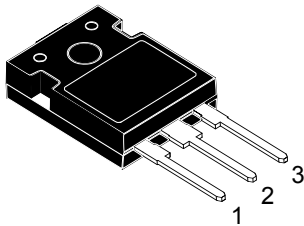
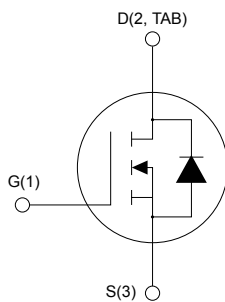


## Automotive-grade silicon carbide Power MOSFET 650 V, 20 mΩ typ., 100 A in an HiP247 package



**HiP247**


AM01475v1\_no2en



### Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
SCTW100N65G2AG	650 V	26 mΩ	100 A

- AEC-Q101 qualified 
- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitance
- Very high operating junction temperature capability ( $T_J = 200\text{ °C}$ )

### Applications

- Main inverter (electric traction)
- DC/DC converter for EV/HEV
- On board charger (OBC)

### Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 2<sup>nd</sup> generation SiC MOSFET technology. The device features remarkably low on-resistance per unit area and very good switching performance. The variation of switching loss is almost independent of junction temperature.

#### Product status link

[SCTW100N65G2AG](#)

#### Device summary

<b>Order code</b>	SCTW100N65G2AG
<b>Marking</b>	SCT100N65G2AG
<b>Package</b>	HiP247
<b>Packing</b>	Tube

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	650	V
$V_{GS}$	Gate-source voltage	-10 to 22	V
	Gate-source voltage (recommended operational values)	-5 to 18	
$I_D$	Drain current (continuous) at $T_C = 25\text{ °C}$	100	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	70	
$I_{DM}^{(1)}$	Drain current (pulsed)	280	A
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ °C}$	420	W
$T_{stg}$	Storage temperature range	-55 to 200	°C
$T_J$	Operating junction temperature range		°C

1. Pulse width limited by safe operating area.

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance, junction-to-case	0.42	°C/W
$R_{thJA}$	Thermal resistance, junction-to-ambient	40	°C/W

## 2 Electrical characteristics

( $T_C = 25\text{ °C}$  unless otherwise specified).

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ , $I_D = 1\text{ mA}$	650			V
$I_{DSS}$	Zero gate voltage drain current	$V_{DS} = 650\text{ V}$ , $V_{GS} = 0\text{ V}$			10	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = -10\text{ to }22\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 1\text{ mA}$	1.9	3.1	5.0	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 18\text{ V}$ , $I_D = 50\text{ A}$		20	26	m $\Omega$
		$V_{GS} = 18\text{ V}$ , $I_D = 50\text{ A}$ , $T_J = 200\text{ °C}$		36		

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 520\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	3315	-	pF
$C_{oss}$	Output capacitance		-	267	-	pF
$C_{riss}$	Reverse transfer capacitance		-	46	-	pF
$Q_g$	Total gate charge	$V_{DS} = 520\text{ V}$ , $V_{GS} = -5\text{ to }18\text{ V}$ , $I_D = 50\text{ A}$	-	162	-	nC
$Q_{gs}$	Gate-source charge		-	45	-	nC
$Q_{gd}$	Gate-drain charge		-	49	-	nC
$R_g$	Gate input resistance	$f = 1\text{ MHz}$ , $I_D = 0\text{ A}$	-	1	-	$\Omega$

**Table 5. Switching energy**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}$	Turn-on switching energy	$V_{DD} = 520\text{ V}$ , $I_D = 50\text{ A}$ ,	-	486	-	$\mu\text{J}$
$E_{off}$	Turn-off switching energy	$R_G = 10\ \Omega$ , $V_{GS} = -5\text{ to }18\text{ V}$	-	506	-	$\mu\text{J}$

**Table 6. Reverse SiC diode characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}$	Diode forward voltage	$I_F = 50\text{ A}$ , $V_{GS} = 0\text{ V}$	-	2.8	-	V
$t_{rr}$	Reverse recovery time	$I_F = 50\text{ A}$ , $di/dt = 2140\text{ A}/\mu\text{s}$ , $V_{DD} = 520\text{ V}$ , $R_G = 10\ \Omega$ , $V_{GS} = -5\text{ to }18\text{ V}$	-	26	-	ns
$Q_{rr}$	Reverse recovery charge		-	370	-	nC
$I_{RRM}$	Reverse recovery current		-	24	-	A

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

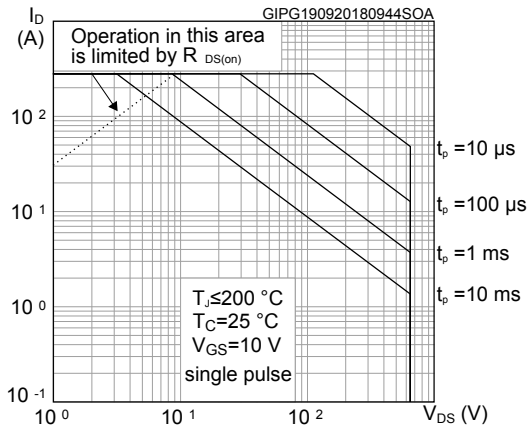


Figure 2. Thermal impedance

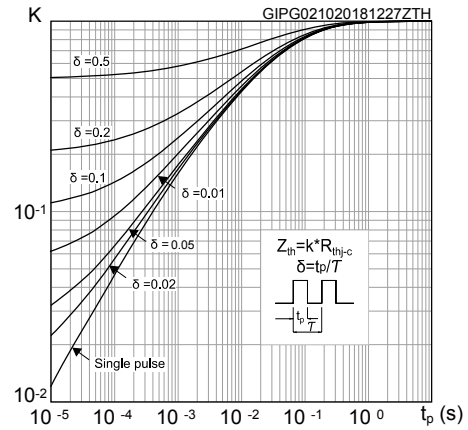


Figure 3. Output characteristics ( $T_J = 25\text{ °C}$ )

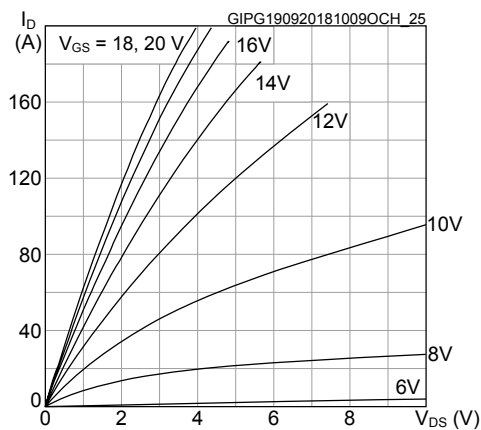


Figure 4. Output characteristics ( $T_J = 200\text{ °C}$ )

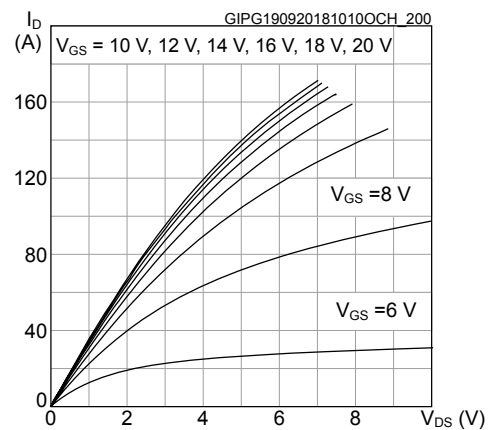


Figure 5. Transfer characteristics

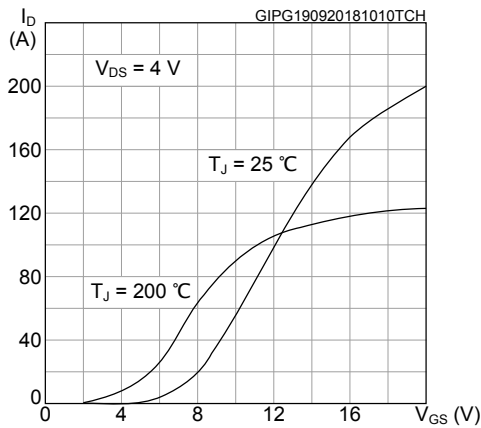


Figure 6. Total power dissipation

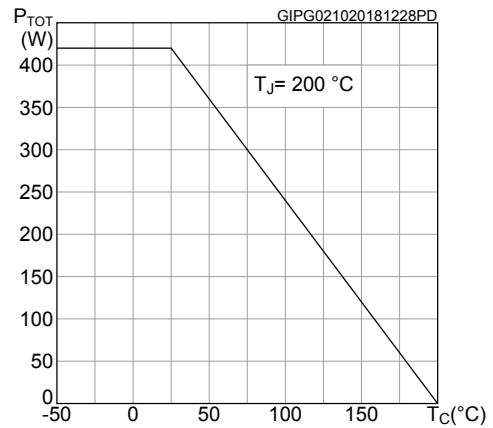


Figure 7. Gate charge vs gate-source voltage

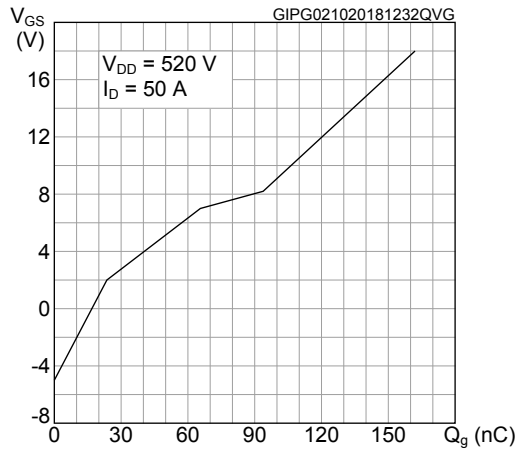


Figure 8. Capacitance variations

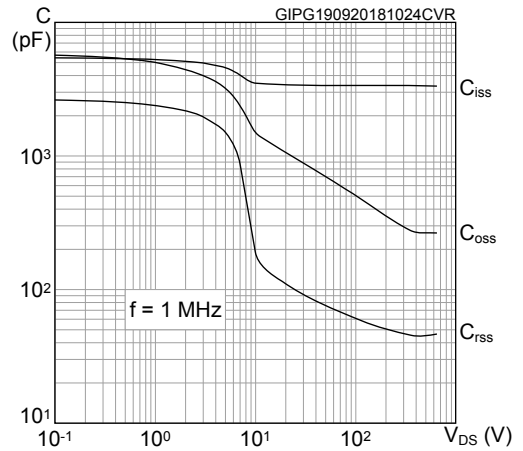


Figure 9. Normalized  $V_{(BR)DSS}$  vs. temperature

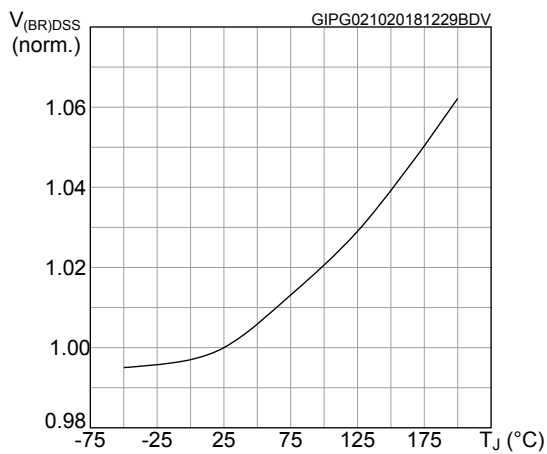


Figure 10. Normalized gate threshold voltage vs. temperature

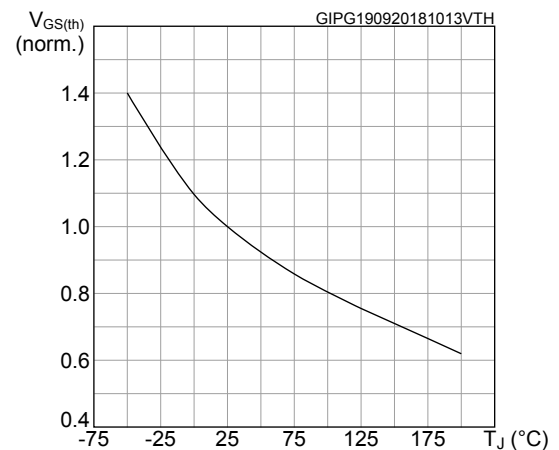


Figure 11. Normalized on-resistance vs. temperature

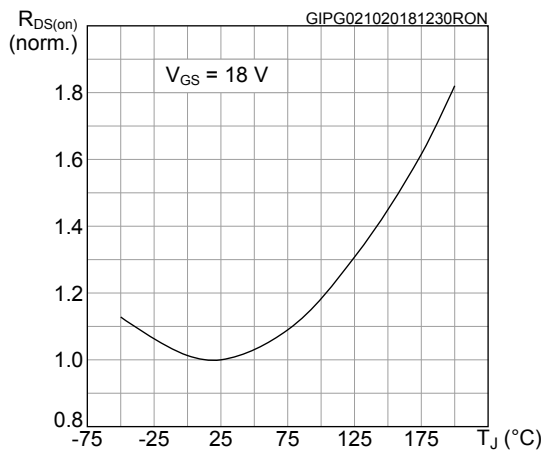
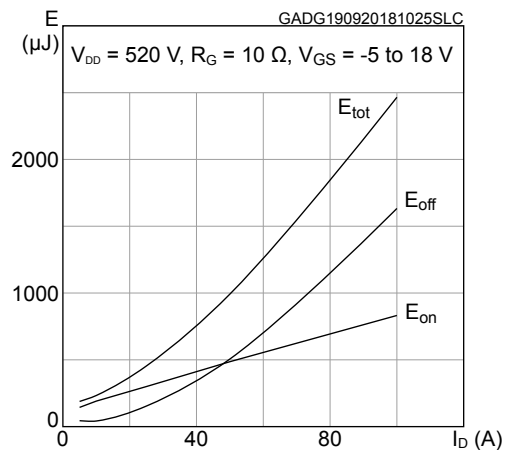
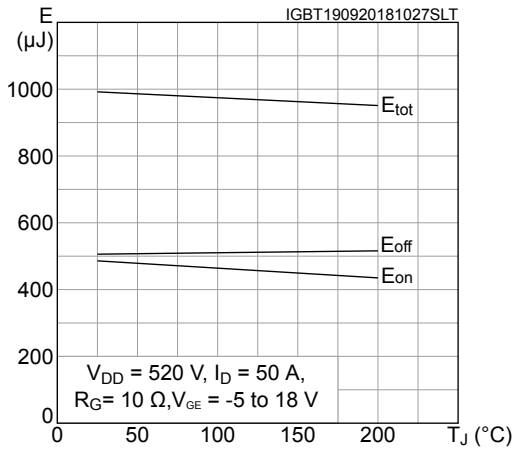


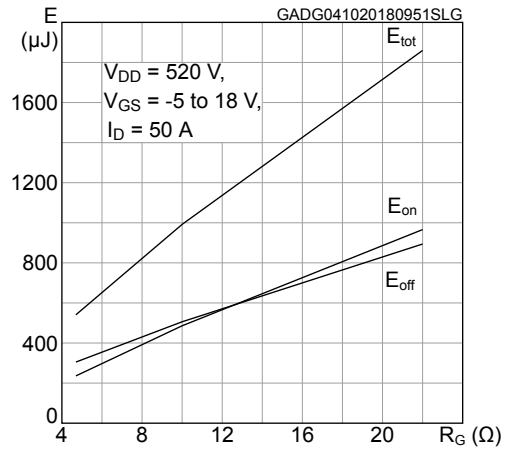
Figure 12. Switching energy vs drain current



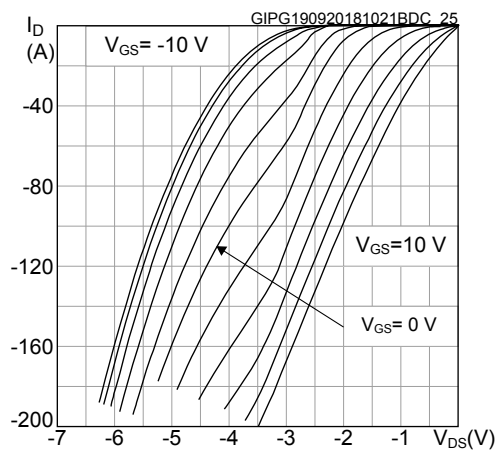
**Figure 13. Switching energy vs junction temperature**



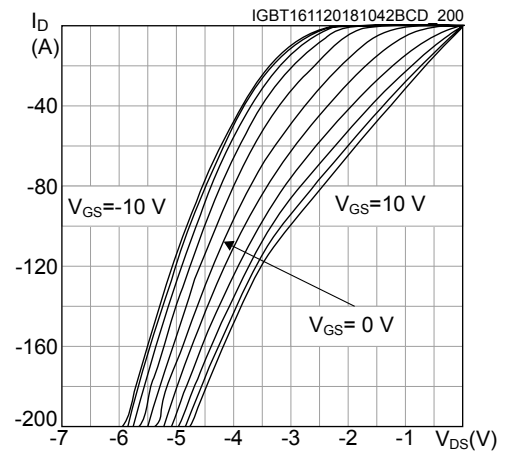
**Figure 14. Switching energy vs gate resistance**



**Figure 15. Body diode characteristics ( $T_J = 25^{\circ}\text{C}$ )**



**Figure 16. Body diode characteristics ( $T_J = 200^{\circ}\text{C}$ )**

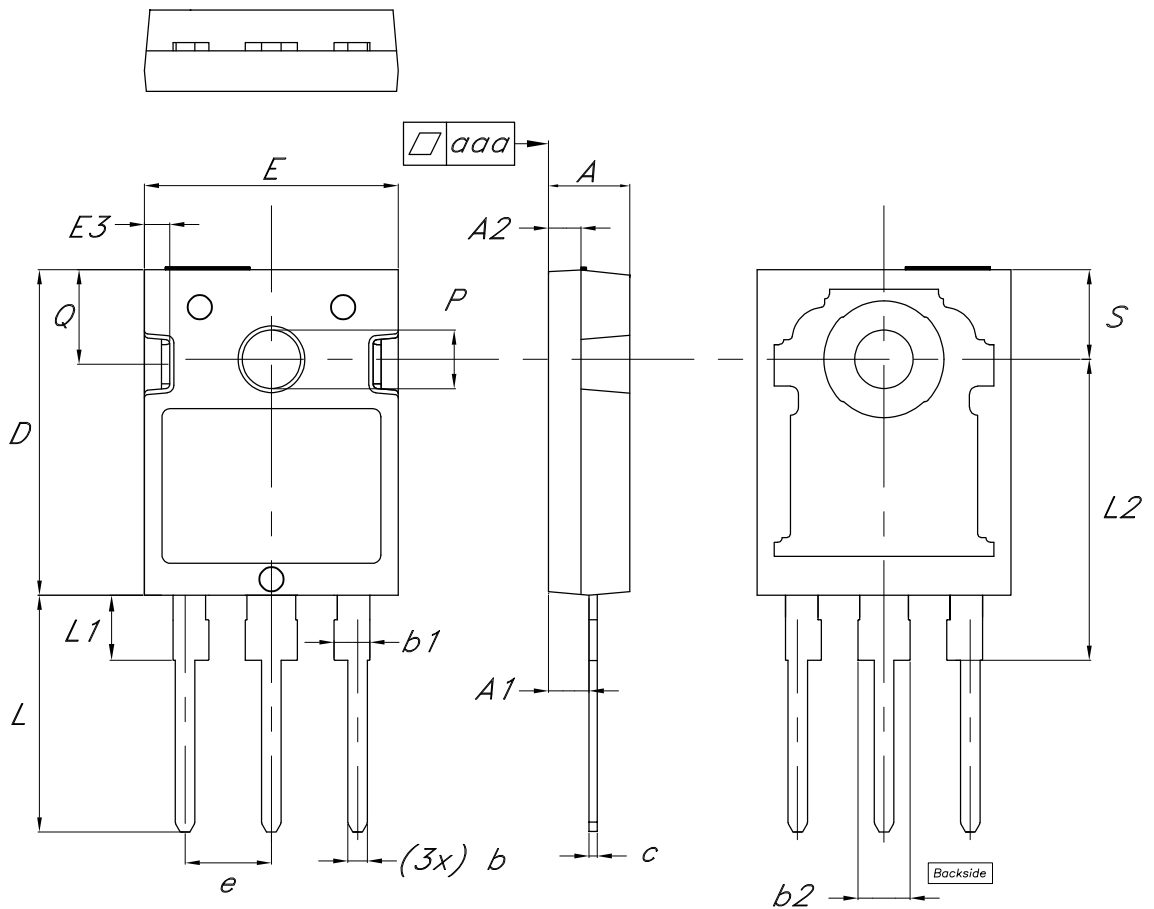


### 3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

#### 3.1 HiP247 package information

Figure 17. HiP247 package outline



8581091\_4

**Table 7. HiP247 package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.85	5.00	5.15
A1	2.20		2.60
A2	1.90	2.00	2.10
b	1.00		1.40
b1	2.00		2.40
b2	3.00		3.40
c	0.40		0.80
D	19.85	20.00	20.15
E	15.45	15.60	15.75
E3	1.45		1.65
e	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2	18.30	18.50	18.70
P	3.55		3.65
Q	5.65		5.95
S	5.30	5.50	5.70
aaa		0.04	0.10



## Revision history

**Table 8. Document revision history**

Date	Revision	Changes
09-May-2016	1	First release
21-Nov-2018	2	Modified features and applications on cover page. Modified <i>Table 1. Absolute maximum ratings, Table 2. Thermal data, Table 3. On/off states, Table 4. Dynamic, Table 5. Switching energy and Table 6. Reverse SiC diode characteristics.</i> Added <i>Section 2.1 Electrical characteristics (curves).</i> Updated <i>Section 3.1 HiP247 package information.</i> Minor text changes.
11-Sep-2020	3	Updated <i>Section 2 Electrical characteristics.</i>
14-Sep-2021	4	Modified $R_{DS(on)}$ value on cover page. Modified applications and description. Modified <i>Table 2. Thermal data, Table 3. On/off states.</i> Modified <i>Figure 14. Switching energy vs gate resistance, Figure 15. Body diode characteristics (<math>T_J = 25\text{ }^\circ\text{C}</math>) and Figure 16. Body diode characteristics (<math>T_J = 200\text{ }^\circ\text{C}</math>).</i> Updated HiP247 package.

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