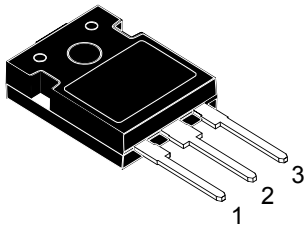
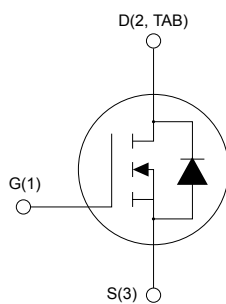


Automotive-grade silicon carbide Power MOSFET 650 V, 20 mΩ typ., 100 A in an HiP247 package



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 2nd 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

Order code	SCTW100N65G2AG
Marking	SCT100N65G2AG
Package	HiP247
Packing	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	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}, V_{GS} = -10\text{ to }22\text{ V}$			± 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 Ω
		$V_{GS} = 18\text{ V}, I_D = 50\text{ A}, T_J = 200\text{ °C}$		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_{rss}	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	-	Ω

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	-	μJ
E_{off}	Turn-off switching energy	$R_G = 10\ \Omega, V_{GS} = -5\text{ to }18\text{ V}$	-	506	-	μJ

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

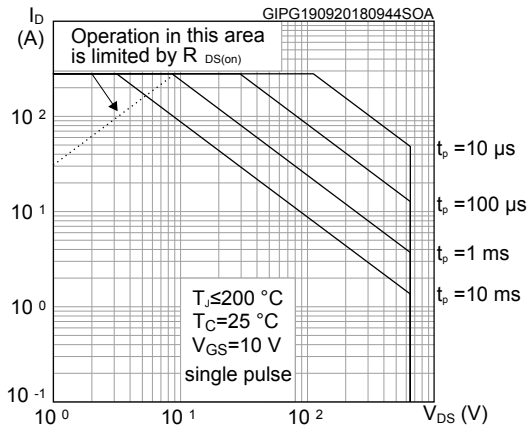


Figure 2. Thermal impedance

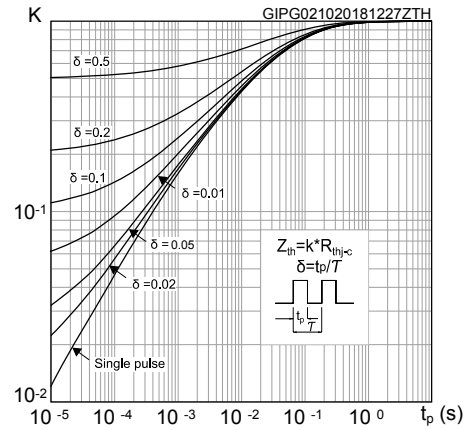


Figure 3. Output characteristics ($T_J = 25\text{ °C}$)

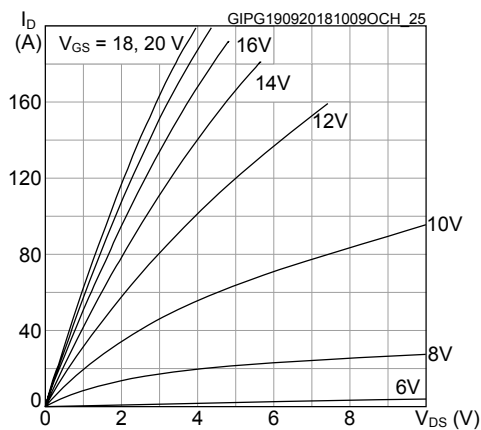


Figure 4. Output characteristics ($T_J = 200\text{ °C}$)

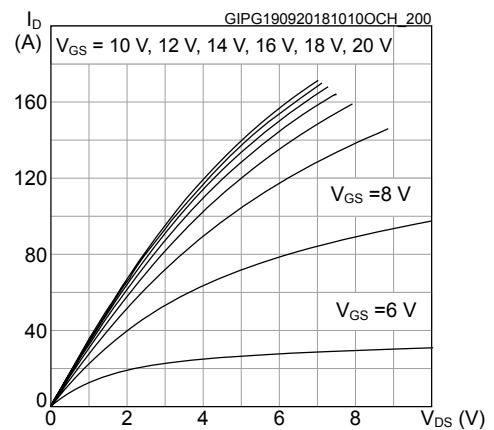


Figure 5. Transfer characteristics

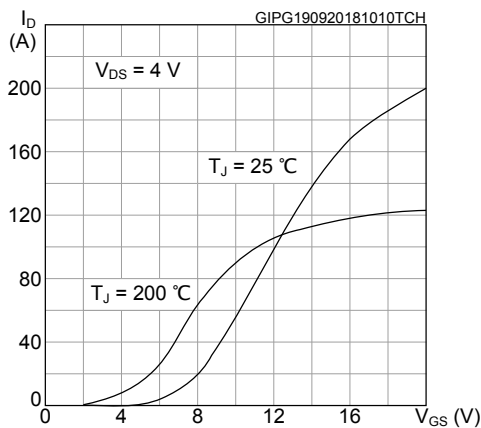


Figure 6. Total power dissipation

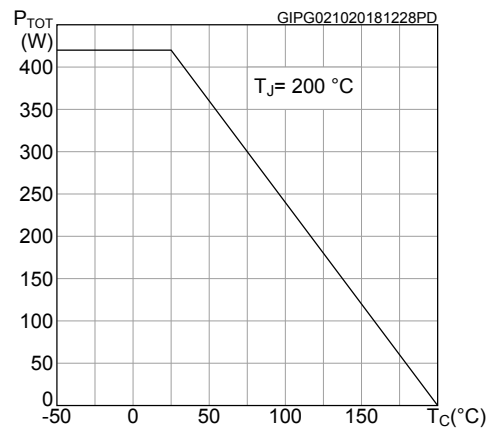


Figure 7. Gate charge vs gate-source voltage

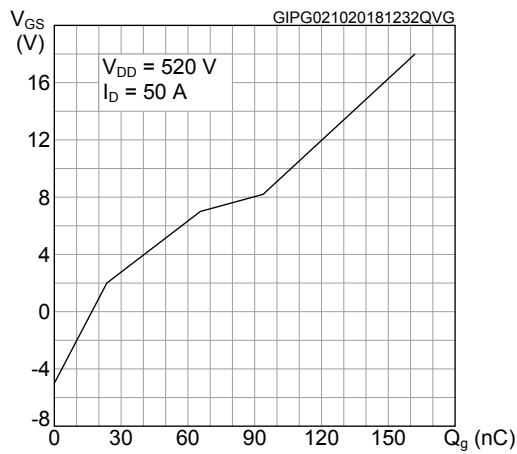


Figure 8. Capacitance variations

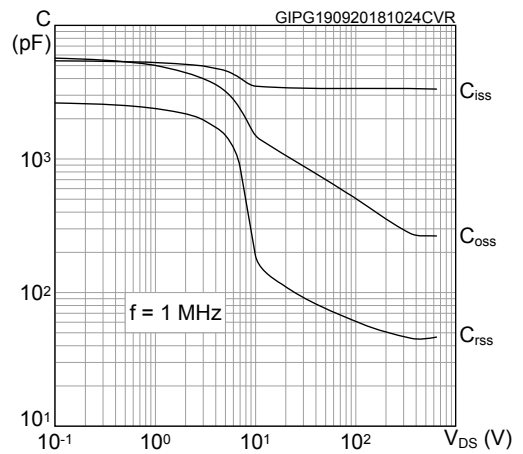


Figure 9. Normalized $V_{(BR)DSS}$ vs. temperature

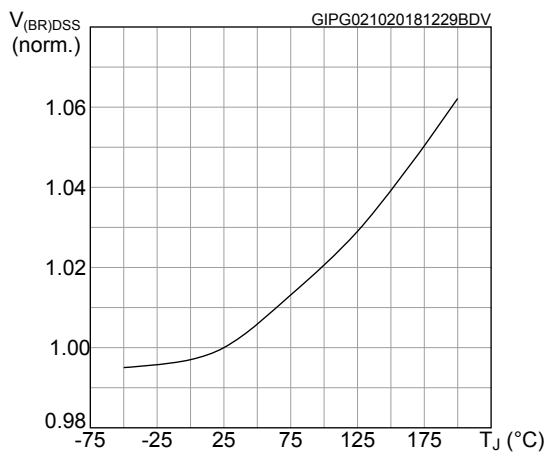


Figure 10. Normalized gate threshold voltage vs. temperature

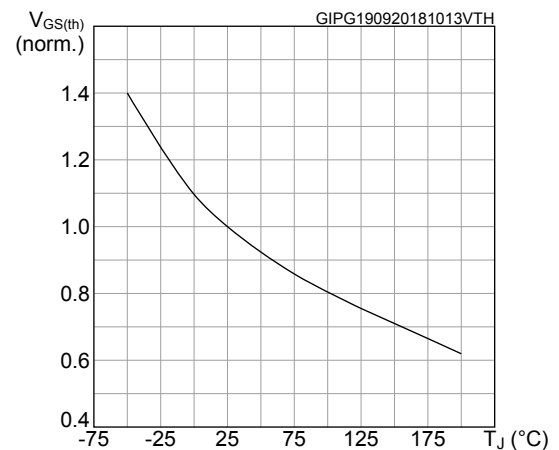


Figure 11. Normalized on-resistance vs. temperature

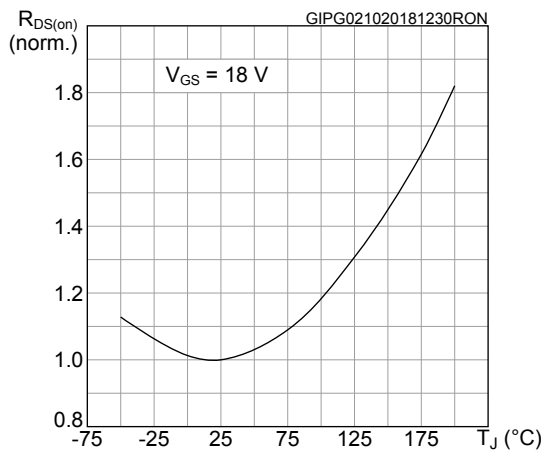


Figure 12. Switching energy vs drain current

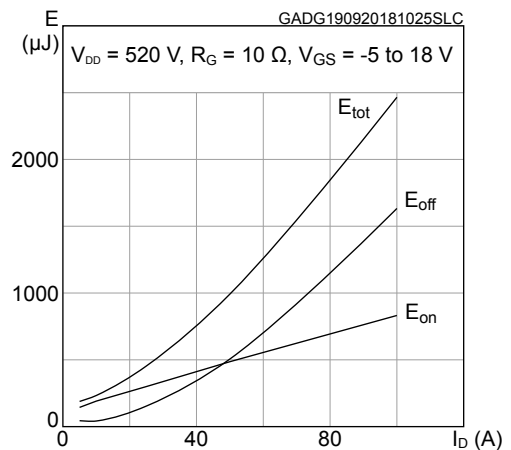


Figure 13. Switching energy vs junction temperature

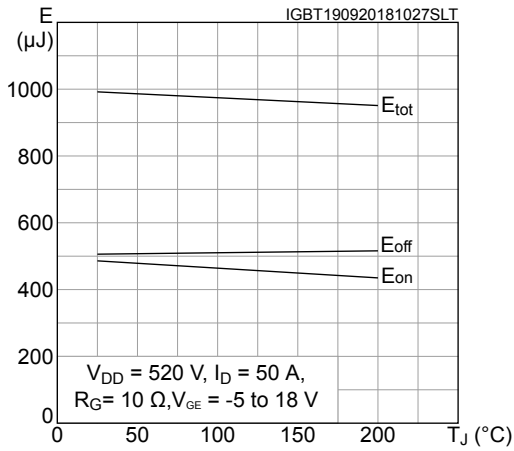


Figure 14. Switching energy vs gate resistance

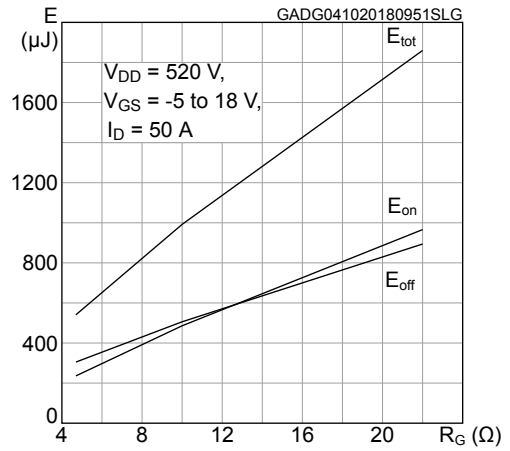


Figure 15. Body diode characteristics ($T_J = 25^{\circ}\text{C}$)

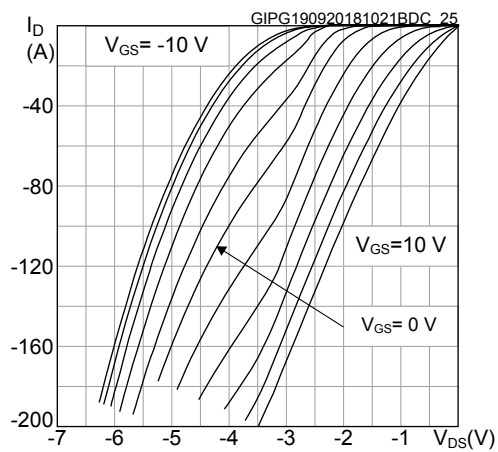
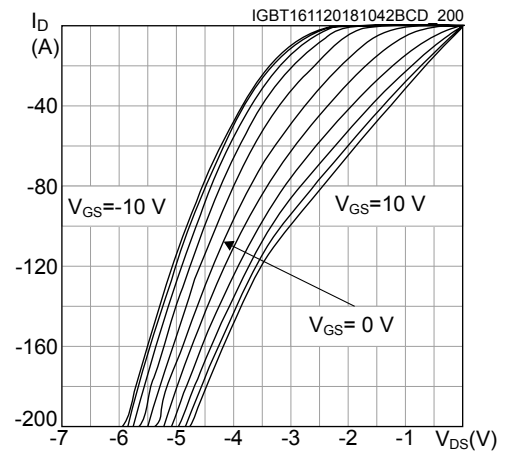


Figure 16. Body diode characteristics ($T_J = 200^{\circ}\text{C}$)

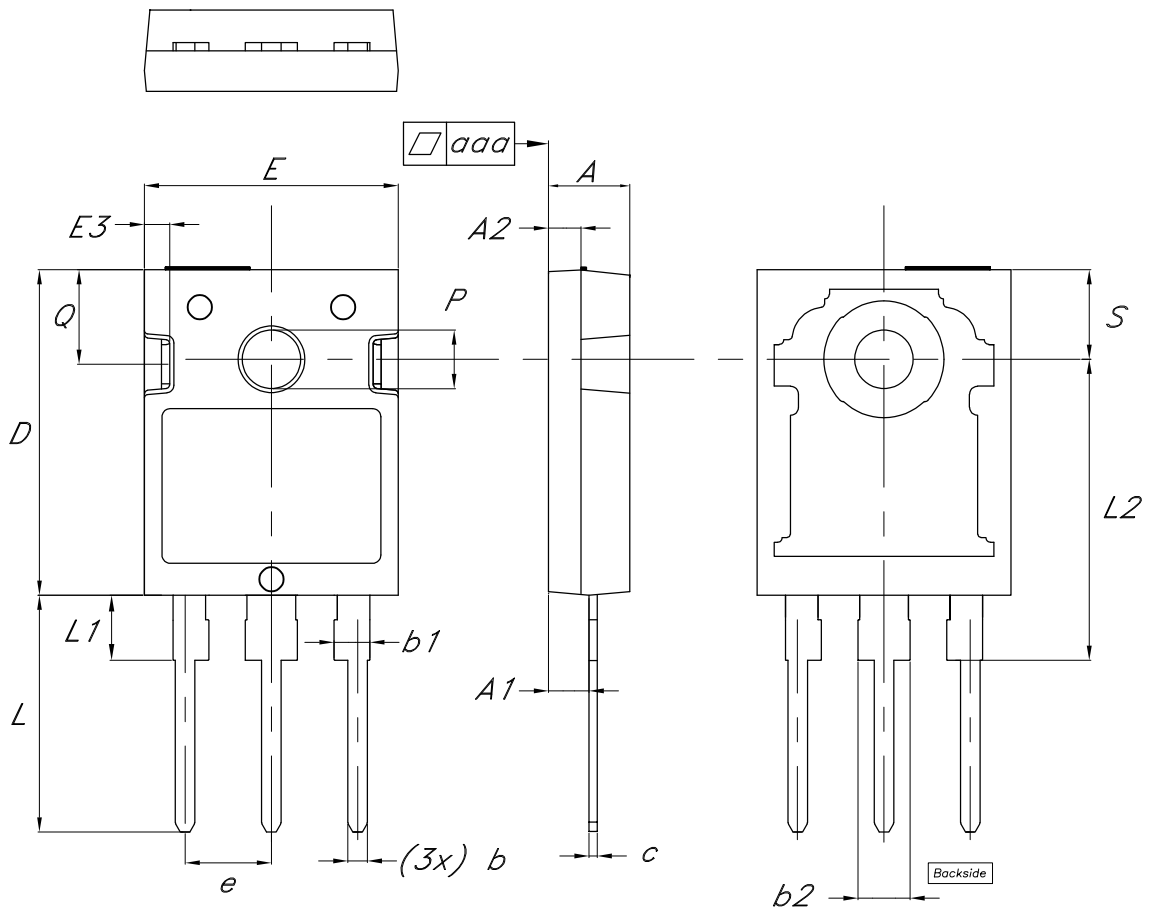


3 Package information

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. 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</i> , <i>Table 2. Thermal data</i> , <i>Table 3. On/off states</i> , <i>Table 4. Dynamic</i> , <i>Table 5. Switching energy</i> and <i>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</i> , <i>Table 3. On/off states</i> . Modified <i>Figure 14. Switching energy vs gate resistance</i> , <i>Figure 15. Body diode characteristics ($T_J = 25\text{ }^\circ\text{C}$)</i> and <i>Figure 16. Body diode characteristics ($T_J = 200\text{ }^\circ\text{C}$)</i> . Updated HiP247 package.

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