Tech Topics

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New Pencil Shaped Aluminum Capacitors CS and PZ Series

Nichicon's new pencil shaped aluminum capacitors are available in two series: CS and PZ. They are designed to provide large capacitance, voltage and ripple current for low profile applications where traditional sized capacitors would be too big. A lower height is achieved by laying the capacitor on its side for mounting. Normally a power supply needs a capacitor with high voltage, capacitance and ripple current on the input side. In the case of a large power supply, usually a bulky can type capacitor is used. In the case of a small power supply, typically a radial type is used by mounting it vertically or horizontally. In recent years, the flat screen market has exploded and makers have requested a lower height capacitor to achieve a slimmer product. The usual response has been to make a bigger diameter and lower height part. However, there was a tradeoff with voltage, capacitance and ripple current so this was not an optimum solution until the pencil capacitor was designed. With the smaller diameter, longer length and laying horizontal on the circuit board, this provided what the designers were demanding.

There are key advantages to the pencil shaped capacitors:

Advantage #1: Lower Height Product

By laying the capacitor on its side, a lower height is achieved making it attractive for low profile applications. Diameters range from 9 to 12.5mm.

Advantage #2: Larger Capacitance by Going Parallel

Multiple capacitors can be put in parallel to achieve much higher capacitances and ripple currents but without increasing in height.

Advantage #3: High Capacitance in Small Size

With a low height dimension, large capacitance is available up to 270 microfarads.

Advantage #4: Low Cost per Capacitance

When compared to other capacitors like ceramic, film and tantalum, aluminum is the lowest cost per microfarad.

Advantage # 5: High Voltage

The pencil caps are available in voltages from 200 thru 450 Volt.

Pencil Capacitors

Quick Facts

- Suitable for thin profiles
- Large capacitance in small size
- High voltage up to 450V
- Long length, small diameter
- Low cost per microfarad
- Long life: up to 10000 Hrs
- 105C
- Ripple Current up to 1265mArms

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Pencil Design Features

Dimensions: 8x50,10x40,10x50,12.5x40, 12.5x50

Capacitance Range: 18 to 270 uF

Rated Voltage: 200 to 450 Volt

Temperature: 105C

Life: 2000-10000 Hours

Ripple Current: 220-1265 mArms at 105C 120 Hz

Note: Lower voltages and higher capacitances available upon request.

Markets

Primary

*Low Profile Power Supply for Digital Electronics * Flat Panel TVs * Lighting * Chargers *

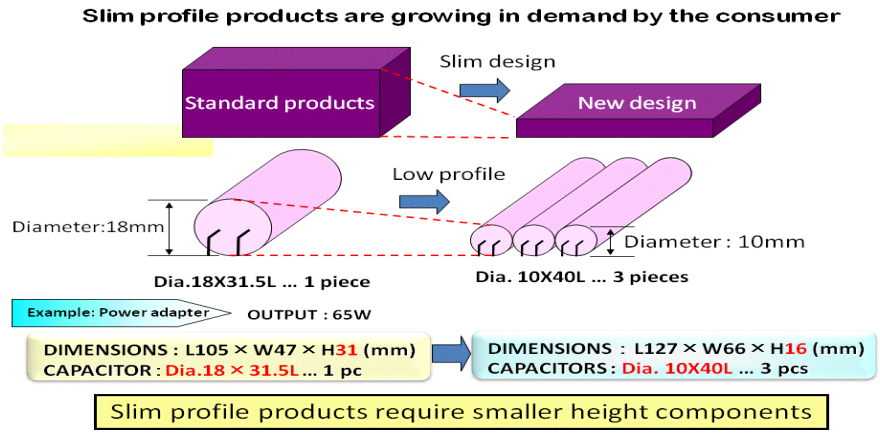
Secondary

*Power Supply Adapters *

Applications

Currently, the flat screen TV market is dominating the usage of the pencil capacitor. In addition, makers of power supply adapters for notebook PCs are adopting this technology to make slim profiles.

Thicker or Thinner?



ALUMINUM ELECTROLYTIC CAPACITORS

CS

Miniature Sized, High Ripple Current, High Reliability series (pencil-shaped type)

Smaller | Long Life | High Ripple Current

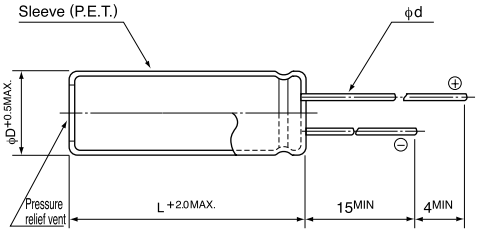
NEW

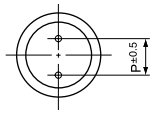
- High ripple current and load life of 10000 hours at +105°C.
- Suited for slim-designed products.
- Compliant to the RoHS directive (2002/95/EC).

Specifications

Item	Performance Characteristics
Category Temperature Range	−40 to +105°C (200 to 400V), −25 to +105°C (450V)
Rated Voltage Range	200 to 450V
Rated Capacitance Range	18 to 270μF
Capacitance Tolerance	±20% at 120Hz, 20°C
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.04CV+100 (μA)
Tangent of loss angle (tan δ)	Rated voltage (V): 200, 250, 400, 450 tan δ (MAX.): 0.20, 0.20, 0.24, 0.24 Measurement frequency : 120Hz, Temperature : 20°C
Stability at Low Temperature	Rated voltage (V): 200, 250, 400, 450 Impedance ratio ZT / Z20 (MAX.) Z−25°C / Z+20°C: 3, 3, 5, 6 Z−40°C / Z+20°C: 6, 6, 6, – Measurement frequency : 120Hz
Endurance	The specifications listed at right shall be met when the capacitors are restored to 20°C after D.C. bias plus rated ripple current is applied for 10000 hours at 105°C, the peak voltage shall not exceed the rated voltage. Capacitance Change: Within ± 20% of the initial capacitance value tan δ: 200% or less than the initial specified value Leakage current: Less than or equal to the initial specified value
Shelf Life	After storing the capacitors under no load at 105°C for 1000 hours and then performing voltage treatment based on JIS C 5101-4 clause 4.1 at 20°C, they shall meet the specified values for the endurance characteristics listed above.
Marking	Printed with white color letter on dark brown sleeve.

Radial Lead Type





(mm)

φD	8	10	12.5
P	3.5	5.0	5.0
φd	0.6	0.6	0.6

Type numbering system (Example : 200V 270μF)

1	2	3	4	5	6	7	8	9	10	11	12
U	C	S	2	D	2	7	1	M	N	Y	9

- Size code
- Configuration ※
- Capacitance tolerance (±20%)
- Rated capacitance (270μF)
- Rated voltage (200V)
- Series name
- Type

※ Configuration

φD	Pb-free leadwire Pb-free PET sleeve
8 · 10	ND
12.5	NY

Dimensions

Cap (μF)	Code	200 (2D)		250 (2E)		400 (2G)		450 (2W)	
18	180							8 × 50	220
27	270					8 × 50	255	10 × 40	290
33	330							10 × 40	360
39	390					10 × 40	400	10 × 50	410
47	470							12.5 × 40	525
56	560			8 × 50	430	10 × 50	520		
68	680					12.5 × 40	600	12.5 × 50	670
82	820	8 × 50	530	10 × 40	610	12.5 × 50	700		
100	101	10 × 40	630	10 × 50	680				
120	121	10 × 40	680						
150	151	10 × 50	830	12.5 × 40	920				
180	181			12.5 × 50	1035				
220	221	12.5 × 40	1075					Case size φD × L (mm)	Rated ripple
270	271	12.5 × 50	1265						

※ The over voltages are also available upon request.

Rated ripple current (mArms) at 105°C 120Hz

● Frequency coefficient of rated ripple current

Frequency	50Hz	120Hz	1kHz	10kHz	100kHz or more
Coefficient	0.80	1.00	1.60	1.80	2.00

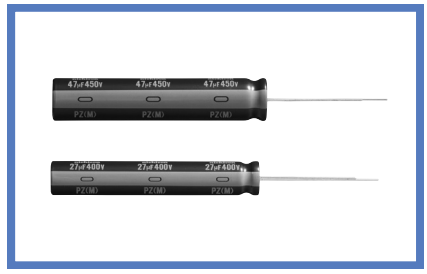
Design, Specifications are subject to change without notice.

ALUMINUM ELECTROLYTIC CAPACITORS

PZ High Voltage, Smaller-sized series (pencil-shaped type)

Smaller | High Ripple Current

NEW

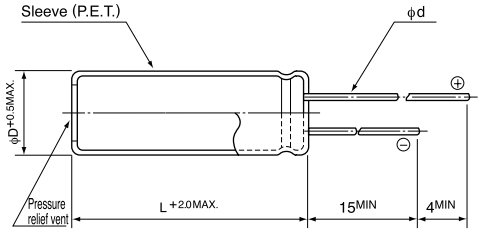


- Load life of 2000 hours at 105°C.
- Suited for slim-designed products.
- Compliant to the RoHS directive (2002/95/EC).

Specifications

Item	Performance Characteristics
Category Temperature Range	−40 to +105°C (200 to 400V), −25 to +105°C (450V)
Rated Voltage Range	200 to 450V
Rated Capacitance Range	24 to 270μF
Capacitance Tolerance	±20% at 120Hz, 20°C
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.04CV+100 (μA)
Tangent of loss angle (tan δ)	Rated voltage (V): 200, 250, 400, 450 tan δ (MAX.): 0.20, 0.20, 0.24, 0.24 Measurement frequency : 120Hz, Temperature : 20°C
Stability at Low Temperature	Rated voltage (V): 200, 250, 400, 450 Impedance ratio ZT / Z20 (MAX.) Z−25°C / Z+20°C: 3, 3, 5, 6 Z−40°C / Z+20°C: 6, 6, 6, − Measurement frequency : 120Hz
Endurance	The specifications listed at right shall be met when the capacitors are restored to 20°C after D.C. bias plus rated ripple current is applied for 2000 hours at 105°C, the peak voltage shall not exceed the rated voltage. Capacitance Change: Within ± 20% of the initial capacitance value tan δ: 200% or less than the initial specified value Leakage current: Less than or equal to the initial specified value
Shelf Life	After storing the capacitors under no load at 105°C for 1000 hours and then performing voltage treatment based on JIS C 5101-4 clause 4.1 at 20°C, they shall meet the specified values for the endurance characteristics listed above.
Marking	Printed with white color letter on dark brown sleeve.

Radial Lead Type



(mm)

φD	8	10	12.5
P	3.5	5.0	5.0
φd	0.6	0.6	0.6

Type numbering system (Example : 250V 120μF)

1 2 3 4 5 6 7 8 9 10 11 12

U P Z 2 E 1 2 1 M N D 9

- 12: Size code
- 10 11: Configuration ※
- 9: Capacitance tolerance (±20%)
- 6 7 8: Rated capacitance (120μF)
- 4 5: Rated voltage (250V)
- 3: Series name
- 1 2: Type

※ Configuration

φD	Pb-free leadwire Pb-free PET sleeve
8 · 10	ND
12.5	NY

Dimensions

Cap (μF)	Code \ V	200		250		400		450	
		2D		2E		2G		2W	
24	240							8 × 50	250
27	270					8 × 50	255		
33	330							10 × 40	360
47	470					10 × 40	435	10 × 50	450
56	560			8 × 50	430	10 × 50	520	12.5 × 40	570
82	820	8 × 50	530	10 × 40	610	12.5 × 40	660	12.5 × 50	730
100	101					12.5 × 50	770		
120	121	10 × 40	680	10 × 50	740				
150	151	10 × 50	830	12.5 × 40	920				
220	221	12.5 × 40	1075	12.5 × 50	1140			Case size φD × L (mm)	Rated ripple
270	271	12.5 × 50	1265						

※ The over voltages are also available upon request.

Rated ripple current (mArms) at 105°C 120Hz

● Frequency coefficient of rated ripple current

V	60Hz	120Hz	500Hz	1kHz	10kHz or more
200 · 250	0.80	1.00	1.20	1.30	1.40
400 · 450	0.80	1.00	1.25	1.40	1.50

Design, Specifications are subject to change without notice.