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/CD converter

Design
- Stacked configuration reduce voltage stresses and improve efficiency. [1]
- Class E inverter and class DE rectifier enables zero-voltage switching.

![Fig. 1 Stacking configuration.](image1)

- 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 [2].

![Fig. 2 Class E inverter stage with self-oscillating resonant gate drive](image2)

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)

Output power
<table>
<thead>
<tr>
<th>Tab. 2 Simulated converter performance</th>
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</thead>
<tbody>
<tr>
<td><strong>Output power</strong></td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
</tr>
<tr>
<td><strong>Power Factor</strong></td>
</tr>
<tr>
<td><strong>Input current THD</strong></td>
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</tbody>
</table>

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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