


## Automotive 650 V power Schottky silicon carbide diode



### Features

- AEC-Q101 qualified 
- No reverse recovery charge in application current range
- Switching behavior independent of temperature
- Recommended to PFC applications
- PPAP capable
- ECOPACK compliant component

### Applications

- On board charger (OBC)
- Solar boost PFC
- Telecom power equipment
- Charging stations

### 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 PFC applications, the SiC diode will boost performance in hard switching conditions.

#### Product status

STPSC10H065BY-TR

#### Product summary

Symbol	Value
$I_{F(AV)}$	10 A
$V_{RRM}$	650 V
$T_{j(max.)}$	175 °C

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C unless otherwise specified)**

Symbol	Parameter		Value	Unit
V <sub>RRM</sub>	Repetitive peak reverse voltage	T <sub>j</sub> = -40 °C to + 175 °C	650	V
I <sub>F(RMS)</sub>	Forward rms current		22	A
I <sub>F(AV)</sub>	Average forward current	T <sub>c</sub> = 140 °C <sup>(1)</sup> , DC	10	A
I <sub>FSM</sub>	Surge non repetitive forward current	t <sub>p</sub> = 10 ms sinusoidal, T <sub>c</sub> = 25 °C	90	A
		t <sub>p</sub> = 10 ms sinusoidal, T <sub>c</sub> = 125 °C	80	
		t <sub>p</sub> = 10 μs square, T <sub>c</sub> = 25 °C	470	
I <sub>FRM</sub>	Repetitive peak forward current	T <sub>c</sub> = 140 °C <sup>(1)</sup> , T <sub>j</sub> = 175 °C, δ = 0.1	42	A
T <sub>stg</sub>	Storage temperature range		-55 to +175	°C
T <sub>j</sub>	Operating junction temperature range		-40 to +175	°C

1. Value based on R<sub>th(j-c)</sub> max.

**Table 2. Thermal parameters**

Symbol	Parameter	Typ. value	Max. value	Unit
R <sub>th(j-c)</sub>	Junction to case	1.25	1.5	°C/W

For more information, please refer to the following application note:

- [AN5088](#): Rectifiers thermal management, handling and mounting recommendations

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I <sub>R</sub> <sup>(1)</sup>	Reverse leakage current	T <sub>j</sub> = 25 °C	V <sub>R</sub> = V <sub>RRM</sub>	-	9	100	μA
		T <sub>j</sub> = 150 °C		-	85	425	
V <sub>F</sub> <sup>(2)</sup>	Forward voltage drop	T <sub>j</sub> = 25 °C	I <sub>F</sub> = 10 A	-	1.45	1.65	V
		T <sub>j</sub> = 150 °C		-	1.7	2.05	

1. t<sub>p</sub> = 10 ms, δ < 2%

2. t<sub>p</sub> = 500 μs, δ < 2%

To evaluate the conduction losses, use the following equation:

$$P = 0.972 \times I_{F(AV)} + 0.108 \times I_{F(RMS)}^2$$

For more information, please refer to the following application notes related to the power losses:

- [AN604](#): Calculation of conduction losses in a power rectifier
- [AN4021](#): Calculation of reverse losses on a power diode

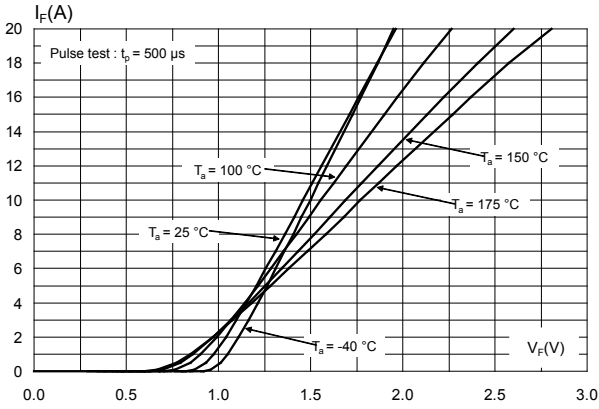
**Table 4. Dynamic electrical characteristics**

Symbol	Parameter	Test conditions	Typ.	Unit
$Q_{cj}^{(1)}$	Total capacitive charge	$V_R = 400\text{ V}$	28.5	nC
$C_j$	Total capacitance	$V_R = 0\text{ V}, T_c = 25\text{ }^\circ\text{C}, F = 1\text{ MHz}$	480	pF
		$V_R = 400\text{ V}, T_c = 25\text{ }^\circ\text{C}, F = 1\text{ MHz}$	48	

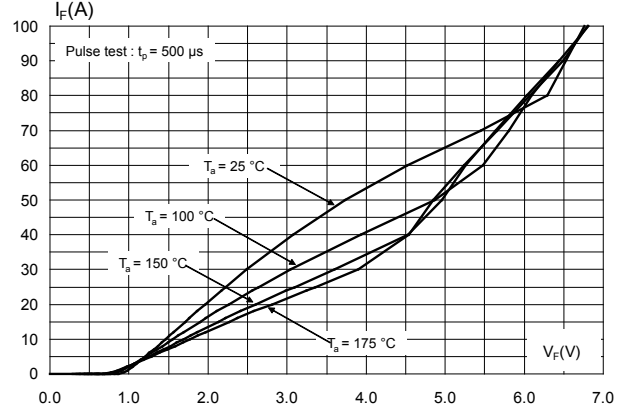
1. Most accurate value for the capacitive charge:  $Q_{cj}(V_R) = \int_0^{V_R} C_j(V)dV$

### 1.1 Characteristics (curves)

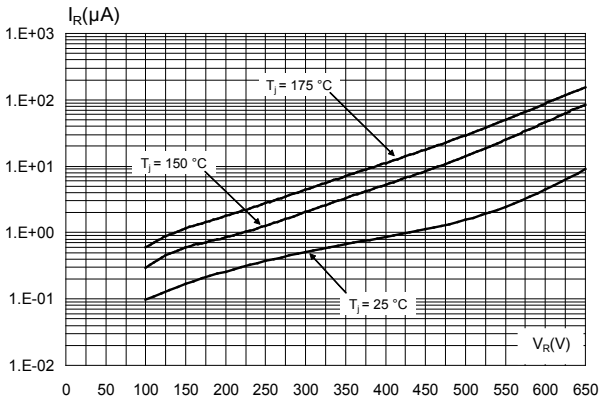
**Figure 1. Forward voltage drop versus forward current (typical values, low level)**



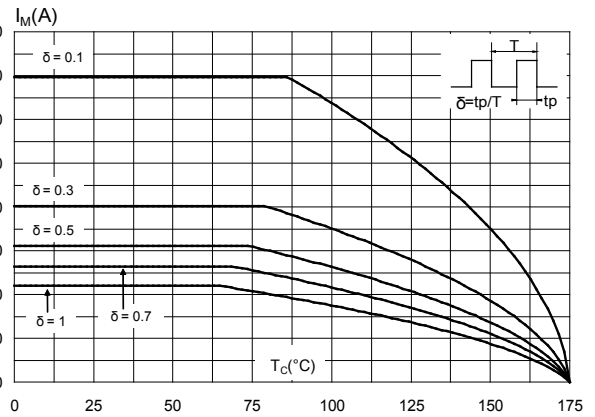
**Figure 2. Forward voltage drop versus forward current (typical values, high level)**



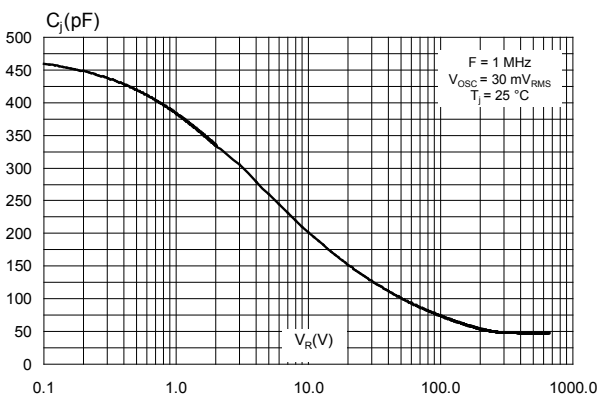
**Figure 3. Reverse leakage current versus reverse voltage applied (typical values)**



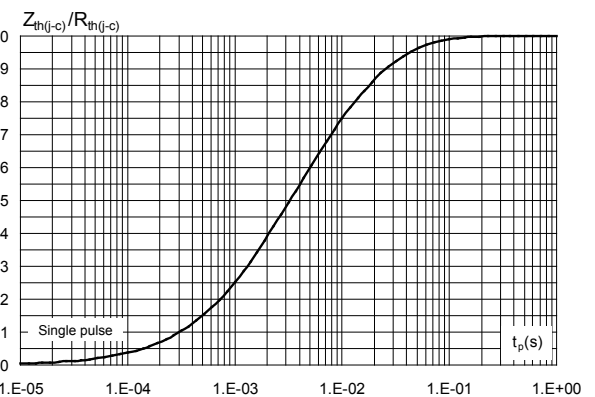
**Figure 4. Peak forward current versus case temperature**



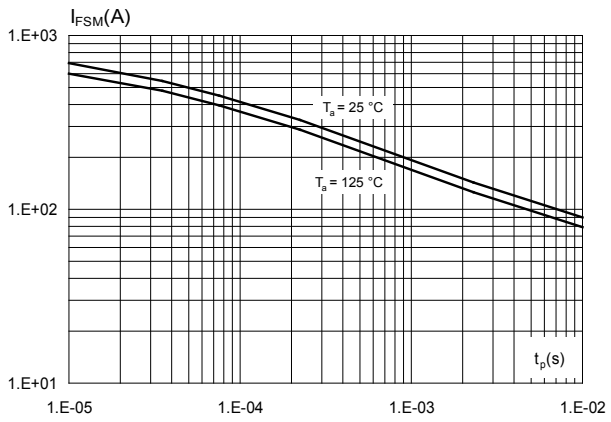
**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**



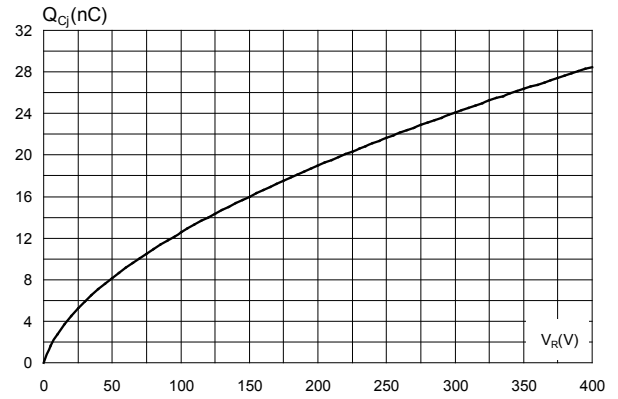
**Figure 6. Relative variation of thermal impedance junction to case versus pulse duration**



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



**Figure 8. Total capacitive charges versus reverse voltage applied (typical values)**



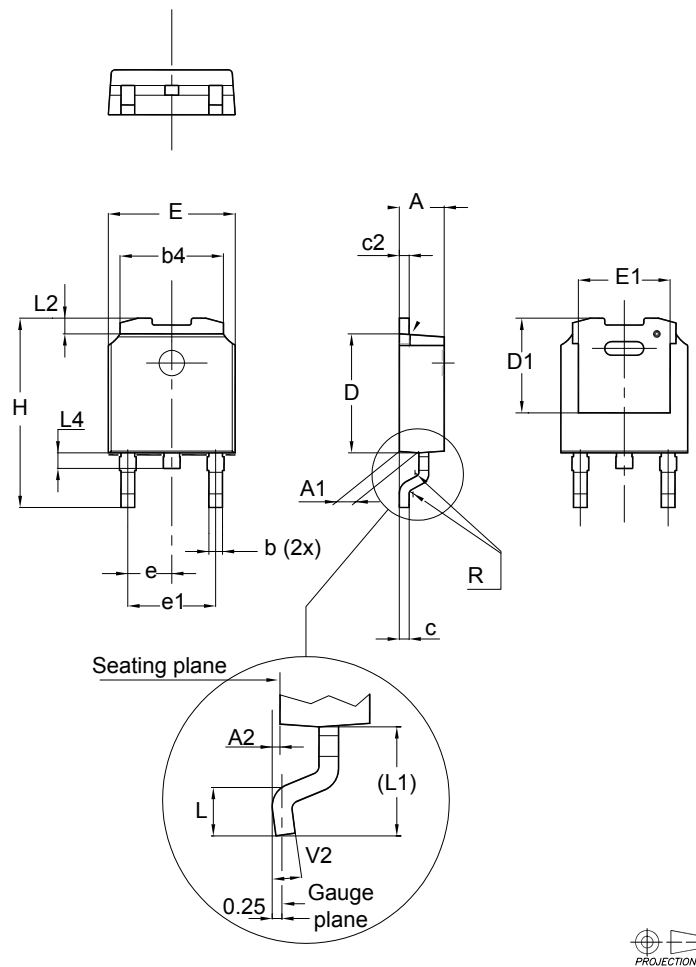
## 2 Package information

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.

### 2.1 DPAK package information

- Epoxy meets UL94, V0

Figure 9. DPAK package outline

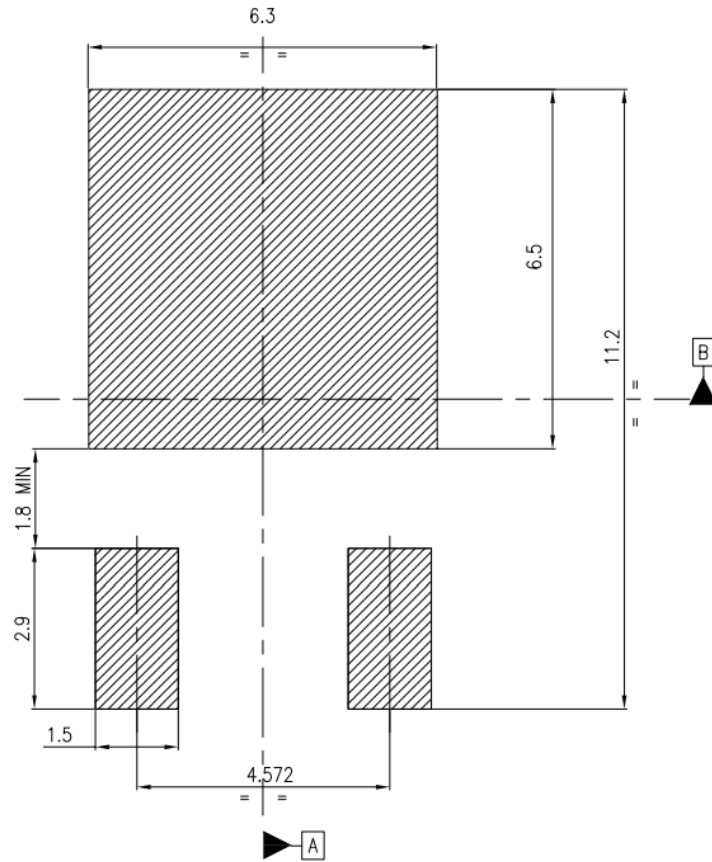


**Table 5. DPAK mechanical data**

Dim.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
b	0.64		0.90	0.025		0.035
b4	5.20		5.40	0.205		0.213
c	0.45		0.60	0.018		0.024
c2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
D1	4.95	5.10	5.25	0.195	0.201	0.207
E	6.40		6.60	0.252		0.260
E1	4.60	4.70	4.80	0.181	0.185	0.189
e	2.159	2.286	2.413	0.085	0.090	0.095
e1	4.445	4.572	4.699	0.175	0.180	0.185
H	9.35		10.10	0.368		0.398
L	1.00		1.50	0.039		0.059
(L1)	2.60	2.80	3.00	0.102	0.110	0.118
L2	0.65	0.80	0.95	0.026	0.031	0.037
L4	0.60		1.00	0.024		0.039
R		0.20			0.008	
V2	0°		8°	0°		8°

1. Inches dimensions given for reference only

Figure 10. DPAK recommended footprint (dimensions are in mm)





### 3 Ordering Information

**Table 6. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC10H065BY-TR	PSC10 H065Y	DPAK	0.32 g	2500	Tape and reel

## Revision history

**Table 7. Document revision history**

Date	Revision	Changes
08-Mar-2018	1	Initial release.
20-Oct-2022	2	Updated <a href="#">Table 6</a> . Added <a href="#">Section Application</a> paragraph on cover page. Minor text changes.

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