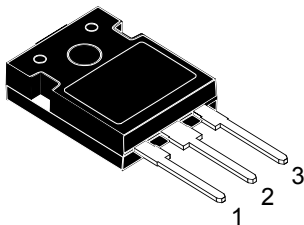
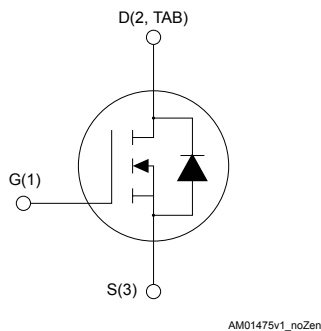


Silicon carbide Power MOSFET 1200 V, 169 mΩ typ., 20 A in an HiP247 package



HiP247



Features

- Very low $R_{DS(on)}$ over the entire temperature range
- Very high operating junction temperature capability ($T_J = 200\text{ °C}$)
- 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

[SCT20N120](#)

Product summary

Order code	SCT20N120
Marking	SCT20N120
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 $T_C = 25\text{ °C}$	20	A
I_D	Drain current (continuous) at $T_C = 100\text{ °C}$	16	A
$I_{DM}^{(1)}$	Drain current (pulsed)	45	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	175	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	°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
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0 V, V _{DS} = 1200 V			100	μA
		V _{GS} = 0 V, V _{DS} = 1200 V, T _J = 200 °C		50		
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	2	3.5		V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 20 V, I _D = 10 A		169	239	mΩ
		V _{GS} = 20 V, I _D = 10 A, T _J = 150 °C		189		
		V _{GS} = 20 V, I _D = 10 A, T _J = 200 °C		220		

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	-	650	-	pF
C _{oss}	Output capacitance		-	65	-	pF
C _{rss}	Reverse transfer capacitance		-	14	-	pF
Q _g	Total gate charge	V _{DD} = 800 V, I _D = 10 A, V _{GS} = 0 to 20 V	-	45	-	nC
Q _{gs}	Gate-source charge		-	7	-	nC
Q _{gd}	Gate-drain charge		-	11.7	-	nC
R _g	Gate input resistance	f=1 MHz, I _D = 0 A	-	7	-	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 = 10 A	-	160	-	μJ
E _{off}	Turn-off switching energy	R _G = 6.8 Ω, V _{GS} = -2 to 20 V	-	90	-	μJ
E _{on}	Turn-on switching energy	V _{DD} = 800 V, I _D = 10 A	-	165	-	μJ
E _{off}	Turn-off switching energy	R _G = 6.8 Ω, V _{GS} = -2 to 20 V, T _J = 150 °C	-	100	-	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 = 10 A, R _G = 0 Ω, V _{GS} = 0 to 20 V	-	10	-	ns
t _{f(V)}	Fall time		-	17	-	ns
t _{d(off)V}	Turn-off delay time		-	27	-	ns
t _{r(V)}	Rise time		-	16	-	ns

Table 7. Reverse SiC diode characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode forward voltage	$I_F = 5\text{ A}$, $V_{GS} = -5\text{ V}$	-	3.6	-	V
t_{rr}	Reverse recovery time	$I_{SD} = 10\text{ A}$, $V_{GS} = -5\text{ V}$, $V_R = 800\text{ V}$, $di/dt = 1650\text{ A}/\mu\text{s}$	-	15	-	ns
Q_{rr}	Reverse recovery charge		-	75	-	nC
I_{rrm}	Peak reverse recovery current		-	8	-	A

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

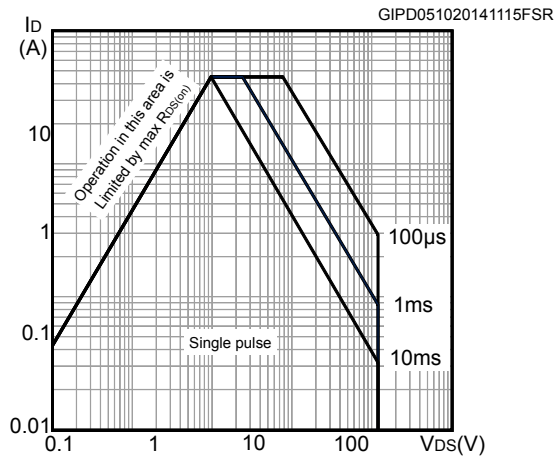


Figure 2. Typical transient thermal impedance

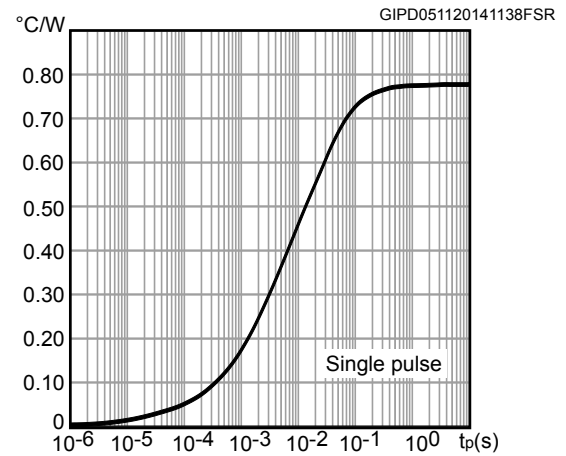


Figure 3. Output characteristics ($T_J = 25^\circ\text{C}$)

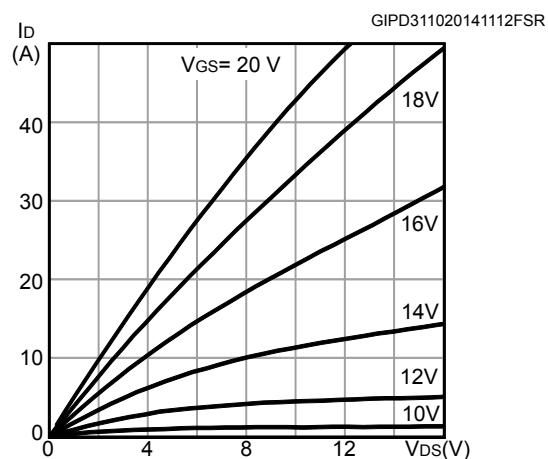


Figure 4. Output characteristics ($T_J = 200^\circ\text{C}$)

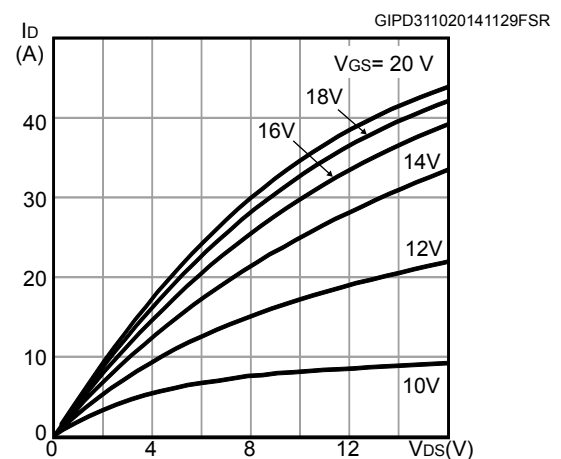


Figure 5. Transfer characteristics

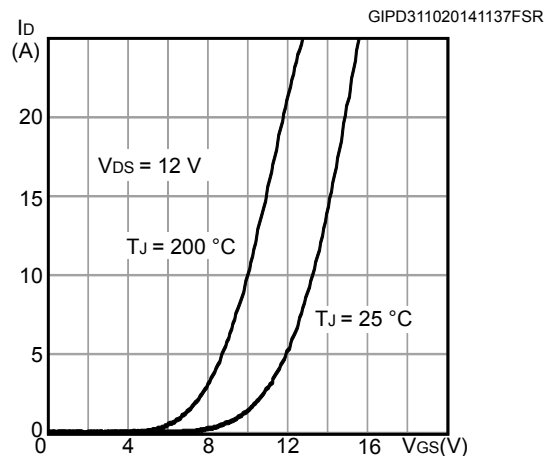


Figure 6. Body diode characteristics ($T_J = -50^\circ\text{C}$)

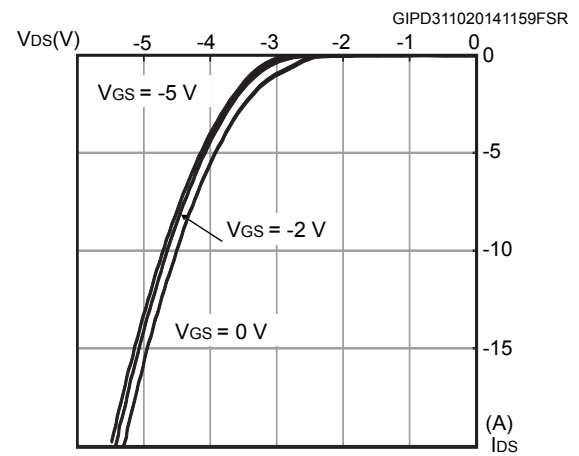


Figure 7. Body diode characteristics ($T_J = 25^\circ\text{C}$)

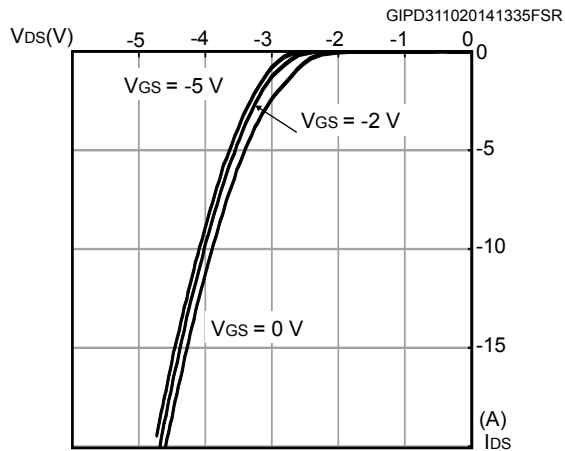


Figure 8. Body diode characteristics ($T_J = 150^\circ\text{C}$)

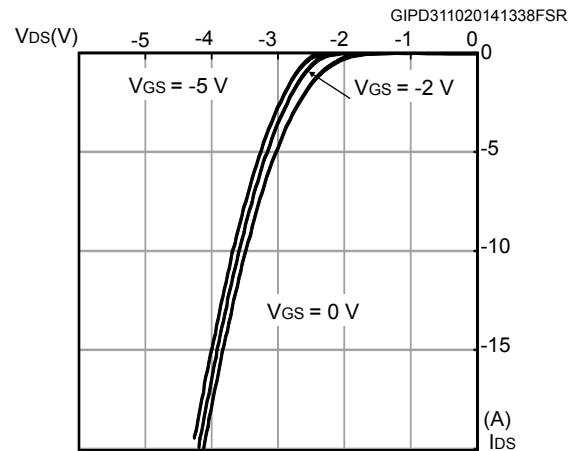


Figure 9. 3rd quadrant characteristics ($T_J = -50^\circ\text{C}$)

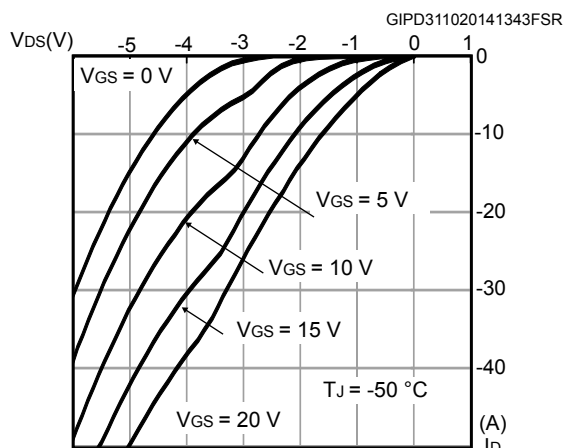


Figure 10. 3rd quadrant characteristics ($T_J = 25^\circ\text{C}$)

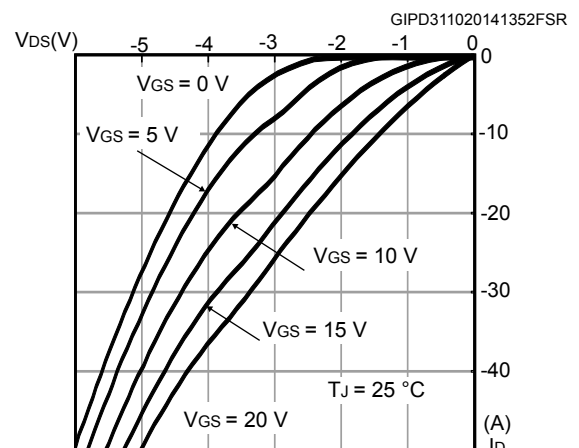


Figure 11. 3rd quadrant characteristics ($T_J = 150^\circ\text{C}$)

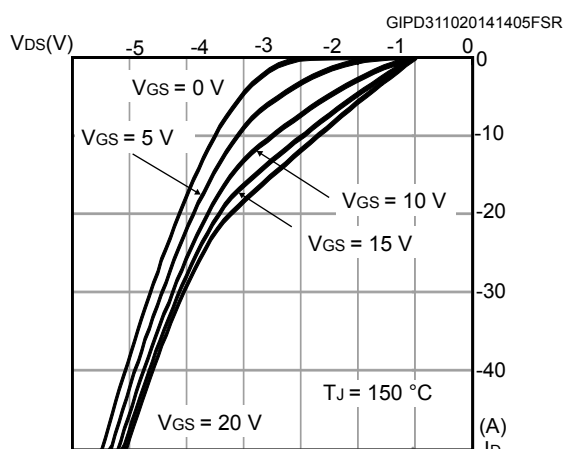


Figure 12. Normalized gate threshold voltage vs. temperature

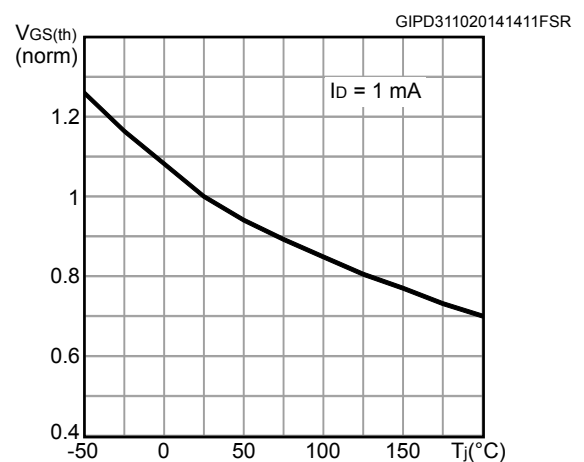


Figure 13. Normalized on-resistance vs. temperature

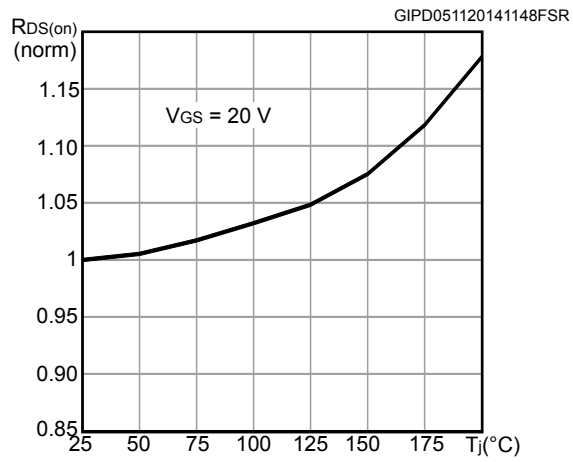
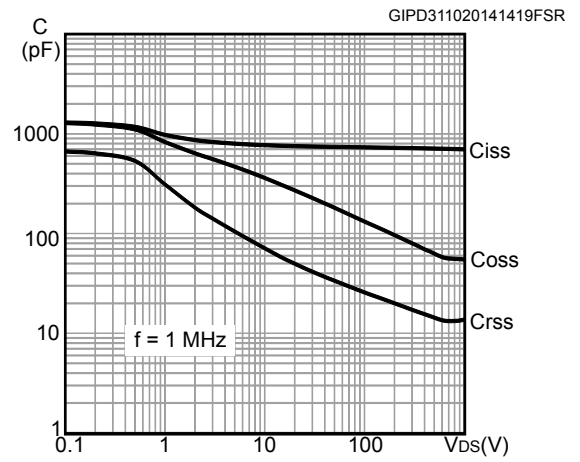


Figure 14. Capacitance variations

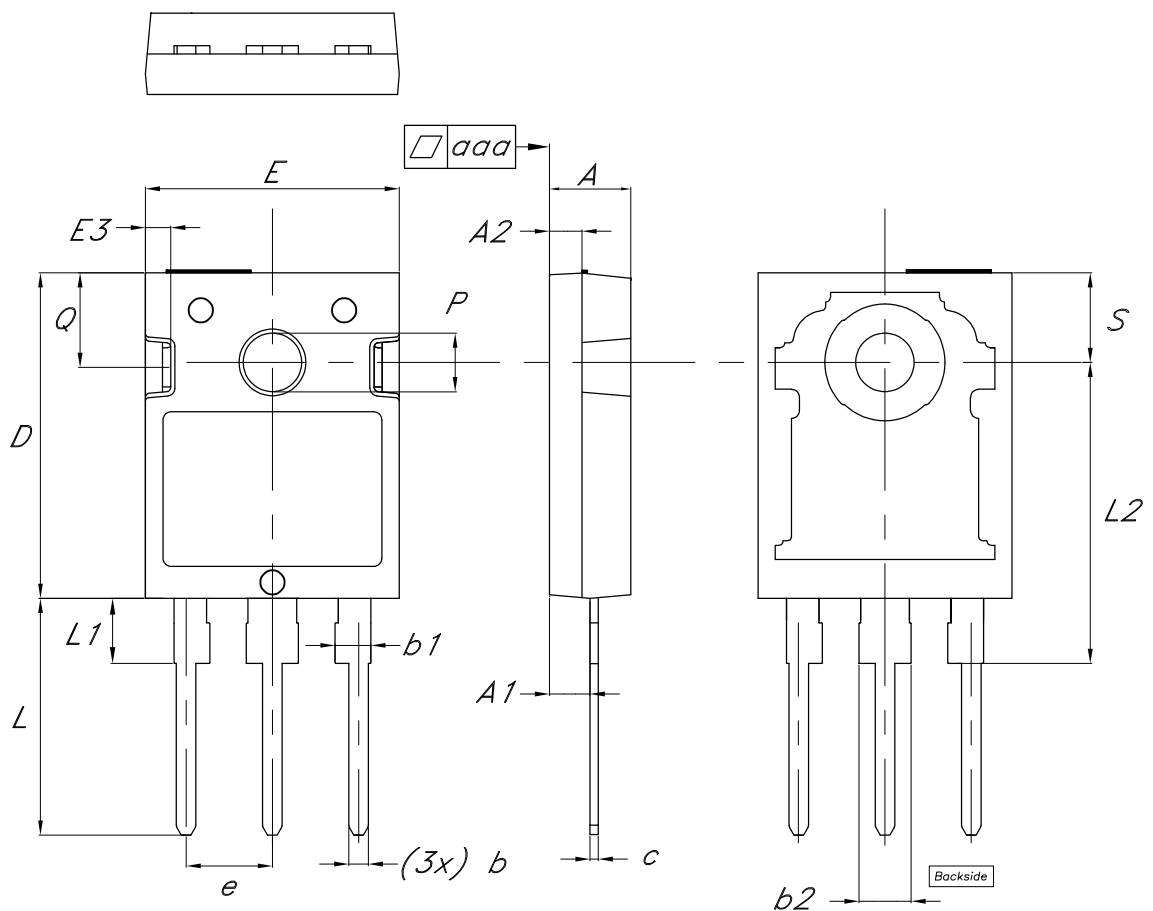


3 Package information

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 15. 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
07-Nov-2014	1	First release
17-Feb-2015	2	Updated title in cover page.
20-Feb-2015	3	Updated <i>Figure 3: Thermal impedance</i> . Minor text changes.
17-Dec-2015	4	Updated title in cover page and <i>Table 4: On/off states</i> .
17-Sep-2019	5	Updated <i>Figure 1. Safe operating area</i> and <i>Section 4.1 HiP247 package information</i> . Minor text changes.
20-Mar-2025	6	Updated Section 3.1: HiP247 package information . Minor text changes.

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