22kW BI-DIRECTIONAL ACTIVE FRONT END (AFE) CONVERTER CRD-22AD12N

HIGH-EFFICIENCY, **HIGH-POWER-DENSITY**

This reference design demonstrates the application of Wolfspeed's 1200V C3M™ Silicon Carbide MOSFETs to create a 22kW three phase bidirectional active front end (AFE) converter for electric vehicle (EV) on-board charger (OBC); DC fast charging; and other industrial applications such as energy storage systems and three phase PFC power supplies. This design operates as a standalone AC/DC converter and is compatible with both single-phase and three-phase inputs. It has two operating modes: power factor correction (PFC) mode and inverter mode. In both modes, the DC bus voltage is flexible to demonstrate operation under a range of conditions. The use of 1200V C3M 32mOhm Silicon Carbide MOSFETs in a TO- 247-4 package provides the best figure of merit (FOM) and reduces switching loss and cross talk.

The design accomplishes

- Peak efficiencies of 98.5% in both PFC and inverter mode
- Power density of 4.6kW/L
- 45kHz switching frequency

This reference design is offered as a comprehensive design package which can be used as a starting point for new Silicon Carbide designs.

FEATURES

- PFC and Inverter Mode
- Flexible DC Bus Voltage
- Low RDs(on)
- TO-247-4 Package Kelvin Pin

BENEFITS

- Fast Switching and Low Switching Losses
- Reduced System Losses
- High Power Density

APPLICATIONS

- EV On-Board Charging
- DC Fast Charging
- Energy Storage Systems
- PFC Power Supplies

SYSTEM SPECS

	3-phase PFC	1-phase PFC	1-phase Inverter
INPUT VOLTAGE	305-450VAC$_{LL}$ 50/60Hz	180-264 VAC$_{LL}$ 50/60Hz	350-760VDC
OUTPUT VOLTAGE	650-900VDC	380-900VDC	230VAC 50Hz
OUTPUT POWER	22kW max, 32A limit	6.6kW Max, 18A limit	6.6kW

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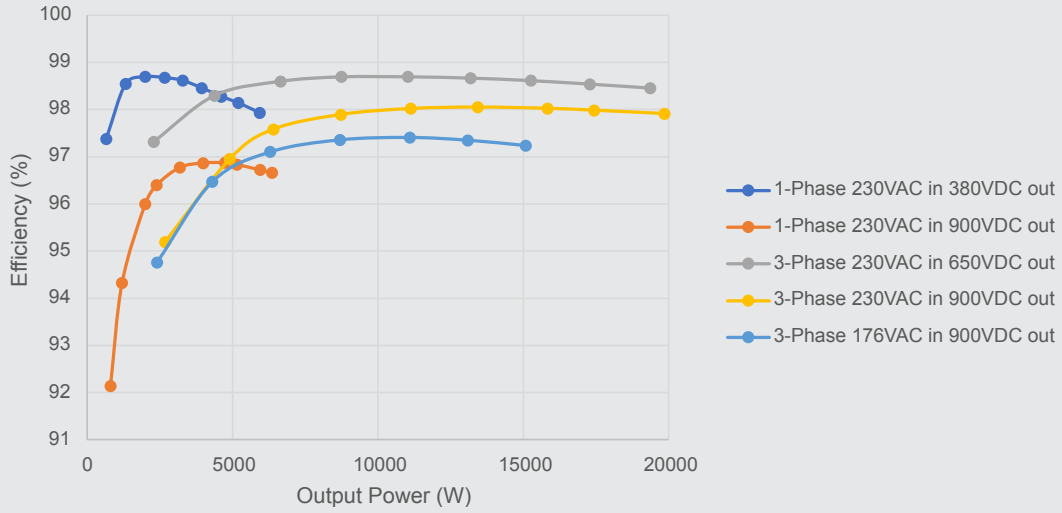
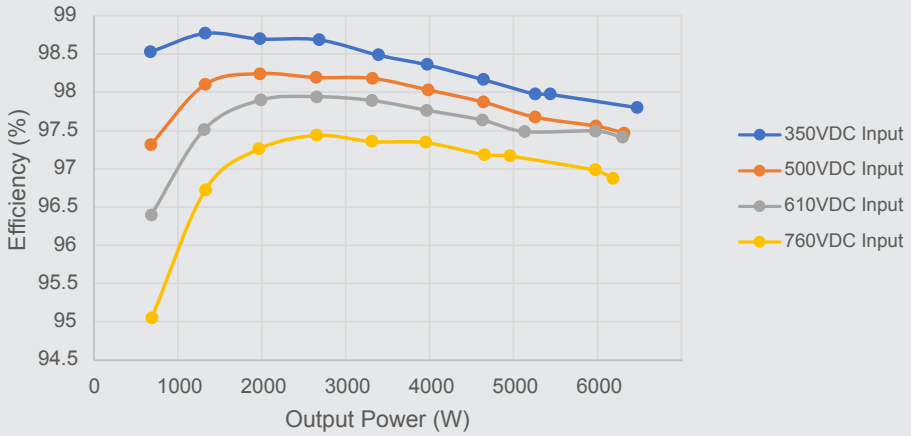
AC-->DC EFFICIENCY - PFC MODE



DC-->AC EFFICIENCY - INVERTER MODE



SYSTEM BLOCK DIAGRAM