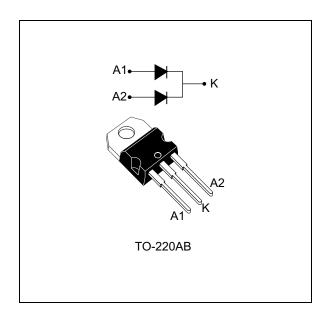
life.augmented

STPSC16H065C

650 V power Schottky silicon carbide diode

Datasheet - production data



Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- High forward surge capability
- ECOPACK[®]2 compliant component

Description

The SiC diode is an ultrahigh performance power Schottky diode. It is manufactured using a silicon carbide substrate. The wide band-gap material allows the design of a Schottky diode structure with a 650 V rating. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimized capacitive charge at turn-off behavior is independent of temperature.

Especially suited for use in interleaved or bridgeless topologies, this dual-diode rectifier will boost the performance in hard switching conditions. Its high forward surge capability ensures a good robustness during transient phases.

Table 1. Device summary

Symbol	Value
I _{F(AV)}	2 x 8 A
V _{RRM}	650 V
T _j (max)	175 °C

Characteristics STPSC16H065C

1 Characteristics

Table 2. Absolute ratings (limiting values per diode at 25 °C unless otherwise specified)

	5 \	•		•	•
Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage	Repetitive peak reverse voltage			V
I _{F(RMS)}	Forward rms current			22	Α
	Average forward current	$T_{\rm C} = 140 {}^{\circ}{\rm C}^{(1)}, {\rm DC}$	Per diode	8	Α
I _{F(AV)}	Average forward current	$T_{\rm C} = 135 {}^{\circ}{\rm C}^{(2)}, {\rm DC}$	Per device	16	Α
		t_p = 10 ms sinusoidal, T_c = 25 °C		75	
I_{FSM}	Surge non repetitive forward current	$t_p = 10 \text{ ms sinusoidal}, T_c = 125 °C$		69	Α
		$t_p = 10 \mu s \text{ square}, T_c = 25 \text{ °C}$		420	
I_{FRM}	Repetitive peak forward current	$T_c = 140 {}^{\circ}C^{(1)}, T_j = 175 {}^{\circ}C, \delta = 0.1$		34	Α
T _{stg}	Storage temperature range			-65 to +175	°C
T _i	Operating junction temperature ⁽³⁾			-40 to +175	°C

^{1.} Value based on $R_{th(j-c)}$ max (per diode)

Table 3. Thermal resistance parameters

Symbol	Parameter		Тур.	Max.	Unit
В	Junction to case	Per diode	1.3	1.6	
R _{th(j-c)}	Junction to case	Per device	0.8	0.95	°C/W
R _{th(c)}	Coupling		-	0.3	

When the diodes 1 and 2 are used simultaneously:

 ΔT_i (diode 1) = P(diode1) x R_{th(j-c)}(Per diode) + P(diode2) x R_{th(c)}

Table 4. Static electrical characteristics (per diode)

Symbol	Parameter	Tests conditions		Min.	Тур.	Max.	Unit
I _R ⁽¹⁾	Reverse leakage current	T _j = 25 °C	V - V	-	7	80	۸
'R`	Reverse leakage current	T _j = 150 °C	$V_R = V_{RRM}$	-	65	335	μΑ
V _E (2)	Forward voltage drop	T _j = 25 °C	- I _F = 8A	-	1.56	1.75	V
v F ` ′	V _F ⁽²⁾ Forward voltage drop	T _j = 150 °C		-	1.98	2.5	V

^{1.} $t_p = 10 \text{ ms}, \delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 1.35 \times I_{F(AV)} + 0.144 \times I_{F^{2}(RMS)}$$

^{2.} Value based on $R_{\text{th(j-c)}}$ max (per device)

^{3.} $\frac{dPtot}{dT_i} < \frac{1}{Rth(i-a)}$ condition to avoid thermal runaway for a diode on its own heatsink

^{2.} $t_p = 500 \ \mu s, \ \delta < 2\%$

STPSC16H065C Characteristics

Table 5. D	ynamic electrical	characteristics	(perdiode)
Iable J. D	VIIaiiiic Electiica	Cital actel istics	(peraroue)

Symbol	Parameter	Test conditions	Тур.	Unit
Q _{cj} ⁽¹⁾	Total capacitive charge	V _R = 400 V	23.5	nC
Ci	Total capacitance	$V_R = 0 \text{ V}, T_c = 25 \text{ °C}, F = 1 \text{ MHz}$	414	pF
	Total Capacitatice	$V_R = 400 \text{ V}, T_c = 25 \text{ °C}, F = 1 \text{ MHz}$	38	PΓ

^{1.} Most accurate value for the capacitive charge: $Q_{cj} = \int_0^{v_{OUT}} c_{j}^{OUT} dv_{R}$

Figure 1. Forward voltage drop versus forward current (typical values, low level, per diode)

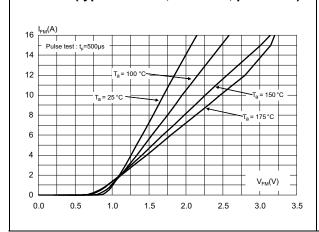


Figure 2. Forward voltage drop versus forward current (typical values, high level, per diode)

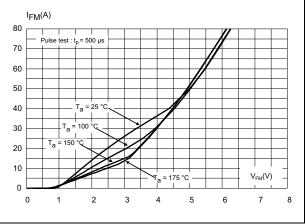


Figure 3. Reverse leakage current versus reverse voltage applied (typical values, per diode)

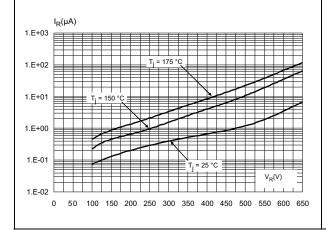
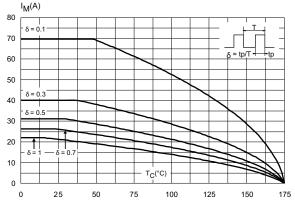


Figure 4. Peak forward current versus case temperature (per diode)



Characteristics STPSC16H065C

Figure 5. Junction capacitance versus reverse voltage applied (typical values, per diode C_j(pF) 500 F = 1 MHz 450 V_{OSC} = 30 mV_{RMS} 400 T_j = 25 °C 350 300 250 200 150 100 50 $V_R(V)$ 0 0.1 1.0 10.0 100.0 1000.0

Figure 6. [Relative variation of thermal impedance junction to case versus pulse duration

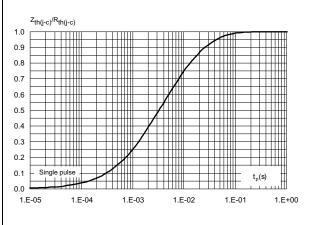


Figure 7. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform, per diode)

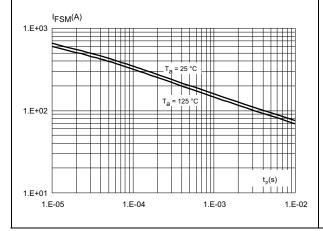
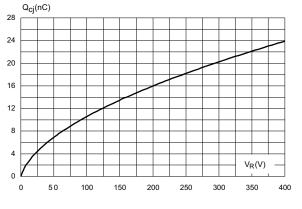


Figure 8. Total capacitive charges versus reverse voltage applied (typical values, per diode)



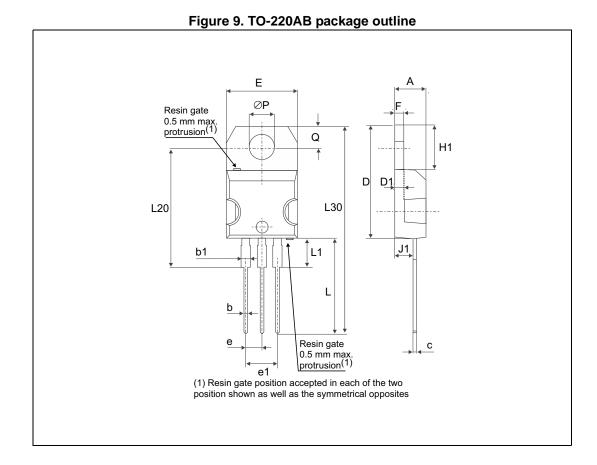
4/8 DocID024810 Rev 5

2 Package information

- Epoxy meets UL94, V0
- Cooling method: conduction (C)
- Recommended torque value: 0.4 to 0.6 N⋅m

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.

2.1 TO-220AB package information



Package information STPSC16H065C

Table 6. TO-220AB package mechanical data

			Dimer	nsions		
Ref.		Millimeters				
	Тур.	Min.	Max.	Тур.	Min.	Max.
Α		4.40	4.60		0.17	0.18
b		0.61	0.88		0.024	0.035
b1		1.14	1.70		0.045	0.067
С		0.48	0.70		0.019	0.027
D		15.25	15.75		0.60	0.62
D1	1.27			0.05		
E		10	10.40		0.39	0.41
е		2.40	2.70		0.094	0.106
e1		4.95	5.15		0.19	0.20
F		1.23	1.32		0.048	0.052
H1		6.20	6.60		0.24	0.26
J1		2.40	2.72		0.094	0.107
L		13	14		0.51	0.55
L1		3.50	3.93		0.137	0.154
L20	16.40			0.64		
L30	28.90			1.13		
ØP		3.75	3.85		0.147	0.151
Q		2.65	2.95		0.104	0.116

^{1.} Values in inches are converted from mm and rounded to 4 decimal digits.

3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPSC16H065CT	STPSC16H065CT	TO-220AB	1.86 g	50	Tube

4 Revision history

Table 8. Document revision history

Date	Revision Changes	
24-Jun-2013	1	First issue.
07-Nov-2013	2	Updated Figure 1 and Figure 2.
20-Mar-2014	3	Updated Table 3.
02-Nov-2015	4	Updated cover page and Table 7. Format updated to current standard.
07-Dec-2015	5	Updated Table 7.

IMPORTANT NOTICE - PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2015 STMicroelectronics - All rights reserved

DocID024810 Rev 5