

STPSC10TH13TI

Dual 650 V power Schottky silicon carbide diode in series

Datasheet - production data



Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- Suited for specific bridge-less topologies
- High forward surge capability
- Insulated package:
 - Capacitance: 7 pF
 - Insulated voltage: 2500 V rms

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 minimal capacitive turn-off behavior is independent of temperature.

Especially suited for use in specific bridge-less topologies, this dual 650 V 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 (per diode)

Symbol	Value
I _{F(AV)}	10 A
V _{RRM}	650 V
T _j (max.)	175 °C

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This is information on a product in full production.

1 Characteristics

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

Symbol	Par	Value	Unit	
V _{RRM}	Repetitive peak reverse voltage		650	V
I _{F(RMS)}	Forward rms current		22	А
I _{F(AV)}	Average forward current	$T_c = 70 \ ^{\circ}C^{(1)}$, DC current	10	А
	Owners and the former of	$t_p = 10 \text{ ms sinusoidal}, T_c = 25 \text{ °C}$	90	
I _{FSM}	Surge non repetitive forward current	$t_p = 10$ ms sinusoidal, $T_c = 125$ °C	80	А
	Current	$t_p = 10 \ \mu s$ sinusoidal, $T_c = 25 \ ^{\circ}C$	470	
I _{FRM}	Repetitive peak forward current	$T_c = 70 \ ^{\circ}C^{(1)}, \ \delta = 0.1$	41	А
T _{stg}	Storage temperature range		-55 to +175	°C
Тj	Operating junction temperature (2)	-40 to +175	°C

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

2. $\frac{dPtot}{dTj} < \frac{1}{Rth(j-a)}$ condition to avoid thermal runaway for a diode on its own heatsink

 Table 3. Thermal resistance

Symbol	Parameter		Тур.	Max.	Unit
D	Junction to case	Per diode	3.1	4.1	°C/W
R _{th(j-c)}	th(j-c) Junction to case	Total	1.8	2.3	C/VV
R _{th(c)}				0.5	°C/W

When the diodes are used simultaneously:

 $\Delta T_{j(diode1)} = P_{(diode1)} \times R_{th(j-c)}$ (per diode) + $P_{(diode2)} \times R_{th(c)}$

Table 4. Static electrica	I characteristics	(per die	ode)
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Symbol	Parameter	Tests conditions		Min.	Тур.	Max.	Unit
I _R ⁽¹⁾	Reverse leakage	T _j = 25 °C	V - V	-	9	100	μA
'R `	current	$T_j = 150 \text{ °C}$ $V_R = V_{RI}$	V _R = V _{RRM}	-	85	425	μΑ
V _F ⁽²⁾	Forward voltage drop	T _j = 25 °C	I _F = 10A	-	1.56	1.75	V
VF ($V_F^{(2)}$ Forward voltage drop $T_j = 150$	T _j = 150 °C	IF = TOA	-	1.98	2.5	v

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

2. Pulse test: t_p = 500 µs, δ < 2%

To evaluate the conduction losses use the following equation:

 $P = 1.35 \text{ x } I_{F(AV)} + 0.115 \text{ x } I_{F}^{2}(RMS)$



Symbol	Parameter	Test conditions	Тур.	Unit
Q _{cj} ⁽¹⁾	Total capacitive charge	V _R = 400 V	28.5	nC
C	C _i Total capacitance	$V_{R} = 0 \text{ V}, \text{ T}_{c} = 25 \text{ °C}, \text{ F} = 1 \text{ MHz}$	480	pF
U j		V_{R} = 400 V, T_{c} = 25 °C, F = 1 MHz	48	μr

Table 5. Dynamic electrical	characteristics (per diode)
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1. Most accurate value for the capacitive charge: $Q_{cj} = \int_{0}^{V_{OUT}} c_{j}(v_{R}).dv_{R}$







2 Package information

- Epoxy meets UL94, V0
- Lead-free package
- Cooling method: by 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 Insulated TO-220AB package information







Dimensions						
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
А	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
В	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
С	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
е	2.40		2.70	0.094		0.106
F	6.20		6.60	0.244		0.259
ØI	3.75		3.85	0.147		0.151
14	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
12	1.14		1.70	0.044		0.066
13	1.14		1.70	0.044		0.066
М		2.60			0.102	

Table 6. Insulated TO-220AB package mechanical data



3 Ordering information

Table	7.	Ordering	information
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Order code	Marking	Package	Weight	Base qty	Delivery mode
STPSC10TH13TI	STPSC 10TH13TI	Insulated TO-220AB	2.3g	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.
05-Jan-2016	3	Updated <i>Table 7</i> . Format updated to current standard.



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