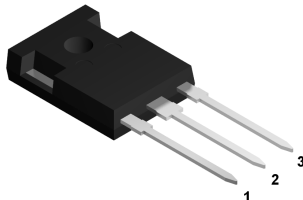
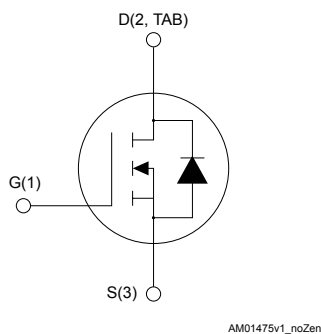


Silicon carbide Power MOSFET 1200 V, 80 mΩ typ., 45 A in an HiP247 long leads package



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

[SCTWA30N120](#)

Product summary

Order code	SCTWA30N120
Marking	SCT30N120
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, limited by silicon) at $T_C = 25\text{ °C}$	45	A
I_D	Drain current (continuous, limited by bonding wires) at $T_C = 25\text{ °C}$	40	A
I_D	Drain current (continuous) at $T_C = 100\text{ °C}$	34	A
$I_{DM}^{(1)}$	Drain current (pulsed)	90	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	270	W
T_{stg}	Storage temperature range	-55 to 200	°C
T_j	Operating junction temperature range		

1. Pulse width limited by safe operating area.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.65	°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	$V_{GS} = 0\text{ V}$, $V_{DS} = 1200\text{ V}$		1	25	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 1200\text{ V}$, $T_J = 200\text{ }^{\circ}\text{C}$		50		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	3.5		V
$R_{DS(on)}$	Static drain-source on- resistance	$V_{GS} = 20\text{ V}$, $I_D = 20\text{ A}$		80	100	m Ω
		$V_{GS} = 20\text{ V}$, $I_D = 20\text{ A}$, $T_J = 150\text{ }^{\circ}\text{C}$		90		m Ω
		$V_{GS} = 20\text{ V}$, $I_D = 20\text{ A}$, $T_J = 200\text{ }^{\circ}\text{C}$		100		m Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{GS} = 0\text{ V}$, $V_{DS} = 400\text{ V}$, $f = 1\text{ MHz}$	-	1700	-	pF
C_{oss}	Output capacitance		-	130	-	pF
C_{rss}	Reverse transfer capacitance		-	25	-	pF
R_G	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	5	-	Ω
Q_g	Total gate charge	$V_{DD} = 800\text{ V}$, $I_D = 20\text{ A}$ $V_{GS} = 0\text{ to }20\text{ V}$	-	105	-	nC
Q_{gs}	Gate-source charge		-	16	-	nC
Q_{gd}	Gate-drain charge		-	40	-	nC

Table 5. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
E_{on}	Turn-on switching energy	$V_{DD} = 800\text{ V}$, $I_D = 20\text{ A}$, $R_G = 6.8\text{ }\Omega$, $V_{GS} = -2\text{ to }20\text{ V}$	-	500	-	μJ
E_{off}	Turn-off switching energy		-	350	-	μJ
E_{on}	Turn-on switching energy	$V_{DD} = 800\text{ V}$, $I_D = 20\text{ A}$, $R_G = 6.8\text{ }\Omega$, $V_{GS} = -2\text{ to }20\text{ V}$ $T_J = 150\text{ }^{\circ}\text{C}$	-	500	-	μJ
E_{off}	Turn-off switching energy		-	400	-	μJ

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$t_{d(on)V}$	Turn-on delay time	$V_{DD} = 800\text{ V}$, $I_D = 20\text{ A}$, $V_{GS} = 0\text{ to }20\text{ V}$	-	19	-	ns
$t_f(V)$	Fall time		-	28	-	ns
$t_{d(off)V}$	Turn-off delay time		-	45	-	ns
$t_r(V)$	Rise time		-	20	-	ns

Table 7. Reverse SiC diode characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
V_{SD}	Diode forward voltage	$I_F = 10\text{ A}$, $V_{GS} = 0\text{ V}$	-	3.5	-	V
t_{rr}	Reverse recovery time	$I_{SD} = 20\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 800\text{ V}$	-	140	-	ns
Q_{rr}	Reverse recovery charge		-	140		nC
I_{RRM}	Reverse recovery current		-	2		A

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

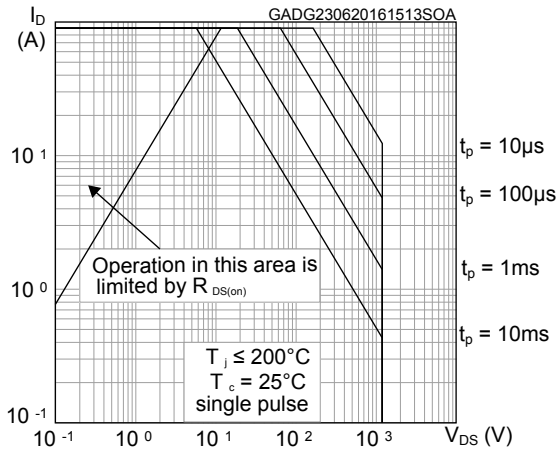


Figure 2. Normalized transient thermal impedance

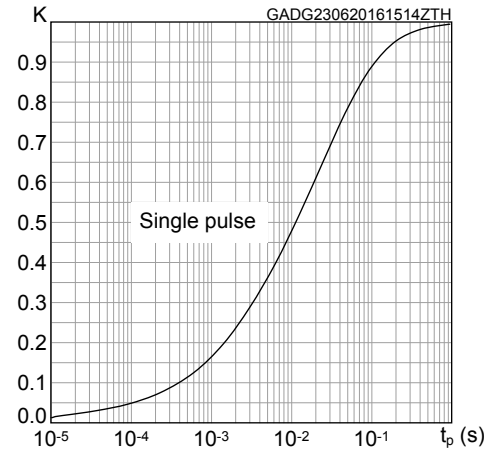


Figure 3. Output characteristics ($T_J = 25^\circ\text{C}$)

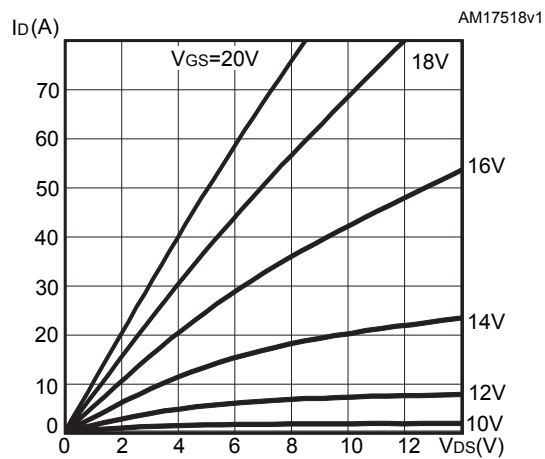


Figure 4. Output characteristics ($T_J = 150^\circ\text{C}$)

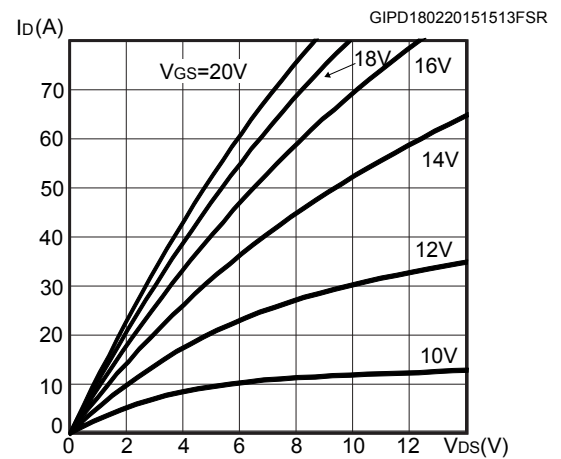


Figure 5. Output characteristics ($T_J = 200^\circ\text{C}$)

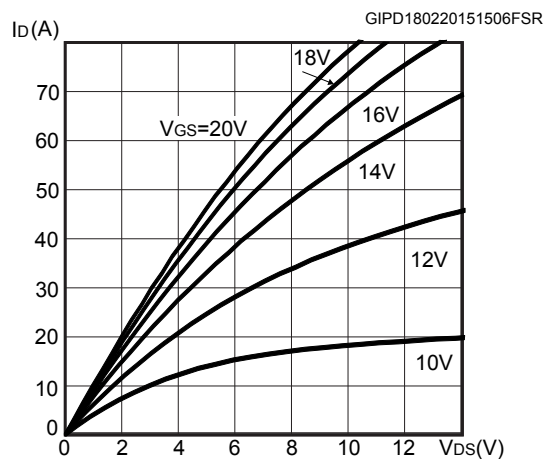


Figure 6. Transfer characteristics

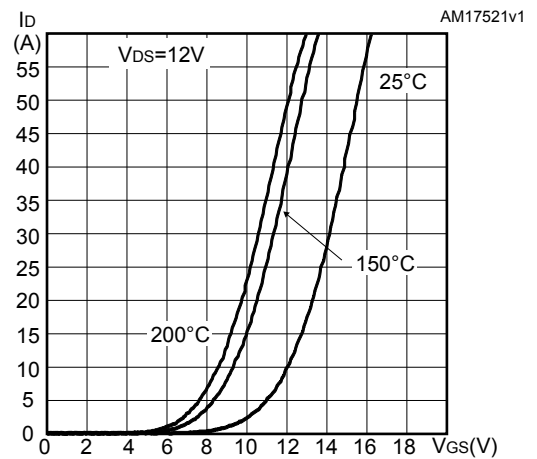


Figure 7. Total power dissipation

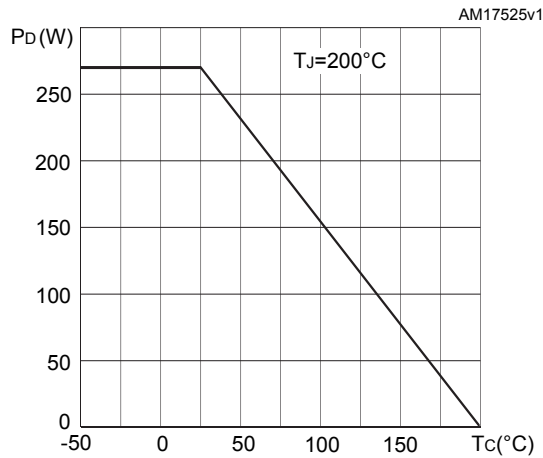


Figure 8. Maximum continuous drain current vs case temperature

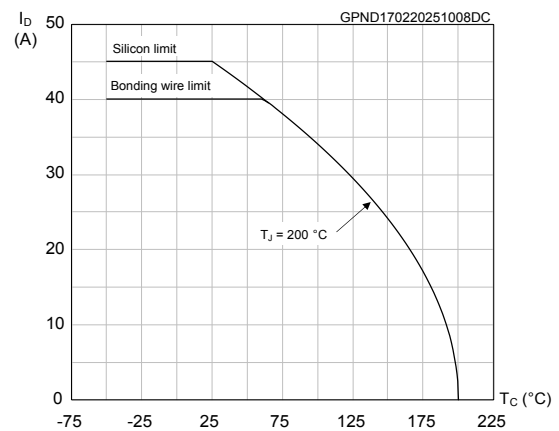


Figure 9. Gate charge vs gate-source voltage

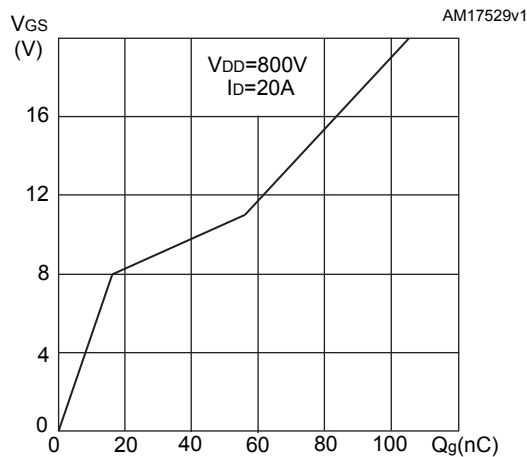


Figure 10. Capacitance variations

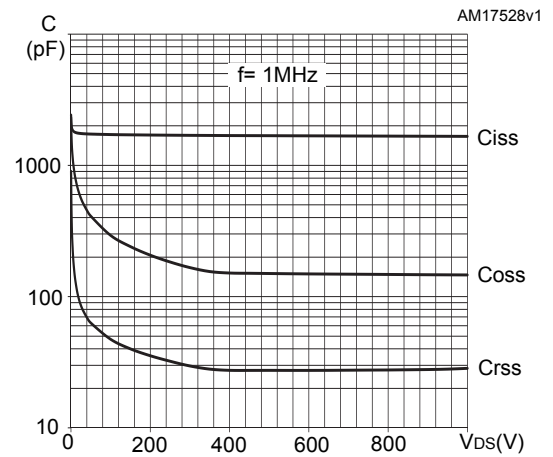


Figure 11. Switching energy vs. drain current

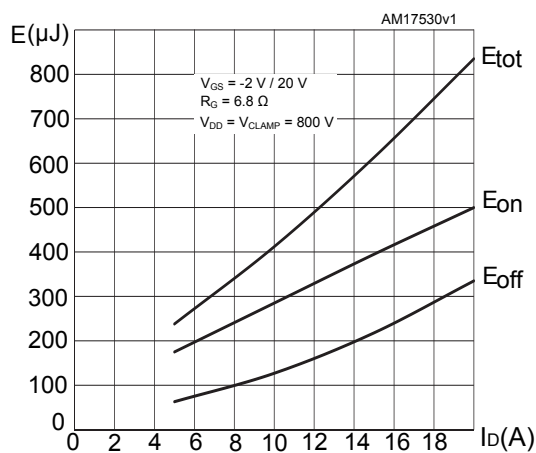


Figure 12. Switching energy vs. junction temperature

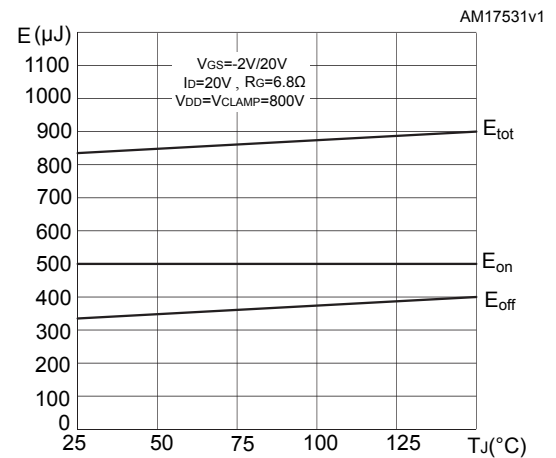


Figure 13. Normalized $V_{(BR)DSS}$ vs. temperature

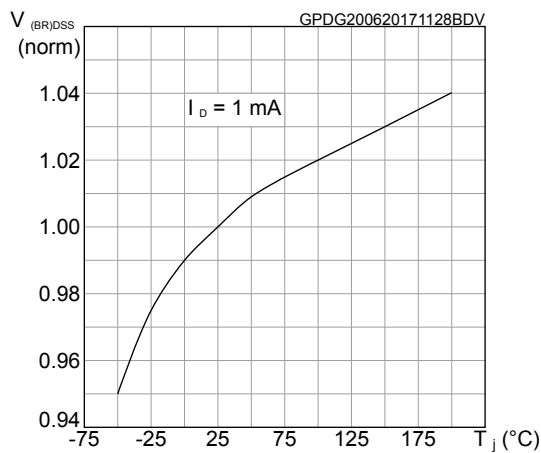


Figure 14. Normalized gate threshold voltage vs. temperature

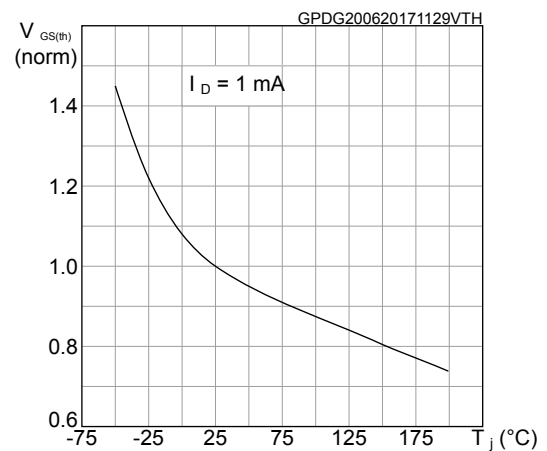


Figure 15. Normalized on-resistance vs. temperature

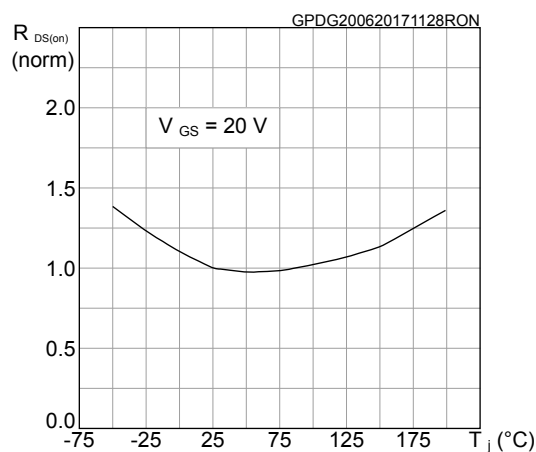


Figure 16. Body diode characteristics ($T_J = -50\text{ °C}$)

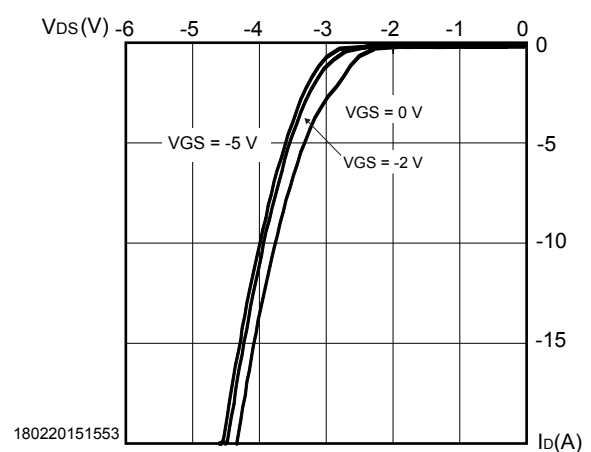


Figure 17. Body diode characteristics ($T_J = 25\text{ °C}$)

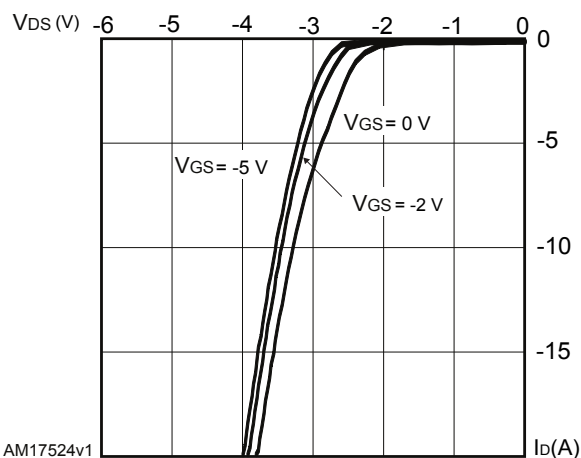


Figure 18. Body diode characteristics ($T_J = 150\text{ °C}$)

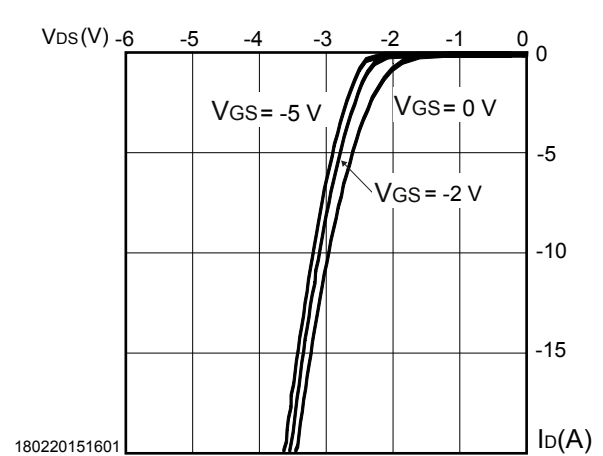


Figure 19. 3rd quadrant characteristics ($T_J = -50\text{ }^{\circ}\text{C}$)

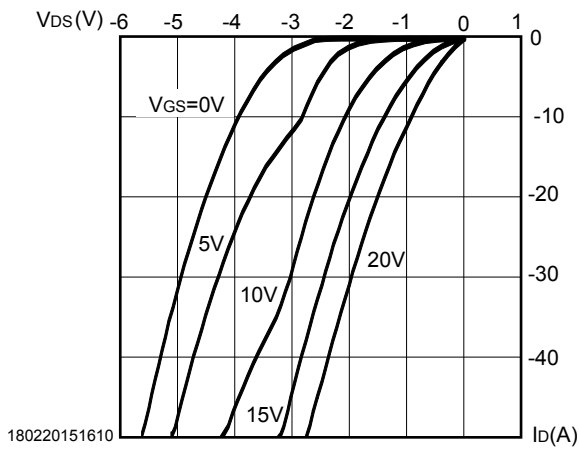


Figure 20. 3rd quadrant characteristics ($T_J = 25\text{ }^{\circ}\text{C}$)

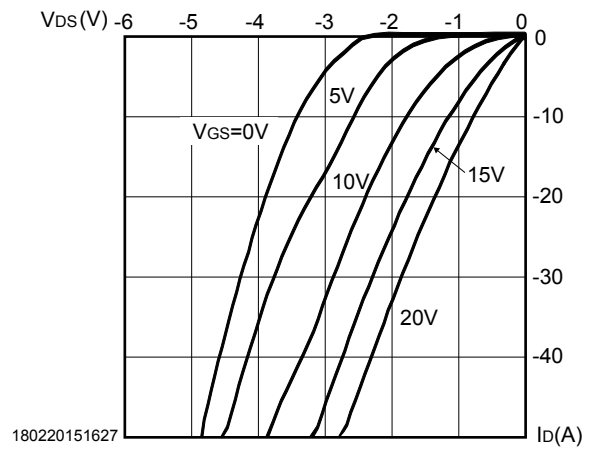
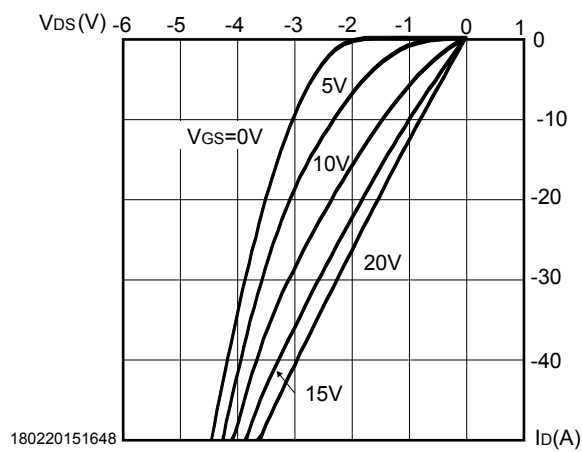


Figure 21. 3rd quadrant characteristics ($T_J = 150\text{ }^{\circ}\text{C}$)

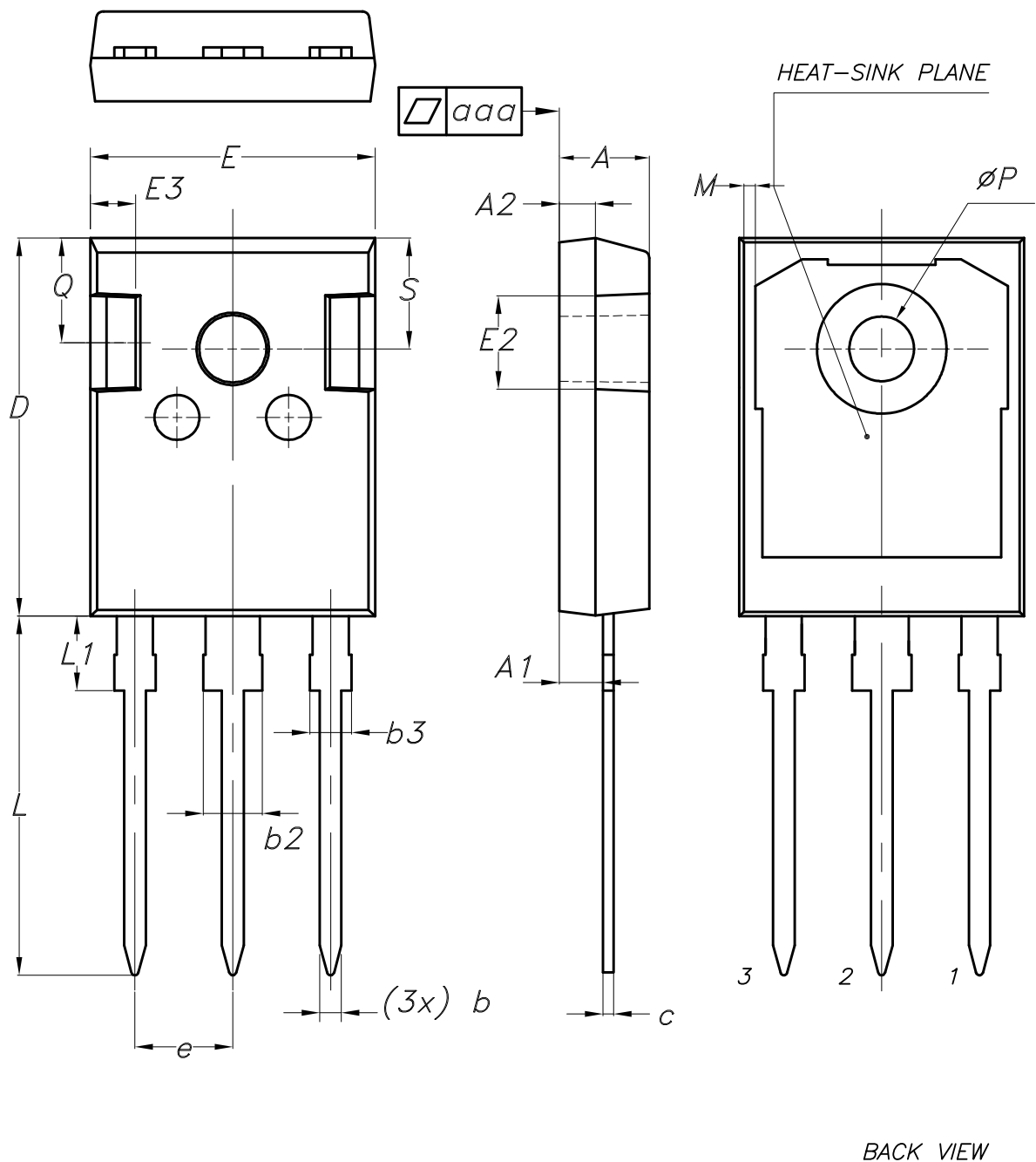


3 Package information

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 long leads package information

Figure 22. HiP247 long leads package outline



BACK VIEW

8463846_5

Table 8. 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 9. Document revision history

Date	Revision	Changes
11-Jan-2016	1	First release.
19-Jun-2017	2	Updated title, features in cover page. Minor text edit in <i>Section 1: "Electrical ratings"</i> and <i>Section 2: "Electrical characteristics"</i> . Updated <i>Figure 2: "Safe operating area"</i> , <i>Figure 3: "Thermal impedance"</i> , <i>Figure 13: "Normalized V(BR)DSS vs. temperature"</i> , <i>Figure 14: "Normalized gate threshold voltage vs. temperature"</i> and <i>Figure 15: "Normalized on-resistance vs. temperature"</i> . Document status promoted from preliminary to production data.
18-Feb-2025	3	Updated title on cover page. Updated Figure 8 . Updated Section 3.1: HiP247 long leads package information . Minor text changes.

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