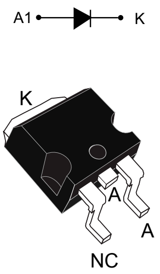
Datasheet

1200 V, 15 A, silicon carbide power Schottky diode



D²PAK HV

Product label

Product status link
STPSC15H12G2-TR

Product summary	
$I_{F(AV)}$	15 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
- D²PAK HV creepage distance (anode to cathode) = 5.38 mm min.
- ECOPACK2 compliant

Applications

- EV Charging station
- DC/DC
- PFC

Description

This 15 A, 1200 V 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 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 STPSC15H12G2-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		38	A
$I_{F(AV)}$	Average forward current	T_c = 155 °C, DC current	15	A
I_{FRM}	Repetitive peak forward current	T_c =155 °C, T_j = 175 °C, δ = 0.1	58	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, T_c = 25 °C	105	A
		t_p = 10 ms sinusoidal, T_c = 150 °C	90	
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	0.45	0.6	°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	$V_R = V_{RRM}$	-	7.5	90	µA
		T_j = 150 °C		-	45	600	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 15 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:
- $P = 1.09 \times I_{F(AV)} + 0.0775 \times I_F{}^2{}_{(RMS)}$

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	-	94	-	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	-	1200	-	pF
		V_R = 800 V, T_c = 25 °C, F = 1 MHz	-	78	-	

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)

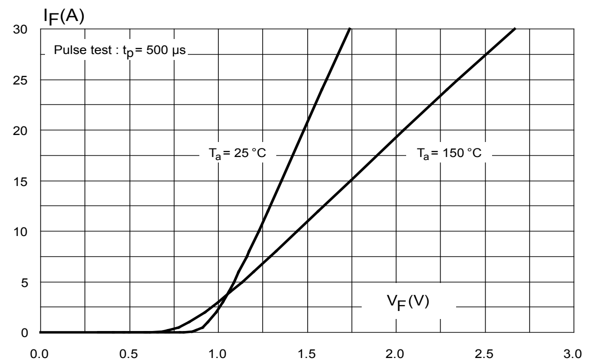


Figure 2. Reverse leakage current versus reverse voltage applied (typical values)

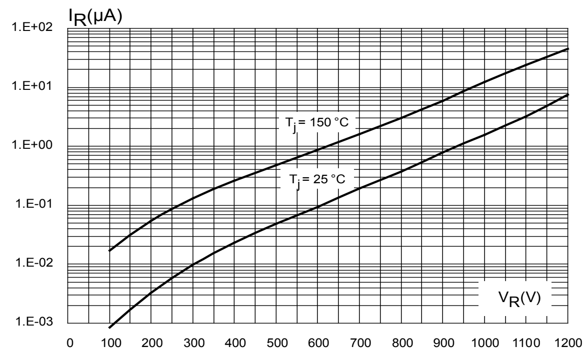


Figure 3. Peak forward current versus case temperature

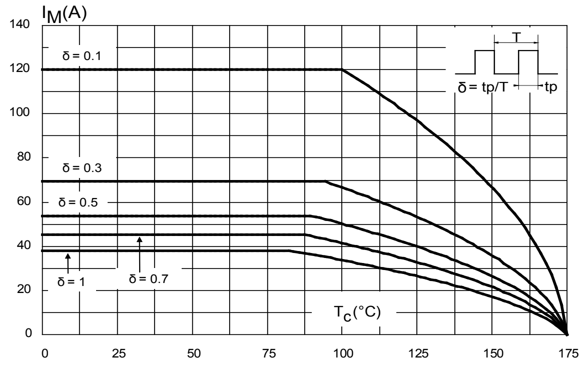


Figure 4. Junction capacitance versus reverse voltage applied (typical values)

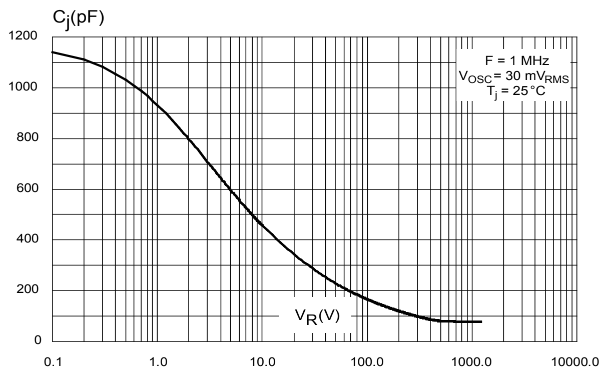


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

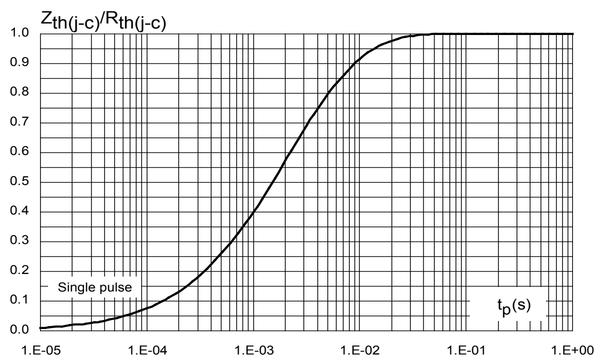


Figure 6. Non- repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

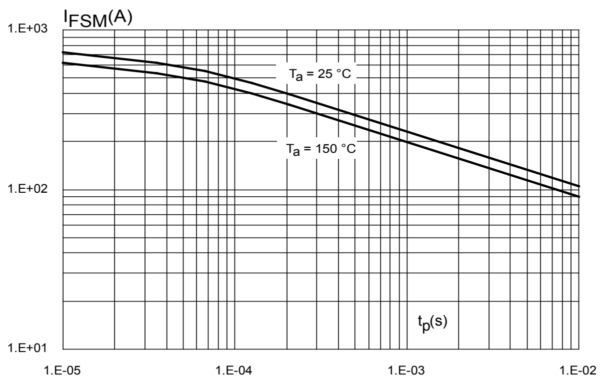


Figure 7. Total capacitive charges versus reverse voltage applied (typical values)

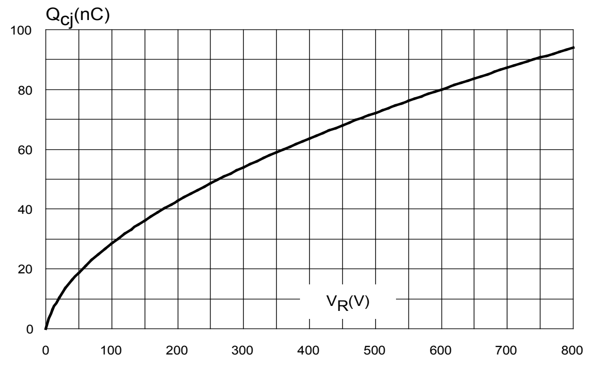
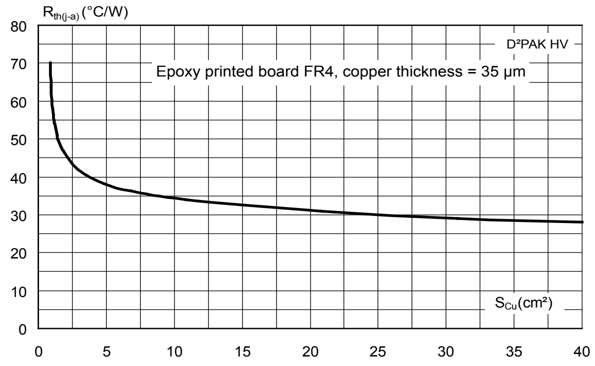


Figure 8. Thermal resistance junction to ambient versus copper surface under tab for D²PAK package (typical values)



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 9. D²PAK high voltage package outline

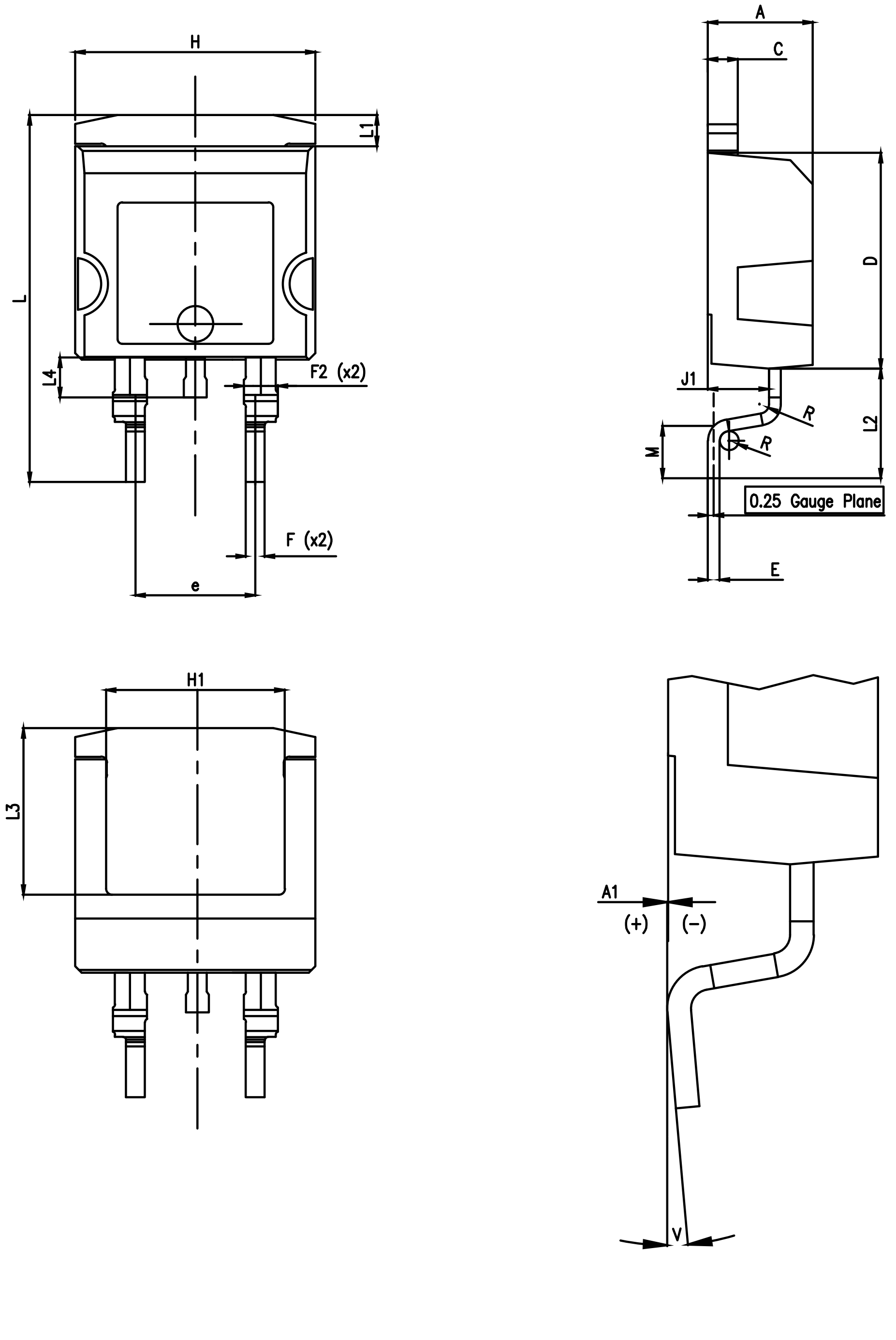
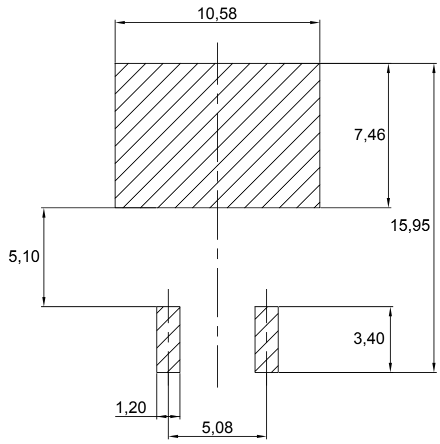


Table 5. D²PAK high voltage package mechanical data

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 10. D²PAK high voltage footprint in mm



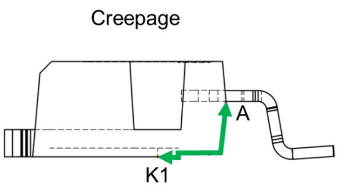
2.1.1 Creepage distance between Anode and Cathode

Table 6. Creepage distance between anode and cathode

Symbol	Parameter		Value	Unit
$Cd_{A\text{-}K1}$	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	

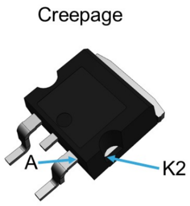
Note: D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

Figure 11. Creepage with top coating



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

Figure 12. Creepage without top coating



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

3 Ordering information

Table 7. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC15H12G2-TR	SC15H12G2	D^2PAK HV	1.48 g	1000	Tape and reel

Revision history

Table 8. **Document revision history**

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