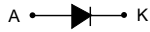


## 650 V, 2 A high surge silicon carbide power Schottky diode



### Product label



### Product status

STPSC2H065

### Product summary

Symbol	Value
$I_{F(AV)}$	2 A
$V_{RRM}$	650 V
$T_{j(max.)}$	175 °C
$V_{F(typ.)}$	1.38 V

### Features

- No reverse recovery charge in application current range
- Switching behavior independent of temperature
- High forward surge capability
- ECOPACK2 compliant component
- Power efficient product

### Applications

- Switch mode power supply
- PFC
- "DC/DC" converters
- LLC topologies
- Boost diode

### Description

The SiC diode is an ultra-high 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 STPSC2H065 SiC diode will boost performance in hard switching conditions.

# 1 Characteristics

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

Symbol	Parameter		Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage		650	V
$I_{F(RMS)}$	Forward rms current		6.5	A
$I_{F(AV)}$	Average forward current	$T_c = 160\text{ °C}^{(1)}$ , DC	2	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms}$ sinusoidal, $T_c = 25\text{ °C}$	20	A
		$t_p = 10\text{ ms}$ sinusoidal, $T_c = 125\text{ °C}$	18	
		$t_p = 10\text{ }\mu\text{s}$ square, $T_c = 25\text{ °C}$	140	
$I_{FRM}$	Repetitive peak forward current	$T_c = 160\text{ °C}^{(1)}$ , $T_j = 175\text{ °C}$ , $\delta = 0.1$	8.5	A
$T_{stg}$	Storage temperature range		-65 to +175	°C
$T_j$	Operating junction temperature range		-40 to +175	°C

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

**Table 2. Thermal resistance parameters**

Symbol	Parameter	Typ. value	Max. value	Unit
$R_{th(j-c)}$	Junction to case	2.50	3.50	°C/W

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

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-	1.5	20	$\mu\text{A}$
		$T_j = 150\text{ °C}$		-	17	84	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 2\text{ A}$	-	1.38	1.55	V
		$T_j = 150\text{ °C}$		-	1.60	1.95	

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

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

To evaluate the conduction losses, use the following equation:

$$P = 1.001 \times I_{F(AV)} + 0.474 \times I_{F(RMS)}^2$$

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

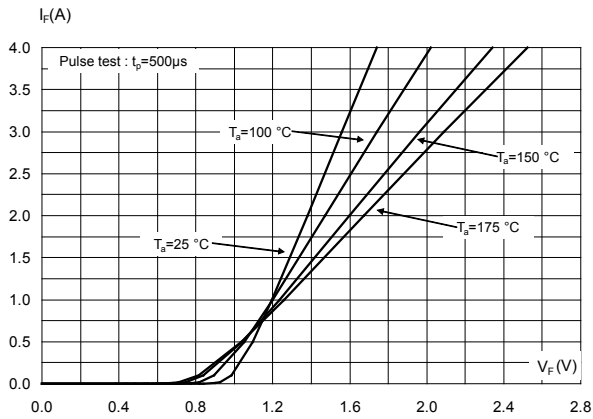
**Table 4. Dynamic electrical characteristics**

Symbol	Parameter	Test conditions	Typ.	Unit
$Q_{cj}^{(1)}$	Total capacitive charge	$V_R = 400 \text{ V}$	7.9	nC
$C_j$	Total capacitance	$V_R = 0 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	135	pF
		$V_R = 400 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	14	

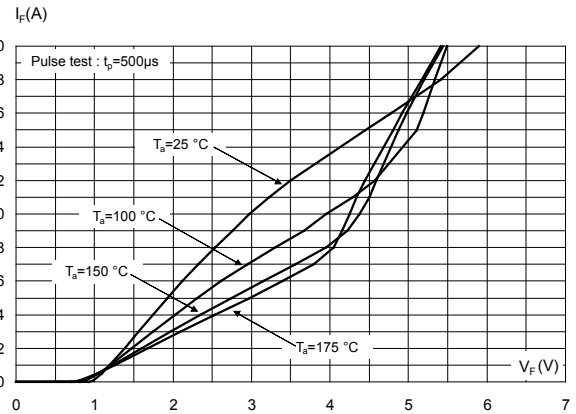
1. Most accurate value for the capacitive charge:  $Q_{cj}(V_R) = \int_0^{V_R} C_j(V) dV$

## 1.1 Characteristics (curves)

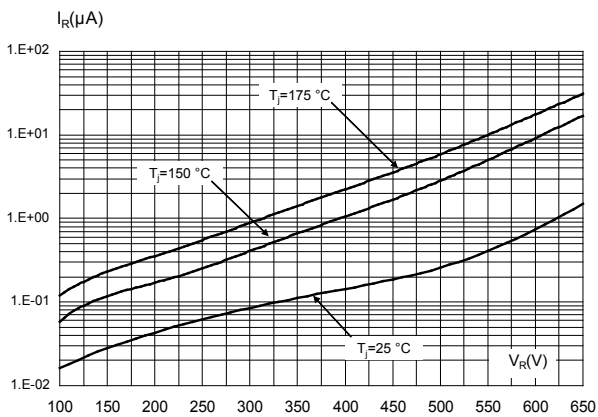
**Figure 1. Forward voltage drop versus forward current (typical values, low level)**



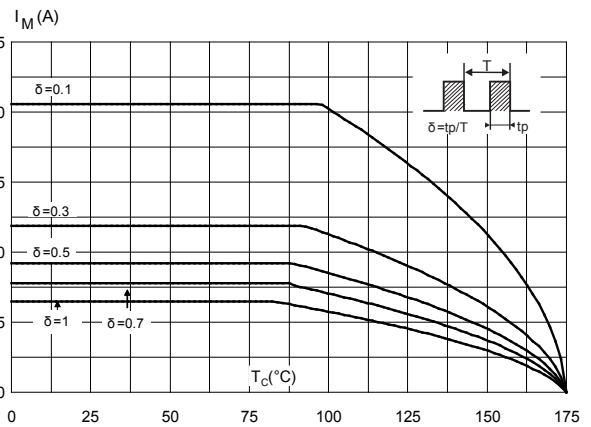
**Figure 2. Forward voltage drop versus forward current (typical values, high level)**



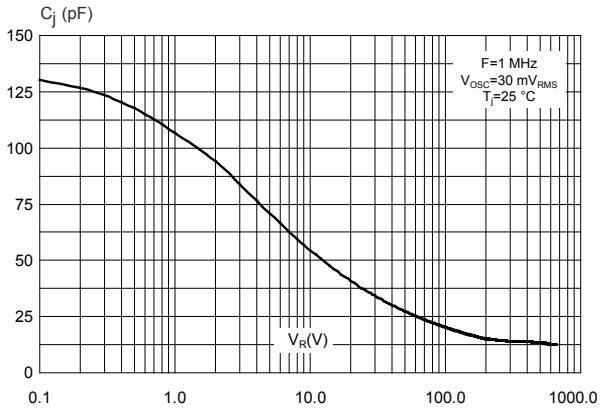
**Figure 3. Reverse leakage current versus reverse voltage applied (typical values)**



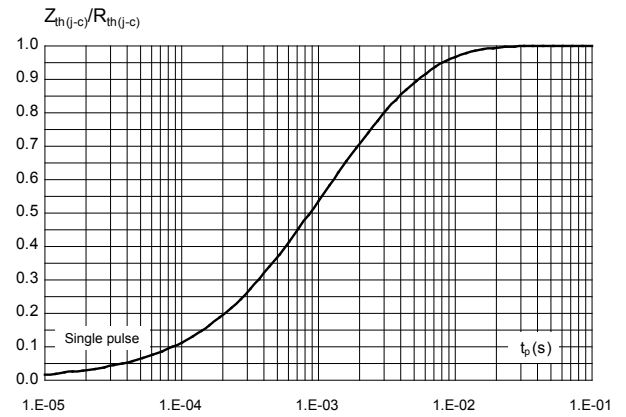
**Figure 4. Peak forward current versus case temperature**



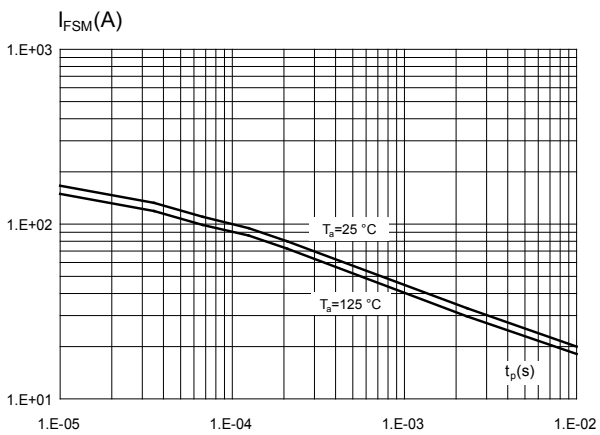
**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**



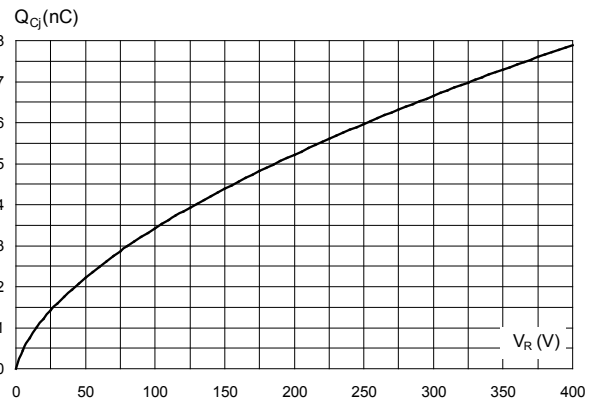
**Figure 6. Relative variation of thermal impedance junction to case versus pulse duration**



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



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



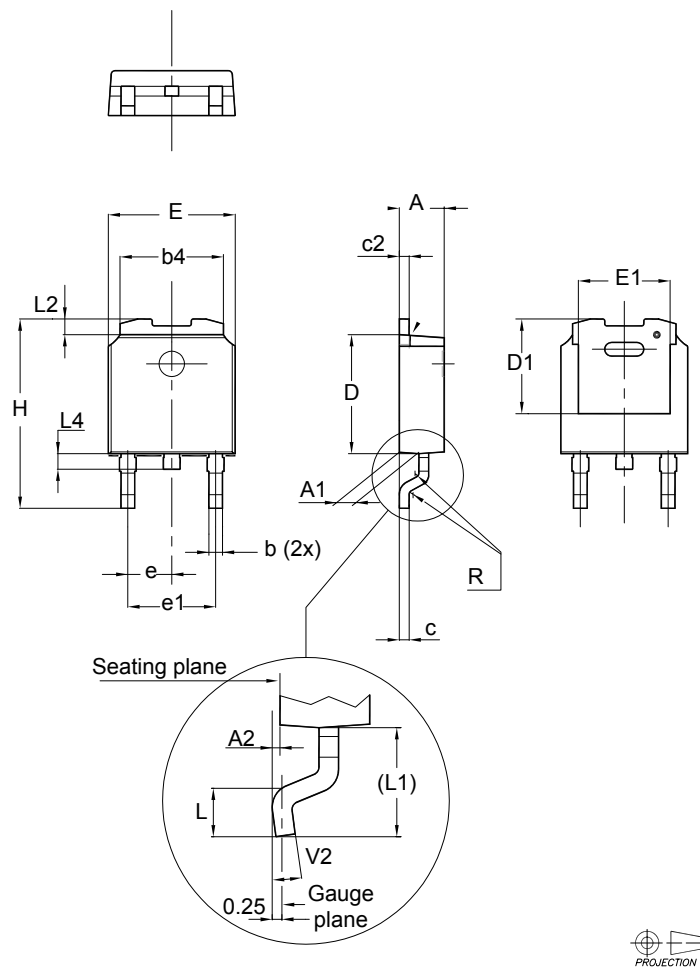
## 2 Package information

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**

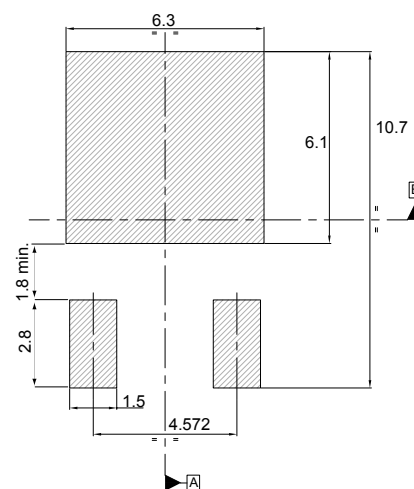


**Table 5. DPAK mechanical data**

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)**



The device must be positioned within  $\Phi 0.05 \text{ A B}$

### 3 Ordering Information

**Table 6. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC2H065B-TR	PSC2 H065	DPAK	0.35 g	2500	Tape and reel



## Revision history

**Table 7. Document revision history**

Date	Version	Changes
25-Apr-2019	1	First issue.

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