



299 PHL-4TSI: The Ideal DC-Link Capacitor for Fixed Electrical Vehicle (EV) Chargers

By Theo van de Steeg

To do their job properly, electric vehicle (EV) chargers need to handle a lot of power. Depending on battery capacity, an overnight recharge can require up to 30 kW. A fast charge at a high voltage charging station, which replenishes the battery to 80 % of its capacity, can use as much as 250 kW.

A long life DC-link capacitor bank plays a key role in the EV charger's high voltage power circuits to enable charging in the shortest possible time while minimizing battery aging and maintaining safe operation. It provides a stable DC voltage for the switch mode power circuit that controls the rate of charge. At the same time, it functions as the low impedance return path for the switching currents from that same circuit. If the DC-link capacitor bank stops working, the battery charger will stop working as well.



Vishay's 299 PHL-4TSI 400 V and 450 V snap-in, four-terminal aluminum electrolytic capacitors are the robust, high power capacitance solution EV chargers need for the DC-link capacitor bank. The 299 PHL-4TSI capacitors offer an improved ripple current capability at an ambient temperature of 105 °C, with a useful life of 5000 h.

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Vishay's 299 PHL-4TSI capacitor

This high ripple current rating, which ranges from 2.45 A to 6.77 A at 100 Hz, allows you to reduce the component count when ripple current is the most important parameter in the specification of the capacitor bank. An extended-cathode construction ensures that even higher ripple currents can be handled when the parts are cooled with forced air or via a heatsink.

The long useful life of 5000 h is equivalent to 24 / 7 operation over a period of more than 20 years, provided that the ambient temperature does not exceed 65 °C. Under cyclic operation, as in a fixed battery charger, the 299 PHL-4TSI series can achieve this 20-year lifetime with even higher maximum ambient temperatures.

299 PHL-4TSI KEY SPECIFICATIONS	
DESCRIPTION	VALUE
Case size (D x L in mm)	35 x 50 to 45 x 100
Capacitance range	470 µF to 2200 µF
Capacitance tolerance	± 20 %
Ripple current range at 100 Hz and 105 °C	2.45 A to 6.77 A
Rated voltage range	400 V to 450 V
Operating temperature range	-40 °C to +105 °C
Useful life at 105 °C	5000 h

The 299 PHL-4TSI series capacitors, which are available in can sizes ranging from 35 mm x 60 mm to 45 mm x 100 mm, have four-terminal snap-in pins suitable for soldering. This pin configuration not only provides keyed polarity, but also better mechanical stability than the two-terminal snap-in pin configuration used on capacitors with smaller can sizes.

Sometimes manufacturers implement the DC-link with screw-terminal capacitors that are hand-mounted on a bus bar. One can gain worthwhile cost savings by instead building the DC-link with these large can, four-terminal snap-in capacitors from Vishay, which can be placed on a high current PCB and mounted using a wave solder process.

The characteristics of the 299 PHL-4TSI capacitors make them ideal not just for fixed battery chargers but for many other high power applications.