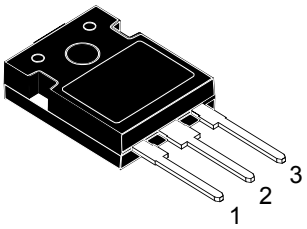
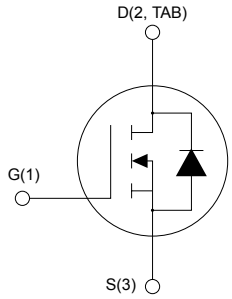
SCT10N120

Datasheet

Silicon carbide Power MOSFET 1200 V, 500 mΩ typ., 12 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 °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, 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.

Product status link
SCT10N120

Product summary	
Order code	SCT10N120
Marking	SCT10N120
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 °C	12	A
I_D	Drain current (continuous) at T_C = 100 °C	10	A
I_{DM} (1)	Drain current (pulsed)	24	A
P_{TOT}	Total power dissipation at TC = 25 °C	150	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	1.17	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	40	°C/W

2 Electrical characteristics

(T_{CASE} = 25 °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 V, I_D = 1 mA	1200			V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1200 V, V_{GS} = 0 V			10	µA
		V_{DS} = 1200 V, V_{GS} = 0 V, T_J = 200 °C (1)			100	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V, V_{GS} = -10 to 22 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	1.8	3.5		V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 20 V, I_D = 6 A		500	690	mΩ
		V_{GS} = 20 V, I_D = 6 A, T_J = 150 °C		520		mΩ
		V_{GS} = 20 V, I_D = 6 A, T_J = 200 °C		580		mΩ

1. *Specified by design, not tested in production.*

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 400 V, f = 1 MHz, V_{GS} = 0 V	-	290	-	pF
C_{oss}	Output capacitance		-	30	-	pF
C_{rss}	Reverse transfer capacitance		-	9	-	pF
Q_g	Total gate charge	V_{DD} = 800 V, I_D = 6 A, V_{GS} = 0 to 20 V	-	22	-	nC
Q_{gs}	Gate-source charge		-	3	-	nC
Q_{gd}	Gate-drain charge		-	10	-	nC
R_g	Gate input resistance	f = 1 MHz, I_D = 0 A	-	8	-	Ω

Table 5. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	V_{DD} = 800 V, I_D = 6 A, R_G = 10 Ω, V_{GS} = -5 to 20 V	-	90	-	µJ
E_{off}	Turn-off switching energy		-	30	-	µJ
E_{on}	Turn-on switching energy	V_{DD} = 800 V, I_D = 6 A, R_G = 10 Ω, V_{GS} = -5 to 20 V, T_J = 150 °C	-	104	-	µJ
E_{off}	Turn-off switching energy		-	33	-	µJ

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 800 V, I_D = 6 A, R_G = 10 Ω, V_{GS} = -5 to 20 V	-	7	-	ns
t_f	Fall time		-	17	-	ns
$t_{d(off)}$	Turn-off delay time		-	14	-	ns
t_r	Rise time		-	12	-	ns

Table 7. Reverse SiC diode characteristics

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
V_{SD}	Diode forward voltage	I_F = 6 A, V_{GS} = 0 V	-	4.3	-	V
t_{rr}	Reverse recovery time	I_{SD} = 6 A, di/dt = 2000 A/µs V_{DD} = 800 V, T_J= 150 °C	-	16	-	ns
Q_{rr}	Reverse recovery charge		-	107	-	nC
I_{RRM}	Reverse recovery current		-	12	-	A

2.1 Electrical characteristics curves

Figure 1. Safe operating area

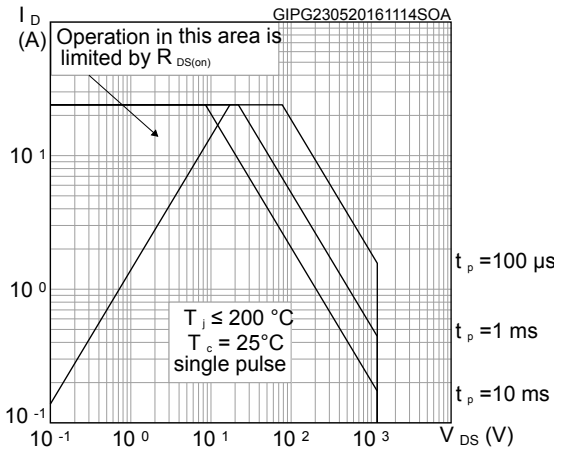


Figure 2. Normalized transient thermal impedance

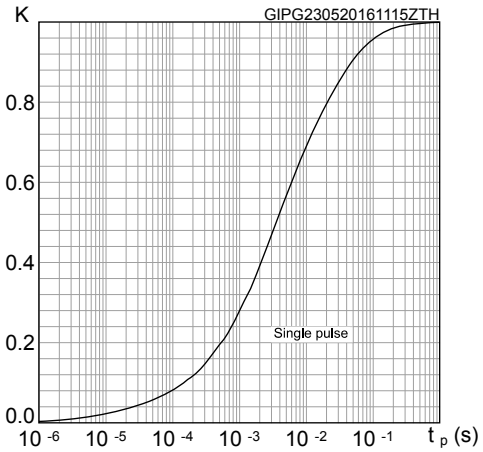


Figure 3. Output characteristics (T_J= 25 °C)

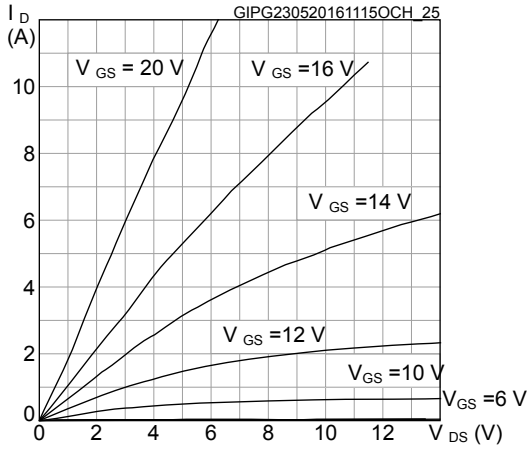


Figure 4. Output characteristics (T_J= 150 °C)

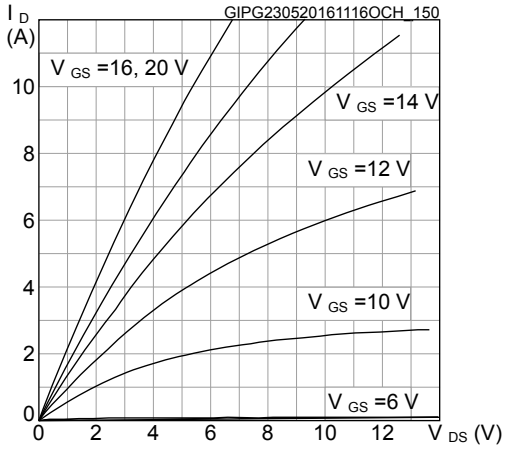


Figure 5. Output characteristics (T_J= 200 °C)

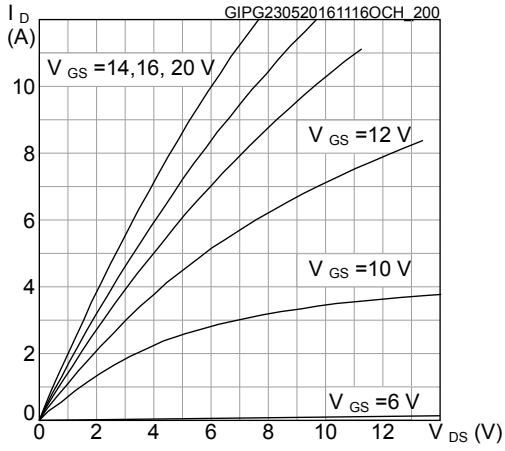


Figure 6. Transfer characteristics

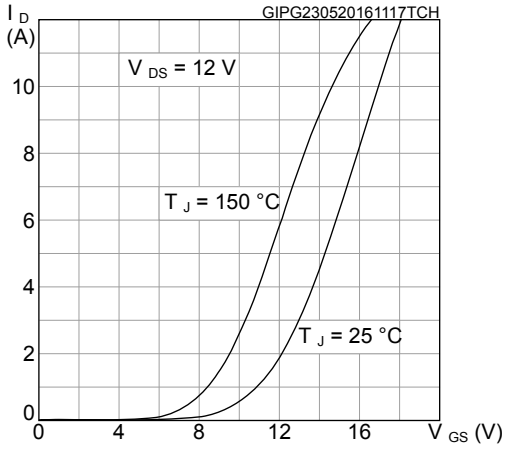


Figure 7. Power dissipation

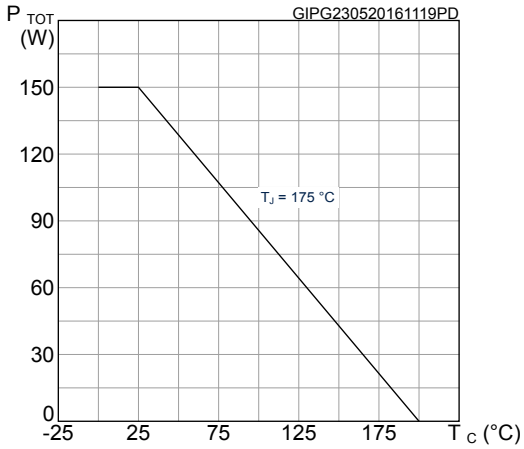


Figure 8. Gate charge vs gate-source voltage

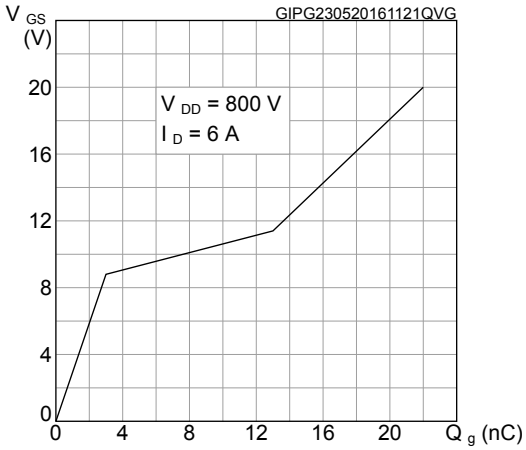


Figure 9. Capacitance variations

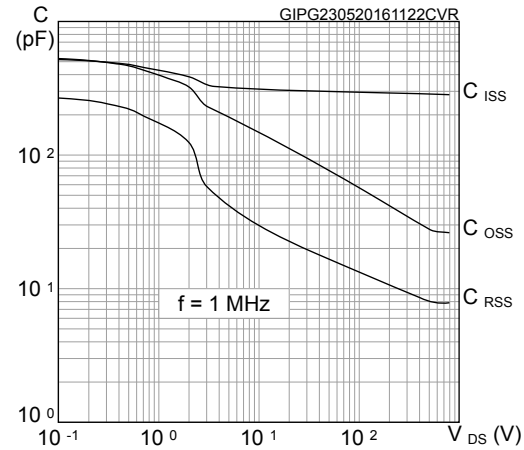


Figure 10. Switching energy vs. drain current

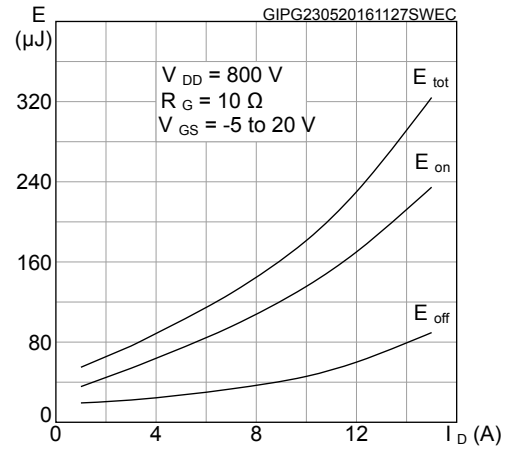


Figure 11. Switching energy vs. junction temperature

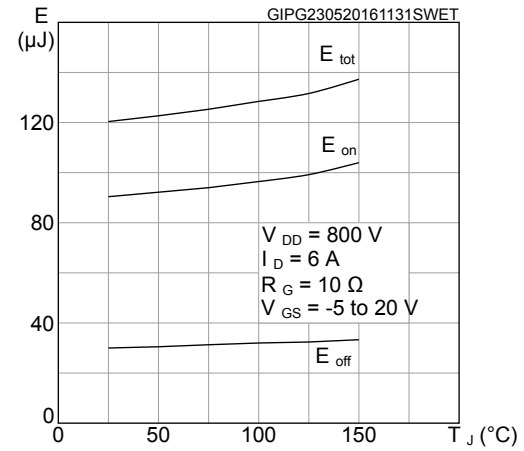


Figure 12. Normalized $V_{(BR)DSS}$ vs. temperature

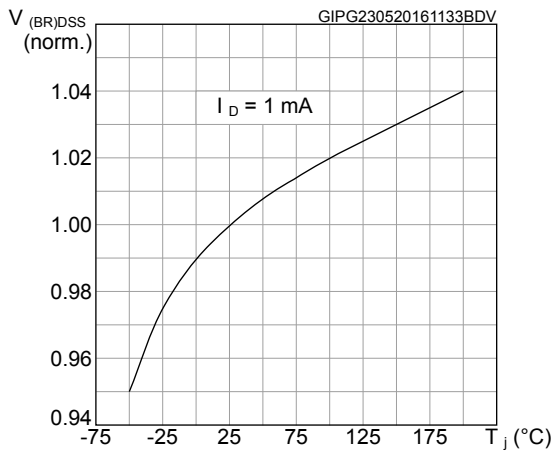


Figure 13. Normalized gate threshold voltage vs. temperature

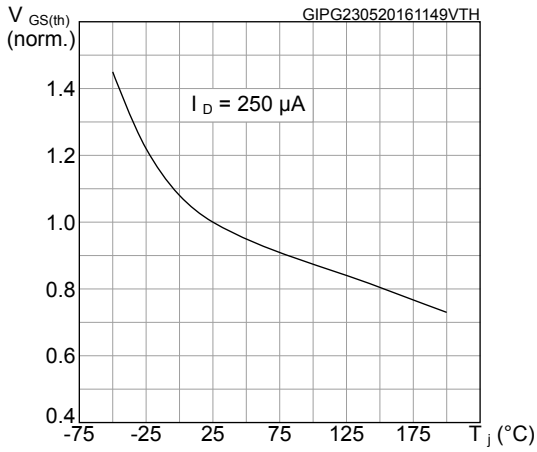


Figure 14. Normalized on-resistance vs. temperature

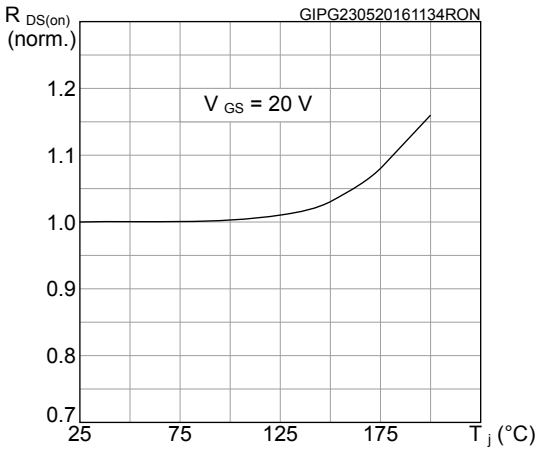


Figure 15. Body diode characteristics (T_J= -50 °C)

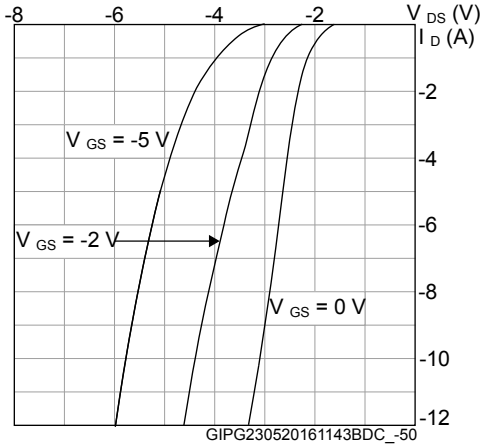


Figure 16. Body diode characteristics (T_J= 25 °C)

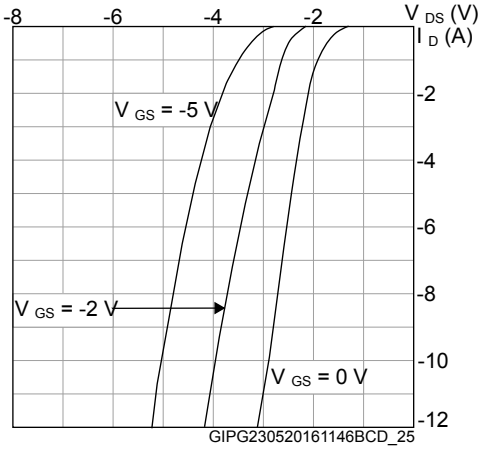


Figure 17. Body diode characteristics (T_J= 150 °C)

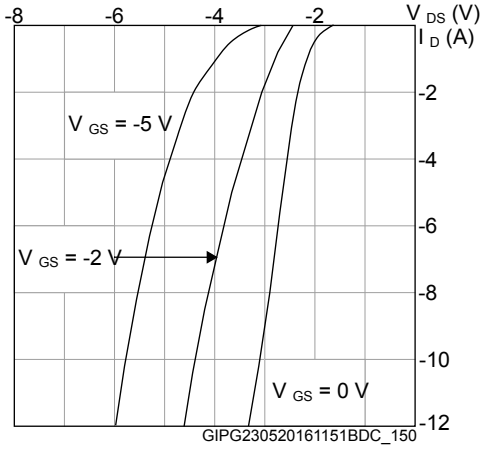


Figure 18. 3rd quadrant characteristics (T_J= -50 °C)

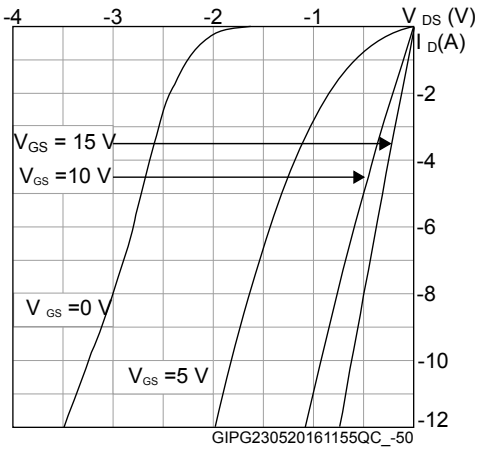


Figure 19. 3rd quadrant characteristics (T_J= 25 °C)

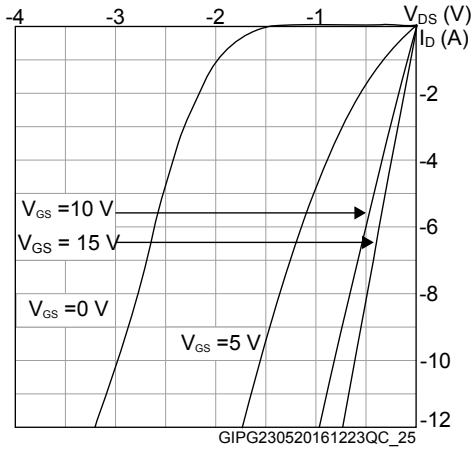
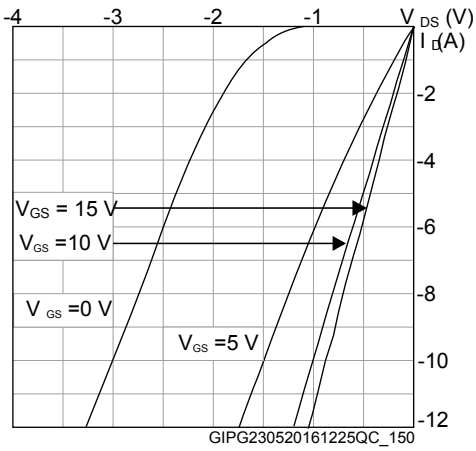


Figure 20. 3rd quadrant characteristics (T_J= 150 °C)



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 21. HiP247 package outline

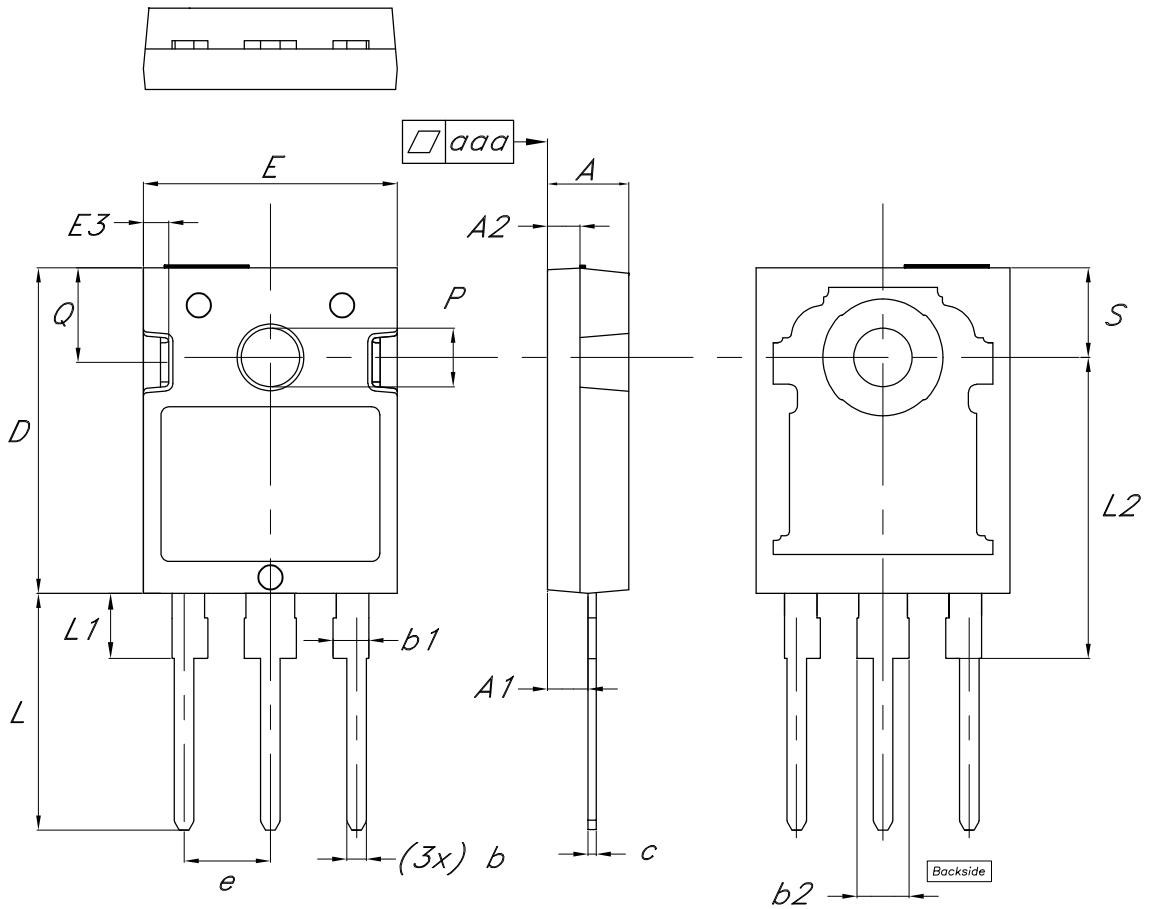


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Table 8. **HiP247 package mechanical data**

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 9. **Document revision history**

Date	Revision	Changes
23-Feb-2016	1	First release
23-May-2016	2	Modified: title, features and *Figure 1: "Internal schematic diagram"* in cover page Modified: *Table 2: "Absolute maximum ratings"* and *Table 3: "Thermal data"* Modified: *Table 4: "On/off states"*, *Table 5: "Dynamic"*, *Table 6: "Switching energy (inductive load)"*, *Table 7: "Switching times"* and *Table 8: "Reverse SiC diode characteristics"* Added: *Section 4.1: "Electrical characteristics (curves)"* Minor text changes
21-Mar-2018	3	Removed maturity status indication from cover page. The document status is production data. Updated *Section 2.1 Electrical characteristics curves*. Minor text changes.
24-Mar-2025	4	Updated Section 3.1: HiP247 package information. Minor text changes.