SiC MOSFET
The real breakthrough in high-voltage switching

Based on the advanced and innovative properties of wide bandgap materials, ST’s silicon carbide (SiC) MOSFETs feature very low $R_{\text{DS(on)}}$ per area, with the new SCT*N65G2 650V product family and the SCT*N120G2 1200V product family in development, combined with excellent switching performance, translating into more efficient and compact designs. ST is among the first companies to produce high-voltage SiC MOSFETs. These new families feature the industry’s highest temperature rating of 200 °C for improved thermal design of power electronics systems.

**KEY FEATURES**
- Very low switching losses
- Low power losses at high temperatures
- Higher operating temperature (up to 200 °C)
- Body diode with no recovery losses
- Easy to drive

**KEY BENEFITS**
- Smaller form factor and higher power density
- Reduced size/cost of passive components
- Higher system efficiency
- Reduced cooling requirements and heatsink size

**KEY APPLICATIONS**
- Traction inverter
- EV charge station
- Photovoltaics
- Factory automation
- Motor drive
- Data center power supply
- OBC & DC/DC converter

Silicon Carbide: The Enabling Technology for higher power density in Industrial and Automotive application

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SiC MOSFET VERSUS SILICON TRANSISTOR

Table 1 compares the new ST’s second generation 650 V, 55 mΩ SCTH35N65G2V-7 SiC MOSFET with a trench field-stop (TFS) IGBT of the same voltage rating and equivalent on-state resistance. The SiC MOSFET exhibits significantly reduced switching losses, even at high temperatures. This enables designers to operate at very high switching frequencies, reducing the size of passive components for smaller form factors. In addition, for the SiC MOSFET the variation of Eon and Eoff with temperature is very small. As an example, the Eoff of the SiC MOSFET remains basically unchanged as the temperature rises from 25 °C to 175 °C, while the Eoff of the IGBT increases by the 89%. Even the change in resistance as the temperature rises is very low and lower than the competition, as shown in Figure 1.

Table 1: Switching loss comparison

<table>
<thead>
<tr>
<th>Device</th>
<th>Von typ. (V) @ 25 °C, 20 A</th>
<th>Von typ. (V) @ 175 °C, 20 A</th>
<th>Eon-typ (µJ) @ 20 A, 400 V 25 °C / 175 °C</th>
<th>Eoff-typ (µJ) @ 20 A, 400 V 25 °C / 175 °C</th>
<th>Eoff rise with temperature</th>
<th>Die size (Normalized)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCTH35N65G2V-7</td>
<td>1.1</td>
<td>1.48</td>
<td>100 / 100</td>
<td>35 / 35</td>
<td>negligible variation vs. Temperature!</td>
<td>0.53</td>
</tr>
<tr>
<td>30 A,650 V TFS IGBT</td>
<td>1.45</td>
<td>1.55</td>
<td>240 / 450</td>
<td>205 / 390</td>
<td>+89% from 25 °C to 175 °C</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note: Von measured @ Vgs-siC=18V, Vgs-IGBT=15V - Eon includes the reverse recovery of the diode

Figure 1. normalized on-state resistance vs temperature

NEW PRODUCTS COMING SOON

STPAKTM
Multi Sintering Package:
Ready for the Next Generation EV Traction Inverter
SCTHS*N65G2AG – 650 V

HU3PAKTM
Top Side Cooling Package:
Ready for Industrial and Automotive High Performance Application
SCTHU*N65G2 – 650 V

DEVICE SUMMARY OR PRODUCT TABLE

<table>
<thead>
<tr>
<th>Commercial Product</th>
<th>VDS (V)</th>
<th>ID max (A)</th>
<th>RDS(on) Typ (Ω) @ Vgs = 18 V</th>
<th>TJ max (°C)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCTH35N65G2V-7</td>
<td>650</td>
<td>45</td>
<td>0.055</td>
<td>175</td>
<td>H2PAK-7</td>
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<td>SCTH90N65G2V-7</td>
<td>116</td>
<td>0.018</td>
<td>175</td>
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<td>H2PAK-7</td>
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<td>SCTW90N65G2V</td>
<td>119</td>
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<td>175</td>
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<td>SCTH100N65G2-7AG</td>
<td>95</td>
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<td>200</td>
<td>H2PAK-7</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>HIP247</td>
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