



Exclusive features: SP-Cap

● Very low ESR (Equivalent Series Resistance) characteristics

The specialty polymer capacitor has very low ESR characteristics which allows it to have rapid current discharge capability. This makes the SP-Cap an excellent choice as a bulk capacitor in CPU applications.

● Very low impedance characteristics

● Stable capacitance characteristics

The specialty polymer capacitor has stable capacitance characteristics versus changes in the operating temperature and frequency.

● Voltage derating not required for standard product

The specialty polymer capacitor usually can be operated at full rated voltage. Voltage derating may be required depending on the operating temperature. (125°C rated product)

● Stable temperature characteristics

The specialty polymer capacitor has stable capacitance and ESR characteristics versus changes in operating temperature.

● High safety taking full advantage of the material

More difficult to ignite and "smoke" than a tantalum electrolytic capacitor.

● Surface mounting and reduced height

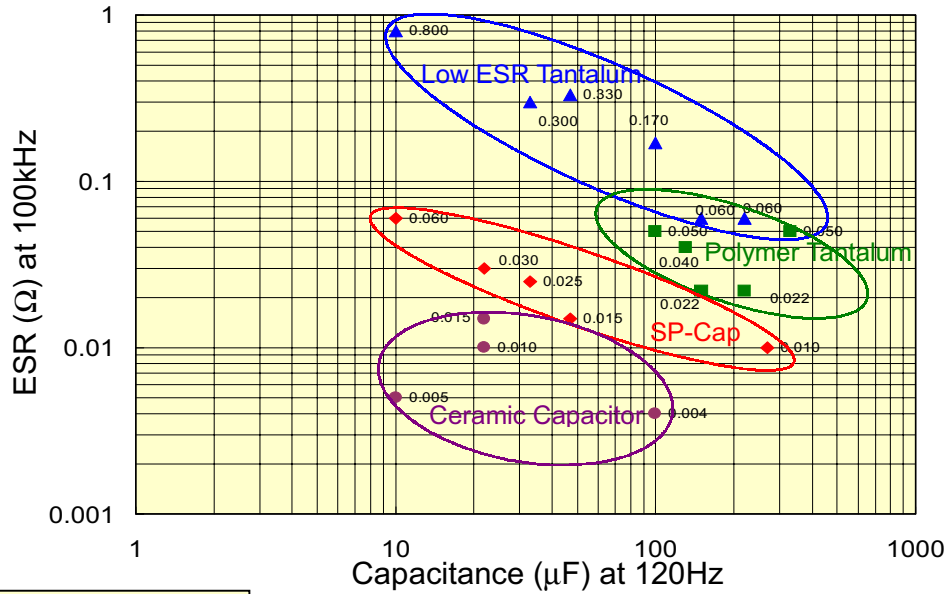
With the adoption of our exclusive new structure, surface mounting and a reduction in height have been achieved.



Comparison with other types of capacitors

Very low ESR and large capacitance

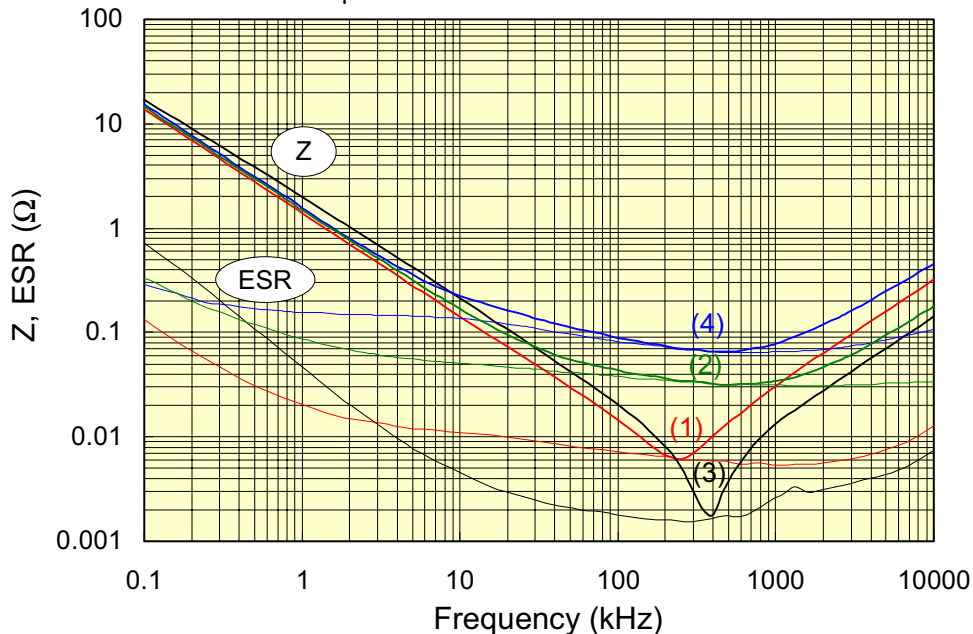
ESR: Approx. 1/10 or less than that of a tantalum capacitor
 Capacitance: Approx. 3 times or more than that of a ceramic capacitor



Very low impedance

Lowest impedance among electrolytic capacitors

- (1) SP-Cap (SL series) 2V100μF
- (2) Polymer Tantalum capacitor 4V100μF
- (3) Ceramic capacitor 6.3V100μF
- (4) Low ESR Tantalum capacitor 10V100μF

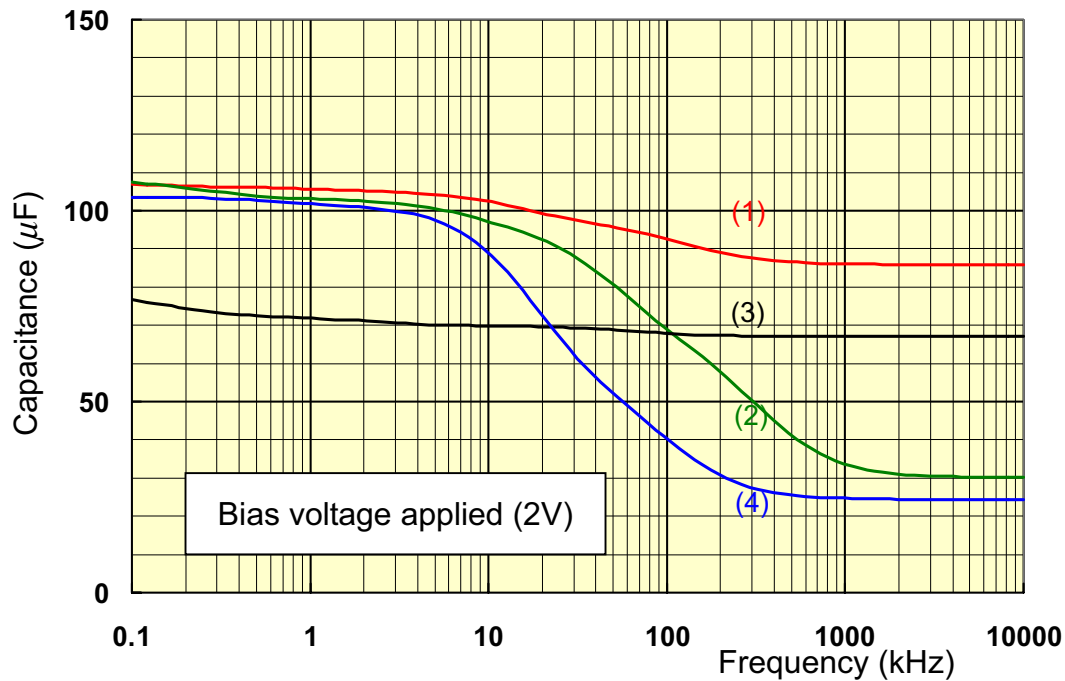
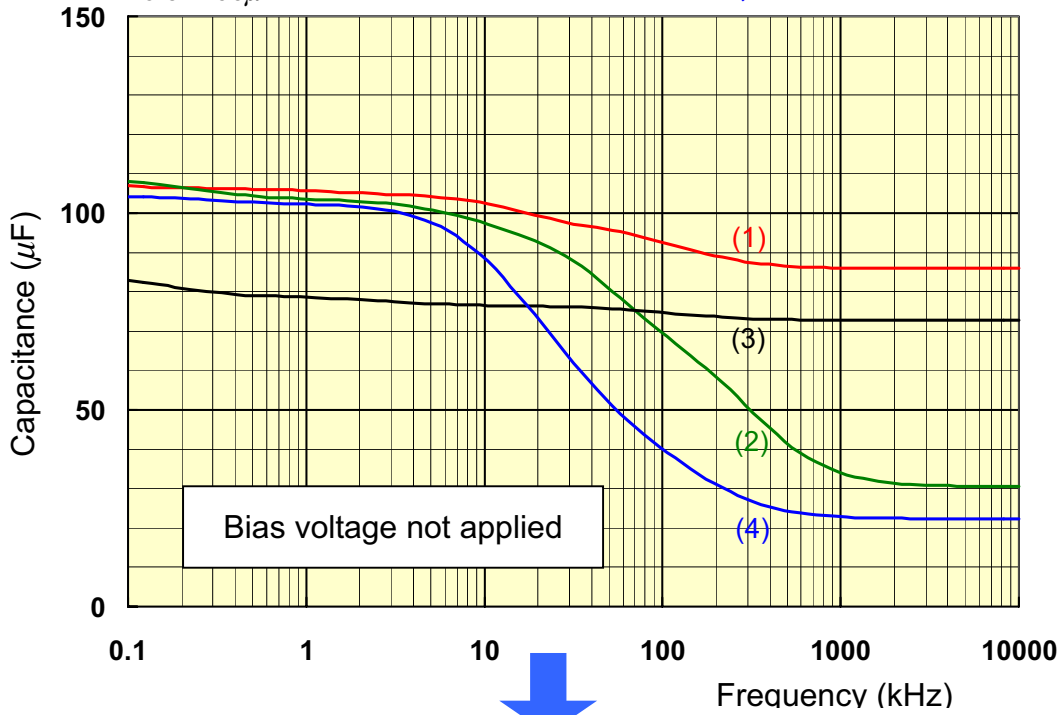




■ Stable capacitance*

- (1) SP-Cap (SL series)
2V100 μ F
- (3) Ceramic capacitor
6.3V100 μ F

- (2) Polymer Tantalum capacitor
4V100 μ F
- (4) Low ESR Tantalum capacitor
10V100 μ F



* Please refer to 'Estimation of capacitance-frequency characteristics using the Ladder model'



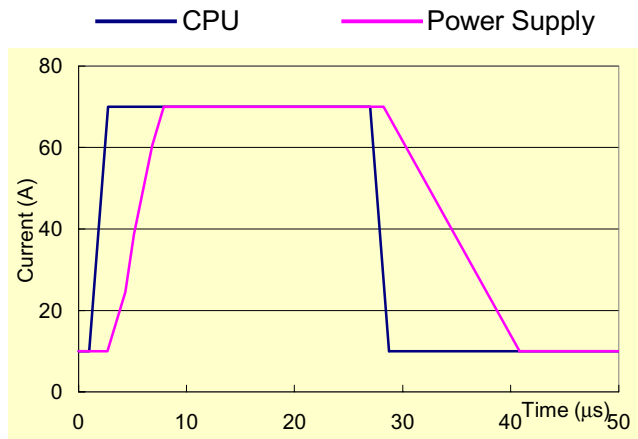
Example of simulation

SP-AL can replace MLCC!
 3 pcs of EEFC0D0101R(2V100 μ F) can replace 30 pcs of MLCC 6.3V10 μ F Y5V 1206.

Circuit conditions

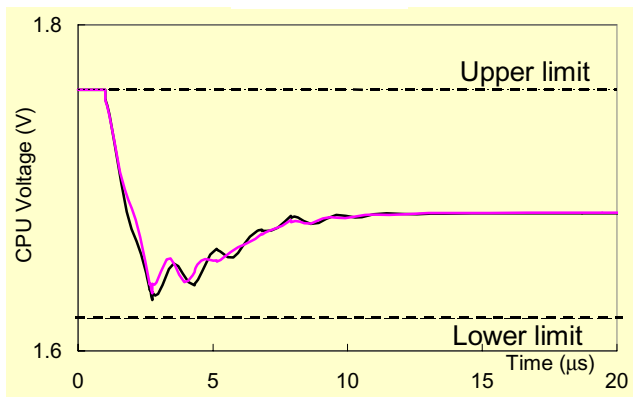
- Vin 11.4V
- Vout 1.75V
- Ip-p 60A
(Imax:70A Imin:10A)
- CPU slew rate 40A/ μ s
- Vp-p 140mV
(Transient Resp.+/-25mV)
- Switching Freq. 200kHz x3phase(=600kHz)
- Inductance 1.1 μ H
- Target CPU **Desktop P4 Northwood**

Current behavior of CPU and Power Supply

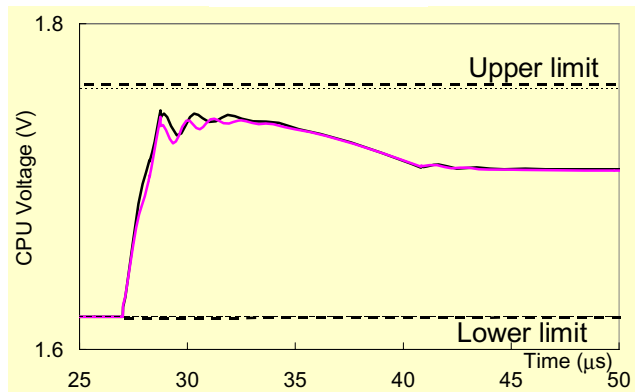


Transient response simulation results

Droop



Overshoot



Line	Capacitor solution	Droop	Overshoot
	Bulk Capacitors: (A-FJ6.3V1500 μ F x8 + OS 4V510 μ F x4)		
—	Bulk Capacitors + MLCC1206(Y5V)10 μ F x38	129mV	127mV
—	Bulk Capacitors + SP-Cap CD2V100 μ F x3 + MLCC1206(Y5V)10 μ F x8	125mV	123mV



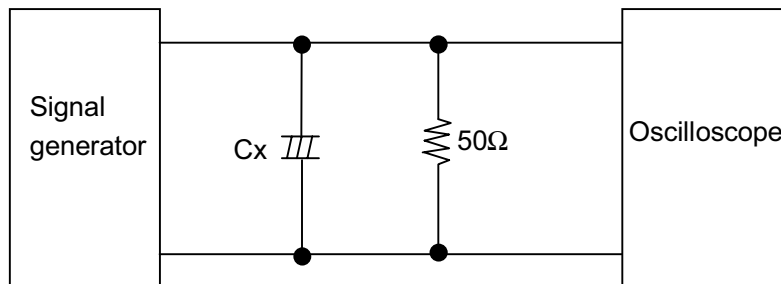
Special Capabilities

Excellent noise absorption

Noise absorption of the SP-Cap compared with other types of capacitors is shown below.

Test Circuit

Input voltage: 8Vp-p
Frequency : 1MHz



Results of comparison obtained when the noise absorption levels are set identical to each other.

Input waveform (1MHz)	Output waveform		
	Aluminum capacitor	Tantalum capacitor	SP-Cap
	1000 μ F \times 4 	100 μ F \times 3 	47 μ F \times 1
8V p-p	54mV p-p	40mV p-p	30mV p-p

The SP-Cap is excellent for noise absorption and capable of reducing the number of parts, thus reducing overall circuit size.

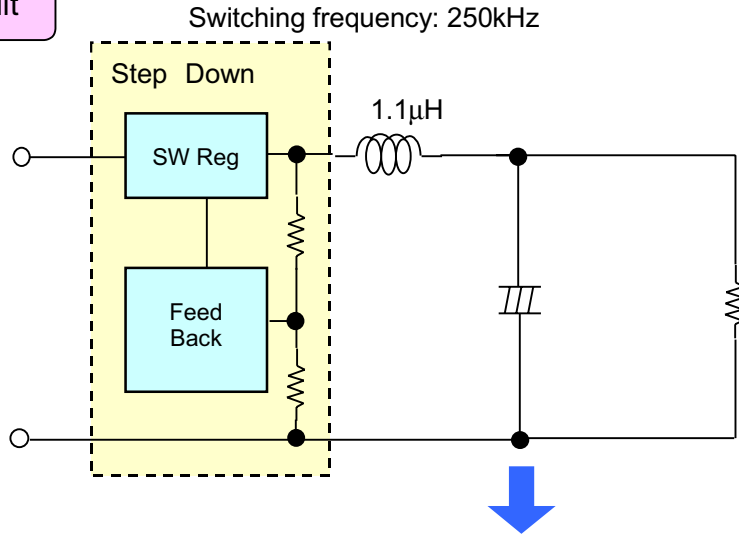




Excellent ripple voltage reduction

The voltage smoothing capability of the SP-Cap on the switching power supply output side compared with that of other types of capacitors is shown below.

Test Circuit



Ripple Voltage Reduction Comparison.
All capacitors valued identically at 220µF.

SP-Cap	Polymer tantalum	Low ESR tantalum
2.5V 220µF	2.5V 220µF	6.3V 220µF
ESR=10mΩ at 100kHz	ESR=25mΩ at 100kHz	ESR=50mΩ at 100kHz
Ripple voltage:50mVp-p	Ripple voltage:125mVp-p	Ripple voltage:265mVp-p

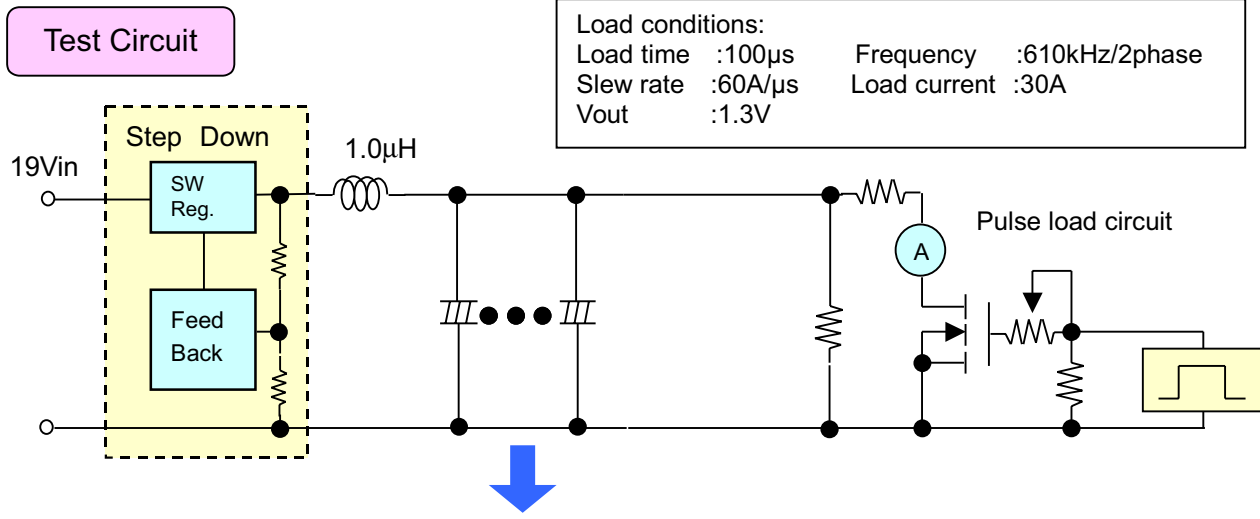
To reduce ripple voltage, an SP-Cap with a very low ESR is more suitable. For the same capacitance, an SP-Cap allows the ripple voltage to be reduced to approximately 1/3 that of a polymer tantalum capacitor and approximately 1/5 that of a low ESR tantalum capacitor.

Special Capabilities



Excellent transient response

The transient response of the SP-Cap as the load varies in a high speed condition compared with that of other types of capacitors is shown below.



Results of comparisons obtained when variable output voltages are identical to each other.

Specialty Polymer Aluminum (SP-Cap)		Specialty Polymer Tantalum	
2V 270 μ F x5 pcs	2V 220 μ F x8 pcs	4V 470 μ F x5 pcs	2.5V 330 μ F x8 pcs
Total Cap. = 1350 μ F at 120Hz	Total Cap. = 1760 μ F at 120Hz	Total Cap. = 2350 μ F at 120Hz	Total Cap. = 2640 μ F at 120Hz
ESR=3m Ω max.at 100kHz	ESR=1.9m Ω max.at 100kHz	ESR=3m Ω max.at 100kHz	ESR=1.9m Ω max.at 100kHz

Because the SP-Cap provides a very low ESR, the same transient response can be obtained with less capacitance. To obtain the same transient response with polymer tantalum, higher capacitance is required than with the polymer aluminum.

