SOLUTION BRIEF

12 kW PSU for AI server SMPS

REF_12KW_HFHD_PSU – enabled by Si, SiC, and GaN

The growing demand for power in AI applications has created a pressing need for power conversion solutions that are both highly efficient and compact. To support the development of next-generation data center infrastructure, power supplies must deliver high efficiency and high power-density. This requires the whole power conversion chain such as the AC/DC converter, the intermediate bus converter (IBC), and the voltage regulator module (VRM) stages to be capable of providing high power to the data processing hardware (e.g. GPUs, etc.) in a small form factor compared to past requirements.

The REF_12KW_HFHD_PSU reference design from Infineon demonstrates a viable approach for achieving higher power density and efficiency simultaneously in the AC/DC power conversion stage compared to current state-of-the-art solutions.

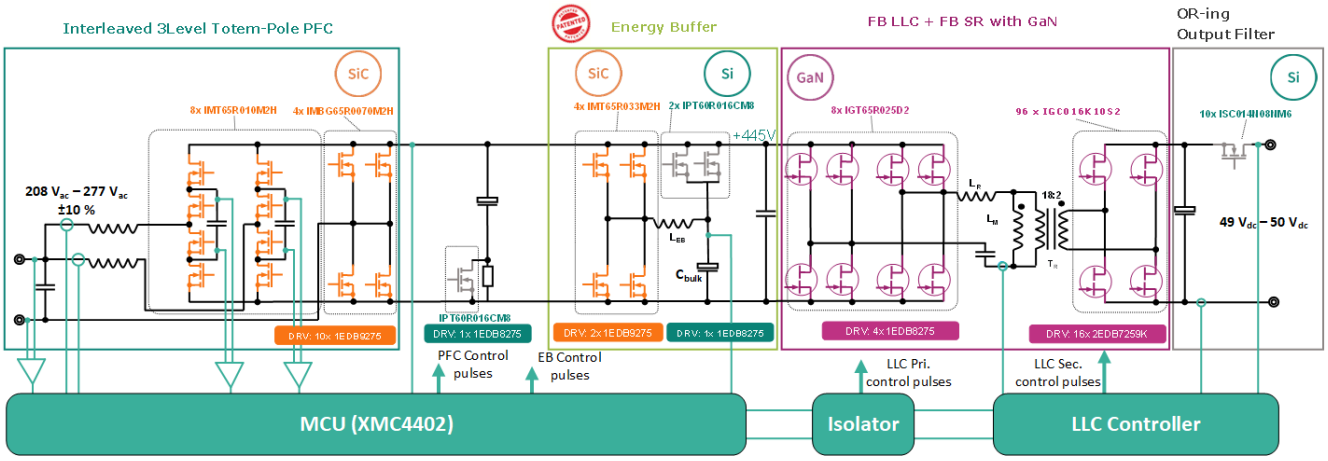
Key features

- 97.8 % peak efficiency and over 96.5 % efficiency from 30 % till 100 % of the load
- High power density 113 W/in^3 (more than double compared to the ORv3)
- Full GaN solution on the LLC DC/DC converter with > 98.5 % peak efficiency
- Digital control of PFC and LLC converter
- Proprietary and integrated magnetics design.
- 3L flying capacitor interleaved PFC with >99 % peak efficiency

Highlighted Products

- CoolSiC™ MOSFET 650 V
- CoolGaN™ Transistors 650 V
- 600 V CoolMOS™ 8 SJ MOSFET
- CoolGaN™ Transistor 100 V
- OptiMOS™ 6 Power MOSFET 80 V
- EiceDRIVER™ 1EDB, 1EDN, 2EDB
- OPTIREG™ switches
- CoolSET™ flyback controller with integrated 800 V CoolMOS™

Functional blocks of the 12 kW PSU solution



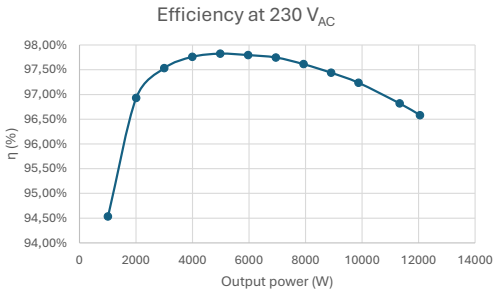
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The REF_12KW_HFHD_PSU is implemented comprising two power conversion stages, the PFC AC/DC power conversion stage, and the isolated DC/DC power conversion stage. The first AC/DC conversion stage is a two-phase interleaved 3-Level flying capacitor PFC converter with peak efficiency greater than 99 %. The key and main functions of this converter is to rectify and boost the AC input voltage to 445 V_{DC}, provide power factor correction at the AC input and ensure low Total Harmonic Distortion (THD) of the current input waveform. The second power conversion stage is the isolated LLC DC/DC conversion stage with peak efficiency greater than 98.5 %. For both primary and secondary side, the full bridge topology is implemented with CoolGaN™ devices. It provides galvanic reinforced isolation, regulates the output voltage to 50 V_{DC} nominal, and rejects the double line frequency component which is present on the DC link voltage. Additionally, the REF_12KW_HFHD_PSU integrates also an energy buffer auxiliary circuit in order provide 20 ms hold up time extension during line cycle drop out (LCDO), by discharging the electrolytic capacitor bank, while this auxiliary circuit can be used also to implement the grid shaping function. Overall PSU achieves 97.8 % peak efficiency, and 96.5 % efficiency at full load.

Key benefits

- Complete power supply unit with 3L interleaved PFC and full bridge LLC
- Maximized PSU performance by combining Infineon's GaN, Si and SiC technologies.
- Fit in 19 inches rack for universality
- Energy buffer circuit implemented for grid shaping and hold-up extension.
- Highest efficiency and power density.

PSU and efficiency curve at nominal input voltage





Specification	Value
Input voltage range	208 V_{AC} – 277 V_{AC} (±10 %)
Output voltage range	49 V_{DC} – 50 V_{DC} (Droop curve applied)
Maximum output power	12000 W
Hold-up time	20 ms at full load

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