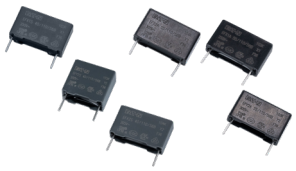
Use case
Eaton film capacitors for distributed solar inverters



Eaton film capacitors provide reliable EMI filtering in distributed solar inverters

Due to rapid technological improvements, low cost of raw materials, and increased efficiencies of batteries, renewables (such as solar) are becoming more competitive energy sources in many countries. According to a report by Deloitte[1], solar and wind systems contributed a total of 11.8 GW to the energy sector in the first eight months of 2023. The renewables segment is primed to expand even further in 2024 with growing climate change as well as environmental, social, and governance (commonly called ESG) concerns.

Solar inverters are vital components of solar systems for residential or commercial applications. The main function of a solar inverter is to convert variable energy output (DC) from the PV cells into AC output to power appliances in buildings. The energy produced by solar panels is also stored in batteries for later use. Distributed solar inverter configurations integrate multiple inverters to build solar arrays, so that the overall architecture can instantaneously feed all the individual inverters via a single DC bus. Distributed solar inverters offer several benefits over centralized architecture, including lower costs, improved efficiency, high reliability, flexibility of installation, and 100% uptime. Distributed inverters are preferred in smaller and medium-scale projects compared to large-scale projects where centralized configurations are favored.

Interconnection of multiple inverters in a distributed system results in voltage fluctuations, thus generating electrical noise. EMI filtering elements, such as capacitors, can help protect sensitive electronics from damage by suppressing unwanted current conduction that may interfere with power and signal lines. In distributed solar inverters, common and differential-mode EMI filtering via capacitors serve as low impedance to shunt noise signals with minimal power dissipation. Eaton's film safety and DC-link capacitors offer high-reliability capacitance in common industry footprints making them suitable for use in a wide range of distributed inverter designs.

Eaton's film safety capacitors use metallized polypropylene film, encapsulated in a UL94V-0 compliant resin in a plastic case. The class X1 and X2 families offer various sizes and styles for differential and common-mode filtering across power lines, with versions also meeting THB Grade IIIB and AEC-Q200 standards. Eaton's film DC-Link capacitors, ideal for DC filtering, use metallized polypropylene film, encapsulated in a UL94V-0 compliant resin in a plastic case. They come in 2 or 4 pin tinned copper wire terminals, with an automotive-qualified variant available.

Eaton's film pulse capacitors (EFPLS/EFPLA) combine metallized films and are encased in a UL94V-0 compliant resin in a plastic case. The EFPLS handles high dV/dt and ripple currents, while the EFPLA, compliant with THB Grade IIIB and AEC-Q200, is suitable for demanding environments. Lastly, Eaton's film AC-filtering (EFACA) capacitors comprise metallized polypropylene, encased in a UL94V-0 compliant resin in a plastic case with 2 or 4 pin tinned copper wire terminals to enhance AC/DC and DC/AC conversions and meet THB Grade IIIB and AEC-Q200 standards.

1. 2024 renewable energy industry outlook

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