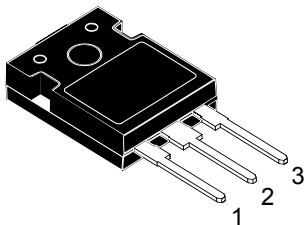
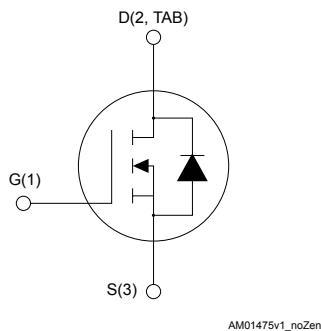


Silicon carbide Power MOSFET 1200 V, 80 mΩ typ., 45 A in an HiP247 package



HiP247



Product status link

[SCT30N120](#)

Product summary

Order code	SCT30N120
Marking	SCT30N120
Package	HiP247
Packing	Tube

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.

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

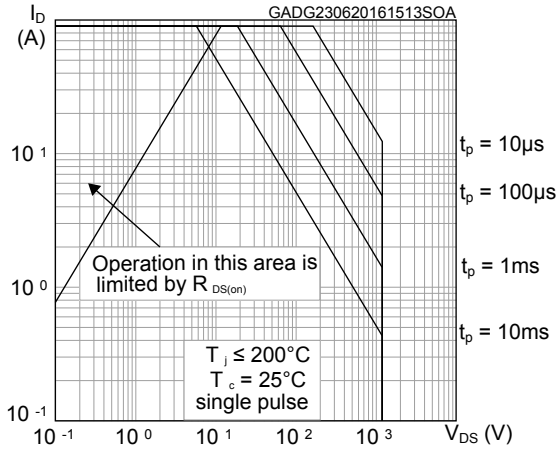


Figure 2. Normalized transient thermal impedance

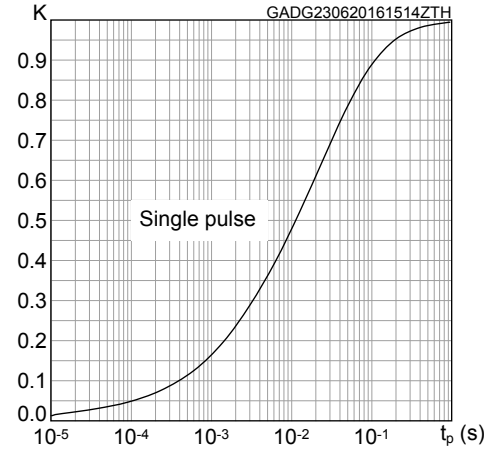


Figure 3. Output characteristics (T_J = 25 °C)

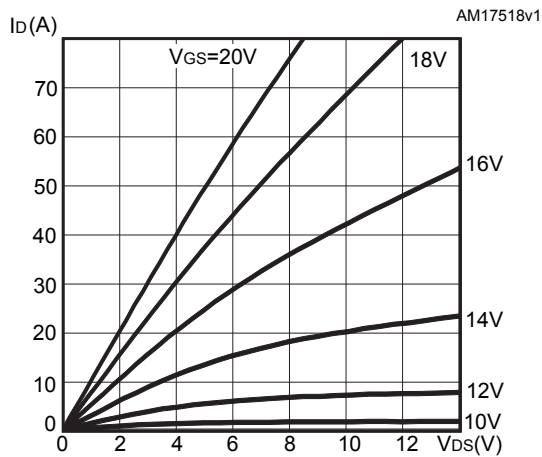


Figure 4. Output characteristics (T_J = 150 °C)

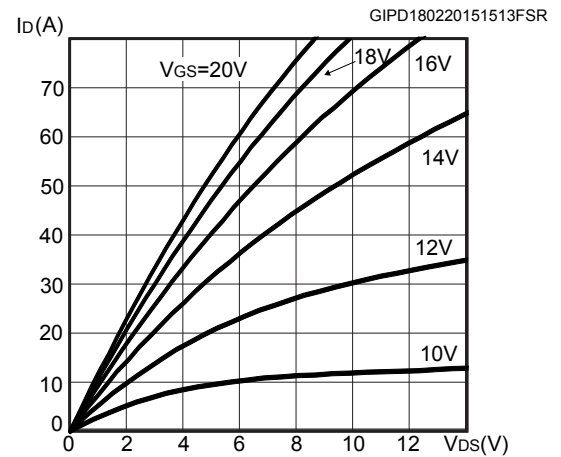


Figure 5. Output characteristics (T_J = 200 °C)

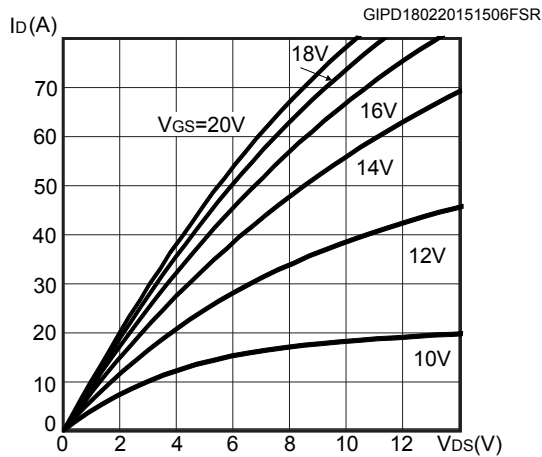


Figure 6. Transfer characteristics

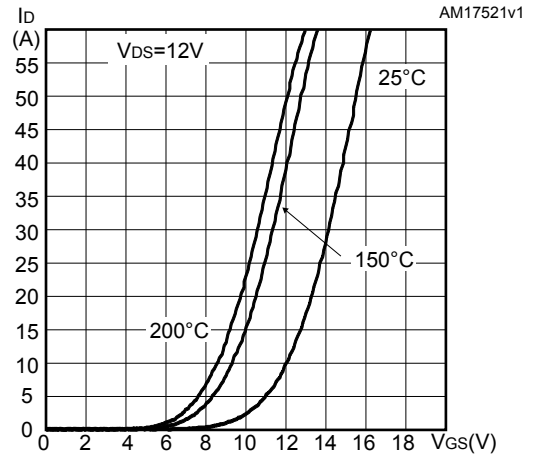


Figure 7. Total power dissipation

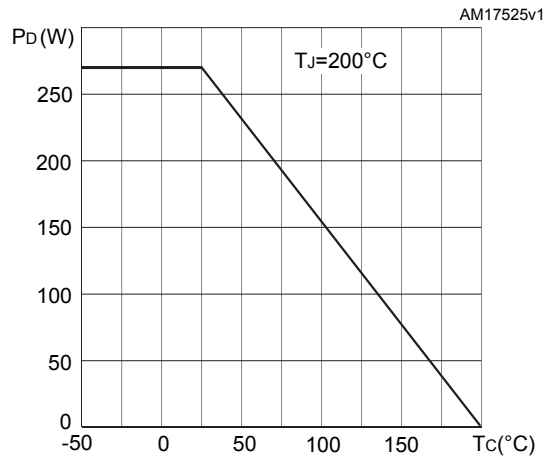


Figure 8. Maximum continuous drain current vs case temperature

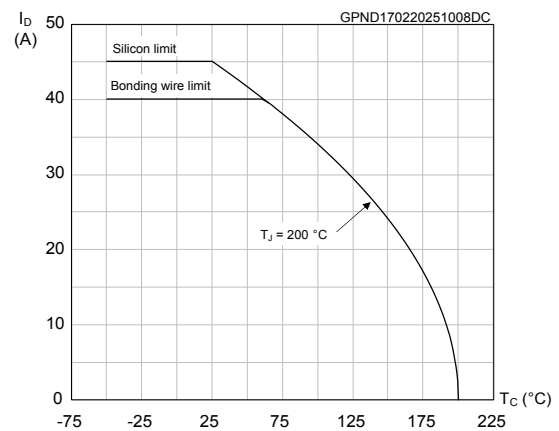


Figure 9. Gate charge vs gate-source voltage

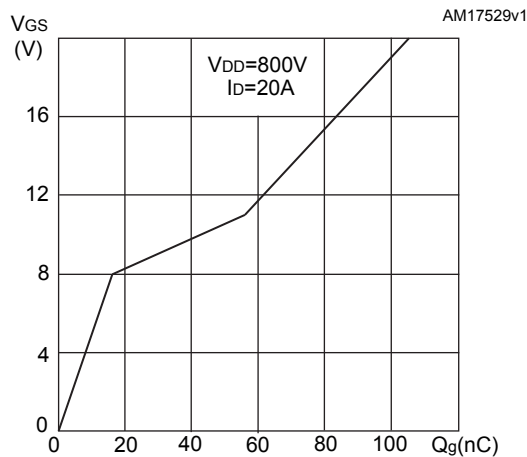


Figure 10. Capacitance variations

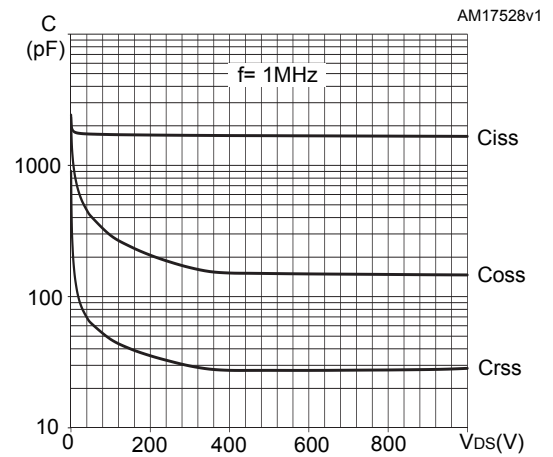


Figure 11. Switching energy vs. drain current

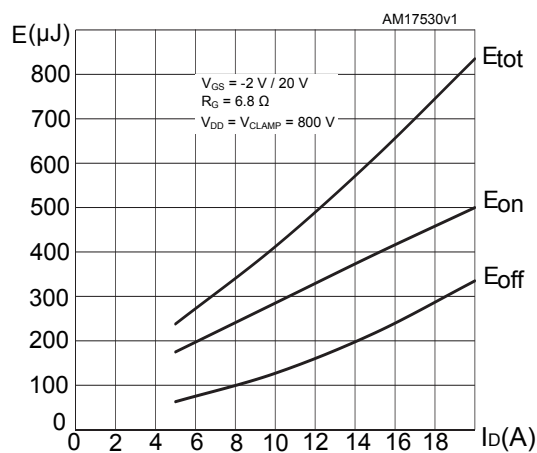


Figure 12. Switching energy vs. junction temperature

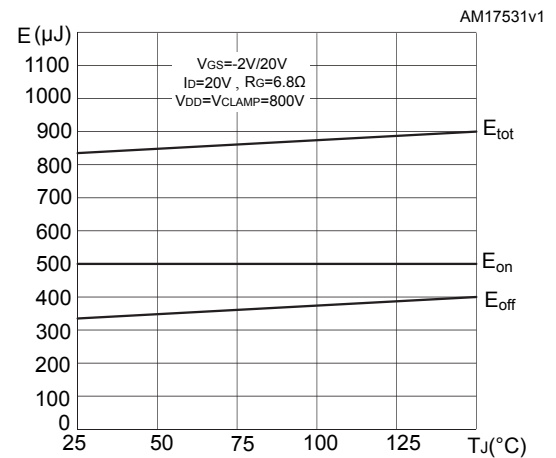


Figure 13. Normalized $V_{(BR)DSS}$ vs. temperature

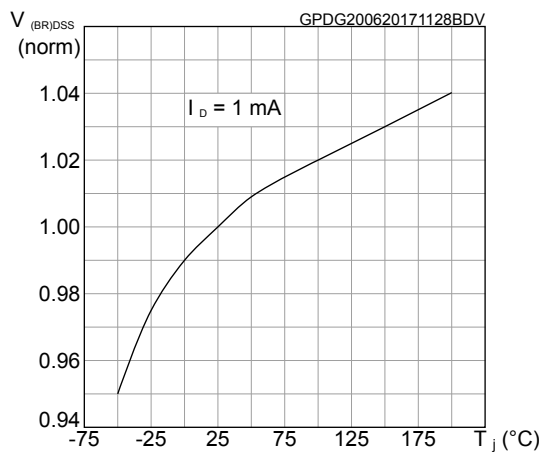


Figure 14. Normalized gate threshold voltage vs. temperature

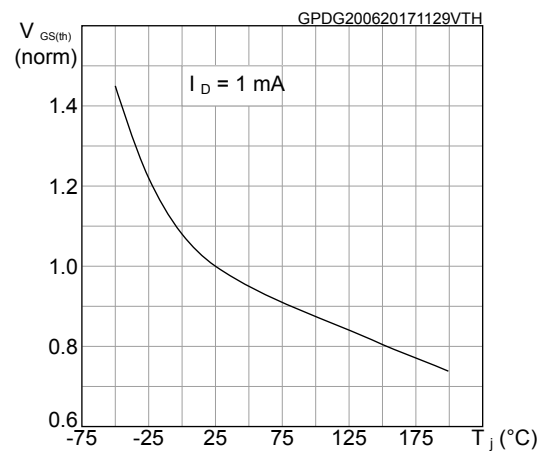


Figure 15. Normalized on-resistance vs. temperature

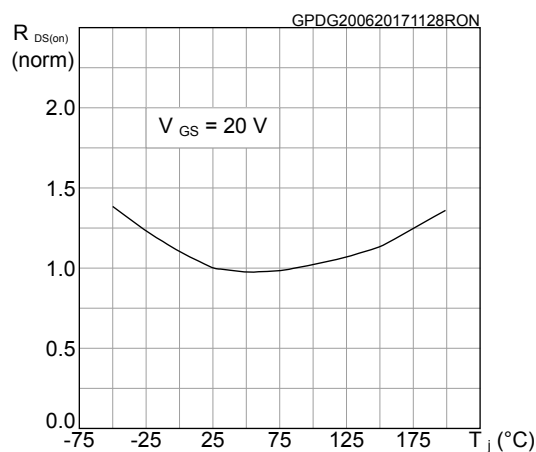


Figure 16. Body diode characteristics ($T_J = -50\text{ °C}$)

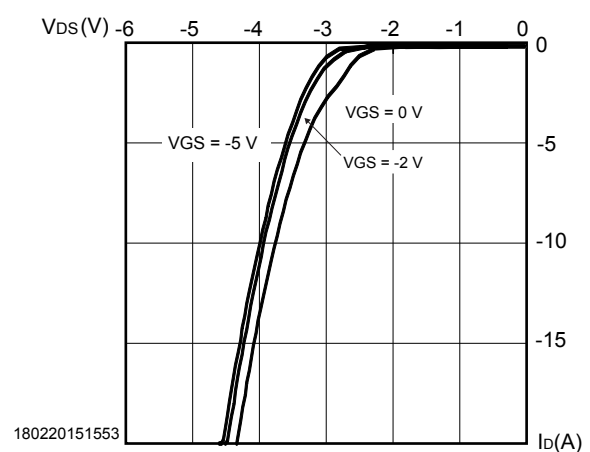


Figure 17. Body diode characteristics ($T_J = 25\text{ °C}$)

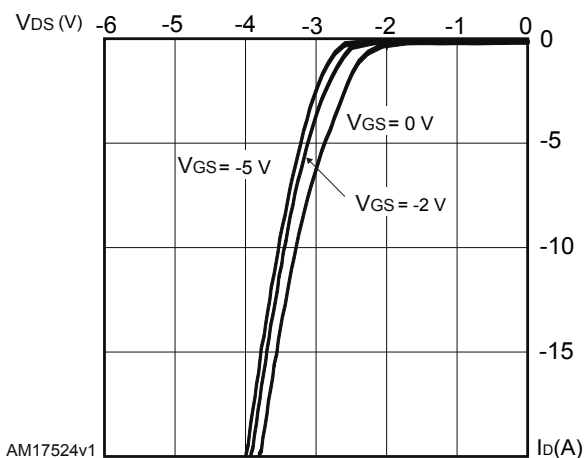


Figure 18. Body diode characteristics ($T_J = 150\text{ °C}$)

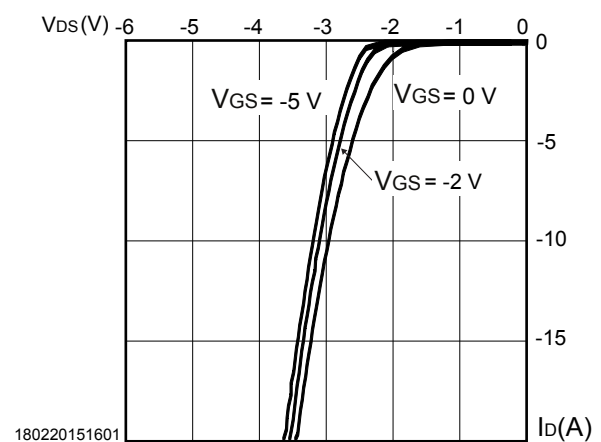


Figure 19. 3rd quadrant characteristics ($T_J = -50\text{ }^{\circ}\text{C}$)

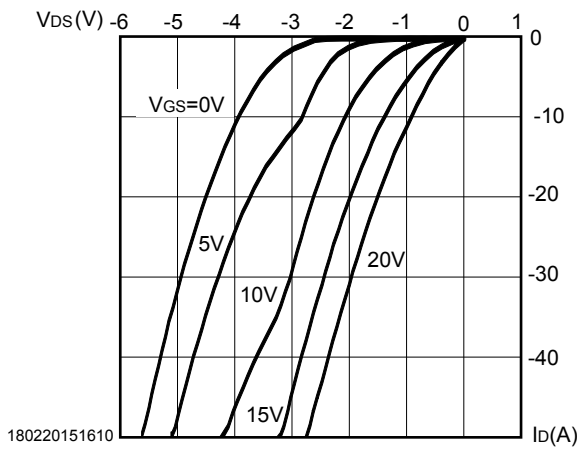


Figure 20. 3rd quadrant characteristics ($T_J = 25\text{ }^{\circ}\text{C}$)

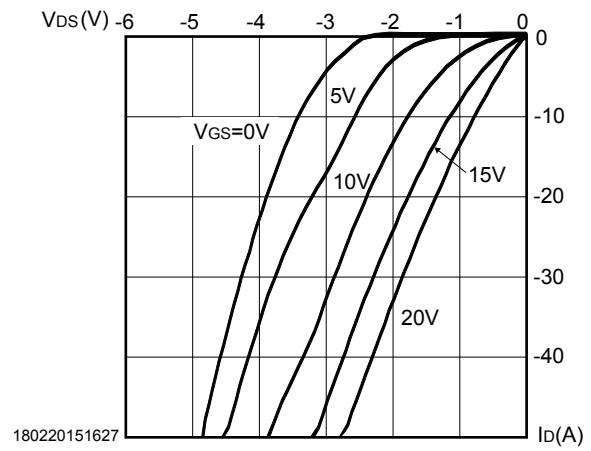
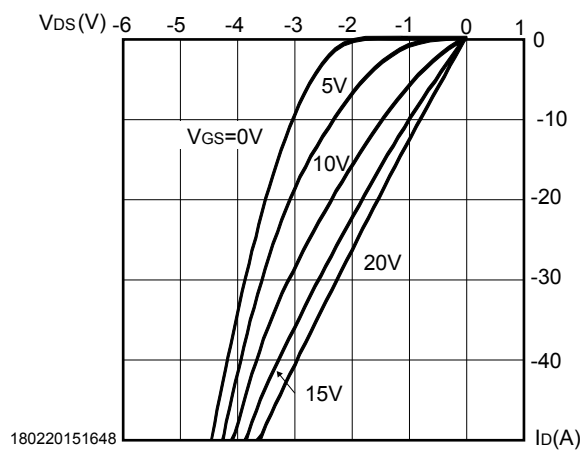


Figure 21. 3rd quadrant characteristics ($T_J = 150\text{ }^{\circ}\text{C}$)

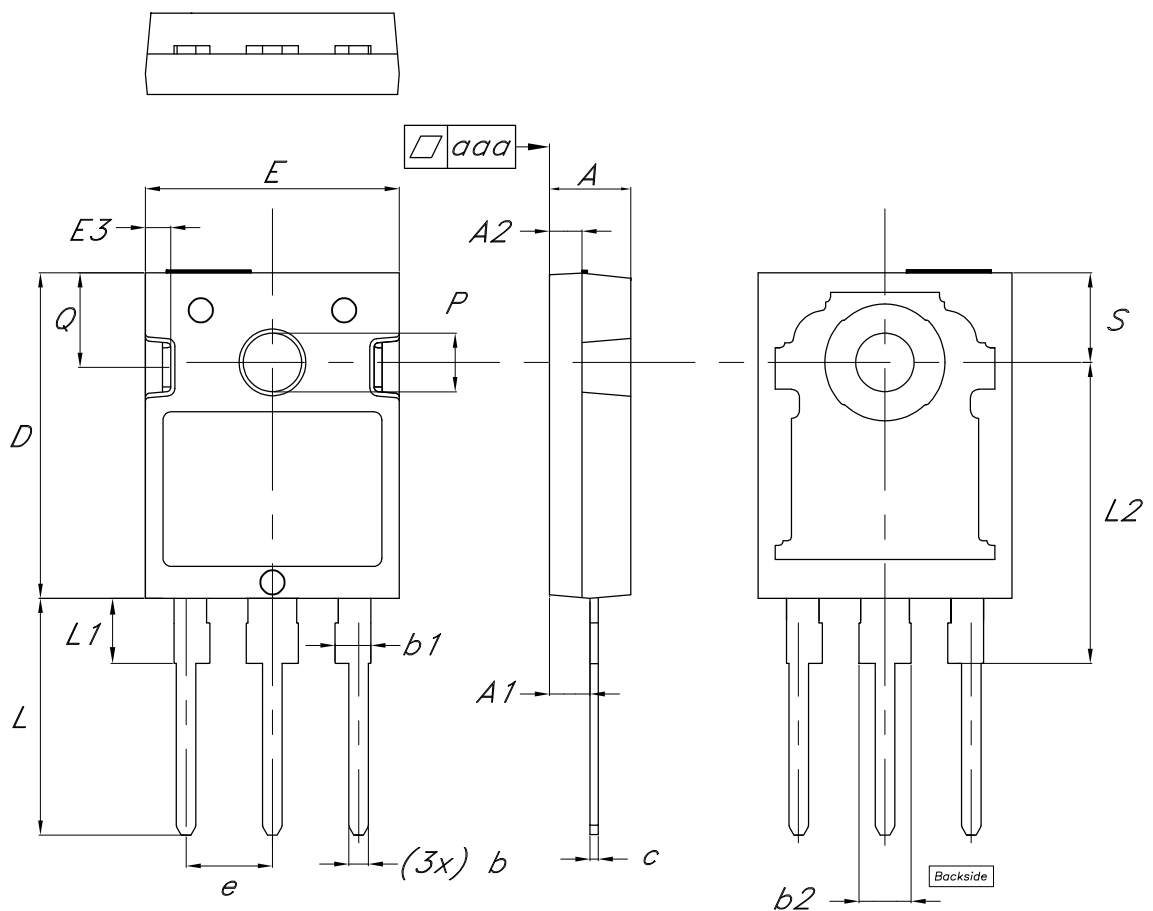


3 Package information

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 package information

Figure 22. HiP247 package outline



8581091_4

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
10-May-2012	1	First release
21-May-2013	2	Updated trr value in <i>Table 8</i> . Updated dynamic parameters in <i>Table 5</i> , VGS(th) in <i>Table 4</i> and Eon in <i>Table 6</i> .
24-Jun-2013	3	Document status promoted from target to preliminary data. Added: <i>Section 2.1: Electrical characteristics (curves)</i>
11-Jul-2013	4	Updated <i>Figure 6: Output characteristics (TJ = 200 °C)</i> and <i>Figure 7: Transfer characteristics</i> .
18-Dec-2013	5	Updated parameters in <i>Table 2: Absolute maximum ratings</i> and <i>Table 4: On/off states</i> .
27-May-2014	6	Added <i>Table 7: Switching times</i> . Updated <i>Section 3: Package mechanical data</i> . Minor text changes.
25-Sep-2014	7	Document status promoted from preliminary to production data.
17-Feb-2015	8	Updated title in cover page.
20-Feb-2015	9	Updated <i>Section 2.1: Electrical characteristics (curves)</i> .
24-Jul-2016	10	Updated title and features in cover page. Updated <i>Figure 2: "Safe operating area"</i> and <i>Figure 3: "Thermal impedance"</i> . Minor text changes.
11-May-2017	11	Updated <i>Table 4: "On/off states"</i> and <i>Section 2.1: "Electrical characteristics (curves)"</i> . Minor text changes.
17-Mar-2025	12	Updated Section 3.1: HiP247 package information . Minor text changes.

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