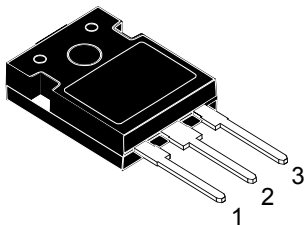
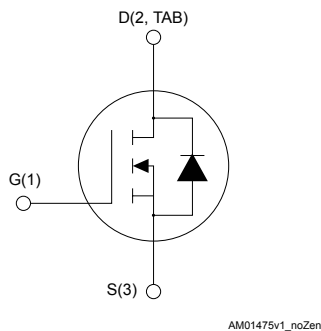


Silicon carbide Power MOSFET 1200 V, 52 mΩ typ., 65 A in an HiP247 package



HiP247



Features

- Very low $R_{DS(on)}$ over the entire temperature range
- Very high operating junction temperature capability ($T_J = 200\text{ °C}$)
- Very fast and robust intrinsic body diode
- Low capacitance

Applications

- AC-DC converters
- DC-DC converters
- Motor drives
- Solar inverters (string and central)
- Uninterruptable power supplies (UPS)

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 allow 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.



Product status link

[SCT50N120](#)

Product summary

Order code	SCT50N120
Marking	SCT50N120
Package	HiP247
Packing	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	1200	V
V_{GS}	Gate-source voltage	-10 to 25	V
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	65	A
I_D	Drain current (continuous) at $T_C = 100\text{ °C}$	50	A
$I_{DM}^{(1)}$	Drain current (pulsed)	130	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	318	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	0.55	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	40	°C/W

2 Electrical characteristics

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

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$		1	100	μA
		$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 200\text{ }^{\circ}\text{C}$		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	$V_{DS} = V_{GS}$, $I_D = 1\text{ mA}$	1.8	3.0		V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 20\text{ V}$, $I_D = 40\text{ A}$		52	69	m Ω
		$V_{GS} = 20\text{ V}$, $I_D = 40\text{ A}$, $T_J = 150\text{ }^{\circ}\text{C}$		59		m Ω
		$V_{GS} = 20\text{ V}$, $I_D = 40\text{ A}$, $T_J = 200\text{ }^{\circ}\text{C}$		70		m Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 400\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1900	-	pF
C_{oss}	Output capacitance		-	170	-	pF
C_{rss}	Reverse transfer capacitance		-	30	-	pF
Q_g	Total gate charge	$V_{DD} = 800\text{ V}$, $I_D = 40\text{ A}$, $V_{GS} = 0\text{ to }20\text{ V}$	-	122	-	nC
Q_{gs}	Gate-source charge		-	19	-	nC
Q_{gd}	Gate-drain charge		-	35	-	nC
R_g	Gate input resistance	$f = 1\text{ MHz}$ open drain	-	1.9	-	Ω

Table 5. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	$V_{DD} = 800\text{ V}$, $I_D = 40\text{ A}$	-	530	-	μJ
E_{off}	Turn-off switching energy	$R_G = 2.2\text{ }\Omega$, $V_{GS} = -5\text{ to }20\text{ V}$	-	310	-	μJ
E_{on}	Turn-on switching energy	$V_{DD} = 800\text{ V}$, $I_D = 40\text{ A}$	-	670	-	μJ
E_{off}	Turn-off switching energy	$R_G = 2.2\text{ }\Omega$, $V_{GS} = -5\text{ to }20\text{ V}$ $T_J = 150\text{ }^{\circ}\text{C}$	-	334	-	μJ

Table 6. Reverse SiC diode characteristics

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
V_{SD}	Diode forward voltage	$I_F = 20\text{ A}$, $V_{GS} = 0\text{ V}$	-	3.5	-	V
t_{rr}	Reverse recovery time	$I_F = 40\text{ A}$, $di/dt = 2000/\text{ns}$ $V_{DD} = 800\text{ V}$	-	55	-	ns
Q_{rr}	Reverse recovery charge		-	230	-	nC
I_{RRM}	Reverse recovery current		-	14	-	A

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

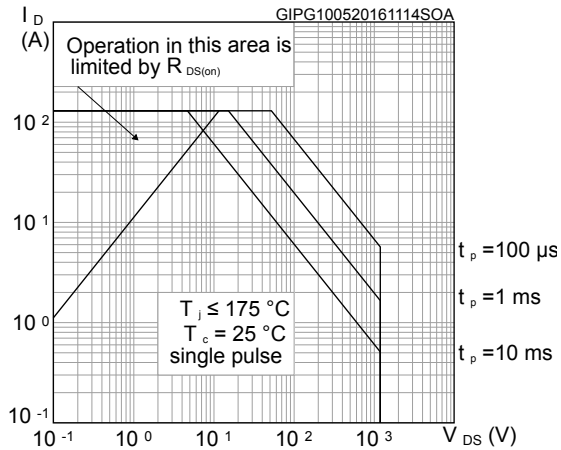


Figure 2. Normalized transient thermal impedance

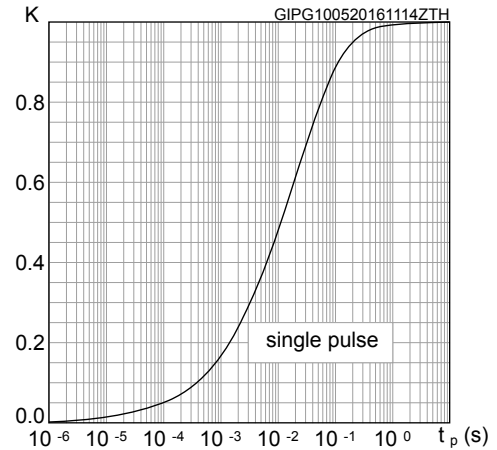


Figure 3. Output characteristics ($T_J = 25\text{ °C}$)

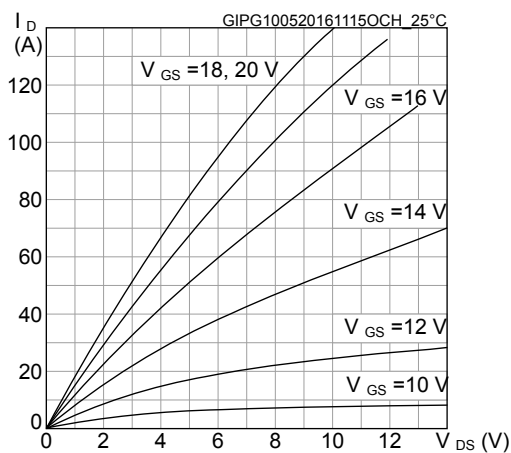


Figure 4. Output characteristics ($T_J = 150\text{ °C}$)

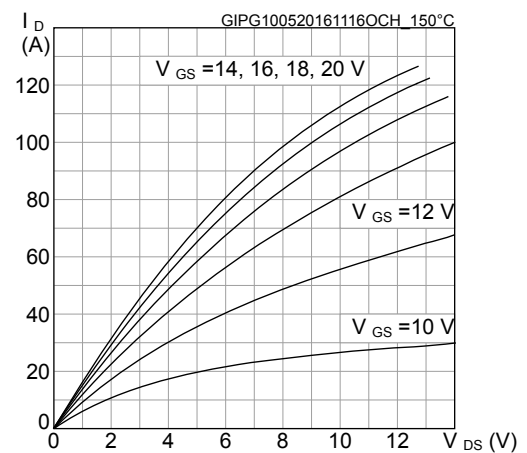


Figure 5. Output characteristics ($T_J = 200\text{ °C}$)

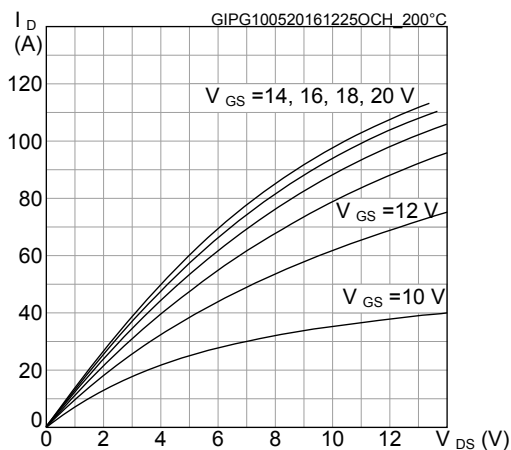


Figure 6. Transfer characteristics

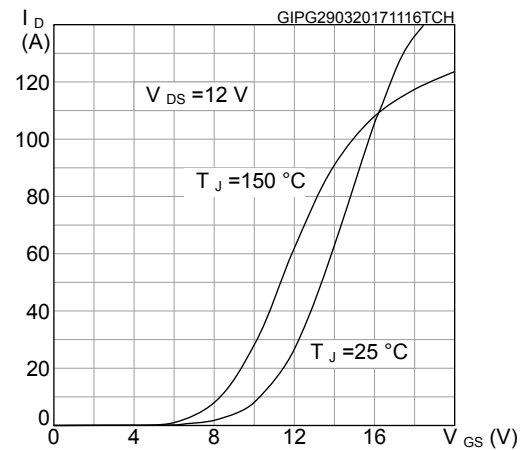


Figure 7. Power dissipation

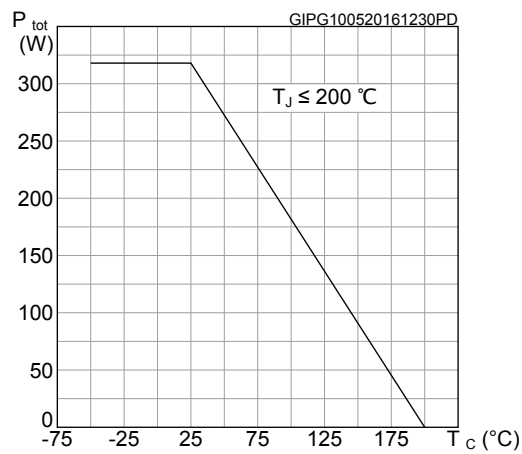


Figure 8. Gate charge vs gate-source voltage

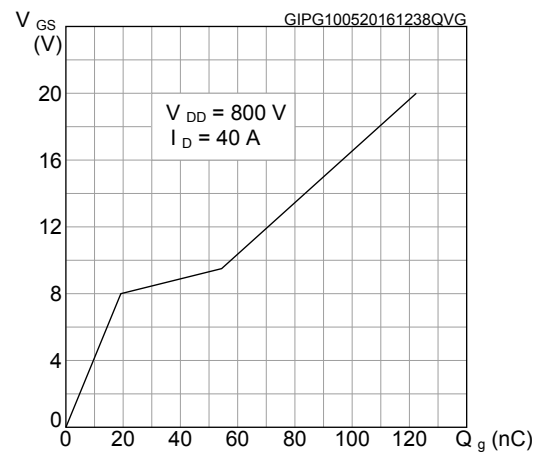


Figure 9. Capacitance variations

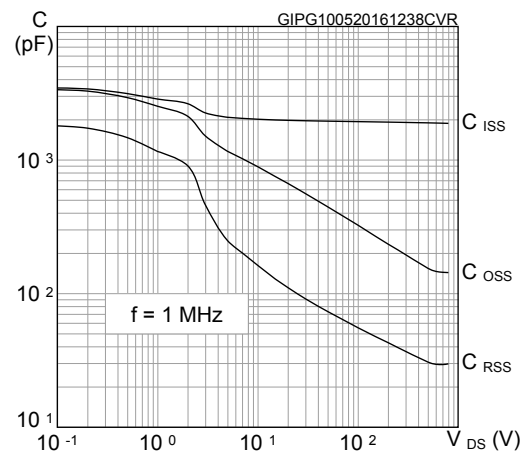


Figure 10. Switching energy vs. drain current

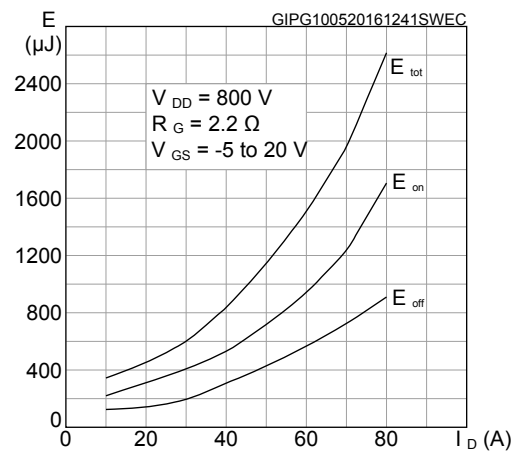


Figure 11. Switching energy vs. junction temperature

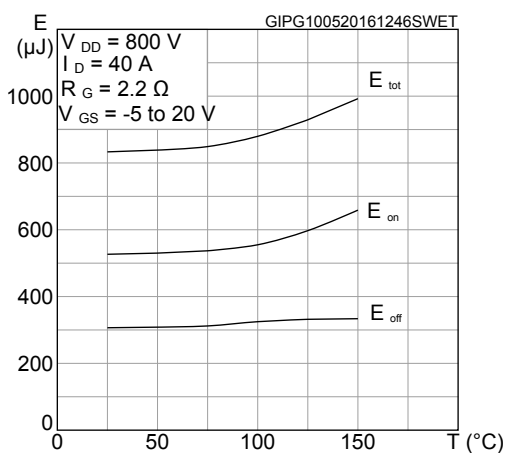


Figure 12. Normalized $V_{(BR)DSS}$ vs. temperature

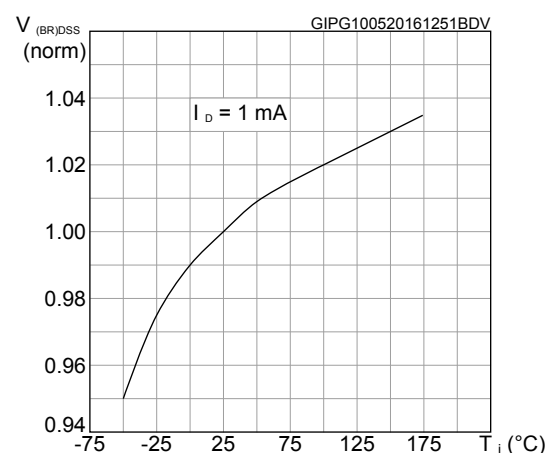


Figure 13. Normalized gate threshold voltage vs. temperature

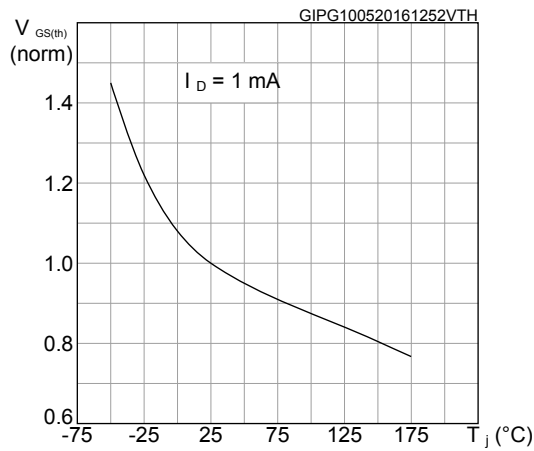


Figure 14. Normalized on-resistance vs. temperature

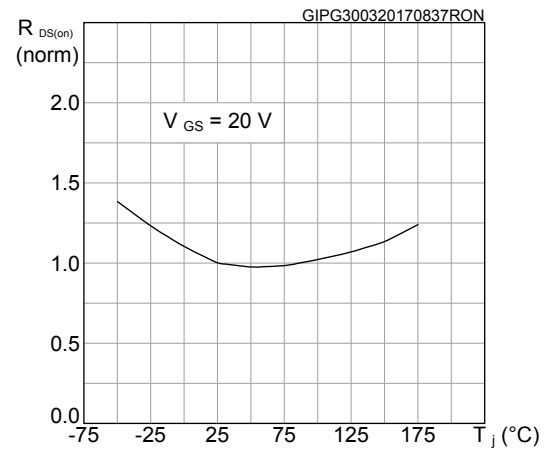


Figure 15. Reverse conduction characteristics ($T_J = -50^\circ\text{C}$)

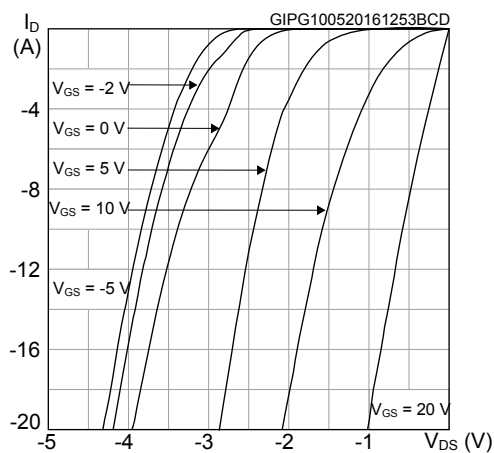


Figure 16. Reverse conduction characteristics ($T_J = +25^\circ\text{C}$)

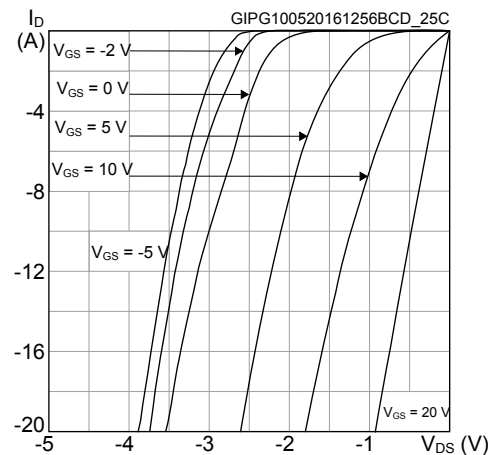
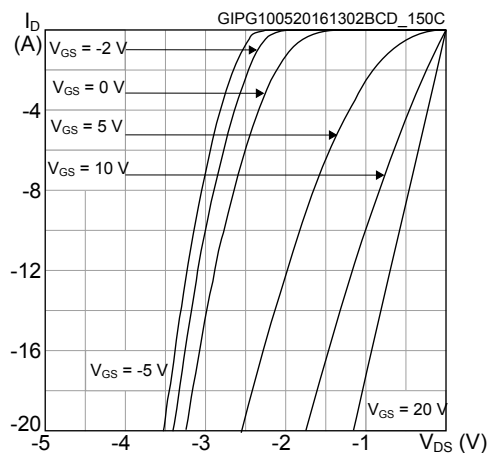


Figure 17. Reverse conduction characteristics ($T_J = 150^\circ\text{C}$)

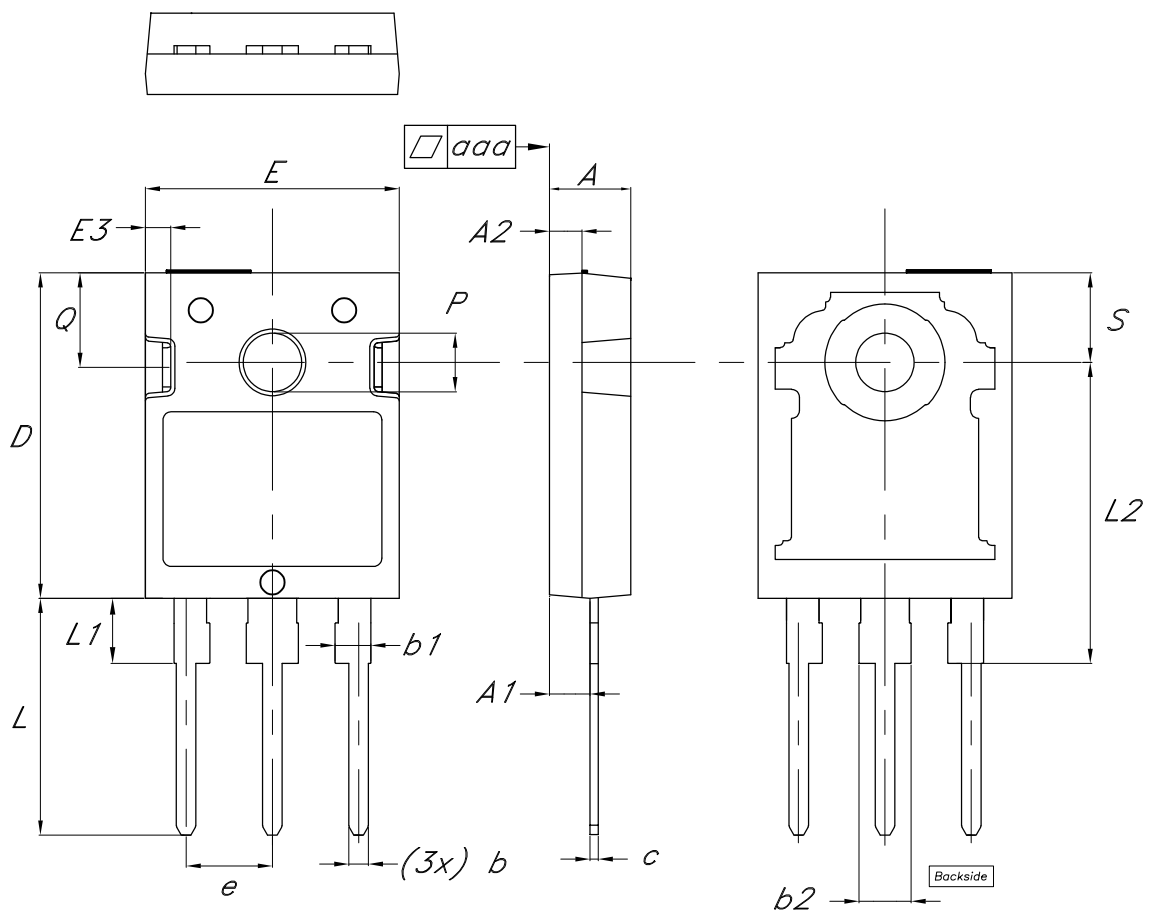


3 Package information

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 18. 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
17-Jun-2015	1	First release
12-May-2016	2	Modified title. Modified: Table 2: "Absolute maximum ratings", Table 4: "On/off states", Table 5: "Dynamic", Table 6: "Switching energy (inductive load)", and Table 7: "Reverse SiC diode characteristics". Added: Section 4.1: "Electrical characteristics (curves)". Minor text changes.
23-Jun-2016	3	Document status promoted from preliminary to production data.
29-Mar-2017	4	Modified Table 7: "Reverse SiC diode characteristics" Modified Figure 7: "Transfer characteristics", Figure 15: "Normalized on-resistance vs. temperature", Figure 16: "Reverse conduction characteristics ($T_J = -50\text{ }^{\circ}\text{C}$)", Figure 17: "Reverse conduction characteristics ($T_J = 25\text{ }^{\circ}\text{C}$)" and Figure 18: "Reverse conduction characteristics ($T_J = 150\text{ }^{\circ}\text{C}$)." Minor text changes.
12-Mar-2025	5	Updated Section 3.1: HiP247 package information. Minor text changes.

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