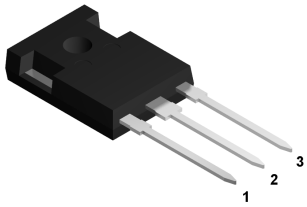
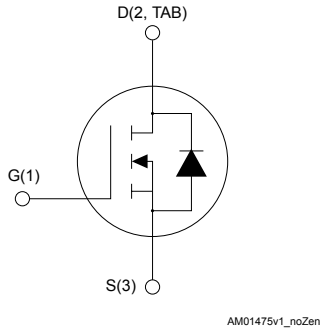
SCTWA30N120

Datasheet

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 °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 °C	45	A
I_D	Drain current (continuous, limited by bonding wires) at T_C = 25 °C	40	A
I_D	Drain current (continuous) at T_C = 100 °C	34	A
I_{DM} (1)	Drain current (pulsed)	90	A
P_{TOT}	Total power dissipation at T_C = 25 °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 °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 V, V_{DS} = 1200 V		1	25	µA
		V_{GS} = 0 V, V_{DS} = 1200 V, T_J = 200 °C		50		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 = 1 mA	1.8	3.5		V
$R_{DS(on)}$	Static drain-source on- resistance	V_{GS} = 20 V, I_D = 20 A		80	100	mΩ
		V_{GS} = 20 V, I_D = 20 A, T_J = 150 °C		90		mΩ
		V_{GS} = 20 V, I_D = 20 A, T_J = 200 °C		100		mΩ

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{GS} = 0 V, V_{DS} = 400 V, f = 1 MHz	-	1700	-	pF
C_{oss}	Output capacitance		-	130	-	pF
C_{rss}	Reverse transfer capacitance		-	25	-	pF
R_G	Intrinsic gate resistance	f = 1 MHz, I_D = 0 A	-	5	-	Ω
Q_g	Total gate charge	V_{DD} = 800 V, I_D = 20 A V_{GS} = 0 to 20 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 V, I_D = 20 A, R_G = 6.8 Ω, V_{GS} = -2 to 20 V	-	500	-	µJ
E_{off}	Turn-off switching energy		-	350	-	µJ
E_{on}	Turn-on switching energy	V_{DD} = 800 V, I_D = 20 A, R_G = 6.8 Ω, V_{GS} = -2 to 20 V T_J = 150 °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 V, I_D = 20 A, V_{GS} = 0 to 20 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 A, V_{GS} = 0 V	-	3.5	-	V
t_{rr}	Reverse recovery time	I_{SD} = 20 A, di/dt = 100 A/µs V_{DD} = 800 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

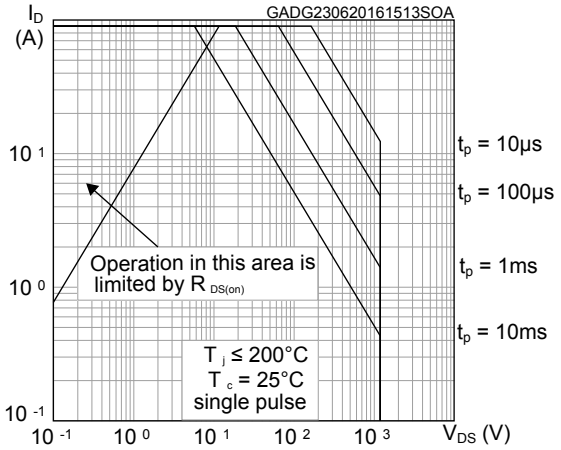


Figure 2. Nolmalized transient thermal impedance

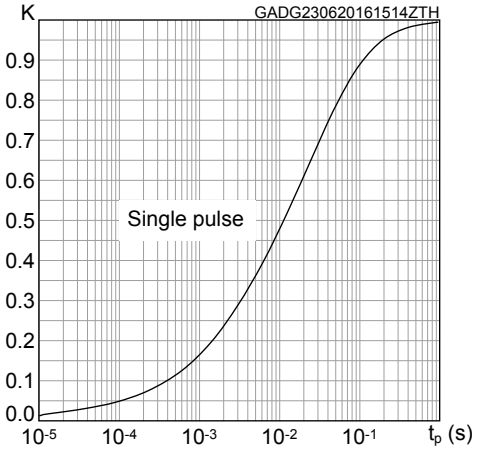


Figure 3. Output characteristics (T_J = 25 °C)

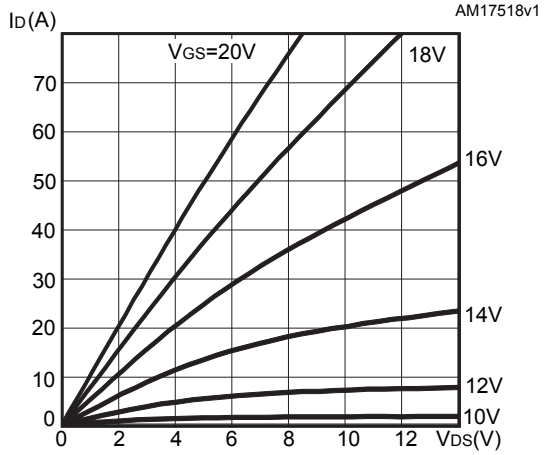


Figure 4. Output characteristics (T_J = 150 °C)

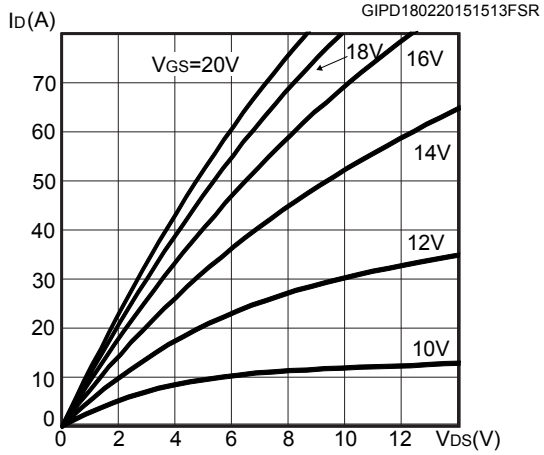


Figure 5. Output characteristics (T_J = 200 °C)

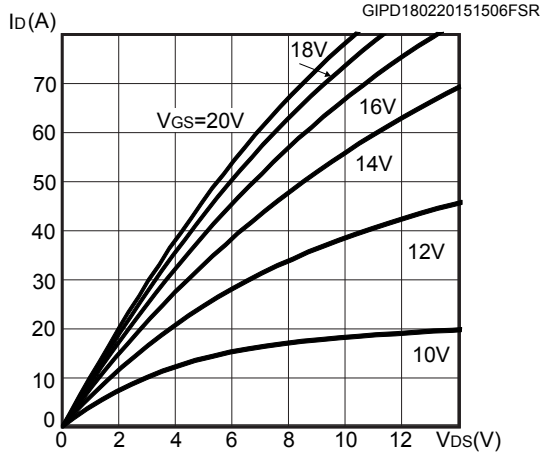


Figure 6. Transfer characteristics

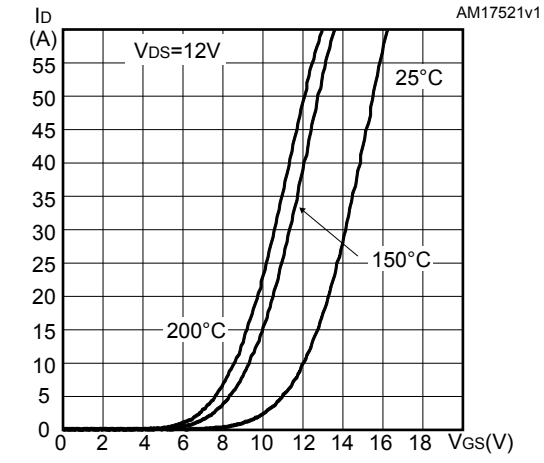


Figure 7. Total power dissipation

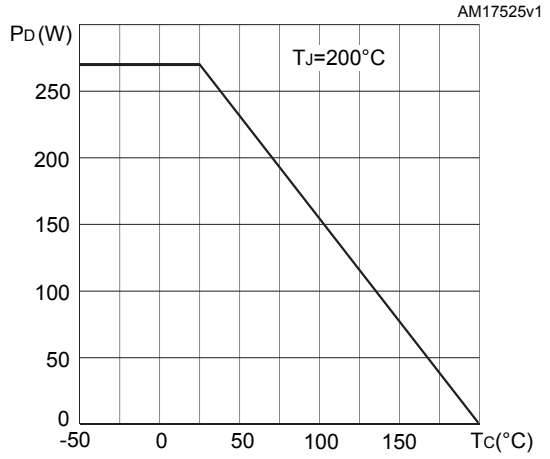


Figure 8. Maximum continuous drain current vs case temperature

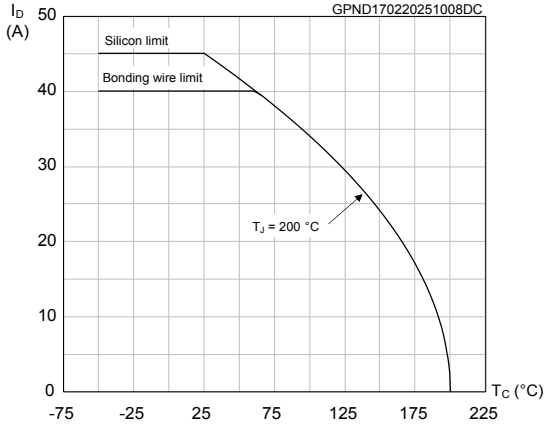


Figure 9. Gate charge vs gate-source voltage

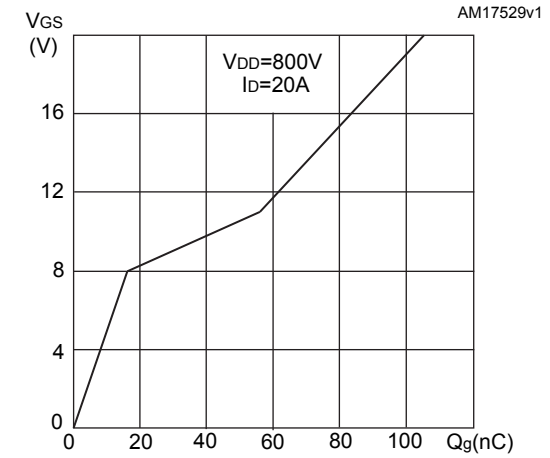


Figure 10. Capacitance variations

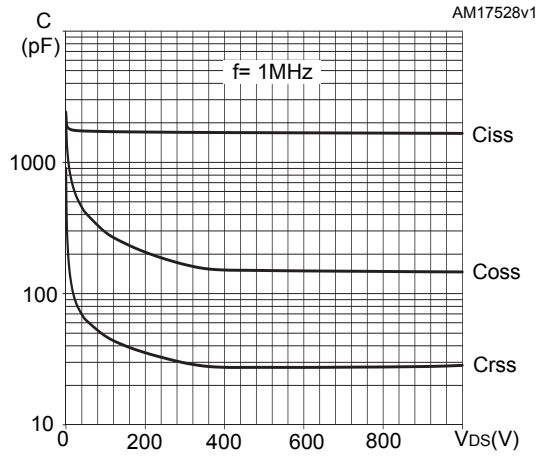


Figure 11. Switching energy vs. drain current

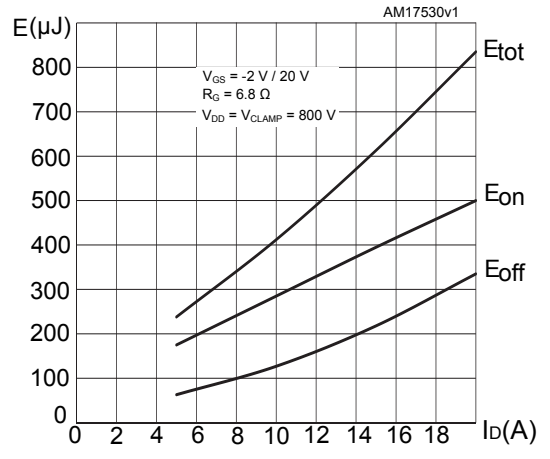


Figure 12. Switching energy vs. junction temperature

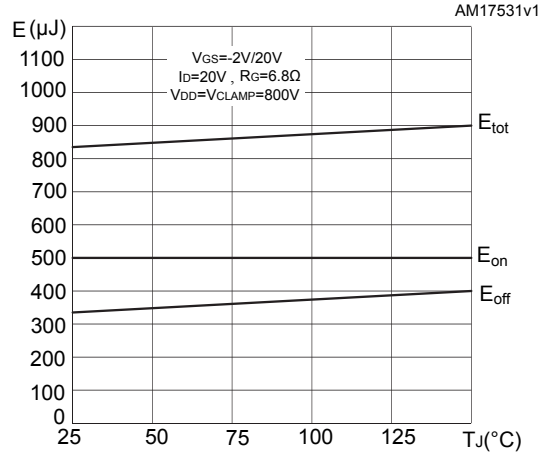


Figure 13. Normalized $V_{(BR)DSS}$ vs. temperature

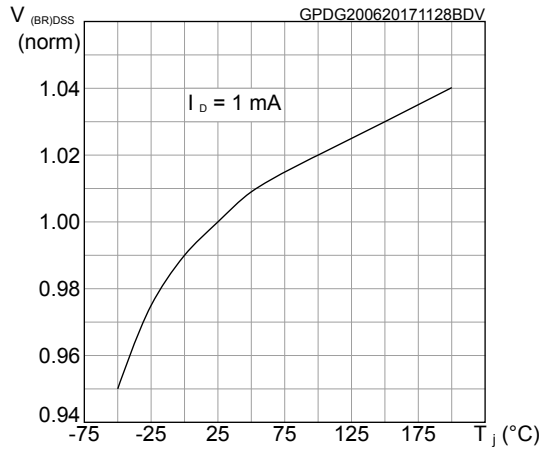


Figure 14. Normalized gate threshold voltage vs. temperature

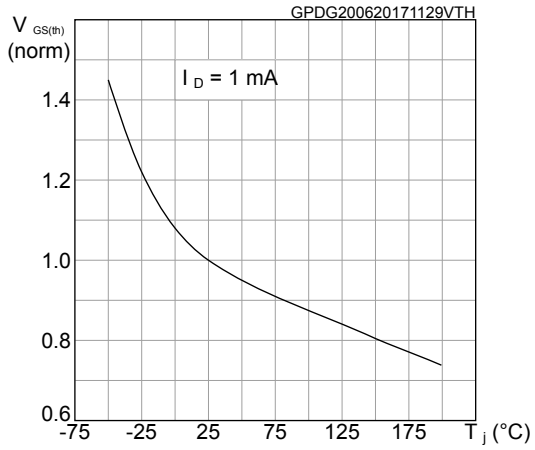


Figure 15. Normalized on-resistance vs. temperature

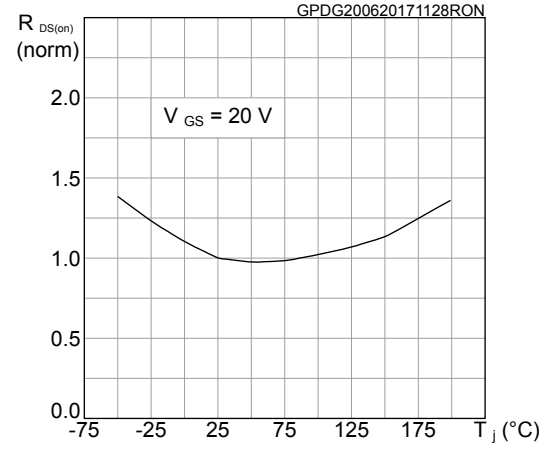


Figure 16. Body diode characteristics (T_J = -50 °C)

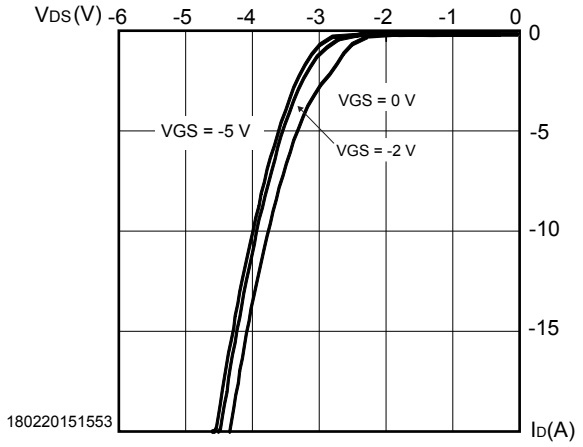


Figure 17. Body diode characteristics (T_J = 25 °C

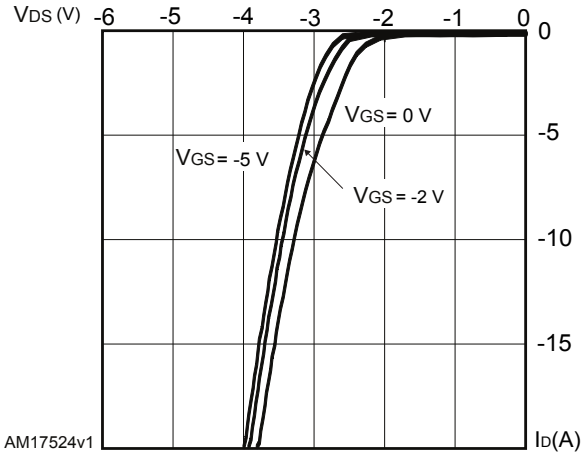


Figure 18. Body diode characteristics (T_J = 150 °C)

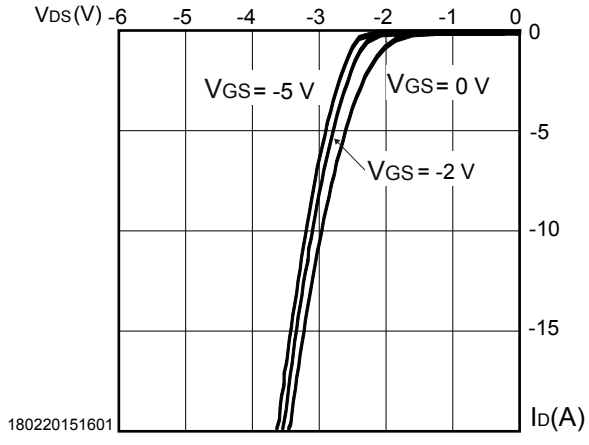


Figure 19. 3rd quadrant characteristics (T_J = -50 °C)

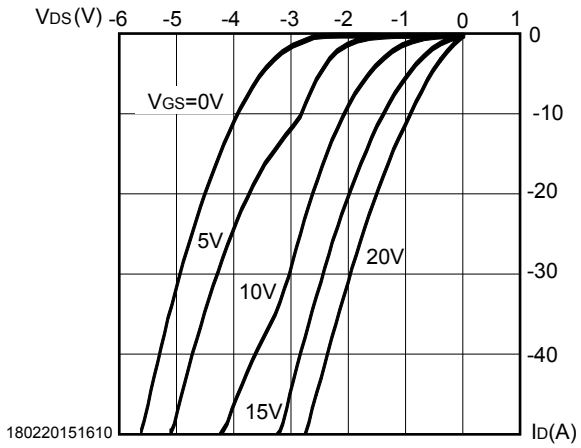


Figure 20. 3rd quadrant characteristics (T_J = 25 °C)

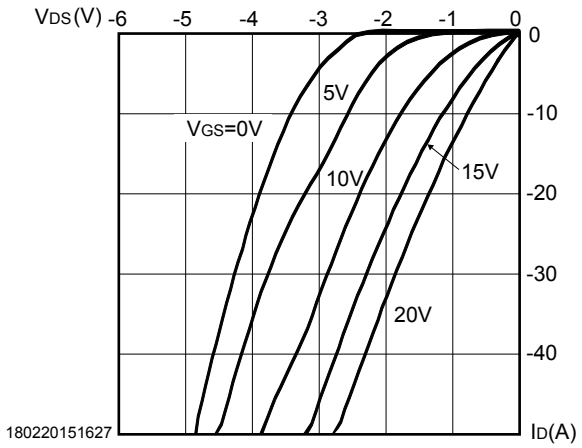
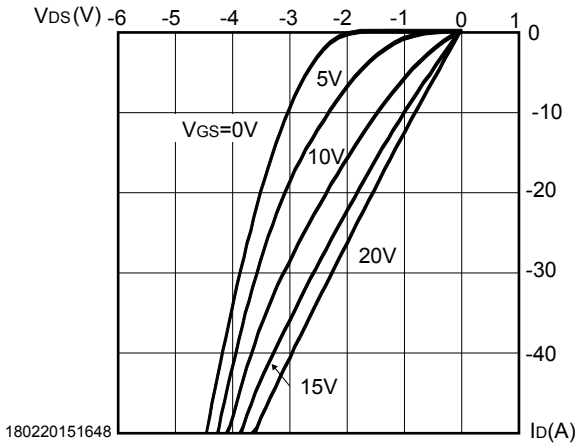


Figure 21. 3rd quadrant characteristics (T_J = 150 °C)



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 long leads package information

Figure 22. **HiP247 long leads package outline**

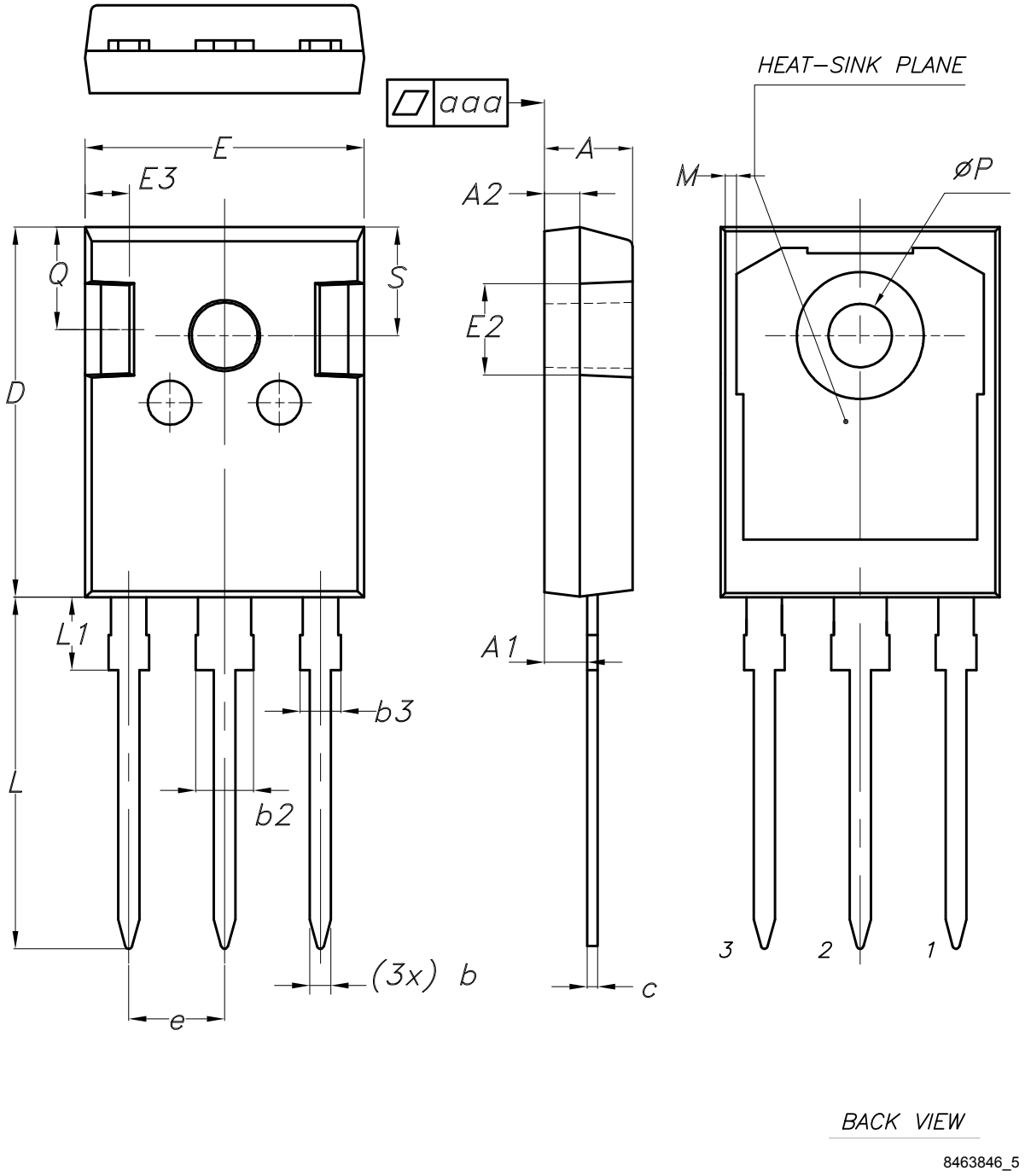


Table 8. **HiP247 long leads package mechanical data**

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 *Section 1: "Electrical ratings"* and *Section 2: "Electrical characteristics"*. Updated *Figure 2: "Safe operating area"*, *Figure 3: "Thermal impedance"*, *Figure 13: "Normalized V(BR)DSS vs. temperature"*, *Figure 14: "Normalized gate threshold voltage vs. temperature"* and *Figure 15: "Normalized on-resistance vs. temperature"*. 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.