

Silicon carbide Power MOSFET 1700 V, 6 A, 1.4 Ω (typ., $T_J = 150\text{ }^\circ\text{C}$) in an HiP247™ package

Datasheet - preliminary data

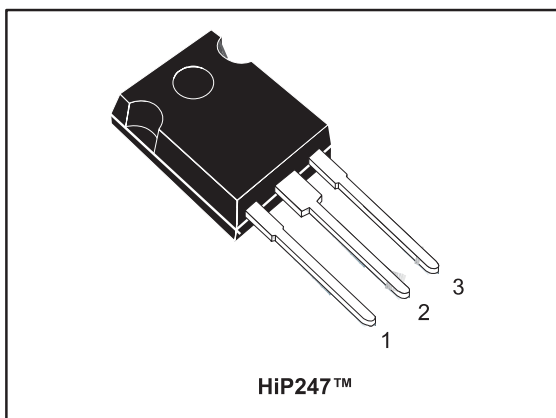
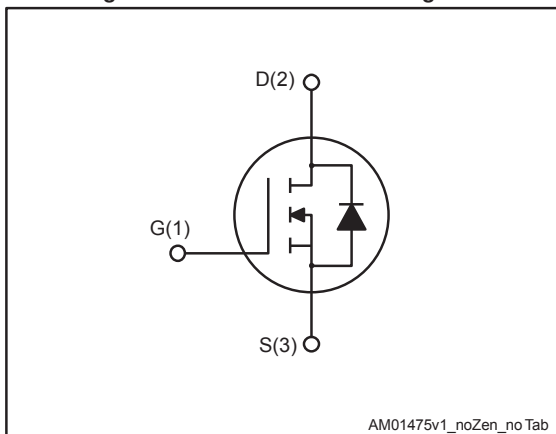


Figure 1: Internal schematic diagram



Features

- Very tight variation of on-resistance vs. temperature
- Slight variation of switching losses vs. temperature
- Very high operating junction temperature capability ($T_J = 200\text{ }^\circ\text{C}$)
- Very fast and robust intrinsic body diode

Applications

- Auxiliary power supply for server
- Switch mode power supply

Description

This silicon carbide Power MOSFET is produced exploiting the advanced, innovative properties of wide bandgap materials. This results in unsurpassed on-resistance per unit area and very good switching performance almost independent of temperature. The outstanding thermal properties of the SiC material, combined with the device's housing in the proprietary HiP247™ package, allows designers to use an industry standard outline with significantly improved thermal capability. These features render the device perfectly suitable for high-efficiency and high power density applications.

Table 1: Device summary

Order code	Marking	Package	Packing
SCT1000N170	SCT1000N170	HiP247™	Tube



The device meets ECOPACK standards, an environmentally-friendly grade of products commonly referred to as "halogen-free". See [Section 3: "Package information"](#).

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1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	1700	V
V_{GS}	Gate-source voltage	-10 to 25	V
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	6	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	5	
$I_{DM}^{(1)}$	Drain current (pulsed)	12	A
P_{TOT}	Total dissipation at $T_C = 25\text{ °C}$	120	W
T_{stg}	Storage temperature range	-55 to 200	°C
T_j	Operating junction temperature range		°C

Notes:

⁽¹⁾Pulse width limited by safe operating area.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.46	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient max	50	°C/W

2 Electrical characteristics

($T_{CASE} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified).

Table 4: On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	1700			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 1700\text{ V}$, $V_{GS} = 0\text{ V}$		1		μA
		$V_{DS} = 1700\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 200\text{ }^{\circ}\text{C}$		10		
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	$V_{DS} = V_{GS}$, $I_D = 1\text{ mA}$	2.1	3.5		V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 20\text{ V}$, $I_D = 3\text{ A}$		1	1.5	Ω
		$V_{GS} = 20\text{ V}$, $I_D = 3\text{ A}$, $T_J = 150\text{ }^{\circ}\text{C}$		1.4		
		$V_{GS} = 20\text{ V}$, $I_D = 3\text{ A}$, $T_J = 200\text{ }^{\circ}\text{C}$		1.6		

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 1000\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	150	-	pF
C_{oss}	Output capacitance		-	12	-	pF
C_{rss}	Reverse transfer capacitance		-	5	-	pF
Q_g	Total gate charge	$V_{DD} = 1000\text{ V}$, $I_D = 2\text{ A}$, $V_{GS} = 0\text{ to }20\text{ V}$	-	14	-	nC
Q_{gs}	Gate-source charge		-	2	-	nC
Q_{gd}	Gate-drain charge		-	8	-	nC
R_g	Gate input resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	9.6	-	Ω

Table 6: Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E _{on}	Turn-on switching energy	V _{DD} = 1000 V, I _D = 2 A, R _G = 6.8 Ω, V _{GS} = -5 to 20 V	-	46	-	μJ
E _{off}	Turn-off switching energy		-	11	-	μJ
E _{on}	Turn-on switching energy	V _{DD} = 1000 V, I _D = 2 A, R _G = 6.8 Ω, V _{GS} = -5 to 20 V, T _J = 150 °C	-	57	-	μJ
E _{off}	Turn-off switching energy		-	13	-	μJ

Table 7: Reverse diode characteristics

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
V _{SD}	Diode forward voltage	I _F = 3 A, V _{GS} = 0 V	-	4.2	-	V
t _{rr}	Reverse recovery time	I _{SD} = 2 A, di/dt = 1000 A/μs, V _{DD} = 1000 V	-	22	-	ns
Q _{rr}	Reverse recovery charge		-	76	-	nC
I _{RRM}	Reverse recovery current		-	5.8	-	A

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

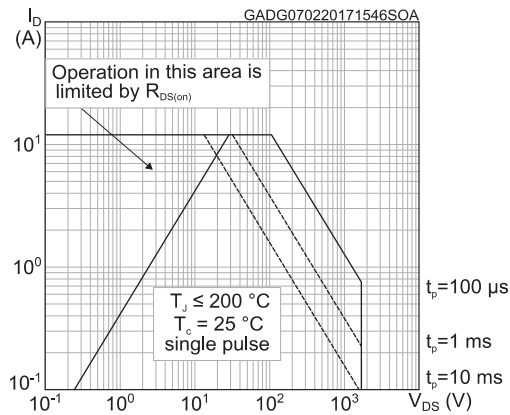


Figure 3: Thermal impedance

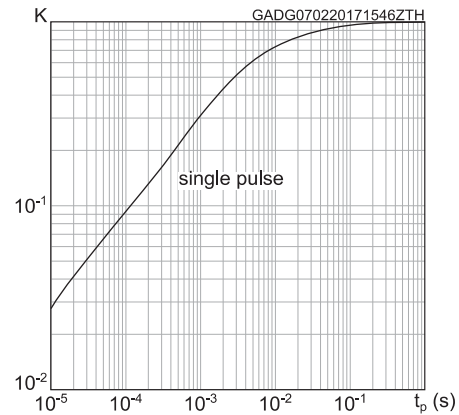


Figure 4: Output characteristics (TJ= 25 °C)

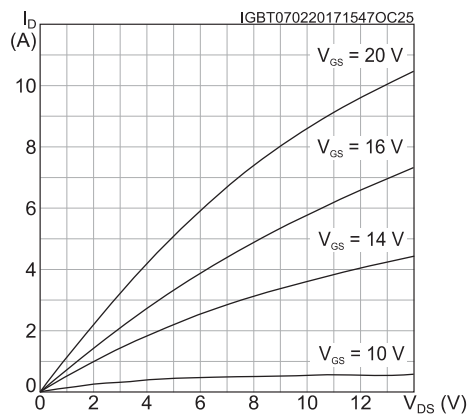


Figure 5: Output characteristics (TJ= 200 °C)

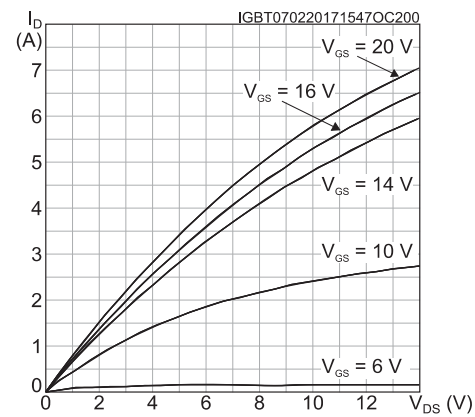


Figure 6: Transfer characteristics

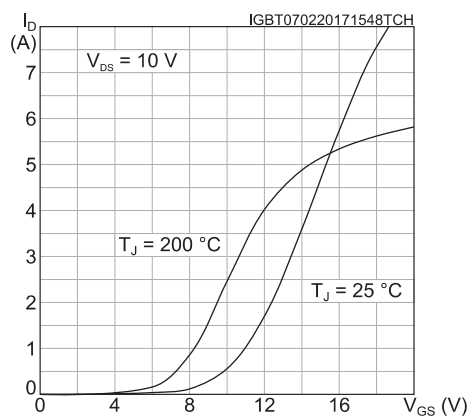


Figure 7: Power dissipation

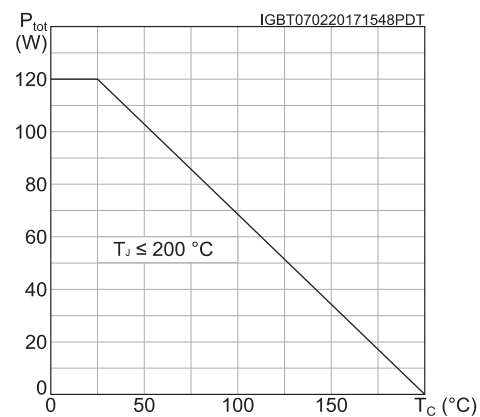


Figure 8: Gate charge vs gate-source voltage

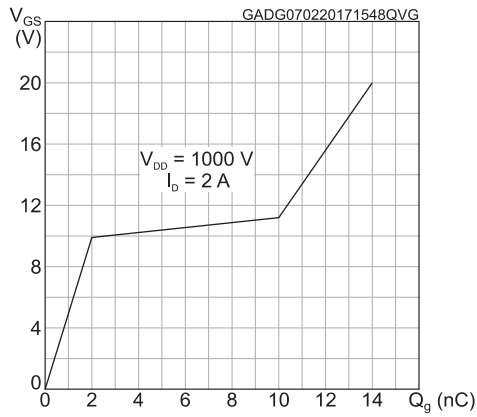


Figure 9: Capacitance variations

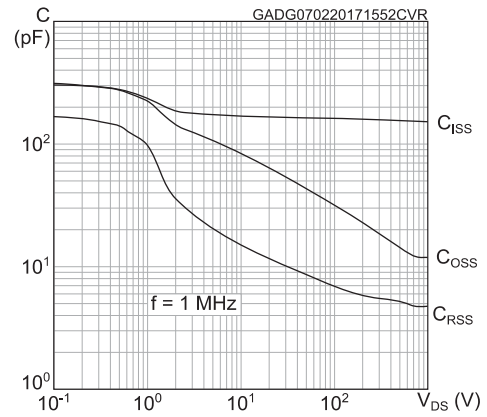


Figure 10: Switching energy vs. drain current

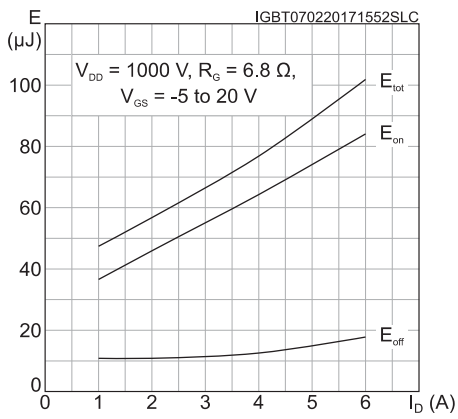


Figure 11: Switching energy vs. junction temperature

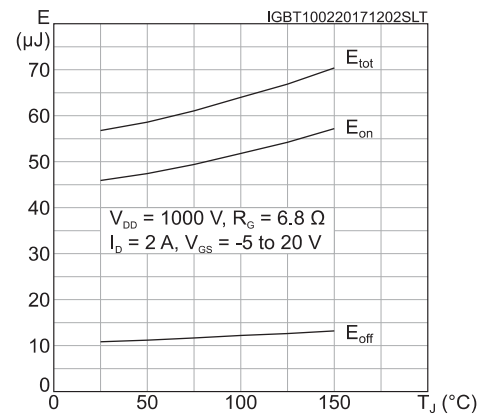
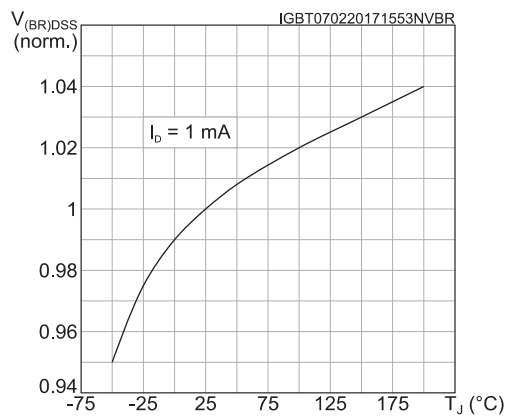
Figure 12: Normalized $V_{(BR)DSS}$ vs. temperature

Figure 13: Normalized gate threshold voltage vs. temperature

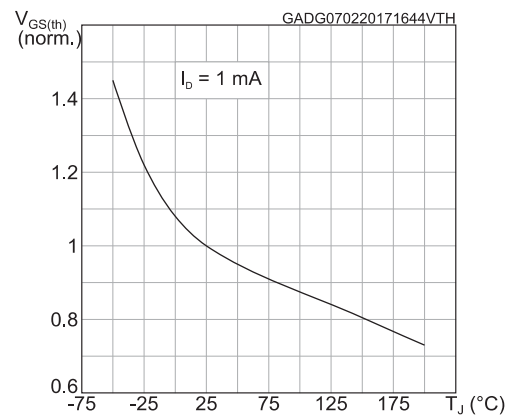
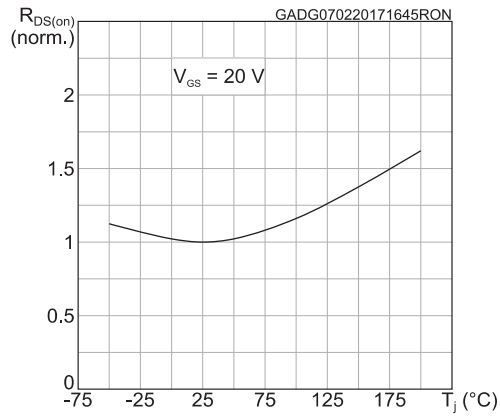
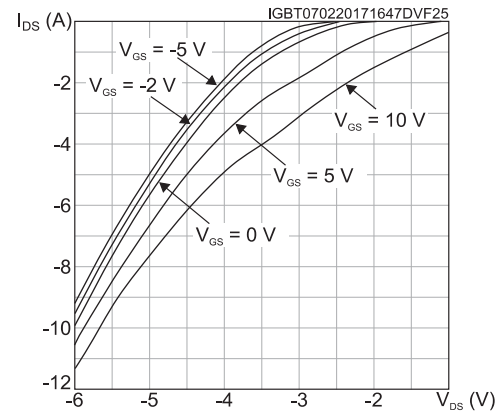
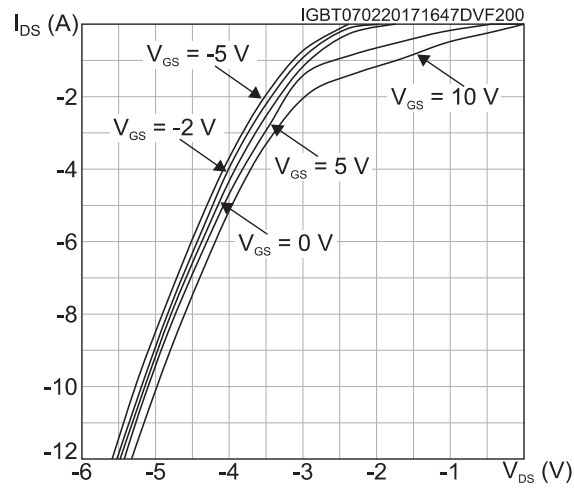


Figure 14: Normalized on-resistance vs. temperature

Figure 15: Reverse conduction characteristics ($T_J = 25$ °C)Figure 16: Reverse conduction characteristics ($T_J = 200$ °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 mechanical data

Figure 17: HiP247™ package outline

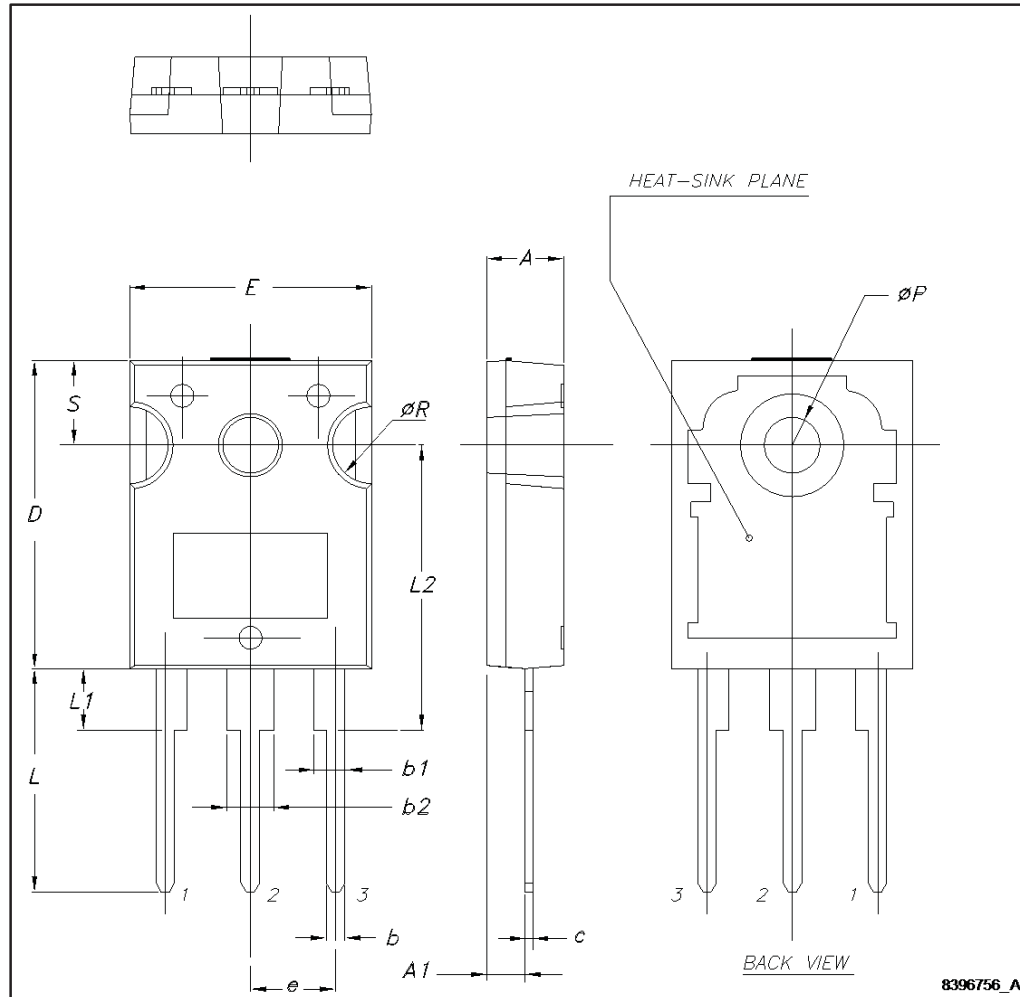


Table 8: HiP247™ package mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S	5.30	5.50	5.70

4 Revision history

Table 9: Document revision history

Date	Revision	Changes
29-Jul-2015	1	First release
10-Feb-2017	2	Updated title and features on cover page. Updated <i>Section 1: "Electrical ratings"</i> and <i>Section 2: "Electrical characteristics"</i> . Minor text changes

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