How to design With GaN in 1 Hour!

April 1, 2017

transphorm
Highest Performance, Highest Reliability GaN
Agenda

- The “Do It Yourself” HEM Guide to AC-DC Design
- Choose the right topology
- Deal with all the challenges
- Solutions
- Next Steps
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The “Do it Yourself” Guide to Design In GaN
(complete the design in < 1 hour)

<table>
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<tbody>
<tr>
<td>Plug-In $V_{AC}$</td>
<td>$85 V_{AC} / 265 V_{AC}$</td>
<td>EMI Certification</td>
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<td>Output Voltage</td>
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</tr>
<tr>
<td>Power Rating</td>
<td>500 W</td>
<td>Monitor and Logging Functions</td>
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</tr>
<tr>
<td>True Efficiency</td>
<td>$&gt; 95%$</td>
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<thead>
<tr>
<th>Type</th>
<th>IGBT</th>
<th>MOSFETs</th>
<th>GaN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>&lt; 50 kHz</td>
<td>&lt; 250 kHz</td>
<td>&gt; 250 kHz</td>
</tr>
<tr>
<td>Transformer</td>
<td>Traditional Regular Wiring</td>
<td>Higher Quality Transformers</td>
<td>Requires the best Quality</td>
</tr>
<tr>
<td>Ease of Implementation</td>
<td>Well-Known</td>
<td>Well-Known</td>
<td>Complex</td>
</tr>
<tr>
<td>Challenges</td>
<td>Frequency –Size of Transformers</td>
<td>Heat</td>
<td>Every single detail</td>
</tr>
</tbody>
</table>
# Bridge Rectifier & PFC Topologies

<table>
<thead>
<tr>
<th>Type</th>
<th>MOSFET Bridge + CCM PFC</th>
<th>MOSFET Bridge + Interleaved PFC</th>
<th>Ideal Diode Bridge Rectifier + GaN + Interleaved</th>
<th>Bridgeless Totem Pole</th>
<th>Bridgeless Totem Pole + GaN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Range</td>
<td>&lt; 100W</td>
<td>100 W to 1000 W</td>
<td>100 W to 1000 W</td>
<td>&gt; 1 kW</td>
<td>&gt; 1 kW</td>
</tr>
<tr>
<td>Efficiency</td>
<td>&lt; 85%</td>
<td>&lt; 96%</td>
<td>&gt; 98%</td>
<td>&gt; 97%</td>
<td>&gt; 99%</td>
</tr>
<tr>
<td>Power Factor</td>
<td>.90?</td>
<td>&gt;.98</td>
<td>&gt;.99</td>
<td>&gt;.99</td>
<td>&gt;.99</td>
</tr>
<tr>
<td>Challenges</td>
<td>Heat Dissipation</td>
<td>Heat Dissipation</td>
<td>Speed of GaN</td>
<td>Harmonic Noise</td>
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</tr>
<tr>
<td></td>
<td>Decreased Reliability</td>
<td></td>
<td></td>
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## LLC & SR Topologies

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<tr>
<th>Type</th>
<th>Flyback</th>
<th>Forward</th>
<th>Half-Bridge MOSFET</th>
<th>Full-Bridge MOSFET</th>
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<td>&lt; 90%</td>
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<tr>
<td>Challenges</td>
<td>Power Stability</td>
<td>Control &amp; Losses</td>
<td>More Complex but well-known</td>
<td>Even more complex with controller</td>
</tr>
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Agenda

- The “Do It Yourself” HEM Guide to AC-DC Design
- Choose the right topology
- Deal with all the challenges
- Solutions
- Next Steps
Deal with the challenges:

- Drivers
- Inductors
- Transformer
- Components
- Noise
- PCB layout
- Traces length & width
- Copper plating
- Etc.
The “Do it Yourself” Guide to Design In GaN
(complete the design in < 1 hour)

Carrier Circuit Board

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Let us simplify your life!

TD-DEV-500-12V Carrier Board
Carrier Board for all Telcodium Modules

Includes:
- EMI Filtering
- Early Power
- Sensors
- PMBus

We Provide:
- 3D File (.igs)
- Schematics (Orcad .dsn)
- Schematics (.pdf)
- Gerber File (.zip)
- BOM (.xls)
Let us simplify your life!

- TD-DIODE-1000 Module
  Efficient Bridge Rectifier
- TD-PFC-500 Module
  Interleaved PFC

GaN Provides Efficiency >98%
Let us simplify your life!

TD-DIODE-1000 Module + TD-PFC-500 Module

Efficiency for HEM PFC 390V module (115Vrms & 230Vrms)
Let us simplify your life!

TD-DIODE-1000 Module + TD-PFC-500 Module

Power Factor for HEM PFC 390V module (115Vrms & 230Vrms)
Let us simplify your life!

TD-LLC-x00-xxV Module

- Available in different models:
  - 200W 12V
  - 300W 12V
  - 400W 12V
  - 500W 12V

- Also available in 48V Output

GaN Provides Efficiency >97%
Let us simplify your life!

TD-CPU-192 Module

- Includes Monitoring of:
  - Input Current & Voltage
  - Input Frequency
  - Output Current and Voltage
  - Temperature Sensors
  - Fan Speed
  - LED Control
  - PMBus
- Includes Documentation
Deal with the challenges: DONE!

- Drivers
- Inductors
- Transformer
- Components
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AVAILABLE EXCLUSIVELY AT
Let us simplify your life! Part 2

For $5000 and 2 weeks we can adjust to your custom form factor

Contact us for your specific requirements
Thank You!

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info@telcodium.com

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