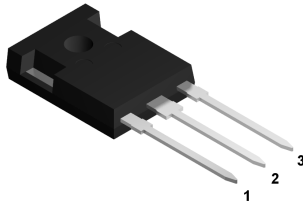
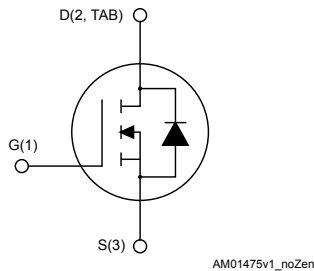


Automotive-grade silicon carbide Power MOSFET 1200 V, 45 mΩ typ., 52 A in an HiP247 long leads package




HiP247 long leads



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
SCTWA60N120G2AG	1200 V	58 mΩ	52 A

- AEC-Q101 qualified 
- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitance
- Very high operating junction temperature capability ($T_J = 200\text{ °C}$)

Applications

- Main inverter (electric traction)
- DC/DC converter for EV/HEV
- On board charger (OBC)

Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 2nd generation SiC MOSFET technology. The device features remarkably low on-resistance per unit area and very good switching performance. The variation of switching loss is almost independent of junction temperature.

Product status link

[SCTWA60N120G2AG](#)

Product summary

Order code	SCTWA60N120G2AG
Marking	SCT60N120G2AG
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 22	V
	Gate-source voltage (recommended operational values)	-5 to 18	
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	52	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	39	
$I_{DM}^{(1)}$	Drain current (pulsed)	156	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	388	W
T_{stg}	Storage temperature range	-55 to 200	°C
T_J	Operating junction temperature range		°C

1. Pulse width is limited by safe operating area.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.45	°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
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	1200			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 1200\text{ V}$			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	$V_{DS} = V_{GS}$, $I_D = 1\text{ mA}$	1.9	3.1	5.0	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 18\text{ V}$, $I_D = 30\text{ A}$		45	58	m Ω
		$V_{GS} = 18\text{ V}$, $I_D = 30\text{ A}$, $T_J = 200\text{ °C}$		113		

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 800\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	2086	-	pF
C_{oss}	Output capacitance		-	90	-	pF
C_{rss}	Reverse transfer capacitance		-	18	-	pF
R_g	Gate input resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	1	-	Ω
Q_g	Total gate charge	$V_{DS} = 800\text{ V}$, $V_{GS} = -5\text{ to }18\text{ V}$, $I_D = 30\text{ A}$	-	101	-	nC
Q_{gs}	Gate-source charge		-	36	-	nC
Q_{gd}	Gate-drain charge		-	23	-	nC

Table 5. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	$V_{DD} = 800\text{ V}$, $I_D = 30\text{ A}$	-	431	-	μJ
E_{off}	Turn-off switching energy	$R_G = 2.2\ \Omega$, $V_{GS} = -5\text{ V to }18\text{ V}$	-	68	-	μJ

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 800\text{ V}$, $I_D = 20\text{ A}$, $R_G = 4.5\ \Omega$, $V_{GS} = -5\text{ to }18\text{ V}$	-	11	-	ns
t_r	Rise time		-	5	-	ns
$t_{d(off)}$	Turn-off delay time		-	18	-	ns
t_f	Fall time		-	13	-	ns

Table 7. Reverse SiC diode characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode forward voltage	$I_{SD} = 30\text{ A}$, $V_{GS} = 0\text{ V}$	-	3.5	-	V
t_{rr}	Reverse recovery time	$I_{SD} = 30\text{ A}$, $V_{GS} = 0\text{ V}$, $di/dt = 2000\text{ A}/\mu\text{s}$, $V_{DD} = 800\text{ V}$	-	53	-	ns
Q_{rr}	Reverse recovery charge		-	192	-	nC
I_{RRM}	Reverse recovery current		-	11	-	A

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

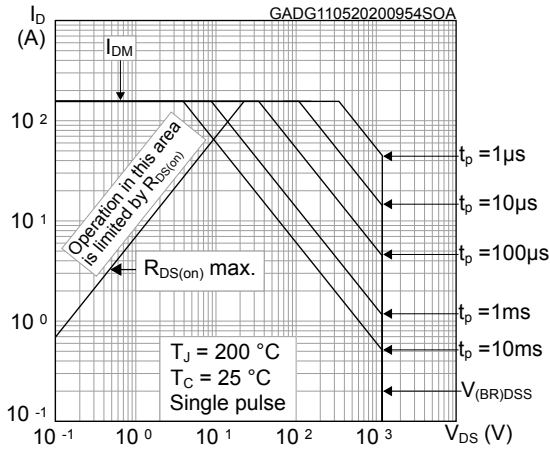


Figure 2. Maximum transient thermal impedance

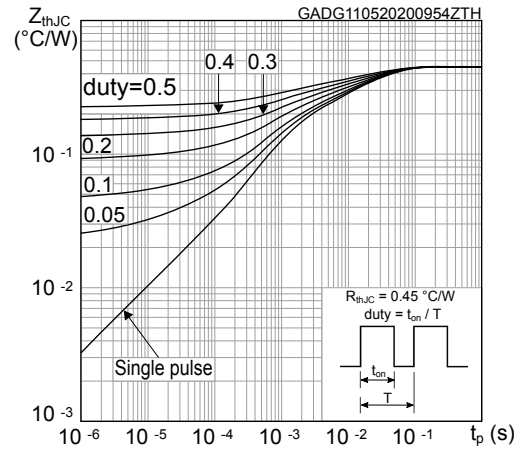


Figure 3. Typical output characteristics (T_J = 25 °C)

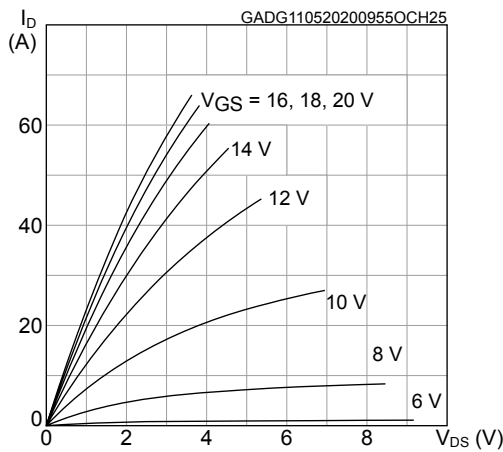


Figure 4. Typical output characteristics (T_J = 200 °C)

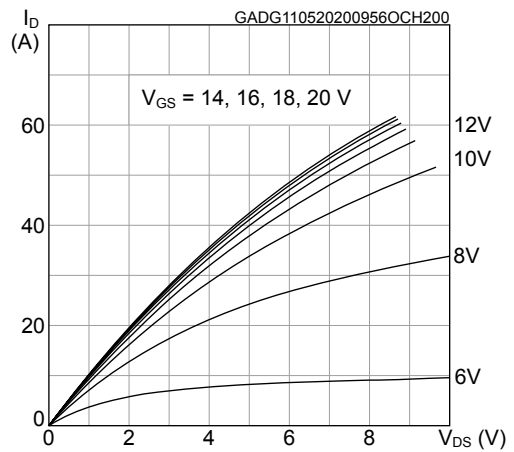


Figure 5. Typical transfer characteristics

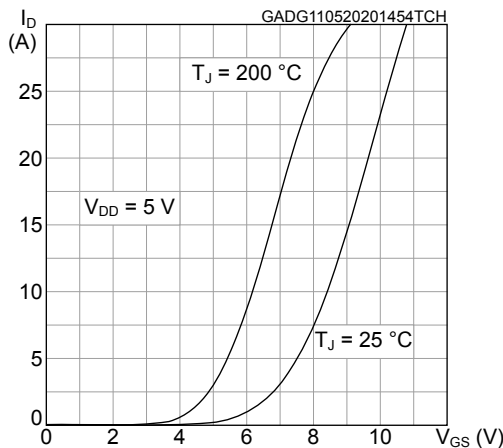


Figure 6. Total power dissipation

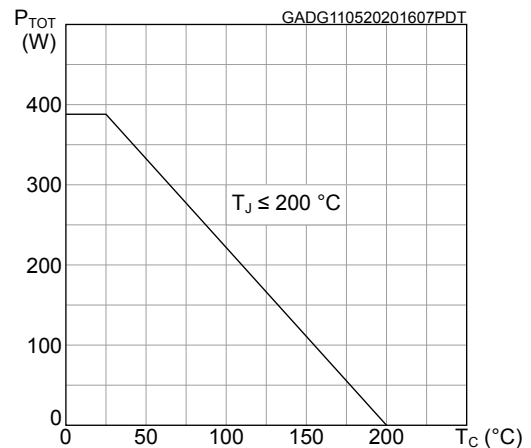


Figure 7. Typical gate charge characteristics

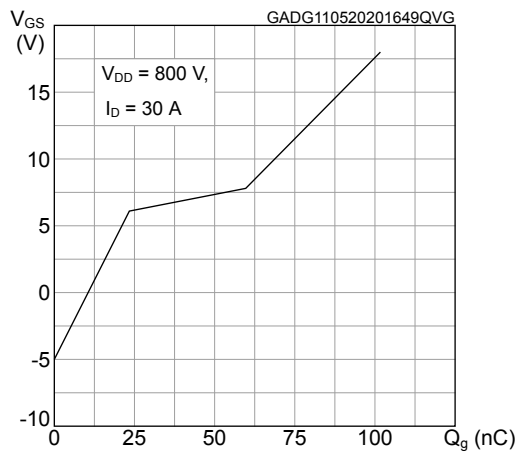


Figure 8. Typical capacitance characteristics

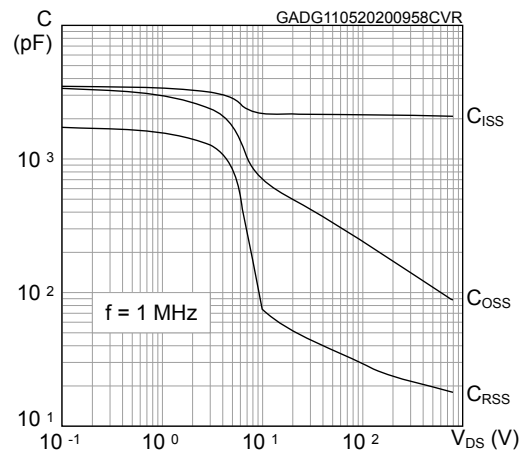


Figure 9. Typical switching energy vs drain current

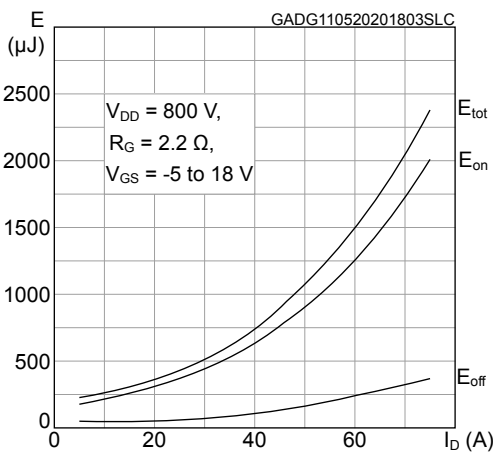


Figure 10. Typical switching energy vs temperature

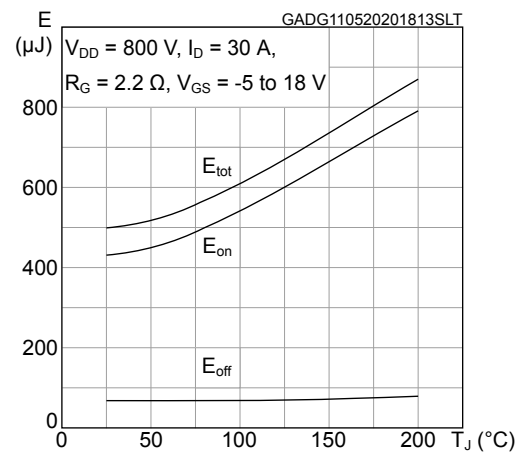


Figure 11. Normalized breakdown voltage vs temperature

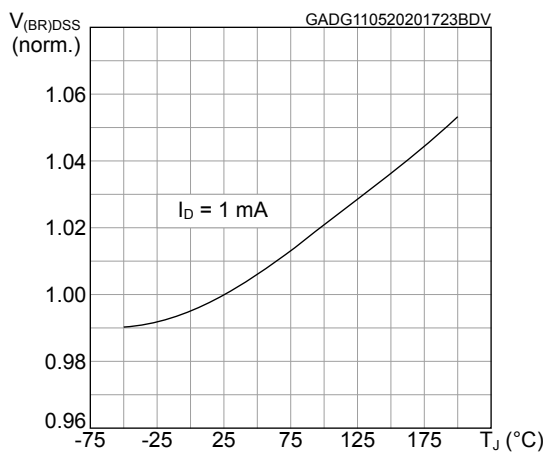


Figure 12. Normalized gate threshold vs temperature

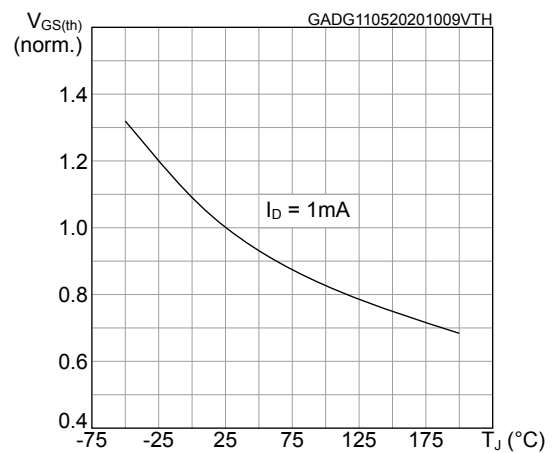


Figure 13. Normalized on-resistance vs temperature

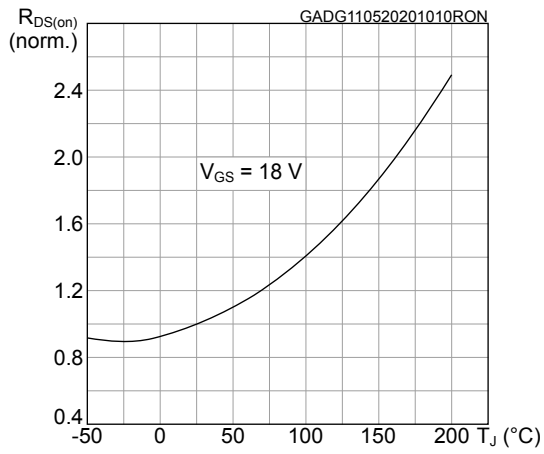


Figure 14. Typical reverse conduction characteristics ($T_J = 25\text{ }^\circ\text{C}$)

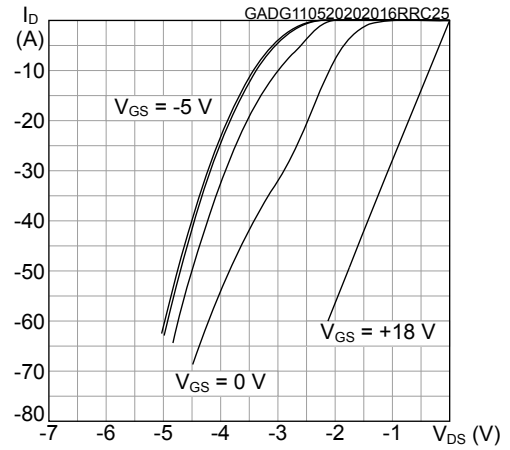
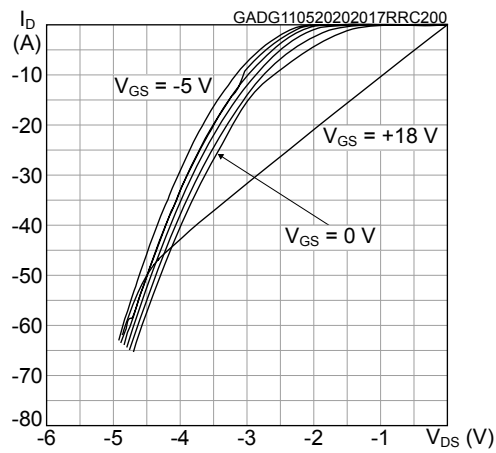


Figure 15. Typical reverse conduction characteristics ($T_J = 200\text{ }^\circ\text{C}$)

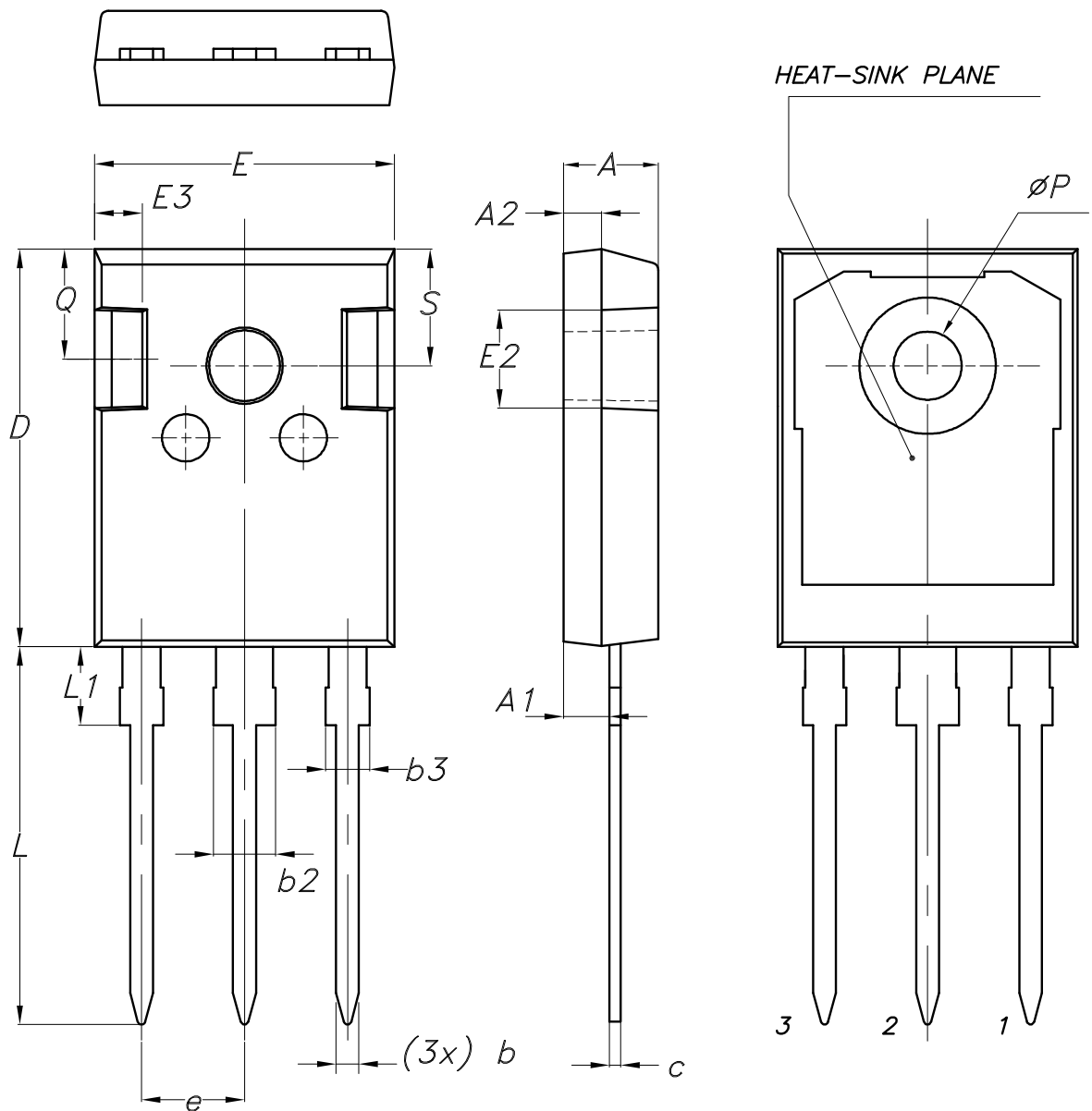


3 Package information

In order 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 16. HiP247 long leads package outline



8463846_2_F

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

Revision history

Table 9. Document revision history

Date	Version	Changes
16-Dec-2020	1	First release.

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