High-Performance 48-to-12 V Cascaded Multi-Resonant Switched-Capacitor Converter for Datacenters

Motivation and Applications

- The intermediate bus converter in 48 V data center application requires high efficiency and high power density
- Regulation and isolation are not required

48 V data center power delivery architecture

Proposed Topology

- Cascaded Multi-Resonant converter
- 1st stage uses only two switches to save space of active components, and gate drive level shifters
- State-plane method is used to calculate multi-resonant inductor current

Hardware Demonstration

- Dimensions: 17.3 × 23 × 6.6 mm
- Power density: 6000 W/in³ at 12 V output
- 80 A continuous output and 130 A - 2 ms transient output

Nvidia

Experimental Results

Comparison with State-of-the-Art 48-to-12 V Solutions

Measured efficiencies including gate drive loss