test	No mechanical damages	—	Distance between holding points 90mm, bending width 2mm, 1 time.
Resistance to Soldering Heat (Reflow Soldering)	10	5	Preheating: 150+30°C, 90 ± 30 seconds Heating: 230°C or more, 30 ± 10 seconds, max. 260°C
Solderability	95% coverage min.	—	245°C±3°C, 3 seconds ± 0.5 seconds
Load Life	10	5	70°C±2°C, 1000h, Rated current × 100%, 1.5h ON/0.5h OFF cycle
Load Life Moisture	10	5	85°C±2°C, 85%±5%RH, 1000h, Rated current × 10%, 1.5h ON/0.5h OFF cycle
Rapid Change of Temperature	10	5	-55°C (30min.)/+125°C (30min.) 1000 cycles
Resistance to Solvent	No evidence of damages to protective coating and marking.	—	Conforming to MIL-STD-202F
Residual Resistance	10kΩ or more	—	Measure DC resistance after fusing

KOA SPEER ELECTRONICS, INC.

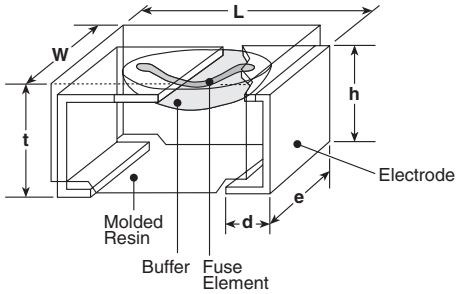
CCP
chip fuse

EU RoHS COMPLIANT

features

- Immediate cut-off of excessive heat
- No generation of heat
- UL94V0 epoxy case
- Suitable for flow and reflow soldering
- UL248.14, file #131375
- One-time fuse device
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Size Code	Dimensions inches (mm)					
	L	W	t	h	e	d
2B	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.047±.008 (1.2±0.2)	.031±.004 (0.8±0.1)	.047±.004 (1.2±0.1)	.024±.004 (0.6±0.1)
2E		.098±.008 (2.5±0.2)	.087±.008 (2.2±0.2)	.075±.004 (1.9±0.1)	.067±.004 (1.7±0.1)	.02±.004 (0.5±0.1)

ordering information

CCP	2B	20		T	TE
Type	Size Code	Rating	Fusing Magnification	Termination Material	Packaging
	2B: 1206 2E: 1210	Reference rating chart	Blank: 200% (2B) 250% (2E) H: 200% (2E)	T: Sn	TE: 7" embossed plastic (2B - 3,000 pieces/reel) (2E - 2,000 pieces/reel)

applications and ratings

Part Designation	Current Rating	Fusing Current	Fusing Time	Internal R. Maximum (mΩ)	Maximum Open Circuit Voltage*	Rated Ambient Temperature	Operating Temperature Range
CCP2B15	0.75A	1.5A	1 second max. @ fusing current	150	24V (40V/76V)*	+70°C	-40°C to +125°C
CCP2B20	1.00A	2.0A		100			
CCP2B25	1.25A	2.5A		75			
CCP2B30	1.50A	3.0A		60			
CCP2B35	1.75A	3.5A		50			
CCP2B40	2.00A	4.0A		45			
CCP2B50	2.50A	5.0A		35			
CCP2B63	3.15A	6.3A		23			
CCP2B80	4.00A	8.0A		19			
CCP2B100	5.00A	10.0A		15			
CCP2E10H	0.50A	1.0A		200	72V		
CCP2E13H	0.65A	1.3A		170			
CCP2E15H	0.75A	1.5A		150			
CCP2E20H	1.00A	2.0A		100			
CCP2E25H	1.25A	2.5A		75			
CCP2E30H	1.50A	3.0A		60			
CCP2E35H	1.75A	3.5A		50			
CCP2E38H	1.90A	3.8A		48			

* Note: High rated voltage (76V: 0.75A ~ 3.15A; 40V: 4A ~ 5A) also available, please contact KOA.

For further information on packaging, please refer to Appendix A.

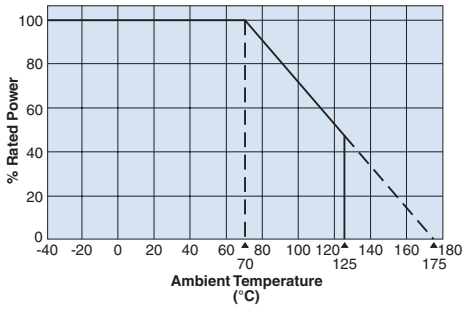
12/12/19

applications and ratings (continued)

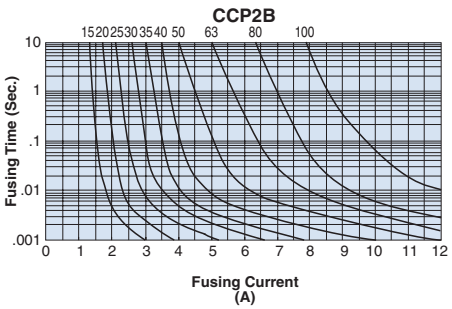
Part Designation	Current Rating	Fusing Current	Fusing Time	Internal R. Maximum (mΩ)	Maximum Open Circuit Voltage	Rated Ambient Temperature	Operating Temperature Range
CCP2E40H	2.00A	4.0A	1 second max. @ fusing current	45	72V	+70°C	-40°C to +125°C
CCP2E45H	2.25A	4.5A		40			
CCP2E50H	2.50A	5.0A		35			
CCP2E63H	3.15A	6.3A		23			
CCP2E100	4.00A	10.0A		15			
CCP2E10	0.4A	1.0A		200			
CCP2E13	0.52A	1.3A		170			
CCP2E15	0.6A	1.5A		150			
CCP2E20	0.8A	2.0A		100			
CCP2E25	1.0A	2.5A		75			
CCP2E30	1.2A	3.0A		60			
CCP2E35	1.4A	3.5A		50			
CCP2E38	1.5A	3.8A		48			
CCP2E40	1.6A	4.0A		45			
CCP2E45	1.8A	4.5A		40			
CCP2E50	2.0A	5.0A		35			
CCP2E63	2.5A	6.25A		23			

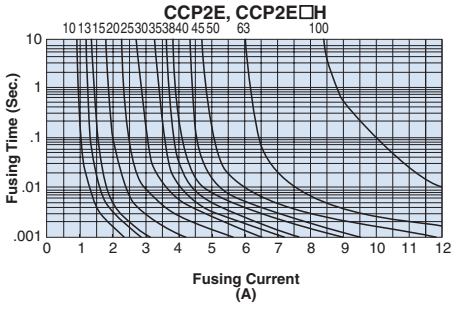
environmental applications

Derating Curve



Fusing Characteristics





Performance Characteristics

Parameter	Requirement Δ R±% Limit	Typical	Test Method
Fusing Characteristics	Within 1 second	—	CCP2B: 200% of rated current shall be carried CCP2E: 250% of rated current shall be carried CCP2E☐H: 200% of rated current shall be carried
Open Circuit Voltage	No fusing, flaming, explosion	—	Apply DC voltage between the termination after fusing. CCP2B: 24V; CCP2E, CCP2E☐H: 72V
Residual Resistance	10kΩ or more	—	Measure DC resistance after fusing
Bending Test	No mechanical damages	—	Distance between holding points 90mm, bending width 10mm, 1 time
Resistance to Soldering Heat	±10%	±2.5%	260°C ±5°C, 10 seconds ± 0.5 seconds, 2 cycles
Solderability	±95% coverage min.	—	230°C ±5°C, 3 seconds ± 0.5 seconds
Load Life	±10%	±3%	70°C ± 3°C, 1000 hours, rated current, 1.5 hr ON, 0.5 hr OFF cycle
Load Life Moisture	±10%	±1.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, rated current, 1.5 hr ON, 0.5 hr OFF cycle
Rapid Change of Temperature	±10%	±4.0%	-40°C (30 minutes), +125°C (30 minutes), 10 cycles
Resistance to Solvent	No evidence of damages to protective coating and marking	—	Conforming to MIL-STD-202F

KOA SPEER ELECTRONICS, INC.

CCF1N

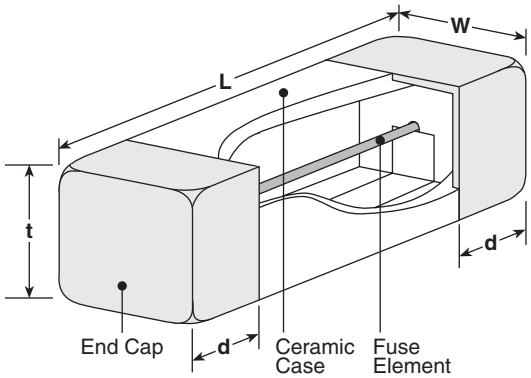
chip fuse

EU RoHS COMPLIANT

features

- Surface mount fuse suitable for primary and secondary circuits
- Ceramic case provides excellent mechanical strength
- Suitable for flow and reflow soldering
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type	Dimensions inches (mm)			
	L	W	t	d
CCF	.236±.008 (6.0±0.2)	.098±.008 (2.5±0.2)	.098±.008 (2.5±0.2)	.055±.008 (1.4±0.2)

ordering information

CCF	1	N	1		T	TE
Type	Style	Characteristic	Rated Current	Rated Voltage (UL)	Termination Material	Packaging
		N: Normal blow	Reference rating chart	Nil: 125Va.c./60Vd.c. or 65Va.c./65Vd.c. D: 125Va.c./160Vd.c.	T: Sn	TE: 4mm pitch embossed plastic (1,000 pieces/reel)

For further information on packaging, please refer to Appendix A.

circuit protection

12/12/17

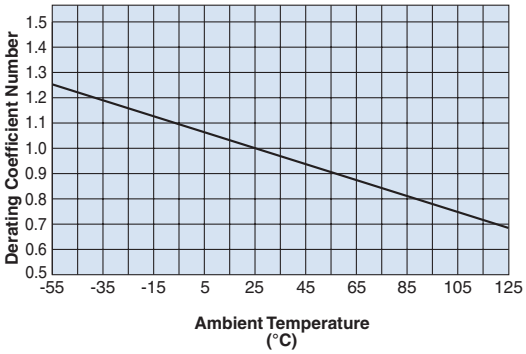
applications and ratings

Part Designation	Current Rating	Voltage Rating	Operating Temperature Range	Interrupting Capacity	Fusing Characteristics		Internal R. (mΩ) Max.	Normal Melting I²t (A², seconds)
					Rated Current	Fusing Time		
CCF1N0.4	400mA	UL (c-UL) AC 125V DC 60V (DC 160V)	-55°C to +125°C	UL (c-UL) AC 125V 50A DC 60V 50A (DC 160V)	UL (c-UL) 100% 200%	4 hour min. 1 second max.	650	0.024
CCF1N0.5	500mA						510	0.030
CCF1N0.63	630mA						390	0.052
CCF1N0.8	800mA						250	0.125
CCF1N1	1A	PSE AC 100V		PSE AC 100V 100A	PSE 130% 160% 200%	4 hour min. 1 hour max. 1 second max.	90.4	0.156
CCF1N1.25	1.25A						75.9	0.220
CCF1N1.6	1.6A						59.3	0.513
CCF1N2	2A						42.9	0.814
CCF1N2.5	2.5A						36.6	1.31
CCF1N3.15	3.15A	UL (c-UL) AC 125V DC 60V		UL (c-UL) AC 125V 50A DC 60V 50A	UL (c-UL) 100% 200%	4 hour min. 1 second max.	26	2.37
CCF1N4	4A						20.1	3.85
CCF1N5	5A						15.3	6.5
CCF1N6.3	6.3A						11.4	10.6
CCF1N7	7A	(DC 160V)		(DC 160V)			10.6	12.8
CCF1N8	8A						9.5	17.0
CCF1N10	10A						7.5	27.7
CCF1N12	12A	UL (c-UL) AC 65V DC 65V		UL (c-UL) AC 65V 50A DC 65V 50A	UL (c-UL) 100% 200%	4 hour min. 60 seconds max.	4.5	73.5
CCF1N15	15A						3.5	125.5
CCF1N30	30A	DC 65V		DC 65V 100A	100% 200%	4 hour min. 60 seconds max.	1.7	527.5

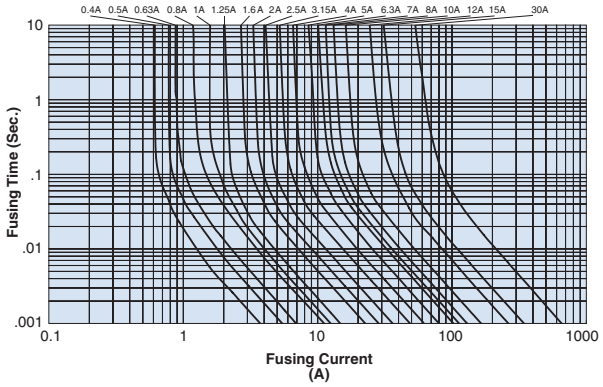
High rated voltage products (DC 160V: 400mA to 10A) are available. Please contact KOA Speer.

environmental applications

Derating Curve



Fusing Characteristics



Performance Characteristics

Parameter	Requirement Δ R±% Limit	Typical	Test Method
Fusing Characteristics	Within specified time. No restrike	—	Fusing time measured under rated current x 160% and 200%
Surface Temperature Rise	Max. Temp. Rise 140°C	—	Surface temperature should be measured by rated current x 115%
	Max. Temp. Rise 75°C	—	Surface temperature should be measured by rated current x 100%
Bending Test	No mechanical damages	—	Distance between holding points 90mm, bent by 3mm at rate of 1mm/s
Resistance to Soldering Heat	±10%	±3%	260°C ±5°C, 10 seconds ± 0.5 seconds
Solderability	±95% coverage min.	—	235°C ±5°C, 3 seconds ± 0.5 seconds
Load Life	±10%	±5%	70°C ± 2°C, 1000 hours, rated current x 70%, 1.5 hr ON, 0.5 hr OFF cycle
Load Life Moisture	±10%	±5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, rated current x 70%, 1.5 hr ON, 0.5 hr OFF cycle
Rapid Change of Temperature	±10%	±5%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles

KOA SPEER ELECTRONICS, INC.

CCF1F

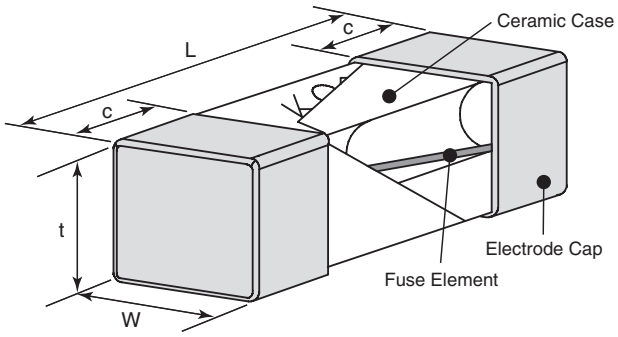
chip current fuses (anti-sulfuration)

EU RoHS COMPLIANT

features

- Meets IEC60127-4 specifications (7A or less)
- Stable fusing characteristics due to original technology
- Suitable for reflow and flow soldering
- Products meet EU RoHS requirements
- Excellent anti-sulfuration characteristics due to using high sulfuration-proof material

dimensions and construction



Type	Dimensions inches (mm)			
	L	W	t	c
CCF1F (2410)	.236±.008 (6.0±0.2)	.098±.008 (2.5±0.2)	.098±.008 (2.5±0.2)	.055±.008 (1.4±0.2)

ordering information

CCF	1	F	1	T	TE
Type	Style	Fusing Characteristic	Rated Current	Termination Surface Material	Packaging
		F: Fast-acting		T: Sn	TE: 4mm pitch plastic embossed BK: Bulk

applications and ratings

Part Designation	Current Rating	Voltage Rating	Interrupting Capacity	Fusing Characteristics Rated Current	Fusing Characteristics Fusing Time	Internal R. (mΩ) Max.	Normal Melting I²t (A², sec.)	Operating Temperature Range
CCF1F0.4	0.4A	UL(c-UL) AC 125V DC 125V	UL(c-UL) AC125V 50A DC125V 50A	UL(c-UL) 100% 200%	4 hour min. 60 sec. max.	650	0.024	-55°C to +125°C
CCF1F0.5	0.5A					510	0.030	
CCF1F0.63	0.63A					390	0.052	
CCF1F0.8	0.8A					250	0.125	
CCF1F1	1A					90.4	0.156	
CCF1F1.25	1.25A					75.9	0.220	
CCF1F1.6	1.6A					59.3	0.513	
CCF1F2	2A					42.9	0.814	
CCF1F2.5	2.5A					36.6	1.31	

For further information on packaging, please refer to Appendix A.

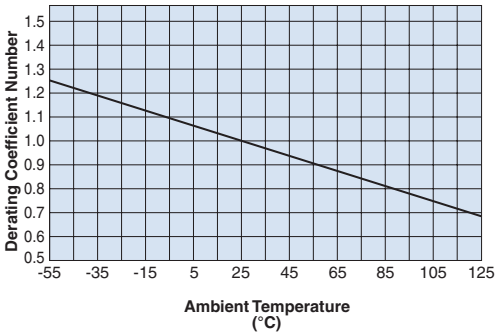
12/12/17

applications and ratings (continued)

Part Designation	Current Rating	Voltage Rating	Interrupting Capacity	Fusing Characteristics		Internal R. (mΩ) Max.	Normal Melting I²t (A², sec.)	Operating Temperature Range
				Rated Current	Fusing Time			
CCF1F3.15	3.15A	UL(c-UL) AC 125V DC 125V	UL(c-UL) AC125V 50A DC125V 50A	UL(c-UL) 100% 200%	4 hour min. 60 sec. max.	26.0	2.37	-55°C to +125°C
CCF1F4	4A					20.1	3.85	
CCF1F5	5A					15.3	6.5	
CCF1F6.3	6.3A					11.4	10.6	
CCF1F7	7A					10.6	12.8	
CCF1F8	8A					9.5	17.0	
CCF1F10	10A					7.5	27.7	
CCF1F12	12A	UL(c-UL) AC 65V DC 65V	UL(c-UL) AC65V 50A DC65V 50A			4.5	73.5	
CCF1F15	15A					3.5	125.5	

environmental applications

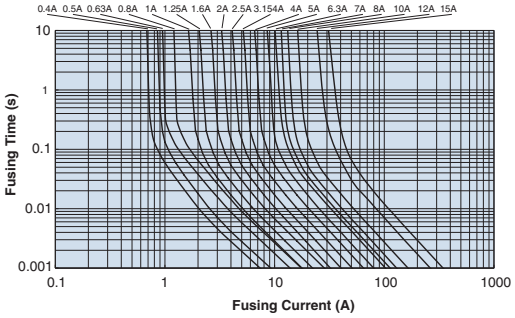
Derating Curve



Stationary Current: Regard the peak of stationary current waveform as stationary current value when the stationary current is repeated pulse. Normal derating of this product should be 0.7max. as standards.

Deratings by ambient temperatures. When using the products at the temperatures other than normal temperature (25°C ± 5°), temperature adjustment will be required. Please refer the derating coefficient as shown in the figure.

Fusing Characteristics



Performance Characteristics

Parameter	Requirements		Test Method
	Limit	Typical	
Fusing Characteristics	Within specified time. Insulation resistance shall not be less than 0.1MΩ	—	Fusing time measured under rated current x 200%) (at 25°C)
Surface Temperature Rise	Maximum temperature rise 75°C and not fusing (all the rating)	—	Surface temperature should be measured by 1.00/N
Bending Test	No mechanical damage	—	Distance between holding points 90mm, bent by 3mm at rate of 1mm/second
Resistance to Soldering Heat	ΔR±10%	±3%	260°C ± 5°C, 10 seconds ± 0.5 seconds
Solderability	95% coverage minimum	—	235°C ± 5°C, 3 seconds ± 0.5 seconds
Load Life	ΔR±10%	±5%	70°C ± 2°C, 1000 hours, rated current x 70%, 1.5 hr ON, 0.5 hr OFF cycle
Load Life Moisture	ΔR±10%	±5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, rated current x 70%, 1.5 hr ON, 0.5 hr OFF cycle
Rapid Change of Temperature	ΔR±10%	±5%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Sulfuration Test	ΔR±10%	—	Soaked in industrial oil with 3.5% sulfur concentration, 105°C±3°C, 500 hours

Precautions for the Varistors

The reliability of the metal oxide varistors are dependant on the ways of their use and could lead to accidents so please be aware.

Selection and Protection

- It is recommended that the steady-state circuit voltage which remains at 80% or less of the max. allowable circuit voltage. Exceeding the specification will cause deterioration, short-circuits, etc.
- Select proper parts according to the surge energy and the number of the impressions if the varistors are used to absorb the surge for an inductive loading.
- The rated surge endurance is defined in terms of shock wave current waveform (starting up 8μs/wave-tail length 20μs).
- Insert fuses or thermal fuses in series with varistors if the size of the surge power cannot be estimated, in order to prevent varistors from bursting due to an excessive surge over the rating.
- Give consideration on the layout to combustible materials and to take measurements on the circuits (fuses or thermal fuses) since there may be smoking or flaming if the varistor short-circuits due to an excessive surge over the rating.
- Upon mold sealing, fully confirm the reliability and use the resin which has small contractile stress at stiffening since the protection coat may peel off, cracks may occur at the solder connection, and the characteristics of the varistor may change.
- Perform the withstand voltage test and the insulation resistance test with the varistors removed from the circuit since the test voltage may exceed the varistor voltage.

Failure Mode

- Varistor voltage will drop and the leakage current will increase when excessive surge which is above the rating is applied to the varistor. Temperature will increase due to Joule heating as the leakage current increases, which will cause thermal runaway and short circuit.
- When commercial power of 200Vr.m.s. is connected to varistors for 100Vr.m.s. (270V/1mA), the varistor may burst and become open.

Chip Varistors for Surface Mount

- Please perform damp-proofing on the surface of the varistors prior to the use when installing in a high-humidity and high-temperature environment.

Reference

- For basic precautions, please refer to the technical report of JEITA EMAJ-R039 Safety

Terms and Definitions

Maximum Allowable Circuit Voltage

- The maximum commercial frequency sinusoidal voltage effective value or maximum DC voltage which can be applied continuously.

Maximum Energy (E)

- The maximum energy within the varistor voltage change rate of ±10% when a single impulse of 2ms is applied. (NV73 2E, 2J, 2L are applied 100 times.)

Maximum Peak Current (I_P)

- The maximum peak current within the varistor voltage change rate of ±10%, when a single standard impulse of 8/20μs is applied in two times with an interval of 5 min. (NV73 2E, 2J, 2L are 100 times.)

Operating Temperature (T_{opt})

- The allowable ambient temperature range while the device is operating.

Storage Temperature (T_{stg})

- The temperature range in which the elements do not deteriorate.

Varistor Voltage (V_C)

- The terminal voltages on both ends of the varistor when the specified current is applied.

Clamping Voltage (V_P)

- The peak value of the voltage between two terminals of the varistor when the specified standard waveform impulse current (8/20μs) is applied.

Recommended value of varistor voltage for the power supply voltage

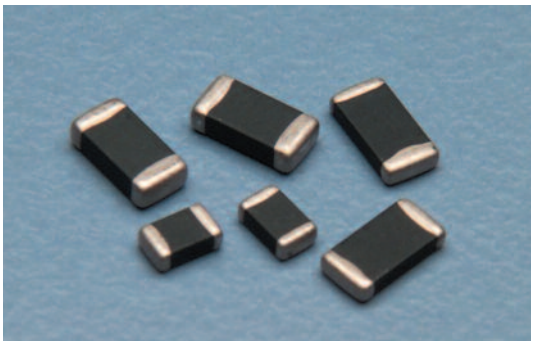
Voltage of Power Line	Varistor Voltage
3.3V d.c.	8.2V
5V d.c.	8.2V, 12V
12V d.c.	24V, 27V
24V d.c.	47V, 56V
48V d.c.	82V, 100V, 120V

KOA SPEER ELECTRONICS, INC.

NV73

metal oxide varistor

EU RoHS COMPLIANT

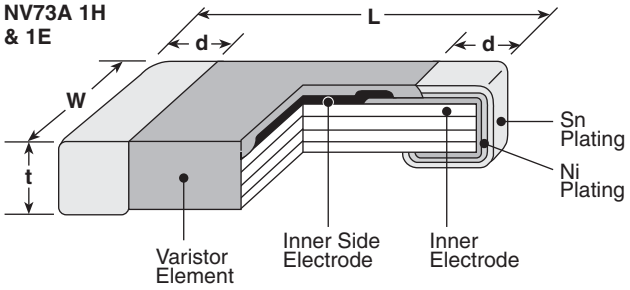


features

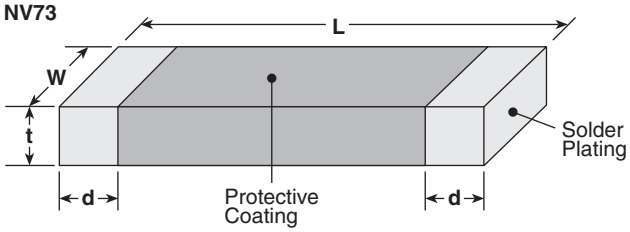
- Multilayer structure
- High surge current
- Protector against static electricity, switching and incoming surges
- Suitable for both flow and reflow soldering
- Products with lead-free terminations meet EU RoHS requirements. Pb located in glass material, electrode and varistor element is exempt per Annex 1, exemption 5 of EU directive 2005/95/EC

dimensions and construction

NV73A 1H & 1E



NV73



Type (Inch Size Code)	Dimensions inches (mm) L	W	t	d
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.012±.001 (0.3±0.03)	.004 min. (0.1 min.)
1E (0402)	.023±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.023 max. (0.6 max.)	.01±.006 (0.25±0.15)
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.016 +.006 -.008 (0.4 +0.15 -0.2)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.051 max. (1.3 max.)	.02±.010 (0.5±0.25)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.065 max. (1.65 max.)	.02 +.014 -.010 (0.5 +0.35 -0.25)
2E (1210)	.126±.008 (3.2±0.2)	.098±.008 (2.5±0.2)	.059 max. (1.5 max.)	.020±.008 (0.5±0.2)
2J (1812)	.177±.008 (4.5±0.2)	.126±.008 (3.2±0.2)	.079 max. (2.0 max.)	.020 +.012 -.004 (0.5 +0.3 -0.1)
2L (2220)	.224±.008 (5.7±0.2)	.197±.008 (5.0±0.2)	.098 max. (2.5 max.)	.020 +.001 -.004 (0.5 +0.3 -0.1)
C2L (2220)	.232±.008 (5.9±0.2)	.201±.008 (5.1±0.2)	.106 max. (2.7 max.)	.028 +.016 -.012 (0.7 +0.4 -0.3)

ordering information

NV73	A	L	1J	T	TE	8
Type	Energy Code	Capacitance Type	Size	Termination Material	Packaging	Varistor Voltage
	A B C	Blank: Standard L: Low Capacitance (1E only)	1H: 0201 1E: 0402 1J: 0603 2A: 0805 2B: 1206 2E: 1210 2J: 1812 2L: 2220	T: Sn	TBM: 2mm press paper (1H: 15,000 pieces/reel) TP: 2mm pitch paper (1E: 10,000 pieces/reel) TE: 7" embossed plastic (1J, 2A, 2B: 2,500 pieces/reel; 2J, 2L: 1,000 pieces/reel 2E: 2,000 pieces/reel)	8: 8V 12: 12V 120: 120V

For further information on packaging, please refer to Appendix A.

circuit protection

12/10/20

applications and ratings

Part Designation	Varistor Voltage V_{1mA} (V)	Varistor Voltage Tolerance (V)	Maximum Allowable Voltage d.c. (V)	Clamping Voltage Ic=1A (V) 8/20µs	Maximum Energy (J) 10/1000µs	Maximum Peak Current (A) 2 times 8/20µs	Capacitance (Typ) 1kHz (pF)	Operating Temp. (°C)	Storage Temp. (°C)
NV73A1HTTBM12	12	10 - 15.6	6.5	35	0.01	1	33	-40°C to +85°C	-40°C to +125°C
NV73A1ETTP8	8	6.4 - 9.6	5.5	20	0.05	20	480		
NV73A1ETTP18	18	16.2 - 19.8	14.0	35			160		
NV73AL1ETTP12	12	10 - 14	5.5	30	0.03	5	50		
NV73AL1ETTP21	21	18 - 24	14.0	50			50		
NV73AL1ETTP28	28	24 - 32	18.0	65	0.005	2	15		
NV73AL1ETTP120	120	90 - 150		350 (1C=0.5A)		0.5	3 (1MHz)		

Part Designation	Varistor Voltage Vc	Maximum Allowable Voltage		Clamping Voltage		Maximum Energy E (J)	Maximum Peak Current I_P (A) (2 times)	Operating Temp. T_{opt} (°C)	Storage Temp. T_{stg} (°C)
	Ic = 1mA (V)	a.c rms (V)	d.c (V)	V_{1A}	V_{2A}				
NV73A1JTTE8.2	6.8 - 9.8	4.2	6.0	—	21	0.1	30	-40°C to +85°C	-40°C to +125°C
NV73A1JTTE12	10 - 14.4	6.1	8.6	—	29				
NV73A1JTTE15	12.5 - 18	7.6	10.8	—	35				
NV73A1JTTE18	16 - 20	9.1	12.8	—	37				
NV73A1JTTE20	18 - 22	10.6	15.0	—	40				
NV73A1JTTE22	19 - 24	12.0	16.5	—	42				
NV73A1JTTE24	21.8 - 26.5	14.0	18.0	—	46				
NV73A1JTTE27	25 - 32	17.0	22.0	—	49				
NV73A2ATTE8.2	6.8 - 9.8	4.2	6.0	18	—	0.01	10		
NV73A2ATTE12	10 - 14.4	6.1	8.6	24	—	0.03	20		
NV73A2ATTE15	12.5 - 18	7.6	10.8	29	—	0.04			
NV73A2ATTE18	16 - 20	9.1	12.8	29	—				
NV73A2ATTE20	18 - 22	10.6	15.0	33	—	0.05			
NV73A2ATTE22	19 - 24	12.0	16.5	39	—				
NV73A2ATTE24	21.8 - 26.5	14.0	18.0	42	—	0.06			
NV73A2ATTE27	25 - 32	17.0	22.0	50	—	0.07			
NV73A2ATTE33	30 - 39	20.0	26.0	60	—	0.12			
NV73A2ATTE39	37 - 47	25.0	31.0	72	—	0.14	25		
NV73A2ATTE47	45 - 54	30.0	38.0	86	—	0.16			
NV73B2ATTE8.2	6.8 - 9.8	4.2	6.0	—	18	0.03	20		
NV73B2ATTE12	10 - 14.4	6.1	8.6	—	24	0.05	35		
NV73B2ATTE15	12.5 - 18	7.6	10.8	—	30	0.07			
NV73B2ATTE18	16 - 20	9.1	12.8	—	32	0.08			
NV73B2ATTE20	18 - 22	10.6	15.0	—	36	0.09			
NV73B2ATTE22	19 - 24	12.0	16.5	—	40	0.11			
NV73B2ATTE24	21.8 - 26.5	14.0	18.0	—	42	0.12			
NV73B2ATTE27	25 - 32	17.0	22.0	—	58	0.24			
NV73B2ATTE33	30 - 39	20.0	26.0	—	66	0.25	50		
NV73C2ATTE8.2	6.8 - 9.8	4.2	6.0	—	18	0.04	25		
NV73C2ATTE12	10 - 14.4	6.1	8.6	—	24	0.09	50		
NV73C2ATTE15	12.5 - 18	7.6	10.8	—	29	0.11			
NV73C2ATTE18	16 - 20	9.1	12.8	—	32	0.13			
NV73C2ATTE20	18 - 22	10.6	15.0	—	35	0.14			
NV73C2ATTE22	19 - 24	12.0	16.5	—	40	0.17			
NV73C2ATTE24	21.8 - 26.5	14.0	18.0	—	42	0.18			
NV73A2BTTE27	25 - 32	17.0	22.0	—	55	0.13	40		
NV73A2BTTE33	30 - 39	20.0	26.0	—	60	0.15			
NV73A2BTTE39	37 - 47	25.0	31.0	—	72	0.18			
NV73A2BTTE47	45 - 54	30.0	38.0	—	85	0.22			
NV73A2BTTE56	52 - 62	35.0	45.0	—	100	0.26			

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/24/14

applications and ratings (continued)

Part Designation	Varistor Voltage Vc	Maximum Allowable Voltage		Clamping Voltage		Maximum Energy E (J)	Maximum Peak Current Ip (A) (2 times)	Operating Temp. Topt (°C)	Storage Temp. Tstg (°C)
	Ic = 1mA (V)	a.c rms (V)	d.c (V)	V_{1A}	V_{2A}				
NV73B2BTTE8.2	6.8 - 9.8	4.2	6.0	—	18	0.03	30	-40°C to +85°C	-40°C to +125°C
NV73B2BTTE12	10 - 14.4	6.1	8.6	—	24	0.07	50		
NV73B2BTTE15	12.5 - 18	7.6	10.8	—	29	0.09			
NV73B2BTTE18	16 - 20	9.1	12.8	—	32	0.1			
NV73B2BTTE20	18 - 22	10.6	15.0	—	35	0.11			
NV73B2BTTE22	19 - 24	12.0	16.5	—	40	0.12			
NV73B2BTTE24	21.8 - 26.5	14.0	18.0	—	42	0.14			
NV73B2BTTE27	25 - 32	17.0	22.0	—	52	0.16			
NV73C2BTTE8.2	6.8 - 9.8	4.2	6.0	—	18	0.06	40		
NV73C2BTTE12	10 - 14.4	6.1	8.6	—	24	0.1	70		
NV73C2BTTE15	12.5 - 18	7.6	10.8	—	29	0.13			
NV73C2BTTE18	16 - 20	9.1	12.8	—	29	0.15			
NV73C2BTTE20	18 - 22	10.6	15.0	—	31	0.17			
NV73C2BTTE22	19 - 24	12.0	16.5	—	35	0.19			
NV73C2BTTE24	21.8 - 26.5	14.0	18.0	—	38	0.2			
NV73C2BTTE27	25 - 32	17.0	22.0	—	48	0.24			

Part Designation	Varistor Voltage Vc	Maximum Allowable Voltage		Clamping Voltage			Maximum Energy E (J)	Maximum Peak Current Ip (A) (2 times)	Operating Temp. Topt (°C)	Storage Temp. Tstg (°C)
	Ic = 1mA (V)	a.c rms (V)	d.c (V)	$V_{2.5A}$	V_{5A}	V_{10A}				
NV73A2ETTE15	12.8 - 17.3	8.0	11.0	30	—	—	1.0	400	-50°C to +125°C	-50°C to +150°C
NV73A2ETTE18	15.3 - 20.7	11.0	14.0	34	—	—	1.2			
NV73A2ETTE22	19.8 - 24.2	12.0	16.5	39	—	—	1.4			
NV73A2ETTE24	21.6 - 26.4	14.0	18.0	39	—	—	1.4			
NV73A2ETTE27	24.3 - 29.7	17.0	22.0	44	—	—	1.7			
NV73A2ETTE33	29.7 - 36.3	20.0	26.0	54	—	—	1.9			
NV73A2ETTE39	35.1 - 42.9	25.0	30.0	65	—	—	1.7			
NV73A2ETTE47	42.3 - 51.7	30.0	38.0	77	—	—	2.0			
NV73A2ETTE56	50.4 - 61.6	35.0	45.0	90	—	—	2.0			
NV73A2ETTE82	73.8 - 90.2	50.0	65.0	135	—	—	1.2	250		
NV73A2ETTE100	90.0 - 110.0	60.0	85.0	165	—	—	1.4	200		
NV73A2ETTE110	99.0 - 121.0	70.0	90.0	180	—	—	1.4			
NV73A2JTTE12	10.2 - 13.8	6.0	9.0	—	27	—	0.9	500		
NV73A2JTTE15	12.8 - 17.3	8.0	11.0	—	32	—	1.2			
NV73A2JTTE18	16.2 - 19.8	11.0	14.0	—	35	—	1.4			
NV73A2JTTE22	19.8 - 24.2	12.0	16.5	—	41	—	1.6			
NV73A2JTTE24	21.6 - 26.4	14.0	18.0	—	44	—	1.7			
NV73A2JTTE27	24.3 - 29.7	17.0	22.0	—	49	—	2.0			
NV73A2JTTE33	29.7 - 36.3	20.0	26.0	—	54	—	2.5			
NV73A2JTTE39	35.1 - 42.9	25.0	30.0	—	65	—	2.9			
NV73A2JTTE47	42.3 - 51.7	30.0	38.0	—	77	—	3.5			
NV73A2JTTE56	50.4 - 61.6	35.0	45.0	—	90	—	4.2			
NV73A2JTTE68	61.2 - 74.8	40.0	56.0	—	110	—	4.8			
NV73A2JTTE82	73.8 - 90.2	50.0	65.0	—	135	—	4.5	400		
NV73A2JTTE100	90 - 110	60.0	85.0	—	165	—	5.8			
NV73A2JTTE110	99 - 121	70.0	90.0	—	180	—	5.8			
NV73A2JTTE150	135 - 165	95.0	127.0	—	248	—	5.8	300		
NV73B2JTTE15	12.8 - 17.3	8.0	11.0	—	32	—	1.8	800		
NV73B2JTTE18	15.3 - 20.7	11.0	14.0	—	35	—	1.9			
NV73B2JTTE22	19.8 - 24.2	12.0	16.5	—	41	—	2.3			
NV73B2JTTE24	21.6 - 26.4	14.0	18.0	—	44	—	2.3			
NV73B2JTTE27	24.3 - 29.7	17.0	22.0	—	49	—	2.7			
NV73B2JTTE33	29.7 - 36.3	20.0	26.0	—	54	—	3.0			

applications and ratings (continued)

Part Designation	Varistor Voltage Vc	Maximum Allowable Voltage		Clamping Voltage			Maximum Energy E (J)	Maximum Peak Current Ip (A) (2 times)	Operating Temp. Topt (°C)	Storage Temp. Tstg (°C)
	Ic = 1mA (V)	a.c rms (V)	d.c (V)	$V_{2.5A}$	V_{5A}	V_{10A}				
NV73B2JTTE39	35.1 - 42.9	25.0	30.0	—	65	—	3.7	800	-50°C to +125°C	-50°C to +150°C
NV73B2JTTE47	42.3 - 51.7	30.0	38.0	—	77	—	4.2			
NV73B2JTTE56	50.4 - 61.6	35.0	45.0	—	90	—	4.2			
NV73A2LTTE12	10.2 - 13.8	6.0	9.0	—	—	28	1.9	1000		
NV73A2LTTE15	12.8 - 17.3	8.0	11.0	—	—	33	2.3			
NV73A2LTTE18	16.2 - 19.8	11.0	14.0	—	—	36	2.7			
NV73A2LTTE22	19.8 - 24.2	12.0	16.5	—	—	41	2.9			
NV73A2LTTE24	21.6 - 26.4	14.0	18.0	—	—	45	3.1			
NV73A2LTTE27	24.3 - 29.7	17.0	22.0	—	—	48	3.8			
NV73A2LTTE33	29.7 - 36.3	20.0	26.0	—	—	57	4.3			
NV73A2LTTE39	35.1 - 42.9	25.0	30.0	—	—	65	5.5			
NV73A2LTTE47	42.3 - 51.7	30.0	38.0	—	—	77	6.3			
NV73A2LTTE56	50.4 - 61.6	35.0	45.0	—	—	90	7.7			
NV73A2LTTE68	61.2 - 74.8	40.0	56.0	—	—	110	8.8			
NV73A2LTTE100	90 - 110	60.0	85.0	—	—	165	6.8			
NV73A2LTTE110	99 - 121	70.0	90.0	—	—	180	6.8			
NV73B2LTTE15	12.8 - 17.3	8.0	11.0	—	—	33	4.2	1200		
NV73B2LTTE18	15.3 - 20.7	11.0	14.0	—	—	36	5.4			
NV73B2LTTE22	19.8 - 24.2	12.0	16.5	—	—	41	5.8			
NV73B2LTTE24	21.6 - 26.4	14.0	18.0	—	—	45	5.8			
NV73B2LTTE27	24.3 - 29.7	17.0	22.0	—	—	48	7.2			
NV73B2LTTE33	29.7 - 36.3	20.0	26.0	—	—	57	7.8			
NV73B2LTTE39	35.1 - 42.9	25.0	30.0	—	—	65	9.6			
NV73B2LTTE47	42.3 - 51.7	30.0	38.0	—	—	77	12.0			
NV73B2LTTE56	50.4 - 61.6	35.0	45.0	—	—	90	7.7			
NV73B2LTTE82	73.8 - 90.2	50.0	65.0	—	—	135	5.6	1000		
NV73C2LTTE39	35.1 - 42.9	25.0	30.0	—	—	65	5.6 (1 time)	2500 (1 time)		
NV73C2LTTE82	73.8 - 90.2	50.0	65.0	—	—	135	14 (1 time)	4500 (1 time)		

Maximum allowable voltage - the maximum sinusoidal RMS voltage or maximum DC voltage which can be applied continuously
E: Maximum energy - the maximum energy within the varistor voltage change of ±10% when a single impulse of 2m sec. is applied
Ip: Maximum peak current - the maximum peak current within the varistor voltage change of ±10% when a single standard impulseof 8/20μ sec. is applied two times with an interval of 5 min.
Topt: Operating temperature - Ambient temperature range when the device is operating
Tstg: Storage temperature - Temperature range without causing the device any failure

environmental applications

Performance Characteristics

Parameter	Requirement Δ V±%	Test Method
Varistor Voltage	Within specified tolerance	Voltage between terminals when 1mA is flowed
Solderability	95% coverage minimum	230°C ± 5°C, 4 seconds ± 1 second; 235°C ± 5°C, 4 seconds ± 1 second***
Resistance to Solder Heat	±10%	260°C ± 5°C, 10 seconds ± 0.5 second*; 270°C ± 5°C, 3 seconds ± 0.5 second**; 260°C ± 5°C, 4 seconds ± 1 second***
Rapid Change of Temperature	±10%	-40°C (30 minutes), +125°C (30 minutes), 30 cycles; 5 cycles***
Maximum Peak Current	±10%	A single standard impulse of 8/20μ seconds, positive/negative applied once each; A single standard impulse of 8/20μ seconds, 100 pulse, 30 second interval***
Maximum Energy	±10%	A single standard impulse of 10/1000μs, once*; A single standard impulse of 2ms, once**; A single standard impulse of 10/1000μs, 100pluse, 90 second interval***
High Temperature Life with d.c. Bias	±10%	85°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (d.c.); 125°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (d.c.)***
Low Temperature Life with d.c. Bias***	±10%	-50°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (d.c.)
High Temperature Life with a.c. Bias**	±10%	85°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage ($Va.c._{r.m.s.}$)
High Temperature & High Humidity Life with d.c. Bias	±10%	40°C ± 5°C, 95% RH, 500h, Load: Maximum allowable voltage (d.c.)
Capacitance*	Typical	1kHz: Others, 1MHz: Varistor voltage 120V
High Temperature Storage Life	±10%	125°C ± 5°C, 1000h; 150°C ± 5°C, 1000h***
Low Temperature Storage Life	±10%	-40°C ± 5°C, 1000h; -50°C ± 5°C, 1000h***

* 1H, 1E ** 1J, 2A, 2B *** 2E, 2J, 2L

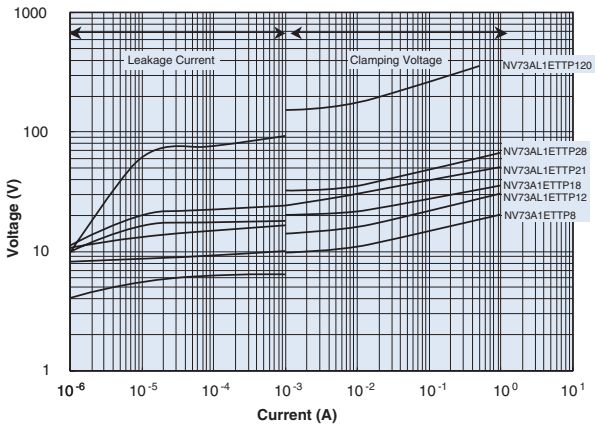
For Voltage Current Curves Graphs see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/06/18

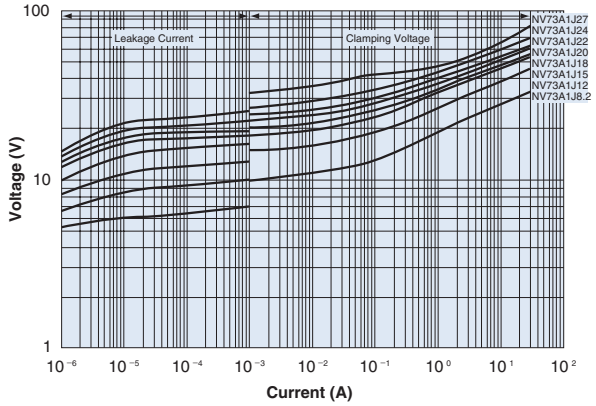
environmental applications (continued)

Voltage-Current Curves (Ta = 25°C)

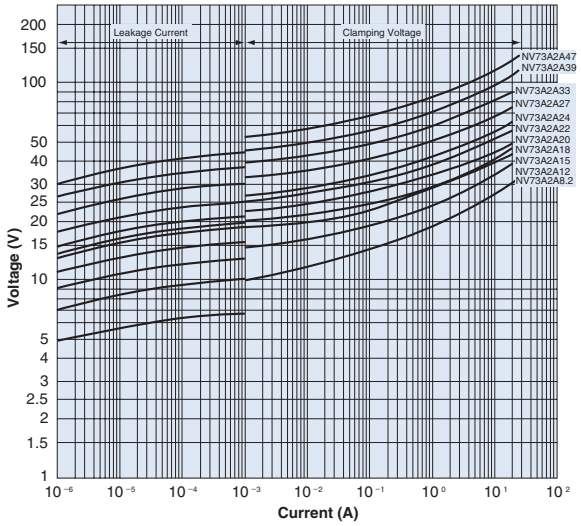
NV73A 1E



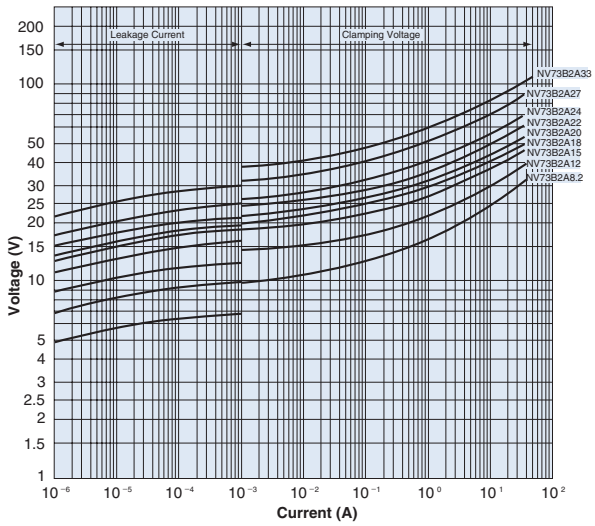
NV73A 1J



NV73A 2A



NV73B 2A



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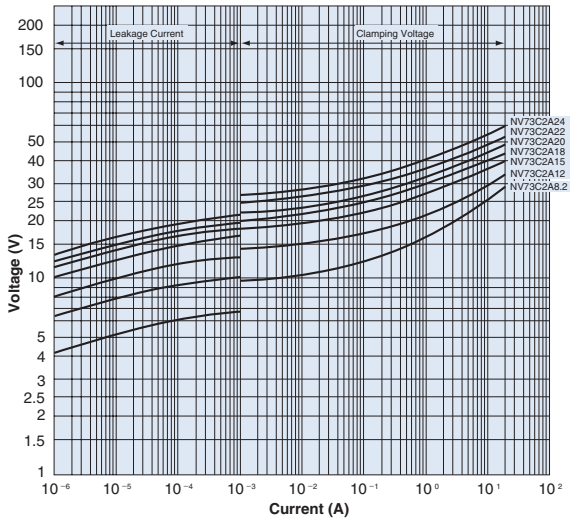
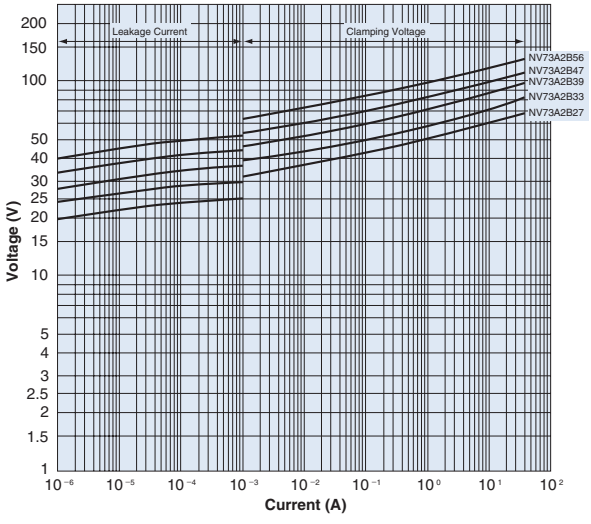


NV73A 2B

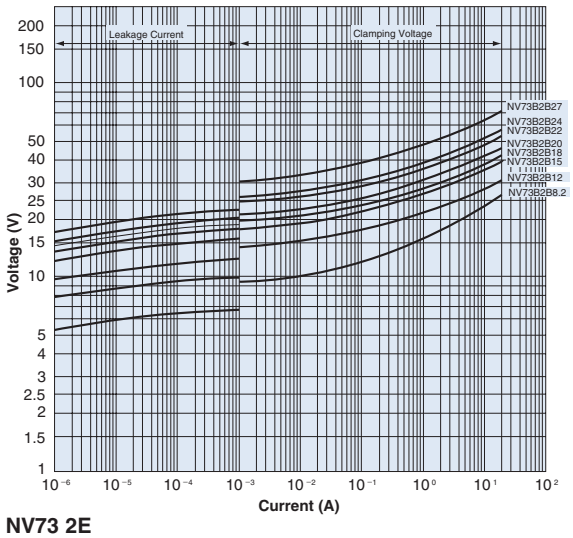


circuit protection

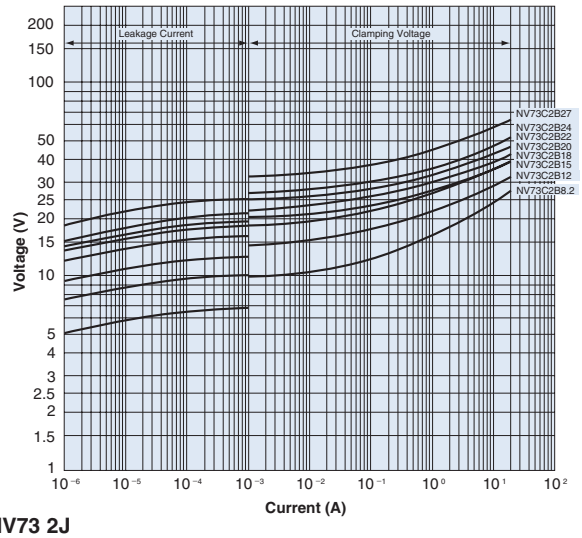
environmental applications (continued)

Voltage-Current Curves (Ta = 25°C)

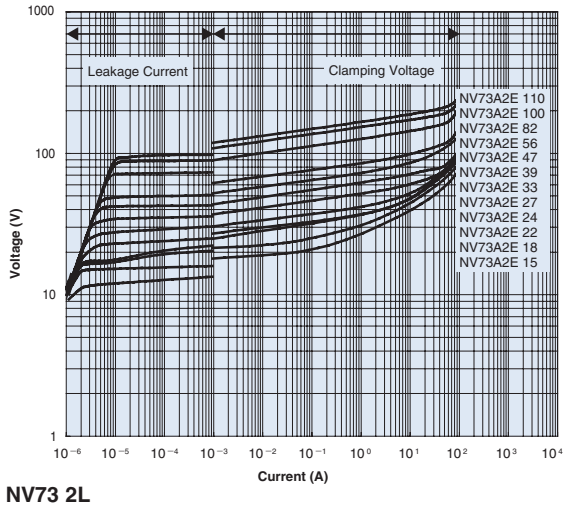
NV73B 2B



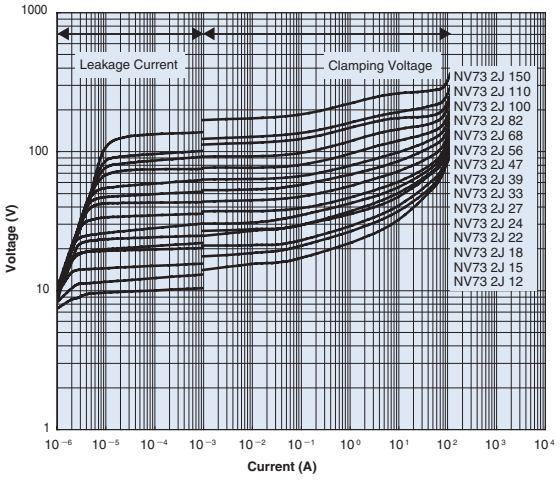
NV73C 2B



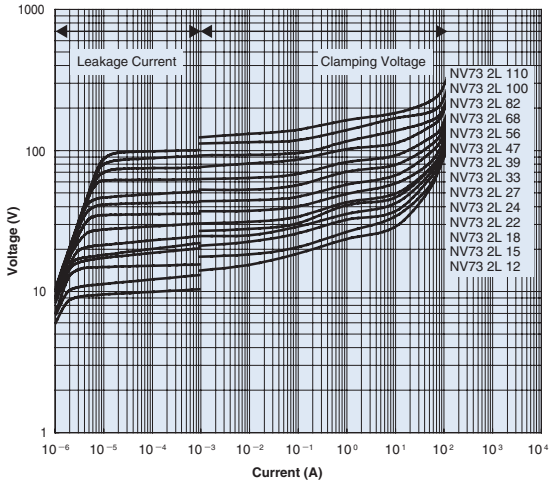
NV73 2E



NV73 2J



NV73 2L



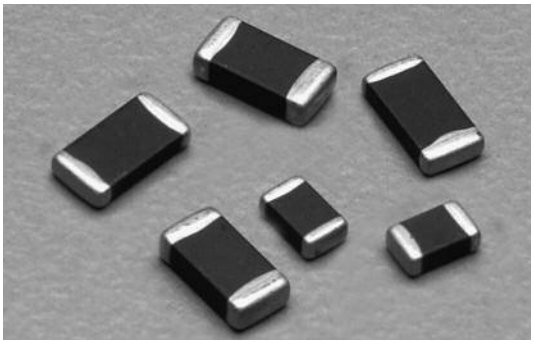
circuit protection

KOA SPEER ELECTRONICS, INC.

NV73DL

multilayer type metal oxide varistor (automotive)

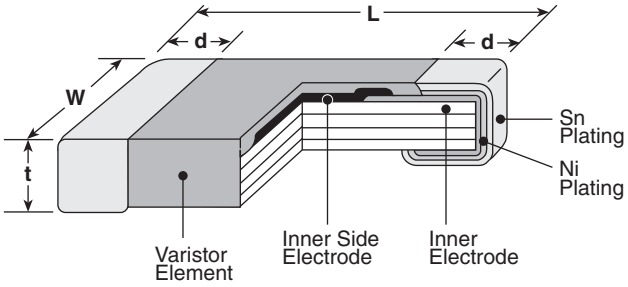
EU RoHS COMPLIANT



features

- SMD type metal oxide varistors
- Ideal for countermeasures against ESD (Conforming to IEC61000-4-2)
- High maximum energy type
- Low leakage current
- High resistance to cyclic temperature stress
- Suitable for both flow and reflow soldering
- Products with lead-free terminations meet EU RoHS requirements. Pb located in glass material, electrode and varistor element is exempt per Annex 1, exemption 5 of EU directive 2005/95/EC.
- AEC-Q200 Tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm) L	W	t	d
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.039 max. (1.0 max.)	.016±.006 (0.4±0.15)
2A (0805)	.079±.010 (2.0±0.25)	.049±.008 (1.25±0.2)	.051 max. (1.30 max.)	.020±.010 (0.5±0.25)
2B (1206)	.126±.012 (3.2±0.3)	.063±.012 (1.6±0.3)	.057 max. (1.45 max.)	.022±.012 (0.55±0.3)

ordering information

NV73	DL	2A	T	TE	27
Type	Energy Code	Size	Termination Material	Packaging	Varistor Voltage
		1J: 1.6 x 0.08 2A: 2.0 x 1.2 2B: 3.2 x 1.6	T: Sn	TE: 7" embossed plastic	

applications and ratings

Part Designation	Varistor Voltage (V)	Maximum Allowable Voltage		Maximum Clamping Voltage (V)		Maximum Energy (J)	Maximum Peak Current 8/20μs (A) 1 time	Short-Time Applied Voltage (5 min) (V_{DC})	Capacitance (Typ) 1kHz (pF)
	V_{1mA}	A.C. ($V_{r.m.s.}$)	D.C. (V)	V_{1A}	V_{2A}				
NV73DL1JTTE12	10~14.4	6.1	8.6	24	—	0.1	80	10	630
NV73DL1JTTE22	22~27	14	16	42	—	0.2	100	24.5	390
NV73DL1JTTE27	24~32	17	22	50	—	0.2	100	24.5	320
NV73DL1JTTE33	33~39	20	26	60	—	0.3	100	24.5	200
NV73DL1JTTE47	40~54	30	34	81	—	0.3	100	42	130
NV73DL2ATTE12	10~14.4	6.1	8.6	24	—	0.1	120	10	1070
NV73DL2ATTE22	22~27	14	16	42	—	0.3	160	24.5	610
NV73DL2ATTE27	24~32	17	22	50	—	0.3	160	24.5	580
NV73DL2ATTE33	33~39	20	26	60	—	0.3	160	24.5	380
NV73DL2ATTE47	40~54	30	34	81	—	0.3	160	42	260
NV73DL2ATTE68	62~72	45	56	108	—	0.3	160	64	190
NV73DL2ATTE82	74~90	50	65	135	—	0.3	160	75	105

For further information on packaging, please refer to Appendix A.

12/19/17

applications and ratings (continued)

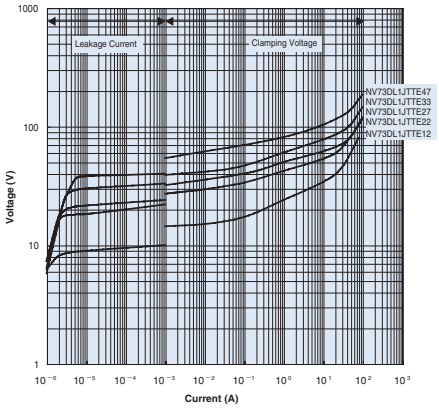
Part Designation	Varistor Voltage (V)	Maximum Allowable Voltage		Maximum Clamping Voltage (V)		Maximum Energy (J)	Maximum Peak Current 8/20μs (A) 1 time	Short-Time Applied Voltage (5 min) (V_{DC})	Capacitance (Typ) 1kHz (pF)
	V_{1mA}	A.C.($V_{r.m.s.}$)	D.C.(V)	V_{1A}	V_{2A}				
NV73DL2BTTE22	22~27	14	16	—	42	1	300	24.5	1600
NV73DL2BTTE27	24~32	17	22	—	50	1	300	24.5	1360
NV73DL2BTTE33	33~39	20	26	—	60	1	300	24.5	870
NV73DL2BTTE68	62~72	45	56	—	108	1.5	300	64	380
NV73DL2BTTE82	74~90	50	65	—	135	1.5	300	75	250

Operating temperature range: -40°C to +125°C
Storage temperature range: -40°C to +150°C

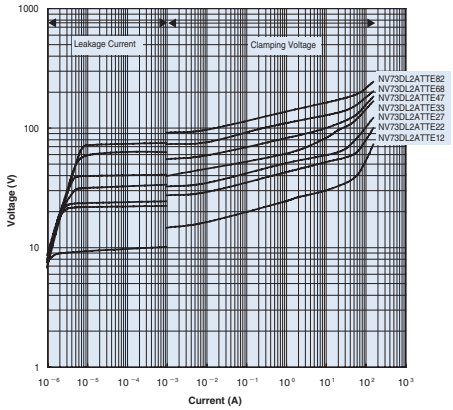
environmental applications

Voltage Current Curves (Ta = +25°C)

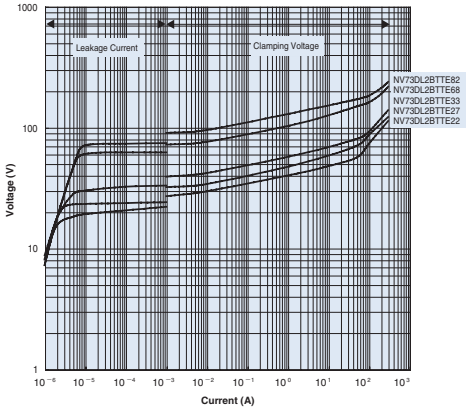
NV73DL1J



NV73DL2A



NV73DL2B



Performance Characteristics

Parameter	Requirement Δ V1mA±%	Test Method
Varistor Voltage	Within specified tolerance	Voltage between terminals when 1mA and 10mA are flowed
Solderability	95% coverage minimum (Ag-Pd: 75% coverage min.)	230°C ± 5°C, 5 seconds ± 0.5 second
Resistance to Solder Heat	±10%	260°C ± 5°C, 10 seconds ± 0.5 second
Rapid Change of Temperature	±10%	-40°C (30 minutes)/ +125°C (30 minutes), 1000 cycles
Short-Time Applied Voltage	±10%	Maximum value of D.C. voltage that can be applied for a short period of time (5 min.) (NV73D2A 12: 1 min.)
Maximum Peak Current	±10%	A single standard impulse current of 8/20μ seconds is applied
Maximum Energy	±10%	A single standard impulse of 2m second, once
Electrostatic Discharge	±10%	25kV (Non contact) (NV73DL1J12, NV73DL2A12: 15kV (Non contact))
Vibration Resistance	No visible damage. No remarkable mechanical damage	Vibration frequency: 10Hz~2000Hz; Full amplitude: 1.5mm, 10Hz~2000Hz~10Hz 20 min. XYZ direction 4 hrs for each total 12 hrs
High Temperature Life with d.c. Bias	±10%	125°C ± 2°C, 1000h, Applied voltage: Varistor voltage ($V1_{ma}$) x 0.85
High Temperature & High Humidity Life with Bias	±10%	85°C ± 2°C, 85% RH, 1000h, Applied voltage: Varistor voltage ($V1_{ma}$) x 0.85
Thermal Shock	±10%	-55°C (15 min.)/ +125°C (15 min.) 300 cycles
Shock	±10%	Half sine wave, Applied time: 1m second, Applied cycle: 500m/s², 5 cycles
High Temperature Storage	±10%	150°C, 1000h
Low Temperature Storage	±10%	-40°C, 1000h

KOA SPEER ELECTRONICS, INC.

NV73DS

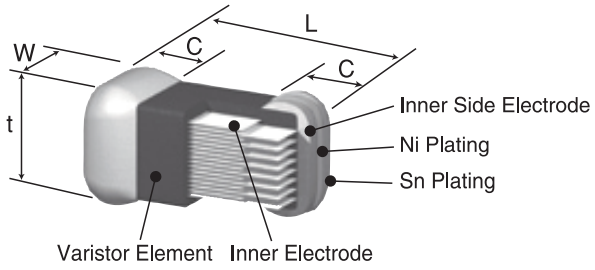
multilayer type metal oxide varistor (load dump surge)

EU RoHS COMPLIANT

features

- Symmetrical non-linearity V-I characteristics absorb positive and negative surge
- Suitable for protection of automotive applications from load dump surge on electronic components
- Meets JASO load dump surge test requirements
- Operating temperatures up to 125°C
- High resistance to cyclic temperature stress
- Suitable for both flow and reflow solderings
- Products meet EU RoHS requirements
- AEC-Q200 Tested

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)			
	L	W	t	C
NV73DS 2L (2420)	.240±.014 (6.1±0.35)	.201±.014 (5.1±0.35)	.146 max. (3.7 max.)	.041±.008 (1.05±0.2)

ordering information

NV73	DS	2L	T	TE	27
Type	Energy Code	Size	Termination Material	Packaging	Varistor Voltage
	A B	2L: 6.1 x 5.1mm	T: Sn	TE: 7" embossed plastic (8mm pitch)	

applications and ratings

Part Designation	Varistor Voltage (Range) (V)	Maximum Allowable Voltage		Clamping Voltage (V)	Maximum Load Dump Surge Energy	Maximum Peak Current	Short-Time Applied Voltage (5 min)
	V_{1mA}	A.C.($V_{r.m.s.}$)	D.C.(V)	V_{20A}	J	8/20μs (A) 1 time	(V_{DC})
NV73DSA2LTTE27	20~25	14	16	40	70	200	24.5
NV73DSB2LTTE27	20~25	14	16	40	63	200	24.5
NV73DSB2LTTE47	40~45	30	34	60	65	200	38

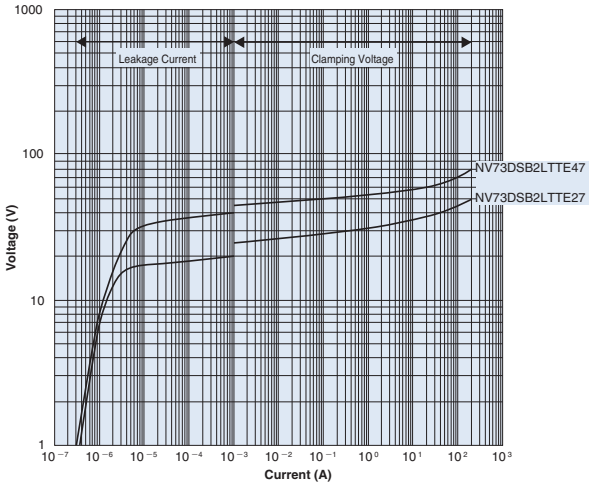
Operating temperature range: -40°C to +125°C
Storage temperature range: -40°C to +150°C

For further information on packaging, please refer to Appendix A.

10/29/20

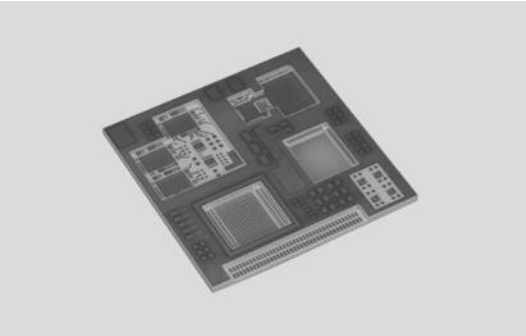
environmental applications

Voltage Current Curves (Ta = +25°C)

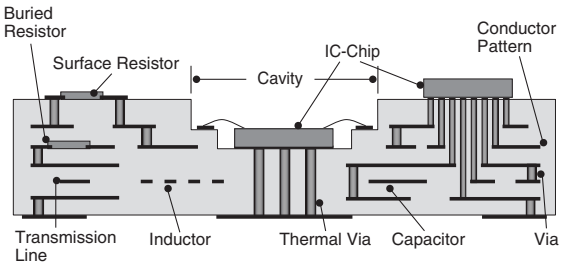


Performance Characteristics

Parameter	Requirement Δ V1mA	Test Method
Varistor Voltage	Within specified tolerance	Voltage between terminals when 1mA is flowed
Resistance to Solder Heat	±10%	260°C ± 5°C, 10 seconds ± 0.5 second
Solderability	95% coverage minimum	230°C ± 5°C, 5 seconds ± 0.5 second
Rapid Change of Temperature	±10%	-40°C (30 minutes)/ +125°C (30 minutes), 1000 cycles
Short-Time Applied Voltage	±10%	Maximum value of D.C. voltage that can be applied for a short period of time (5 min.)
Maximum Peak Current	±10%	A single standard impulse current of 8/20μ seconds is applied
Maximum Energy	±10%	A single standard impulse of 2m second, once
Electrostatic Discharge	±10%	25kV (Non contact)
Vibration Resistance	No visible damage. No remarkable mechanical damage	Vibration frequency: 10Hz~2000Hz; Full amplitude: 1.5mm, 10Hz~2000Hz~10Hz 20 min. XYZ direction 4 hrs for each total 12 hrs
High Temperature & High Humidity Life with Bias	±10%	85°C ± 2°C, 85% RH, 1000h, Applied voltage: Varistor voltage ($V1_{ma}$) x 0.85
High Temperature Life with d.c. Bias	±10%	125°C ± 2°C, 1000h, Applied voltage: Varistor voltage ($V1_{ma}$) x 0.85
Thermal Shock	±10%	-55°C (15 min.)/ +125°C (15 min.) 300 cycles
Shock	±10%	Half sine wave, Applied time: 1m second, Applied cycle: 500m/s², 5 cycles
High Temperature Storage	±10%	150°C, 1000h
Low Temperature Storage	±10%	-40°C, 1000h



construction



ordering information

New Part #	KLC	AB1
	Type	KOA Ref. Number

features

- KOA's substrates are suitable for bare chip mounting, as the thermal expansion cofficient is close to silicon's one and outstanding dimensional accuracy and flatness.
- Thanks to our low dielectric ceramics and low resistive conductors, the substrates excel in the high frequency characteristics
- Minituarization and high integration are possible because of multilayer wiring, multi-cavity structure and the surface/buried printing resistors possibilities
- Special shapes of substrate and cavity such as circle shape, polygonal shape and concave or convex shape are available
- Thermal vias under bare chips can be implemented to improve the thermal conductivity of the substrate
- The substrates are outstanding in heat resistance and humidity resistance. There will be no outgas occurrence from the ceramics.
- Products meet EU RoHS requirements

what is LTCC ?

LTCC stands for Low Temperature Co-fired Ceramics.

KOA's LTCC are multilayer ceramic substrates. This technology permits to use low resistive material as conductor patterns due to the lower temperature needed during firing process compared to general ceramic firing process. This is achieved by adding glass to alumina. KOA uses Silver based paste (Ag) to create the electrical structures in and on the ceramics layers. To be noted, that top and bottom layers patterns can be platted using various processes.

Thanks to these materials, low loss electrical performance can be achieved as well as high dimensional accuracy.

KOA's LTCC provides clear advantages for system downsizing by forming surface resistors, inner resistors, and transmission lines on/ in the substrate. In addition, our thermal expansion coefficient is close to silicon's one, enhancing the reliability of mounted bare chip.

Furthermore, cavity structures can be formed, making possible the creation of low profile packages.

environmental applications

Characteristics of Substrate Material

Parameter	Characteristics
Bending Strength (MPa)	250
Thermal Expansion Coefficient (x10^{-6}/K)	5.5
Thermal Conductivity (W/m • K)	3
Insulation Resistance (Ω • cm)	>10^{13}
Dielectric Constant at 1GHz	6.6
Dielectric Loss at 1GHz	<0.004
Density (g/cm^3)	2.8
Surface Roughness Ra (μm)	<0.4
Withstanding Voltage (kV/mm)	>15
Substrate Thickness (mm)	0.4~2.0 Standard
Layer Thickness (μm/Layer)	80, 100, 125 Standard

Symbol	Parameter	Design Value
A	Line Width	0.06mm Min.
B	Line to Line Spacing	0.06mm Min.
C	Via Diameter	0.1mm, 0.15mm, 0.2mm
D	Via Pad Diameter	Via diameter +0.05mm Min.
E	Via to Via Spacing	0.2mm Min.
F	Via pad to Line Spacing	0.125mm Min.
G	Part Edge to Conductor Spacing	0.2mm Min.
H	Part Edge to Via Spacing	0.3mm Min.
J1, J2	Cavity Width	0.6mm Min.
K1, K2	Cavity Depth	0.1mm Min.
L	Wall Width of Cavity	0.5mm Min.
M	Shelf Width in the Cavity	0.5mm Min.

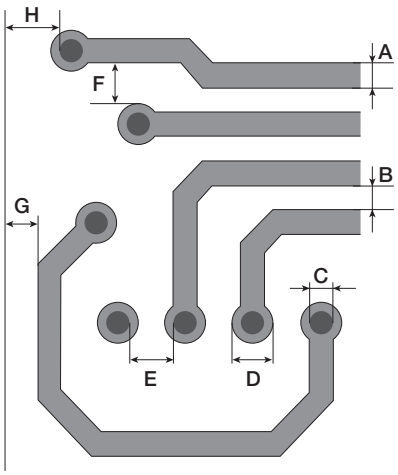
Conductor

Parameter	Characteristics
Material of Conductor	Ag
Resistivity of Conductor (μΩ • cm)	2.5
Surface Plating	Ni-Au, Ni-Pd-Au

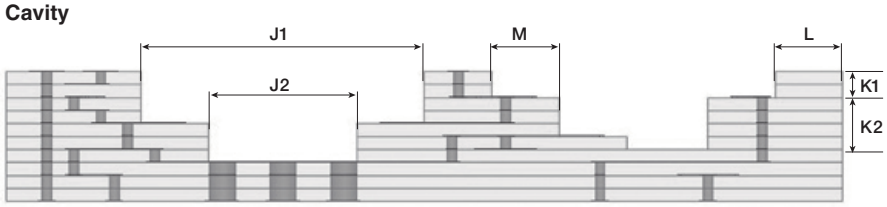
Surface · Buried printed resistor

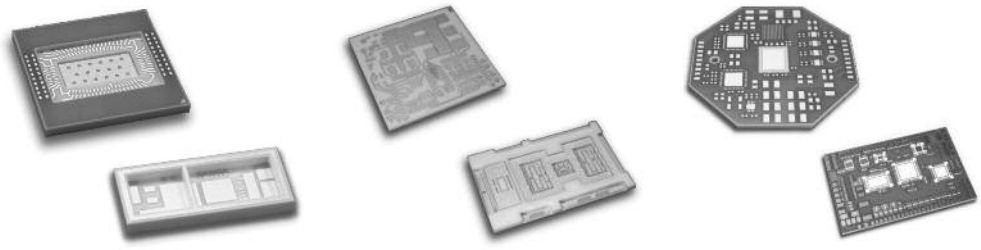
Parameter	Surface Resistor	Buried Resistor
Resistance Range (Ω)	10 ~ 100k	10 ~ 200k
Resistance Tolerance (%)	±5	±20 ~ 50

Surface layer - Inner layer

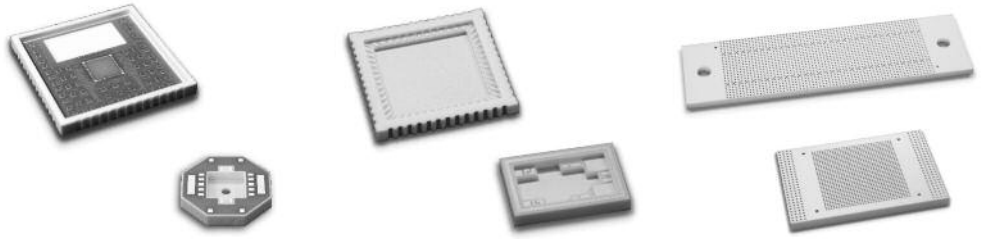


Cavity



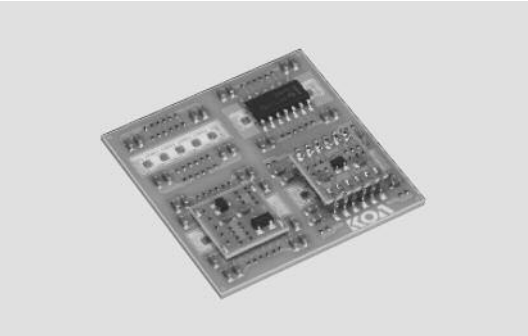


Sensor Module | RF Module | Multi Chip Module



MEMS Sensor Package | Various Device Package | Interposer Substrate

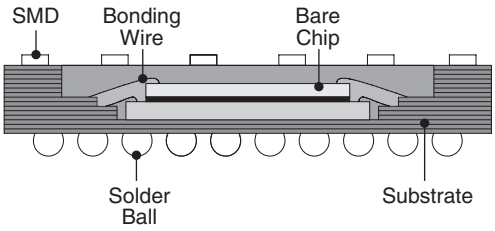
substrates & others



features

- Plural semiconductors in one package offers downsized system with high performance and standardization
- Wiring space saving by multilayer fine patterns on build-up substrate. No signal delay by shortened wiring distance
- Less mounting problem because of the decreasing number of the terminals

construction



Package Specifications

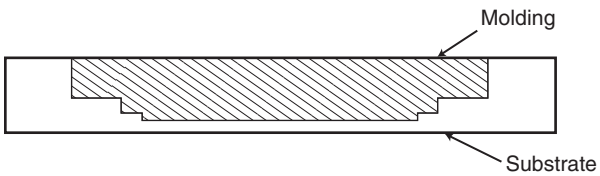
Item	Content
Terminal Pitch	0.8mm~
Mountable Device	• SMD • Bare Chip • Printed Resistor
Package	• SON • BGA • LGA
Substrate for Package	• LTCC

Mounting Specifications

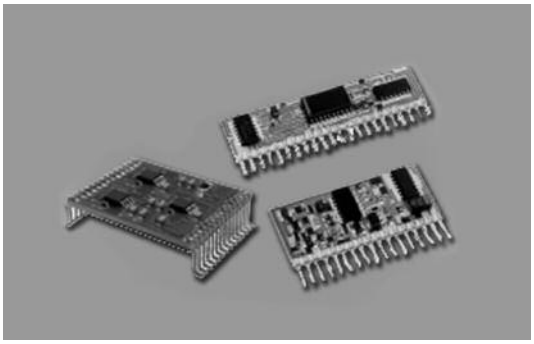
Item	Unit	Min.	Std.	Max.	Note
Substrate Dimension	mm	—	—	100 x 100	
Substrate Thickness	mm	0.4	—	2.0	
Bare Chip Pad Pitch	µm	100	—	—	
Bare Chip Pad Dimension	µm	70	—	—	
Bare Chip Thickness	mm	0.1	0.2	—	
Molding Height	mm	0.3	1.0	1.2	Height from chip surface
Wire Length	mm	0.3	—	3.0	
Wire Loop Height	µm	100	200	—	
Wire Diameter | Au		20	25	40	
Plating	Nonelectrical Au Plating				
Substrate	• LTCC				

Molding

Material	Color
Epoxy	Black



EU RoHS COMPLIANT



features

- Adjustment processes are decreased by function and ratio trimmings
- High density mounting by bonding (COB)
- Various types of package are available
- High reliability achieved by KOAs original thick film technology
- Thick film printed circuit substrate applies the non-noble metal paste (conductive paste and resistive paste) and receives the many total inquires including material selecting, pattern designing and mass production

ordering information

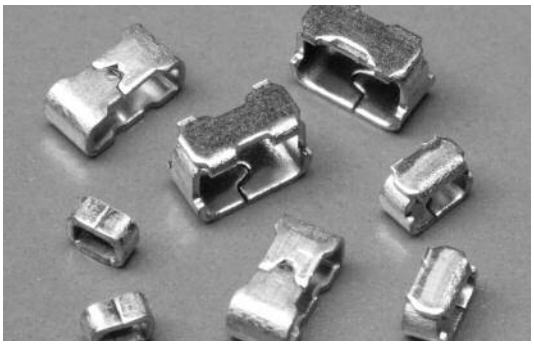
KA	7777	D
Product Code	**KOA Ref. Number**	**Terminal Surface Material**
KA: Hybrid IC		D: SnAgCu T: Sn

Component - KA Series

Substrate Materials	**Item**	**Printing**	**Mounting**	**Bonding**
	Al_2O_3 Alumina	o	o	o
	Glass epoxy	x	o	o
Conductors, Resistors	**Item**	**Ag-Pd**	**Ag-Pt**	
	Conductor resistance	18mΩ/□/15μm	5mΩ/□/10μm	
	Heat shock	-55°C~+125°C 300 Cycles	-55°C~+125°C 500 Cycles	
	Printed Resistor	5Ω~10MΩ ±100x10^{-6}/K		
Mounting	**Item**	**Specifications**		
	COB	Au Wire, Al Wire		
	BGA	0.5mm Pitch~		
	QFP	0.4mm Pitch~		
	Chip	0.4mm x 0.2mm		
Package, Outside Terminals	**Package**	**Lead Pitch**		
	SIP	1.8mm, 2.0mm, 2.5mm, 2.54mm		
	DIP, SOP	1.27mm, 1.8mm, 2.54mm		
	ZIP	2.54mm		
	BGA, LGA	1.0mm~		
Over Coating, Plating	**Over Coating**	**Color**		**UL Standard**
	Epoxy metamorphic phenol	Black		94 V0 Approved
	Epoxy	Black		94 V1 Approved

o= Available x= Not available

EU RoHS COMPLIANT

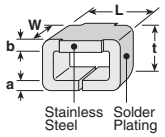


features

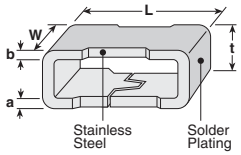
- Surface-mountable chip type test terminal
- Automatic machine insertable
- Suitable for reflow and wave soldering
- Available in three standard sizes: 0603, 0805 or 1206
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Tested (RCU only)

dimensions and construction

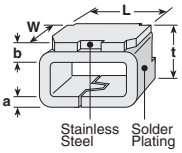
RCU



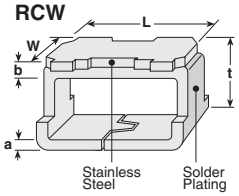
RCS



RCT



RCW



Note: Top surfaces of RCT and RCW are not solderable.

Type (Inch Size Code)	Dimensions inches (mm) L	W	t	a	b
RCU (0603)	.063 (1.6)	.031 (0.8)	.045 (1.15)	.009 (0.23)	.009 (0.23)
RCT (0805)	.079 (2.0)	.049 (1.25)	.057 (1.45)	.009 (0.23)	.018 (0.45)
RCS (1206)	.126 (3.2)	.063 (1.6)	.049 (1.25)	.009 (0.23)	.009 (0.23)
RCW (1206)			.079 (2.0)	.009 (0.23)	.018 (0.45)

ordering information

RCU	C	TE
Type	Termination Material	Packaging
RCU RCT RCS RCW	C: SnCu	TE: 7" embossed plastic (2,000 pieces/reel) TED: 10" embossed plastic (5,000 pieces/reel) RCW not available in TED

For further information on packaging, please refer to Appendix A.

applications and ratings

Part Designation	Rated Current	Standard Resistance	Rated Ambient Temperature	Operating Temperature Range
RCU	2 Amps	50mΩ or less	+70°C	-55°C to +125°C
RCT				
RCS				
RCW				

environmental applications

Performance Characteristics

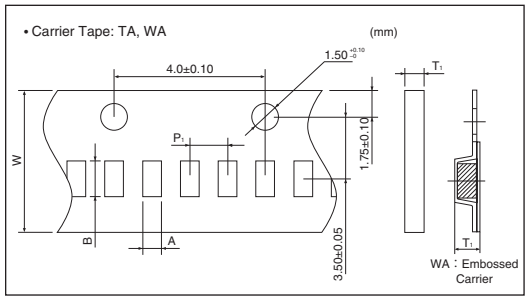
Parameter	Requirement Real R Limit	Typical	Test Method
Resistance	50mΩ Max. after the test	10mΩ Max. after the test	25°C
Resistance to Solder Heat			260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature			-55°C (30 minutes), +125°C (30 minutes), 100 cycles
High Temperature Exposure			+125°C, 240 hours

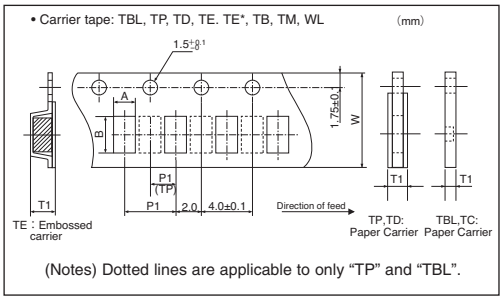
For Product Specific packaging, please refer to the individual product data sheets.

Type		Component Size (mm)			Carrier Tape	Quantity/ Reel (Pieces)	Taping (mm)					Reel Size øa (mm)
		L	W	T			A	B	W	P1	T1	
RK73B RK73H RK73G RK73Z RS73 HSG73P HV73 SG73 SR73 RF73	1F	0.4	0.2	0.13	TX	40,000	0.25±0.04	0.45±0.04	4	1.0	0.40±0.1	180
					TBL	20,000	0.25±0.04	0.45±0.04	8	2	0.31±0.1	180
	1H	0.6	0.3	0.23	TCM	15,000	0.37±0.05	0.67±0.05	8	2	0.42±0.1	180
	1E	1.0	0.5	0.35	TPL	20,000	0.65±0.10	1.15±0.10	8	2	0.42+0.2/-0	180
					TP	10,000						
	1J	1.6	0.8	0.45	TP	10,000	1.1±0.1	1.9±0.1	8	2	0.6+0.2/-0	180
					TD	5,000	1.1±0.1	1.9±0.1	8	4	0.6+0.2/-0	180
	2A	2.0	1.25	0.5	TP	10,000	1.65±0.20	2.4±0.2	8	2	0.75+0.2/-0	180
					TD	5,000	1.65±0.20	2.4±0.2	8	4	0.75+0.2/-0	180
					TE	4,000	1.6±0.2	2.4±0.2	8	4	0.9±0.1	180
	2B	3.2	1.6	0.6	TD	5,000	2±0.2	3.5±0.2	8	4	0.75+0.2/-0	180
					TE	4,000	1.9±0.2	3.5±0.2	8	4	1.0±0.1	180
	2E, 2E1	3.2	2.6	0.6	TD	5,000	2.85±0.20	3.5±0.2	8	4	0.75+0.2/-0	180
					TE	4,000	2.85±0.20	3.5±0.2	8	4	1.0±0.15	180
	W2H, 2H	5.0	2.5	0.6	TE	4,000	2.9±0.2	5.35±0.20	12	4	1.0±0.15	180
	W3A2, W3A, 3A	6.3	3.1	0.6	TE	4,000	3.44±0.20	6.65±0.20	12	4	1.0±0.15	180
XR73B XR73H	1H	0.6	0.3	0.13	TWA	40,000	0.37±0.05	0.67±0.05	8	1	0.50±0.1	180
					TWL	20,000				2		
XR73Z	1E	1.0	0.5	0.14	TWL	20,000	0.6±0.05	1.12±0.05	8	2	0.50±0.1	180
RN73H RN73R LT73 LT73V	1E	1.0	0.5	0.35	TP	10,000	0.65±0.10	1.15±0.10	8	2	0.42+0.2/-0	180
	1J	1.6	0.8	0.45	TD	5,000	1.1±0.1	1.9±0.1	8	4	0.6+0.2/-0	180
	2A	2.0	1.25	0.5	TD	5,000	1.65±0.20	2.4±0.2	8	4	0.75+0.2/-0	180
					TE	4,000	1.6±0.2	2.4±0.2	8	4	1.0±0.15	180
	2B	3.2	1.6	0.6	TD	5,000	2±0.2	3.5±0.2	8	4	0.75+0.2/-0	180
					TE	4,000	1.9±0.2	3.5±0.2	8	4	1.0±0.15	180
	2E	3.2	2.5	0.6	TD	5,000	2.85±0.20	3.5±0.2	8	4	0.75+0.2/-0	180
					TE	4,000	2.85±0.20	3.5±0.2	8	4	1.0±0.15	180
UR73 UR73V	D1E	1.0	0.5	0.4	TP	10,000	0.65±0.10	1.15±0.10	8	2	0.5+0.2/-0	180
	D1J	1.6	0.8	0.5	TD	5,000	1.1±0.1	1.9±0.1	8	4	0.68+0.2/-0	180
	D2A	2.0	1.25	0.55	TD	5,000	1.65±0.2	2.4±0.2	8	4	0.75+0.2/-0	180
	2A				TD	5,000						
	D2B	3.2	1.6	0.6	TD	5,000	2±0.2	3.5±0.2	8	4	0.75+0.2/-0	180
	2B				TD	5,000						
	D2H	5.0	2.5	0.65	TE	4,000	2.9±0.2	5.35±0.20	12	4	1.0±0.15	180
	D3A	6.3	3.1	0.6	TE	4,000	3.44±0.20	6.65±0.20	12	4	1.0±0.15	180
WK73 WU73 WG73	1E	0.5	1.0	0.35	TP	10,000	0.65±0.10	1.15±0.10	8	2	0.42+0.2/-0	180
	1J	0.8	1.6	0.45	TD	5,000	1.1±0.1	1.9±0.1	8	4	0.6+0.2/-0	180
	2A	1.25	2.0	0.55	TD	5,000	1.65±0.20	2.4±0.2	8	4	0.75+0.2/-0	180
	2B15, 2B	1.6	3.2	0.6	TD	5,000	2.0±0.2	3.5±0.2	8	4	0.75+0.2/-0	180
	2H2, 2H	2.5	5.0	0.6	TE	4,000	2.9±0.2	5.35±0.20	12	4	1.0±0.15	180
	2J	3.1	4.6	0.6	TE	4,000	3.35±0.20	4.85±0.20	12	4	1.0±0.15	180
	3A3, 3A	3.1	6.3	0.6	TE	4,000	3.44±0.20	6.65±0.20	12	4	1.0±0.15	180
SLR	1	6.3	3.1	1.9	TE	1,000	3.6±0.1	6.8±0.1	12	8	2.35±0.1	180
					TED	2,000						255
MWS	5	16.9	8.6	4.8	TEG	1,500	8.90±0.10	17.3±0.10	24	12	5.1±0.10	380
PS	L (0.2mΩ)	6.3	3.15	1.40	TEB	5,000	3.45±0.1	6.60±0.1	12	8	1.6±0.1	330
	L (0.3mΩ)	6.3	3.15	1.32	TEB	5,000	3.45±0.1	6.60±0.1	12	8	1.6±0.1	330
	L (0.5mΩ)	6.3	3.15	1.12	TEB	5,000	3.45±0.1	6.60±0.1	12	8	1.6±0.1	330
	F (0.5mΩ)	3.0	3.8	1.8	TEB	3,000	3.25±0.1	4.25±0.1	12	8	2.2±0.1	330
	F (1mΩ)	3.0	3.8	1.8	TEB	3,000	3.25±0.1	4.25±0.1	12	8	2.2±0.1	330

RK73 series fit for ø255 and ø330 reels, and RN73 series for ø255 reel. For further details, please refer to individual specification sheets.

Packaging specifications





KOA SPEER ELECTRONICS, INC.

Appendix A

packaging - surface mount components

For Product Specific packaging, please refer to the individual product data sheets.

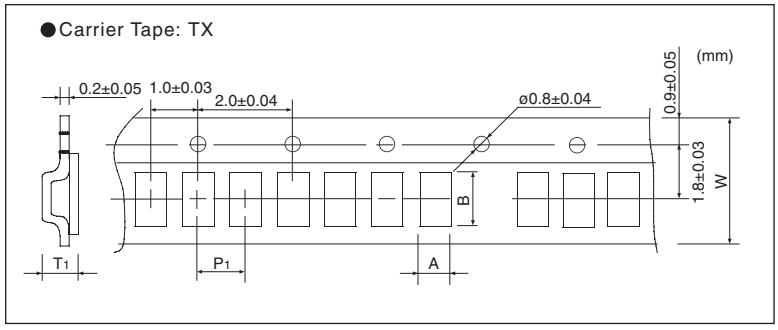
Type		Component Size (mm)			Carrier Tape	Quantity/ Reel (Pieces)	Taping (mm)					Reel Size øa (mm)
		L	W	T			A	B	W	P1	T1	
TLR	2A	2.0	1.25	0.25	TD	5,000	1.65±0.1	2.4±0.1	8	4	0.42+0.2/-0	178
	2BN, 2B, 2BW, 2BP	3.2	1.6	0.6	TD	5,000	2.0±0.10	3.5±0.10	8	4	0.75±0.05	180
	2H, 2HW	5.0	2.5	0.6	TE	4,000	2.9±0.10	5.35±0.10	12	4	0.77±0.1	180
	3AW, 3AP, 3APS	6.4	3.2	0.6	TE	2,000	3.55±0.10	6.75±0.10	12	8	1.0±0.1	180
TLRZ	1E	1.0	0.5	0.4	TB	10,000	0.65±0.1	1.15±0.1	8	2	0.6±0.03	180
	1J	1.6	0.8	0.5	TD	5,000	1.10±0.1	1.90±0.1	8	4	0.6±0.05	180
	2A	2.0	1.25	0.5	TD	5,000	1.65±0.2	2.40±0.1	8	4	0.75±0.05	180
	2B	3.2	1.6	0.5	TD	5,000	2.0±0.10	3.5±0.10	8	4	0.75±0.05	180
TLRH	2A	2.0	1.25	0.25	TD	5,000	1.65±0.1	2.4±0.1	8	4	0.42+0.2/-0	178
	3AW, 3AP	6.3	3.2	0.5	TE	2,000	3.55±0.20	6.75±0.20	12	8	1.0±0.1	178
SL	07, W07	5.0	2.5	1.7	TE	2,000	3.1±0.1	5.5±0.1	12	4	2.25±0.10	180
	1, W1	6.3	3.1	1.9	TE	1,000	3.6±0.1	6.8±0.1	12	8	2.35±0.10	180
	2	11.5	7.0	2.5	TE	1,000	7.7±0.1	12.2±0.10	24	12	3.1±0.1	255
SLN	2, 3	11.5	7.0	2.4	TE	1,000	7.7±0.1	12.2±0.10	24	12	3.1±0.1	255
	5	11.5	7.0	2.5	TED	1,000	7.7±0.1	12.2±0.10	24	12	3.1±0.1	255
TSL	1	6.3	3.1	1.0	TE	3,000	3.4±0.1	6.6±0.1	12	4	1.3±0.1	180
CSR	1	10.8	6.2	2.1	TE	1,000	6.7±0.1	11.1±0.10	24	12	2.60±0.10	255
	2	12.8	8.2	3.1	TE	1,000	9±0.1	13±0.10	24	12	4.35±0.10	330
BLR	1L	13.0	5.5	2.5	TE	1,000	6.2±0.1	15.0±0.1	24	12	6.7±0.1	330
	2L	18.0	6.3	3.0	TE	1,000	7.0±0.1	20.5±0.1	32	12	7.5±0.1	380
	3L	18.0	8.2	3.0	TE	750	10.0±0.1	20.5±0.1	32	12	7.0±0.1	380
LR73	A	14	5.2	2.0	TE	2,000	1.45±0.20	5.7±0.2	24	8	2.3±0.2	255
	B	14	3	2.0	TE	2,000	1.45±0.20	3.4±0.2	24	8	2.5±0.2	255
	C	11.2	3.2	3.5	TE	1,500	1.17±0.10	4.3±0.1	24	8	4.4±0.15	330
NT73	1J	1.6	0.8	0.45	TD	5,000	1.1±0.1	1.9±0.1	8	4	0.6+0.2/-0	180
	2A	2.0	1.25	0.5	TD	5,000	1.65±0.20	2.4±0.2	8	4	0.75+0.2/-0	180
	2B	3.2	1.6	0.6	TD	5,000	2±0.2	3.5±0.2	8	4	0.75+0.2/-0	180
LP73	1J	1.6	0.8	0.5	TE	5,000	1.1±0.1	1.9±0.1	8	4	0.6±0.1	180
	2A	2.0	1.25	0.5	TE	5,000	1.6±0.1	2.4±0.1	8	4	0.85+0.2/-0	180
	2B	3.2	1.6	0.5	TE	5,000	2.0±0.1	3.6±0.1	8	4	0.85+0.2/-0	180
SDT73H/V/S	2B	3.2	1.6	0.5	TEK/TE	1,000/5,000	2.0±0.1	3.6±0.1	8	4	0.85+0.2/-0	180
RD41	2ES, 12M	3.5	1.4	–	TE	3,000	1.7±0.1	3.7±0.1	8	4	2.0 max.	178
RN41, CC	2E, 25, 3AS	5.9	2.2	–	TE	1,500	2.4±0.1	6.2±0.1	12	4	2.9 max.	178
RCU		1.6	0.8	1.15	TE/TED	2,000/5,000	1.05±0.15	1.85±0.15	8	4	1.25±0.1	178/260
RCT		2.0	1.25	1.45	TE/TED	2,000/5,000	1.65+0.1/-0.2	2.45±0.15	8	4	1.70±0.1	178/260
RCS		3.2	1.6	1.25	TE/TED	2,000/5,000	2.0±0.2	3.6±0.2	8	4	1.45±0.15	178/260
RCW		3.2	1.6	2.0	TE	2,000	1.95+0.1/-0.05	3.4+0.1/-0.05	8	4	2.2±0.1	178
CNN	2A2	2.54	2.0	0.5	TE	4,000	2.4±0.2	2.9±0.2	8	4	1±0.15	180
KPC	Q16	4.9	5.99	1.6	TE	2,500	6.5±0.1	5.3±0.1	12	8	2.1±0.1	330
	Q20	8.66	5.99	1.6	TE	2,500	6.5±0.1	9.0±0.1	16	8	2.1±0.1	330
	Q24	8.66	5.99	1.6	TE	2,500	6.5±0.1	9.0±0.1	16	8	2.1±0.1	330
	N08	4.83	5.99	1.6	TE	2,500	6.5±0.1	5.3±0.1	12	8	2.1±0.1	330
	N14	8.66	5.99	1.6	TE	2,500	6.5±0.1	9.0±0.1	16	8	2.1±0.1	330
	N16	9.91	5.99	1.6	TE	2,500	6.5±0.1	10.3±0.1	16	8	2.1±0.1	330
	S03	2.92	2.30	0.95	TE	3,000	3.15±0.1	2.77±0.1	8	4	1.22±0.1	180
HVD		8.66	5.99	1.6	TE	2,500	6.5±0.1	9.0±0.1	16	8	2.1±0.1	330
KQC	0603	1.6	1.05	0.7	TE	2,000	1.20±0.05	1.77±0.05	8	4	0.86±0.05	178
KQT, KQC	0402	1.0	0.5	0.55	TD	2,000	0.65±0.05	1.20±0.05	8	4	0.68±0.1	178
					TP	10,000				2		
KQ	0603	1.6	1.0	0.9	TE	2,000	1.15±0.05	1.86±0.05	8	4	1.05±0.05	178
	0805	2.0	1.5	1.3	TE	2,000	1.6±0.1	2.22±0.1	8	4	1.5±0.1	178
	1008	2.5	2.2	1.8	TE	2,000	2.35±0.1	2.7±0.1	8	4	2.1±0.1	178
LPC	4045	4.5	4.0	4.5	TE	2,500	4.75±0.2	4.15±0.2	12	8	4.6±0.2	380
	4235	4.5	4.2	3.5	TM	2,000	4.5±0.2	4.8±0.2	12	8	4.05±0.2	330
	4545	4.1	4.6	4.6	TE	2,500	5.0±0.2	4.5±0.2	12	8	5.0±0.2	380
NV73 NV73DL	1H	0.6	0.3	0.3	TBM	15,000	0.38±0.02	0.68±0.02	8	2	0.42±0.02	180
	1E	1.0	0.5	0.5	TP	10,000	0.65±0.1	1.15±0.1	8	2	0.6+0.2/-0	180
	1J	1.6	0.8	0.8	TE	2,500	1.2±0.1	1.9±0.1	8	4	1.75 max.	178
	2A	2.0	1.25	1.3 max.	TE	2,500	1.6±0.1	2.4±0.1	8	4	1.75 max.	178
	2B	3.2	1.6	1.65 max.	TE	2,500	2.0±0.1	3.6±0.1	8	4	1.75 max.	178
	2E	3.2	2.5	1.5 max.	TE	2,000	2.85±0.1	3.50±0.1	8	4	1.55 max.	178
	2J	4.5	3.2	2.0 max.	TE	1,000	3.60±0.1	4.90±0.1	12	8	2.05 max.	180
	2L	5.7	5.0	2.5 max.	TE	1,000	5.40±0.1	6.00±0.1	12	8	2.60 max.	180

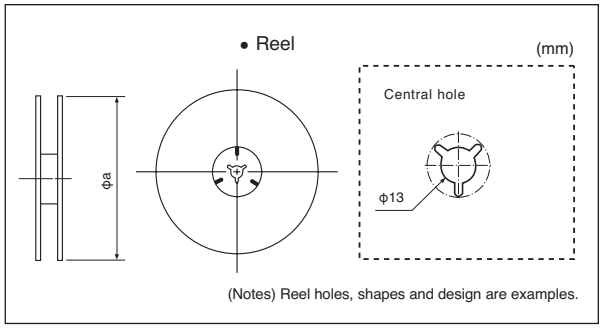
For Product Specific packaging, please refer to the individual product data sheets.

Type		Component Size (mm)			Carrier Tape	Quantity/ Reel (Pieces)	Taping (mm)					Reel Size øa (mm)
		L	W	T			A	B	W	P1	T1	
NV73DS	2L	6.1	5.1	3.7 max.	TE	550	5.30±0.1	6.6±0.1	12	8	3.70 max.	180
TF	10B	1.0	0.5	0.45	TB	10,000	0.65±0.05	1.15±0.05	8	2	0.6±0.04	180
	16S,16A,16V	1.6	0.8	0.4	TD	5,000	1.1±0.1	1.9±0.1	8	4	0.6+0.2/-0	180
CCP	2B	3.2	1.6	1.2	TE	3,000	1.9±0.1	3.5±0.1	8	4	1.5±0.1	180
	2E	3.2	2.5	2.2	TE	2,000	2.8±0.1	3.5±0.1	8	4	2.4±0.1	180
CCF	1N, 1F	6.0	2.5	2.5	TE	1,000	2.7±0.2	6.4±0.2	12	4	2.9±0.2	180
CZB CZP	1J	1.6±0.15	0.8±0.15	0.8±0.15	TD	4,000	1.1±0.1	1.8±0.1	8.1±0.1	4.0±0.1	1.1±0.1	178
	2A	2.0±0.2	1.25±0.2	0.9±0.2	TD	2,000/4,000*	1.6±0.1	2.4±0.1	8.1±0.1	4.0±0.1	1.2±0.1	178
	2B	3.2±0.2	1.6±0.2	0.51±0.25	TE	3,000	1.8±0.1	3.5±0.1	8.1±0.1	4.0±0.1	1.8±0.1	178
MHL	1E	1.0±0.1	0.5±0.1	0.5±0.1	TP	10,000	0.67±0.1	1.17±0.1	8.0±0.22	2.0±0.23	0.63±0.1	178
	1J	1.6±0.15	0.8±0.15	0.8±0.15	TD	4,000	1.15±0.1	1.85±0.1	8.0±0.1	4.0±0.1	1.1±0.1	178

* CZB2A: <2200Ω=TD:4,000; 2200Ω=TD: 2,000 pcs/reel

Packaging specifications



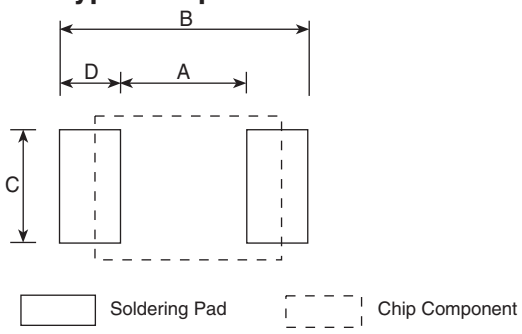


standard soldering pad dimensions

The optimum soldering pad dimensions may differ depending on soldering conditions, however, the following land dimensions are generally recommended.

Type	Style	Dimensions millimeters				
		Component Size	A	B	C	D
RK73 RS73 HV73 SG73 RN73 HSG73P SR73 LT73 NT73 LP73 SDT73 RF73	1F	0.4×0.2	0.12	0.48	0.18	0.18
	1H	0.6×0.3	0.25	0.7	0.3	0.225
	1E	1.0×0.5	0.5	1.3	0.3	0.4
	1J	1.6×0.8	1.0	2.0	0.6	0.5
	2A	2.0×1.25	1.3	2.5	1.05	0.6
	2B	3.2×1.6	2.2	4.0	1.4	0.9
	2E, 2E1	3.2×2.5	2.2	4.0	2.3	0.9
	W2H/2H	5.0×2.5	3.3/3.5	6.1/6.3	2.3	1.4
	W3A2, W3A, 3A	6.3×3.1	4.6	8.0	3.0	1.7
RK73 AT	1J	1.6×0.8	1.0	2.5	0.85	0.75
SG73 AT	2A	2.0×1.25	1.2	3.0	1.33	0.9
HV73 AT	2B	3.2×1.6	2.05	4.4	1.7	1.175
UR73	2A	2.0×1.25	1.3	2.6	1.1	0.65
	2B	3.2×1.6	2.2	4.2	1.6	1.0
UR73D	1E	1.0×0.5	0.4	1.7	0.5	0.65
	1J	1.6×0.8	0.5	2.5	0.9	1.0
	2A	2.0×1.25	0.8	3.4	1.3	1.3
	2B	3.2×1.6	1.2	4.6	1.8	1.7
	2H (10mΩ~30mΩ)	5.0×2.5	1.8	6.1	2.6	2.15
	2H (33mΩ~100mΩ)		3.3	6.1	2.5	1.4
	3A (10mΩ~30mΩ)	6.3×3.1	2.3	8.0	3.3	2.85
	3A (33mΩ~100mΩ)		4.6	8.0	3.2	1.7
UR73V	2A	2.0×1.25	1.2	3.4	1.3	1.1
	2B	3.2×1.6	2.2	4.2	1.6	1.0
UR73VD	2A (10mΩ~18mΩ)	2.0×3.1	0.6	3.4	1.3	1.4
	2A (20mΩ~36mΩ)		0.8	3.4	1.3	1.3
	2B (10mΩ~13mΩ)	3.2×1.6	0.7	4.4	1.6	1.85
	2B (15mΩ~16mΩ)		0.9	4.4	1.6	1.75
	2B (18mΩ~20mΩ)		1.0	4.4	1.6	1.7
	2B (22mΩ~27mΩ)		1.2	4.4	1.6	1.6
WK73 WU73 WG73	1E	0.5×1.0	0.2	1.1	1.0	0.45
	1J	0.8×1.6	0.4	1.7	1.6	0.65
	2A	1.25×2.0	0.55	2.35	2.0	0.9

Flat Type Components - For Reflow Soldering



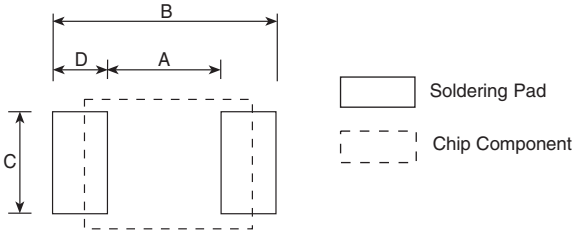
Type	Style	Dimensions millimeters				
		Component Size	A	B	C	D
WK73 WU73 WG73	2B15, 2B	1.6×3.2	0.7	2.3	3.2	0.8
	2H2, 2H	2.5×5.0	1.0	3.5	5.0	1.25
	2J	3.1×4.6	1.6	3.9	4.6	1.15
	3A3, 3A	3.1×6.3	1.6	3.9	6.3	1.15
SLR	1	6.3×3.1	3.4	8.0	3.0	2.3
TF	10B	1.0×0.5	0.5	1.3	0.3	0.4
	16S,16A,16V	1.6×0.8	1.0	2.0	0.6	0.5
PS	L	6.3×3.15	3.4	7	3.4	1.8
	F	3.0×3.8	Described on the product page			
TLR	2A	2.0×1.25	0.5	2.5	1.3	1.0
	2BW, 2BP (0.5mΩ)	3.2×1.6	0.6	4.0	1.8	1.7
	2BN,2B, 2BW,2BP (1mΩ,1.5mΩ)		0.8	4.0	1.8	1.6
	2BN,2B, 2BW,2BP (2mΩ~20mΩ)		1.4	4.0	1.8	1.3
	2H, 2HW (0.5mΩ~1.5mΩ)	5.0×2.5	1.0	6.1	3.0	2.55
	2H, 2HW (2mΩ~6mΩ)		1.3	6.1	3.0	2.4
	2H, 2HW (7mΩ~10mΩ)		3.3	6.1	3.0	1.4
	3AW (0.5mΩ~0.82mΩ)	6.35×3.18	0.8	7.55	3.83	3.375
	3AW (1mΩ~4mΩ)		1.45	7.55	3.83	3.05
	3AW (5mΩ~8mΩ)		3.45	7.55	3.83	2.05
	3AW (9mΩ, 10mΩ)		4.4	7.55	3.83	1.575
	3AP (0.5mΩ~0.82mΩ)	6.35×3.18	0.8	7.55	3.83	3.375
	3AP (1mΩ, 1.5mΩ)		1.45	7.55	3.83	3.05
	3AP (2mΩ)		1.05	7.55	3.83	3.25
	3AP (3mΩ~4mΩ)		1.45	7.55	3.83	3.05

standard soldering pad dimensions (continued)

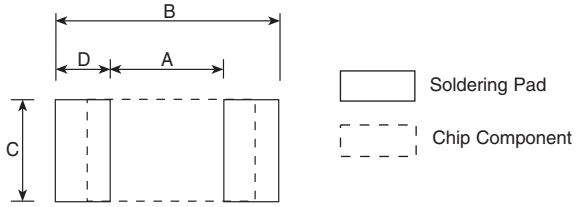
The optimum soldering pad dimensions may differ depending on soldering conditions, however, the following land dimensions are generally recommended.

Type	Style	Dimensions millimeters				
		Component Size	A	B	C	D
TLR	3AP (5mΩ~8mΩ)	6.35×3.18	3.45	7.55	3.83	2.05
	3AP (9mΩ, 10mΩ)		4.4	7.55	3.83	1.575
	3APS		3.45	7.55	3.83	2.05
TLRH	2A	2.0×1.25	0.5	2.5	1.3	1.0
	3AW	6.3×3.2	4.4	7.5	3.7	1.55
	3AP	6.3×3.2	2.15	7.55	3.83	2.7
TLRZ	1E	1.0×0.5	0.5	1.3	0.6	0.4
	1J	1.6×0.8	0.5	2.0	0.9	0.75
	2A	2.0×1.25	0.5	2.5	1.45	1.0
	2B	3.2×1.6	2.2	3.8	1.8	0.8
SL	07, W07	5.0×2.5	2.3	7.0	2.6	2.35
	1, W1	6.3×3.1	3.4	8.0	3.0	2.3
	2	11.5×7.0	5.4	15.0	5.0	4.8
SLN	2, 3, 5	11.5×7.0	5.0	15.0	6.0	5.0
TSL	1	6.3×3.1	3.4	8.0	3.0	2.3
KQT KQ KQC	0402	1.0×0.5	0.46	1.18	0.66	0.36
	0603	1.6×1.0	0.8	2.0	1.02	0.6
	0805	2.0×1.5	0.76	2.8	1.78	1.02
	1008	2.5×2.2	1.27	3.31	2.54	1.02
CCF	1N, 1F	6.0×2.5	3.0	7.2	2.8	2.1
CCP	2B	3.2×1.6	2.2	5.0	1.4	1.4
	2E	3.2×2.5	2.2	5.0	2.0	1.4
NV73 NV73DL	1H	0.6×0.3	0.25~0.35	0.65~0.95	0.25~0.35	0.2~0.3
	1E	1.0×0.5	0.51	1.73	0.51	0.61
	1J	1.6×0.8	1.0	3.0	1.0	1.0
	2A	2.0×1.25	1.2	4.0	1.2	1.4
	2B	3.2×1.6	2.2	5.0	1.3	1.4
	2E	3.2×2.5	2.2	5.0	2.2	1.4
	2J	4.5×3.2	3.0	5.8	2.9	1.4
	2L	5.7×5.0	4.5	7.5	4.7	1.5
NV73DS	2L	6.1×5.1	4.5	7.5	4.7	1.5

Flat Type Components - For Reflow Soldering



Flat Type Components - For Flow Soldering



Type	Style	Dimensions millimeters				
		Component Size	A	B	C	D
RK73 RS73 HV73 SG73 RN73 HSG73P SR73 LT73 NT73 LP73 SDT73 RF73	1E	1.0×0.5	0.5	1.5	0.5	0.5
	1J	1.6×0.8	1.0	2.4	0.8	0.7
	2A	2.0×1.25	1.3	3.1	1.25	0.9
	2B	3.2×1.6	2.2	4.4	1.6	1.1
	2E, 2E1	3.2×2.5	2.2	4.4	2.5	1.1
	W2H/2H	5.0×2.5	3.3/3.5	6.1/6.3	2.5	1.4
	W3A2, W3A, 3A	6.3×3.1	4.6	8.0	3.2	1.7
RK73 AT	1J	1.6×0.8	1.0	2.5	0.85	0.75
SG73 AT	2A	2.0×1.25	1.2	3.0	1.33	0.9
HV73 AT	2B	3.2×1.6	2.05	4.4	1.7	1.175
UR73	2A	2.0×1.25	1.3	2.6	1.1	0.65
	2B	3.2×1.6	2.2	4.2	1.6	1.0
UR73D	1E	1.0×0.5	0.4	1.7	0.5	0.65
	1J	1.6×0.8	0.5	2.5	0.9	1.0
	2A	2.0×1.25	0.8	3.4	1.3	1.3
	2B	3.2×1.6	1.2	4.6	1.8	1.7
	2H (10mΩ~30mΩ)	5.0×2.5	1.8	6.1	2.6	2.15
	2H (33mΩ~100mΩ)		3.3	6.1	2.5	1.4
	3A (10mΩ~30mΩ)	6.3×3.1	2.3	8.0	3.3	2.85
	3A (33mΩ~100mΩ)		4.6	8.0	3.2	1.7
UR73V	2A	2.0×1.25	1.2	3.4	1.3	1.1
	2B	3.2×1.6	2.2	4.2	1.6	1.0

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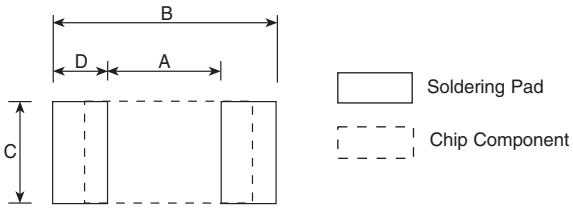
standard soldering pad dimensions (continued)

The optimum soldering pad dimensions may differ depending on soldering conditions, however, the following land dimensions are generally recommended.

Type	Style	Dimensions millimeters				
		Component Size	A	B	C	D
UR73VD	2A (10mΩ~18mΩ)	2.0×1.25	0.6	3.4	1.3	1.4
	2A (20mΩ~36mΩ)		0.8	3.4	1.3	1.3
	2B (10mΩ~13mΩ)	3.2×1.6	0.7	4.4	1.6	1.85
	2B (15mΩ~16mΩ)		0.9	4.4	1.6	1.75
	2B (18mΩ~20mΩ)		1.0	4.4	1.6	1.7
	2B (22mΩ~27mΩ)		1.2	4.4	1.6	1.6
TF	10B	1.0×0.5	0.5	1.5	0.5	0.5
	16S, 16A	1.6×0.8	1.0	2.4	0.8	0.7
NV73 NV73DL	1J	1.6×0.8	1.0	3.0	1.0	1.0
	2A	2.0×1.25	1.2	4.0	1.2	1.4
	2B	3.2×1.6	2.2	5.0	1.3	1.4
	2E	3.2×2.5	2.2	5.0	2.2	1.4
	2J	4.5×3.2	3.0	5.8	2.9	1.4
	2L	5.7×5.0	4.5	7.5	4.7	1.5
NV73DS	2L	6.1×5.1	4.5	7.5	4.7	1.5
CCF	1N, 1F	6.0×2.5	3.0	7.2	2.8	2.1
CCP	2B	3.2×1.6	2.2	5.0	1.4	1.4
	2E	3.2×2.5	2.2	5.0	2.0	1.4

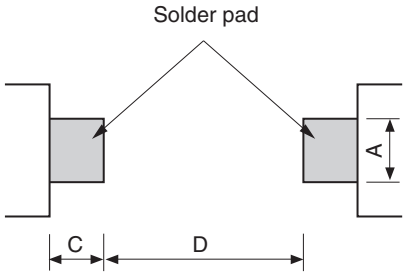
Flat Type Components - For Flow Soldering



melf type components—RD41, RN41, MLT, CC

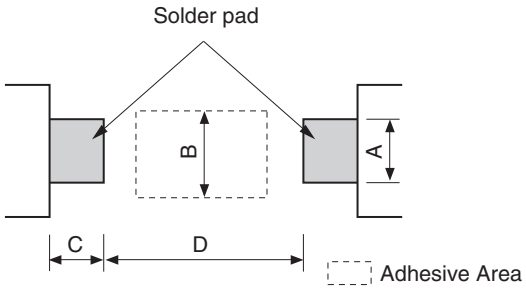
Reflow Soldering

Type	Style	Dimensions millimeters			
		Component Size	A	C	D
RD41 RN41 CC	2ES 12M	3.5 X 1.40	1.5	1.3	1.7
	2E 25	5.9 X 2.2	2.2	2.2	3.0
	3AS	5.9 X 2.2	15.0	15.0	4.0



Flow Soldering

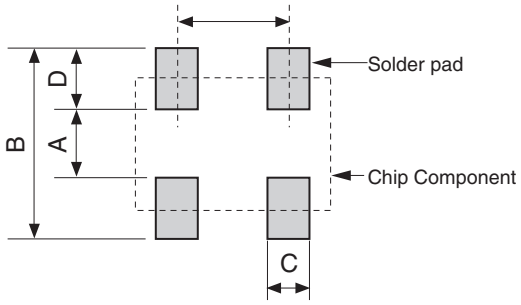
Type	Style	Dimensions millimeters				
		Component Size	A	B	C	D
RD41 RN41 CC	2ES 12M	3.5 X 1.40	1.5	2.2	1.5	2.0
	2E 25	5.9 X 2.2	2.0	3.0	3.0	4.0
	3AS	5.9 X 2.2	15.0	3.0	15.0	4.0



resistor arrays—CN

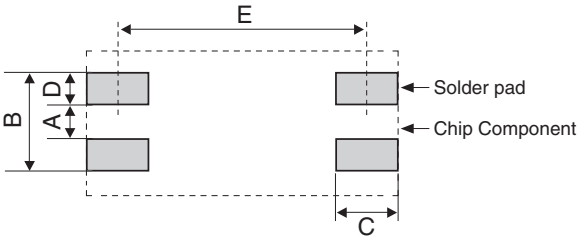
Type	Style	Dimensions millimeters					
		Component Size	A	B	C	D	E
CNN	2A2	2.54 X 2.0	1.2	2.8	0.6	0.8	1.27

Chip Networks



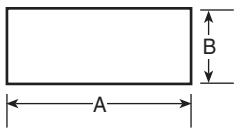
MWS

Type	Style	Dimensions millimeters					
		Component Size	A	B	C	D	E
MWS	5	16.9 X 8.6	2.2	6.2	2.5	2.0	14.1



other chips—RCS, RCT, RCU, RCW

Type	Dimensions millimeters	
	A	B
RCU	2.5~2.7	0.6~0.8
RCT	2.9~3.1	1.05~1.25
RCS	4.1~4.3	1.4~1.6
RCW		



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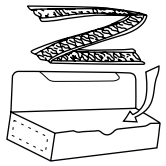
axial tapings

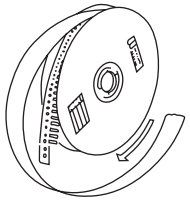
Straight Type Name	Taping Type Name	Lead ød (mm)	Packaging Style	Packaging & Q'ty (pcs)		Weight (g)		
				AMMO	Reel	AMMO	Reel	Net 1000pcs
MOS1/2*2	MOS1/2CT26	0.6	T26	2000	—	350	—	140
MOS1/2	MOS1/2CT52	0.6	T52	2000	5000	590	1400	250
MOS1	MOS1CT52	0.6	T52	2000	4000	810	1550	350
MOS1	MOS1CT526	0.6	T52	2000	4000	810	1550	350
MOS1C8	MOS1CT528	0.8	T52	2000	4000	810	1550	350
MOS1	MOS1CL52	0.8	L52	2000	4000	810	1550	350
MOS2	MOS2CT52	0.8	T52	1000	2000	910	1750	800
MOS2	MOS2CT521	0.8	T521	1000	1000	910	950	800
MOS2	MOS2CL521	0.8	L521	1000	1000	910	950	800
MOS3	MOS3CL521	0.8	L521	500	—	775	—	1350
MOS3	MOS3CT521	0.8	T521	500	1000	775	1500	1350
MOS3	MOS3CT631	0.8	T631	1000	1000	1580	1600	1400
MOS3	MOS3CL631	0.8	L631	1000	1000	1580	1600	1400
SPR1/4*3	SPR1/4CT26	0.45	T26	2000	—	250	—	90
SPR1/4	SPR1/4CT52	0.45	T52	2000	5000	340	850	140
SPR1/2	SPR1/2CT26	0.6	T26	2000	—	350	—	140
SPR1/2	SPR1/2CT52	0.6	T52	2000	5000	590	1400	250
SPR1/2	SPR1/2CL52	0.65	L52	2000	5000	590	1400	250
SPR1	SPR1CT52	0.8	T52	2000	4000	1140	2150	500
SPR1	SPR1CL52	0.8	L52	2000	4000	1140	2150	500
SPR2	SPR2CT52	0.8	T52	1000	2000	910	1750	800
SPR2	SPR2CT521	0.8	T521	1000	1000	910	950	800
SPR2	SPR2CL521	0.8	L521	1000	1000	910	950	800
SPR3	SPR3CT521	0.8	T521	500	1000	765	1500	1350
SPR3	SPR3CL521	0.8	L521	500	—	775	—	1350
SPR3	SPR3CT631	0.8	T631	1000	1000	1580	1600	1400
SPR3	SPR3CL631	0.8	L631	1000	1000	1580	1600	1400
RF16	RF16CT26	0.45	T26	2000	—	220	—	90
RF16	RF16CT52	0.45	T52	2000	5000	340	800	150
RF25	RF25CT26	0.6	T26	2000	—	330	—	140
RF25	RF25CT52	0.6	T52	2000	5000	500	1300	230
RF50	RF50CT52	0.6	T52	2000	4000	660	1320	310
RF1	RF1CT52	0.8	T52	2000	4000	1080	2050	500
RF2	RF2CT521	0.8	T521	500	1000	700	1420	1300
RF2	RF2CT631	0.8	T631	1000	—	1410	—	1350
Z16	Z16CT26	0.45	T26	5000	—	615	—	110
Z16	Z16CT52	0.45	T52	3000	5000	530	920	150
Z25	Z25CT26	0.6	T26	2000	—	410	—	180
Z25	Z25CT52	0.6	T52	2000	5000	530	1400	240
J1/6Z	J1/6ZCT26	0.5	T26	2000	—	230	—	90
J1/6Z	J1/6ZCT52	0.5	T52	2000	5000	320	950	130
J1/4Z	J1/4ZCT26	0.6	T26	2000	—	320	—	130
J1/4Z	J1/4ZCT52	0.6	T52	2000	5000	460	1310	190
JL5	JL5CT26	0.5	T26	5000	—	420	—	75
JL5	JL5CT52	0.5	T52	5000	—	680	—	120
JL6	JL6CT26	0.6	T26	5000	—	515	—	100
JL6	JL6CT52	0.6	T52	5000	—	815	—	160
JL8	JL8CT52	0.8	T52	—	10000	—	3054	305
LP1/8	LP1/8CT26	0.65	T26	2000	—	410	—	170
LP1/8	LP1/8CT52	0.65	T52	2000	—	580	—	260
LP1/16	LP1/16CT26	0.5	T26	4000	—	450	—	100
LP1/16	LP1/16CT52	0.5	T52	4000	—	630	—	150
CFS1/4	CFS1/4 CT26	0.45	T26	5000	—	615	—	110
CFS1/4	CFS1/4 CT52	0.45	T52	3000	5000	530	920	150
CF1/4	CF1/4 CT26	0.6	T26	2000	—	410	—	180
CF1/4	CF1/4 CT52	0.6	T52	2000	5000	530	1400	240
CFB1/2	CFB1/2 CT52	0.7	T52	2000	4000	1110	2280	520
CFS1/2	CFS1/2 CT26	0.6	T26	2000	—	525	—	230
SDT101A	SDT101AXCT26	0.4	T26	2000	—	350	—	75
SDT101A	SDT101AXCT52	0.4	T52	2000	—	470	—	150
SDT101B	SDT101BXNT52	0.4	T52	—	2000	—	410	150
CFS1/2	CFS1/2 CT52	0.6	T52	2000	4000	640	1500	290
CFPS1/4	CFPS1/4 CT26	0.45	T26	5000	—	615	—	100
CFPS1/4	CFPS1/4 CT52	0.45	T52	3000	—	530	—	150
CFP1/4	CFP1/4 CT26	0.6	T26	2000	—	410	—	180

Packaging

(1) AMMO Pack (Symbol:A) Standard



(2) Reel (Symbol: R)



*1: The same taping applicable also to MOX.
*2: The same taping applicable also to MOSX.
*3: The same taping applicable also to SPRX.

axial tapings

Straight Type Name	Taping Type Name	Lead ød (mm)	Packaging Style	Packaging & Q'ty (pcs)		Weight (g)		
				AMMO	Reel	AMMO	Reel	Net 1000pcs
CFP1/4	CFP1/4 CT52	0.6	T52	2000	5000	530	1400	240
CFP1/4	CFP1/4 CL52	0.65	L52	2000	—	530	—	240
CFPS1/2	CFPS1/2 CT26	0.6	T26	2000	—	525	—	230
CFPS1/2	CFPS1/2 CT52	0.6	T52	2000	4000	640	1500	290
MFS1/4**	MFS1/4 □CT26	0.45	T26	3000	—	350	—	90
MFS1/4	MFS1/4 □CT52	0.45	T52	3000	—	500	—	120
MFS1/2	MFS1/2 □CT26	0.6	T26	2000	—	360	—	160
MFS1/2	MFS1/2 □CT52	0.6	T52	2000	5000	500	1300	215
MF1/4	MF1/4 □CT26	0.6	T26	2000	—	360	—	160
MF1/4	MF1/4 □CT52	0.6	T52	2000	5000	500	1300	215
MF1/2	MF1/2 □CT52	0.6	T52	2000	4000	900	2000	360
SNF 2C	SNF 2CCT26	0.45	T26	3000	—	500	—	110
SNF 2C	SNF 2CCT52	0.45	T52	3000	—	430	—	150
SNF 2E	SNF 2ECT26	0.6	T26	2000	—	450	—	180
SNF 2E	SNF 2ECT52	0.6	T52	2000	5000	470	1400	240
SNF 2H	SNF 2HCT52	0.7	T52	2000	4000	950	2010	520
RNS1/4	RNS1/4 □CT52	0.6	T52	2000	4000	600	1550	440
RNS1/8	RNS1/8 □CT26	0.6	T26	2000	—	400	—	180
RNS1/8	RNS1/8 □CT52	0.6	T52	2000	5000	600	1550	220
RNS1/2	RNS1/2 □CT52	0.6	T52	2000	4000	1100	2150	500
RNS1	RNS1 □CT521	0.8	T521	500	1000	750	2100	1500
RCR16	RCR16 CT26	0.45	T26	5000	—	500	—	100
RCR16	RCR16 CT52	0.45	T52	3000	—	450	—	150
RCR25	RCR25 CT26	0.6	T26	2000	—	390	—	180
RCR25	RCR25 CT52	0.6	T52	2000	—	520	—	240
RCR25EN	RCR25EN CT26	0.6	T26	2000	—	390	—	180
RCR25RN	RCR25EN CT52	0.6	T52	2000	—	520	—	240
RCR50 (+)	RCR50(+) CT52	0.7	T52	2000	3000	1050	1630	520
RCR50EN	RCR50ENCT52	0.7	T52	2000	3000	1050	1630	520
RCR60	RCR60 CT52	0.7	T52	2000	3000	1050	1630	520
RCR75	RCR75 CT52	0.8	T52	1000	—	830	—	800
RCR100	RCR100 CT521	0.8	T521	500	—	750	—	1400
RCR100	RCR100 CT631	0.8	T631	1000	—	1450	—	1400
RK1/4	RK1/4 □CT26	0.6	T26	2000	—	360	—	250
RK1/4	RK1/4 □CT52	0.6	T52	2000	5000	500	1300	250
RK1/2	RK1/2 □CT52	0.6	T52	2000	4000	900	—	380
RK1	RK1 □CT521	0.8	T521	500	—	700	—	1340
PCF1/2	PCF1/2 CT52	0.7	T52	—	2000	—	1140	450
PCF1	PCF1 CT631	0.8	T631	—	1000	—	1530	1270
PCF2	PCF2 CT631	0.8	T631	—	500	—	1340	2160
HPC1/2	HPC1/2 CT52	0.8	T52	1000	2000	800	1440	600
HPC1	HPC1 CT631	0.8	T631	—	1000	—	1440	1170
CW1/4	CW1/4 CT26	0.45	T26	2000	—	460	—	150
CW1/4	CW1/4 CT52	0.45	T52	3000	—	690	—	150
CW1/2	CW1/2 CT52	0.6	T52	2000	—	570	—	250
CW1*4	CW1 CT52	0.8	T52	1000	—	580	—	650
CW2*4	CW2 CT52	0.8	T52	1000	—	780	—	950
CW2*4	CW2 CT521	0.8	T521	1000	—	790	—	950
CW3*4	CW3 CT521	0.8	T521	500	—	740	—	1780
CW3*4	CW3 CT631	0.8	T631	500	—	750	—	1780
CW1S	CW1S CT52	0.6	T52	2000	—	570	—	250
CWFS23	CWFS23 CT52	0.8	T52	1000	—	780	—	950
CWFS23	CWFS23 CT521	0.8	T521	1000	—	790	—	950
CWFS35	CWFS35 CT521	0.8	T521	500	—	740	—	1780

□ T.C.R.

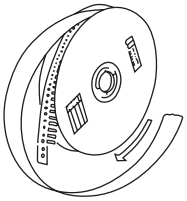
* 4 The same taping applicable also to CW-P, CW-X and CW-H

** ±0.1% and ±0.25% not available in reel packaging

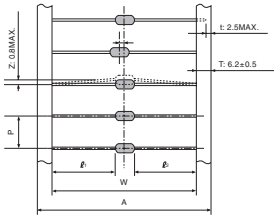
Packaging

(1) AMMO Pack (Symbol:A) Standard

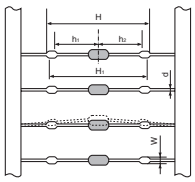
(2) Reel (Symbol: R)



T-Type



L-Type



T-Type

Packaging Style	Dimensions (mm)				
	W	P	A	$l l_1-l_2 l$	Accumulated Tolerance
T26*6	26 $^{+0.2}_{-0}$	5.00±0.3	39±1.0	0.2Max.*5	250.0±3mm/P×50
	26 $^{+1}_{-0}$	5.00±0.3	39±1.0	1.0Max.	100.0±2mm/P×20
T52*6	52±1	5.08±0.38	64.5±1.0	1.0Max.	101.6±2mm/P×20
T521	52±1	10.16±0.80	64.5±1.0	1.0Max.	203.2±3mm/P×20
T631	63±1	10.16±0.80	—	1.0Max.	203.2±3mm/P×20

*5 Applied to CFS1/4 (CFPS1/4) T26 Only

*6 Contact us for LP and SDT series

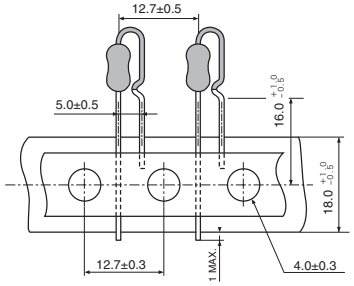
L-Type

Type		Dimensions (mm)			
		H±1	W	d	h_1, h_2
MOS*2	1 □L52 2 □L521 3 □L631	25.5 36.0 42.5	1.20~1.45	0.8 0.8 0.8	$l h_1-h_2 l \leq 1$
SPR*3	1/2□L52	26.0	1.17~1.40	0.65	
	1 □L52 2 □L521 3 □L631	25.5 36.0 42.5	1.20~1.45	0.8 0.8 0.8	
CFP	1/4□L52	H1: 24.5±1	1.17~1.4	0.65	
CFPB	1/2□L52	H1: 27.5±1		0.65	
CW	1/2□L52	26.0	1.05~1.35	0.6	
CW	1 □L52	27.5	1.20~1.40	0.8	

radial tapings

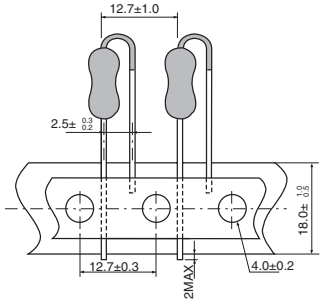
(mm)

VT



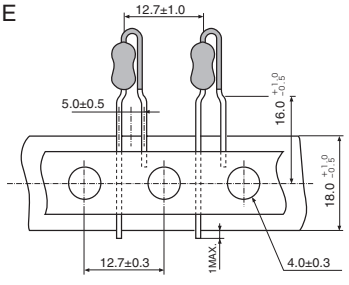
Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO
MFS1/2□CVT	0.6	2000	2500	750
MF1/4□CVT	0.6	2000	2500	750
RNS1/8□CVT	0.6	2000	2500	750
J1/4Z CVT*	0.6	2000	2500	670
CF1/4 CVT	0.6	2000	2500	720
CFS1/2 CVT	0.6	2000	2500	800
CFP1/4 CVT*	0.6	2000	2500	720
CFPS1/2 CVT*	0.6	2000	2500	800
RF25 CVT*	0.6	2000	2500	750

VT



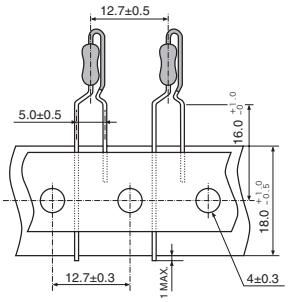
Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO
MFS1/4 □CVT	0.45	3000	3000	620
CFS1/4 CVT	0.45	3000	3000	720
SPR1/4 CVT*	0.45	3000	3000	720

VTE



Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO
MFS1/2□CVTE	0.6	2000	2500	750
MF1/4□CVTE	0.6	2000	2500	750
RNS1/8□CVTE	0.6	2000	2500	750
MOS1/2 CVTE	0.6	2500	2500	930
SPR1/2 CVTE	0.6	2500	2500	930
CF1/4 CVTE	0.6	2500	2500	900
CFS1/2 CVTE	0.6	2500	2500	1000
RF25 CVTE	0.6	2000	2500	750

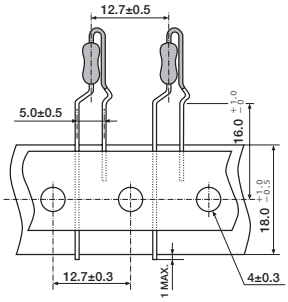
VTP



Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO
MOS1/2 CVTP	0.6	2000	2500	740
MOS1 CVTP	0.6	1500	—	1110
MOS2 CVTP	0.65	1000	—	1080
SPR1/2 CVTP	0.6	2000	2500	740
SPR1 CVTP	0.6	1000	—	740
SPR2 CVTP	0.65	1000	—	1080
MFS1/2□CVTP	0.6	2000	2500	750

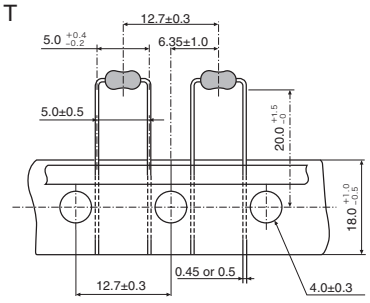
Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO
CW1/2 CVTP*	0.6	2000	—	750
CW1 CVTP*	0.8	1000	—	740
CW2 CVTP*	0.8	1000	—	1080
J1/4Z CVTP*	0.6	2000	2500	670
MF1/4 CVTP	0.6	2000	2500	750
RNS1/8 CVTP	0.6	2000	2500	750
CF1/4 CVTP	0.6	2000	2500	740
CFS1/2 CVTP	0.6	2000	2500	800
CFP1/4 CVTP	0.6	2000	2500	740
CFPS1/2 CVTP	0.6	2000	2500	800
RF25 CVTP	0.6	2000	2500	750
RCR75 CYVTP**	0.65	1000	—	1080

VTF



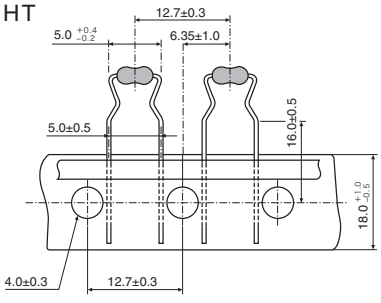
Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO
SPR2CVTF	0.8	1000	—	1080
MOS2CVTF	0.8	1000	—	1060

MT



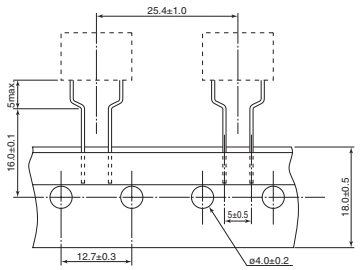
Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO
MFS1/4□CMT	0.45	3000	—	620
CFS1/4 CMT	0.45	3000	3000	630
CFPS1/4 CMT	0.45	3000	3000	630
J1/6Z CMT	0.5	2000	—	450

MHT



Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO
CFS1/4 CMHT	0.45	3000	—	630
CFPS1/4 CMHT	0.6	3000	—	720
RF16 CMHT	0.45	3000	—	240

FT



Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO
BPR26 CFT	0.6	500	—	790
BPR58 CFT	0.8	500	—	1940

□T.C.R. * The insulated coating on the lead wire is not available.

Also for MOSX, SPRX types, radial taping in the same shape as MOS, SPR types is applicable.

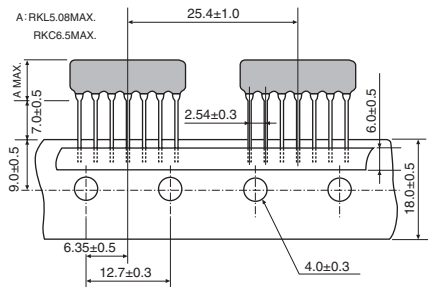
** Surge resistance is not guaranteed. Rating specifications are different. Please contact KOA for details.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 12/14/20

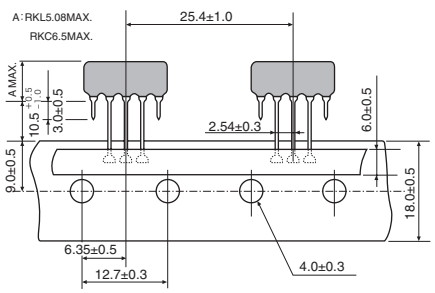
radial tapings

(mm)

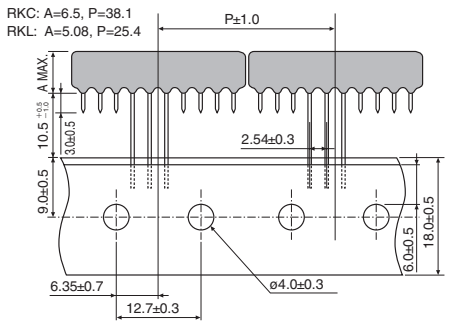
TBA (4pin-10pin)



TPA (4pin-9pin)



TUA (10pin)

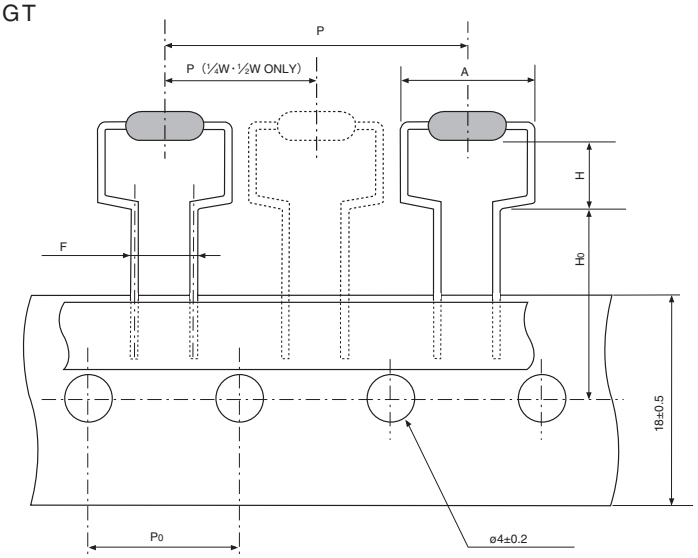


Radial Type Name	AMMO (pcs)	Weight g/AMMO
RKC TBA	1000	850(9Pin)
RKL TBA	1000	850(9Pin)

Radial Type Name	AMMO (pcs)	Weight g/AMMO
RKC TPA	1000	800(9Pin)
RKL TPA	1000	800(9Pin)

Radial Type Name	AMMO (pcs)	Weight g/AMMO
RKC TUA	1000	850(9Pin)
RKL TUA	1000	850(9Pin)

GT



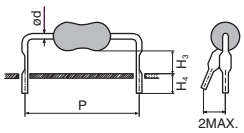
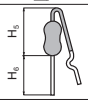
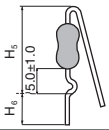
Radial Type Name	Radial Lead ød	AMMO (pcs)	Weight g/AMMO	F	P	P0	H	H0	AMax.
MOS1/2CGT	0.6	2000	740	5±0.5	12.7±1.0	12.7±0.3	$6.5^{+0.6}_{0}$	16±0.5	12
MOS1CGT	0.8	1000	730	$7.5^{+0.8}_{-0.2}$	30±1.0	15±0.3	$6.5^{+1.0}_{0}$	19±0.7	14.5
MOS1CGT4	0.8	1000	700				$4.0^{+1.0}_{0}$		
MOS2CGT	0.8	500	580				$7.5^{+1.0}_{0}$		17.5
MOS2CGT4	0.8	500	560				$4.0^{+1.0}_{0}$		
MOS3CGT	0.8	500	910				$8.5^{+1.0}_{0}$		21
MOS3CGTS[1]	0.8	500	910	7.5±0.5			5.5±1.0	19±1.0	
SPR1/2CGT	0.6	2000	740	5±0.5	12.7±1.0	12.7±0.3	$6.5^{+0.6}_{0}$	16±0.5	12
SPR1CGT	0.8	1000	770	$7.5^{+0.8}_{-0.2}$	30±1.0	15±0.3	$6.5^{+1.0}_{0}$	19±0.7	14.5
SPR2CGT	0.8	500	540				$7.5^{+1.0}_{0}$		17.5
SPR3CGT	0.8	500	910				$8.5^{+1.0}_{0}$		
CFP1/4CGT	0.65	2000	720	5±0.5	12.7±1.0	12.7±0.3	$6.5^{+0.6}_{0}$	16±0.5	12
CFPS1/2CGT	0.8	1500	600	5±0.5	12.7±1.0	12.7±0.3	$6.5^{+0.6}_{0}$	16±0.5	12
CW1HCGT	0.8	1000	920	$7.5^{+0.8}_{-0.2}$	30±1.0	15±0.3	$6.5^{+1.0}_{0}$	19±0.7	14.5
RF50CGT	0.8	1000	730						
RF1CGT	0.8	1000	770						
RF2CGT	0.8	500	1820				$8.5^{+1.0}_{0}$		21
CW2CGT	0.8	500	1080				$7.5^{+1.0}_{0}$		17.5
CW3CGT	0.8	500	1820				$8.5^{+1.0}_{0}$		21

□ T.C.R.

Also for MOSX, SPRX types, radial taping in the same shape as MOS, SPR types is applicable. [1]Sprocket hole position is different from above image. Please contact KOA.

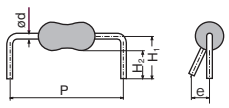
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/15/18

forming (not available taping)

Forming Style	Forming Type Name	Forming Dimension (mm)				Weight g/100pcs	Basic Unit (pcs)	Straight Type Name
		P±1	H3±1orH5	H4±1orH6	d			
L Forming 	CW1/2CL10A (CW1SCL10A)	10.0	5.3	4.5	0.6	24	2000	CW1/2 (CW1S)
	CW1CL12.5A (CW1PCL12.5A) (CW1HCL12.5A)	12.5	6.5	4.0	0.8	56	1000	CW1 (CW1P) (CW1H)
	CW1CL15A (CW1PCL15A) (CW1HCL15A)	15.0	5.3	4.5	0.8	56	1000	CW1 (CW1P) (CW1H)
	CW2CL15A (CW2PCL15A) (CW2HCL15A)	15.0	7.0	4.5	0.8	84	1000	CW2 (CW2P) (CW2H)
	CW2CL20A (CW2PCL20A) (CW2HCL20A)	20.0	8.0	4.5	0.8	84	1000	CW2 (CW2P) (CW2H)
	CW3CL20A (CW3PCL20A) (CW3HCL20A)	20.0	8.0	4.0	0.8	160	1000	CW3 (CW3P) (CW3H)
	CW3CL25A (CW3PCL25A) (CW3HCL25A)	25.0	7.0	4.5	0.8	160	1000	CW3 (CW3P) (CW3H)
	CW5CL30A	30.0	8.5	4.5	0.8	524	500	CW5
	CW5CL35A	35.0	5.5	4.5	0.8	524	500	CW5
	MOS1/2CL10A (MOSX1/2CL10A)	10.0	5.3±1.0	4.0±1.0	0.6	23	2000	MOS1/2 (MOSX1/2)
	MOS1CL12.5A (MOSX1CL12.5A)	12.5	7.0±1.0	4.0±1.0	0.8	31	2000	MOS1 (MOSX1)
	MOS1CL15A (MOSX1CL15A)	15.0	6.5±1.0	4.0±1.0	0.8	31	2000	MOS1 (MOSX1)
	MOS2CL15A (MOSX2CL15A)	15.0	7.0±1.0	4.0±1.0	0.8	71	2000	MOS2 (MOSX2)
	MOS2CL15F (MOSX2CL15F)	15.0	4.5±1.0	4.0±1.0	0.8	71	2000	MOS2 (MOSX2)
	MOS2CL20A (MOSX2CL20A)	20.0	9.0±1.0	4.0±1.0	0.8	71	2000	MOS2 (MOSX2)
	MOS2CL20D (MOSX2CL20D)	20.0	4.8±1.0	4.0±1.0	0.8	71	2000	MOS2 (MOSX2)
	MOS3CL20A (MOSX3CL20A)	20.0	8.0±1.0	4.0±1.0	0.8	130	1000	MOS3 (MOSX3)
	MOS3CL20C (MOSX3CL20C)	20.0	10.0±1.0	4.0±1.0	0.8	130	1000	MOS3 (MOSX3)
	MOS3CL20T (MOSX3CL20T)	20.0	4.0±1.0	4.0±1.0	0.8	130	1000	MOS3 (MOSX3)
	MOS3CL25A (MOSX3CL25A)	25.0	7.0±1.0	4.0±1.0	0.8	130	1000	MOS3 (MOSX3)
	MOS3CL30A (MOSX3CL30A)	30.0	7.0±1.0	4.0±1.0	0.8	130	1000	MOS3 (MOSX3)
	MOS5CL30A (MOSX5CL30A)	30.0	8.5±1.0	4.0±1.0	0.8	524	500	MOS5 (MOSX5)
	MOS5CL35A (MOSX5CL35A)	35.0	5.5±1.0	4.0±1.0	0.8	524	500	MOS5 (MOSX5)
	SPR1/2CL10A (SPRX1/2CL10A)	10.0	5.3	4.0	0.6	23	2000	SPR1/2 (SPRX1/2)
	SPR1CL12.5A (SPRX1CL12.5A)	12.5	6.5	4.0	0.8	54	2000	SPR1 (SPRX1)
	SPR1CL15A (SPRX1CL15A)	15.0	5.3	4.0	0.8	54	2000	SPR1 (SPRX1)
	SPR2CL15A (SPRX2CL15A)	15.0	7.0	4.0	0.8	71	2000	SPR2 (SPRX2)
	SPR2CL20A (SPRX2CL20A)	20.0	9.0	4.0	0.8	71	2000	SPR2 (SPRX2)
	SPR3CL20A (SPRX3CL20A)	20.0	8.0	4.0	0.8	141	1000	SPR3 (SPRX3)
	SPR3CL25A (SPRX3CL25A)	25.0	7.0	4.0	0.8	141	1000	SPR3 (SPRX3)
	SPR5CL30A (SPRX5CL30A)	30.0	8.5	4.0	0.8	456	500	SPR5 (SPRX5)
	SPR5CL35A (SPRX5CL35A)	35.0	5.5	4.0	0.8	456	500	SPR5 (SPRX5)
	RCR50(+)CL15A	15.0	5.3	4.5	0.7	34	2000	RCR50 (+)
	RCR50ENCL15A	15.0	5.3	4.5	0.7	34	2000	RCR50EN
	RCR60CL15A	15.0	5.3	4.5	0.7	34	2000	RCR60
	RCR75CL15A	15.0	7.0	4.5	0.8	69	2000	RCR75
	RCR100CL20A	20.0	8.0	4.0	0.8	142	1000	RCR100
	RCR100CL25A	25.0	7.0	4.0	0.8	142	1000	RCR100
	RK1/4□CL10A	10.0	5.3	4.5	0.6	23	1000	RK1/4
	RK1□CL20A	20.0	8.8	4.5	0.8	146	1000	RK1
	CFP1/4CL10A	10.0	6.5	4.5	0.65	23	1000	CFP1/4
	CFPB1/2CL12.5A	12.5	6.5	4.5	0.65	44	1000	CFPB1/2
	RF25CL10A	10.0	5.35	5.0	0.6	23	2000	RF25
	RF50CL12.5A	12.5	6.0	5.2	0.6	29	2000	RF50
	RF50CL15A	15.0	6.0	5.3	0.6	29	2000	RF50
	RF1CL12.5A	12.5	6.5	4.8	0.8	46	2000	RF1
	RF1CL15A	15.0	5.3	4.5	0.8	46	2000	RF1
	RF1CL20A	20.0	5.3	4.5	0.8	46	2000	RF1
	RF2CL20A	20.0	8.0	5.0	0.8	141	1000	RF2
	RF2CL25A	25.0	7.0	4.5	0.8	141	1000	RF2
U Forming 	MFS1/4□CU	–	5.5Max.	15.0±1.0	0.45	14	2000	MFS1/4
	CFS1/4CU	–	5.5Max.	15.0±1.0	0.45	12	2000	CFS1/4
U Forming 	MF1/4□CU	–	9.5Max.	28.0±3.0	0.6	23	2000	MF1/4
	RK1/4□CU	–	9.5Max.	30.0±3.0	0.6	23	1000	RK1/4
	CF1/4CUCL	–	10.0Max.	10.0±1.0	0.6	23	1000	CF1/4
	CFS1/2CU	–	9.5Max.	30.0±3.0	0.6	44	1000	CFS1/2
U Forming 	MOS1CU (MOSX1CU)	–	21.0Max.	15.0Min.	0.8	55	1000	MOS1 (MOSX1)
	MOS2CU (MOSX2CU)	–	23.5Max.	15.0Min.	0.8	85	1000	MOS2 (MOSX2)
	MOS3CU (MOSX3CU)	–	26.0Max.	15.0Min.	0.8	150	1000	MOS3 (MOSX3)
	SPR1CU (SPRX1CU)	–	21.0Max.	15.0Min.	0.8	54	1000	SPR1 (SPRX1)
	SPR2CU (SPRX2CU)	–	23.5Max.	15.0Min.	0.8	93	1000	SPR2 (SPRX2)
	SPR3CU (SPRX3CU)	–	26.0Max.	15.0Min.	0.8	141	1000	SPR3 (SPRX3)
UCL Forming 	MOS1CUCL (MOSX1CUCL)	–	13.0±1.0	3.5+1.0	0.8	30	1000	MOS (X)1
	MOS2CUCL (MOSX2CUCL)	–	14.5±1.0	3.5±1.0	0.8	60	1000	MOS (X)2
	MOS3CUCL (MOSX3CUCL)	–	20.0Max.	4.0±1.0	0.8	130	1000	MOS (X)3

□ T.C.R.

forming (not available taping)

Forming Style	Forming Type Name	Forming Dimension (mm)					Weight g/100pcs	Basic Unit (pcs)	Straight Type Name
		P±1	H1	H2	e Max.	d			
M Forming 	MFS1/4□CM5F	5.0	–	5.0±1.0	2.0	0.45	14	2000	MFS1/4
	MFS1/4□CM5R	5.0	10.0±1.0	–	2.0	0.45	14	2000	MFS1/4
	MFS1/4□CM5W	5.0	–	15.0	2.0	0.45	14	1000	MFS1/4
	MFS1/2□CM10R	10.0	10.0±1.0	–	2.0	0.6	23	2000	MFS1/2
	MF1/4□CM10F	10.0	–	5.0±1.0	2.0	0.6	23	2000	MF1/4
	MF1/4□CM12.5R	12.5	10.0±1.0	–	2.0	0.6	23	2000	MF1/4
	MF1/2□CM12.5R	12.5	10.0±1.0	–	2.0	0.6	41	1000	MF1/2
	MF1/2□CM15R	15.0	10.0±1.0	–	2.0	0.6	41	1000	MF1/2
	SNF 2CCM5F	5.0	–	5.0±1.0	1.5	0.45	14	2000	SNF 2C
	SNF 2ECM10F	10.0	–	5.0±1.0	1.7	0.6	24	2000	SNF 2E
	SNF 2ECM12.5R	12.5	10.0±1.0	–	1.7	0.6	24	2000	SNF 2E
	SNF 2HCM12.5K	12.5	7.0±1.0	–	2.0	0.7	41	2000	SNF 2H
	SNF 2HCM15K	15.0	7.0±1.0	–	2.0	0.7	41	2000	SNF 2H
	RCR16CM5F	5.0	–	5.0±1.0	2.0	0.45	14	2000	RCR16
	RCR25CM10F	10.0	–	5.0±1.0	2.0	0.6	23	2000	RCR25
	RCR25ENCM10F	10.0	–	5.0±1.0	2.0	0.6	23	2000	RCR25EN
	RCR50(+)CM15F	15.0	–	5.0±1.0	2.0	0.7	40	2000	RCR50
	RCR50CM15F	15.0	–	5.0±1.0	2.0	0.7	40	2000	RCR50+
	RCR60CM15F	15.0	–	5.0±1.0	2.0	0.7	40	2000	RCR60
	RCR100CM20E	20.0	–	4.6±1.0	2.0	0.8	120	1000	RCR100
	RK1/4□CM10F	10.0	–	5.0±1.0	1.7	0.6	21	1000	RK1/4
	RK1/4□CM10R	10.0	–	10.0±1.0	1.7	0.6	21	1000	RK1/4
	RK1/4□CM12.5R	12.5	–	10.0±1.0	1.7	0.6	23	1000	RK1/4
	RK1/2□CM15F	15.0	–	5.0±1.0	2.0	0.6	40	1000	RK1/2
	RK1/2□CM12.5F	12.5	–	5.0±1.0	2.0	0.6	37	1000	RK1/2
	RK1/2□CM15R	15.0	–	10.0±1.0	2.0	0.6	37	1000	RK1/2
	CFS1/4CM5F	5.0	5.9±1.0	5.0±1.0	1.5	0.45	12	2000	CFS1/4
	CF1/4CM10H	10.0	6.0±1.0	4.8±1.0	1.7	0.6	23	1000	CF1/4
	CF1/4CM12.5H	12.5	6.0±1.0	4.8±1.0	1.7	0.6	23	2000	CF1/4
	CFB1/2CM12.5K	12.5	7.0±1.0	5.0±1.0	1.7	0.7	44	1000	CFB1/2
	CFS1/2CM10H	10.0	6.0±1.0	4.8±1.0	1.7	0.6	26	1000	CFS1/2
	CFPS1/4CM5F	5.0	5.9±1.0	5.0±1.0	1.5	0.45	12	2000	CFPS1/4
	CFP1/4CM10H	10.0	6.0±1.0	4.8±1.0	1.7	0.6	23	1000	CFP1/4
	CFPB1/2CM12.5K	12.5	7.0±1.0	5.0±1.0	2.0	0.7	44	1000	CFB1/2
	J1/6ZCM7.5H	7.5	–	$5.0^{+2.0}_{-0}$	1.5	0.5	5	1000	J1/6Z
	J1/4ZCM10H	10.0	–	$5.0^{+2.0}_{-0}$	1.5	0.6	9	1000	J1/4Z
	RF16CM5F	5.0	–	5.0±1.0	2.0	0.45	12	2000	RF16
	RF25CM10X	10.0	16.0±1.0	14.8±1.0	1.5	0.6	23	2000	RF25
	RF50CM12.5E	12.5	–	4.5±1.0	1.5	0.6	29	1000	RF50
	RF1CM15F	15.0	–	5.0±1.0	1.5	0.8	46	2000	RF1
	MO1/2CM15F (MOX1/2CM15F)	15.0	–	5.0±1.0	2.0	0.7	40	2000	MO1/2 (MOX1/2)
	MO1CM15S (MOX1CM15S)	15.0	–	11.5±1.5	2.0	0.8	75	2000	MO1 (MOX1)
	MO2CM20E (MOX2CM20E)	20.0	–	4.6±1.0	2.0	0.8	120	1000	MO2 (MO2)
	MO2CM25C (MOX2CM25C)	25.0	–	3.5±1.0	2.0	0.8	120	1000	MO2 (MOX2)
	MOS1/2CM10C (MOSX1/2CM10C)	10.0	–	3.5±1.0	2.0	0.6	23	2000	MOS (X) 1/2
	MOS1/2CM10F (MOSX1/2CM10F)	10.0	–	5.0±1.0	2.0	0.6	23	2000	MOS (X) 1/2
	MOS1CM12.5C (MOSX1CM12.5C)	12.5	–	3.5±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM12.5D (MOSX1CM12.5D)	12.5	–	4.0±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM15F (MOSX1CM15F)	15.0	–	5.0±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM15J (MOSX1CM15J)	15.0	–	6.3±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM15S (MOSX1CM15S)	15.0	–	11.0±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS2CM15C (MOSX2CM15C)	15.0	–	3.5±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM15E (MOSX2CM15E)	15.0	–	4.5±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM20D (MOSX2CM20D)	20.0	–	4.0±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM20U (MOSX2CM20U)	20.0	–	13.5±1.5	2.0	0.8	71	2000	MOS (X) 2
	MOS3CM20E (MOSX3CM20E)	20.0	–	4.6±1.0	2.0	0.8	120	1000	MOS (X) 3
	MOS3CM26E (MOSX3CM26E)	26.0	–	4.7±1.0	2.0	0.8	120	1000	MOS (X) 3
	MOS5CM30U (MOSX5CM30U)	30.0	–	13.0±1.0	2.0	0.8	456	500	MOS (X) 5
	SPR1/2CM10F (SPRX1/2CM10F)	10.0	–	5.0±1.0	2.0	0.6	23	2000	SPR1/2
	SPR1CM12.5D (SPRX1CM12.5D)	12.5	–	4.0±1.0	2.0	0.8	44	2000	SPR1
	SPR1CM15F (SPRX1CM15F)	15.0	–	5.0±1.0	2.0	0.8	44	2000	SPR1
	SPR2CM15E (SPRX2CM15E)	15.0	–	4.5±1.0	2.0	0.8	71	2000	SPR2
	SPR3CM20E (SPRX3CM20E)	20.0	–	4.6±1.0	2.0	0.8	120	1000	SPR3

□ T.C.R.

minimum ordered quantity

Chip Components

Type		Basic Unit/Bag	Quantity /Box	Taping
RK73B, RK73H	1F~W3A2	1,000	—	O
RK73G	1H~2B	1,000	—	O
RK73Z	1F~W3A	1,000	—	O
RS73	1J~2B	1,000	—	O
RN73R, RN73H	1E~2E	200	—	O
WK73, WU73 WG73	1E~3A3	1,000	—	O
XR73	1H, 1E	1,000	—	O
SR73	1H~W3A2	1,000	—	O
UR73, UR73D, UR73V, UR73VD	1E~3A	1,000	—	O
HV73	1J~3A	1,000	—	O
SG73,SG73P, SG73S, SG73G	1E~W3A	1,000	—	O
SLR	1	100	—	O
MWS	5	—	1,500	O
PSF, PSJ, PSG, PSL		100	—	O
TLR, TLRH	1J, 2A, 2BP, 2B, 2H, 3AW, 2BW, 2HW, 3AP, 3APS	100	—	O
SL, SLN	07, 1, 2, W07, W1, 3, 5	100	—	O
TSL	1	100	—	O
CSR	1, 2	100	—	O
BLR	1L, 2L, 3L	100	100	O
LR72	A, B, C	100	100	O
RD41	2ES	2,000	40,000	O
	2E	2,000	10,000	O
RN41	2ES	2,000	40,000	O
	3AS	2,000	10,000	O
CC	12M	2,000	40,000	O
	25	2,000	10,000	O
CPCN	1/2	1,000	10,000	—
	1, 2N, 2NS	1,000	5,000	—
	3	500	2,000	—
RF73	1J~3A	200	—	O
NT73	1J~2B	200	—	O
LT73, LT73V	2A, 2B	200	—	O
LP73	1J	1,000	—	O
	2A, 2B	500	—	O
SDT73H/V/S	2B	100	—	O
CNN	2A	100	—	O
KQC	0402, 0603	200	—	O
KQT	0402	200	—	O
KQ	0603, 0805, 1008	200	—	O
LPC	4545, 4235	100	—	O
	4045	100	—	O
TF	10B,16S, 16A,16VN	100	—	O
CCF	1N, 1F	100	—	O
NV73	1H • 1E	—	—	O
NV73, NV73DL	1J~2L	1,000	—	O
NV73DS	2L	500	—	O
RCU		100	—	O
RCT		100	—	O
RCS		100	—	O
RCW		100	—	O

Discrete Components

Type		Basic Unit/Bag	Taping
CF (CFP)	S1/4	2,000	O
	1/4, B1/2, S1/2	1,000	O
MF (MFP)	S1/4	2,000	O
	S1/2, 1/4, 1/2	1,000	O
SN	3A	1,000	—
	3D	500	—
SNF	2C	2,000	O
	2E, 2H	1,000	O
RNS	1/8~1	100	O
RK	1/4~1	1,000	O
RCR	16, 25	2,000	O
	50, 50+, 60, 75	2,000	O
	100	1,000	O
HPC	1/2	3,000	O
	1	1,000	O
	2, 3	1,000	—
	4, 5	500	—
PCF	1/2	2,000	O
	1	1,000	O
	2	500	O
RF	16~1	2,000	O
	2	1,000	O
RF25CC		2,000	O
MOS (MOSX)	1/2~2	2,000	O
	3, 1U, 2U	1,000	O
	5	500	—
SPR (SPRX)	1/4	2,000	O
	1/2~2	2,000	O
	3, 1U, 2U	1,000	O
	5	500	—
CW	1/2~3	1,000	O
	5	500	—
BPR	26, 28	1,000 (1,000)	O
	38	1,000 (1,000)	—
	58	500 (1,000)	O
	108, 55, 77	400 (400)	—
LR	6~29	1,000	—
BGR, BWR, BSR	2N, 3N, 5N	(1500)	—
	7N	(700)	—
	10N	(600)	—
	5E, 5P	500	—
BGR, BWR, BSR (Straight type)	1	500	—
	2, 3	(1000)	—
	5	(700)	—
	7, 10	(500)	—
	15	(320)	—
	20	(300)	—
BGR, BSR (Lug terminal*)	15, 20	500	—
	10~20HA, 10~20QA	400	—
	30	180	—
	40	150	—
	30HA, 30QA	180	—
	40HA, 40QA	144	—
BWRV, BSRV	3N, 5N	(1500)	—
	7N	(700)	—
	10N	(600)	—

Please refer to product pages for taping quantities.

Discrete Components (continued)

Type		Basic Unit/Bag	Taping
BWRV, BSRV (Straight type)	3	(1000)	—
	5	(700)	—
	7, 10	(500)	—
	15	(320)	—
	20	(300)	—
BGRV, BSRV (Lug terminal*)	15, 20	500	—
	10~20QA	400	—
	30, 40	150	—
	30~40QA	90	—
BWRV (Lug terminal)	40	135	—
Z	16	2,000	O
	25	1,000	O
J1/6Z, J1/4Z		1,000	O
JLT		—	O
RK92	4L, 5L, 6L 3C, 4C, 5C	1,000	—
	6C, 7C, 8C, 9C, 11X, 18X	1,000	—
	18D	500	—
RK92-L		300	—
RK92D		1,000	—
RKL, RKC	3pin	1,000	—
	4~5pin	1,000	O
	6~9pin	1,000	O
	10pin	1,000	—
	11~17pin	1,000	—
RKH	4~8pin	1,000	—
	9pin	1,000	—
	10~13pin	1,000	—

( ) is flat container

* Please contact us for other lug terminals.

Type		Basic Unit/Bag	Quantity /Box	Taping
MRS	1/8~1/3	100	5,000	—
GS	1/4	500	500	*3
	1/2	200	200	*3
	1	150	150	—
	2, 5	40	40	—
	3	30	30	—
	7, 10, 12	20	20	—
LP	1/16	100	100	O
	1/8	100	100	O
SDT101	A	100	100	O
	B	100	100	—
SDT101S	A	100	—	—
SDT310		100	—	—
PSN•PV•PSO•PN•PWW•PAP		1	—	—
AFS		1	—	—
RW	1/2	20	1000	—
	1	20	1000	—
	2~7	20	500	—
	10	20	300	—
CR		100	1000	—
MRP	3 pin	100	3000	—

Please refer to product pages for taping quantities.

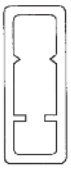
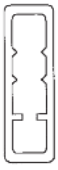
*1 Custom taping for GS1/4, GS1/2 are available on request.

Stick Packaging

Type		Basic Unit/Stick		Stick/Box
RKC		(STB)	(STP)	(STB) & (STP)
	4Pin	54	46	50
	5Pin	42	37	50
	6Pin	34	31	50
	7Pin	30	27	50
	8Pin	26	23	50
	9Pin	23	21	50
	10Pin	21	19	50
	11Pin	19	17	50
	12Pin	18	15	50
	13Pin	16	14	50
	14Pin	15	13	50
RKL		(STB)	(STP)	(STB) & (STP)
	4Pin	55	48	50
	5Pin	44	38	50
	6Pin	37	32	50
	7Pin	31	27	50
	8Pin	27	24	50
	9Pin	24	21	50
	10Pin	22	19	50
	11Pin	20	17	50
	12Pin	18	16	50

The minimum packaging unit is 50 times of the stick basic unit.

Stick (Magazine) Case

Type	Resistor Networks	
	RKL RKC	RKL RKC
Magazine Symbol	STP	STB
Sectional View		
W x H x L (mm)	5.0 x $\frac{11.0}{12.5}$ x 508	3.8 x 13.4 x 580
Quanity (pcs)	13~46	15~54
Weight (g)	30	30

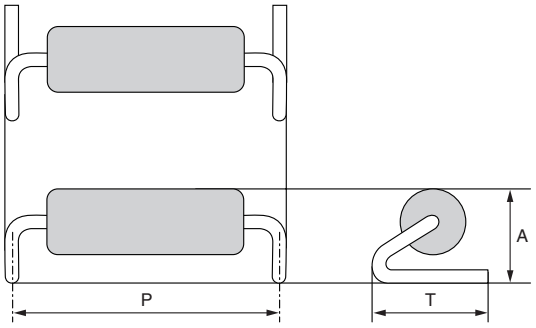
1/27/22

surface mounted device style lead forming

Ratings

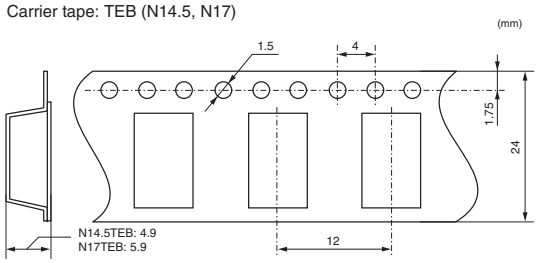
Type	Forming Type Name	Carrier Type	Forming Dimensions (mm)				Quantity/ Reel (pcs)	Weight (g)	
			P	T	A	d		Reel	NET/1000pcs
MOS (X) 1C	N14.5	TEB	14.5 ± 1	5.0 ± 0.5	4.8 ± 0.5	0.8	1000	700	350
MOS (X) 2C SPR(X) 2C RCR75C CW2C	N17	TEB	17.0 ± 1	6.0 ± 0.5	5.8 ± 0.5	0.8	1000	900	600
MOS (X) 3 SPR(X) 3 RCR100 CW3C	N20	TEG	20.0 ± 1	7.5 ± 1	6.5 ± 0.5	0.8	900	1,800	1,400

Forming Style

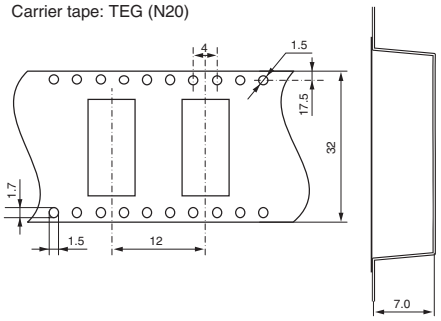


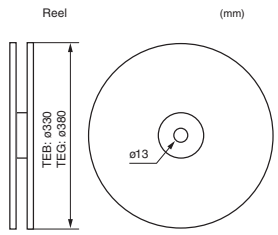
Packaging Specifications

Carrier tape: TEB (N14.5, N17)



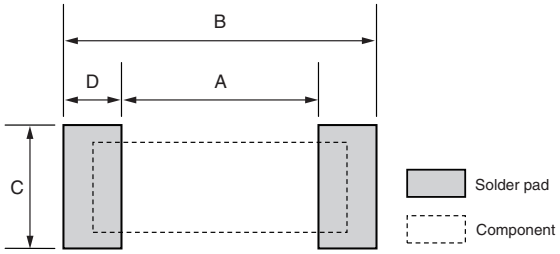
Carrier tape: TEG (N20)





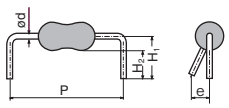
Recommended Pad Dimensions

Type	Forming Type Name	Forming Dimensions (mm)			
		A	B	C	D
MOS (X) 1C	N14.5TEB	12.5	16.5	7.0	2.0
MOS (X) 2C SPR(X) 2C RCR75C CW2C	N17TEB	14.6	19.4	8.0	2.4
MOS (X) 3 SPR(X) 3 RCR100 CW3C	N20TEG	17.6	22.4	9.5	2.4



• Need a dedicated nozzle for automatic mounting. Please ask us before use.

forming (not available taping)

Forming Style	Forming Type Name	Forming Dimension (mm)					Weight g/100pcs	Basic Unit (pcs)	Straight Type Name
		P±1	H1	H2	e Max.	d			
M Forming 	MFS1/4□CM5F	5.0	–	5.0±1.0	2.0	0.45	14	2000	MFS1/4
	MFS1/4□CM5R	5.0	10.0±1.0	–	2.0	0.45	14	2000	MFS1/4
	MFS1/4□CM5W	5.0	–	15.0	2.0	0.45	14	1000	MFS1/4
	MFS1/2□CM10R	10.0	10.0±1.0	–	2.0	0.6	23	2000	MFS1/2
	MF1/4□CM10F	10.0	–	5.0±1.0	2.0	0.6	23	2000	MF1/4
	MF1/4□CM12.5R	12.5	10.0±1.0	–	2.0	0.6	23	2000	MF1/4
	MF1/2□CM12.5R	12.5	10.0±1.0	–	2.0	0.6	41	1000	MF1/2
	MF1/2□CM15R	15.0	10.0±1.0	–	2.0	0.6	41	1000	MF1/2
	SNF 2CCM5F	5.0	–	5.0±1.0	1.5	0.45	14	2000	SNF 2C
	SNF 2ECM10F	10.0	–	5.0±1.0	1.7	0.6	24	2000	SNF 2E
	SNF 2ECM12.5R	12.5	10.0±1.0	–	1.7	0.6	24	2000	SNF 2E
	SNF 2HCM12.5K	12.5	7.0±1.0	–	2.0	0.7	41	2000	SNF 2H
	SNF 2HCM15K	15.0	7.0±1.0	–	2.0	0.7	41	2000	SNF 2H
	RCR16CM5F	5.0	–	5.0±1.0	2.0	0.45	14	2000	RCR16
	RCR25CM10F	10.0	–	5.0±1.0	2.0	0.6	23	2000	RCR25
	RCR25ENCM10F	10.0	–	5.0±1.0	2.0	0.6	23	2000	RCR25EN
	RCR50(+)CM15F	15.0	–	5.0±1.0	2.0	0.7	40	2000	RCR50
	RCR50CM15F	15.0	–	5.0±1.0	2.0	0.7	40	2000	RCR50+
	RCR60CM15F	15.0	–	5.0±1.0	2.0	0.7	40	2000	RCR60
	RCR100CM20E	20.0	–	4.6±1.0	2.0	0.8	120	1000	RCR100
	RK1/4□CM10F	10.0	–	5.0±1.0	1.7	0.6	21	1000	RK1/4
	RK1/4□CM10R	10.0	–	10.0±1.0	1.7	0.6	21	1000	RK1/4
	RK1/4□CM12.5R	12.5	–	10.0±1.0	1.7	0.6	23	1000	RK1/4
	RK1/2□CM15F	15.0	–	5.0±1.0	2.0	0.6	40	1000	RK1/2
	RK1/2□CM12.5F	12.5	–	5.0±1.0	2.0	0.6	37	1000	RK1/2
	RK1/2□CM15R	15.0	–	10.0±1.0	2.0	0.6	37	1000	RK1/2
	CFS1/4CM5F	5.0	5.9±1.0	5.0±1.0	1.5	0.45	12	2000	CFS1/4
	CF1/4CM10H	10.0	6.0±1.0	4.8±1.0	1.7	0.6	23	1000	CF1/4
	CF1/4CM12.5H	12.5	6.0±1.0	4.8±1.0	1.7	0.6	23	2000	CF1/4
	CFB1/2CM12.5K	12.5	7.0±1.0	5.0±1.0	1.7	0.7	44	1000	CFB1/2
	CFS1/2CM10H	10.0	6.0±1.0	4.8±1.0	1.7	0.6	26	1000	CFS1/2
	CFPS1/4CM5F	5.0	5.9±1.0	5.0±1.0	1.5	0.45	12	2000	CFPS1/4
	CFP1/4CM10H	10.0	6.0±1.0	4.8±1.0	1.7	0.6	23	1000	CFP1/4
	CFPB1/2CM12.5K	12.5	7.0±1.0	5.0±1.0	2.0	0.7	44	1000	CFB1/2
	J1/6ZCM7.5H	7.5	–	$5.0^{+2.0}_{-0}$	1.5	0.5	5	1000	J1/6Z
	J1/4ZCM10H	10.0	–	$5.0^{+2.0}_{-0}$	1.5	0.6	9	1000	J1/4Z
	RF16CM5F	5.0	–	5.0±1.0	2.0	0.45	12	2000	RF16
	RF25CM10X	10.0	16.0±1.0	14.8±1.0	1.5	0.6	23	2000	RF25
	RF50CM12.5E	12.5	–	4.5±1.0	1.5	0.6	29	1000	RF50
	RF1CM15F	15.0	–	5.0±1.0	1.5	0.8	46	2000	RF1
	MO1/2CM15F (MOX1/2CM15F)	15.0	–	5.0±1.0	2.0	0.7	40	2000	MO1/2 (MOX1/2)
	MO1CM15S (MOX1CM15S)	15.0	–	11.5±1.5	2.0	0.8	75	2000	MO1 (MOX1)
	MO2CM20E (MOX2CM20E)	20.0	–	4.6±1.0	2.0	0.8	120	1000	MO2 (MO2)
	MO2CM25C (MOX2CM25C)	25.0	–	3.5±1.0	2.0	0.8	120	1000	MO2 (MOX2)
	MOS1/2CM10C (MOSX1/2CM10C)	10.0	–	3.5±1.0	2.0	0.6	23	2000	MOS (X) 1/2
	MOS1/2CM10F (MOSX1/2CM10F)	10.0	–	5.0±1.0	2.0	0.6	23	2000	MOS (X) 1/2
	MOS1CM12.5C (MOSX1CM12.5C)	12.5	–	3.5±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM12.5D (MOSX1CM12.5D)	12.5	–	4.0±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM15F (MOSX1CM15F)	15.0	–	5.0±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM15J (MOSX1CM15J)	15.0	–	6.3±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM15S (MOSX1CM15S)	15.0	–	11.0±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS2CM15C (MOSX2CM15C)	15.0	–	3.5±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM15E (MOSX2CM15E)	15.0	–	4.5±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM20D (MOSX2CM20D)	20.0	–	4.0±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM20U (MOSX2CM20U)	20.0	–	13.5±1.5	2.0	0.8	71	2000	MOS (X) 2
	MOS3CM20E (MOSX3CM20E)	20.0	–	4.6±1.0	2.0	0.8	120	1000	MOS (X) 3
	MOS3CM26E (MOSX3CM26E)	26.0	–	4.7±1.0	2.0	0.8	120	1000	MOS (X) 3
	MOS5CM30U (MOSX5CM30U)	30.0	–	13.0±1.0	2.0	0.8	456	500	MOS (X) 5
	SPR1/2CM10F (SPRX1/2CM10F)	10.0	–	5.0±1.0	2.0	0.6	23	2000	SPR1/2
	SPR1CM12.5D (SPRX1CM12.5D)	12.5	–	4.0±1.0	2.0	0.8	44	2000	SPR1
	SPR1CM15F (SPRX1CM15F)	15.0	–	5.0±1.0	2.0	0.8	44	2000	SPR1
	SPR2CM15E (SPRX2CM15E)	15.0	–	4.5±1.0	2.0	0.8	71	2000	SPR2
	SPR3CM20E (SPRX3CM20E)	20.0	–	4.6±1.0	2.0	0.8	120	1000	SPR3

□ T.C.R.

minimum ordered quantity

Chip Components

Type		Basic Unit/Bag	Quantity /Box	Taping
RK73B, RK73H	1F~W3A2	1,000	—	O
RK73G	1H~2B	1,000	—	O
RK73Z	1F~W3A	1,000	—	O
RS73	1J~2B	1,000	—	O
RN73R, RN73H	1E~2E	200	—	O
WK73, WU73 WG73	1E~3A3	1,000	—	O
XR73	1H, 1E	1,000	—	O
SR73	1H~W3A2	1,000	—	O
UR73, UR73D, UR73V, UR73VD	1E~3A	1,000	—	O
HV73	1J~3A	1,000	—	O
SG73,SG73P, SG73S, SG73G	1E~W3A	1,000	—	O
SLR	1	100	—	O
MWS	5	—	1,500	O
PSF, PSJ, PSG, PSL		100	—	O
TLR, TLRH	1J, 2A, 2BP, 2B, 2H, 3AW, 2BW, 2HW, 3AP, 3APS	100	—	O
SL, SLN	07, 1, 2, W07, W1, 3, 5	100	—	O
TSL	1	100	—	O
CSR	1, 2	100	—	O
BLR	1L, 2L, 3L	100	100	O
LR72	A, B, C	100	100	O
RD41	2ES	2,000	40,000	O
	2E	2,000	10,000	O
RN41	2ES	2,000	40,000	O
	3AS	2,000	10,000	O
CC	12M	2,000	40,000	O
	25	2,000	10,000	O
CPCN	1/2	1,000	10,000	—
	1, 2N, 2NS	1,000	5,000	—
	3	500	2,000	—
RF73	1J~3A	200	—	O
NT73	1J~2B	200	—	O
LT73, LT73V	2A, 2B	200	—	O
LP73	1J	1,000	—	O
	2A, 2B	500	—	O
SDT73H/V/S	2B	100	—	O
CNN	2A	100	—	O
KQC	0402, 0603	200	—	O
KQT	0402	200	—	O
KQ	0603, 0805, 1008	200	—	O
LPC	4545, 4235	100	—	O
	4045	100	—	O
TF	10B,16S, 16A,16VN	100	—	O
CCP	2B, 2E	100	—	O
CCF	1N, 1F	100	—	O
NV73	1H • 1E	—	—	O
NV73, NV73DL	1J~2L	1,000	—	O
NV73DS	2L	500	—	O
RCU		100	—	O
RCT		100	—	O
RCS		100	—	O
RCW		100	—	O

Discrete Components

Type		Basic Unit/Bag	Taping
CF (CFP)	S1/4	2,000	O
	1/4, B1/2, S1/2	1,000	O
MF (MFP)	S1/4	2,000	O
	S1/2, 1/4, 1/2	1,000	O
SN	3A	1,000	—
	3D	500	—
SNF	2C	2,000	O
	2E, 2H	1,000	O
RNS	1/8~1	100	O
RK	1/4~1	1,000	O
RCR	16, 25	2,000	O
	50, 50+, 60, 75	2,000	O
	100	1,000	O
HPC	1/2	3,000	O
	1	1,000	O
	2, 3	1,000	—
	4, 5	500	—
PCF	1/2	2,000	O
	1	1,000	O
	2	500	O
RF	16~1	2,000	O
	2	1,000	O
RF25CC		2,000	O
MOS (MOSX)	1/2~2	2,000	O
	3, 1U, 2U	1,000	O
	5	500	—
SPR (SPRX)	1/4	2,000	O
	1/2~2	2,000	O
	3, 1U, 2U	1,000	O
	5	500	—
CW	1/2~3	1,000	O
	5	500	—
BPR	26, 28	1,000 (1,000)	O
	38	1,000 (1,000)	—
	58	500 (1,000)	O
	108, 55, 77	400 (400)	—
LR	6~29	1,000	—
BGR, BWR, BSR	2N, 3N, 5N	(1500)	—
	7N	(700)	—
	10N	(600)	—
	5E, 5P	500	—
BGR, BWR, BSR (Straight type)	1	500	—
	2, 3	(1000)	—
	5	(700)	—
	7, 10	(500)	—
	15	(320)	—
	20	(300)	—
BGR, BSR (Lug terminal*)	15, 20	500	—
	10~20HA, 10~20QA	400	—
	30	180	—
	40	150	—
	30HA, 30QA	180	—
	40HA, 40QA	144	—
BWRV, BSRV	3N, 5N	(1500)	—
	7N	(700)	—
	10N	(600)	—

Please refer to product pages for taping quantities.

Discrete Components (continued)

Type		Basic Unit/Bag	Taping
BWRV, BSRV (Straight type)	3	(1000)	—
	5	(700)	—
	7, 10	(500)	—
	15	(320)	—
	20	(300)	—
BGRV, BSRV (Lug terminal*)	15, 20	500	—
	10~20QA	400	—
	30, 40	150	—
	30~40QA	90	—
BWRV (Lug terminal)	40	135	—
Z	16	2,000	O
	25	1,000	O
J1/6Z, J1/4Z		1,000	O
JLT		—	O
RK92	4L, 5L, 6L 3C, 4C, 5C	1,000	—
	6C, 7C, 8C, 9C, 11X, 18X	1,000	—
	18D	500	—
RK92-L		300	—
RK92D		1,000	—
RKL, RKC	3pin	1,000	—
	4~5pin	1,000	O
	6~9pin	1,000	O
	10pin	1,000	—
	11~17pin	1,000	—
RKH	4~8pin	1,000	—
	9pin	1,000	—
	10~13pin	1,000	—

( ) is flat container

* Please contact us for other lug terminals.

Type		Basic Unit/Bag	Quantity /Box	Taping
MRS	1/8~1/3	100	5,000	—
GS	1/4	100	1,000 max.	*3
	1/2	50	2,000 max.	*3
	1	50	2,000 max.	—
	2, 3, 5	10	250 max.	—
	7, 10, 12	10	100 max.	—
LP	1/16	100	100	O
	1/8	100	100	O
SDT101	A	100	100	O
	B	100	100	—
SDT101S	A	100	—	—
SDT310		100	—	—
PSN•PV•PSO•PN•PWW•PAP		1	—	—
AFS		1	—	—
RW	1/2	20	1000	—
	1	20	1000	—
	2~7	20	500	—
	10	20	300	—
CR		100	1000	—
MRP	3 pin	100	3000	—

Please refer to product pages for taping quantities.

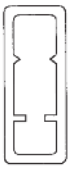
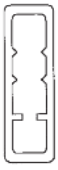
*1 Custom taping for GS1/4, GS1/2 are available on request.

Stick Packaging

Type		Basic Unit/Stick		Stick/Box
RKC		(STB)	(STP)	(STB) & (STP)
	4Pin	54	46	50
	5Pin	42	37	50
	6Pin	34	31	50
	7Pin	30	27	50
	8Pin	26	23	50
	9Pin	23	21	50
	10Pin	21	19	50
	11Pin	19	17	50
	12Pin	18	15	50
	13Pin	16	14	50
	14Pin	15	13	50
RKL		(STB)	(STP)	(STB) & (STP)
	4Pin	55	48	50
	5Pin	44	38	50
	6Pin	37	32	50
	7Pin	31	27	50
	8Pin	27	24	50
	9Pin	24	21	50
	10Pin	22	19	50
	11Pin	20	17	50
	12Pin	18	16	50

The minimum packaging unit is 50 times of the stick basic unit.

Stick (Magazine) Case

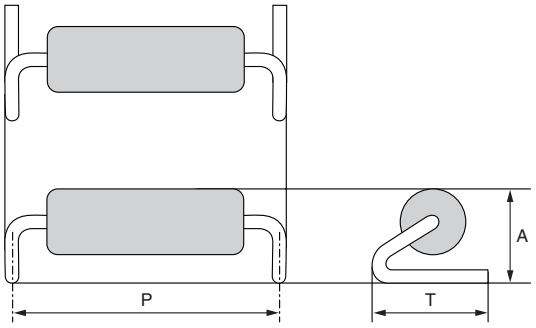
Type	Resistor Networks	
	RKL RKC	RKL RKC
Magazine Symbol	STP	STB
Sectional View		
W x H x L (mm)	5.0 x $\frac{11.0}{12.5}$ x 508	3.8 x 13.4 x 580
Quanity (pcs)	13~46	15~54
Weight (g)	30	30

surface mounted device style lead forming

Ratings

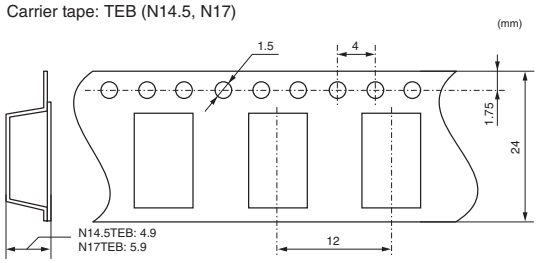
Type	Forming Type Name	Carrier Type	Forming Dimensions (mm)				Quantity/ Reel (pcs)	Weight (g)	
			P	T	A	d		Reel	NET/1000pcs
MOS (X) 1C	N14.5	TEB	14.5 ± 1	5.0 ± 0.5	4.8 ± 0.5	0.8	1000	700	350
MOS (X) 2C SPR(X) 2C RCR75C CW2C	N17	TEB	17.0 ± 1	6.0 ± 0.5	5.8 ± 0.5	0.8	1000	900	600
MOS (X) 3 SPR(X) 3 RCR100 CW3C	N20	TEG	20.0 ± 1	7.5 ± 1	6.5 ± 0.5	0.8	900	1,800	1,400

Forming Style

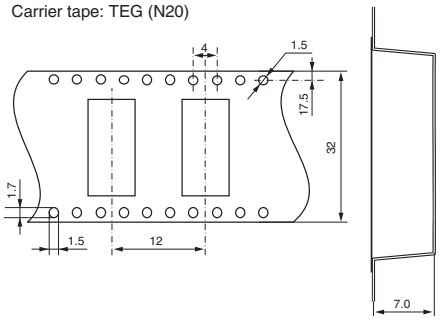


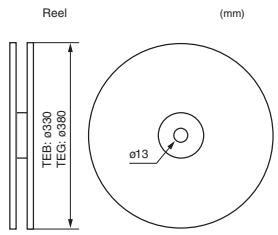
Packaging Specifications

Carrier tape: TEB (N14.5, N17)



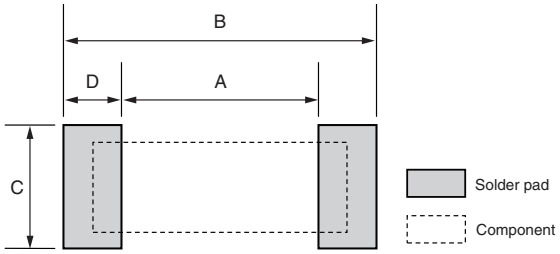
Carrier tape: TEG (N20)





Recommended Pad Dimensions

Type	Forming Type Name	Forming Dimensions (mm)			
		A	B	C	D
MOS (X) 1C	N14.5TEB	12.5	16.5	7.0	2.0
MOS (X) 2C SPR(X) 2C RCR75C CW2C	N17TEB	14.6	19.4	8.0	2.4
MOS (X) 3 SPR(X) 3 RCR100 CW3C	N20TEG	17.6	22.4	9.5	2.4



• Need a dedicated nozzle for automatic mounting. Please ask us before use.

marking

KSE Part Designation		Color		Marking Type
		Body	Marking	
RS73	1J, 2A, 2B	Black	None	None
RK73B RK73B-RT XR73	1H (0201)	Black	None	None
	1E (0402)	Black	None	None
	1J (0603)	Black	White	3 Digits
	2A (0805)	Black	White	3 Digits
	2B (1206)	Black	White	3 Digits
	2E (1210)	Black	White	3 Digits
	2H, W2H (2010)	Black	White	3 Digits
	3A, W3A, W3A2, (2512)	Black	White	3 Digits
RK73Z RK73Z-RT	1H (0201), 1E (0402)	Green	None	None
	1F (01005)	Black	None	None
	1J (0603)	Black	White	0
	2A (0805)	Black	White	000
	2B (1206)	Black	White	000
	2E (1210)	Black	White	000
	2H (2010)	Black	White	000
	3A (2512)	Black	White	000
RK73H RK73H-RT	1F,1H	Black	None	None
	1E (0402)	Blue	None	None
	1J (0603)	Blue	Black	E-24 3 Digits, E-96 None
	2A (0805)	Blue	Black	4 Digits
	2B (1206)	Blue	Black	4 Digits
	2E (1210)	Blue	Black	4 Digits
	2H, W2H (2010)	Blue	Black	4 Digits
	3A, W3A, W3A2, (2512)	Blue	Black	4 Digits
RK73G RK73G-RT	1H (0201)	Black	None	None
	1E (0402)	Black	None	None
	1J (0603)	Dark Blue	Black	E-24 3 Digits E-96 None
	2A (0805)	Dark Blue	Black	4 Digits
	2B (1206)	Dark Blue	Black	4 Digits
RN73R	1E, 1J, 2A, 2B, 2E	Black	None	None
RN73H	1E	Black	—	None
	1J	Black	Red or Yellow	E-24 3 Digits (none above 360k) E-96 or E-192 none
	2A	Black	Red or Yellow	E-24 or E-96 4 Digits (none above 1M) E-192 none
	2B, 2E	Black	Red or Yellow	E-24 or E-96 4 Digits E-192 none
HV73(V)	1J	Black	None	None
HV73(V)-RT	2A-3A	Black	White	3 Digits
WK73	—	Black	White	3 Digits
WK73-RT	—	Black	White	3 Digits
WK731J	—	Black	None	None
WG73	—	Red	White	3 Digits
WU73	—	Black	None	None

KSE Part Designation		Color		Marking Type
		Body	Marking	
UR73	D 1E	White	None	None
	D 1J	White	None	None
	(D) 2A	Indigo, (D) White	White, (D) Black	4 Digits
	(D) 2B	Indigo, (D) White	White, (D) Black	4 Digits
	D 2H	White	Black	4 Digits
	D 3A	White	Black	4 Digits
UR73V (D)	2A/2B	Black	None	None
SG73	1J-W3A	Red Wine	White	3 Digits
SG73G	1J-2B	Green	None	None
SG73P	1E	Black	None	None
SG73P	1J	Green	None	None
SG73P	2A-2E1	Green	Black	3 Digits, E-24 Only
SG73S	1E	Black	None	None
SG73S	1J	Green	None	None
SG73S	2A-2E1	Green	White	3 Digits, E-24 Only
SG73-RT	1J-W3A	Red Wine	White	3 Digits
SG73P-RT	1E	Black	None	None
SG73P-RT	1J	Green	None	None
SG73P-RT	2A-2E1	Green	Black	3 Digits, E-24 Only
SG73S-RT	1E	Black	None	None
SG73S-RT	1J	Green	None	None
SG73S-RT	2A-2E1	Green	White	3 Digits, E-24 Only
CNN	—	Green	Yellow	2 Digits
SR73	1H	Black	None	None
	1E	Indigo	None	None
	1J	Indigo	White	1%: None 2%, 5%: 3 Digits
	2A ~ 3A2	Indigo	White	.5%, 1%: 4 Digits 2%, 5%: 3 Digits
SR73-RT	1E	Black	None	None
	1J	Black	White	1%: None 2%, 5%= 3 Digits
	2A/2B/2E	Black	White	4 Digits
SL	07, W07	Black	White	1%: 4 Digits 5%: 3 Digits
	1/2/3/N2/N3 N5/R1/W1/Z1	Black	White or Laser	Resistance & Tolerance
SLP	2H/2HW 3A/3AW	Black	White or Laser	0.5%, 1%: 4 Digits 5%: 3 Digits
TSL	1	Black	White	Resistance & Tolerance
TLR	2A/3APS (2m)	Black	None	None
	2BW/2HW	Silver	None	None
	2B/3AW/3AP	Silver	Black	4 Digits
	3AW/3AP (0.5m-1.5m)	Black	Black	4 Digits
	2BP (1m-1.5m)	Black	None	None
TLRZ	1E/1J/2A/2B	Silver	None	None
TLRH	2A/3AW/3AP	Black	Black	4 Digits, 2A-no marking
LR72	—	Silver	None	3 Digits
CSR	—	Black	White	Distinctive
RD41	—	Ivory	—	Color bands
RN41	—	Blue	—	Color bands
RM41 *NDNR	—	Green	—	Color bands

marking (continued)

KSE Part Designation		Color		Marking Type
		Body	Marking	
CPCN	—	Gray	None	None
RKC, RKH RKL	—	Black	White	1%=4 Digits 2%, 5%=3 Digits
MRP	—	Black	White	Alphanumeric
MRS	—	Black	White	Alphanumeric
LT73(V)	—	Orange	Black	4 Digits
NT	1J	Pink	—	—
	2A, 2B	Pink	Black	3 Digit
RF73	—	Brown	Black	1J None, 3 Digits
CCP	—	Black	White	2 Digits
CCF	—	White	Black	Alphanumeric
TF16	SN, BN, VN	Black	White	Letter Designation
	AT	Black	Blue	Letter Designation
NV73	—	Black	None	None
NV73A	—	Black	None	None
NV73D	—	Black	None	None
KQ	0603	Black	White	1 Digits
	0805	Black	White	1 Digits
	1008	Black	White	3 Digits
KQ(T)	0402	White	None	None
KQC	0402	White	None	None
	0603	Black	None	None
LP73	—	Black	White	Alphanumeric
LPC	—	Black	None	None
CF	1/4	Tan	—	Color Bands
CFP	1/4, 1/2	Green	—	Color Bands
CFS	1/4	Ivory	—	Color Bands
MF	1/4,1/2,1	Light Gray	—	Color Bands
RCR	16	Blue Gray	—	Color Bands
	50+, 50EN	Green	—	Color Bands
	60	White	—	Color Bands
	75,100	Black	—	Color Bands
PCF	—	Light Green	—	Color Bands
HPC	—	Redish Brown	White	Alphanumeric
RK92	—	Black	White	Alphanumeric
RK92-L	—	Green	Black	Alphanumeric
MOS(x)	—	Lavender	—	Color Bands or Alphanumeric
SPR	1/4,1/2,1	Light Green	—	Color Bands
SPR	2,3,5	Light Green	Black	Alphanumeric
CWFS	—	Gray	Black	Alphanumeric
CW	1/4	Green	—	Color Bands
CW,CW_X	—	Blue	—	Color Bands
CW_P	—	Blue	—	Alphanumeric
CW1S	—	Black	—	Alphanumeric
CW1SS	—	Black	—	2 Silver bands
CWH	—	Black	—	Alphanumeric
RW	—	Black	—	Alphanumeric
BPR	—	White	Black	Alphanumeric
RF	—	Blue	—	Color Bands
RF25CC	—	Blue	—	Color Bands
RNS	—	Light Gray	Black	Alphanumeric
CR	—	Black	White	Alphanumeric

significant figures of nominal resistance

E-12 Decade Values					
10	12	15	18	22	27
33	39	47	56	68	82
E-24 Decade Values					
10	11	12	13	15	16
18	20	22	24	27	30
33	36	39	43	47	51
56	62	68	75	82	91
E-96 Decade Values					
100	102	105	107	110	113
115	118	121	124	127	130
133	137	140	143	147	150
154	158	162	165	169	174
178	182	187	191	196	200
205	210	215	221	226	232
237	243	249	255	261	267
274	280	287	294	301	309
316	324	332	340	348	357
365	374	383	392	402	412
422	432	442	453	464	475
487	499	511	523	536	549
562	576	590	604	619	634
649	665	681	698	715	732
750	768	787	806	825	845
866	887	909	931	953	976
E-192 Decade Values					
100	101	102	104	105	106
107	109	110	111	113	114
115	117	118	120	121	123
124	126	127	129	130	132
133	135	137	138	140	142
143	145	147	149	150	152
154	156	158	160	162	164
165	167	169	172	174	176
178	180	182	184	187	189
191	193	196	198	200	203
205	208	210	213	215	218
221	223	226	229	232	234
237	240	243	246	249	252
255	258	261	264	267	271
274	277	280	284	287	291
294	298	301	305	309	312
316	320	324	328	332	336
340	344	348	352	357	361
365	370	374	379	383	388
392	397	402	407	412	417
422	427	432	437	442	448
453	459	464	470	475	481
487	493	499	505	511	517
523	530	536	542	549	556
562	569	576	583	590	597
604	612	619	626	634	642
649	657	665	673	681	690
698	706	715	723	732	741
750	759	768	777	787	796
806	816	825	835	845	856
866	876	887	898	909	920
931	942	953	965	976	988

Terms & Definitions

Rated Power:
The maximum value of power which can be continuously loaded to a resistor at a rated ambient temperature.

Rated Voltage:
The maximum value of D.C. voltage or A.C. voltage (rms) capable of being applied continuously to a resistor at the rated ambient temperature. Rated voltage shall be calculated from the following formula:

$$\text{Rated Voltage(V)} = \sqrt{\text{Rated Power(W)} \times \text{Nominal Resistance Value (ohm)}}$$

However, it shall not exceed the maximum working voltage.

Critical Resistance Value:
The maximum nominal resistance value at which the rated power can be loaded without exceeding the maximum working voltage. The rated voltage is equal to the maximum working voltage in the critical resistance value.

Maximum Working Value:
The maximum value of D.C. voltage or A.C. voltage (rms) capable of being applied continuously to a resistor or a resistor element. However, the maximum value of the applicable voltage is the rated voltage at the critical resistance value or lower.

Maximum Overload Voltage:
The maximum value of voltage capable of being applied to a resistor for five seconds in the short-time overload test. Typically the applied voltage in the short-time overload test shall be 2.5 times larger than the rated voltage. However, it shall not exceed the maximum overload voltage.

Dielectric Withstanding Voltage:
A.C. voltage (rms) that can be applied to a designated spot between the electrode and the outer coating for one minute in the dielectric withstanding voltage test.

Rated Ambient Temperature:
The maximum ambient temperature at which a resistor is capable of being used continuously with the prescribed rated power. The rated ambient temperature refers to the temperature around the resistor inside the equipment, not to the air temperature outside the equipment.

Derating Curve:
The curve that expresses the relation between ambient temperature and the maximum value of continuously loadable power at its temperature, which is generally expressed in percentage.

Temperature Coefficient of Resistance (T.C.R.):
The rate of change in resistance value per 1°C in the prescribed temperature within the range of resistor operating temperature shall be expressed in the following formula:

$$\text{T.C.R. (ppm/°C)} = \frac{R-R_0}{R_0} \times \frac{1}{T-T_0} \times 10^6$$

Where: R: Measured Resistance at T°C
R_0: Measured Resistance at T_0°C
T: Measured Test Temperature (°C)
T_0: Measured Base Temperature (°C)

KOA SPEER ELECTRONICS, INC.

Lab Kits

surface mount inductors

Open Core Wirewound Chip Inductors

KQT0402TK001Kit
Lead-free, 47 values 10 pcs each

KQ0603TK001Kit
Lead-free, 52 values 10 pcs each

KQ0805TK001Kit
Lead-free, 36 values 10 pcs each

KQ1008TK001Kit
Lead-free, 40 values 10 pcs each

KQC0402TK001Kit
Lead-free, 12 values 20 pcs each

KQC0603TK001Kit
Lead-free, 12 values 20 pcs each

High Current Chip Inductors

LPC4045AK001kit
Lead-free, 18 values 25 pcs each

LPC4235AK001kit
Lead-free, 17 values 25 pcs each

NOTE: Reference product data pages for available values.

surface mount resistors

NEW Anti-Sulfur Precision Flat Chip Resistors

RK73H1ERT-Kit1 (0402 chip size)
122 values, 100 pcs each

RK73H1JRT-Kit1 (0603 chip size)
122 values, 100 pcs each

Precision Flat Chip Resistors

RK73H1FTK001Kit (01005 chip size)
38 values, Lead-free, 25 pcs each (10R0 ~ 620K = ±1%)

RK73H1HTK001Kit (0201 chip size)
217 values, Lead-free, 50 pcs each (0, 10R0 ~ 1M00 = ±1%)

RK73H1ETKit1 (0402 chip size)
122 values, Lead-free, 100 pcs each (0, 10R0 ~ 1M00 = ±1%) E-24

RK73H1JTKit1 (0603 chip size)
122 values, Lead-free, 100 pcs each (0, 10R0 ~ 1M00 = ±1%) E-24

RK73H2ATKit1 (0805 chip size)
122 values, Lead-free, 100 pcs each (0, 10R0 ~ 1M00 = ±1%)

RK73H2BTKit1 (1206 chip size)
122 values, Lead-free, 100 pcs each (0, 10R0 ~ 1M00 = ±1%)

General Purpose Flat Chip Resistors

RK73B1FTK001Kit (01005 chip size)
51 values, Lead-free, 25 pcs each (0, 10 ~ 1M = ±5%)

RK73B1HTK001Kit (0201 chip size)
139 values, Lead-free, 50 pcs each (0, 2R2 ~ 2M2 = ±5%)

surface mount resistors (continued)

High Voltage Flat Chip Resistors

HV73TK001Kit (0603, 0805, 1206, 2010 chip sizes)
156 values, Lead-free, 25 pcs each (10k ~ 10M = +1%)

Varistors

NV73TK001Kit (0201, 0402, 0603, 0805, 1206, 1210, 1812, 2220 chip sizes)
Lead-free, 122 values, 10 pcs each size

NV73DLTK001Kit (0603, 0805, 1206 chip sizes)
17 values, Lead-free, 10 pcs each size

Surge Current Flat Chip Resistors

SG73TK001Kit (0603, 0805, 1206, 1210, 2010, 2512 chip sizes)
204 values, ±10%, Lead-free, 25 pcs each

SG73STK001Kit (0603, 0805, 1206, 1210 chip sizes)
101 values, ±1%, Lead-free, 25 pcs each

SG73PTK001Kit (0603, 0805, 1206, 1210 chip sizes)
97 values, ±1%, Lead-free, 25 pcs each

Wide Terminal Flat Chip Resistors

WK73TK001Kit (0612, 1020, 1218 & 1225 chip sizes)
79 values, Lead-free, 25 pcs each (±1%, ±5%)

WU73TK001Kit (0612 chip sizes)
27 values, 20 pcs each (±1%)

NOTE: Reference product data pages for available values.

surface mount resistors (continued)

Circuit Protection - Thermal Sensors

NT73TK001Kit (0603, 0805, 1206 chip sizes)
Lead-free, 53 values (1J, 2A, 2B), 10 pcs each size

Circuit Protection - Fuses

CCFTK001Kit (2410 chip size)
18 values, Lead-free, 20 pcs each

CCPTK001Kit (1206, 1210 chip sizes)
35 values, Lead-free, 20 pcs each

FuseKit-TF10BN (0402 chip size)
12 values, Lead-free, 100 pcs each

FuseKit-TF16SN (0603 chip size)
14 values, Lead-free, 100 pcs each

FuseKit-TF16AT (0603 chip size)
13 values, Lead-free, 100 pcs each

NOTE: Reference product data pages for available values.

Ultra Precision Flat Chip Resistor

RN73H1ET-Kit (0402 chip size)
49 values, Lead-free, 50 pcs each (±0.1%, 25ppm°C)

RN73H1JT-Kit (0603 chip size)
67 values, Lead-free, 50 pcs each (±0.1%, 25ppm°C)

RN73H2AT-Kit (0805 chip size)
73 values, Lead-free, 50 pcs each (±0.1%, 25ppm°C)

RN73R1ET-Kit1 (0402 chip size)
49 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

RN73R1JT-Kit1 (0603 chip size)
67 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

RN73R2AT-Kit1 (0805 chip size)
73 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

RN73R2BT-Kit1 (1206 chip size)
74 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

RS73F1JT-Kit1 (0603 chip size)
97 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

current sense resistors

Surface Mount Molded

SLW07TK001Kit (2010, 1W size)
27 values, 20 pcs each (±1%).

SLW1TK001Kit (2512, 1.5W size)
25 values, 20 pcs each (±0.5%).

SL1TK001Kit (2512, 1W size)
33 values, 20 pcs each (±1%).

SL2TK001Kit (4528, 2W size)
45 values, 20 pcs each (±1%).

SL3TK001Kit (4528, 3W size)
33 values, 20 pcs each (±1%).

SLN3TK001Kit (4528, 3W size)
32 values, 20 pcs each (±0.5%).

SLN5TK001Kit (4528, 5W size)
21 values, 10 pcs each (±0.5%).

TSL1TK001Kit (2512, 1W size)
33 values, Lead-free, 20 pcs each (±1%).

SLRTK001Kit (2513, 1W size)
40 values, 15 pcs each (±1%).

Metal Plate

TLR2ATK001Kit (0805 chip size)
6 values, complete range, 20 pcs each (±1%).

TLR2BWD-Kit (1206 chip size)
17 values, 15 pcs each (±1%).

TLR2HWD-Kit (2010 chip size)
10 values, 15 pcs each (±1%).

TLR3APD-Kit (2512 chip size)
10 values, 20 pcs each (±1%).

TLRDK001Kit (1206, 1210, 2512 chip sizes)
36 values, Lead-free, complete range, 20 pcs each (±1%).

TLR2BP-Kit (1206 chip size)
17 values, 15 pcs each (±1%).

Chip Resistors

UR73TK001Kit (0402, 0603, 0805, 1206, 2512 chip sizes)
144 values, Lead-free, 20 pcs each (±1%).

UR73VTK001Kit (1206 chip sizes)
8 values, 20 pcs each (±1%).

Thick Film

SR731HTK001Kit (0201 chip size)
29 values, Lead-free, 50 pcs each (R47 ~ 10R0, ±1%, ±5%)

SR731ETK001Kit (0402 chip size)
25 values, Lead-free, 50 pcs each (R100 ~ 1R00, ±1%)

SR731JTK001Kit (0603 chip size)
49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR732ATK001Kit (0805 chip size)
49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR732BTK001Kit (1206 chip size)
49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR732ETK001Kit (1210 chip size)
49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR732HTK001Kit (2010 chip size)
49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR733ATK001Kit (2512 chip size)
49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

Power Shunt

PSF4-Kit (1216 chip size)
2 values, Lead-free, 10 pcs each (±1%).

PSL2-Kit (2512 chip size)
3 values, Lead-free, 10 pcs each (±1%).

NOTE: Reference product data pages for available values.

KOA SPEER ELECTRONICS, INC.

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1100 Town Plaza Court
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PH: 813-886-2457

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425 E. 11th Ave
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1650 Sycamore Ave (Suite 9)
Bohemia, NY 11716
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FX: 631-567-3378

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FX: 513-791-6153

John F. Kilfoil – Michigan
37875 West Twelve Mile Road
Farmington Hills, MI 48331

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10800 E. Bethany Dr.
(Suite 264)
Aurora, CO 80014
PH: 303-790-7171

Metz-Jade Associates, Inc.
Paoli Executive Green II
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43 Leopard Rd
Paoli, PA 19301
PH: 484-318-7779
FX: 484-318-7842

Northeast Representatives
PO Box 447
570 Pleasant St (Shipments)
Marshfield, MA 02051
PH: 781-837-8788
FX: 781-837-9342

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Huntsville, AL 35801
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Rep One Associates, Inc.
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2200 West Ridge Rd
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Rochester, NY 14626
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Victory Sales America, Inc.
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Santa Ana, CA 92705
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FX: 714-527-3868

KOA SPEER ELECTRONICS, INC.

Distributors

corporate Information

Name	Branch Location	Street	City/Zip	State	Phone
Arrow Electronics	See Below	9201 East Dry Creek Road	Centennial	CO	303-824-4000
Brevan Electronics, Inc.	Corporate	6 Continental Boulevard	Merrimack	NH	603-429-1900
Carlton-Bates	Corporate	3600 W. 69th Street	Little Rock	AR	844-284-3700
Digi - Key	Corporate	701 Brooks Avenue South	Thief River Falls	MN	800-344-4539
GW Electronics	Corporate	1833 Executive Drive	Oconomowoc	WI	262-567-9445
Hughes-Peters	See Below	8000 Technology Boulevard	Huber Heights	OH	973-586-9000
Justin Electronics	Corporate	400 Oser Avenue, Suite #800	Hauppauge	NY	631-951-4900
M3 Technology	Corporate	58 Sawgrass Drive	Bellport	NY	631-205-0005
Mouser	Corporate	1000 N Main St	Mansfield	TX	817-804-3800
REM Electronics	See Below	525 S. Park Avenue	Warren	OH	330-373-1300
Rutronik	See Below	2745 N. Dallas Parkway	Plano	TX	469-782-0900
SMD, Inc.	See Below	1 Oldfield	Irvine	CA	949-470-7700
TTI	See Below	2441 Northeast Parkway	Fort Worth	TX	817-740-9000
Verical	Corporate	9201 East Dry Creek Road	Centennial	CO	303-824-4000

branch locations

State	City/Zip	Name	Street	Phone
AL	Huntsville	Arrow Electronics	4930 Corporate Drive (Ste F)	256-864-3300
	Huntsville	TTI, Inc.	4725 Whitesburg Drive (Ste 201)	256-721-1597
AR	Little Rock	Carlton-Bates	3600 W. 69th Street	501-562-9100
AZ	Phoenix	Arrow Electronics	1955 East Sky Harbor Circle N	602-256-2290
	Tempe	TTI, Inc.	2151 East Broadway Road (Ste 211)	480-638-1590
CA	Foothill Ranch	Arrow Electronics	26632 Towne Centre Drive (Ste 100)	949-380-4700
	San Diego	Arrow Electronics	10089 Willow Creek Road (Ste 225)	858-536-7600
	San Jose	Arrow Electronics	1650 Technology Drive (Ste 200)	669-342-3800
	Woodland Hills	Arrow Electronics	20935 Warner Center Lane	818-932-1000
	San Jose	Rutronik	6203 San Ignacia Avenue	669-247-5098
	Irvine	SMD, Inc.	1 Oldfield	949-470-7700
	Chatsworth	TTI, Inc.	9121 Oakdale Avenue (Ste 200)	818-407-8000
	Fremont	TTI, Inc.	48371 Fremont Blvd. (Ste 107)	510-668-0830
	Poway	TTI, Inc.	13475 Danielson Street (Ste 210)	858-748-2025
	Tustin	TTI, Inc.	14511 Myford Road (Ste 210)	714-505-4857
CO	Centennial	Arrow Electronics	9201 East Dry Creek Road	303-824-4000
	Westminster	TTI, Inc.	9035 Wadsworth Pkwy (Ste 1600)	303-427-0241
CT	New Haven	Arrow Electronics	157 Church Street (19th Floor)	203-265-7741
	Wallingford	TTI, Inc.	8 Fairfield Blvd.	203-949-6262
FL	Lake Mary	Arrow Electronics	200 Colonial Center Pkwy (Ste 250)	321-233-8800
	Ft. Lauderdale	Hughes-Peters	3590 NW 54th Street (Ste 6)	954-973-7103
	Orlando	Hughes-Peters	4494 North John Young Parkway	407-849-6060
	Orlando	TTI, Inc.	5810 Hoffner Avenue (Ste 801)	407-273-6977
GA	Duluth	Arrow Electronics	2915 Premiere Parkway (Ste 150)	770-495-5200
	Jasper	Hughes-Peters	11399 Big Canoe	706-579-2187
IL	Itasca	Arrow Electronics	1162 Springlake Drive	630-250-0500
	Downers Grove	Hughes-Peters	5221 Thatcher Road	847-768-7452
	Schaumburg	TTI, Inc.	915 National Parkway (Ste 30 Entrance D)	847-884-6500
IN	Indianapolis	Arrow Electronics	3077 E. 98th Street (Ste 160)	317-810-6250
	Indianapolis	Hughes-Peters	5333 Commerce Square Drive (Unit B)	317-882-1188

branch locations (continued)

State	City/Zip	Name	Street	Phone
KS	Overland Park	TTI, Inc	6405 Metcalf Ave (Ste 105)	913-789-6427
MA	Peabody	Arrow Electronics	4 Technology Drive	978-538-8500
	Concord	Rutronik	300 Baker Avenue	978- 405-3328
	Tewksbury	TTI, Inc.	Three Highwood Drive	978-851-2000
MD	Columbia	Arrow Electronics	7067 Columbia Gateway Drive	410-312-4600
	Columbia	TTI, Inc.	6304 Woodside Court (Ste 115)	410-995-6627
MI	Plymouth	Arrow Electronics	44760 Helm Street	734-335-9260
MN	Bloomington	Arrow Electronics	10900 Hampshire Ave. S	952-828-5350
	Thief River Falls	Digi - Key	701 Brooks Avenue South	800-344-4539
	Minnetonka	Hughes-Peters	13911 Rigedale Drive (Ste 402)	952-544-0969
	Minneapolis	TTI, Inc.	7825 Washington Avenue South (Ste 800)	952-829-7200
MO	Earth City	Arrow Electronics	514 Earth City Expressway (Ste 321)	314-725-4164
NC	Durham	Arrow Electronics	2530 Meridian Parkway (Ste 300)	919-768-6806
	Greensboro	Hughes-Peters	1175 Revolution Mill Drive (Ste 10)	336-275-6391
	Raleigh	TTI, Inc.	220 Horizon Drive (Ste 203)	919-876-8922
NH	Merrimack	Brevan Electronics, Inc.	6 Continental Blvd.	603-429-1900
	Exeter	SMD, Inc.	41 Industrial Drive (Ste 9)	603-681-0320
NJ	Parsippany	Arrow Electronics	90 E. Halsey Road (Ste 114)	973-560-3820
	Parsippany	Hughes-Peters	7 Campus Drive (Ste 100)	973-586-9000
	Mount Laurel	TTI, Inc.	305 Fellowship Road (Ste 100)	856-234-6400
NY	Islandia	Arrow Electronics	2950 Expressway Drive North	631-851-2300
	Pittsford	Arrow Electronics	1000 Pittsford-Victor Rd (2nd Floor)	585-427-0300
	Hauppauge	Justin Electronics	400 Oser Avenue (Ste 800)	631-951-4900
	Bellport	M3 Technology	58 Sawgrass Drive	631-205-0005
	Ronkonkoma	TTI, Inc.	3281 Veterans Highway (Ste E-3)	631-737-2000
	Victor	TTI, Inc	7640 Omnitech Pl (Ste 5-C)	203-949-6262
OH	Beavercreek	Arrow Electronics	70 Birch Alley	937-648-3801
	Huber Heights	Hughes-Peters	8000 Technology Blvd.	937-235-7100
	Warren	REM Electronics	525 S. Park Avenue	330-373-1300
	Dayton (Centerville)	TTI, Inc.	10564 Success Lane (Ste B)	937-885-6270
	Independence	TTI, Inc.	Corporate Plaza 2 6480 Rockside Woods Blvd. (Ste 110)	216-524-2810
OK	Tulsa	Arrow Electronics	7633 E. 63rd Place (Ste 300)	918-986-1581
OR	Beaverton	Arrow Electronics	6600 SW 105th Avenue (Ste 100)	503-629-1400
	Beaverton	TTI, Inc.	8700 SW Nimbus Avenue (Ste B)	503-644-4560
PA	Horsham	Arrow Electronics	200 Gibraltar Road	215-956-4800
	Pittsburgh	Arrow Electronics	201 Penn Center Blvd. (Ste 400)	724-387-7000
	McKean	Hughes-Peters	9003 Main Street (Ste 5) McKean Plaza	814-476-1025
	Erie	REM Electronics Inc.	2126 Filmore Avenue (#5)	814-453-5626
TX	Austin	Arrow Electronics	1908 Kramer Lane, Braker B (Ste 200)	737-703-3500
	El Paso	Arrow Electronics	7733 Plaza Azul	915-834-6100
	Plano	Arrow Electronics	1820 Preston Park Blvd.	972-985-6600
	Stafford	Hughes-Peters	10701 Corporate Drive (Ste 244)	281-565-1181
	Mansfield	Mouser Electronics, Inc.	1000 N. Main Street	817-804-3800
	Plano	Rutronik	2745 N Dallas Pkwy, Parkway Center III (Ste 660)	469-782-0900
	El Paso	SMD, Inc.	11 Founders Blvd. (Ste 600)	949-470-7700
	Houston	TTI, Inc.	7102 N Sam Houston Pkwy (Ste 130)	713-339-2700

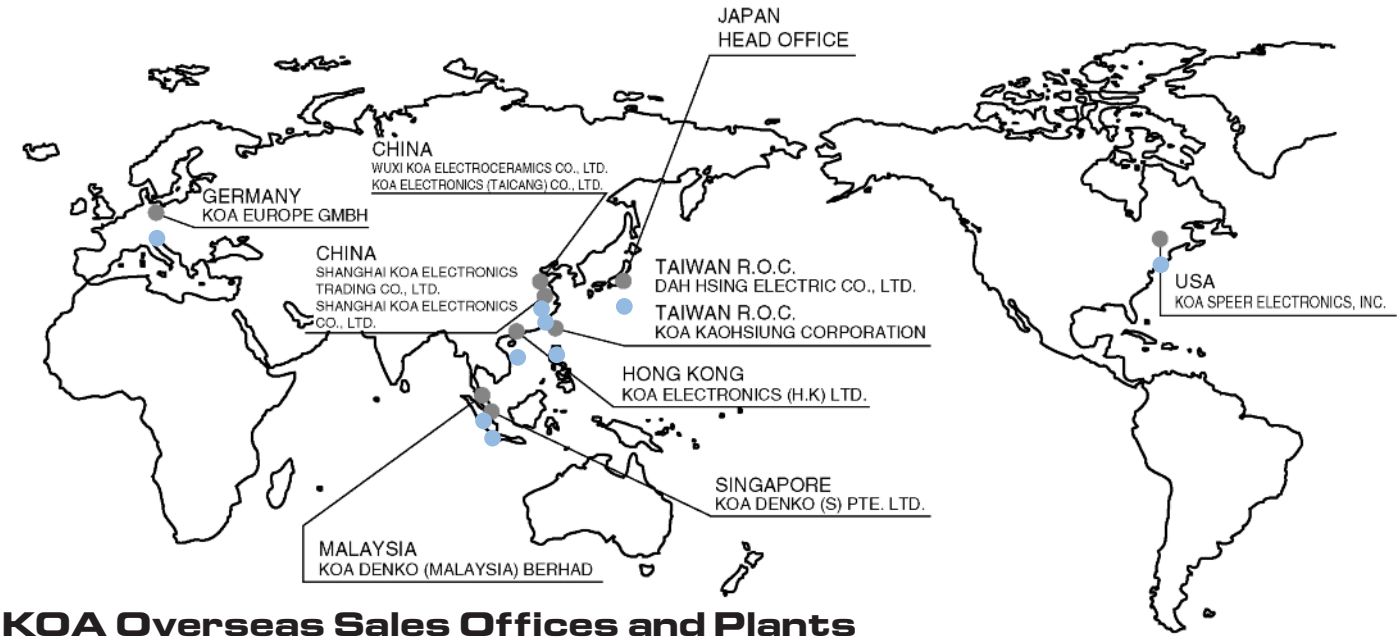
branch locations (continued)

State	City/Zip	Name	Street	Phone
TX	Irving	TTI, Inc.	4600 Fuller Drive (Ste 100)	972-594-5900
	Fort Worth	TTI, Inc. (Mexico & Latin America)	5050 Mark IV Parkway	817-624-6380
	Fort Worth	TTI, Inc. (Telemarketing)	5050 Mark IV Parkway	817-624-6380
	Fort Worth	TTI, Inc. (Teleservices & BDG)	5050 Mark IV Parkway	817-624-6380
UT	Salt Lake City	Arrow Electronics	448 E 6400 S (Ste 400)	801-313-7300
WA	Bellevue	Arrow Electronics	3380 146th Pl SE	425-643-9992
	Redmond	TTI, Inc.	11121 Willows Road NE (Ste 130)	425-882-0291
WI	Brookfield	Arrow Electronics	400 N. Executive Drive (Ste 112)	262-879-0434
	Oconomowoc	GW Electronics	1833 Executive Drive	262-567-9445
	Brookfield	Hughes-Peters	325 N Corporate Drive (Ste 250)	262-505-5841
	Brookfield	TTI, Inc.	250 North Patrick Blvd (Ste 160)	262-797-9233

Canada				
AB	Calgary	Arrow Electronics	160 Quarry Park Blvd, SE	403-735-2800
British Columbia	Burnaby	Arrow Electronics	2025 Willingdon Avenue	604-630-4300
Nova Scotia	Halifax	Arrow Electronics	155 Chain Lake Drive	902-450-2600
Ontario	Mississauga	Arrow Electronics	171 Superior Boulevard (Unit 2)	905-670-7769
	Ottawa	Arrow Electronics	343 Preston Street (Unit 1163)	343-291-1112
	Woodbridge	TTI, Inc.	261 Milani Blvd. (Ste 201)	905-850-3003
Quebec	Pointe-Claire	Arrow Electronics	6500 Trans Canada Highway (4th Floor)	514-421-4360
	Quebec City	Arrow Electronics	1400 Saint-Jean Baptiste Avenue	418-871-9008
	Pointe-Claire	TTI, Inc.	52 Hymus Boulevard (Ste 102)	514-426-1212

KOA SPEER ELECTRONICS. INC.

Global Network



KOA Overseas Sales Offices and Plants

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USA		
KOA Speer Electronics, Inc.	199 Bolivar Drive, Bradford, PA 16701, USA http://www.koaspeer.com/	(Tel) 1-814-362-5536 (Fax) 1-814-362-8883
Germany		
KOA Europe Gmbh	Kaddenbusch 6, D-25578 Dageling Itzehoe, Germany http://www.koaeurope.de/	(Tel) 49-4821-8989-0 (Fax) 49-4821-8989-89
Via Electronic Gmbh	Robert-Friese-Straβe3, D-07629 Hermsdorf, Germany https://via-electronic.de/	(Tel) (49) 036601-9298-0 (Fax) (49) 036601-9298-110
Singapore		
KOA Denko (S) Pte., Ltd	80 Bendemeer Road #03-01 Luzerne, Singapore 339949 http://www.koaspore.com.gg/	(Tel) 65-63395151 (Fax) 65-63398556
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KOA Denko (S) Pte., Ltd Thailand Representative Office	319 Chamchuri Square Building 24th Floor, Room 24101, Phayathai Road, Pathumwan Bangkok 10330 Thailand	(Tel) (+66) 2007-2427
Malaysia		
KOA Denko (Malaysia) Sdn.Bhd.	Lot 7.8&9 Batu Berendam (Ftz) 75350 Melaka, Malaysia.	(Tel) 60-6-2328031 (Fax) 60-6-2313171
China		
Shanghai KOA Electronics Co., Ltd.	No.581 Guiping Road,Cao He Jing, Shanghai, China	(Tel) 86-21-64850723 (Fax) 86-21-64852960
Shanghai KOA Electronics Trading Co., Ltd.	No.581 Guiping Road,Cao He Jing, Shanghai, China http://www.koaglobal.com.cn/	(Tel) 86-21-64320101 (Fax) 86-21-64320083
Shanghai KOA Electronics Trading Co., Ltd. Tianjin Branch	Rm 823, No.219, Nanjing Rd, Heping District Tianjin, China	(Tel) 86-21-64320101 (Fax) 86-21-64320083
KOA Electronics (Taicang) Co., Ltd.	No.77 Luoyang East Road, Taicang Economy Development Area, Taicang, Jiangsu Province, China	(Tel) 86-512-53561111 (Fax) 86-512-53561600
Wuxi KOA Electroceramics Co., Ltd.	Heqiao, Yixing City, Jiangsu Province, China http://www.wuxkoa.com/	(Tel) 86-510-87871645 (Fax) 86-510-87871626
KOA Electronics (H.K.) Ltd.	Unit 2315, Metropolis Tower, 10 Metropolis \Drive, Hunghom, Kowloon, Hong Kong http://www.hk.koaglobal.com/	(Tel) 85-2-24926918 (Fax) 85-2-24927398
Taiwan		
Dah Hsing Electric Co., Ltd.	11th Floor Ping-An Mansion, No.34 Sec.1, Nan-King East Road, Taipei, Taiwan http://www.koadah.com/	(Tel) 88-6-2-2521-4166 (Fax) 88-6-2-2564-1859
KOA Kaohsiung Corporation	17-2 Kai-Fa Road,N.E.P.Z. Kaohsiung, Taiwan http://www.koaglobal.com.Tw/	(Tel) 88-6-7-363-4157 (Fax) 88-6-7-363-4543

Notes

world class quality

Successful companies recognize the value in selecting suppliers committed to total quality. KOA Speer has long embraced the principals of continuous improvement to attain new performance levels in every aspect of customer support. Our manufacturing programs redefine industry standards with defect levels measured in parts per billion. This organization-wide focus on quality resulted in our receiving ISO 9001:2015 certification. In addition, our quality program has received the more stringent IATF16949:2016 certification required to be a tier one supplier in the automotive industry.

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KOA Speer can play a vital role in helping your operation achieve maximum efficiency. Our sales/customer service representatives will meet with your design, production and purchasing teams to create a program that makes sense for your organization. Among the areas we regularly address are data entry and access through customized EDI, and inventory management through dock-to-stock and JIT programs. Our willingness to not only develop these programs but to execute them as promised, makes KOA Speer a dependable partner worth integrating into your operation.

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Providing products and answers when you need them is a fundamental policy at KOA Speer. Our 185,000 square foot warehouse features an automated material handling system based upon bar coding and radio frequency data communication (RFDC) to maintain an inventory of billions of components, while shipping millions of components per day. Standard product availability, the industry's most extensive electronic data interchange (EDI) program and a willingness to inventory to customer requirements, make KOA Speer JIT delivery an integral part of our customer's efforts at improving efficiency.

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