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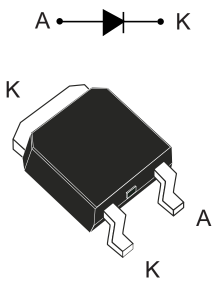
STPSC10H12B2-TR

Datasheet

1200 V, 10 A, silicon carbide power Schottky diode



DPAK HV 2L

Product label
SUSTAINABLE TECHNOLOGY

Product status link
STPSC10H12B2-TR

Product summary	
$I_{F(AV)}$	10 A
V_{RRM}	1200 V
T_j (max.)	175 °C
V_F (typ.)	1.35 V

Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- Robust high voltage periphery
- Operating T_j from -40 °C to 175 °C
- Low V_F
- DPAK HV creepage distance (anode to cathode) = 3 mm min.
- ECOPACK2 compliant

Applications

- EV Charging station
- Servers
- DC/DC
- PFC

Description

This 10A, 1200V 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

Housed in DPAK HV, this diode is perfectly suited for a usage in PFC applications, in charging station, servers, DC/DC modules, easing the compliance to IEC-60664-1.

The STPSC10H12B2-TR 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 (T_j = -40 °C to +175 °C)		1200	V
$I_{F(RMS)}$	Forward rms current		25	A
$I_{F(AV)}$	Average forward current δ = 0.5, square wave	T_c = 155 °C, DC current	10	A
I_{FRM}	Repetitive peak forward current	T_c = 155 °C, T_j = 175 °C, δ = 0.1	38	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, T_c = 25 °C	71	A
		t_p = 10 ms sinusoidal, T_c = 150 °C	60	
T_{stg}	Storage temperature range		-65 to +175	°C
T_j	Operating junction temperature[1]		-40 to +175	°C

1. *(dP_{tot}/dT_j) < ($1/R_{th(j-a)}$) condition to avoid thermal runaway for a diode on its own heatsink.*

Table 2. Thermal resistance parameters

Symbol	Parameter	Value		Unit
		Typ.	Max.	
$R_{th(j-c)}$	Junction to case	0.65	0.9	°C/W

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R [1]	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	5	60	µA
		T_j = 150 °C		-	30	400	
V_F [2]	Forward voltage drop	T_j = 25 °C	I_F = 10 A	-	1.35	1.50	V
		T_j = 150 °C		-	1.75	2.25	

1. *Pulse test: t_p = 5 ms, δ < 2%*
2. *Pulse test: t_p = 500 µs, δ < 2%*

To evaluate the conduction losses, use the following equation:

- $P = 1.03 \times I_{F(AV)} + 0.122 \times I_F{}^2{}_{(RMS)}$

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	-	57	-	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	-	725	-	pF
		V_R = 800 V, T_c = 25 °C, F = 1 MHz	-	47	-	

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)

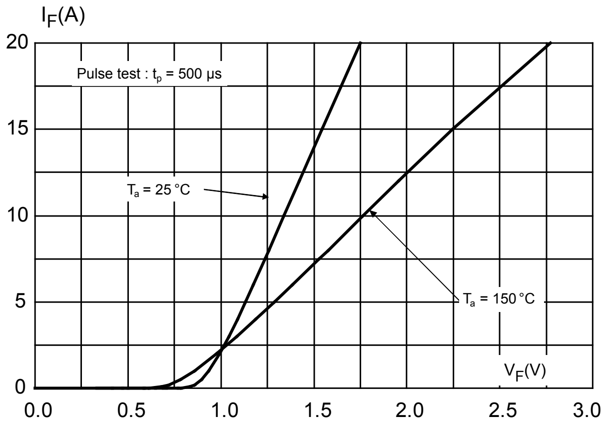


Figure 2. Reverse leakage current versus reverse voltage applied (typical values)

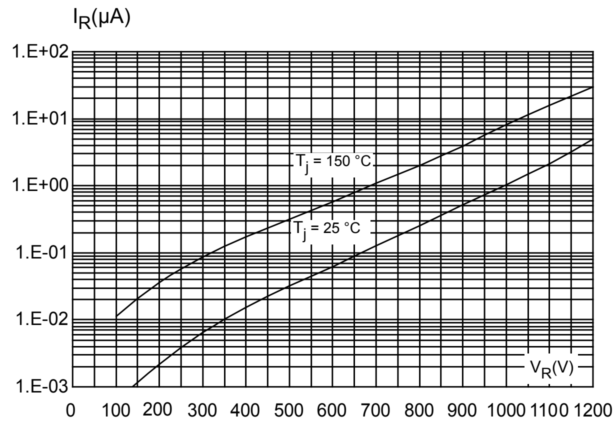


Figure 3. Peak forward current versus case temperature

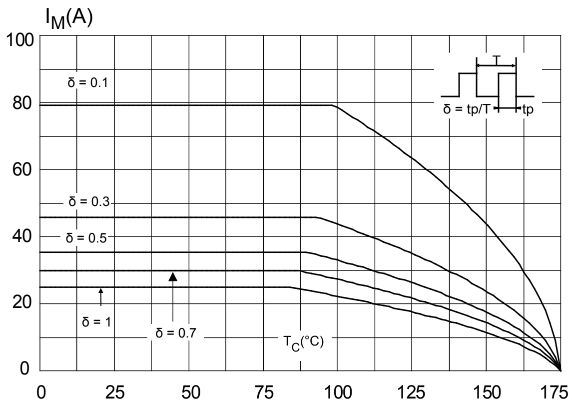


Figure 4. Junction capacitance versus reverse voltage applied (typical values)

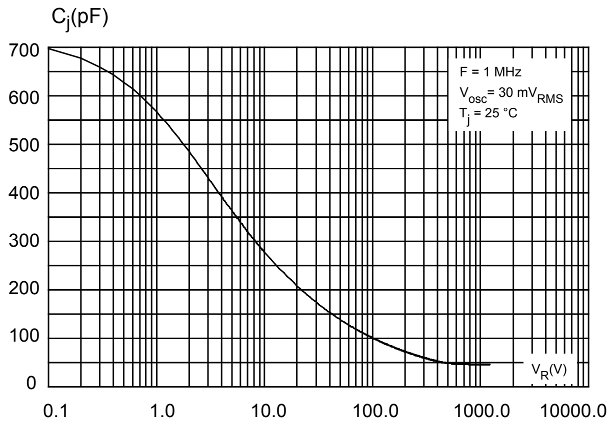


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

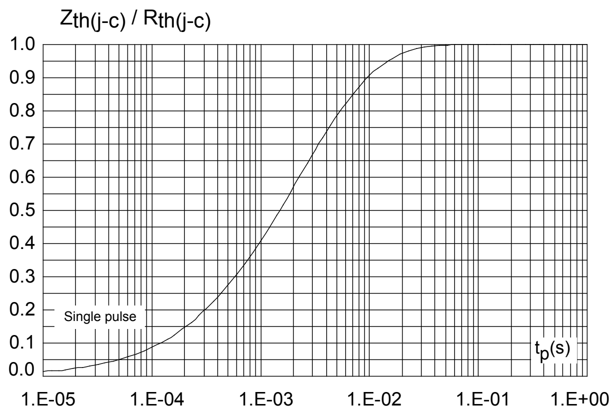


Figure 6. Non- repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

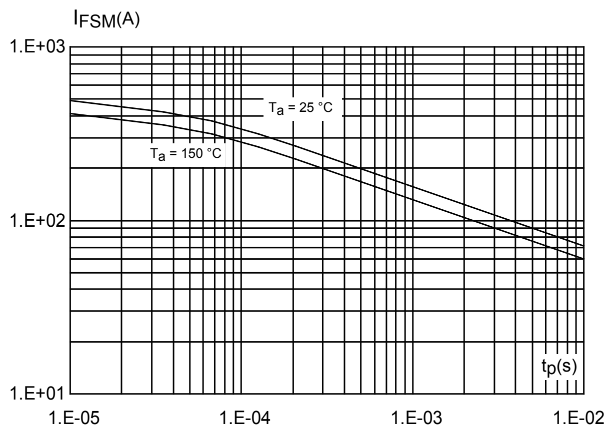


Figure 7. Total capacitive charges versus reverse voltage applied (typical values)

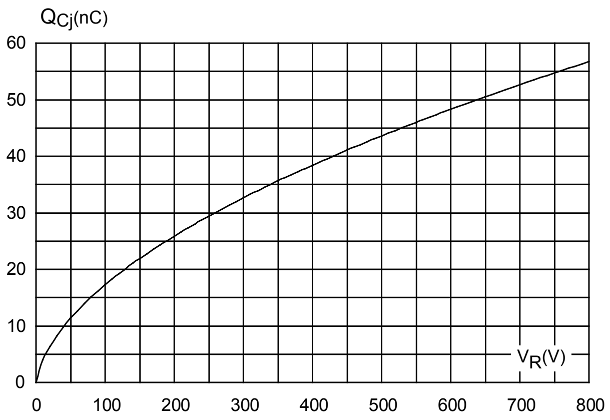
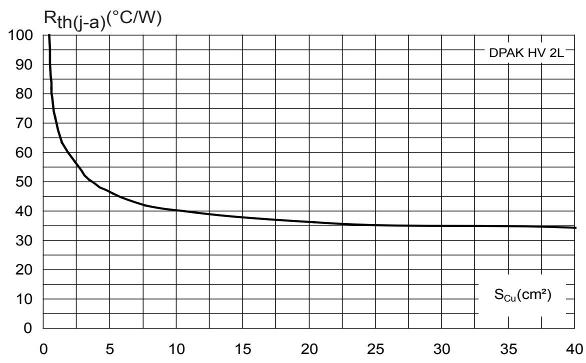


Figure 8. Thermal resistance junction to ambient versus copper surface under tab on epoxy printed board FR4, e_{Cu} = 35 µm (typical values)



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 DPAK HV 2L package information

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

Figure 9. DPAK HV 2L package outline

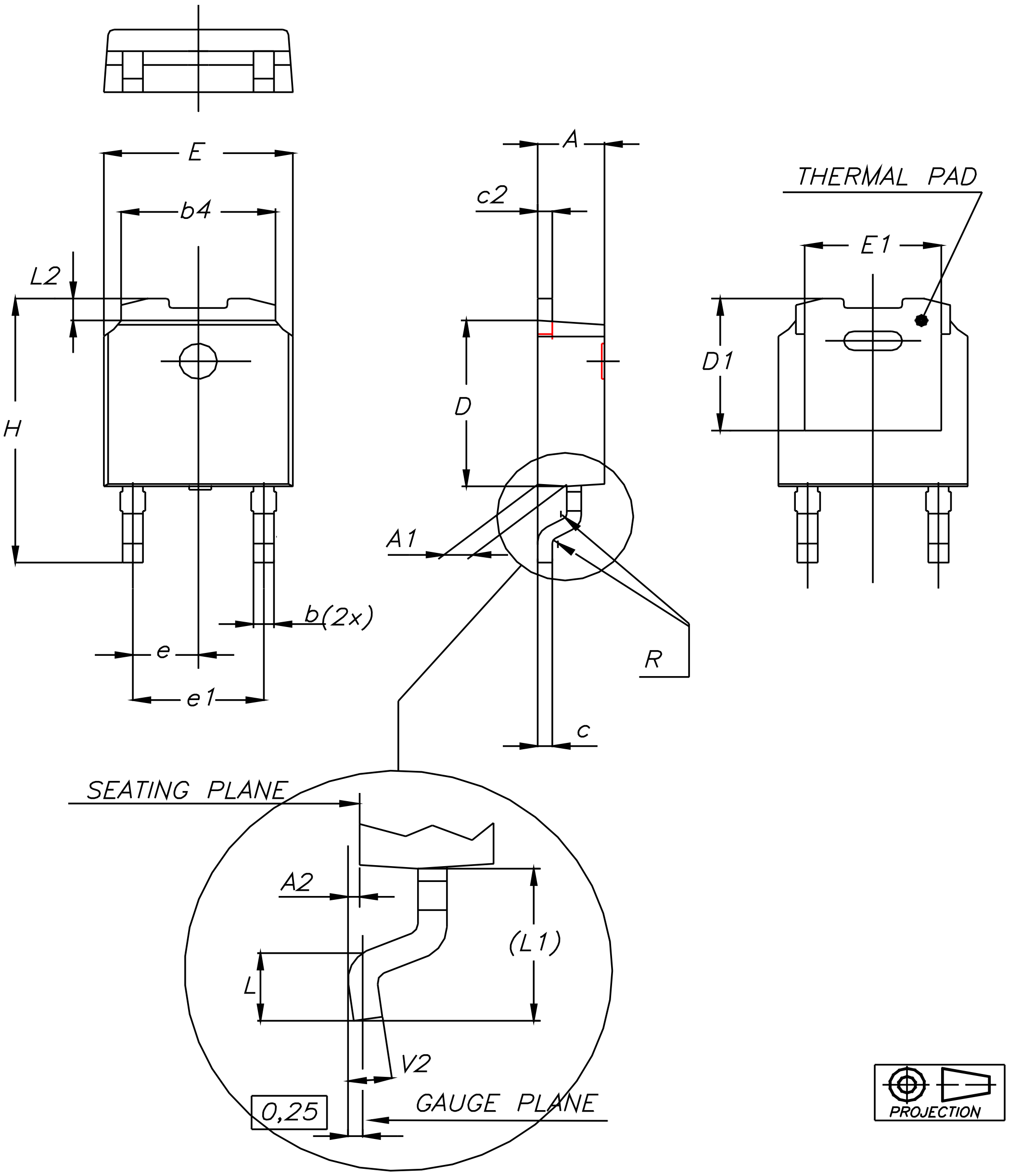
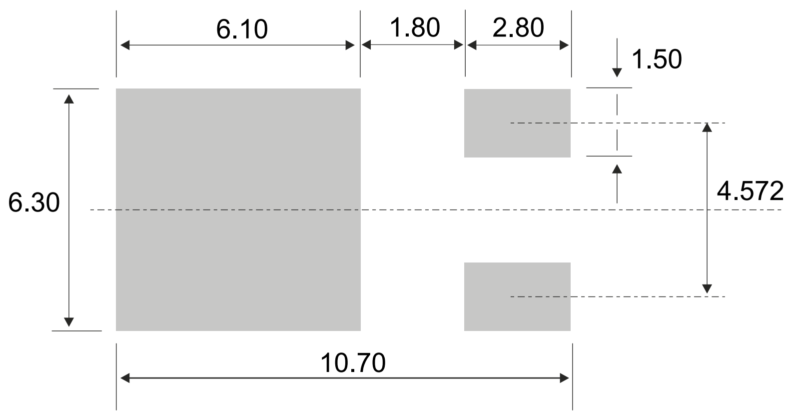


Table 5. **DPAK HV 2L package mechanical data**

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)**



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) = 0.3 mm min. (refer to IEC 60664-1)

3 Ordering information

Table 7. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC10H12B2-TR	PSC10 H12	DPAK HV	0.350 g	2500	Tape and reel

Revision history

Table 8. Document revision history

Date	Revision	Changes
31-Aug-2020	1	First issue.