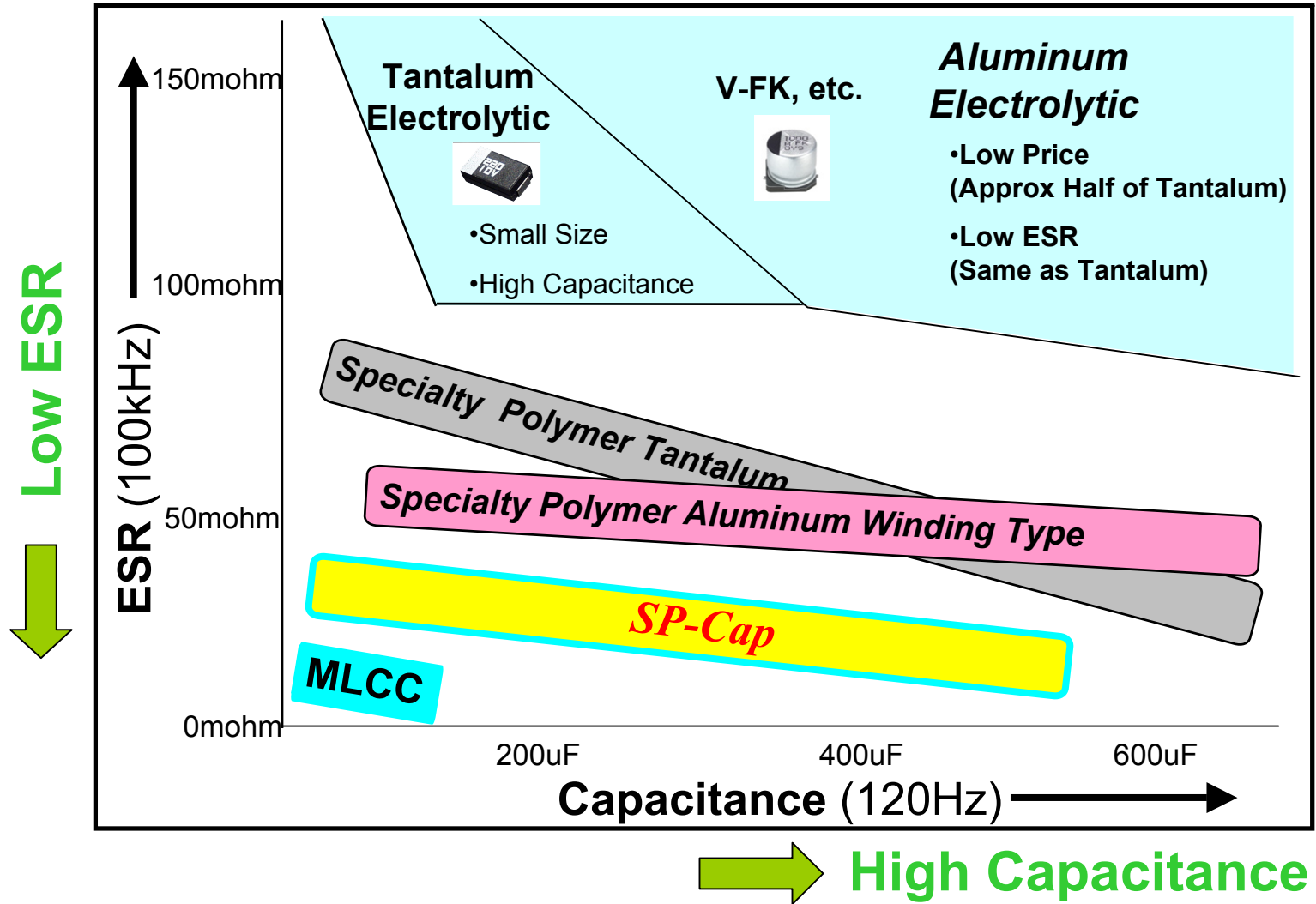


Specialty Polymer Aluminum Electrolytic Capacitors



PMD Standard Components

Comparison of Various Capacitor Types (Capacitance / ESR)

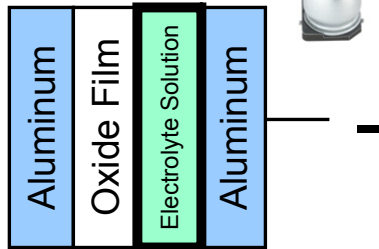


Composition of Electrolytic Capacitors

Electrolyte Characteristics

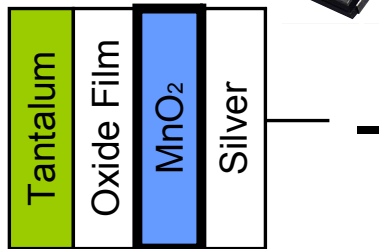
Conventional Capacitors

Aluminum Electrolytic Capacitor



+ —

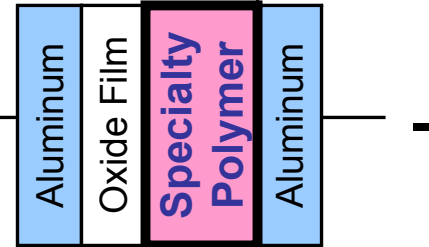
Tantalum Electrolytic Capacitor



+ —

Specialty Polymer Capacitors

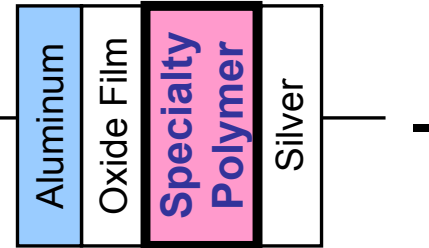
Winding Type (AL)



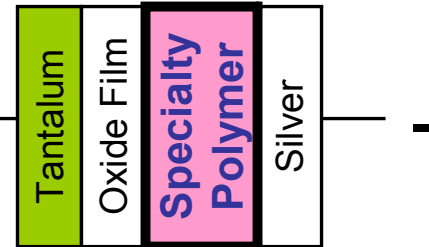
Multi Layer Type (AL)



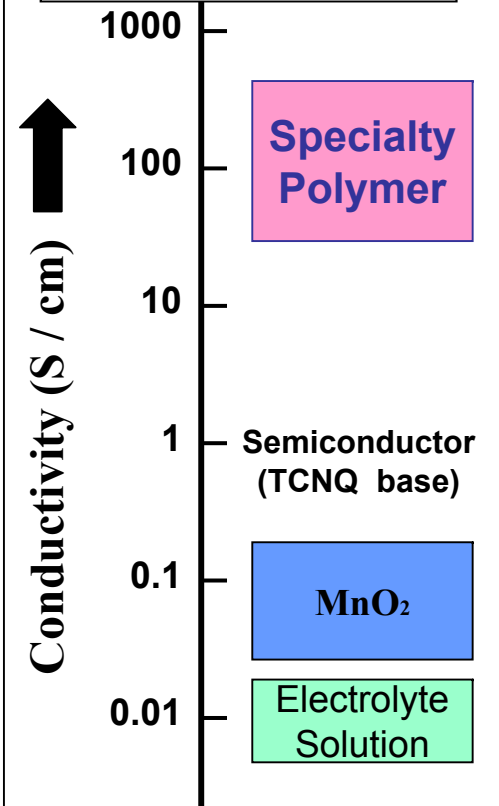
SP-Cap



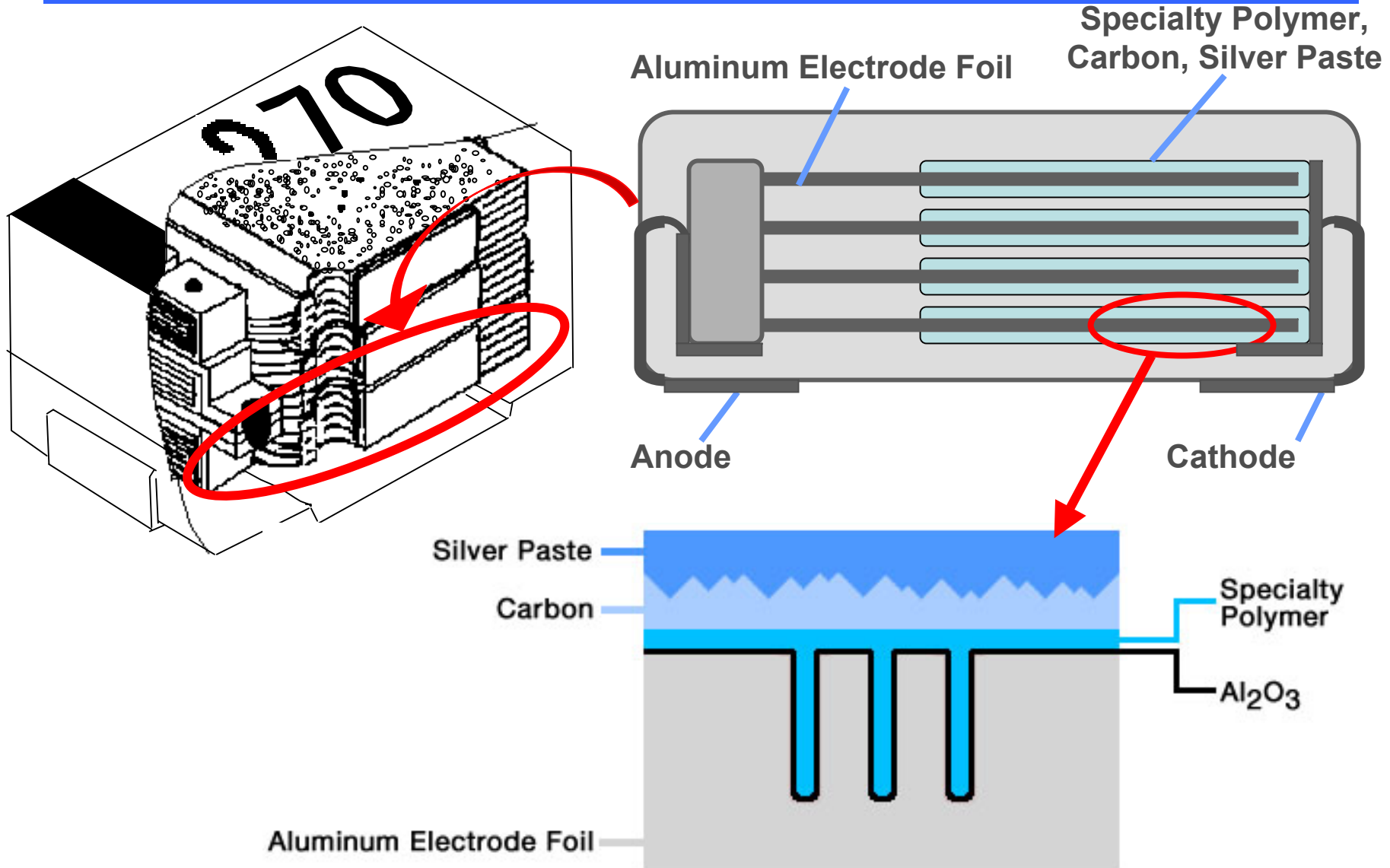
Sinter Type (Ta)



Conductivity by Electrolyte



Construction of the SP-Cap



Features of the SP-Cap

1. Excellent Characteristics:

- 1) Very low ESR (Equivalent Series Resistance)
- 2) Very low Impedance
- 3) Stable Capacitance

Excellent noise absorption

Excellent ripple voltage smoothing

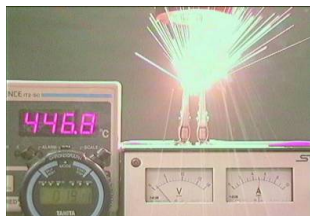
Excellent transient response

2. High Reliability

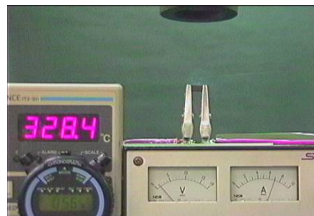
(Reduction in the design lead time.)

- 1) No voltage de-rating (100% voltage apply) guaranteed
- 2) Less flammability even if specified conditions

Tantalum



SP-Cap
Specialty Polymer Capacitor



Best selection as a Tantalum replacement.

5A apply

* Actual ignition depends on each circuit conditions.

3. Low Profile

1.8mm height as the lowest profile type



Effective solution for low profile DC/DC.

Roadmap of SP-Cap Products

New

High Capacitance Series



CD Series (L Case)
2V**150** μ F 18m Ω
7.3x4.3x1.8



UD Series (D Case)
2V**330** μ F 15m Ω
7.3x4.3x2.8



UE Series (E Case)
2V**470** μ F 12m Ω
7.3x4.3x4.2

New

H Series

125°C Guarantee

E Case
2V**330** μ F 12m Ω
7.3x4.3x4.2



D Case
2V**220** μ F 15m Ω
7.3x4.3x2.8



L Case
2V**100** μ F 18m Ω
7.3x4.3x1.8



High Reliability

High Capacitance

Standard Series

CD Series (L Case)



2V**100** μ F
18m Ω
7.3x4.3x1.8

UD Series (D Case)



2V**220** μ F
15m Ω
7.3x4.3x2.8

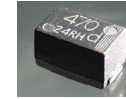
UE Series (E Case)



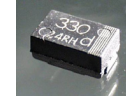
2V**330** μ F
12m Ω
7.3x4.3x4.2

New

S Series



E Case
2V**470** μ F **5m** Ω
7.3x4.3x4.2



D Case
2V**330** μ F **7m** Ω
7.3x4.3x2.8



X Case
2V**180** μ F **9m** Ω
7.3x4.3x1.9



L Case
2V**150** μ F **9m** Ω
7.3x4.3x1.8

Low ESR

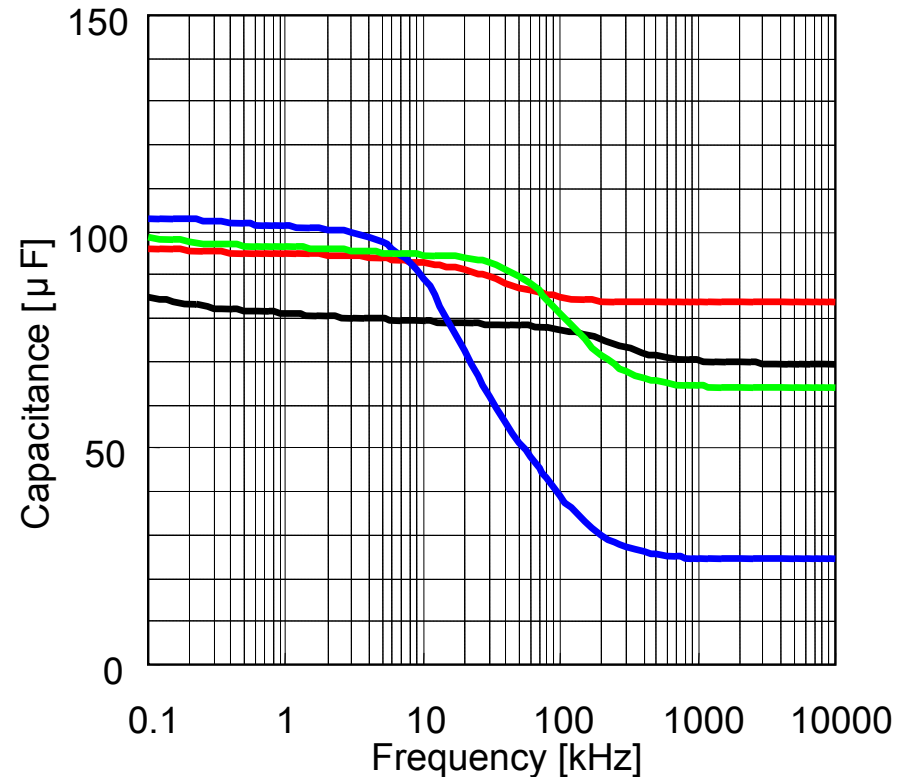
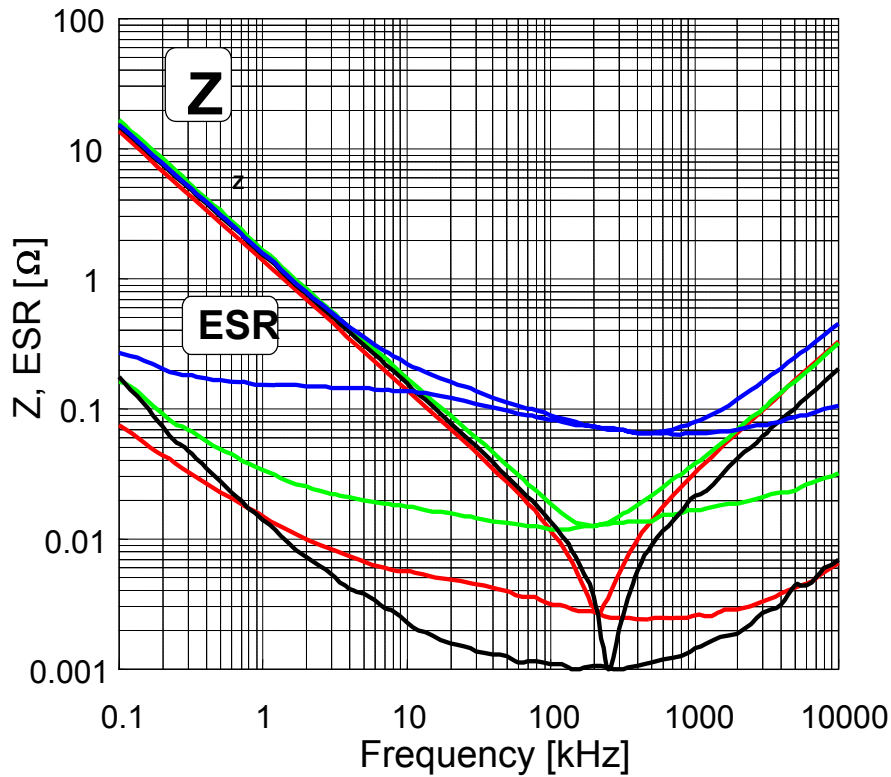
Low Profile

FD Series



FD Series
2V**68** μ F 28m Ω
7.3x4.3x**1.1**

Basic Characteristics of the SP Cap



SP-Cap has very low ESR & very low Impedance characteristic

SP-Cap has stable Capacitance in High Frequency

■ **SP-Cap 6.3V 100 μF**

■ Specialty Polymer Tantalum Capacitor, 10V, 100 μF

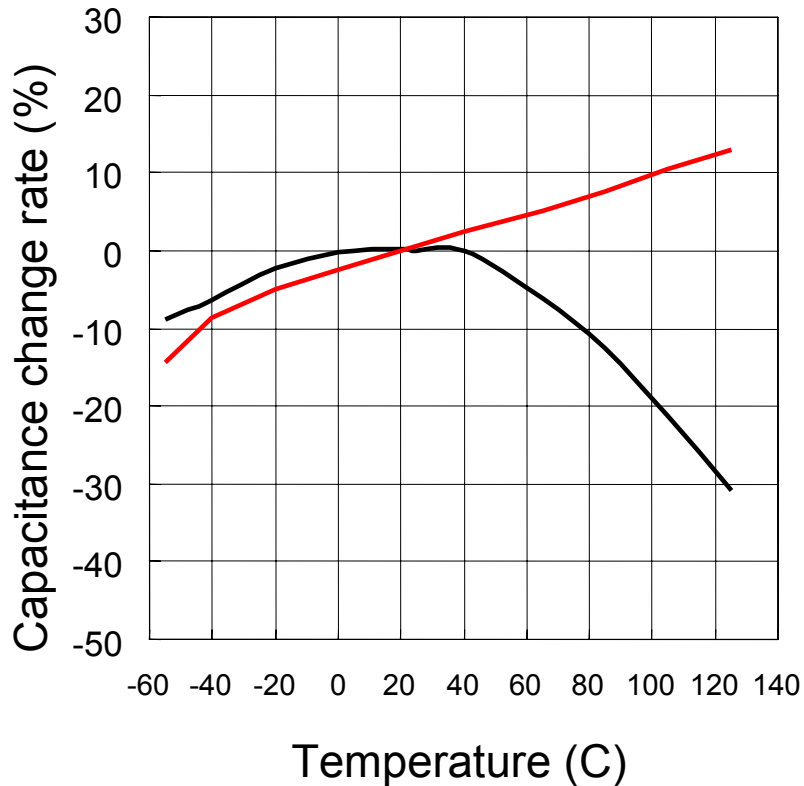
■ Low ESR, Tantalum Capacitor, 10V 100 μF

■ Ceramic Capacitor 6.3V, 100 μF

Basic Characteristics SP-Cap vs. MLCC

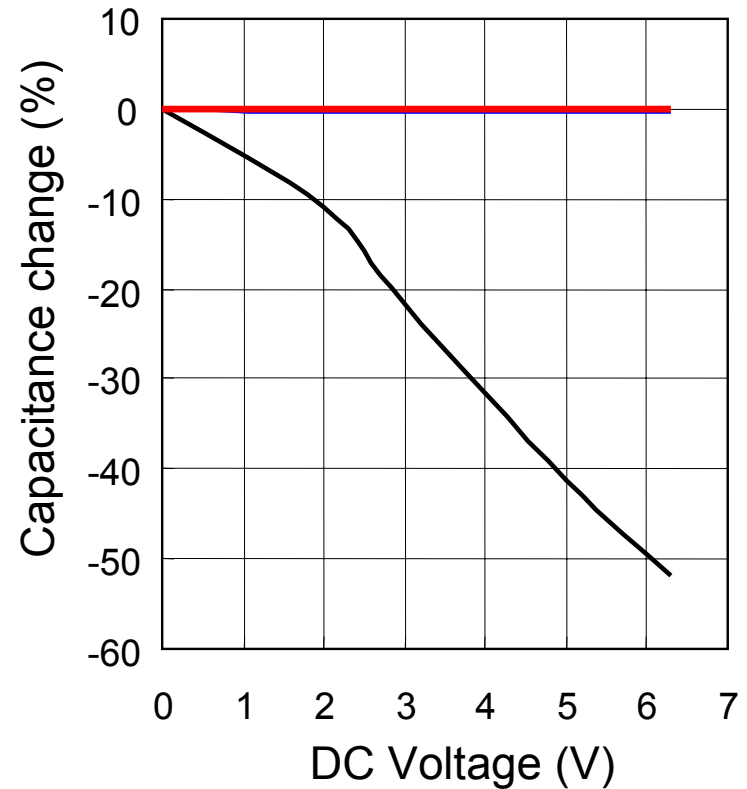
(1) Temperature characteristics

Temperature vs. capacitance at 120Hz

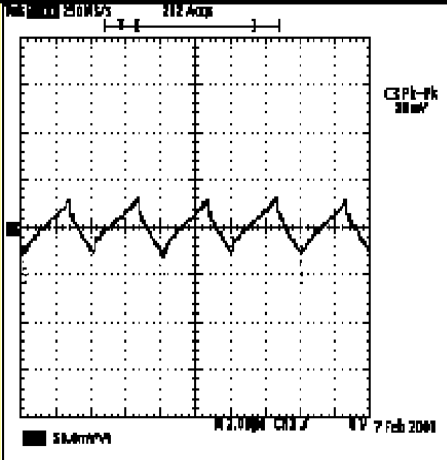
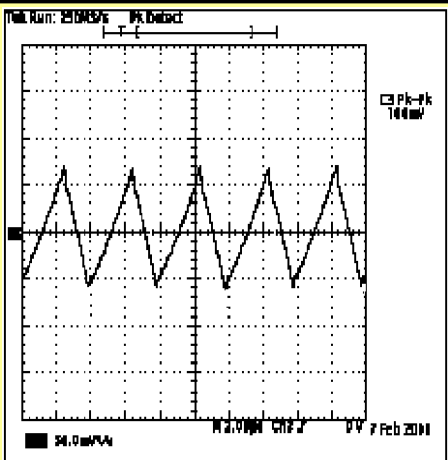
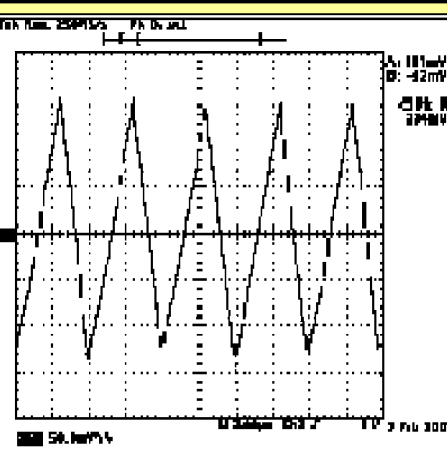


(2) DC bias characteristics

DC Bias Characteristics



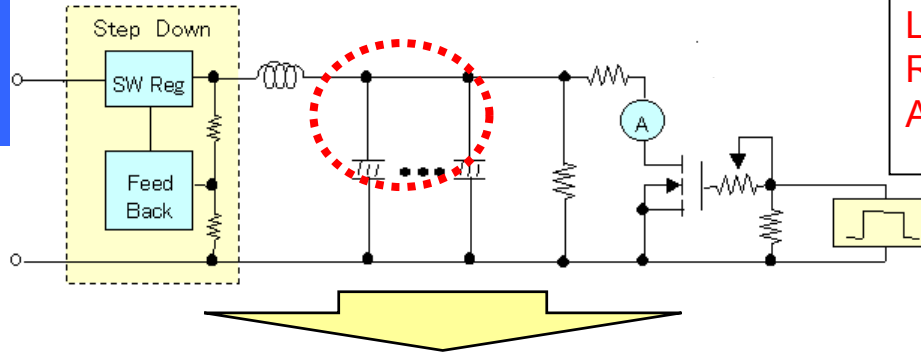
Excellent ripple voltage smoothing

<i>SP-Cap</i>	Specialty Polymer Tantalum	Low ESR Tantalum
2.5V 220uF	2.5V 220uF	6.3V 220uF
ESR=10mohm at 100kHz	ESR=25mohm at 100kHz	ESR=50mohm at 100kHz
Ripple Voltage: 50mVp-p	Ripple Voltage: 125mVp-p	Ripple Voltage: 265mVp-p
		

SP-Cap is extremely effective on ripple voltage elimination
(Contribution of very low ESR characteristic)

Excellent transient response

Circuit Example

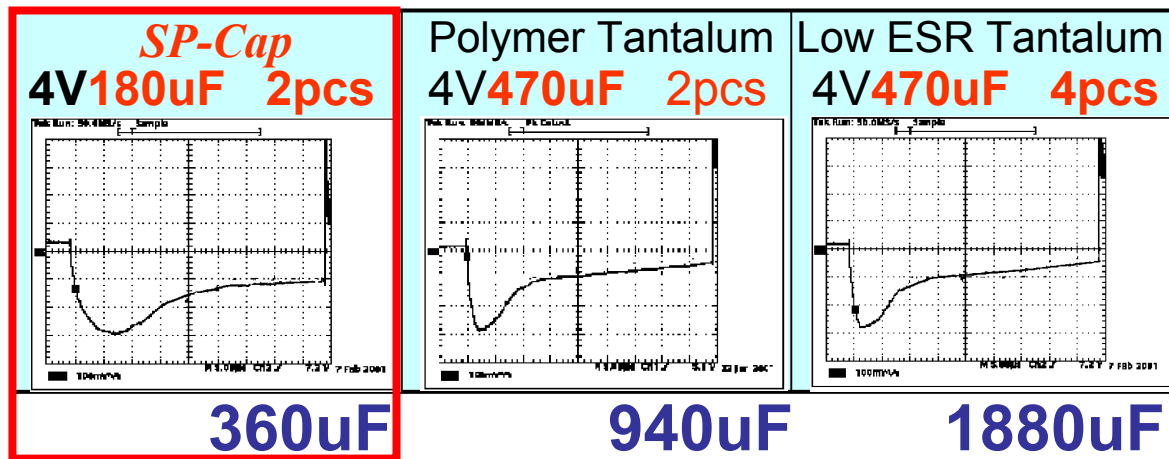


Load Conditions

Load Time: 45 μ S Frequency: 240 μ S
Rising Time: 100nS Load Current: 12A
Applied Voltage: 2V

Pulse Load Circuit

Comparison of Number of Pieces Needed



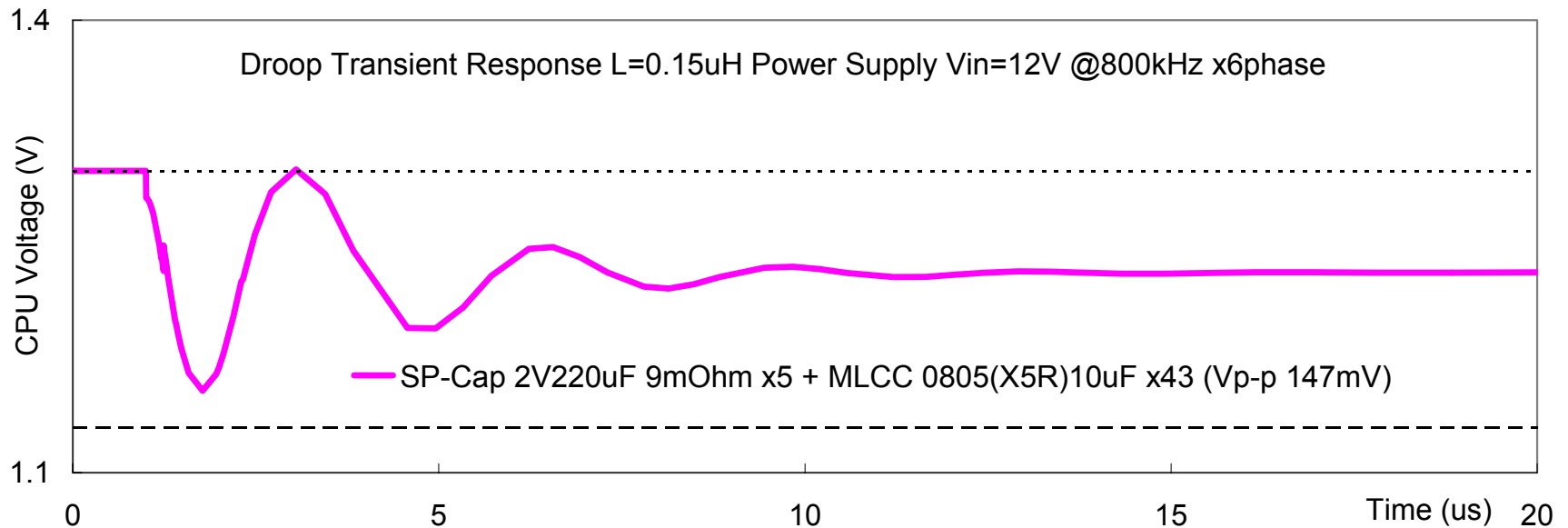
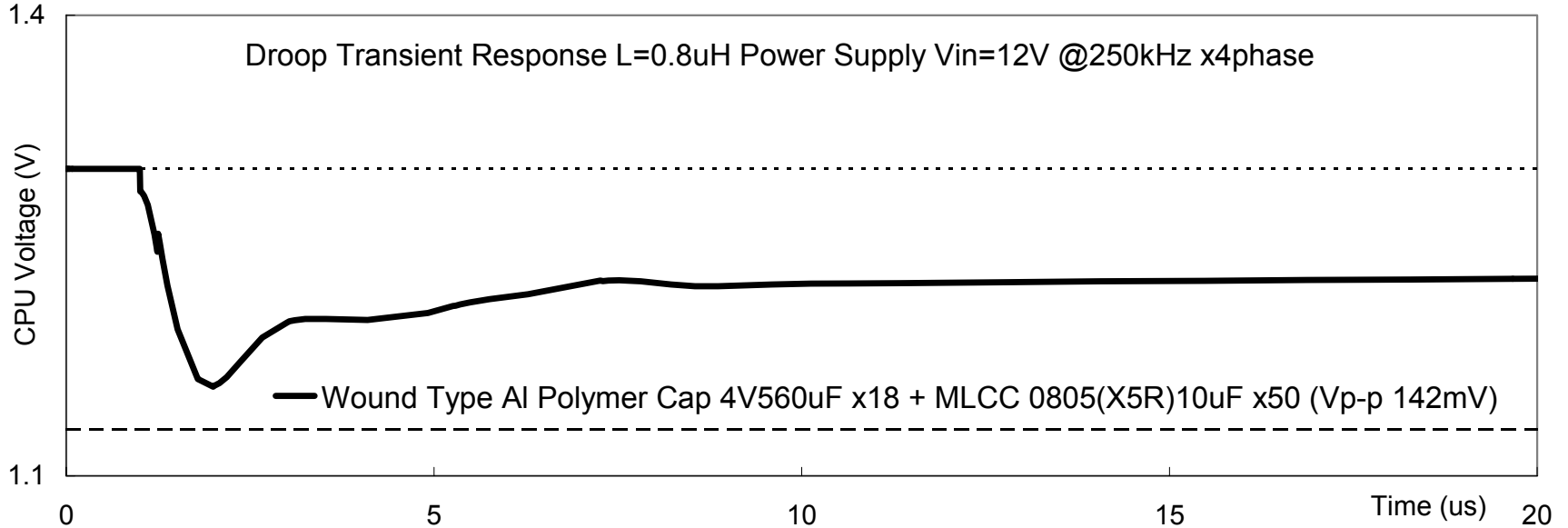
SP-Cap enables the Same Transient Response Capability at Lower Capacitance

Conditions for P-SPICE Model simulation

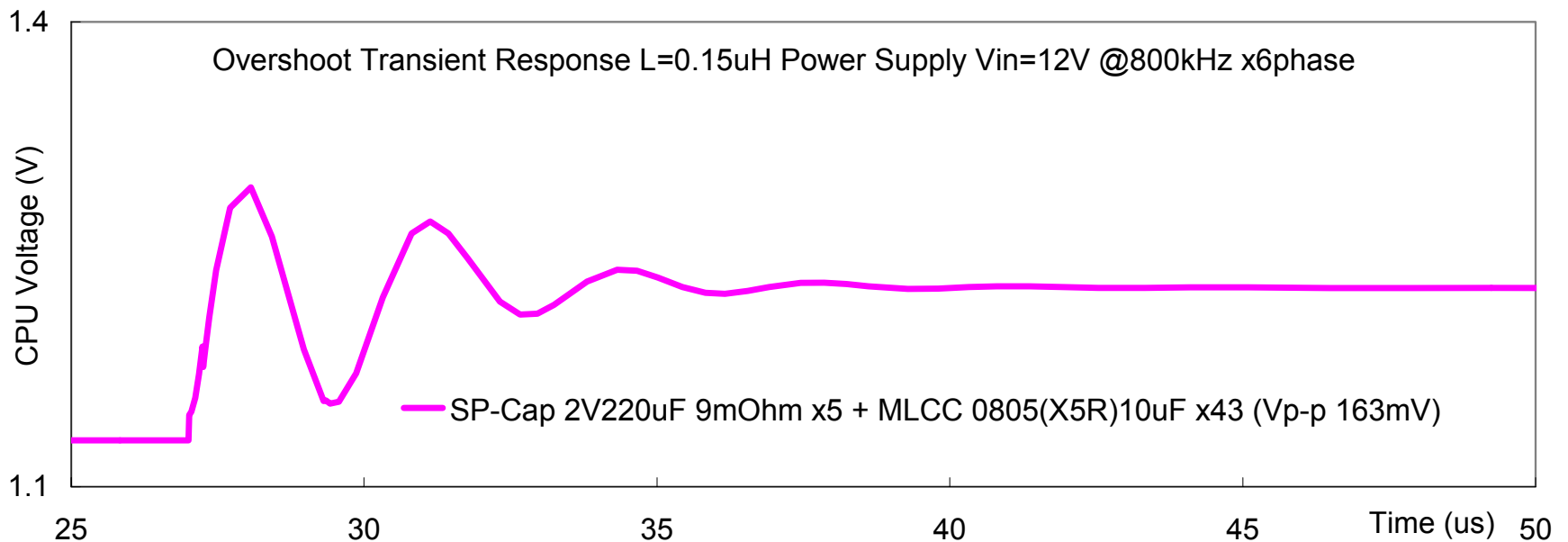
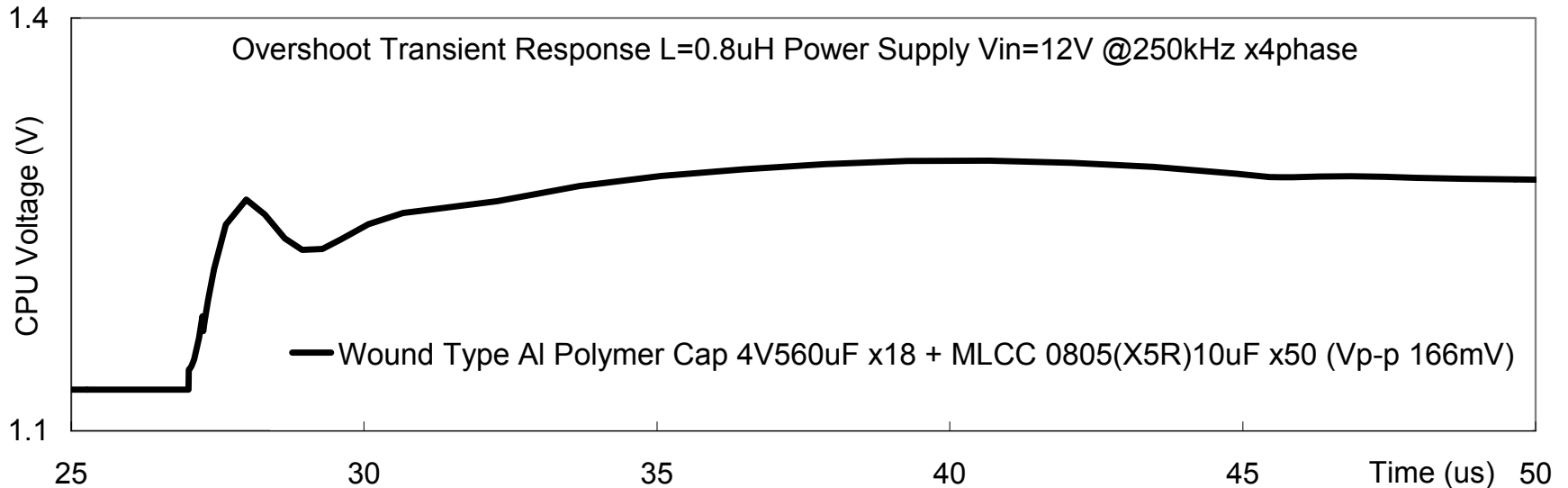
*CPU slew: 500A/us *Iout:120A step *Vin: 12V *Vout: 1.3V +/- 85mV

	Option A	Option B
Output Capacitor Solution	SP Cap + MLCC	Wound Polymer type Al + MLCC
Switching Frequency/Phase	800KHz	250kHz
Number of Phases	6	4
Inductance/Phase	0.15uH	0.8uH
Droop (Vp-p)	147mV	142mV
Overshoot (Vp-p)	163mV	166mV
Total Bulk Capacitance	1,100uF SP-Cap	10,800uF Wound Poly Al
	430uF MLCC	500uF MLCC
	5 pieces SX2V 220uF 9mohm + 43 pieces 0805(X5R) 10uF	18 pieces Wound Poly AL 4V560uF 13mohm + 50 pieces (0805) 10uF

Voltage Droop Simulation

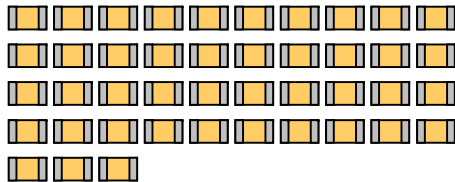


Voltage Overshoot Simulation



Footprint Saving (Component Only)

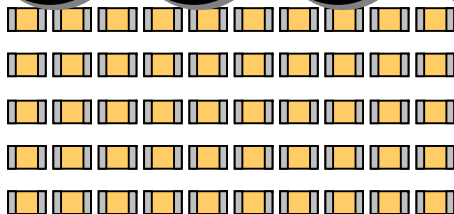
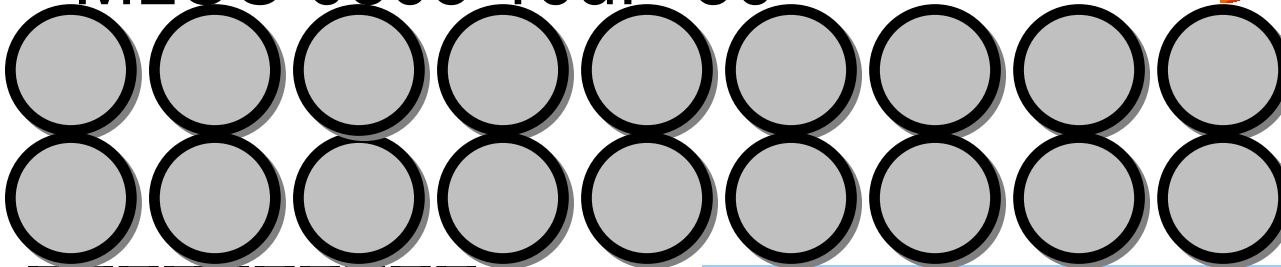
a) SP-Cap 2V/220uF 9mΩ*5+MLCC 0805 10uF*43



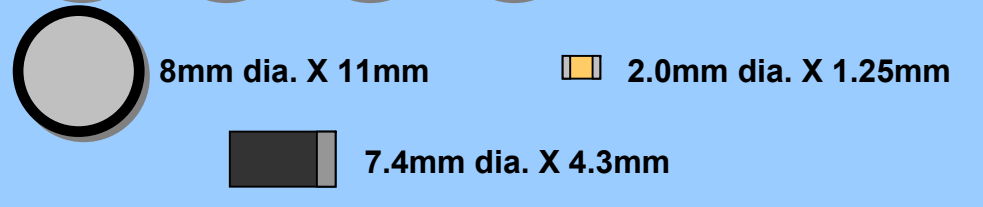
265mm²



b) Wound Polymer Al Type 4V560uF 13mΩ*18
+MLCC 0805 10uF*50



1,277mm²



Applications

■ CPU

Backup
(Transient Response)

■ DC/DC Converter

Noise absorption

■ Power Supply Line

Noise absorption

Car AV



Personal Computers



Digital AV



Communications

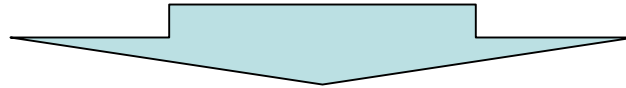


Specialty Polymer Aluminum Electrolytic Capacitor (SP-Cap) is used in a Wide Variety of Digital Devices.

Summary

Specialty Polymer Aluminum Electrolytic Capacitor (SP-Cap)

- ***Excellent noise absorption***
- ***Excellent ripple voltage smoothing***
- ***Excellent transient response capability***



**Contributing to the High Functionality
and Miniaturization of all Applications**

Thank You!



Think Panasonic Components!

Panasonic ideas for life