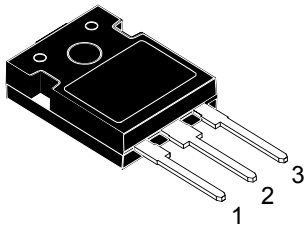
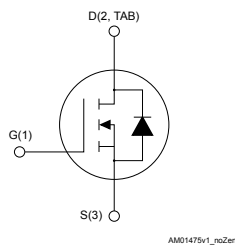


## Silicon carbide Power MOSFET 1700 V, 1.0 $\Omega$ typ., 7 A in an HiP247 package


**HiP247**


### Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
SCT1000N170	1700 V	1.3 $\Omega$	7 A

- High speed switching performance
- Very fast and robust intrinsic body diode
- Low capacitances
- Very high operating junction temperature capability ( $T_J = 200\text{ }^\circ\text{C}$ )

### Applications

- Auxiliary power supply for server
- Switch mode power supply

### 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, combined with the device's housing in the proprietary HiP247 package, allows 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

[SCT1000N170](#)

#### Product summary

<b>Order code</b>	SCT1000N170
<b>Marking</b>	SCT1000N170
<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	1700	V
$V_{GS}$	Gate-source voltage	-10 to 22	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ °C}$	7	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	5	
$I_{DM}^{(1)}$	Drain current (pulsed)	20	A
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ °C}$	96	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	1.83	°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	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	1700			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}, V_{DS} = 1700\text{ V}$			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	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	2.1	3.5		V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 20\text{ V}, I_D = 3\text{ A}$		1.0	1.3	$\Omega$
		$V_{GS} = 20\text{ V}, I_D = 3\text{ A}, T_J = 150\text{ °C}$		1.27		
		$V_{GS} = 20\text{ V}, I_D = 3\text{ A}, T_J = 200\text{ °C}$		1.66		

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 1000\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$	-	133	-	pF
$C_{oss}$	Output capacitance		-	11.3	-	pF
$C_{rss}$	Reverse transfer capacitance		-	3.4	-	pF
$R_g$	Gate input resistance	$f = 1\text{ MHz}, I_D = 0\text{ A}$	-	9.6	-	$\Omega$
$Q_g$	Total gate charge	$V_{DS} = 1000\text{ V}, I_D = 2\text{ A},$ $V_{GS} = -5\text{ V to }20\text{ V}$	-	13.3	-	nC
$Q_{gs}$	Gate-source charge		-	8.7	-	nC
$Q_{gd}$	Gate-drain charge		-	1.7	-	nC

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

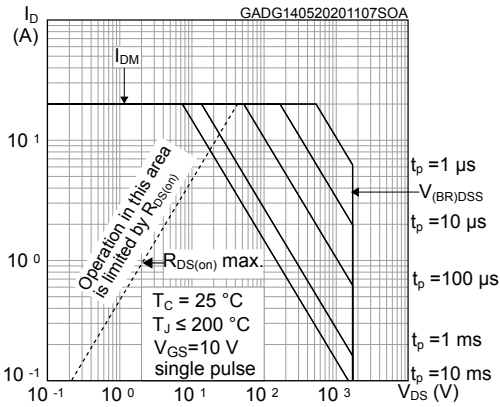
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}$	Turn-on switching energy	$V_{DD} = 1000\text{ V}, I_D = 2\text{ A}$	-	50	-	$\mu\text{J}$
$E_{off}$	Turn-off switching energy	$R_g = 10\ \Omega, V_{GS} = -5\text{ V to }20\text{ V}$	-	17	-	$\mu\text{J}$
$E_{on}$	Turn-on switching energy	$V_{DD} = 1000\text{ V}, I_D = 2\text{ A}, R_g = 10\ \Omega,$	-	65	-	$\mu\text{J}$
$E_{off}$	Turn-off switching energy	$V_{GS} = -5\text{ V to }20\text{ V}, T_J = 200\text{ °C}$	-	18	-	$\mu\text{J}$

**Table 6. Reverse SiC diode characteristics**

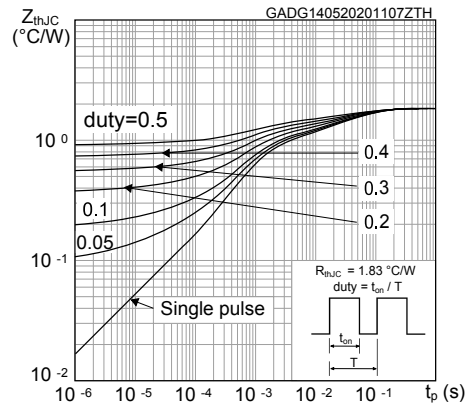
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}$	Diode forward voltage	$I_F = 3\text{ A}, V_{GS} = 0\text{ V}$	-	4.5	-	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 2\text{ A}, V_{GS} = 0\text{ V},$ $di/dt = 1000\text{ A}/\mu\text{s}, V_{DD} = 1000\text{ V}$	-	22	-	ns
$Q_{rr}$	Reverse recovery charge		-	92	-	nC
$I_{RRM}$	Reverse recovery current		-	7	-	A

## 2.1 Electrical characteristics (curves)

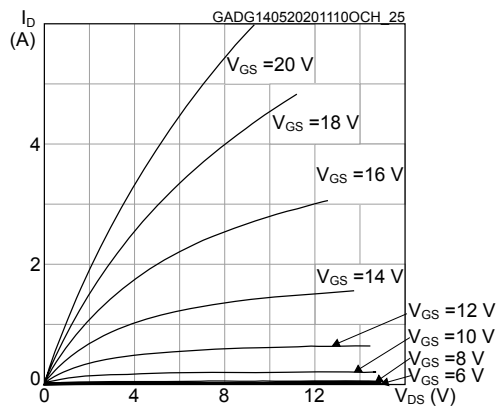
**Figure 1. Safe operating area**



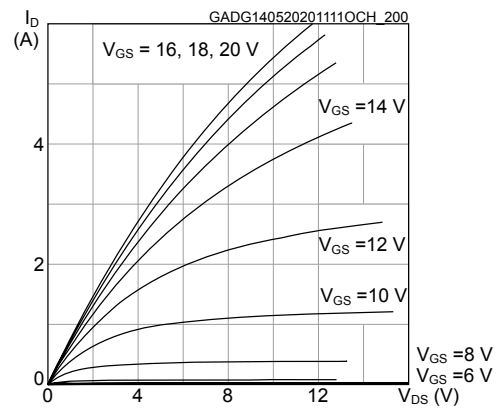
**Figure 2. Maximum transient thermal impedance**



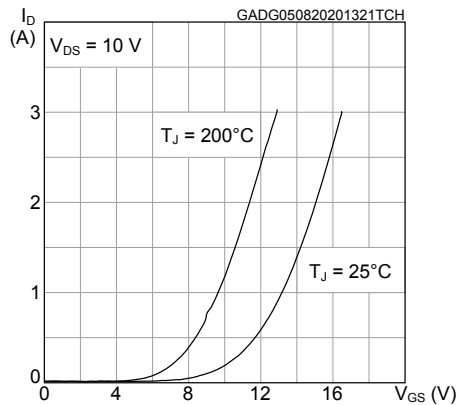
**Figure 3. Typical output characteristics (T<sub>J</sub> = 25 °C)**



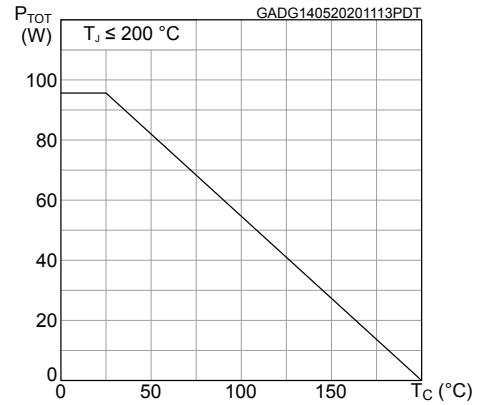
**Figure 4. Typical output characteristics (T<sub>J</sub> = 200 °C)**



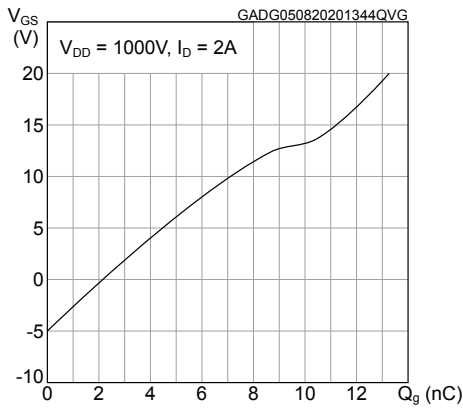
**Figure 5. Typical transfer characteristics**



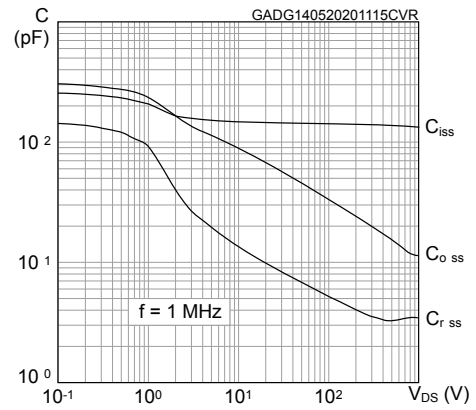
**Figure 6. Total power dissipation**



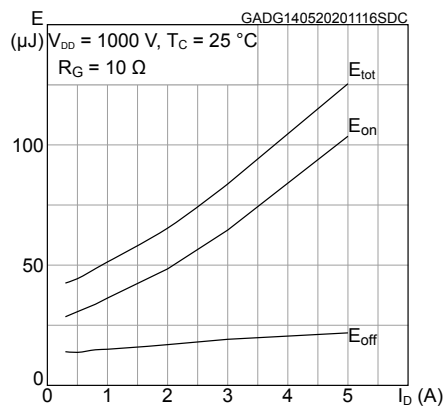
**Figure 7. Typical gate charge characteristics**



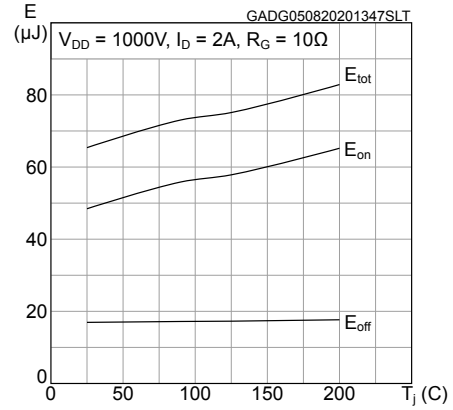
**Figure 8. Typical capacitance characteristics**



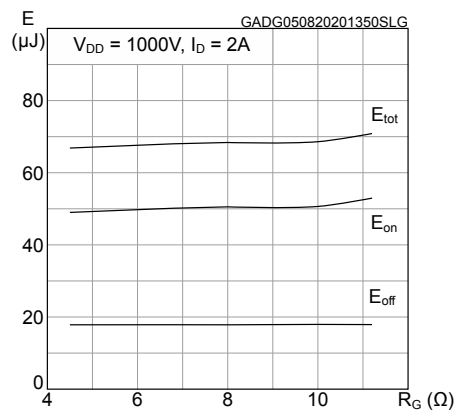
**Figure 9. Typical switching energy vs I\_D**



**Figure 10. Typical switching energy vs temperature**



**Figure 11. Typical switching energy vs R\_G**



**Figure 12. Typical drain-source on-resistance**

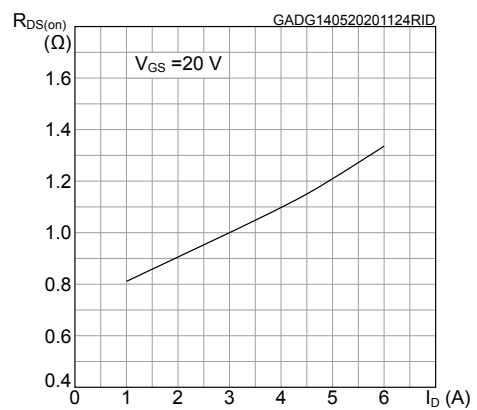


Figure 13. Normalized breakdown voltage vs temperature

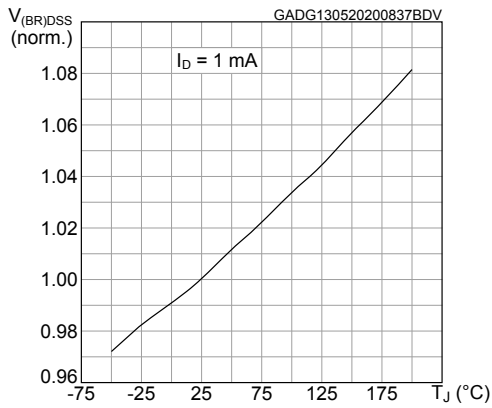


Figure 14. Normalized gate threshold vs temperature

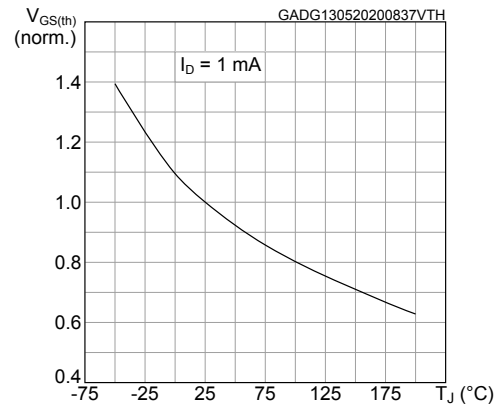


Figure 15. Normalized on-resistance vs temperature

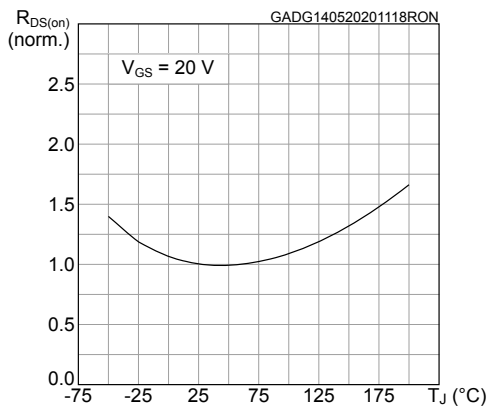


Figure 16. Typical reverse conduction characteristics ( $T_J = 25^{\circ}C$ )

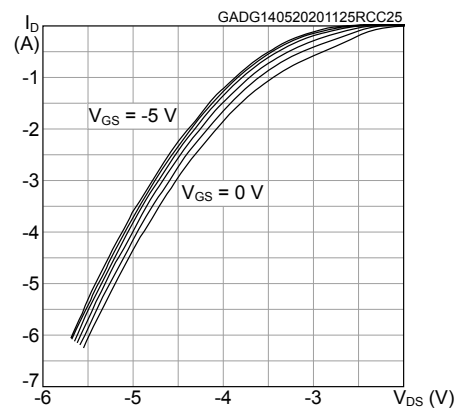
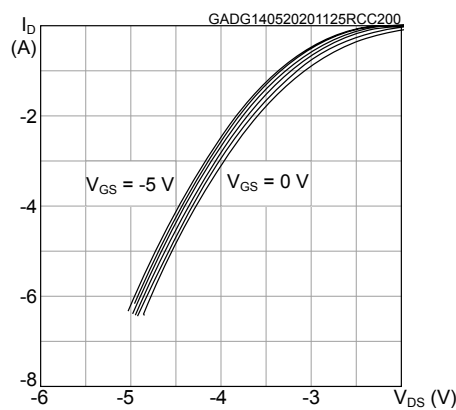


Figure 17. Typical reverse conduction characteristics ( $T_J = 200^{\circ}C$ )

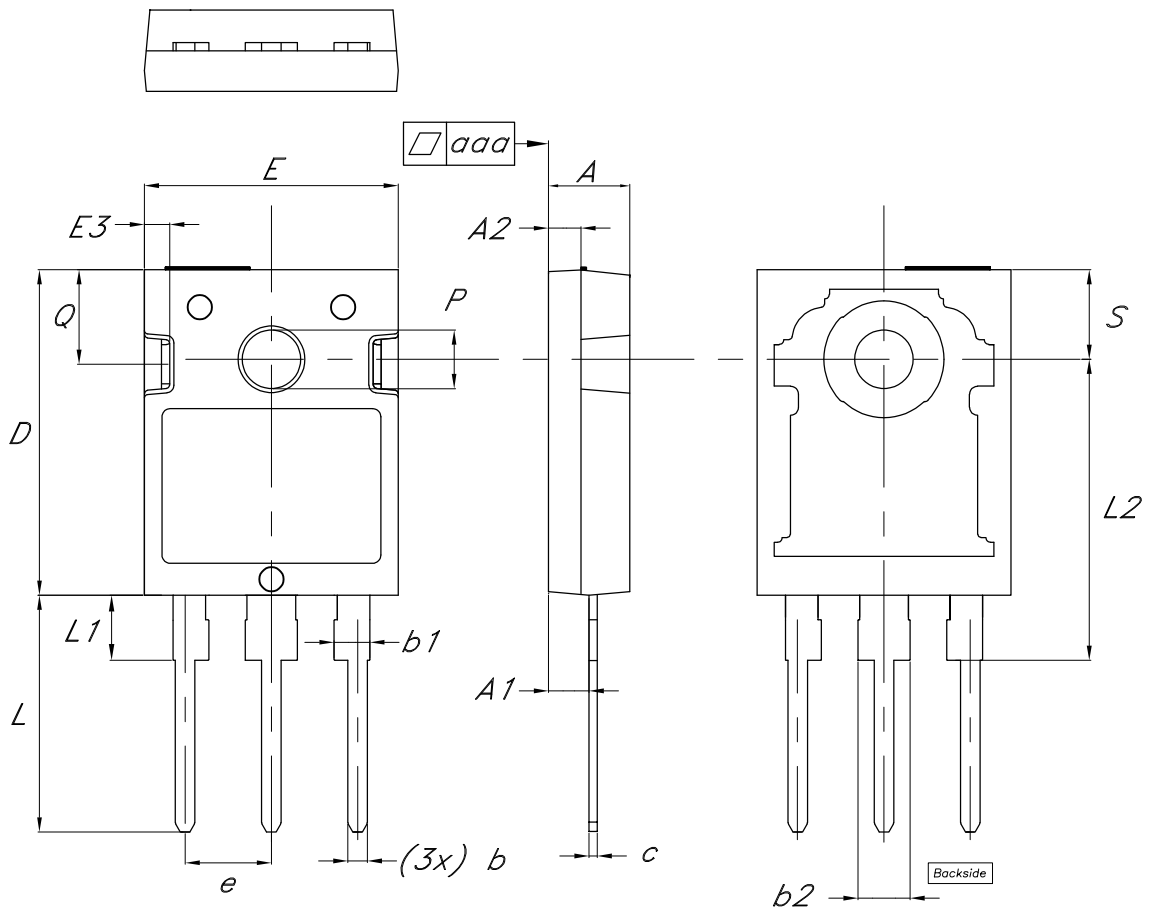


### 3 Package information

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

#### 3.1 HiP247 package information

Figure 18. HiP247 package outline



8581091\_4

**Table 7. 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 8. Document revision history**

Date	Revision	Changes
29-Jul-2015	1	First release.
10-Feb-2017	2	Updated title and features on cover page. Updated <i>Section 1: "Electrical ratings"</i> and <i>Section 2: "Electrical characteristics"</i> . Minor text changes.
04-Aug-2020	3	Updated <i>Section 1 Electrical ratings</i> . Updated <i>Section 2 Electrical characteristics</i> . Updated <i>Section 2.1 Electrical characteristics (curves)</i> . Updated <i>Section 3.1 HiP247 package</i> . Minor text changes.
26-Apr-2021	4	Updated title and <i>Features</i> in cover page. Updated <i>Table 2. Thermal data</i> . Updated <i>Table 3. On/off states</i> . Updated <i>Section 3 Package information</i> .
30-Apr-2021	5	Updated <i>Features</i> in cover page. Updated <i>Table 1. Absolute maximum ratings</i> . Updated <i>Table 3. On/off states</i> .

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