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.

Simudiation performance

Fig. 1 Stacking configuration.

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

• 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. 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

Tab. 1 Converter specifications

<table>
<thead>
<tr>
<th>Input voltage</th>
<th>230 V&lt;sub&gt;AC&lt;/sub&gt; @ 50 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>110 V&lt;sub&gt;DC&lt;/sub&gt;</td>
</tr>
<tr>
<td>Switching frequency</td>
<td>30-37 MHz</td>
</tr>
</tbody>
</table>

References


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