

# STPOWER SiC MOSFET

The real breakthrough in high-voltage switching



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

Based on the advanced and innovative properties of wide bandgap materials, ST's STPOWER SiC MOSFETs feature very low  $R_{DS(on)}$  per area, with the new SCT\*N65G2 650 V and the new SCT\*N120G2 1200 V product family, combined with excellent switching performance, reserve efficient and compact designs. 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

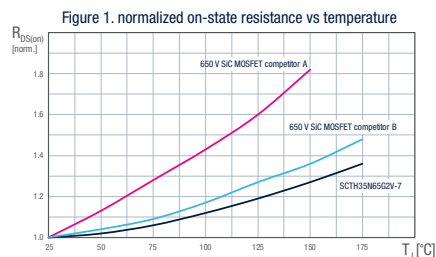
- Smaller form factor and higher power density
- Reduced size/cost of passive components
- Higher system efficiency
- Reduced cooling requirements and heatsink size

### KEY APPLICATIONS

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

### SiC MOSFET VERSUS SILICON TRANSISTOR

**Table 1** compares the new ST's second generation 650 V, 55 mΩ SCTH35N65G2V-7 STPOWER SiC MOSFET with a trench field-stop (TFS) IGBT of the same voltage rating and equivalent on-state resistance. The STPOWER 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 STPOWER SiC MOSFET the variation of  $E_{ON}$  and  $E_{OFF}$  with temperature is very small. As an example, the  $E_{OFF}$  of the STPOWER SiC MOSFET remains basically unchanged as the temperature rises from 25 °C to 175 °C, while the  $E_{OFF}$  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**

| Device               | $V_{on}$ typ. (V)<br>@ 25 °C, 20 A | $V_{on}$ typ. (V)<br>@ 175 °C, 20 A | $E_{on-typ}$ (μJ)<br>@ 20 A, 400 V<br>25 °C / 175 °C | $E_{off-typ}$ (μJ)<br>@ 20 A, 400 V<br>25 °C / 175 °C | $E_{on}$ rise with<br>temperature    | Die size<br>(Normalized) |
|----------------------|------------------------------------|-------------------------------------|--|---|--------------------------------------|--------------------------|
| SCTH35N65G2V-7       | 1.1                                | 1.48                                | 100 / 100  | 35 / 35   | negligible variation vs. Temperature | 0.53                     |
| 30 A, 650 V TFS IGBT | 1.45                               | 1.55                                | 240 / 450  | 205 / 390   | +89% from 25 °C to 175 °C            | 1.00                     |

Note: Von measured @ VGS-SiC=18 V, VGE-IGBT=15 V - Eon includes the reverse recovery of the diode

### STPOWER SiC MOSFET: 650 V Gen2

| Part Number      | $V_{DS}$ (V) | $R_{DS(on)}$ Typ @ 25° C (Ω) | $I_D$ (A)   | Package          |           |            |                  |                  |
|------------------|--------------|------------------------------|-------------|------------------|-----------|------------|------------------|------------------|
|                  |              |                              |             | HiP247           | HiP247-LL | HiP247-4LL | H2PAK-7L         | POWERFLAT 8X8 HV |
|                  |              |                              |             | $T_J$ MAX= 200°C |           |            | $T_J$ MAX= 175°C |                  |
| SCTx35N65G2V     | 650          | 0.55                         | 40**<br>45  | X                | X         |            |                  | X                |
| SCTWA35N65G2V-4  |              |                              |             |                  |           | X          |                  |                  |
| SCTH35N65G2V-7   |              |                              |             |                  |           |            | X                |                  |
| SCTW35N65G2VAG   |              |                              |             | X                |           |            |                  |                  |
| SCTH35N65G2V-7AG |              |                              |             |                  |           |            | X                |                  |
| SCTx90N65G2V     | 650          | 0.018                        | 40**<br>119 | X                | X         |            |                  | X                |
| SCTWA90N65G2V-4  |              |                              |             |                  |           | X          |                  |                  |
| SCTH90N65G2V-7   |              |                              |             |                  |           |            | X                |                  |
| SCTW100N65G2AG   |              |                              |             | X                |           |            |                  |                  |
| SCTH100N65G2-7AG |              |                              |             |                  |           |            | X                |                  |

\*\* value for PowerFLAT 8x8 HV

### STPOWER SiC MOSFET: 1200 V Gen2

| Part Number       | $V_{DS}$ (V) | $R_{DS(on)}$ Typ @ 25° C (Ω) | $I_D$ (A) | Package          |           |            |                  |
|-------------------|--------------|------------------------------|-----------|------------------|-----------|------------|------------------|
|                   |              |                              |           | HiP247           | HiP247-LL | HiP247-4LL | H2PAK-7L         |
|                   |              |                              |           | $T_J$ MAX= 200°C |           |            | $T_J$ MAX= 175°C |
| SCTW40N120G2VAG   | 1200         | 0.075                        | 33        | X                |           |            |                  |
| SCTW40N120G2V     |              | 0.070                        | 45        | X                |           |            |                  |
| SCTWA40N120G2V-4* |              |                              |           |                  |           | X          |                  |
| SCTW60N120G2AG    |              | 0.045                        | 60        | X                |           |            |                  |
| SCTW70N120G2V     |              | 0.025                        | 95        | X                |           |            |                  |
| SCTWA70N120G2V-4* |              |                              |           |                  |           | X          |                  |

\* Datasheet available on line within Q2 2021



© STMicroelectronics - January 2021 - Printed in the United Kingdom - All rights reserved  
 ST and the ST logo are registered and/or unregistered trademarks of STMicroelectronics International NV or its affiliates in the EU and/or elsewhere. In particular, ST and the ST logo are Registered in the US Patent and Trademark Office.  
 For additional information about ST trademarks, please refer to [www.st.com/trademarks](http://www.st.com/trademarks).  
 All other product or service names are the property of their respective owners.

