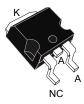


## 650 V, 10 A high surge silicon carbide power Schottky diode





D<sup>2</sup>PAK HV



### Product label



### Product status

STPSC10H065G2

Product summary		
Symbol	Value	
I <sub>F(AV)</sub>	10 A	
V <sub>RRM</sub>	650 V	
T <sub>j(max.)</sub>	175 °C	
V <sub>F(typ.)</sub>	1.38 V	

#### **Features**

- No or negligible reverse recovery
- · Switching behavior independent of temperature
- · High forward surge capability
- Operating T<sub>i</sub> from -40 °C to 175 °C
- Power efficient product
- D<sup>2</sup>PAK HV creepage distance (anode to cathode) = 5.38 mm min.
- ECOPACK2 compliant component

### **Applications**

- Telecom power supply
- Server power supply
- · Switch mode power supply
- DCDC converters
- · LLC topologies

### **Description**

This 10 A, 650 V 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.

Housed in D<sup>2</sup>PAK HV, this diode is perfectly suited for a usage in PFC applications, in charging station, DC/DC, easing the compliance to IEC-60664-1.

The STPSC10H065G2 will boost performances in hard switching conditions. Its high forward surge capability ensures good robustness during transient phases.



### 1 Characteristics

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

Symbol	Para	Parameter			
$V_{RRM}$	Repetitive peak reverse voltage	Repetitive peak reverse voltage		V	
I <sub>F(RMS)</sub>	Forward rms current	Forward rms current		Α	
I <sub>F(AV)</sub>	Average forward current	T <sub>C</sub> = 150 °C, DC current <sup>(1)</sup>	10	Α	
I <sub>FRM</sub>	Repetitive peak forward current	$T_c$ = 150 °C, $T_j$ = 175 °C, $\delta$ = 0.1	40	А	
		$t_p$ = 10 ms sinusoidal, $T_c$ = 25 °C	90		
$I_{FSM}$	Surge non repetitive forward current	$t_p$ = 10 ms sinusoidal, $T_c$ = 125 °C	80	Α	
		$t_p$ = 10 $\mu$ s square, $T_c$ = 25 $^{\circ}$ C	470		
T <sub>stg</sub>	Storage temperature range		-55 to +175	°C	
Tj	Operating junction temperature range		-40 to +175	°C	

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

Table 2. Thermal resistance parameters

Symbol	Parameter	Typ. value	Max. value	Unit
R <sub>th(j-c)</sub>	Junction to case	0.85	1.25	°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 cor	nditions	Min.	Тур.	Max.	Unit
I <sub>R</sub> <sup>(1)</sup>	Reverse leakage	T <sub>j</sub> = 25 °C	V <sub>R</sub> = V <sub>RRM</sub>	-	9	100	
current	T <sub>j</sub> = 150 °C	VR - VRRM	-	85	425	μΑ	
V <sub>F</sub> (2)	Forward voltage	T <sub>j</sub> = 25 °C	= 25 °C I <sub>F</sub> = 10 A	-	1.38	1.55	V
VF \	drop	T <sub>j</sub> = 150 °C	1F - 10 A	-	1.60	1.95	V

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

To evaluate the conduction losses, use the following equation:

 $P = 1.00 \times I_{F(AV)} + 0.095 \times I_{F}^{2} (RMS)$ 

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

DS13663 - Rev 1 page 2/11

<sup>2.</sup> Pulse test:  $t_p$  = 500  $\mu$ s,  $\delta$  < 2%



**Table 4. Dynamic electrical characteristics** 

Symbol	Parameter	Test conditions	Тур.	Unit
Q <sub>Cj</sub> (1)	Total capacitive charge	V <sub>R</sub> = 400 V	32	nC
Ci	C Total compaitemen	V <sub>R</sub> = 0 V, T <sub>C</sub> = 25 °C, F = 1 MHz	595	, r
C <sub>j</sub> Total c	Total capacitance	V <sub>R</sub> = 400 V, T <sub>c</sub> = 25 °C, F = 1 MHz	55	pF

1. Most accurate value for the capacitive charge:  $Q_{cj}(V_R) = \int\limits_0^{V_R} C_j(V) dV$ 

DS13663 - Rev 1 page 3/11



### 1.1 Characteristics (curves)

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

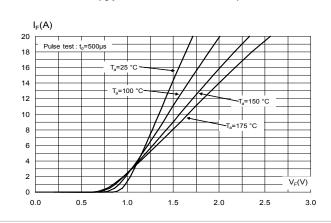


Figure 2. Forward voltage drop versus forward current (typical values, high level)

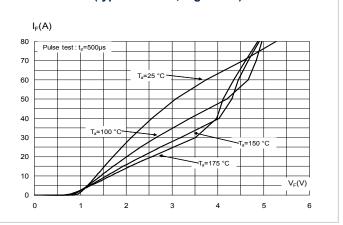


Figure 3. Reverse leakage current versus reverse voltage applied (typical values)

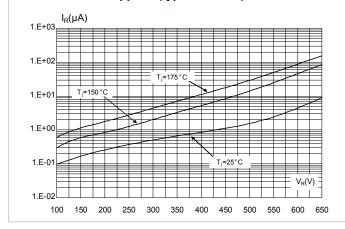


Figure 4. Peak forward current versus case temperature (fw > 10 kHz)

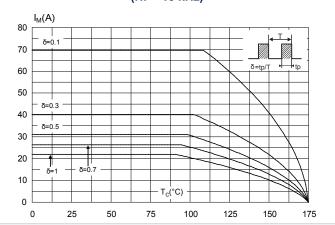


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

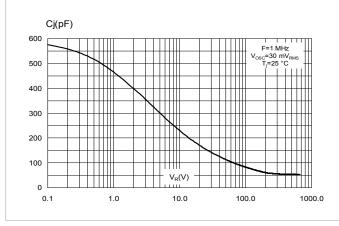
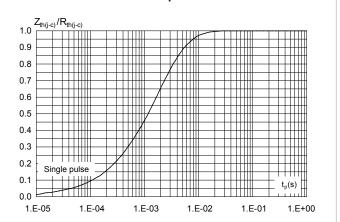
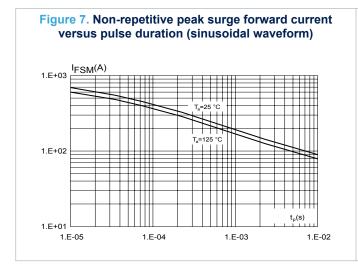


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration



DS13663 - Rev 1 page 4/11





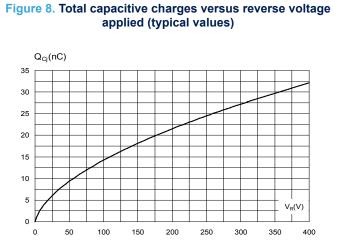
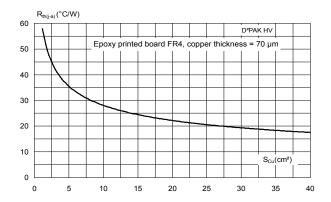


Figure 9. Thermal resistance junction to ambient versus copper surface under tab (typical values)



DS13663 - Rev 1 page 5/11



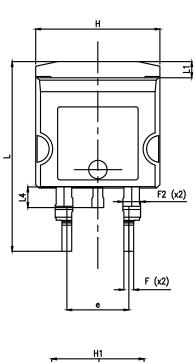
## Package information

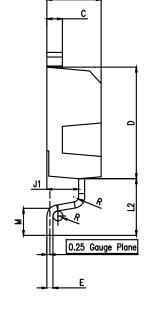
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

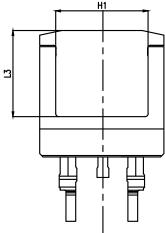
### 2.1 D<sup>2</sup>PAK high voltage package information

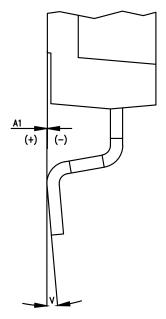
Epoxy meets UL94, V0

Figure 10. D<sup>2</sup>PAK high voltage package outline









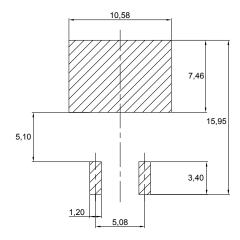
DS13663 - Rev 1 page 6/11



Table 5. D2PAK high voltage package mechanical data

Ref.		Dimensions	
Kei.	Min.	Тур.	Max.
Α	4.30	-	4.70
A1	0.03	-	0.20
С	1.17	-	1.37
D	8.95	-	9.35
е	4.98	-	5.18
E	0.50	-	0.90
F	0.78	-	0.85
F2	1.14	-	1.70
Н	10.00	-	10.40
H1	7.40	-	7.80
J1	2.49	-	2.69
L	15.30	-	15.80
L1	1.27	-	1.40
L2	4.93	-	5.23
L3	6.85	-	7.25
L4	1.5	-	1.7
M	2.6	-	2.9
R	0.20	-	0.60
V	0°	-	8°

Figure 11. D<sup>2</sup>PAK high voltage footprint in mm



Note: For package and tape orientation, reel and inner box dimensions and tape outline please check TN1173.

DS13663 - Rev 1 page 7/11



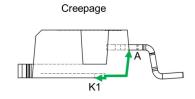
### 2.1.1 Creepage distance between anode and cathode

Table 6. Creepage distance between anode and cathode

Symbol	Parameter			Unit
Cd <sub>A-K1</sub>	Minimum creepage distance between A and K1 (with top coating)		5.38	mm
Cd <sub>A-K2</sub>	Minimum creepage distance between A and K2 (without top coating)		3.48	mm

Note: D<sup>2</sup>PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

Figure 12. Creepage with top coating



Minimum distance between A & K1 = 5.38 mm (with top coating)

Figure 13. Creepage without top coating



Minimum distance between A & K2 = 3.48 mm (without top coating)

DS13663 - Rev 1 page 8/11



# 3 Ordering information

**Table 7. Ordering information** 

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC10H065G2-TR	PSC10H065G2	D²PAK HV	1.48 g	1000	Tape and reel

DS13663 - Rev 1 page 9/11



# **Revision history**

**Table 8. Document revision history** 

Date	Revision	Changes
23-Mar-2021	1	First issue.

DS13663 - Rev 1 page 10/11



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DS13663 - Rev 1 page 11/11

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