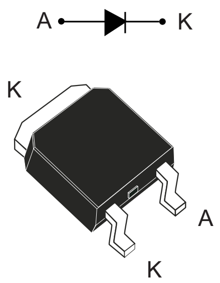
# STPSC10H12B2-TR

Datasheet

## 1200 V, 10 A, silicon carbide power Schottky diode




DPAK HV 2L

| Product label |
| --- |
|   |

| 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)

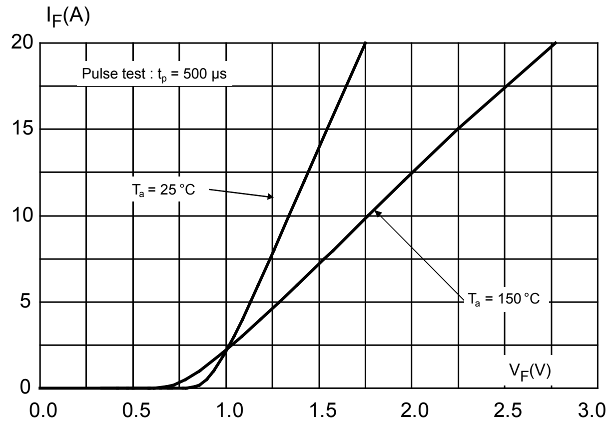



**Figure 2.** Reverse leakage current versus reverse voltage applied (typical values)

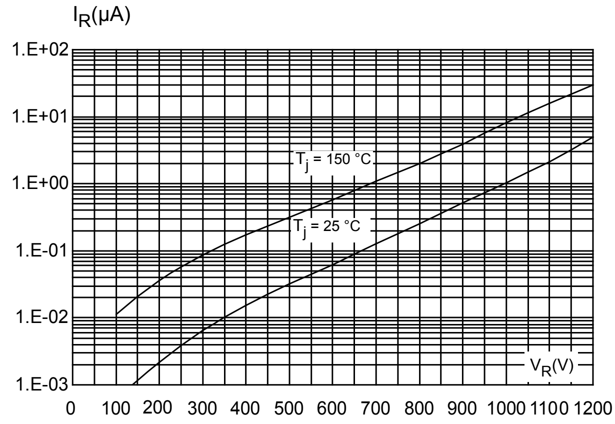



**Figure 3.** Peak forward current versus case temperature

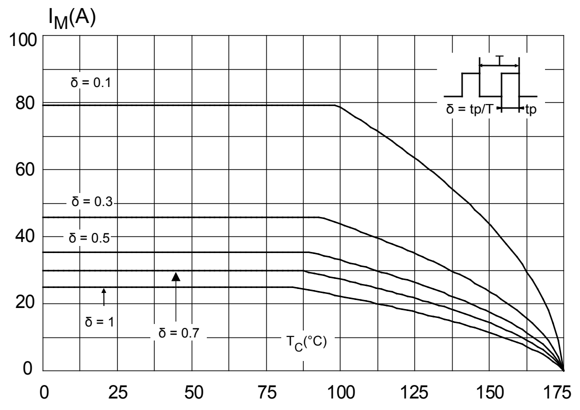



**Figure 4.** Junction capacitance versus reverse voltage applied (typical values)

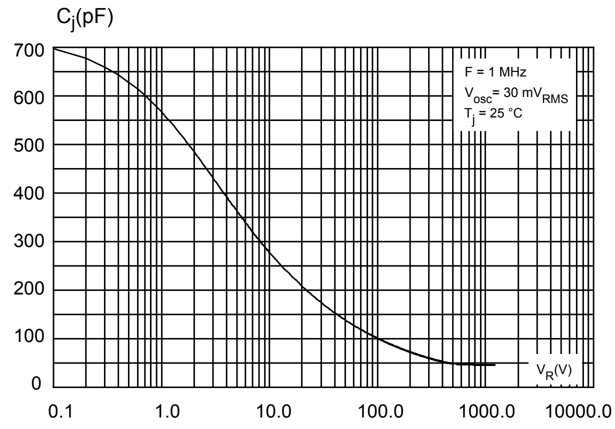


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

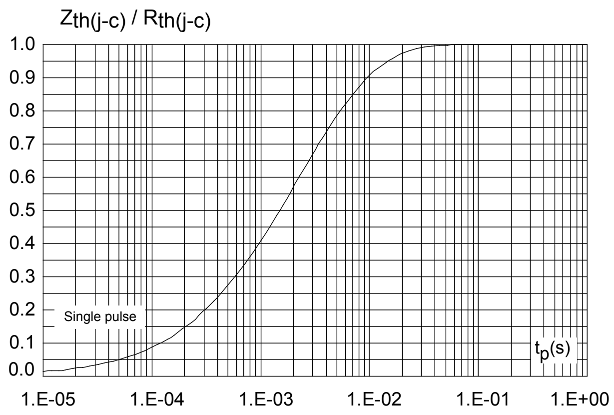



Figure 6. Non- repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

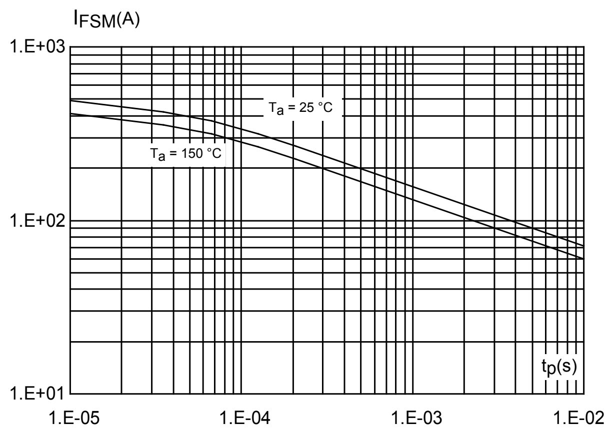



Figure 7. Total capacitive charges versus reverse voltage applied (typical values)

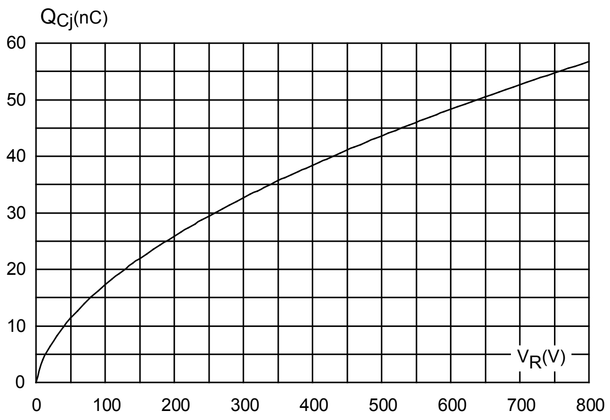
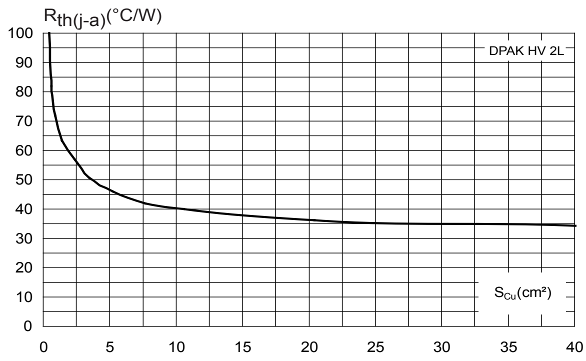



Figure 8. Thermal resistance junction to ambient versus copper surface under tab on epoxy printed board FR4, $e_{Cu}$ = 35 µm (typical values)



# 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**

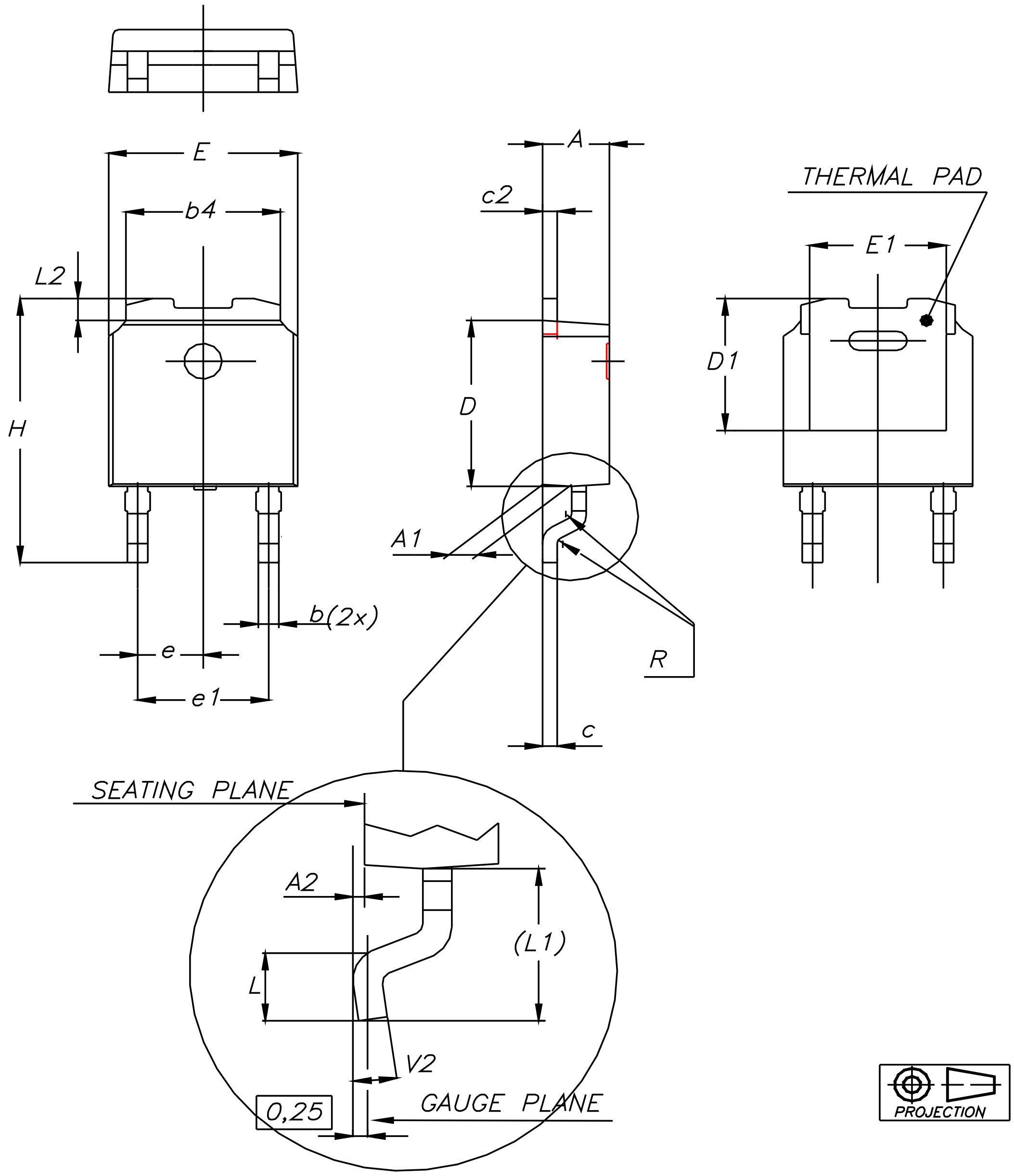
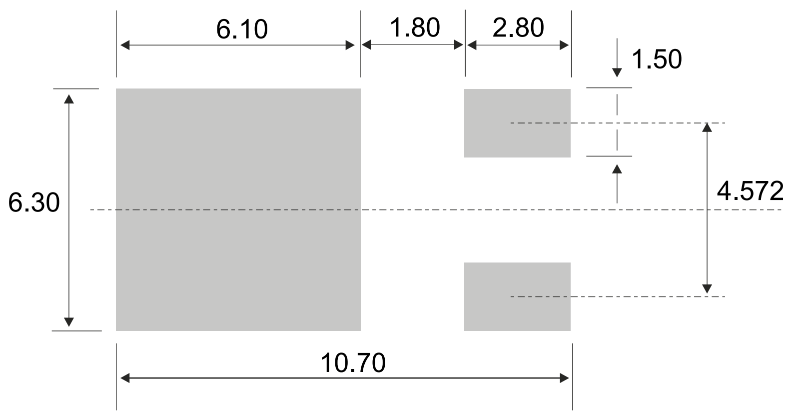


Table 5. **DPAK HV 2L package mechanical data**

| 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. |