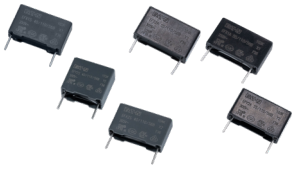
Use case
Eaton film capacitors for fast charging xEV stations



Eaton's film capacitors provide reliable EMI filtering in fast-charging xEV stations

As electric vehicle (EV) adoption continues its upward trend, drivers will be on the lookout for reliable places to charge their vehicles. EV charging infrastructure is an essential component of electric mobility. In 2022, the US government committed $7.5 billion to develop its EV-charging infrastructure by installing 500,000 public chargers by the year 2030[1].

The two main types of public EV infrastructure are AC and DC charging stations. In AC charging stations, the grid is connected to the EV onboard charger (OBC) which converts the alternating current (AC) into direct current (DC) to supply the EV's battery management system (BMS) responsible for supplying power to the batteries. On the other hand, fast-charging DC stations utilize high-energy-density DC to charge batteries directly, reducing charging times significantly. Compared to AC stations capable of charging EV batteries by up to 80% in about 45 minutes, fast-charging DC stations can achieve the same level of charge in as little as 15 minutes.

The standard power output of fast/ultra-fast DC charging stations range from 50 kW to 200 kW compared to 22 kW for AC stations. Since DC charging bypasses the OBC, the system must be able to communicate with the vehicle efficiently to optimize charging rates and adjust the output power parameters to suit the EV battery condition and capacity. Consequently, DC fast-charging stations are more technologically complex to design and susceptible to higher electromagnetic interference (EMI) than AC types.

EMI filtering components such as capacitors help protect sensitive EV electronics from damage by suppressing unwanted current conduction through internal circuitry that can interfere with the power and signal lines. In fast-charging DC stations, common and differential-mode EMI filtering via capacitors serve as low impedance to shunt noise signals with minimal power dissipation. Eaton's film capacitors (Safety, DC-Link, Pulse & AC-filtering) offer high density capacitance in common industry footprints suitable for DC fast-charging stations.

The film safety capacitors use metallized polypropylene film, encapsulated in self-extinguishing resin compliant with UL94V-0. Available in various sizes and styles, the X1 and X2 families cover diverse applications: Class X used for power line differential mode filtering. These capacitors also offer THB Grade IIIB and AEC-Q200 automotive options.

Eaton's DC-Link capacitors are for DC filtering, featuring metallized polypropylene film encased in epoxy resin and housed in a plastic enclosure with 2 or 4 pin tinned copper wire terminals. Eaton offers an automotive-qualified variant compliant with THB Grade IIIB and AEC-Q200.

Eaton's film pulse capacitors combine metallized polypropylene film with double-sided electrodes, encased in a plastic case with tinned wire leads. While EFPLS handles high dV/dt and ripple currents, EFPLA is optimized for demanding environments, such as automotive, and meets THB Grade IIIB and AEC-Q200.

Eaton's film AC filtering capacitors comprise metallized polypropylene film in epoxy resin in a plastic case with 2 or 4 pin tinned copper wire terminals. They filter high ripple harmonics, enhancing AC/DC converters and refining DC/AC inverters, and comply with THB Grade IIIB and AEC-Q200.

1. Building the electric vehicle charging infrastructure America needs

Eaton
Electronics Division
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com/electronics

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