To achieve the energy saving, downsizing for all power electronics

High-Efficiency GaN HEMT Power Device

Marketing Department
Power Device Division
Fujitsu Semiconductor Limited
GaN Power Device’s Merits

**Energy Saving**
- Current Status: The device’s size is large because of the high breakdown voltage.
- **GaN’s Merit**: A smaller die size (lower resistance) even for the high breakdown voltage.
- Much Lower Power Consumption

**Downsizing**
- Current Status: The capacitor and the inductor is large!!
- **GaN’s Merit**: Higher switching frequency ⇒ It is possible to reduce the size of Capacitor and Inductor.
- More Compact Equipment Size
GaN Power Device can be applied in all areas of Automotive, Industrial and Consumer.
FSL’s GaN Power Device

<table>
<thead>
<tr>
<th>Parameters</th>
<th>30V</th>
<th>150V</th>
<th>600V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain Current [A]</td>
<td>12</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Threshold voltage [V]</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>On Resistance [mΩ]</td>
<td>12.5</td>
<td>13</td>
<td>92</td>
</tr>
<tr>
<td>Gate Charge [nC]</td>
<td>4</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>Package (sample)</td>
<td>WLCSP</td>
<td>WLCSP</td>
<td>TO247</td>
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</tbody>
</table>

All products’ sample is available
GaN Power Device’s Development and Mass Production

Fujitsu Semiconductor’s Aizuwakamatsu Plant
Design・Evaluation・Mass Production

Fujitsu Labs Research and Development

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2.5kW Power Supply for ICT System

2.5kW PSU Specification
- Input: 80 - 230V
- Output: 12V / 208A
- Volume: 2.4L

80-230VAC
Synchronous Rectifier

Inductor
Output diode
Capacitor
GaN-HEMT

380VDC
2.5kW Power Supply for ICT System
GaN-HEMT vs. Si-MOSFET

Higher efficiency than Si FET was confirmed

Input: 230VAC, output: 380V, Switching Frequency: 75KHz
High Frequency PFC Evaluation Board

Compact size due to the higher switching frequency

Specification

- **Input:** 100 – 240 V
- **Output:** 380V / 4A
- **Volume:** 202 cm³
- **Efficiency:** 86%@1MHz
GaN-HEMT vs. Si-MOSFET (HV)

GaN power device showed higher efficiency potential at high switching frequency.

<table>
<thead>
<tr>
<th></th>
<th>GaN HEMT</th>
<th>Si FET</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{DS}[\text{A}]$</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>$R_{on}[\text{m}\Omega]$</td>
<td>100</td>
<td>190</td>
</tr>
</tbody>
</table>
High Switching Frequency PFC Board

Specification

Input: AC 80 – 240 V
Output: DC400 V
Switching Freq: 350/500 kHz
Efficiency: 96.75%
**New Lineup  150V  GaN Power Device**

### DC characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakdown Voltage</td>
<td>V</td>
<td>150</td>
</tr>
<tr>
<td>Threshold Voltage</td>
<td>V</td>
<td>1.8</td>
</tr>
<tr>
<td>On - Resistance</td>
<td>mΩ</td>
<td>13</td>
</tr>
</tbody>
</table>

### AC characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Input Capacitance (Ciss)</td>
<td>pF</td>
<td>950</td>
</tr>
<tr>
<td>Output capacitance (Coss)</td>
<td>pF</td>
<td>550</td>
</tr>
<tr>
<td>Reverse transfer capacitance (Crss)</td>
<td>pF</td>
<td>80</td>
</tr>
<tr>
<td>Gate charge capacity (Qg)</td>
<td>nC</td>
<td>16</td>
</tr>
</tbody>
</table>

Compare with Si MOSFET, GaN HEMT’s FOM is less half
shaping tomorrow with you