Design Guide: TIDM-02021

11kW Three-Phase Bidirectional Onboard Charger and Low-Voltage DC-DC Reference Design With F29x MCU

Description

This reference design integrates an 11kW onboard charger (OBC) and a 2.5kW low-voltage (LV) DC-DC converter (LDC). The design uses a three-phase single-stage series resonant dual-active-bridge AC-DC converter topology. TI F29x MCUs and Type-5 enhanced pulse-width-modulator (ePWM) support the complex modulation of the three-phase AC-DC converter.

Resources

TIDM-02021	Design Folder
F29H859TU-Q1	Product Folder
F29H85X-SOM-EVM	Tool Folder
TIDM-02021-PRELIM-DESIGN	Secure Resources Folder

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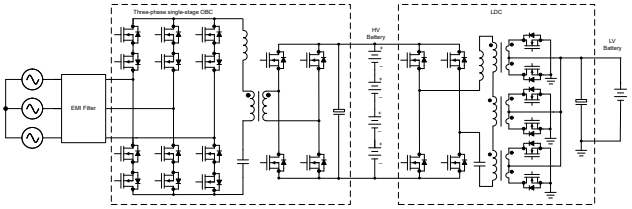
Features

- 11kW maximum power and 97.5% peak efficiency for OBC
- V_{AC}(ph): 175–264V; Nominal 220V
- V_{HVDC}: 450–850V (high-voltage (HV) battery voltage range)
- Three-phase single-stage series resonant dual active bridge (SS-SRDAB) enables ZVS and ZCS soft-switching operation
- 150kHz resonant frequency (80kHz–250kHz operating range) enables high power density
- Supports bidirectional power flow for G2V and V2L and V2G modes
- 2.5kW maximum power for LDC
- V_{LVDC}: Nominal 14V
- Single MCU for OBC and LDC closed-loop control
- Type-5 ePWM simplifies the complex PWM modulation for three-phase single-stage converter

Applications

- Onboard charger
- Integrated high voltage (OBC and DC/DC)



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