Application notes for USB PD

Market changes	Performance	Roles of the capacitors
Application in USB Type C power delivery	High performance charging design that supports larger currents	Acoustic noise prevention Low profile High capacitance

1. What Is a Polymer Aluminum Electrolytic Capacitor?

Murata's conductive polymer capacitors (ECAS series) have lowESR, low-impedance, and high-capacitance features. Additionally, they are superior for their ripple absorption, smoothing, and transient response performances since there is no DC bias characteristic for capacitance and the temperature characteristic is stable. This contributes to reducing the number of parts as well as the size of the circuit board area.

2. Market trends of USB Power Delivery

USB Type-C is becoming the universal standard for USB connectors. The standard connector used up until now could only charge smaller digital equipment such as smartphones. However, with the introduction of the USB PD (USB Power Delivery) standard, USB-C connectors can now be used to charge larger digital equipment with high power consumption, such as laptop PCs. With the latest USB PD standard, USB-C power delivery is increasing from a maximum of 100W to 240W (48V/5A), and with significant user benefits such as greatly reduced charging time, unification of connector types, and the elimination of the need to buy a different adapter for each device, the number of applications for USB-C PD is expected to continue to grow.

3. Features required for capacitors used in USB PD

- Components that **prevent acoustic noise** and are **compact and low-profile** for connection to thinner devices such as laptop PCs
- **High capacitance capacitors** used in power supply lines for inrush current resistance and noise resistance

4. Benefits of using Murata's ECAS series products

① Low noise

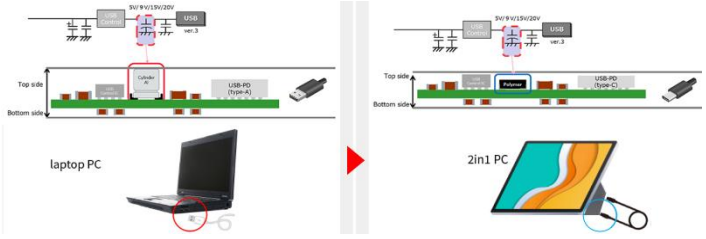
Because the ECAS series has no mechanical vibrations due to the piezoelectric effect, the acoustic noise is extremely low compared to MLCCs, and the problem of harsh noise can be solved.

Conventional MLCC

ECAS Series

② Lowered profile

Since the ECAS series are low-profile components, they are capable of contributing to providing slim and stylish designs for monitors that use USB-PD.



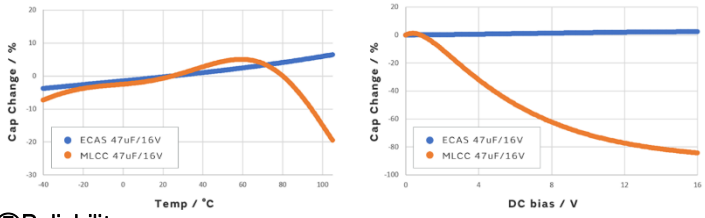
③High capacitance (set miniaturization)

The ECAS series is higher in capacity compared to MLCC and have no DC bias characteristics. Therefore, they can be used to reduce the number of components and miniaturize the set for applications that use several MLCCs and require capacitance.

④Stable capacitance with respect to temperature and voltage changes

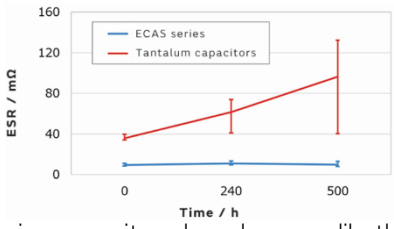
Since MLCC has DC bias characteristics and temperature characteristics, the effective capacity changes when the DC voltage and ambient temperature changes.

On the other hand, since there is hardly any changes in capacitance affected by the DC bias and temperature on the ECAS series, they can be applied for stable power supply designs that do not require having to consider capacitance changes due to temperature and applied voltage.



⑤Reliability

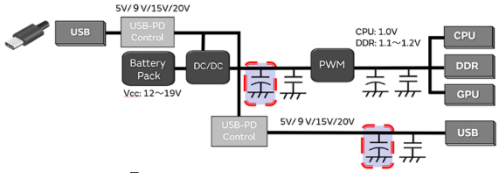
The ECAS has more stable reliability compared to tantalum capacitors, which contributes to stable set operation.



ECAS series capacitors burn less readily than tantalum capacitors, resulting in extremely low risk of ignition if a short occurs due to accidental failure.

5. Example of applied circuit

The ECAS series can be used in circuits such as shown in the figure below.



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