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Application Note
Film caps for smart meters

Smart meters are the core devices for an efficient, intelligent and holistic energy management. A safe and reliable operation is mandatory to avoid any outage at the end customer. As a result, components like film capacitors have to be best in class.

Smart meters

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PRODUCT

ECQUA and ECQUB series metallized polypropylene film capacitor
ECHU(X) series stacked metallized PPS film capacitor

PURPOSE

Smart meters are digital meters representing a transformative technology for the utility industry and its customers. They enable a two-way communication between the meter and the supplier. Film capacitors with a wide voltage & capacitance range – especially with a high humidity resistance – are a perfect solution for smart metering applications.

FEATURES

Wide voltage and capacitance range
Integrated safety function (X2 and X1 safety classes only)
High humidity resistance (X and Y safety classes)

Smart meters

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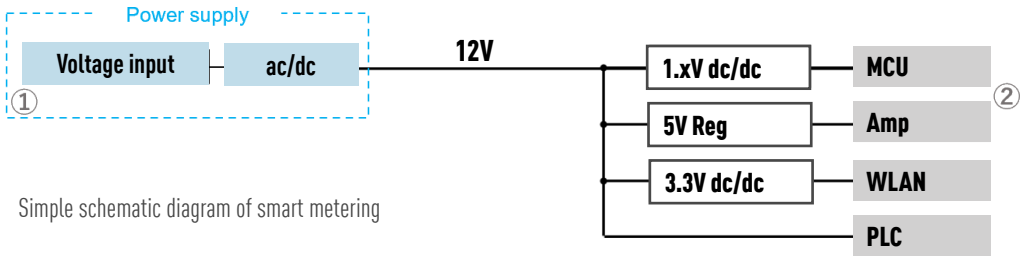
FACTS & FIGURES

The power supply for smart meters has to work safe and fail-safe. As EMI suppression film capacitors are fundamental electric components placed at the input side of the power supply circuit ① (shown in the diagram), it is required to handle high voltage impulses and protect users from harm due to electrical shock. Thanks to Panasonic's in-house patterned metallization technology, also well known as „built-in fuse function", the ECQUA series (safety class X2) and ECQUB series (safety class X1) offer overvoltage impact reduction to realize high safety with open failure mode.

On a very thin layer of vapor deposited aluminum, cells are made within the capacitor's dielectric material. These cells perform as independent small capacitors which are connected in parallel. When overvoltage occurs at one spot, the damaged cell localizes the failure caused by overstress, therefore the damage is only limited in a few sections of the capacitor. When too many of the areas fail in a very short period of time, the capacitor will then fail in an open mode.

Reliability – especially humidity resistance – is critical for smart meters considering they are often placed outdoor. Panasonic has developed its in-house enclosure sealing technology and aluminum vapor deposition to achieve high humidity resistance.

For the amplifier side ② of the e-meter, Panasonic provides its metallized PPS film chip type capacitors to improve the filtering circuit. They are small in case size (down to 1.6mm x0.8mm footprint), feature a tight capacitance tolerance of ±2% & ±5%. The capacitance in a single component can go up to 220nF. Both 16VDC and 50VDC rated voltage versions are available. These capacitors have excellent electric characteristics of low ESR, low loss, stable capacitance against temperature and DC bias. Furthermore, it guarantees a very fast lock-up time and doesn't show a piezoelectric effect as MLCCs do, which makes it a perfect solution for PLL (phase locked loop) circuit in wireless communication circuits.



Simple schematic diagram of smart metering

Function	EMI Supression			Filtering
Safety class	X2	X1	Y2	-
Product series	ECQUA	ECQUB		ECQU(X)
Voltage	275VAC, 310VAC	300VAC		16VDC, 50VDC
Capacitance	0.0082µF to 10µF	0.001µF to 1.0µF	0.001µF to 0.0068µF	0.1nF to 220nF
Fuse function	built-in	built-in	-	-

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Application Note - How to solve various tasks with film capacitors for on-board chargers
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