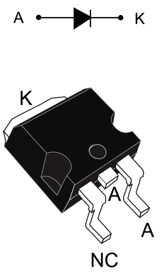
STPSC10H065G2

Datasheet

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



D²PAK HV

STPOWER

Product label
SUSTAINABLE TECHNOLOGY

Product status
STPSC10H065G2

Product summary	
Symbol	**Value**
$I_{F(AV)}$	10 A
V_{RRM}	650 V
$T_{j(max.)}$	175 °C
$V_{F(typ.)}$	1.38 V

Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- High forward surge capability
- Operating T_j from -40 °C to 175 °C
- Power efficient product
- D²PAK 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 D²PAK 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	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		650	V
$I_{F(RMS)}$	Forward rms current		22	A
$I_{F(AV)}$	Average forward current	T_C = 150 °C, DC current[(1)]	10	A
I_{FRM}	Repetitive peak forward current	T_c = 150 °C, T_j = 175 °C, δ = 0.1	40	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, T_c = 25 °C	90	A
		t_p = 10 ms sinusoidal, T_c = 125 °C	80	
		t_p = 10 µs square, T_c = 25 °C	470	
T_{stg}	Storage temperature range		-55 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	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 conditions		Min.	Typ.	Max.	Unit
I_R [(1)]	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	9	100	µA
		T_j = 150 °C		-	85	425	
V_F [(2)]	Forward voltage drop	T_j = 25 °C	I_F = 10 A	-	1.38	1.55	V
		T_j = 150 °C		-	1.60	1.95	

1. *Pulse test: t_p = 10 ms, δ < 2%*
2. *Pulse test: t_p = 500 µs, δ < 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

Table 4. Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Typ.	Unit
Q_{Cj} [(1)]	Total capacitive charge	V_R = 400 V	32	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	595	pF
		V_R = 400 V, T_c = 25 °C, F = 1 MHz	55	

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)

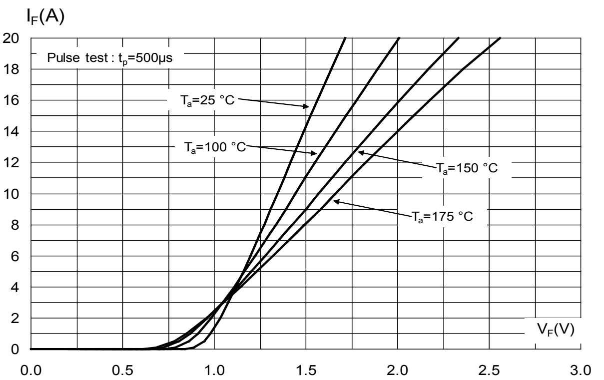


Figure 2. Forward voltage drop versus forward current (typical values, high level)

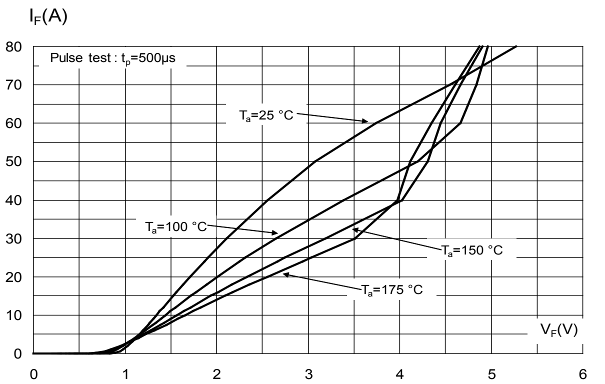


Figure 3. Reverse leakage current versus reverse voltage applied (typical values)

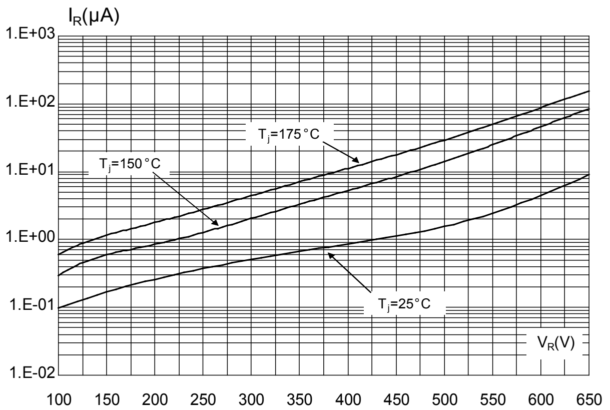


Figure 4. Peak forward current versus case temperature (fw > 10 kHz)

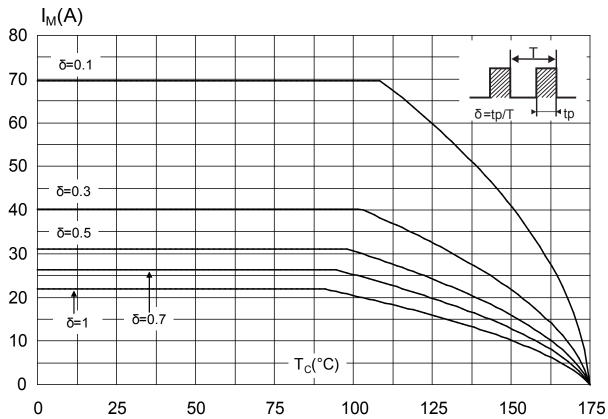


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

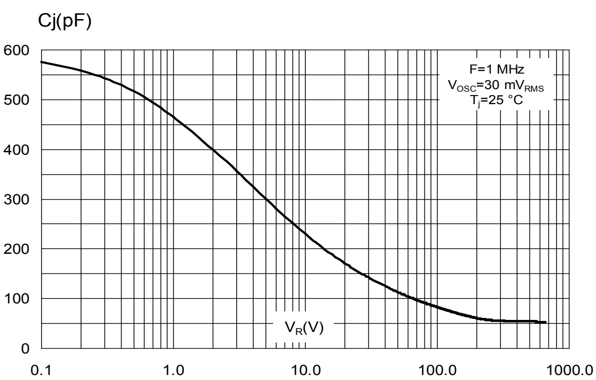


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

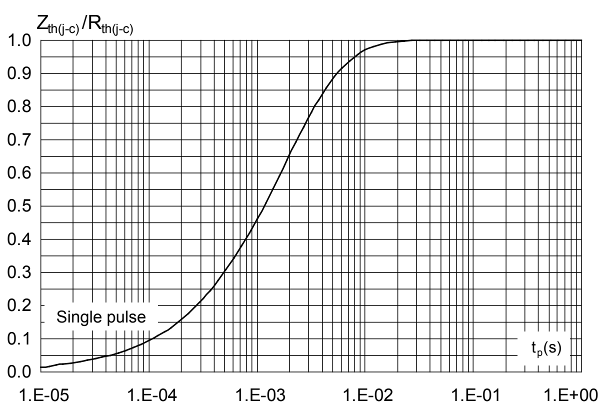


Figure 7. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

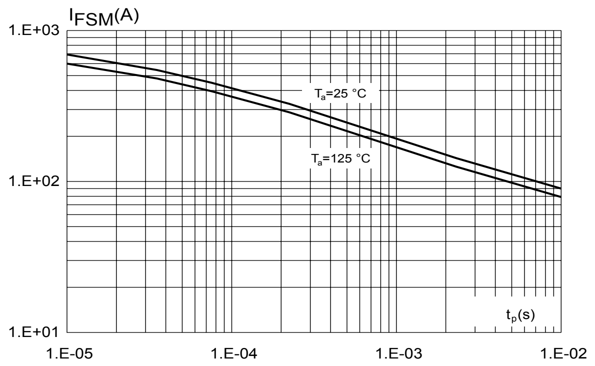


Figure 8. Total capacitive charges versus reverse voltage applied (typical values)

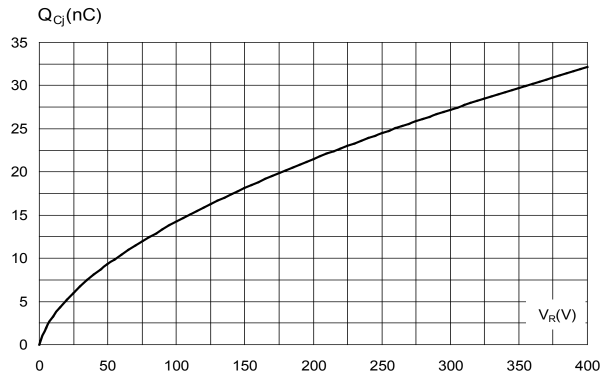
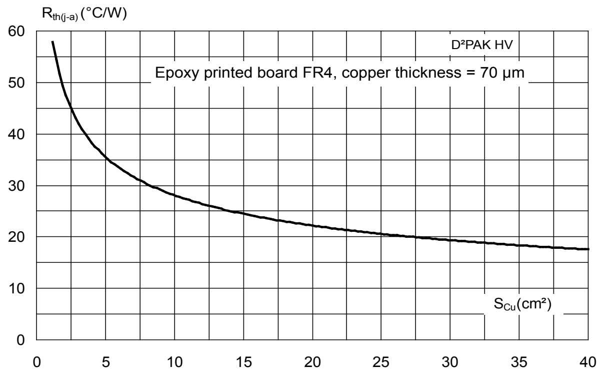


Figure 9. Thermal resistance junction to ambient versus copper surface under tab (typical values)



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. ECOPACK is an ST trademark.

2.1 D²PAK high voltage package information

- Epoxy meets UL94, V0

Figure 10. D²PAK high voltage package outline

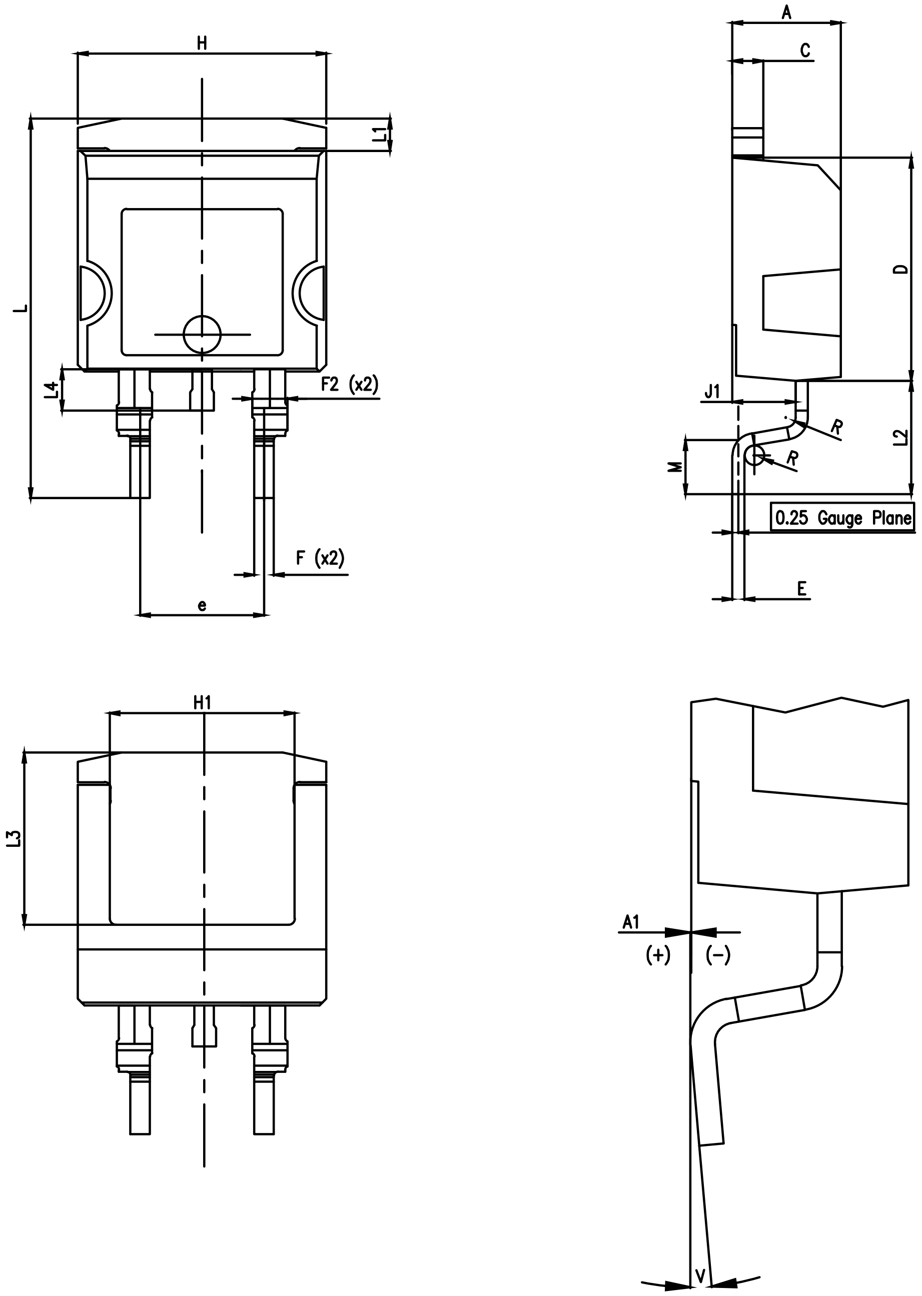
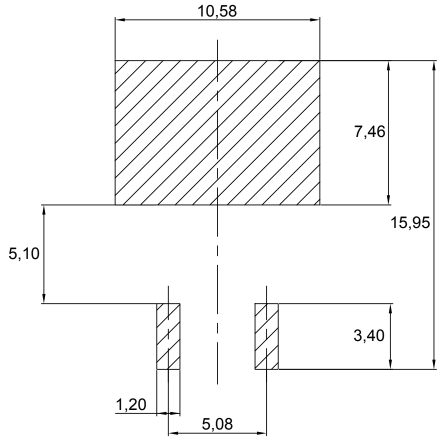


Table 5. D²PAK high voltage package mechanical data

Ref.	Dimensions		
	Min.	Typ.	Max.
A	4.30	-	4.70
A1	0.03	-	0.20
C	1.17	-	1.37
D	8.95	-	9.35
e	4.98	-	5.18
E	0.50	-	0.90
F	0.78	-	0.85
F2	1.14	-	1.70
H	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. D²PAK high voltage footprint in mm



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

2.1.1 Creepage distance between anode and cathode

Table 6. **Creepage distance between anode and cathode**

Symbol	Parameter		Value	Unit
$Cd_{A\text{-}K1}$	Minimum creepage distance between A and K1 (with top coating)	D²PAK HV	5.38	mm
$Cd_{A\text{-}K2}$	Minimum creepage distance between A and K2 (without top coating)		3.48	

Note: D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

Figure 12. **Creepage with top coating**

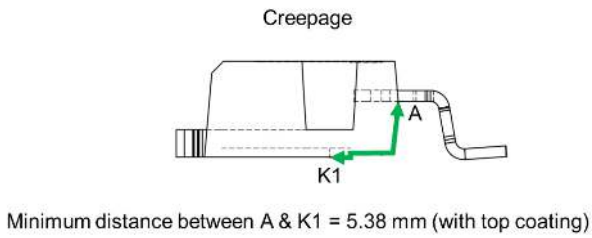
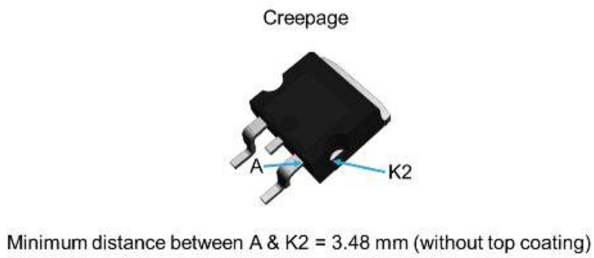


Figure 13. **Creepage without top coating**



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

Revision history

Table 8. Document revision history

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

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