eGaN® FETs for Ultra-High Frequency Power Conversion

Hard switching power conversion at 10 MHz and above requires both high speed eGaN FETs and a circuit that supports low common source inductance and power loop inductance. The ultra high speed capabilities and improved device pinout of the EPC8000 series of gallium nitride transistors enable this class of converters in applications such as envelope tracking and wireless power transmission. These eGaN FETs can achieve switching transition speeds in the sub-nano seconds range, and the gate drive loop and drain-source power path are designed for ultra low inductance.

![Gate Voltage vs Gate Charge](image)

**Gate Voltage $V_G$ [V]**

<table>
<thead>
<tr>
<th>40 V EPC80xx</th>
<th>EPC2014 (1/10th)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 V</td>
<td>4.5 V</td>
</tr>
<tr>
<td>4 V</td>
<td>3.6 V</td>
</tr>
<tr>
<td>3 V</td>
<td>2.7 V</td>
</tr>
<tr>
<td>2 V</td>
<td>1.8 V</td>
</tr>
<tr>
<td>1 V</td>
<td>0.9 V</td>
</tr>
</tbody>
</table>

*Gate charge of the 40 V EPC80xx series device compared with the EPC2014 scaled to 1/10th of its active area.*

**High Frequency Footprint**
- Separate gate return (source) connection
- Low inductance gate connection
- High dv/dt immunity
- Orthogonal gate and drain circuit connections
- Low internal parasitic Inductances
- Reduced $Q_{GD}$ for faster switching

**Design Example: 10 MHz Envelope Tracking Converter**

**42 V to 20 V, 40 W buck converter operating at 10 MHz**

This family of devices is capable of greater than 10 MHz operation. Efficiency of both 5 MHz and 10 MHz operation is shown in the figure to the right.

With mobile communications traffic increasing by 70% in 2012 and over 10x by 2017, envelope tracking will provide a high efficiency RF solution. The eGaN FET, with very low propagation delay, and high frequency capability, and high efficiency is a key enabler of envelope tracking converters which dramatically increases RF power amplifier efficiency.
Applications

- 10 MHz power supply
- Envelope Tracking or Drain modulation in RF Power Amplifiers
- Class D or E wireless charging for tablets and laptops

More Information at epc-co.com

- Application Note: Introducing Family of eGaN FETs for Multi-MHz Hard Switching Applications
- EPC eGaN FET Product Line: epc-co.com/epc/Products/eGaNFETs.aspx
- eGaN FET Demo Boards: epc-co.com/epc/Products/DemoBoards.aspx