STPSC2H12-Y

Datasheet

Automotive 1200 V, 2 A power Schottky silicon carbide diode

DPAK HV 2L

Product label

SUSTAINABLE TECHNOLOGY

Product status link

STPSC2H12-Y

Product summary

$I_{F(AV)}$	2 A
V_{RRM}	1200 V
T_j (max.)	175 °C
V_F (typ.)	1.35 V

Features

- AEC-Q101 qualified
- PPAP capable
- No or negligible reverse recovery
- High forward surge capability
- Operating T_j from -40 °C to 175 °C
- Creepage distance of 3 mm as per IEC 60664-1
- ECOPACK2 compliant component

Applications

- Bootstrap function of SiC MOS-FETS
- Snubber diode
- Switching 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 1200 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 boot strap, snubber circuits, or clamping functions of SiC MOS-FETs, the STPSC2H12-Y diode will help designers getting the best possible performance of their controlled switches in all conditions. This rectifier will enhance the performance of the targeted application.

Its improved creepage distance ensures the compatibility with industrial and automotive creepage standards.

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage (T_j = -40 °C to +175 °C)		1200	V
$I_{F(RMS)}$	Forward rms current		10	A
$I_{F(AV)}$	Average forward current	T_c = 160 °C, DC (1) T_c = 120 °C, DC (1)	2 5	A
I_{FRM}	Repetitive peak forward current	T_c = 160 °C, T_j = 175 °C, δ = 0.1, f_w > 10 kHz	9	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, T_c = 25 °C t_p = 10 ms sinusoidal, T_c = 150 °C	15 13	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	Value		Unit
		Typ.	Max.	
$R_{th(j-c)}$	Junction to case	1.9	2.7	°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	$V_R = V_{RRM}$	-	1	12	µA
		T_j = 150 °C		-	6	80	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 2 A	-	1.35	1.50	V
		T_j = 150 °C		-	1.75	2.25	

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:

$P = 1.12 \times I_{F(AV)} + 0.565 \times I_F{}^2{}_{(RMS)}$

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	Min.	Typ.	Max.	Unit
Q_{Cj} (1)	Total capacitive charge	V_R = 800 V	-	15.6	-	nC

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	-	190	-	pF
		V_R = 800 V, T_c = 25 °C, F = 1 MHz	-	13	-	

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)

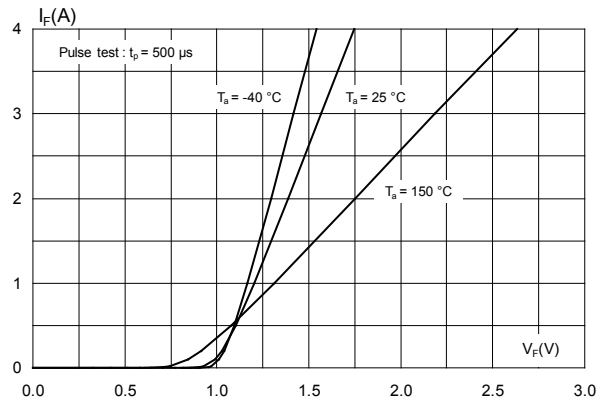


Figure 2. Reverse leakage current versus reverse voltage applied (typical values)

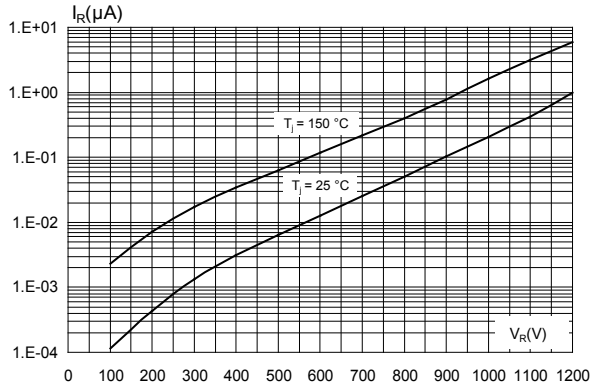


Figure 3. Peak forward current versus case temperature (f_w > 10 kHz)

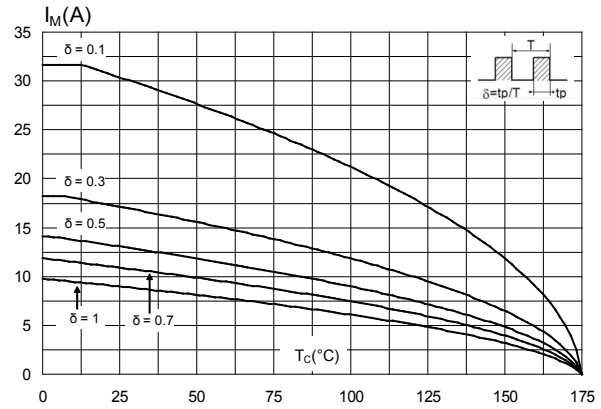


Figure 4. Junction capacitance versus reverse voltage applied (typical values)

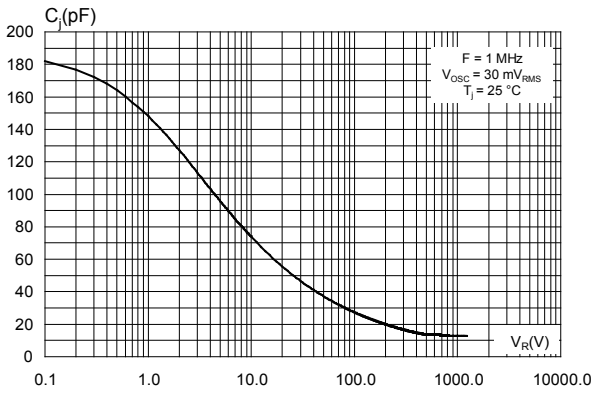


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

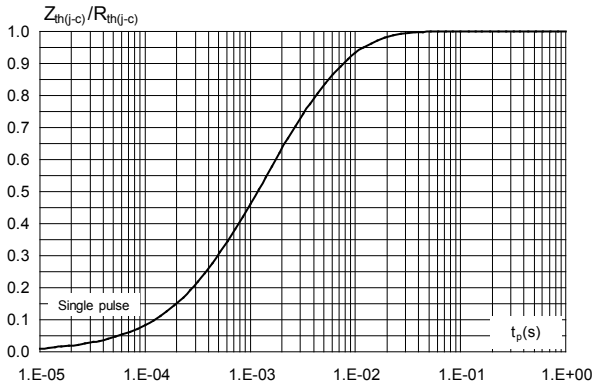


Figure 6. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

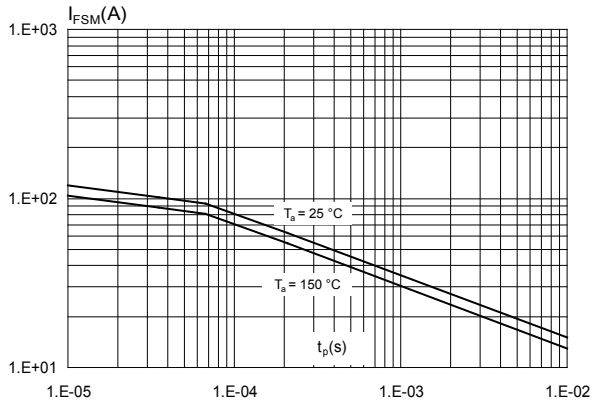


Figure 7. Total capacitive charges versus reverse voltage applied (typical values)

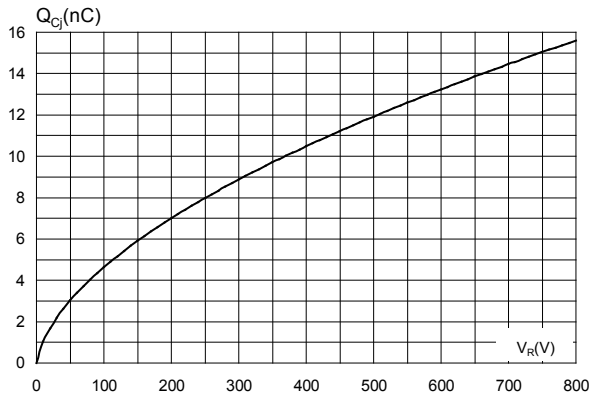
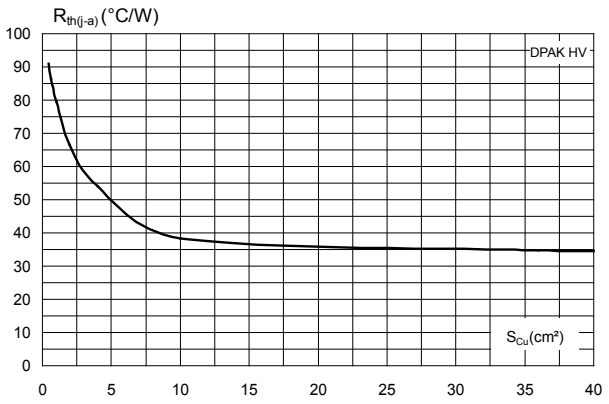


Figure 8. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4, e_{Cu} = 70 µm)



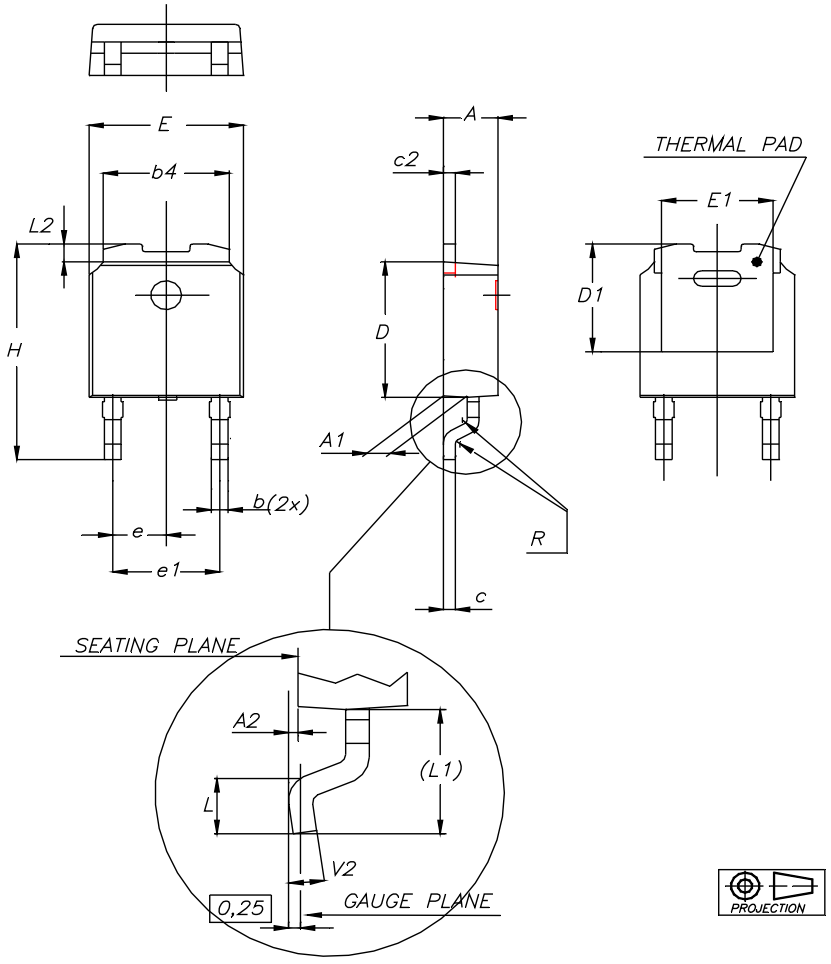
2 Package information

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 DPAK HV 2L package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)

Figure 9. DPAK HV 2L package outline

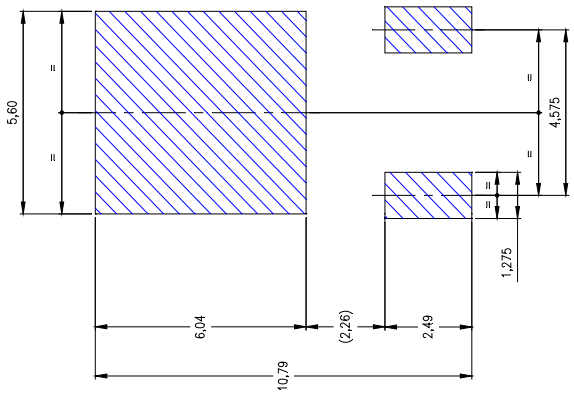


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 5. DPAK HV 2L package mechanical data

Ref.	Dimensions					
	Millimeters			Inches (for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20	2.29	2.40	0.086	0.090	0.095
A1	0.90		1.10	0.035		0.044
A2	0.03		0.23	0.001		0.010
b	0.64	0.76	0.90	0.025	0.030	0.036
b4	5.20	5.10	5.40	0.204	0.201	0.213
c	0.45		0.60	0.017		0.024
c2	0.48		0.60	0.018		0.024
D	6.00		6.20	0.236		0.245
D1	4.60	4.70	4.80	0.181	0.185	0.189
E	6.40		6.60	0.251		0.260
E1	4.95	5.10	5.25	0.194	0.201	0.207
e	2.16	2.28	2.40	0.085	0.090	0.095
e1	4.40		4.60	0.173		0.182
H	9.35		10.10	0.368		0.398
L	1.00		1.50	0.039		0.060
L1	2.60	2.80	3.00	0.102	0.110	0.119
L2	0.65	0.80	0.95	0.025	0.031	0.038
V2	0°		8°	0°		8°

Figure 10. Footprint (dimensions 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-K}	Minimum creepage distance between A and K	DPAK HV	3.0	mm

Note: DPAK HV creepage distance (anode to cathode) =3.0 mm min. (refer to IEC 60664-1)

3 Ordering information

Table 7. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC2H12B2Y-TR	PSC2 H12Y	DPAK HV	0.350 g	2500	Tape and reel

Revision history

Table 8. **Document revision history**

Date	Revision	Changes
19-Sep-2019	1	Initial release.
21-Sep-2021	2	Updated Figure 2.