

ContainerPower Energy Solutions

Three-phase bidirectional inverter



Overview

What is a three-phase AC-DC converter?

Abstract—Future three-phase ac-dc converter systems ideally allow for bidirectional power flow, provide high-frequency isolation, and feature buck-boost capability. Further, high efficiency and high compactness and the applicability of standard half-bridge and/or three-phase full-bridge (B6) semiconductor arrangements are crucial aspects.

What is three-phase bidirectional power-flow transition?

Three-phase bidirectional power-flow transition: full-power 11 kW inverter mode to full-power 11 kW PFC mode—under 230 VAC line-to-neutral voltage. (a) Full time-scale view; (b) Zoom-in view.

What is the efficiency and power loss of three-phase inverter mode?

Figure 51 and Figure 52 display the measured efficiency and power loss under three-phase inverter mode operation at different line voltages. The peak efficiencies of 99.263%, 99.122%, and 98.855% and the full-load efficiencies of 99.166%, 98.938%, and 98.632% are measured for the high-line, nominal, and low-line conditions, respectively.

What is the efficiency of ACDC bidirectional converter?

The system incorporates three-level active neutral point clamped ACDC bidirectional converter, achieving a peak efficiency of 99.15% and 98.95% in three-phase PFC rectifier mode and inverter mode respectively.

How much power can a three-phase grid convert?

When interfacing three-phase grid, the design can convert steady state maximum power of 11 kW in both power-flow directions, i.e., either PFC mode or inverter mode, with peak efficiency of 99.15 % (PFC) and 99.122 % (inverter) with 230 VRMS grid voltage.

How does a three-phase AFE converter work?

The design uses switching frequency up to 90 kHz and an LCL output filter to reduce the size of the magnetics. A peak efficiency of 98.6% is achieved. The design shows how to implement a complete three-phase AFE control in the DQ domain. This bidirectional converter enables both DC fast charging and vehicle-to-grid (V2G) applications.

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