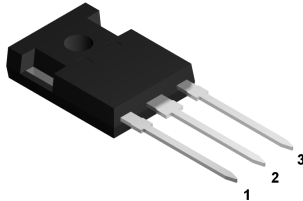
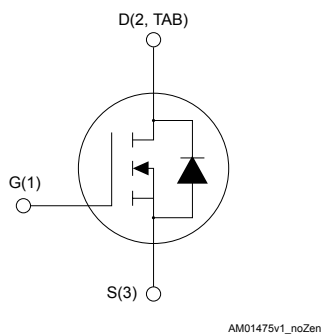


Silicon carbide Power MOSFET 1200 V, 52 mΩ typ., 65 A in an HiP247 long leads package



HiP247 long leads



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

[SCTWA50N120](#)

Product summary

Order code	SCTWA50N120
Marking	SCT50N120
Package	HiP247 long leads
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

($T_C = 25\text{ °C}$ 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
		$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 200\text{ °C}$		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
		$V_{GS} = 20\text{ V}$, $I_D = 40\text{ A}$, $T_J = 150\text{ °C}$		59		m Ω
		$V_{GS} = 20\text{ V}$, $I_D = 40\text{ A}$, $T_J = 200\text{ °C}$		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	$R_G = 2.2\text{ }\Omega$, $V_{GS} = -5\text{ to }20\text{ V}$ $T_J = 150\text{ °C}$	-	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)

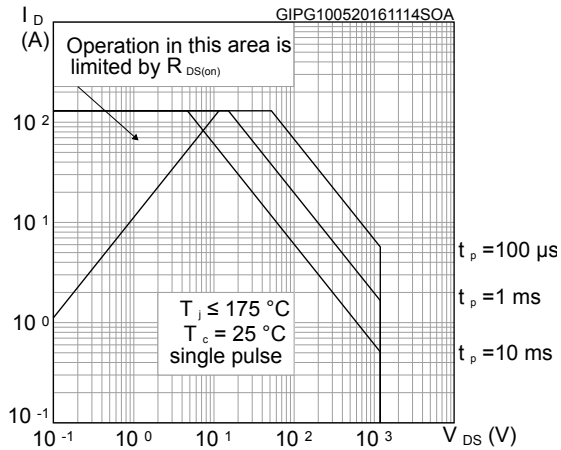
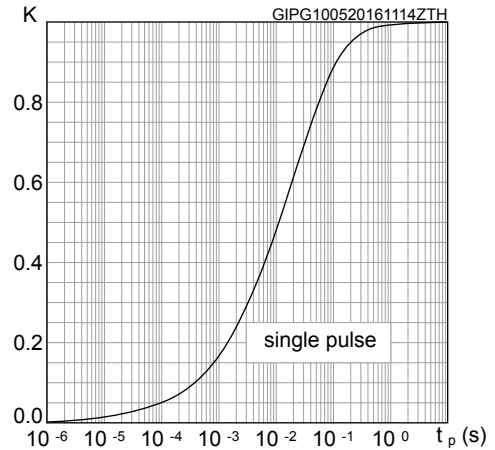
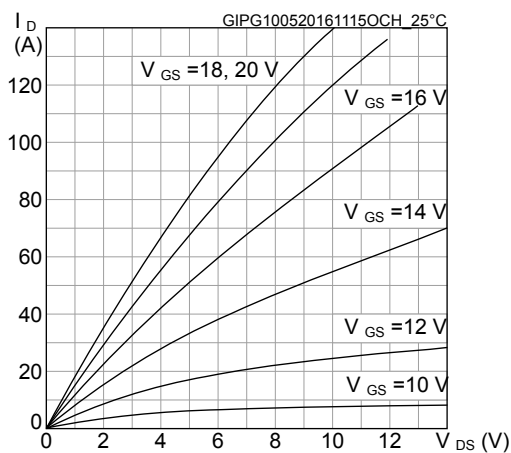
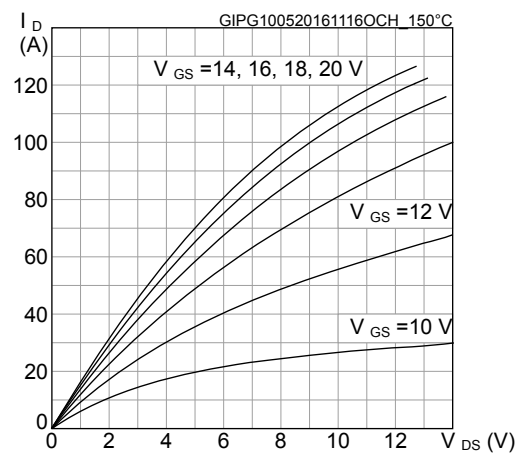
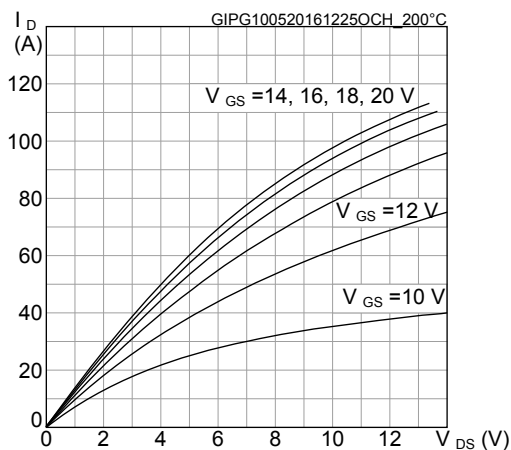
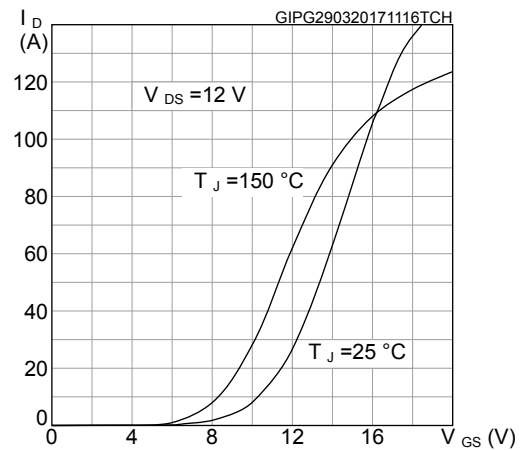
Figure 1. Safe operating area

Figure 2. Normalized transient thermal impedance

Figure 3. Output characteristics (T_J = 25 °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

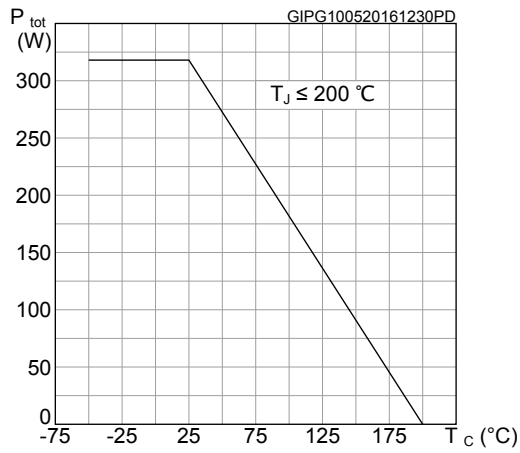


Figure 8. Gate charge vs gate-source voltage

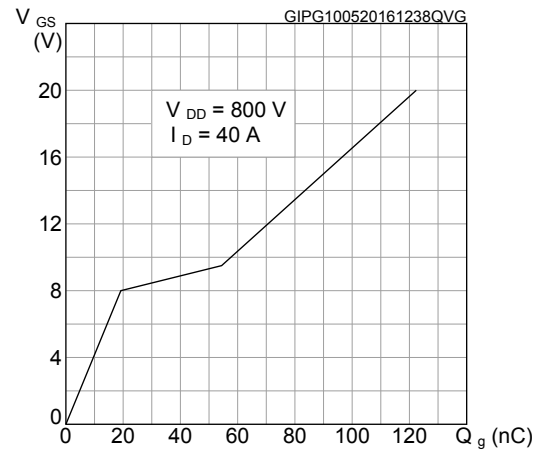


Figure 9. Capacitance variations

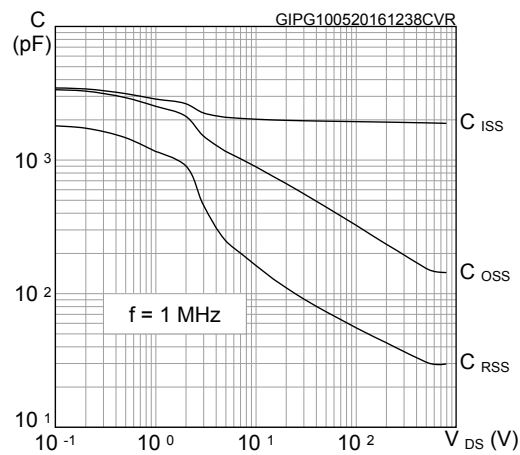


Figure 10. Switching energy vs. drain current

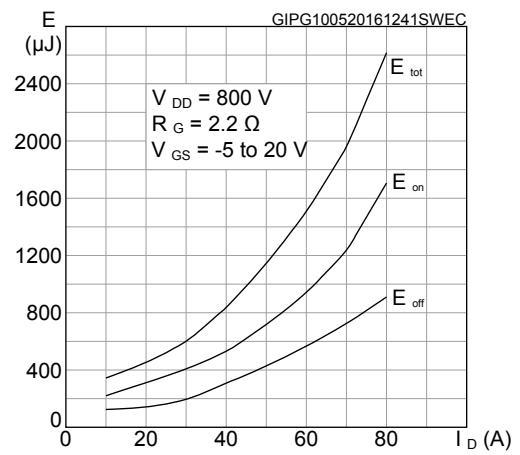


Figure 11. Switching energy vs. junction temperature

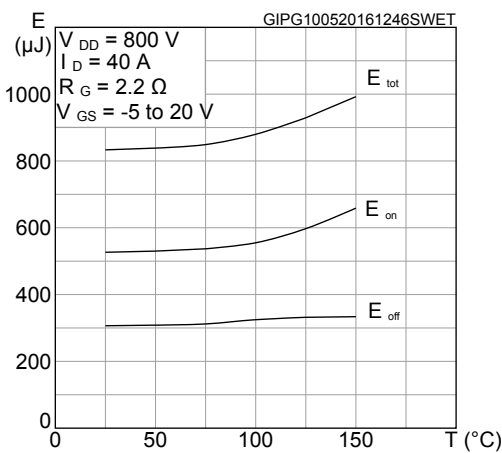


Figure 12. Normalized $V_{(BR)DSS}$ vs. temperature

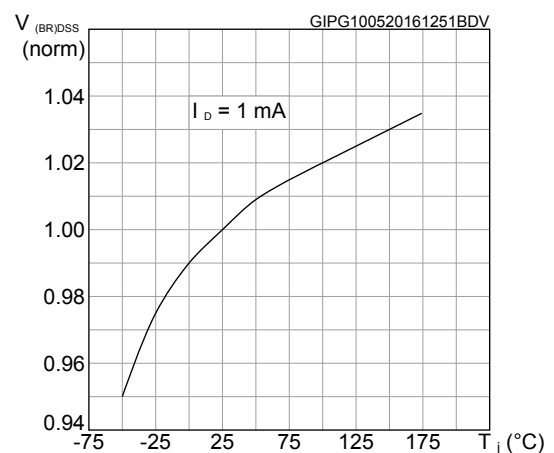


Figure 13. Normalized gate threshold voltage vs. temperature

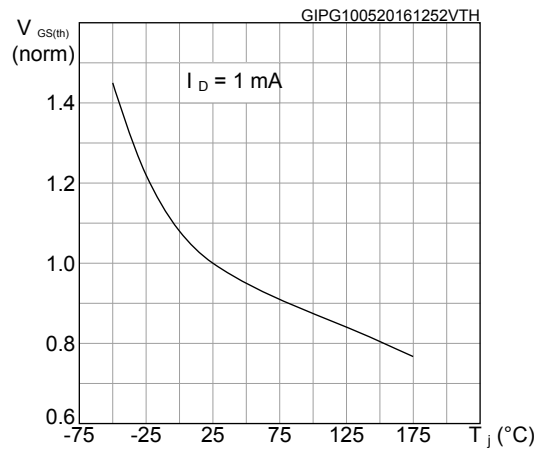


Figure 14. Normalized on-resistance vs. temperature

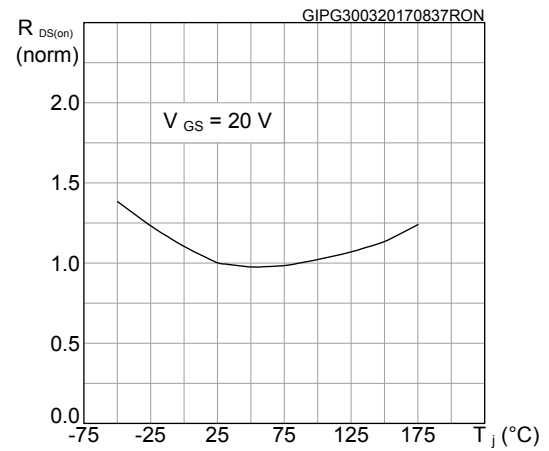


Figure 15. Reverse conduction characteristics (T_J = -50 °C)

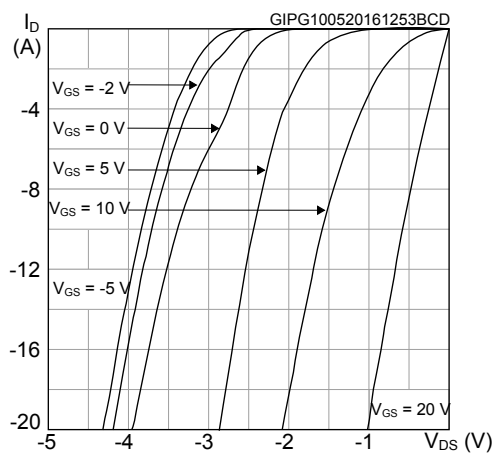


Figure 16. Reverse conduction characteristics (T_J = +25 °C)

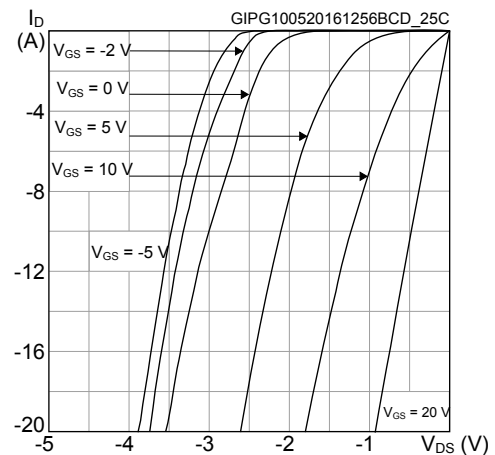
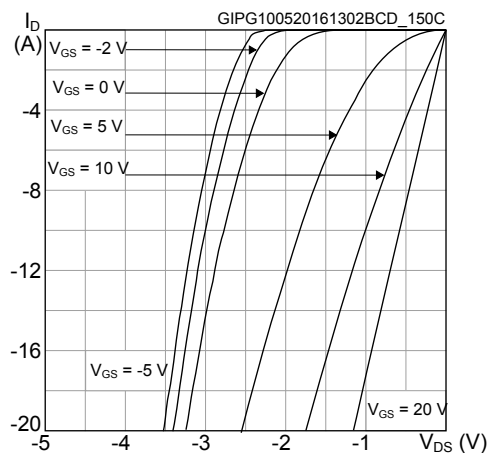


Figure 17. Reverse conduction characteristics (T_J = 150 °C)

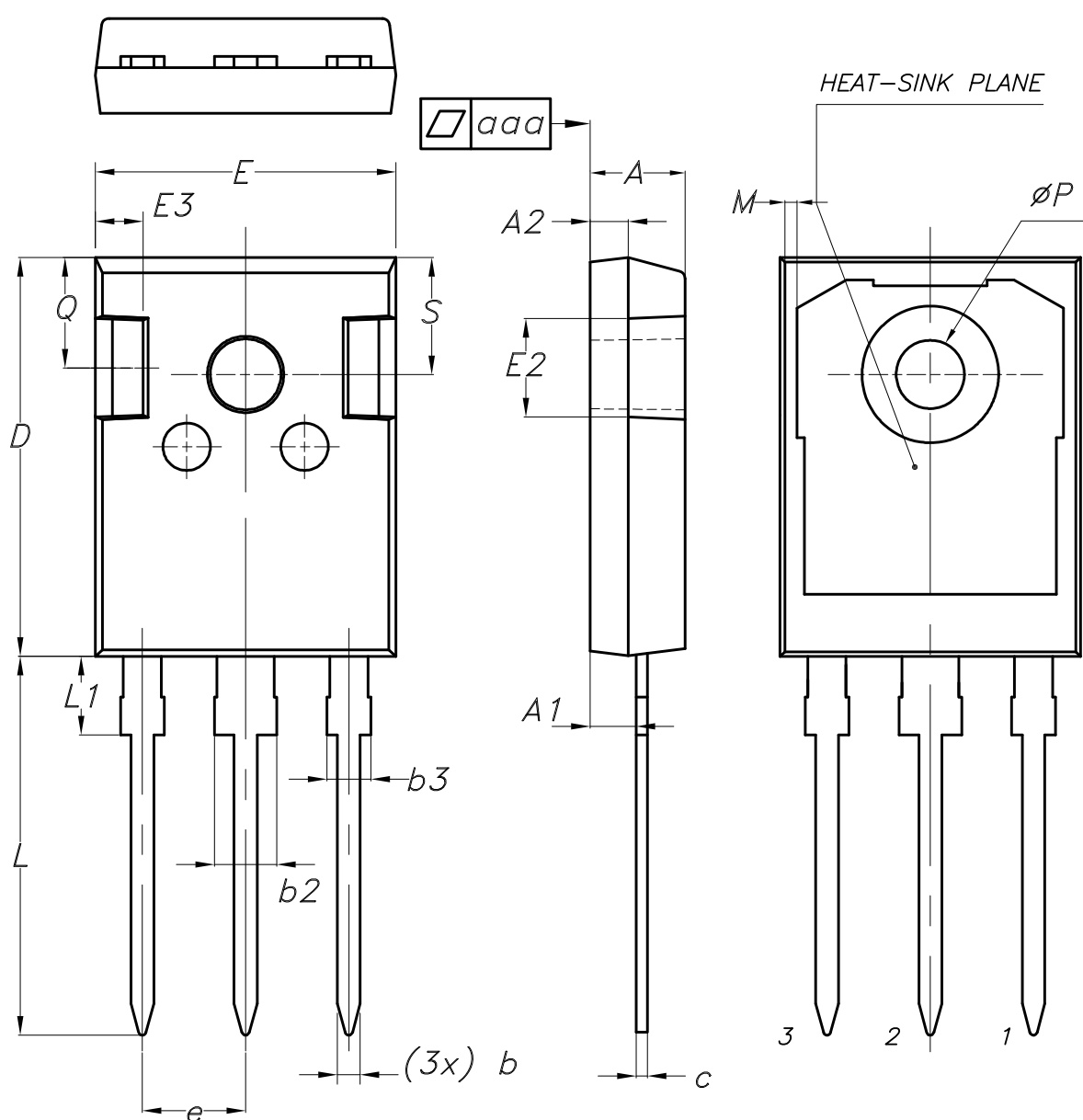


3 Package information

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 long leads package information

Figure 18. HiP247 long leads package outline



BACK VIEW

8463846_5

Table 7. HiP247 long leads package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16		1.26
b2			3.25
b3			2.25
c	0.59		0.66
D	20.90	21.00	21.10
E	15.70	15.80	15.90
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1			4.30
P	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25
aaa		0.04	0.10

Revision history

Table 8. Document revision history

Date	Revision	Changes
07-Jun-2016	1	First release
14-Sep-2016	2	Document status changed from preliminary to production data.
30-Mar-2017	3	Modified <i>Table 7: "Reverse SiC diode characteristics"</i> Modified <i>Figure 7: "Transfer characteristics"</i> , <i>Figure 15: "Normalized on-resistance vs. temperature"</i> , <i>Figure 16: "Reverse conduction characteristics (TJ = -50 °C)"</i> , <i>Figure 17: "Reverse conduction characteristics (TJ = 25 °C)"</i> and <i>Figure 18: "Reverse conduction characteristics (TJ = 150 °C)"</i> Minor text changes.
18-Feb-2025	4	Updated title on cover page. Updated Section 3.1: HiP247 long leads package information . Minor text changes.

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