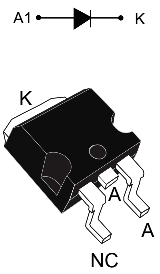
# 1200 V, 15 A, silicon carbide power Schottky diode




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)

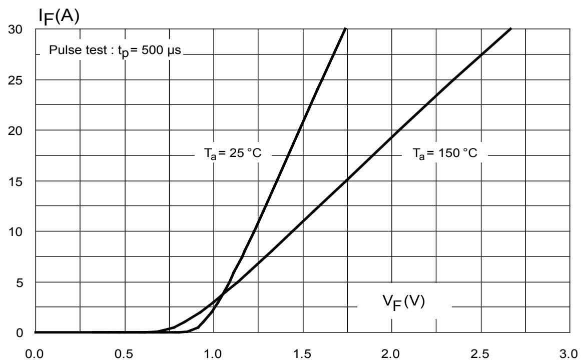



**Figure 2.** Reverse leakage current versus reverse voltage applied (typical values)

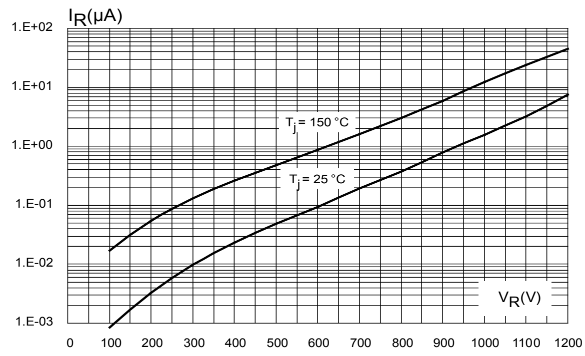



**Figure 3.** Peak forward current versus case temperature

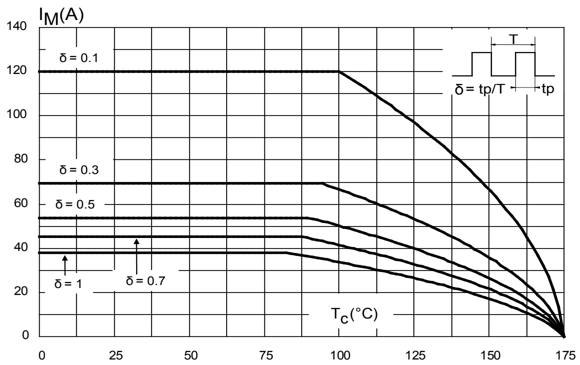



**Figure 4.** Junction capacitance versus reverse voltage applied (typical values)

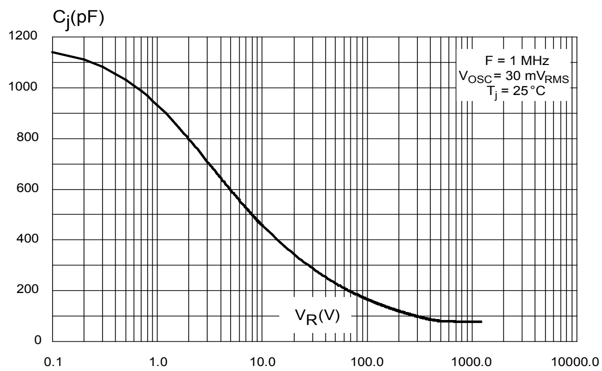



**Figure 5.** Relative variation of thermal impedance junction to case versus pulse duration

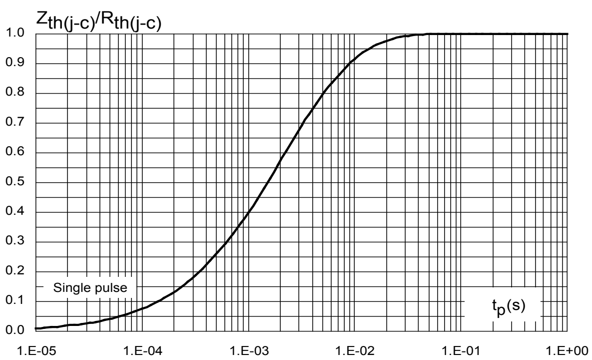



**Figure 6.** Non- repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

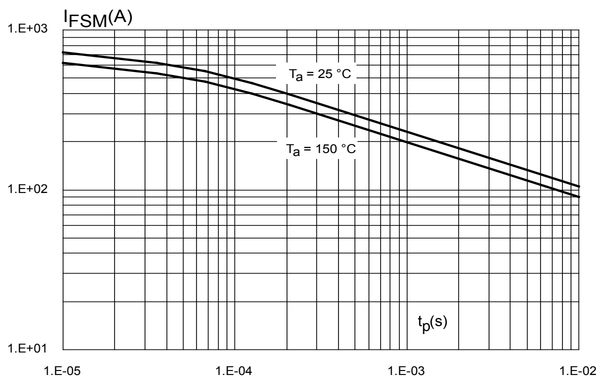


**Figure 7.** Total capacitive charges versus reverse voltage applied (typical values)

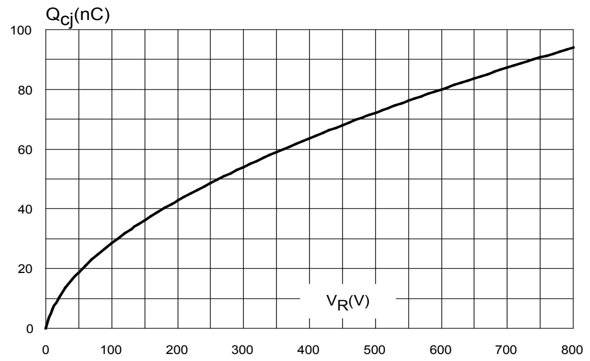
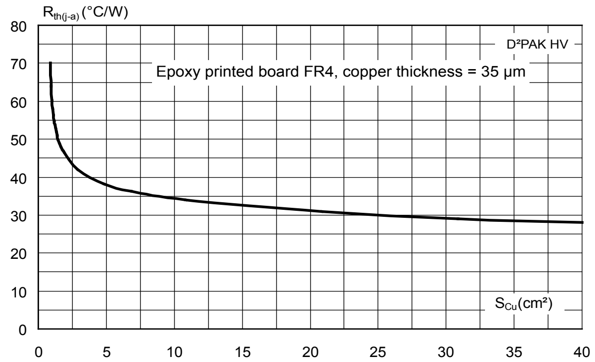



**Figure 8.** Thermal resistance junction to ambient versus copper surface under tab for D²PAK package (typical values)



# 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

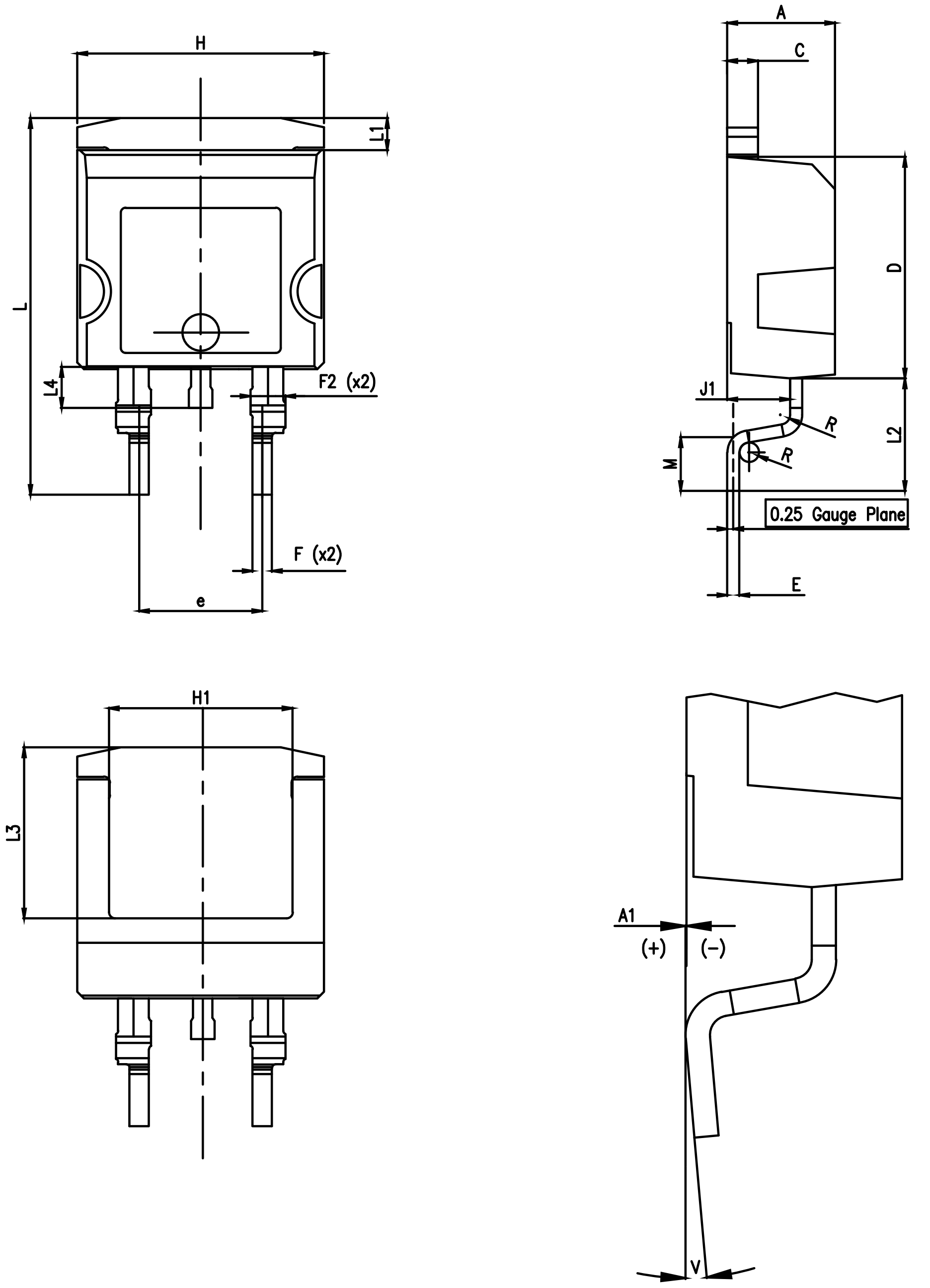
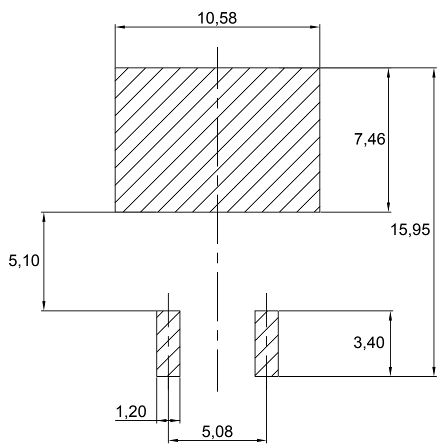


Table 5. D²PAK high voltage package mechanical data

| 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



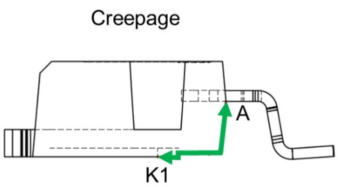
### 2.1.1 Creepage distance between Anode and Cathode

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 | |

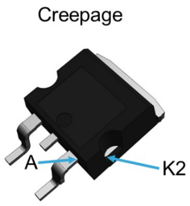
*Note: D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)*

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 | $D^2$PAK HV | 1.48 g | 1000 | Tape and reel |

## Revision history

**Table 8. Document revision history**

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

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