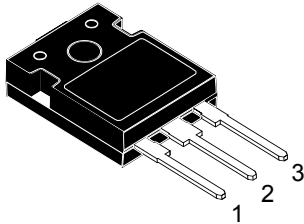
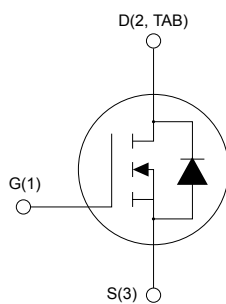


# Silicon carbide Power MOSFET 1200 V, 62 mΩ typ., 36 A in an HiP247 package


**HiP247**


AM01475v1\_noZen



## Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
SCTW40N120G2V	1200 V	100 mΩ	36 A

- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitance
- Very high operating junction temperature capability (T<sub>J</sub> = 200 °C)

## Applications

- Switching mode power supply
- DC-DC converters
- Industrial motor control

## Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 2<sup>nd</sup> 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

[SCTW40N120G2V](#)

### Product summary

<b>Order code</b>	SCTW40N120G2V
<b>Marking</b>	SCT40N120G2V
<b>Package</b>	HiP247
<b>Packing</b>	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 $T_C = 25\text{ °C}$	36	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	27	
$I_{DM}^{(1)}$	Drain current (pulsed)	108	A
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ °C}$	278	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	0.63	°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	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = -10\text{ to }22\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 1\text{ mA}$	1.90	2.45	4.90	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 18\text{ V}$ , $I_D = 20\text{ A}$		62	100	m $\Omega$
		$V_{GS} = 18\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 200\text{ °C}$		137		

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 800\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	1233	-	pF
$C_{oss}$	Output capacitance		-	56	-	pF
$C_{rss}$	Reverse transfer capacitance		-	15	-	pF
$R_G$	Intrinsic gate resistance	$f = 1\text{ MHz}$ , $I_D = 0\text{ A}$	-	1	-	$\Omega$
$Q_g$	Total gate charge	$V_{DD} = 800\text{ V}$ , $V_{GS} = -5\text{ to }18\text{ V}$ , $I_D = 20\text{ A}$	-	61	-	nC
$Q_{gs}$	Gate-source charge		-	13	-	nC
$Q_{gd}$	Gate-drain charge		-	25	-	nC

**Table 5. Switching energy (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}$	Turn-on switching energy	$V_{DD} = 800\text{ V}$ , $I_D = 20\text{ A}$ ,	-	243	-	$\mu\text{J}$
$E_{off}$	Turn-off switching energy	$R_G = 4.7\ \Omega$ , $V_{GS} = -5\text{ V to }18\text{ V}$	-	48	-	$\mu\text{J}$

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 800\text{ V}$ , $I_D = 20\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = -5\text{ to }18\text{ V}$	-	13.4	-	ns
$t_r$	Rise time		-	10.3	-	ns
$t_{d(off)}$	Turn-off delay time		-	22	-	ns
$t_f$	Fall time		-	7.9	-	ns

**Table 7. Reverse SiC diode characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}$	Diode forward voltage	$I_{SD} = 20\text{ A}$ , $V_{GS} = 0\text{ V}$	-	3.3	-	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 20\text{ A}$ , $di/dt = 2000\text{ A}/\mu\text{s}$ , $V_{DD} = 800\text{ V}$ , $V_{GS} = -5\text{ to }18\text{ V}$	-	15	-	ns
$Q_{rr}$	Reverse recovery charge		-	77	-	nC
$I_{RRM}$	Reverse recovery current		-	9	-	A

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

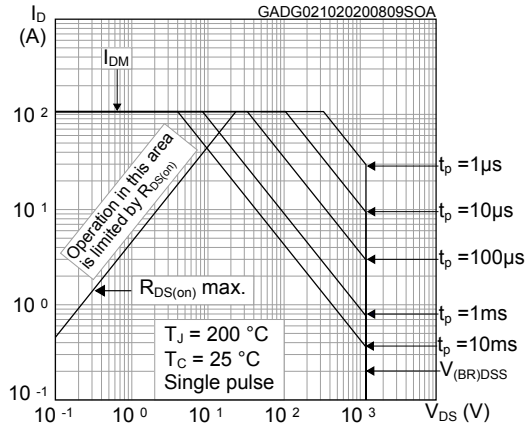


Figure 2. Maximum transient thermal impedance

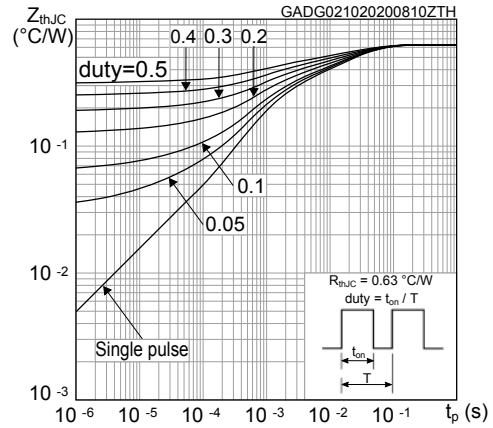


Figure 3. Typical output characteristics ( $T_J = 25^\circ\text{C}$ )

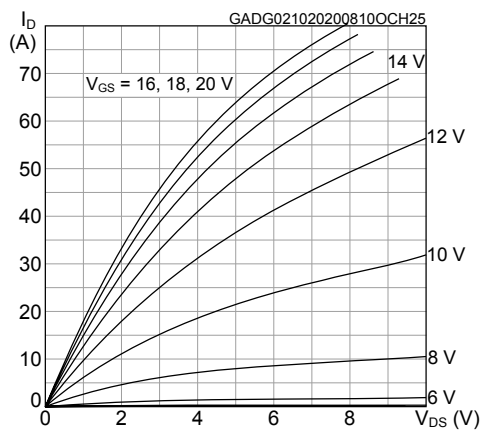


Figure 4. Typical output characteristics ( $T_J = 200^\circ\text{C}$ )

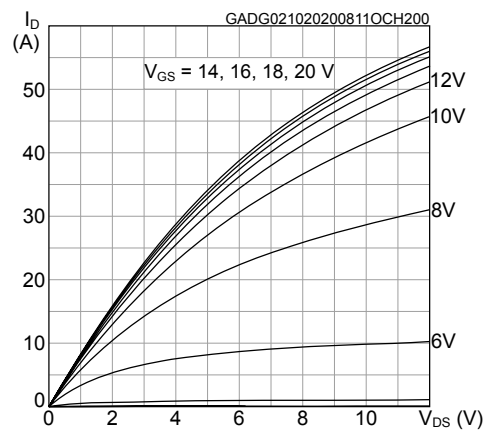


Figure 5. Typical transfer characteristics

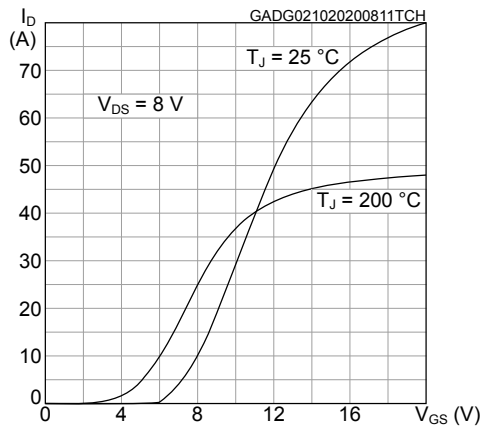


Figure 6. Total power dissipation

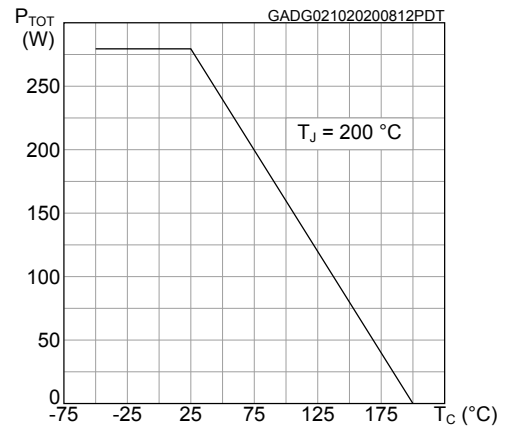


Figure 7. Typical gate charge characteristics

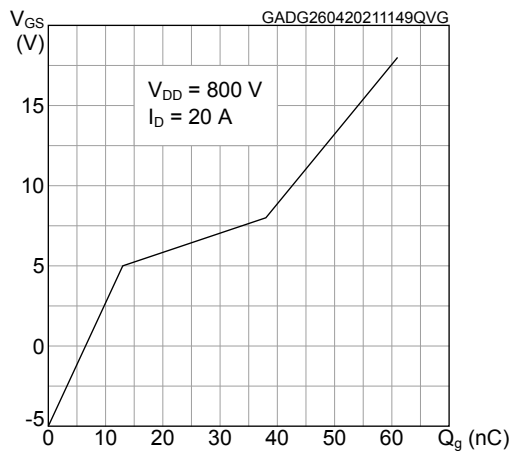


Figure 8. Typical capacitance characteristics

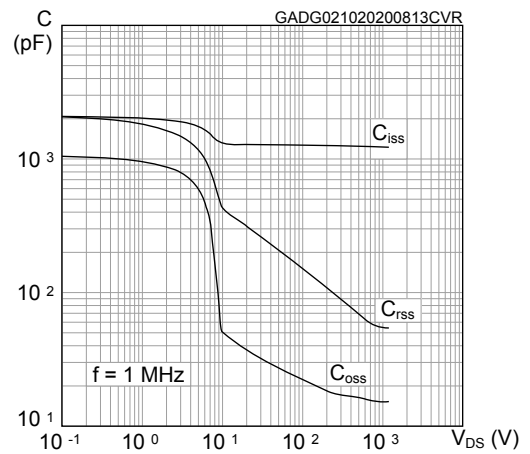


Figure 9. Typical switching energy vs drain current

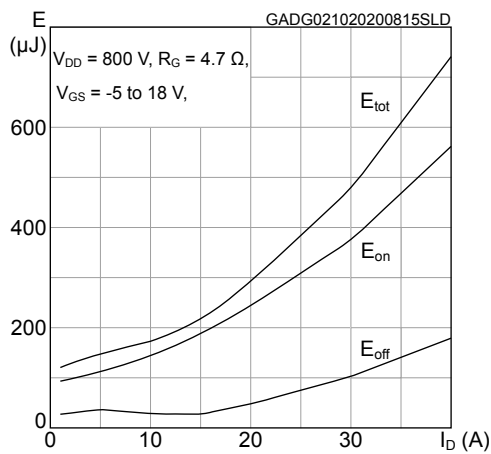


Figure 10. Typical switching energy vs junction temperature

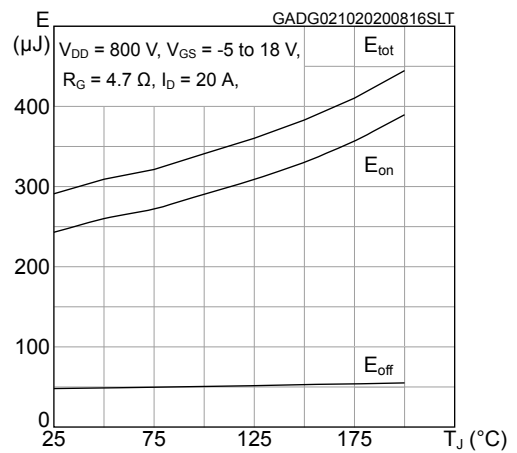


Figure 11. Normalized breakdown voltage vs temperature

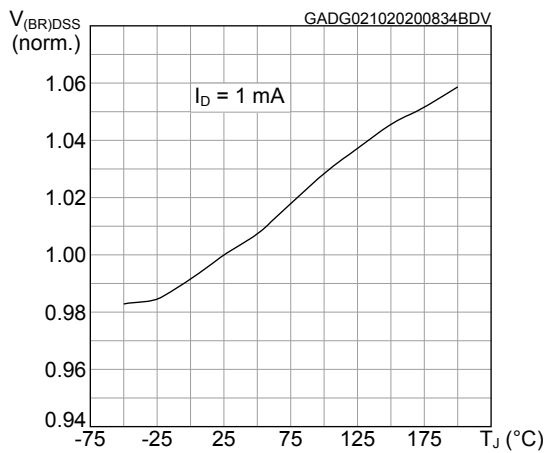


Figure 12. Normalized gate threshold vs temperature

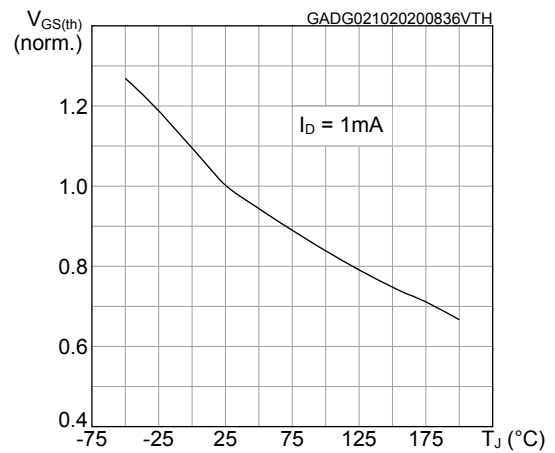


Figure 13. Normalized on-resistance vs temperature

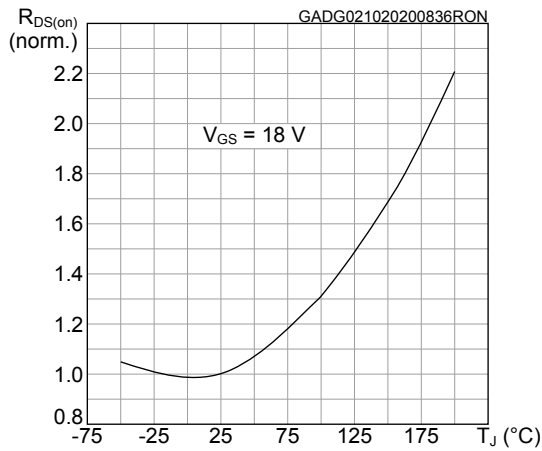


Figure 14. Typical reverse conduction characteristics ( $T_J = 25$  °C)

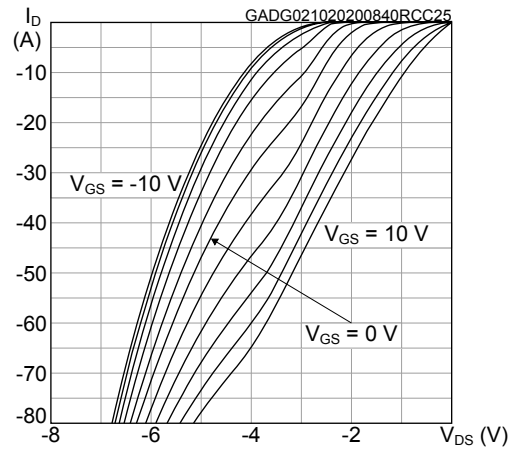


Figure 15. Typical reverse conduction characteristics ( $T_J = 200$  °C)

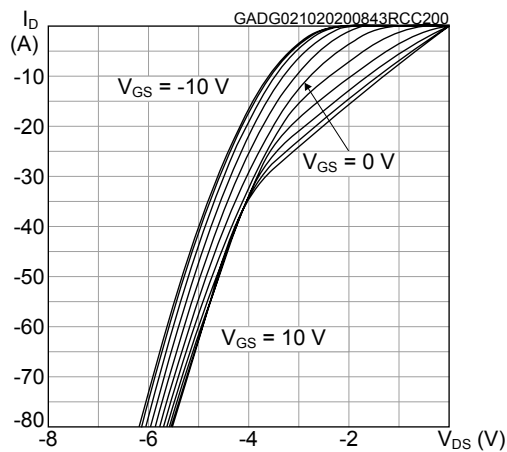
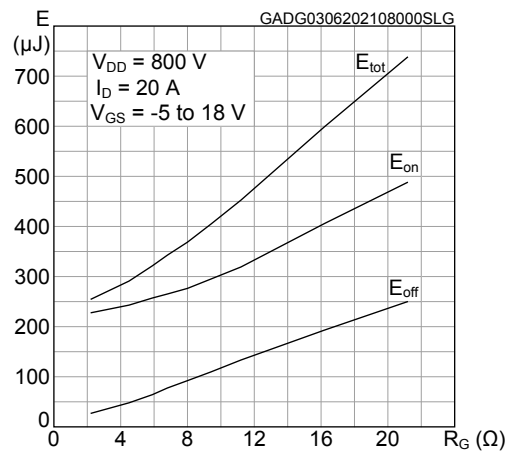


Figure 16. Typical switching energy vs gate resistance

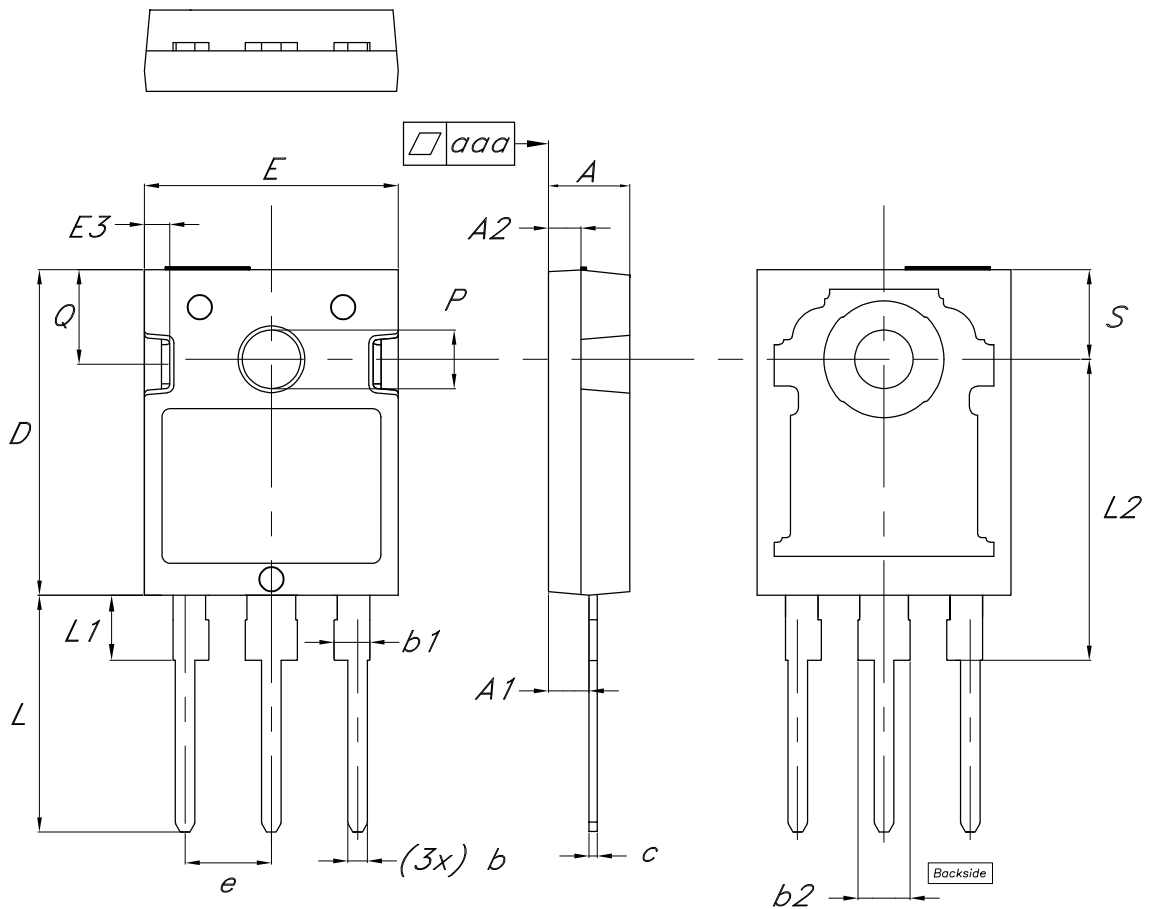


### 3 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

#### 3.1 HiP247 package information

Figure 17. 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	Version	Changes
08-Oct-2020	1	First release.
09-Jun-2021	2	Modified title, $R_{DS(on)}$ value, applications and description on cover page. Modified <a href="#">Table 2. Thermal data</a> and <a href="#">Table 3. On/off states</a> . Modified <a href="#">Section 2.1 Electrical characteristics (curves)</a> . Minor text changes.

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