Stacked class E resonant Very High Frequency converter for European mains power factor correction

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Stacked class E resonant Very High Frequency converter for European mains power factor correction

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Introduction
• Great demand for compact PFCs in LED products.
• Driver size can be reduced by increasing switching frequency.
• This poster: design of 50 W resonant VHF AC/DC converter

Design
• Stacked configuration reduce voltage stresses and improve efficiency.
• Class E inverter and class DE rectifier enables zero-voltage switching.

Fig. 1 Stacking configuration.

- GaN devices with low parasitic capacitance enable high switching frequency.
- Air-core inductors gives high Q magnetics at high frequencies.
- Self-resonant gate driver enables VHF switching.

Fig. 2 Class E inverter stage with self-oscillating resonant gate drive

Simulation performance

Fig. 3 Left: \( V_{ds} \) (red) and 10x scaled \( V_{gs} \) (blue) of inverter switch
Right: Rectifier input voltage (red) and current (blue)

Fig. 4 Input voltage (red) and current (blue)

Output power | 52.2 W |
---|---|
Efficiency | 90.3 % |
Power Factor | 93 % |
Input current THD | 38 % |

Tab. 2 Simulated converter performance

Conclusion
• Stacked topology reduce voltage stresses.
• GaN transistors and air-core inductors enable VHF operation
• Self-oscillating gate drive enables open-loop operation

References


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