

# 可靠的选择 —— Panasonic Polymer cap产品及应用详解

Aug, 2018

Panasonic Industrial Devices Sales (China) Co,Ltd

- 01 电容的概念与作用
- 02 高分子电容介绍
- 03 高分子电容替换方案
- 04 高分子电容典型应用
- 05 答疑&抽奖

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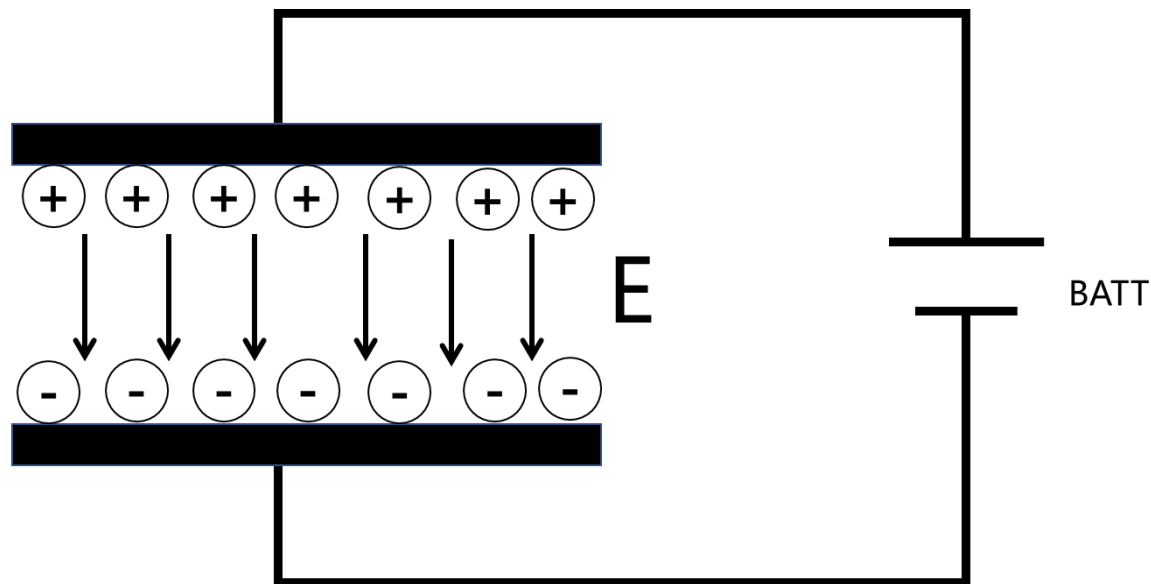
高分子电容典型应用

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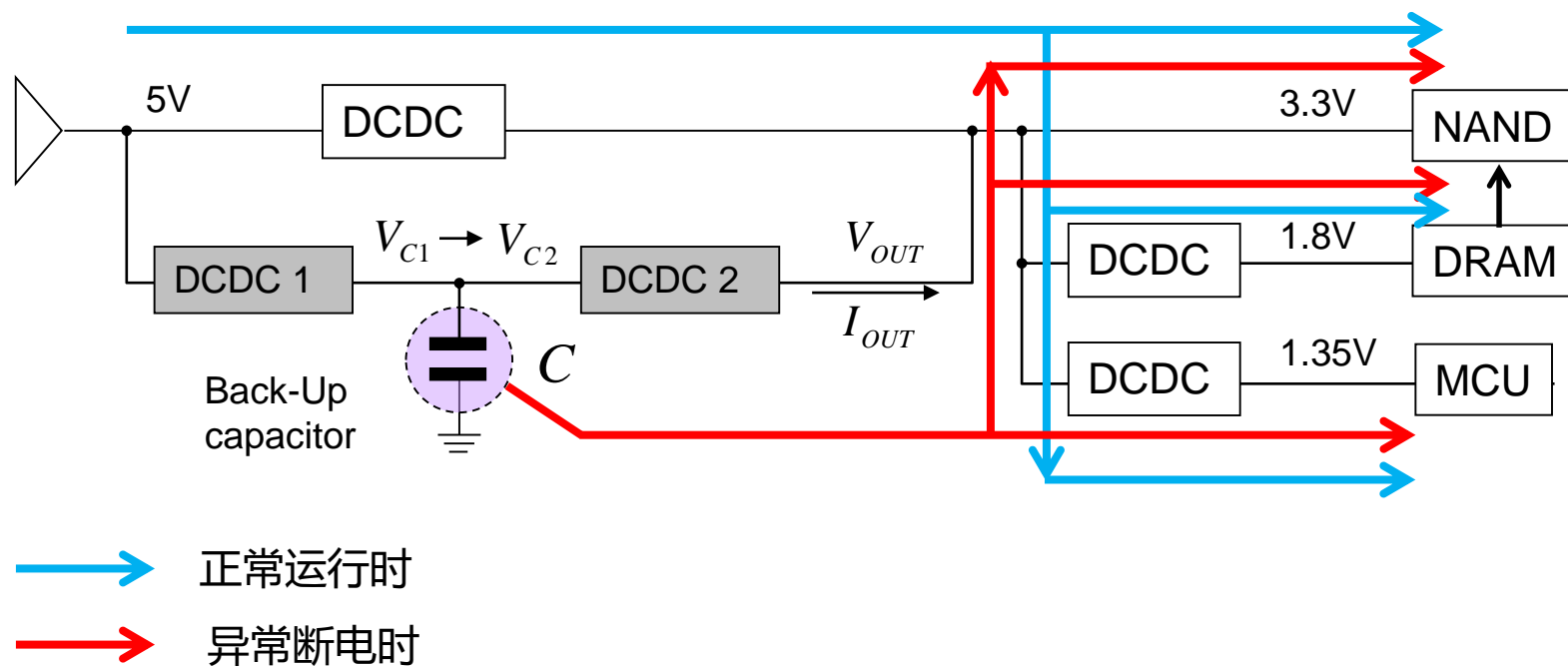
- 储能
- 改善动态响应
- 滤波

$$C = \frac{\epsilon \cdot S}{d}$$

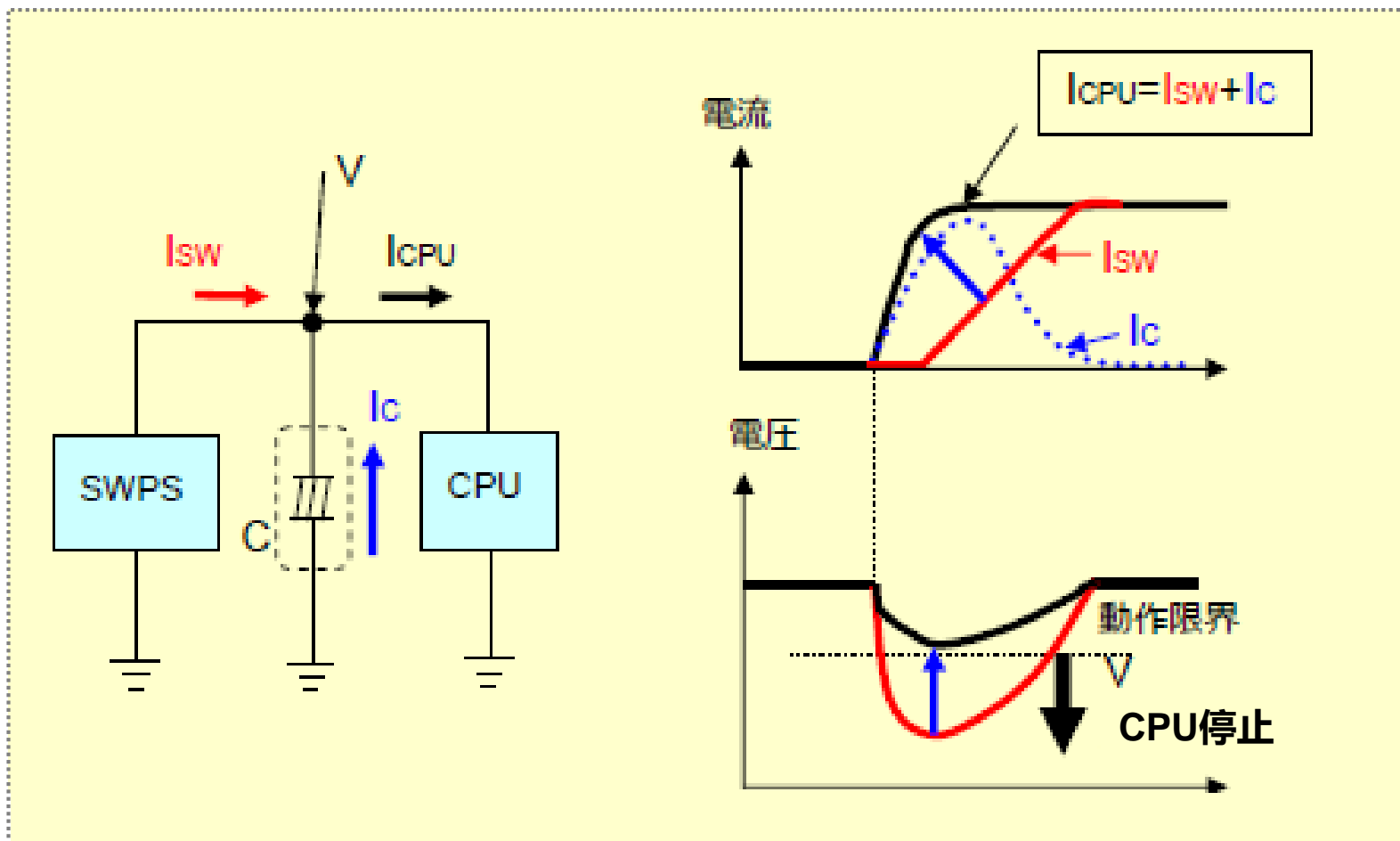
其中：  
C为电容值，单位 F（法拉）  
 $\epsilon$ 为介质的介电常数，F/m  
S为金属平板的面积， $m^2$   
d为金属平板的间距，m

- 储能

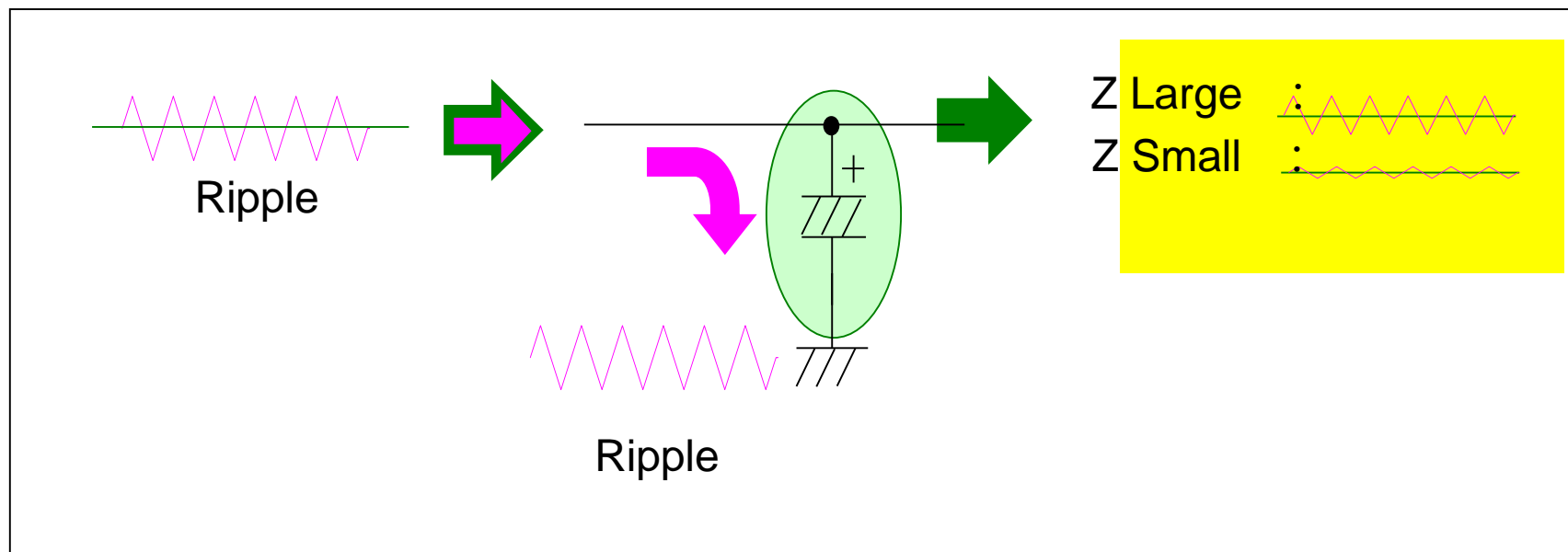
企业级SSD备电保护



- 电压平滑，改善动态响应



- 滤波



※Intel X86架构的Notebook, 服务器, 挖矿机等处理器的核供电处都需要低ESR的SP-Cap来滤除纹波

01 电容的概念与作用

**02 高分子电容介绍**

03 高分子电容替换方案

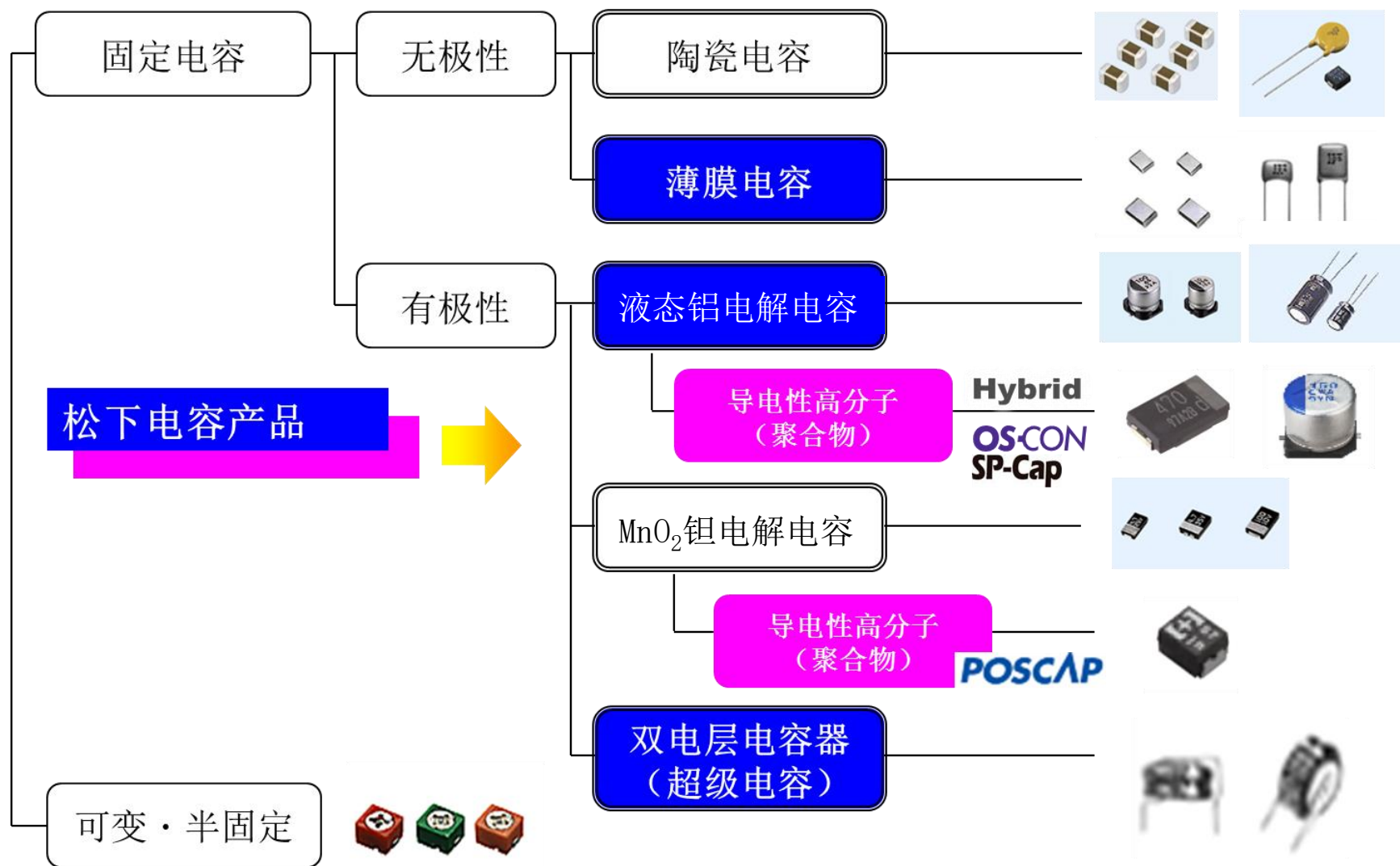
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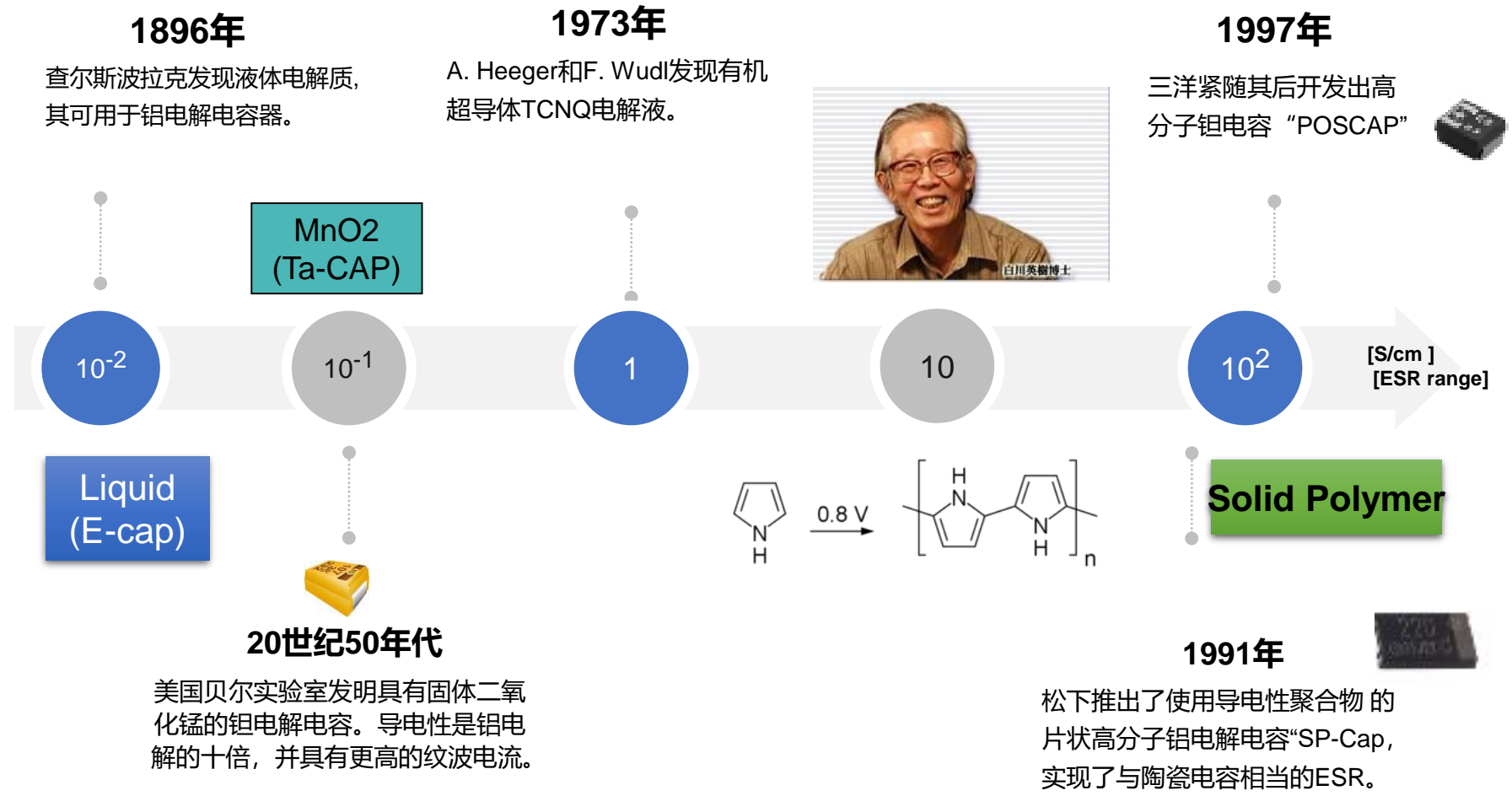
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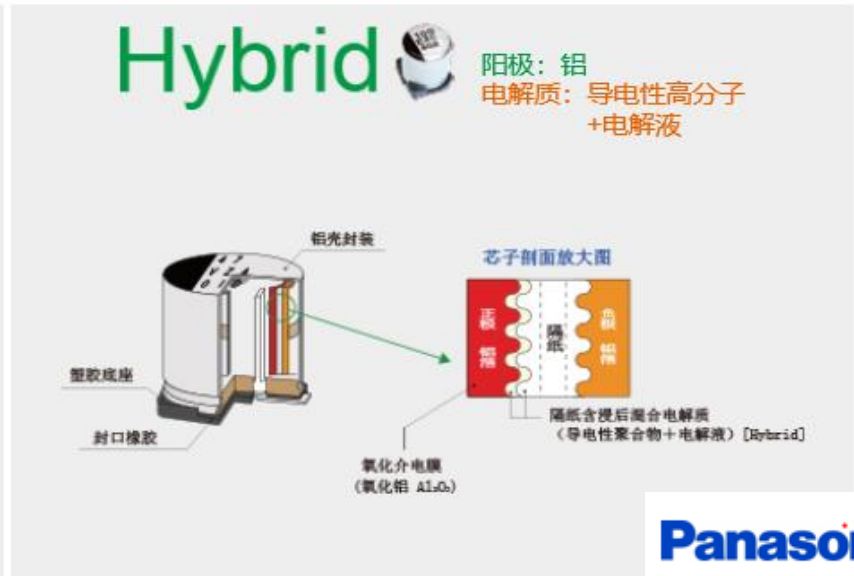
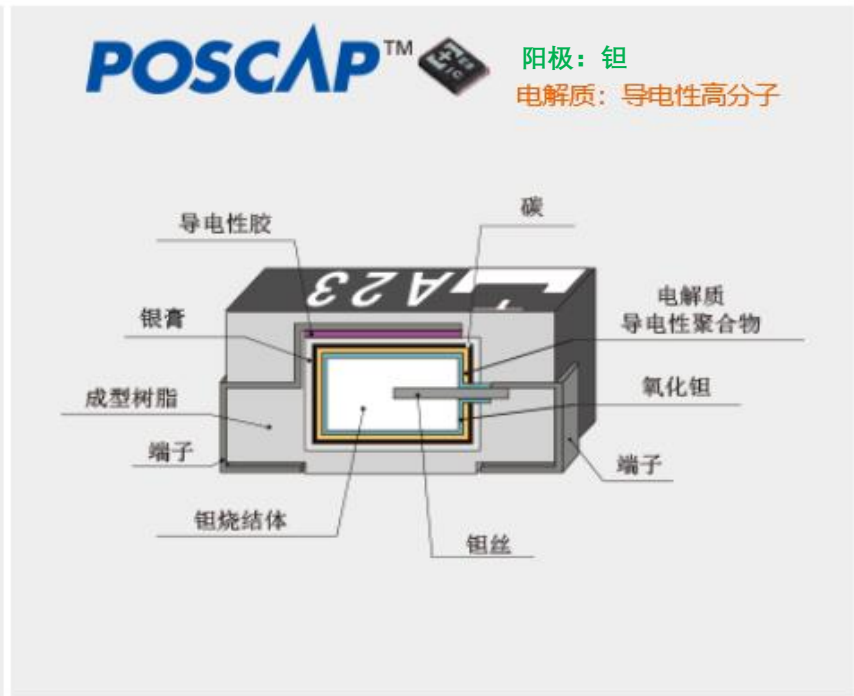
**目录**

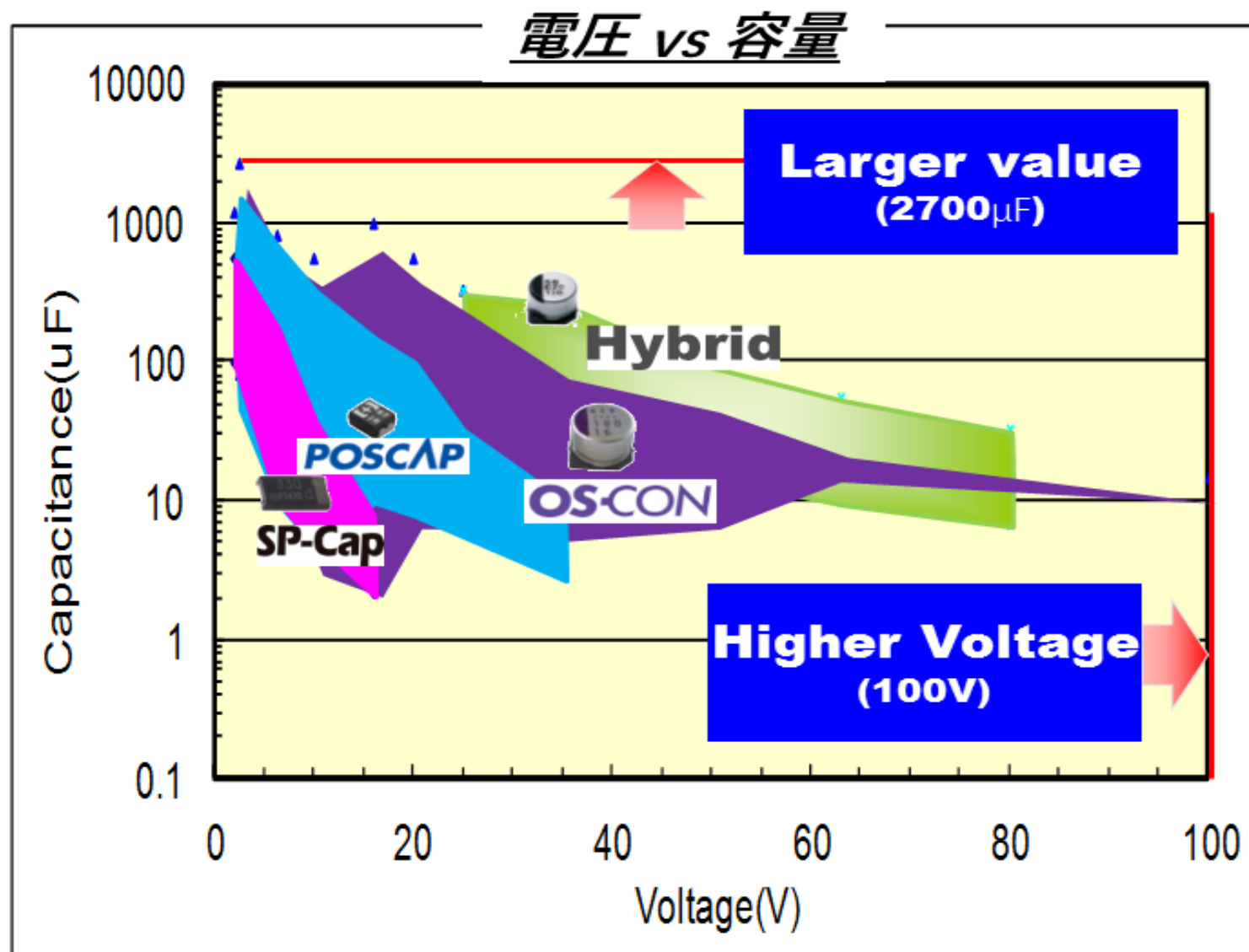


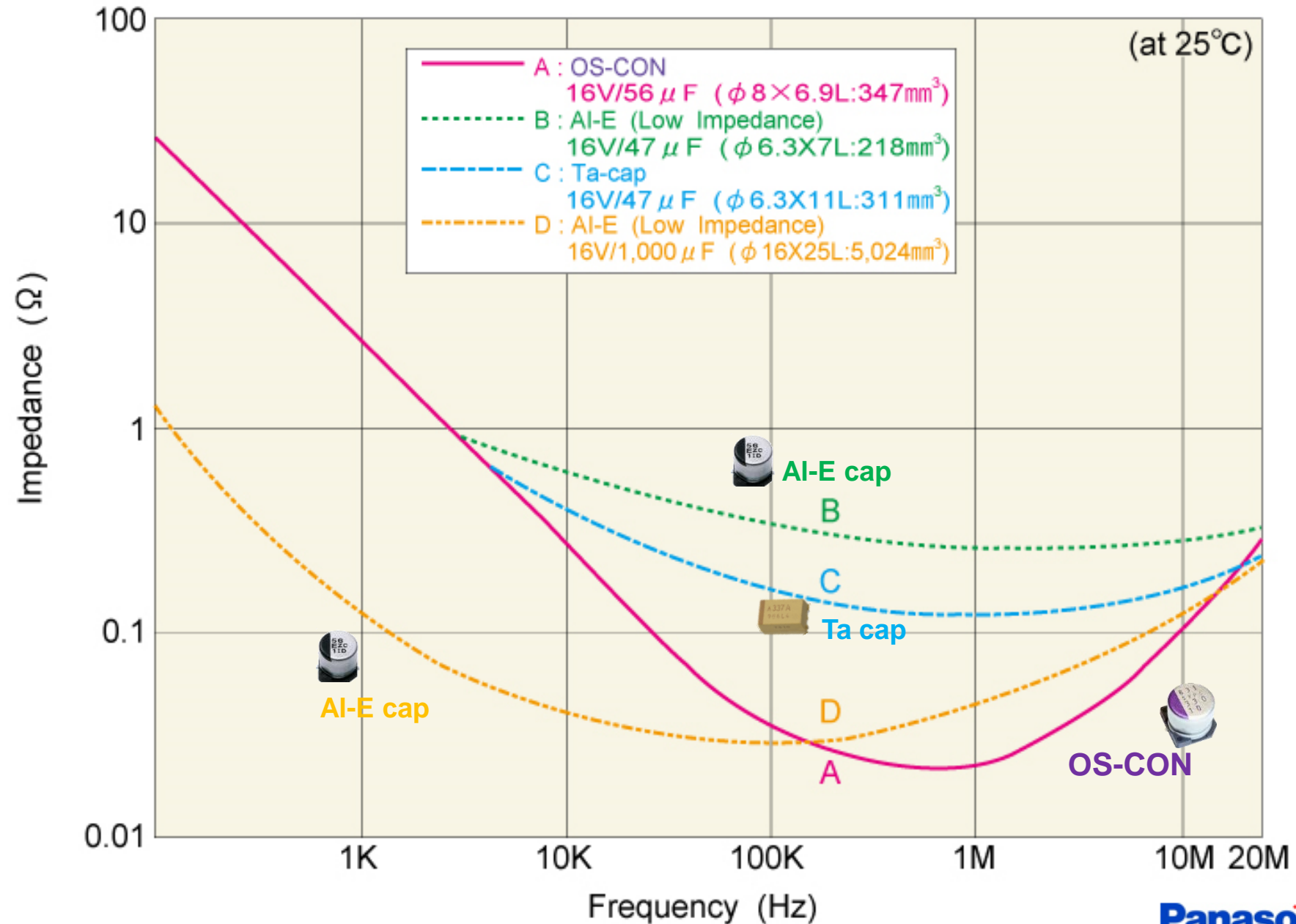


## ➤ Conductivity





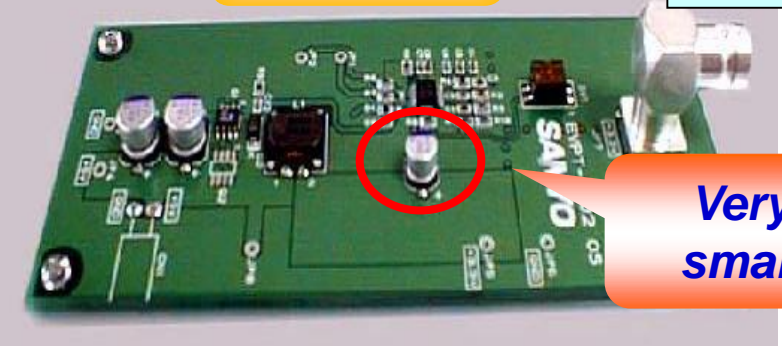




**Efficiency**

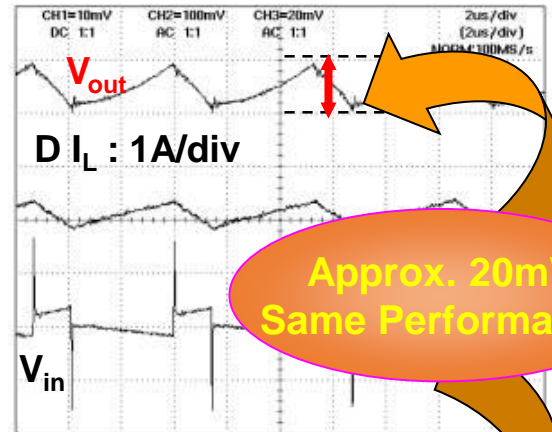
**Dimension**

**OS-CON**

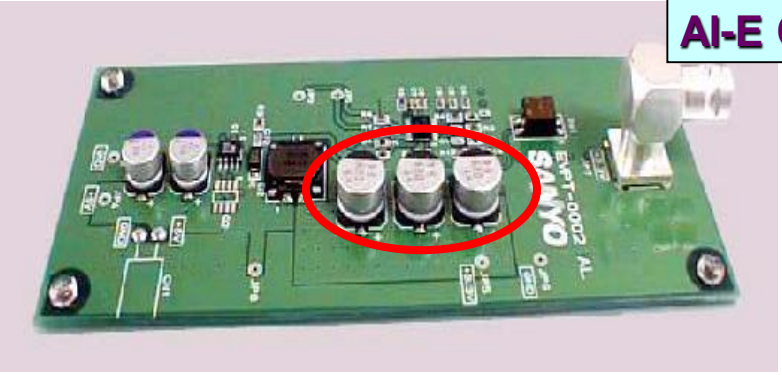


**Very small**

**OS-CON 6SVP100M 1p.**

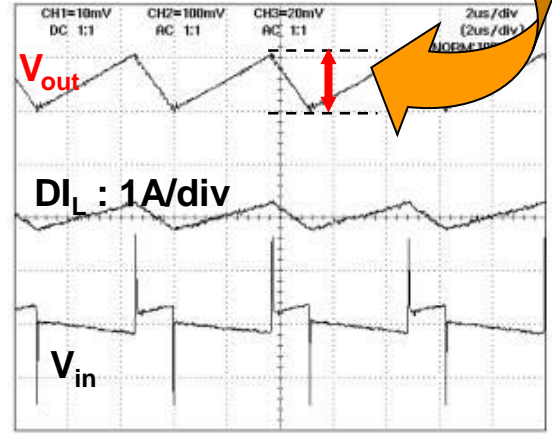


**Approx. 20mV Same Performance**



**Al-E Caps**

**Al-E Caps 6V/680uF 3pcs.**



**Replace 3pcs Al-E-Cap with just 1p OS-CON, helping circuit downsizing at same performance**

## Basic calculating formula for presumption of life

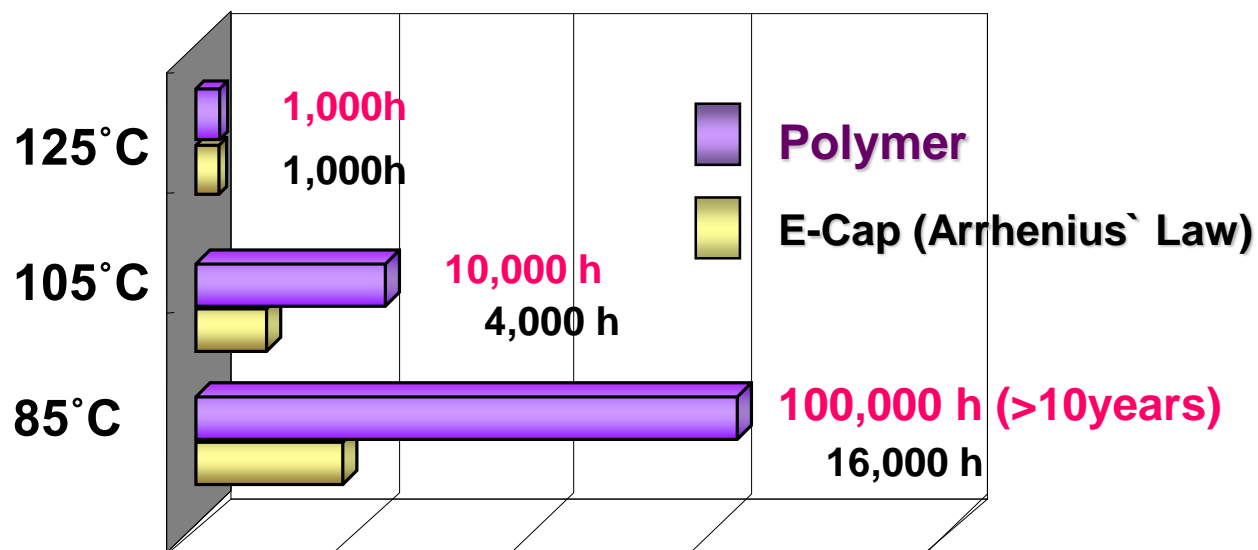
$$L_x = L_o \times 10^{\frac{T_o - T_x}{20}} \quad \text{x10 times by 20°C reduction}$$

L<sub>x</sub> : Life Expectance in actual use (temperature T<sub>x</sub>) (h)

L<sub>o</sub> : Guaranteed life at maximum temperature in use (h)

T<sub>o</sub> : Maximum operating temperature (deg.C)

T<sub>x</sub> : Temperature in actual use



## Formula of the expected life time

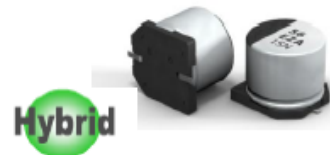


Conductive Polymer Aluminum Solid Capacitors

Life Time 5,000h@105°C, 2,000h@125°C

[ Formula ]

$$L_x = L_o \times 10^{\frac{T_o - T_x}{20}}$$



Conductive Polymer Hybrid Aluminum Electrolyte Capacitors

Life Time 10,000h@105°C, 4,000h@125°C

[ Formula ]

$$L_x = L_o \times 2^{\frac{T_o - T_x}{10}}$$

Lx : Life expectancy in actual use (temperature Tx) (h)  
 Lo : Guaranteed life at maximum temperature in use (h)  
 To : Maximum operating temperature (°C)  
 Tx : Temperature in actual use (temperature of SP-Cap) (°C)

Life Time 2,000h@105°C

[ Formula ]

$$L_x = L_o \times 10^{\frac{T_o - T_x}{20}}$$



Conductive Polymer Aluminum Solid Capacitors

Life Time 2,000h@105°C

[ Formula ]

$$L_x = L_o \times 10^{\frac{T_o - T_x}{20}}$$



Conductive Polymer Tantalum Solid Capacitors



***Ta-Cap (MnO<sub>2</sub>)***      ***Polymer***

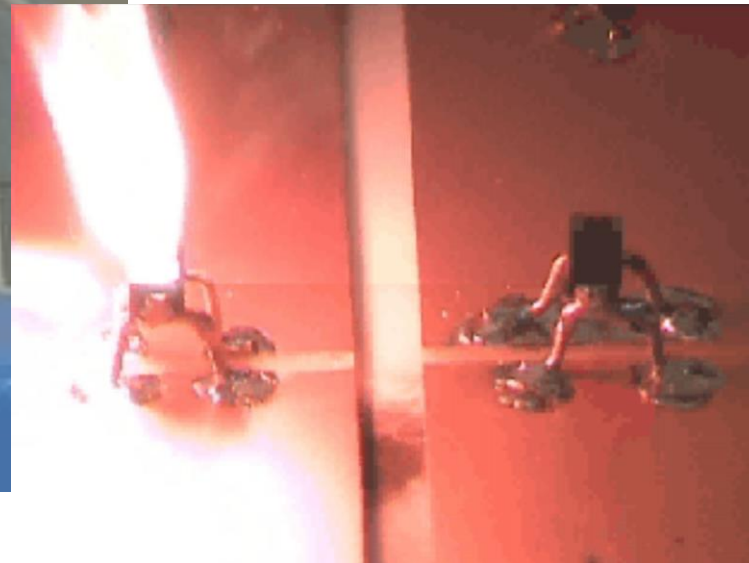
**Reliability**

**Over Voltage Test**

**\*Destructive\***

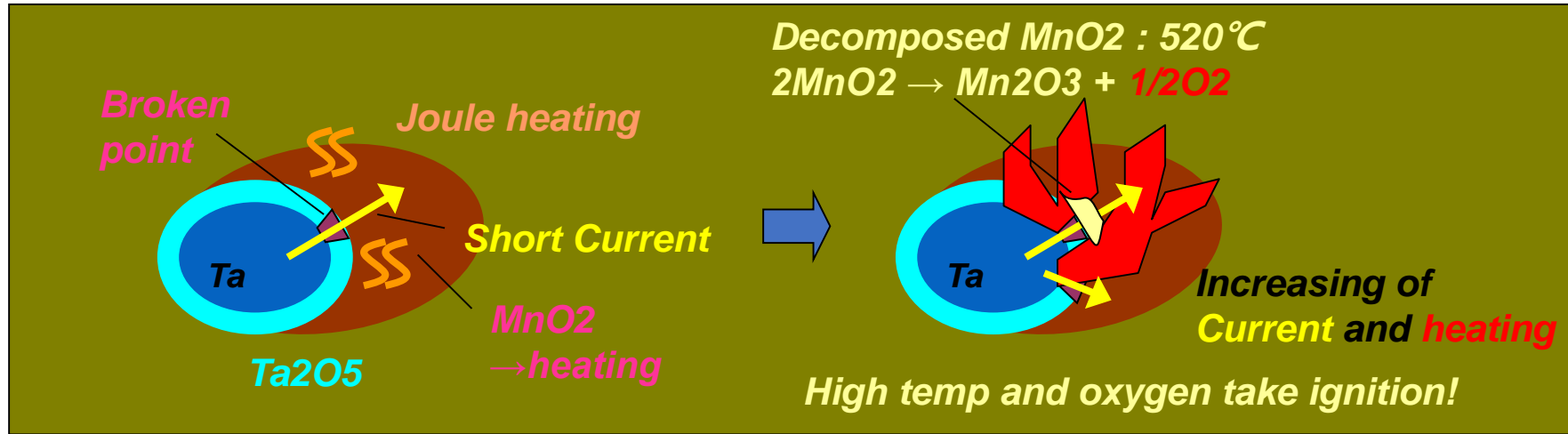
**Load Voltage : 30V.DC**

**Limit current : 6A Max.**

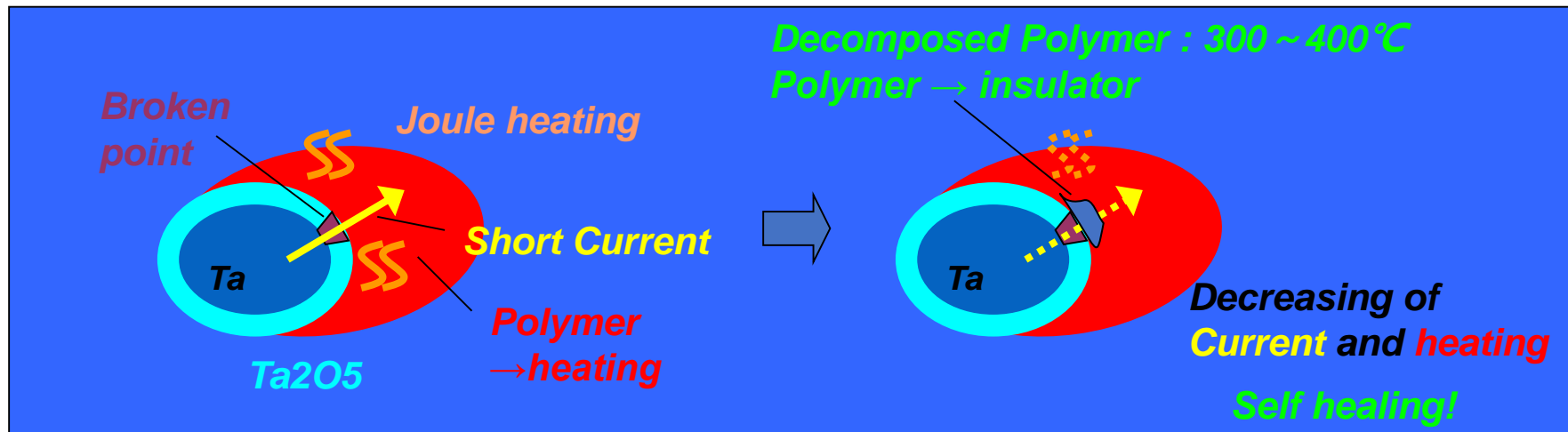


**video**

## Ta-Cap ( $MnO_2$ )



## POSCAP



**Reliability**

**De-Rating Differences:**

Standard Tantalum’s recommendation is **30 to 50%** of WV.

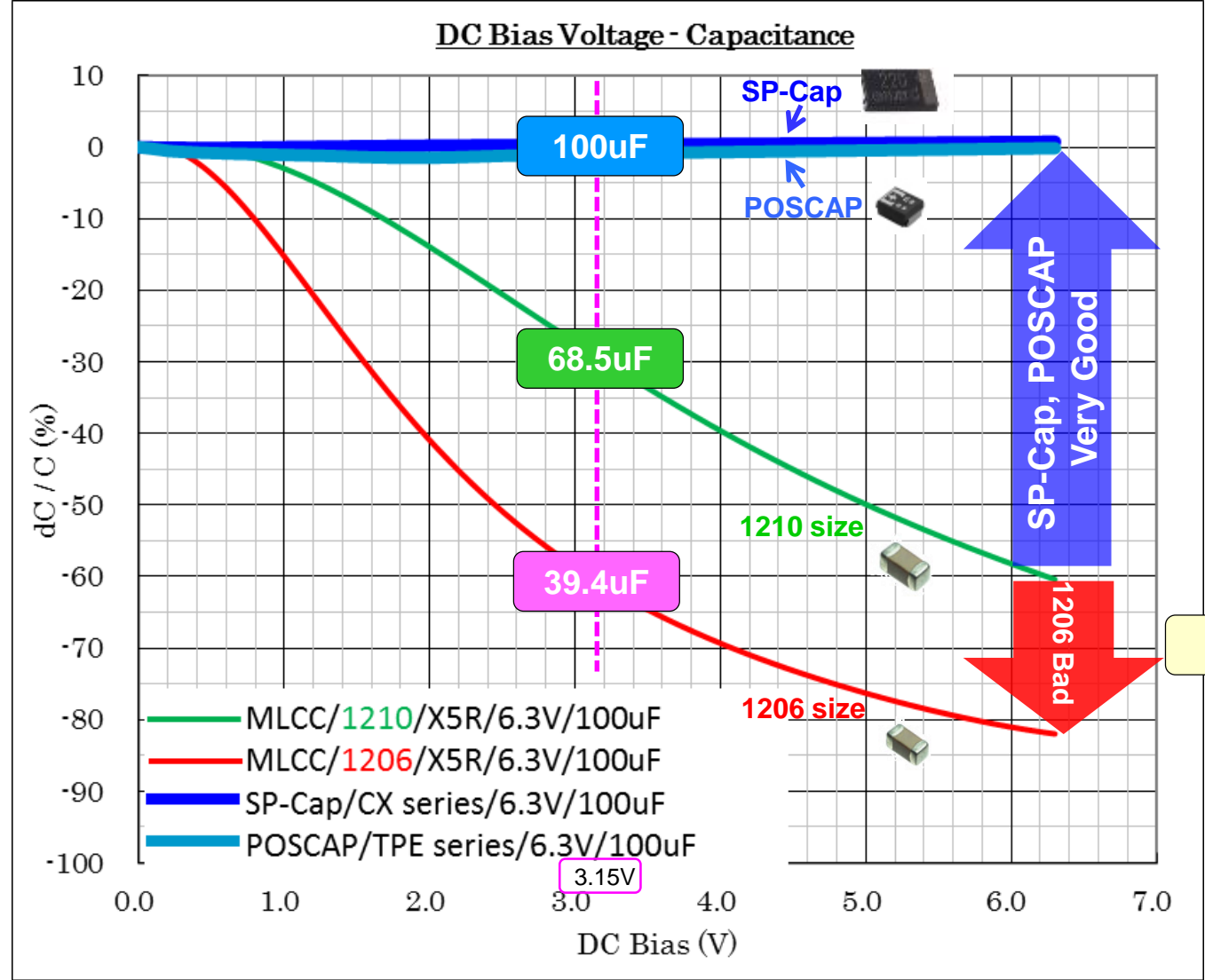
**POSCAP’s** recommendation is **80-90%** & SP-Cap is **100%** of WV.

(Actually can guarantee 100%, but keep margin for DC tolerance and ripple voltage peak)

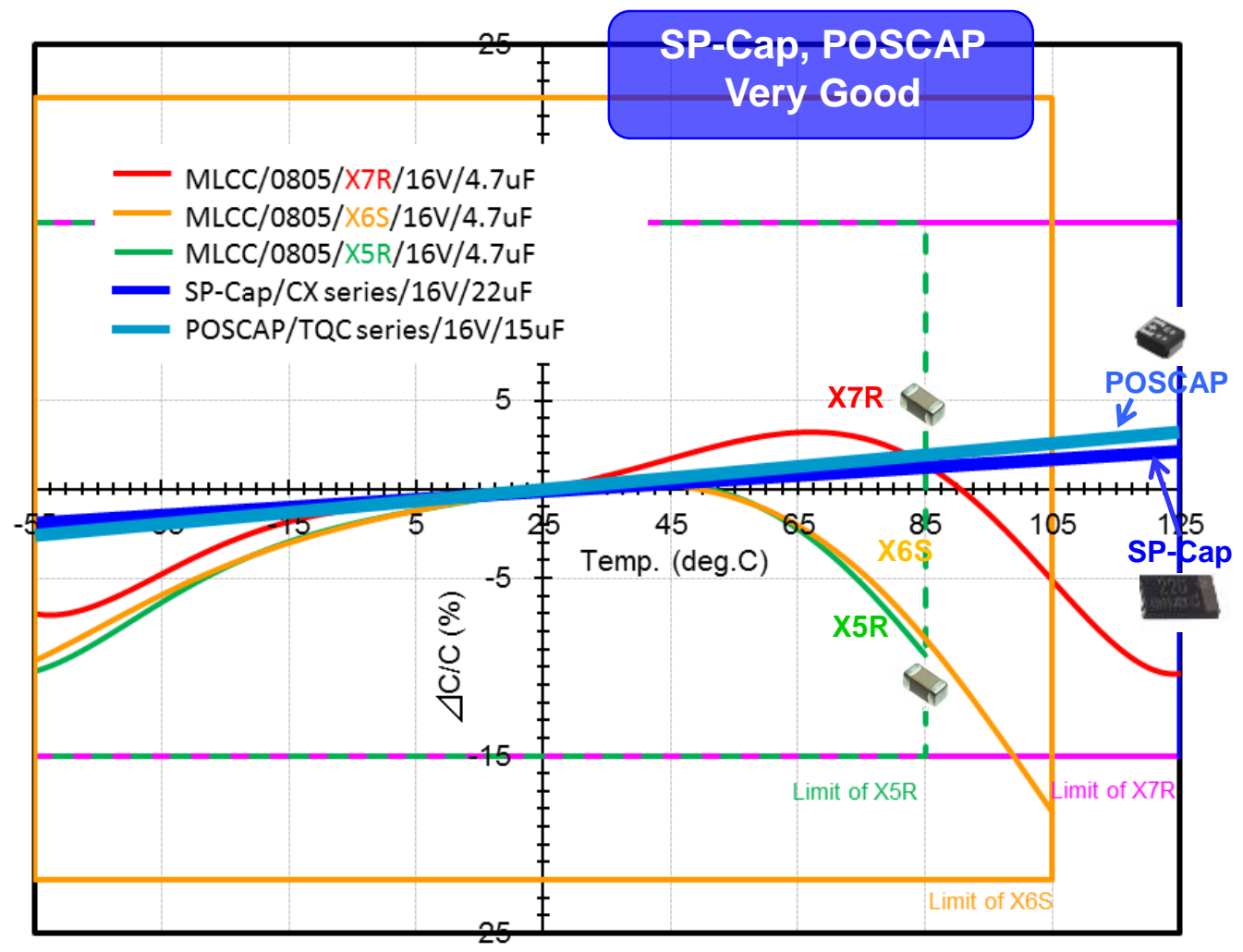
	<b>Ta-Cap</b>	<i>POSCAP/SP-Cap</i>
<b>Line Voltage (WV)</b>	<b>(RV)</b>	<b>(RV)</b>
<b>3.3</b>	<b>10</b>	<b>4</b>
<b>5</b>	<b>10-16</b>	<b>6.3</b>
<b>12</b>	<b>25</b>	<b>16</b>

*Bigger capacitance in same size by lower rated voltage  
Smaller size for miniaturization and optimisation*

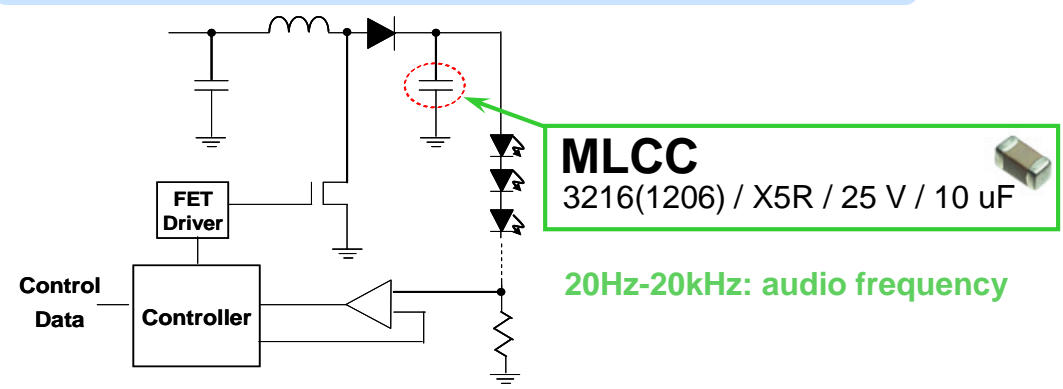
## Capacitance stability of Polymer Cap. is better than MLCC



Capacitance stability of Polymer Cap. is better than X7R (MLCC)



## Example of the power supply for LED backlight

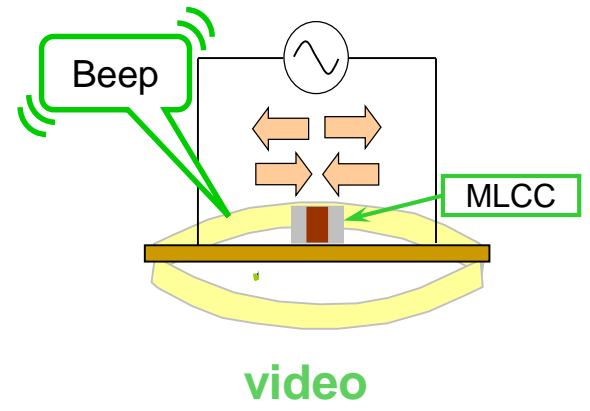


**SP-Cap**  
CS Series/7.3x4.3mm / 25 V / 10 uF

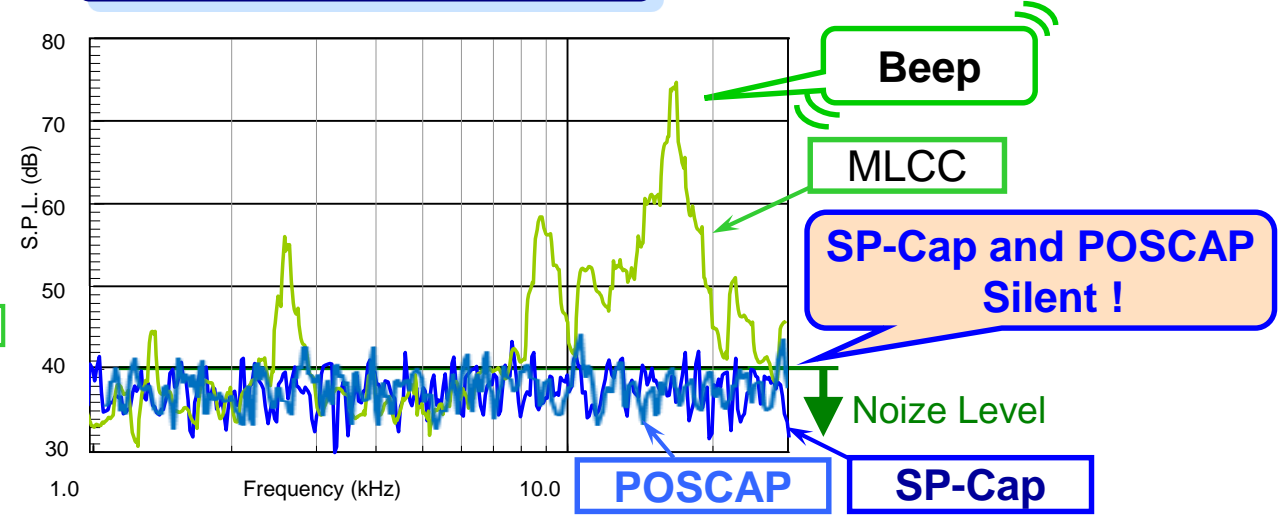


**POSCAP**  
TQC Series/3.5x2.8mm / 25 V / 15 uF

## Principles of PiezoNoise



## Sound Pressure Level





Conductive Polymer Aluminum Solid Capacitors

Low ESR

High Ripple

High Voltage

Voltage range 2 to 100 VDC  
 Capacitance Range 3.3 to 2700 uF  
 Temperature range -55°C/+105°C, -55°C/+125°C  
 Lifetime 2,000h@125°C  
 ESR Down to 5mΩ  
 Ripple current **up to 7,200mArms**  
 Size Ø 4mm to 10mm  
 Height 5.5mm to 13mm

Conductive Polymer Hybrid Aluminum Electrolyte Capacitors

Low ESR

Long Life

Low LC



Voltage range 25 to 80 VDC  
 Capacitance Range 10 to 330 uF  
 Temperature range -55°C/+105°C, -55°C/+125°C  
 Lifetime **10,000h@105°C, 4,000h@125°C**  
 ESR Down to 20mΩ  
 Ripple current up to 2500mArms  
 Size Ø5mm to 10mm  
 Height 5.8mm to 10.2mm

Voltage range 2 to 35 VDC  
 Capacitance Range 15 to 560 uF  
 Temperature range -40°C/+105°C, -40°C/+125°C  
 Lifetime 2,000h@105°C, 1,000h@105°C  
 ESR **Down to 3mΩ**  
 Ripple current up to 8,500mArms@45deg.C  
 Size 7.3x4.3mm  
 Height 1.1 to 2.1mm

Voltage range 2 to 35 VDC  
 Capacitance Range **2.7 to 1500 uF**  
 Temperature range -55°C/+105°C, -55°C/+125°C  
 Lifetime 2,000h@105°C  
 ESR Down to 6mΩ  
 Ripple current up to 4400mArms  
 Size **2.0x1.25mm** to 7.3x4.3mm  
 Height **0.9** to 3.8mm



Conductive Polymer Aluminum Solid Capacitors

Super Low ESR

Low Profile

Conductive Polymer Tantalum Solid Capacitors

Super small

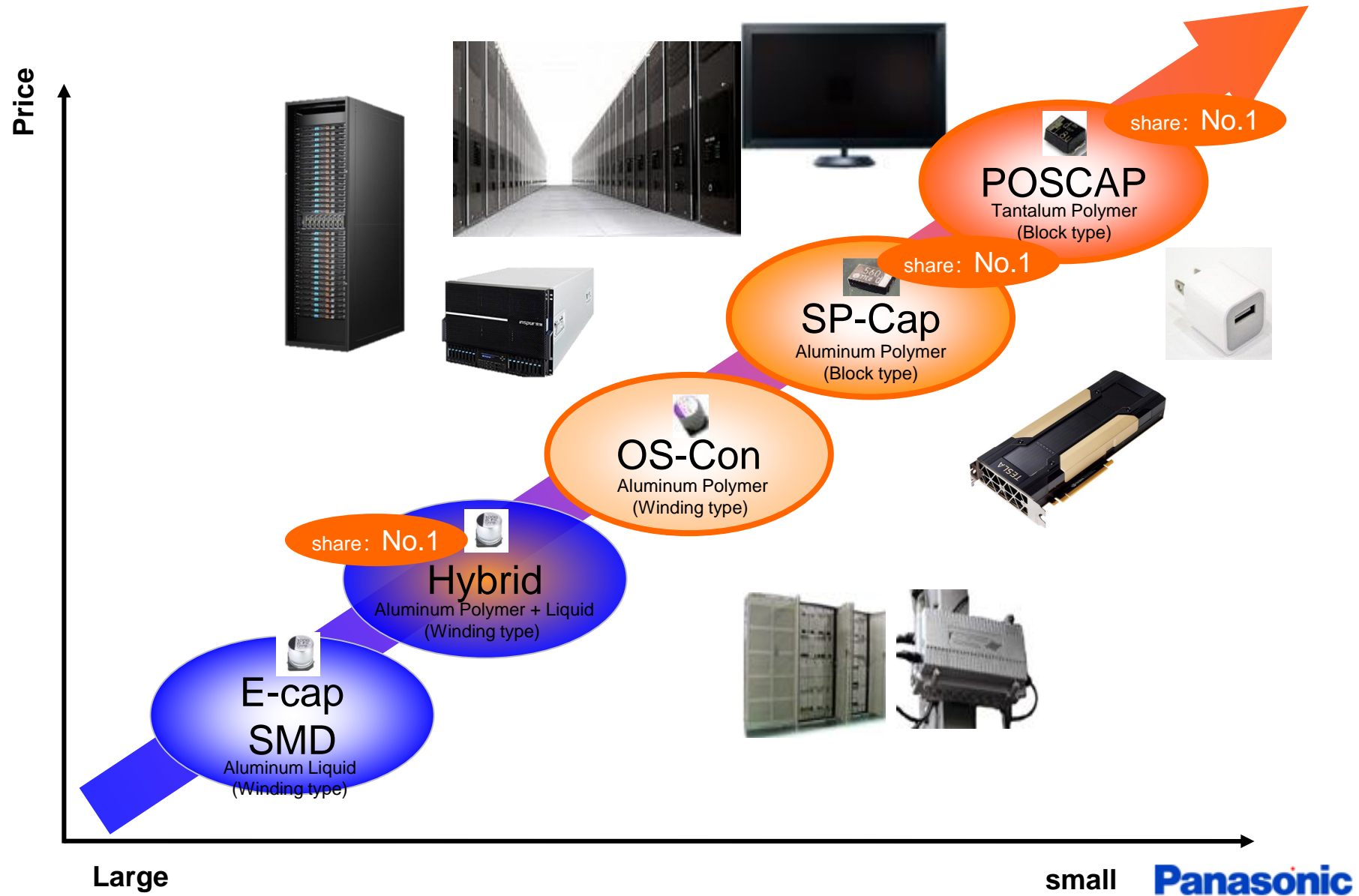
Low ESR

Large Cap



Panasonic

## Leading low ESR technology





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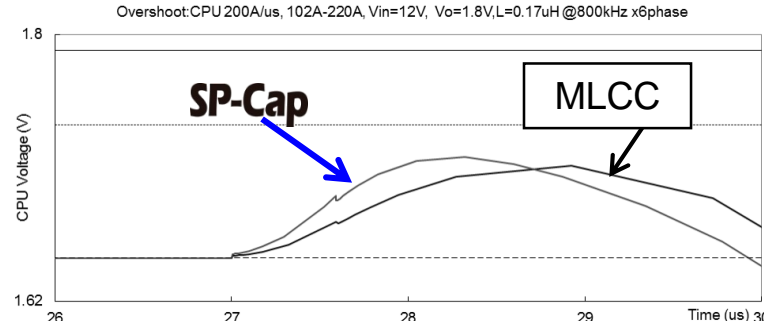
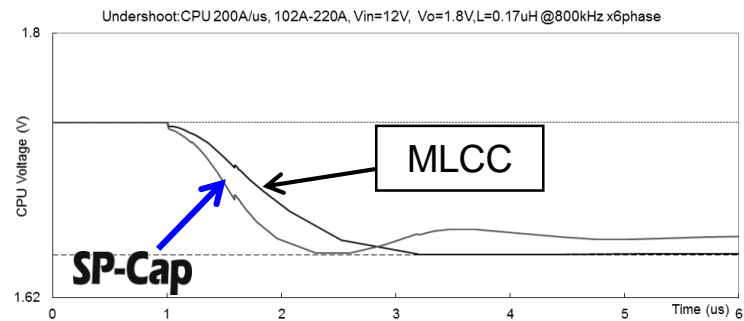
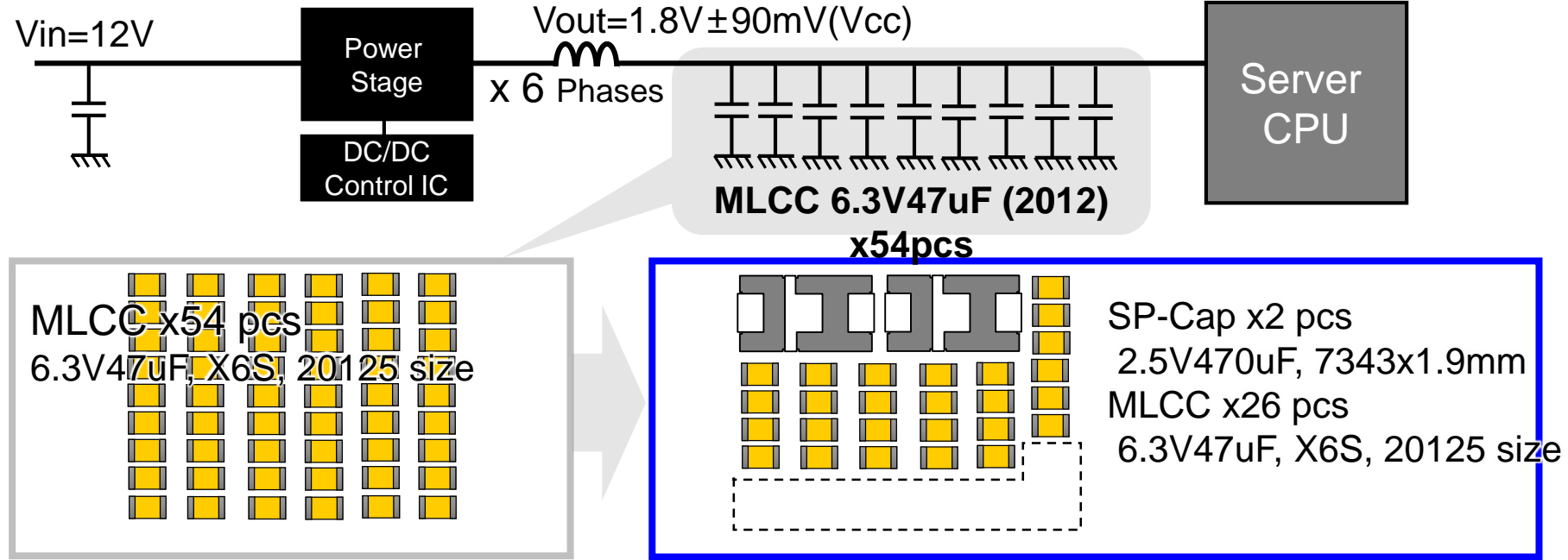
04 高分子电容典型应用

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## Capacitor Characteristics Comparison





Maintaining the same level performance !

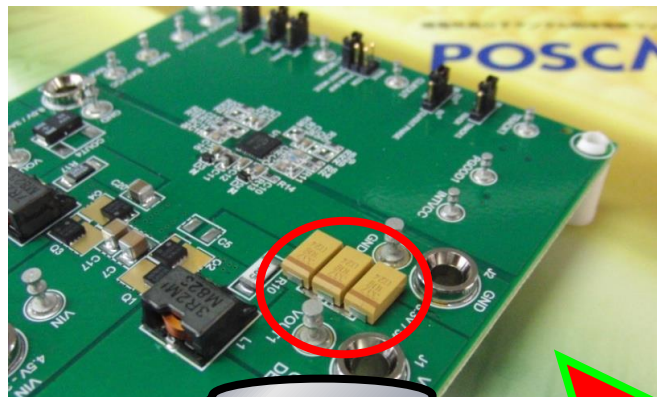
Items	MLCC 	Panasonic SP-Cap 
Space	460 mm <sup>2</sup>	320mm <sup>2</sup> 30% reduction
Cost (Index)	1	0.8 20% saving

Proposal for VR13.HC Input 12V Line OS-CON High Ripple Current type

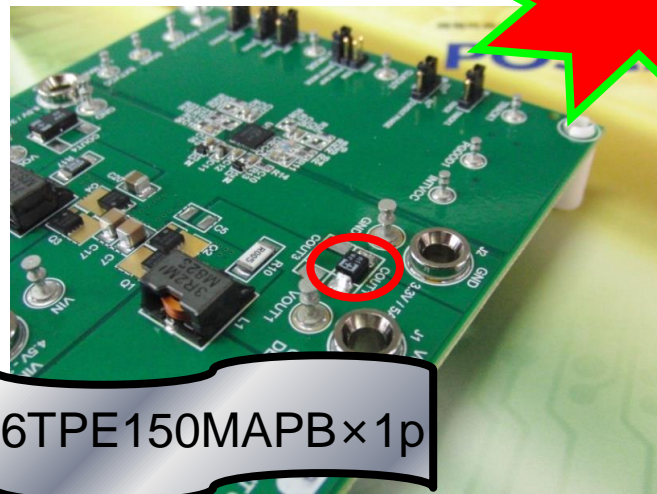
■Replacement proposal



	E-Cap, Hybrid	OS-CON
Item	16V-270uF Φ8x10 (Ripple 1.2~1.7A) 	16V-270uF (16SVPG270M) Φ6x10 (Ripple 5.8A) 
Ripple	10.2A (=1.7mΩ/p) <b>-66%</b>	11.6A (=5.8A/p)
Usage	6pcs <b>-79%</b>	2pcs
Area	413.3mm <sup>2</sup>	87.1mm <sup>2</sup>



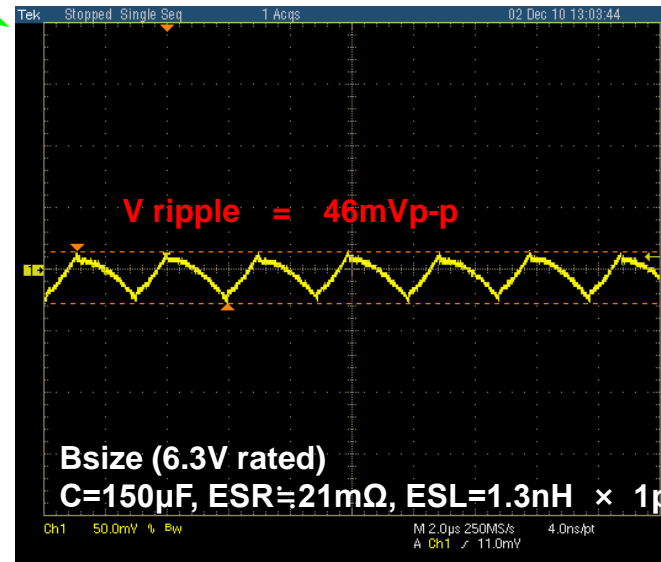
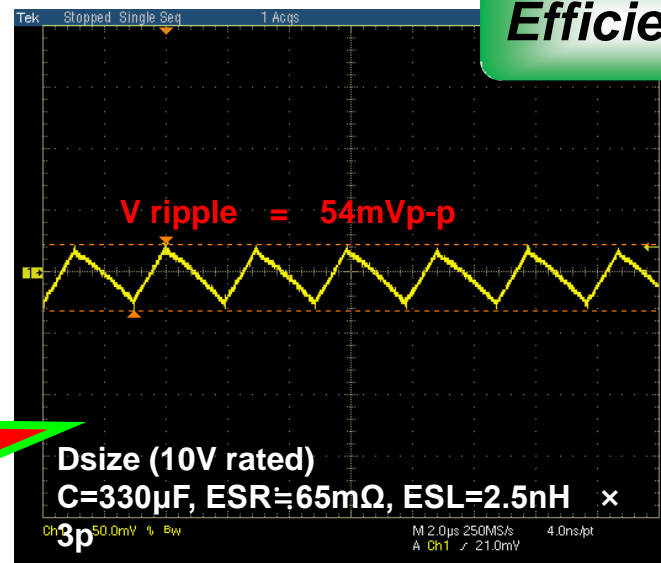
10V 330uF × 3p



6TPE150MAPB × 1p

**Small size  
Low cost**

**Efficiency**



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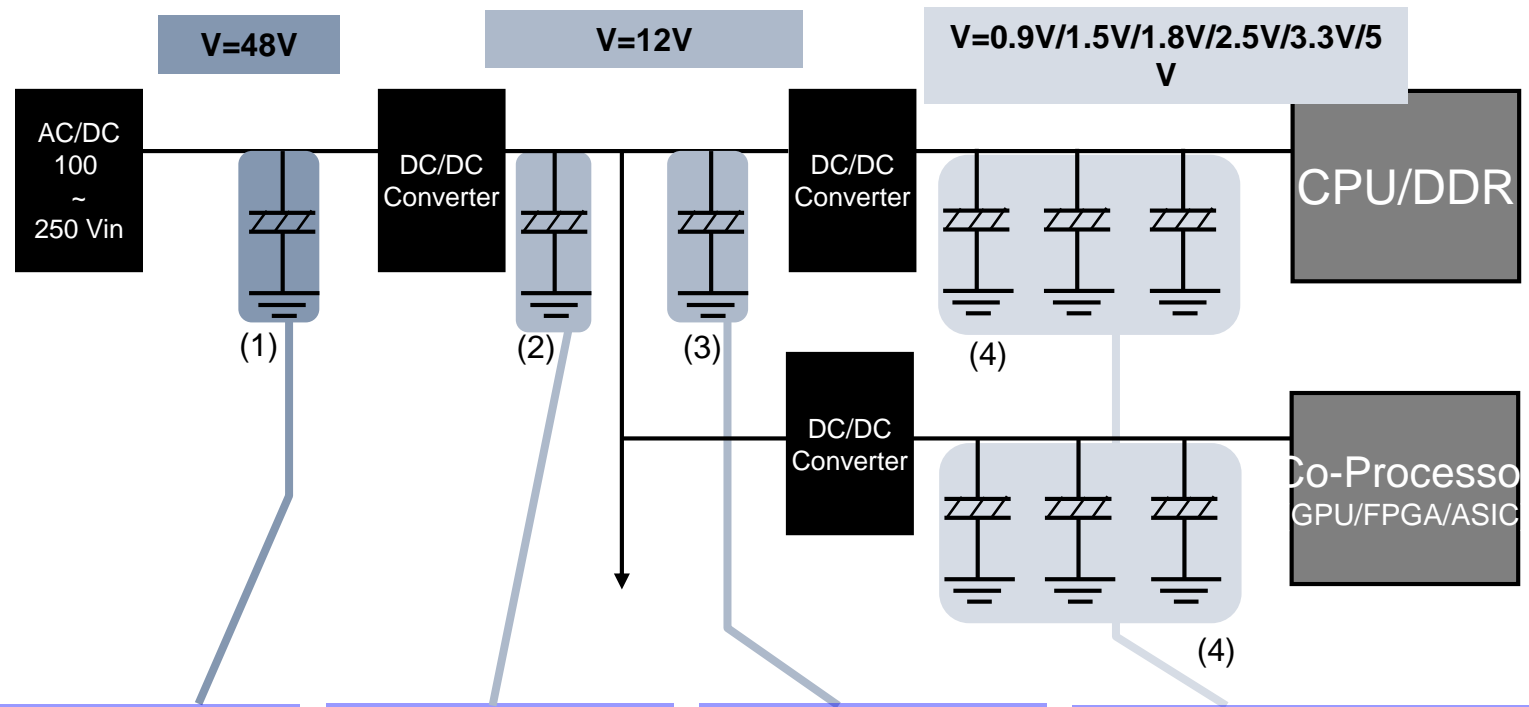
**04 高分子电容典型应用**

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Typical Power Circuit



Our Products

**(1) Requirement**  
High voltage  
High ripple

 Hybrid  
ZC Series  
 OS-CON  
SXV Series

**(2) Requirement**  
High voltage  
High ripple

 OS-CON  
SEPC Series  
SEPG Series  
SVPF Series  
SVPG Series

**(3) Requirement**  
High ripple

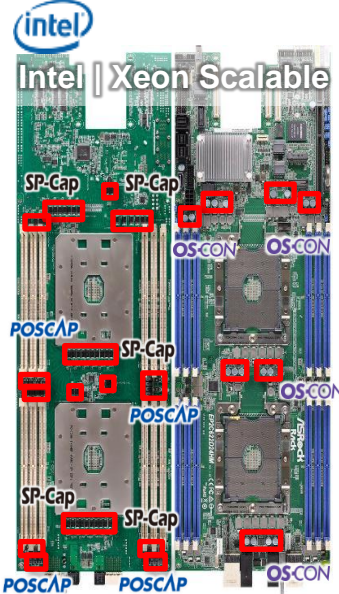
**SP-Cap**  
CX Series  
 **POSCAP**  
TQC Series

**(4) Requirement**  
Large cap, Low ESR, Low ESL

**SP-Cap** **POSCAP**  
GX Series  
SX Series  
TPE Series  
TPF Series

## Panasonic Polymer Capacitor Serving to Major Servers and Accelerators

**Server**



intel | Xeon Scalable


AMD

IBM

Qualcomm

CAVIUM

**Accelerator**



nVIDIA | Tesla V100 (GPU)

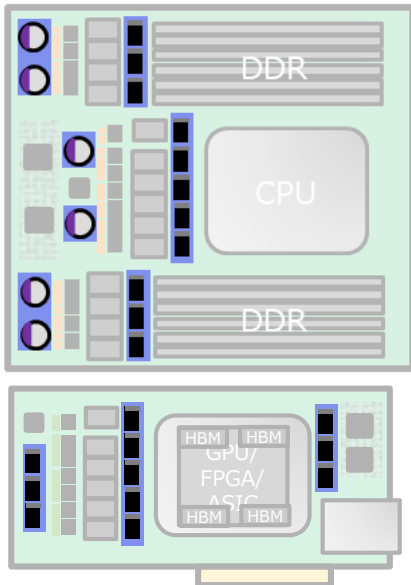
AMD

intel

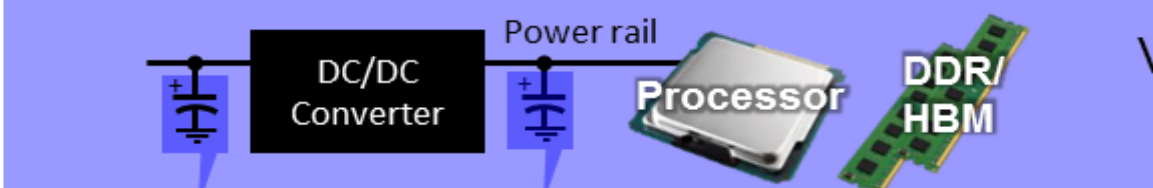
Google

XILINX

BITMAIN



**How to Serve**



DC/DC Converter


Power rail

Processor

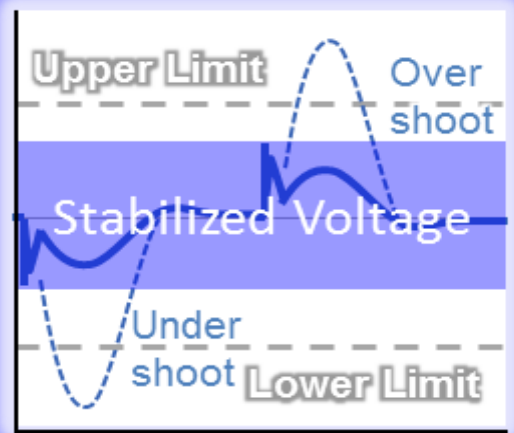
DDR/HBM

Panasonic polymer capacitors serve to stabilize the power for processors at load transients

**SP-Cap POSCAP OSCON Hybrid**



**V**



Upper Limit

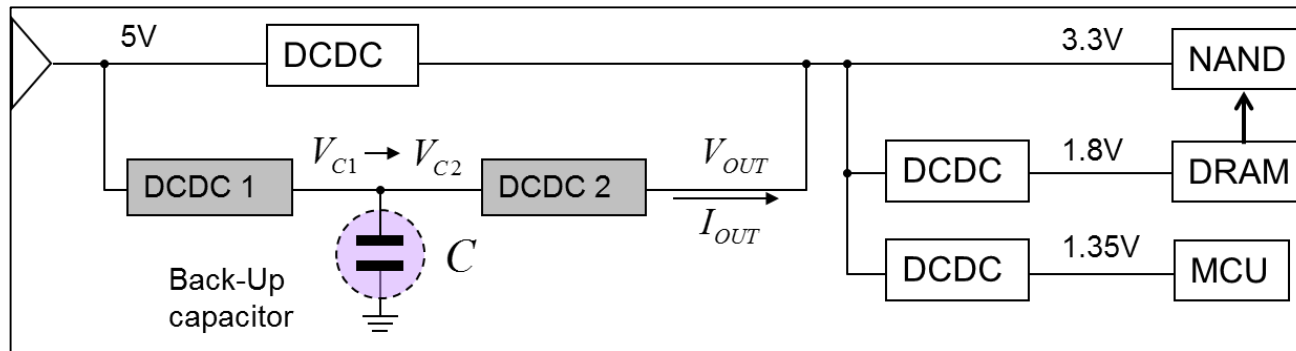
Over shoot

Stabilized Voltage

Under shoot

Lower Limit

**uS**



$T_{backup}$  : Backup time

$$T_{backup} = \frac{1/2 \times C \times (V_{C1}^2 - V_{C2}^2) \times k}{(V_{OUT} \times I_{OUT})}$$

$V_{C1}$  : Discharge start voltage

$V_{C2}$  : Discharge stop voltage

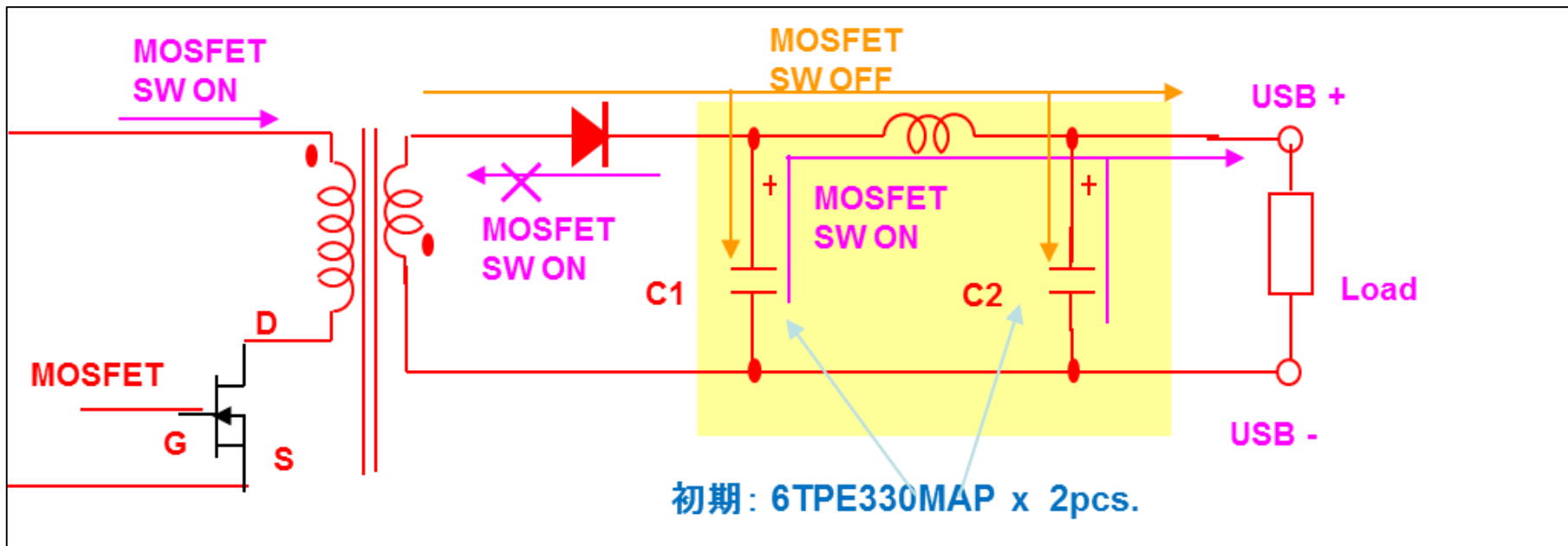
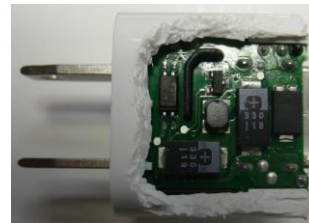
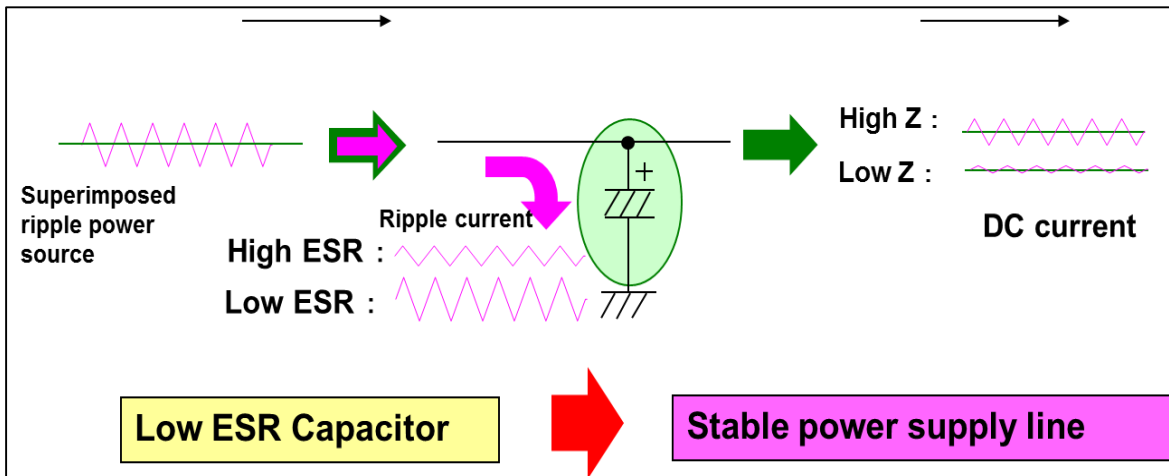
$C$  : Capacitance of backup capacitor

$k$  : Efficiency of DC/DC converter

**$T_{backup} \propto CV^2$**

备电电容容值越大，耐压越高，备电时间越长。







避免受潮

避免正负极接反

注意额定温度·电压

正确选用车规品

## 五、答疑&抽奖

