Test Report: PMP23547

GaN-Based 8kW 3-Phase Totem-Pole PFC and 3-Phase LLC Reference Design

Description

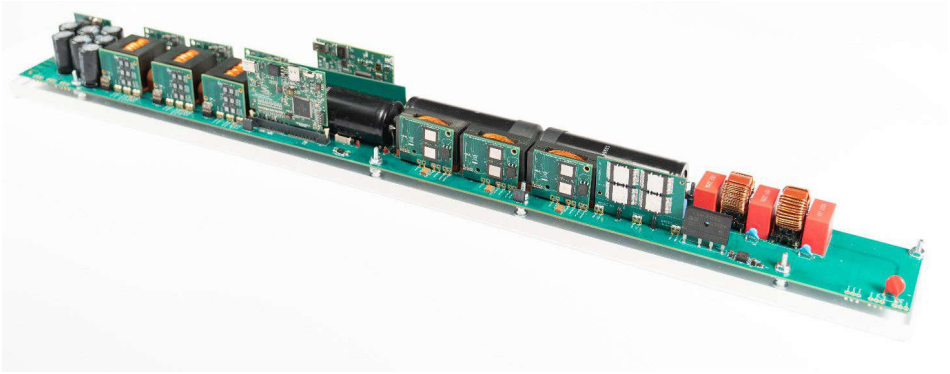
This reference design is a high-density and high efficiency, 8kW power supply. The first stage is a TCM (triangular conduction mode) power factor correction (PFC) converter followed by a delta-delta connected three phase inductor-inductor-capacitor (LLC) converter. Both power stages are implemented with TI high-performance Gallium Nitride (GaN) power switches. The PFC uses a three-phase totem pole PFC in a zero-current detection (ZCD) based control mechanism. The control method operates with variable frequency and maintains zero voltage switching (ZVS) overall operating conditions. The control is implemented with a TMS320F280039C high performance micro-controller and the LMG3527R030 GaN field effect transistor (FET) with integrated ZCD sensing. The operating frequency range of the converter is approximately between 70kHz and 1.2MHz. The LLC operates between 200kHz and 1.5MHz. The delta-delta resonant tank connection provides reduced root-mean-square (RMS) currents. Control is implemented with a TMS320F28P550SJ high performance micro-controller. The LLC uses LMG3527R030 GaN FETs on the primary and LMG3100R017 GaN FETs on the secondary.

Features

- Peak efficiency at full load: 97.5%
- Dimensions: 700mm × 68.5mm × 32mm

Applications

- Rack and server power



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