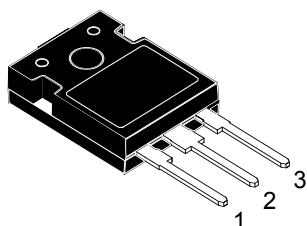
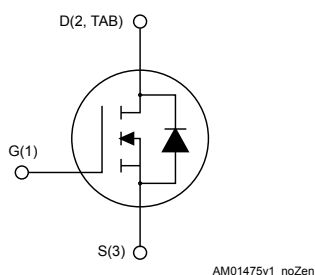


Silicon carbide Power MOSFET 650 V, 55 mΩ typ., 45 A in an HiP247 package



HiP247



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
SCTW35N65G2V	650 V	67 mΩ	45 A

- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitance
- Very high operating junction temperature capability (T_J = 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 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

[SCTW35N65G2V](#)

Product summary

Order code	SCTW35N65G2V
Marking	SCTW35N65G2V
Package	HiP247
Packing	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	650	V
V_{GS}	Gate-source voltage	-10 to 22	V
	Gate-source voltage (recommended operating range)	-5 to 20	
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	45	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	35	
$I_{DM}^{(1)}$	Drain current (pulsed)	90	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	240	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	0.72	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	40	°C/W

2 Electrical characteristics

($T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise specified).

Table 3. On/off-states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	650			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 650\text{ V}$			5	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	$V_{DS} = V_{GS}$, $I_D = 1\text{ mA}$	1.8	3.2	5.0	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 20\text{ V}$, $I_D = 20\text{ A}$		45	67	m Ω
		$V_{GS} = 18\text{ V}$, $I_D = 20\text{ A}$		55		
		$V_{GS} = 20\text{ V}$, $I_D = 20\text{ A}$, $T_J = 200\text{ }^{\circ}\text{C}$		68		

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{GS} = 0\text{ V}$, $V_{DS} = 400\text{ V}$, $f = 1\text{ MHz}$	-	1370	-	pF
C_{oss}	Output capacitance		-	125	-	pF
C_{rss}	Reverse transfer capacitance		-	30	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$	-	2	-	Ω
Q_g	Total gate charge	$V_{DD} = 400\text{ V}$, $I_D = 20\text{ A}$, $V_{GS} = 0\text{ to }20\text{ V}$	-	73	-	nC
Q_{gs}	Gate-source charge		-	14	-	nC
Q_{gd}	Gate-drain charge		-	27	-	nC

Table 5. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	$V_{DD} = 400\text{ V}$, $I_D = 20\text{ A}$,	-	100	-	μJ
E_{off}	Turn-off switching energy	$R_G = 4.7\text{ }\Omega$, $V_{GS} = -5\text{ to }20\text{ V}$	-	35	-	μJ

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400\text{ V}$, $I_D = 20\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = -5\text{ to }20\text{ V}$	-	16	-	ns
t_f	Fall time		-	14	-	ns
$t_{d(off)}$	Turn-off delay time		-	35	-	ns
t_r	Rise time		-	9	-	ns

Table 7. Reverse diode characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD}	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_F = 20\text{ A}$,	-	3.3	-	V
t_{rr}	Reverse recovery time	$V_{DD} = 400\text{ V}$, $I_F = 20\text{ A}$, $di/dt = 1000\text{ A}/\mu\text{s}$	-	18	-	ns
Q_{rr}	Reverse recovery charge		-	85	-	nC
I_{RRM}	Reverse recovery current		-	7	-	A

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

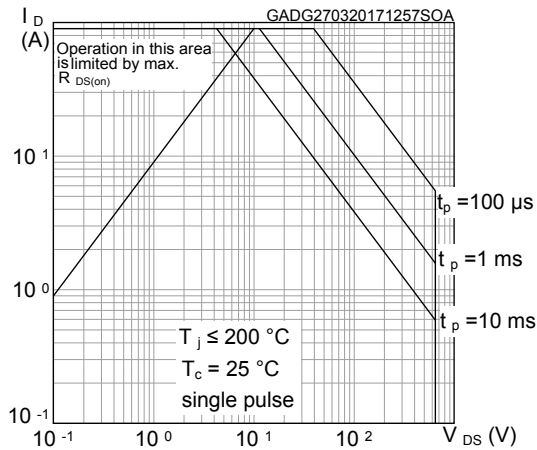


Figure 2. Thermal impedance

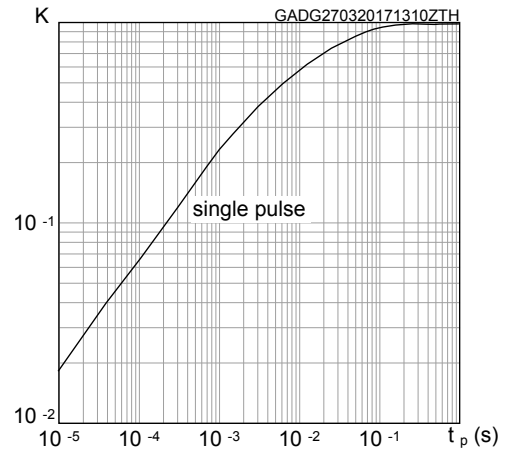


Figure 3. Output characteristics (T_J = 25 °C)

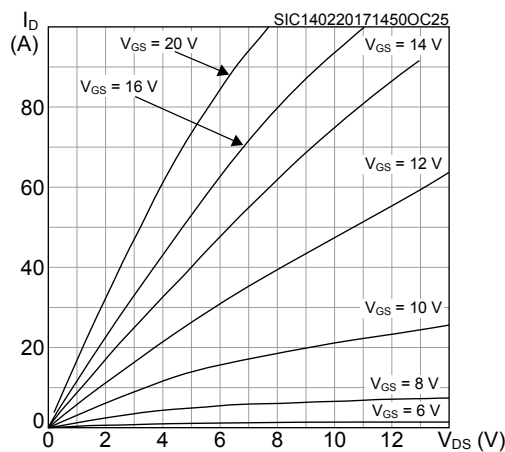


Figure 4. Output characteristics (T_J = 175 °C)

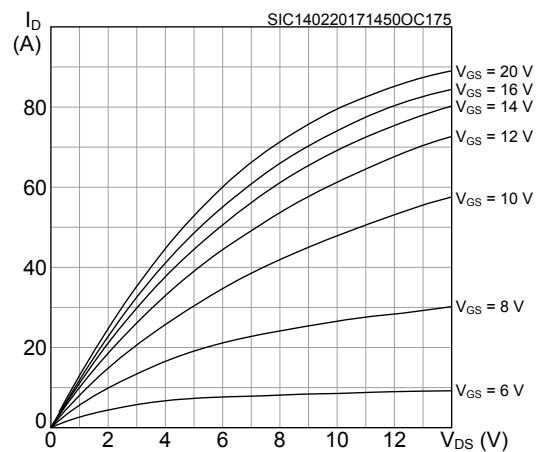


Figure 5. Transfer characteristics

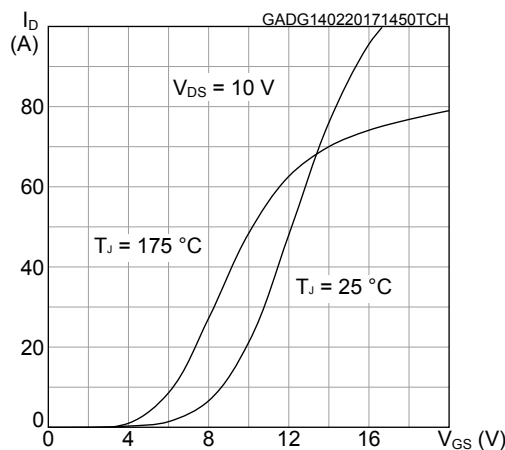


Figure 6. Total power dissipation

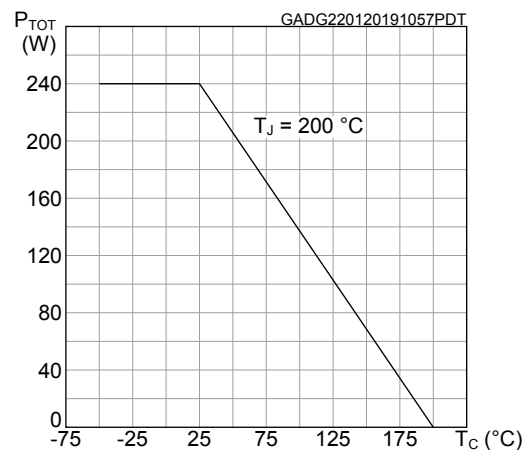


Figure 7. Gate charge vs gate-source voltage

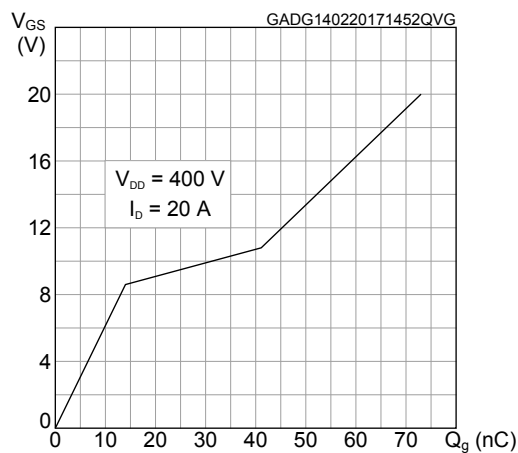


Figure 8. Capacitance variations

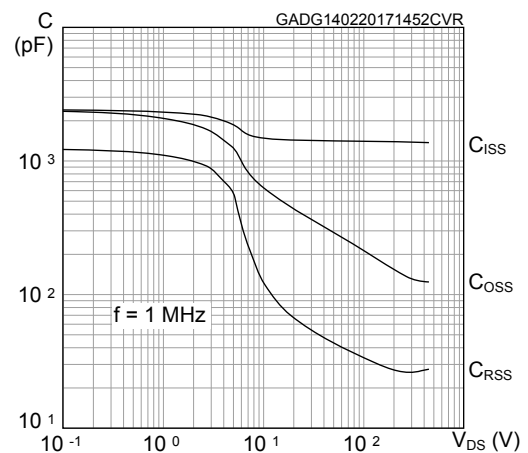


Figure 9. Switching energy vs drain current

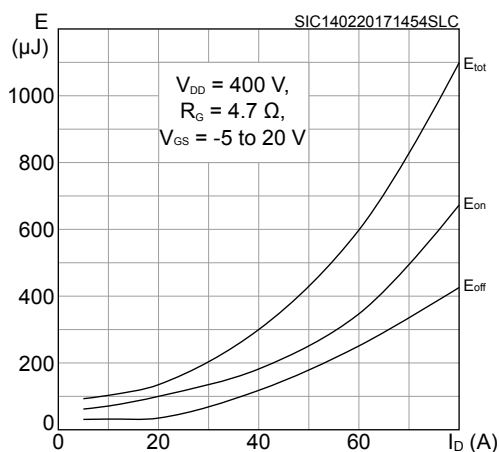


Figure 10. Switching energy vs junction temperature

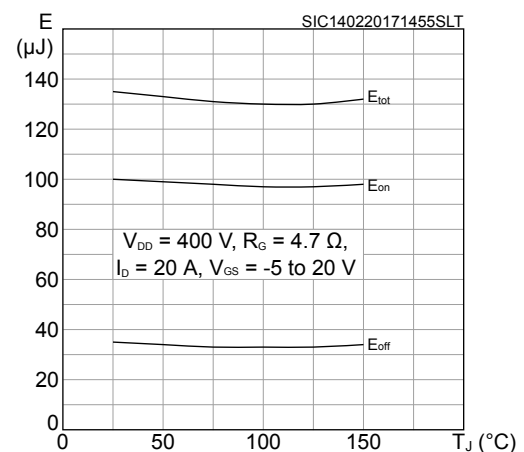


Figure 11. Normalized $V_{(BR)DSS}$ vs temperature

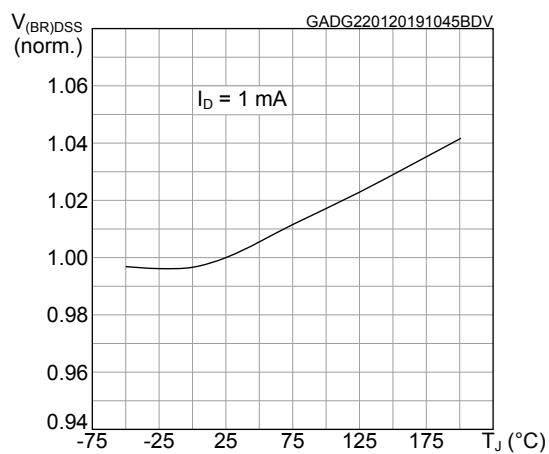


Figure 12. Normalized gate threshold voltage vs temperature

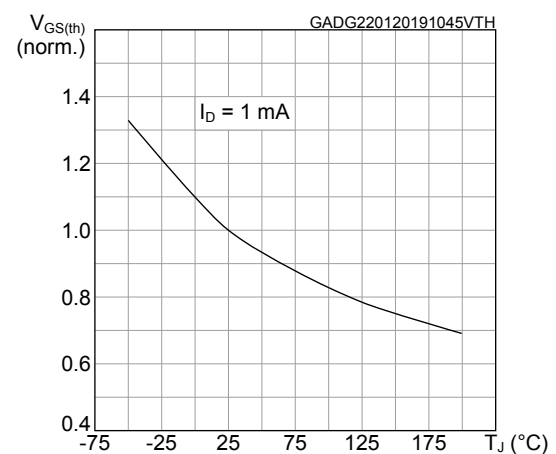


Figure 13. Normalized on-resistance vs temperature

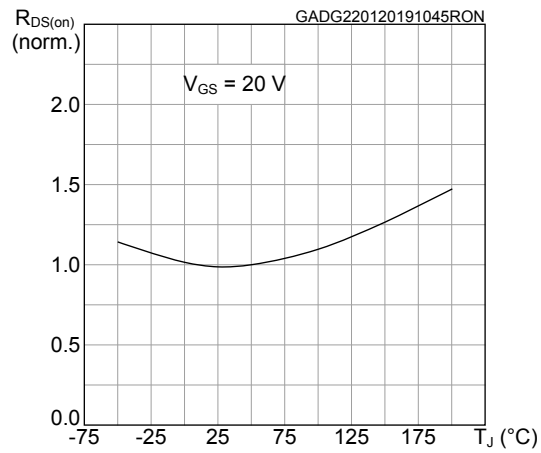


Figure 14. Reverse conduction characteristics ($T_J = 25\text{ }^{\circ}\text{C}$)

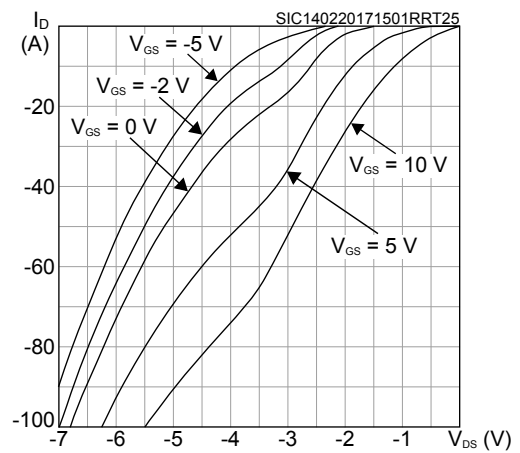
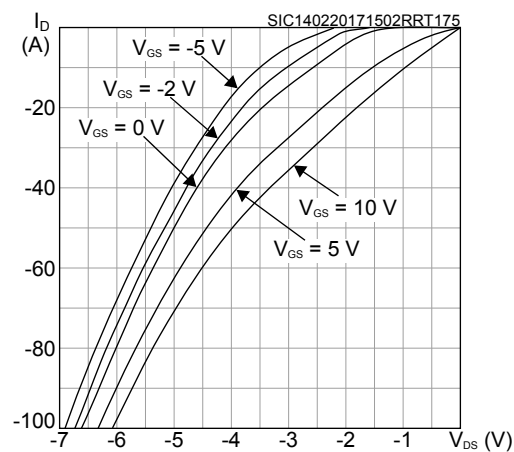


Figure 15. Reverse conduction characteristics ($T_J = 175\text{ }^{\circ}\text{C}$)

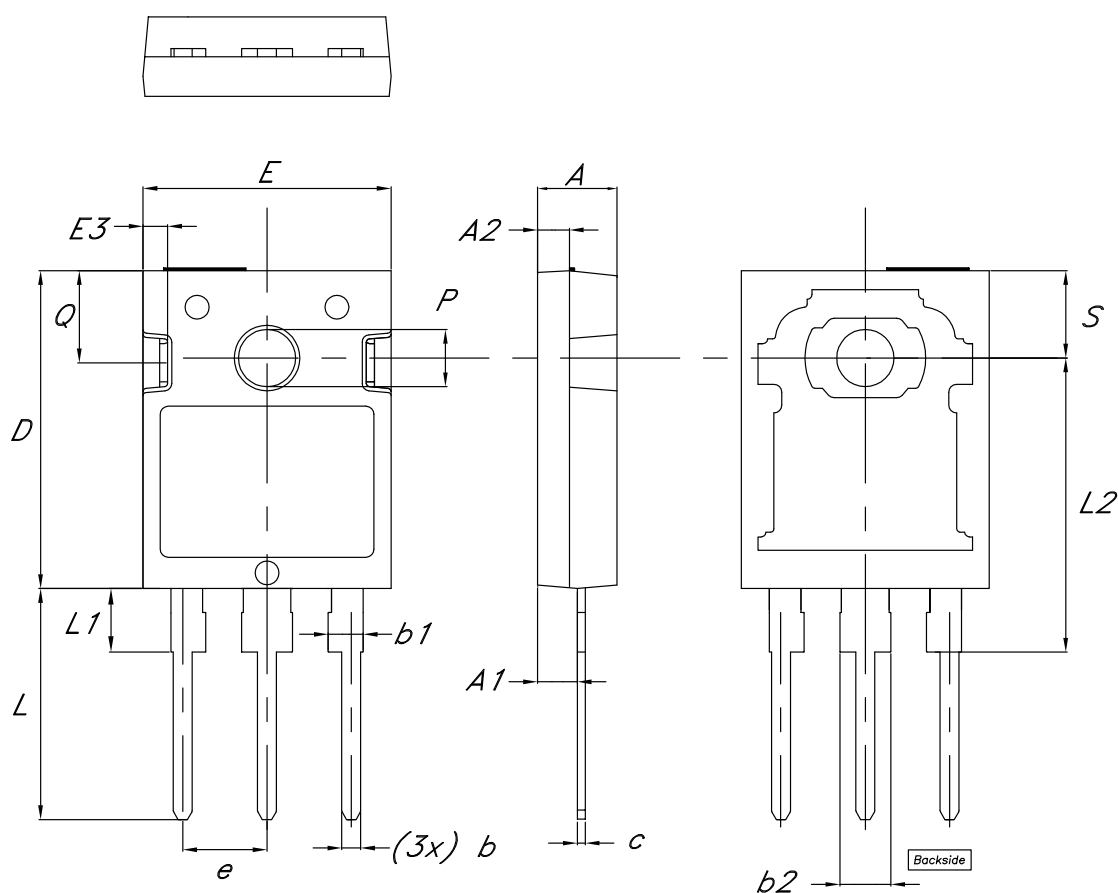


3 Package information

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 package information

Figure 16. HiP247 package outline



8581091_2

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

Revision history

Table 9. Document revision history

Date	Revision	Changes
31-Mar-2017	1	First release
12-Dec-2017	2	Modified title. Modified <i>Table 4: "On/off-states"</i> . Minor text changes.
04-Oct-2019	3	Updated title, features and description in cover page. Removed maturity status indication from cover page. The document status is production data. Updated <i>Section 3.1 HiP247 package information</i> . Content reworked to improve readability.
20-Dec-2019	4	Updated <i>Table 1. Absolute maximum ratings</i> . Minor text changes.
25-Jan-2021	5	Updated features and applications in cover page. Updated Table 3. On/off-states . Updated V_{SD} value from 4.5 V to 3.3 V in Table 7. Reverse diode characteristics . Minor text changes.

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