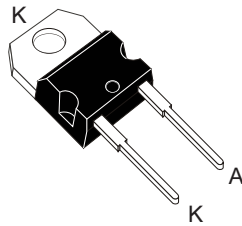


## 650 V, 6 A high surge silicon carbide power Schottky diode



TO-220AC



### Product label



### Product status link

[STPSC6G065](#)

### Product summary

|              |        |
|--------------|--------|
| $I_{F(AV)}$  | 6 A    |
| $V_{RRM}$    | 650 V  |
| $T_J$ (max.) | 175 °C |
| $V_F$ (typ.) | 1.30 V |

### Features

- No reverse recovery charge in application current range
- Switching behavior independent of temperature
- High forward surge capability
- Operating  $T_J$  from -55 °C to 175 °C
- ECOPACK2 compliant component

### Applications

- Solar inverter
- Air conditioning equipment
- UPS power supply
- Telecom / Server power equipment
- OBC (On board battery chargers)
- EV Charging station

### Description

The SiC diode STPSC6G065, available in TO-220AC, is an ultrahigh performance power Schottky rectifier. It is manufactured using a silicon carbide substrate. The wide band-gap material allows the design of a low  $V_F$  Schottky diode structure with a 650 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.

Based on latest technology optimization, this diode has an improved forward surge current capability, making it ideal for use in PFC, where this **ST SiC diode** boosts the performance in hard switching conditions. Using the latest design improvement of the “G” series of ST SiC diodes, as well as implemented tests in production, this diode is becoming the reference point in the combination of efficiency and application robustness to the application design.

# 1 Characteristics

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

| Symbol       | Parameter                                                                     |                                                                                              | Value                 | Unit |
|--------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------|------|
| $V_{RRM}$    | Repetitive peak reverse voltage ( $T_j = -55\text{ °C}$ to $+175\text{ °C}$ ) |                                                                                              | 650                   | V    |
| $I_{F(RMS)}$ | Forward rms current                                                           |                                                                                              | 15                    | A    |
| $I_{F(AV)}$  | Average forward current                                                       | $T_c = 140\text{ °C}$ , $\delta = 1$                                                         | 6                     | A    |
| $I_{FRM}$    | Repetitive peak forward current                                               | $T_c = 140\text{ °C}$ , $T_j = 175\text{ °C}$ , $\delta = 0.1$ ,<br>$f_{sw} > 10\text{ kHz}$ | 26                    | A    |
| $I_{FSM}$    | Surge non repetitive forward current                                          | $t_p = 10\text{ ms}$ sinusoidal                                                              | $T_c = 25\text{ °C}$  | A    |
|              |                                                                               |                                                                                              | $T_c = 150\text{ °C}$ |      |
|              |                                                                               | $t_p = 10\text{ }\mu\text{s}$ square                                                         | $T_c = 25\text{ °C}$  |      |
| $T_{stg}$    | Storage temperature range                                                     |                                                                                              | -65 to +175           | °C   |
| $T_j$        | Operating junction temperature range                                          |                                                                                              | -55 to +175           | °C   |

**Table 2. Thermal resistance parameters**

| Symbol        | Parameter        | Value |      | Unit |
|---------------|------------------|-------|------|------|
|               |                  | Typ.  | Max. |      |
| $R_{th(j-c)}$ | Junction to case | 2.10  | 3.0  | °C/W |

For more information, you can 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 | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$    | -    | 6    | 60   | $\mu\text{A}$ |
|             |                         | $T_j = 175\text{ °C}$ |                    | -    | 32   | 240  |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 6\text{ A}$ | -    | 1.30 | 1.45 | V             |
|             |                         | $T_j = 175\text{ °C}$ |                    | -    | 1.49 | 1.70 |               |

1. Pulse test:  $t_p = 10\text{ ms}$ ,  $\delta < 2\%$

2. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

$$P = 0.879 \times I_{F(AV)} + 0.137 \times I_F^2 (RMS)$$

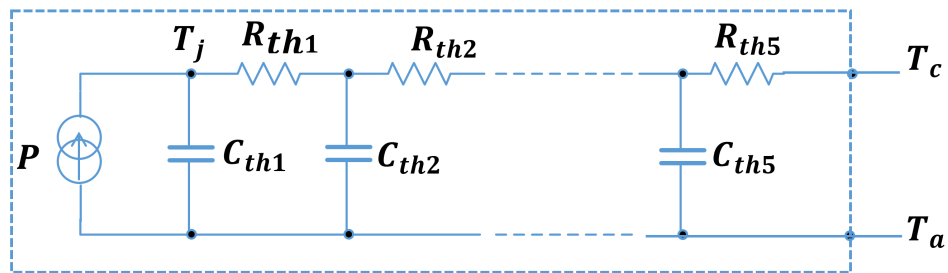
For more information, you can refer to the following application notes related to the power losses:

- [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 | $V_R = 400 \text{ V}$                                                     | -    | 19   | -    | nC   |
| $C_j$          | Total capacitance       | $V_R = 0 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$   | -    | 370  | -    | pF   |
|                |                         | $V_R = 400 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$ | -    | 26   | -    |      |

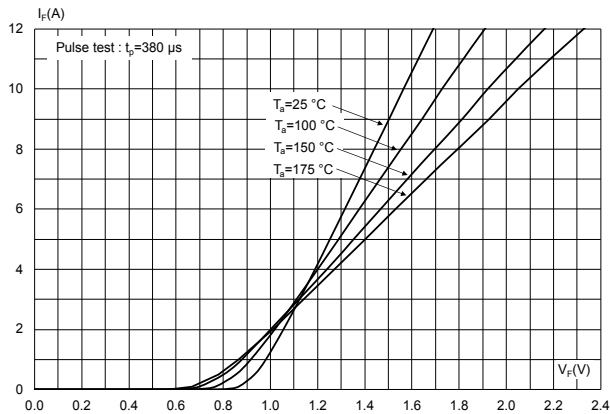
1. Most accurate value for the capacitive charge:  $Q_{Cj}(V_R) = \int_0^{V_R} C_j(V) dV$

**Figure 1. Thermal transient impedance model circuit of the diode –  $Z_{th(j-c)}$** 

**Table 5. Components typical values of the diode thermal transient impedance model  $Z_{th(j-c)}$** 

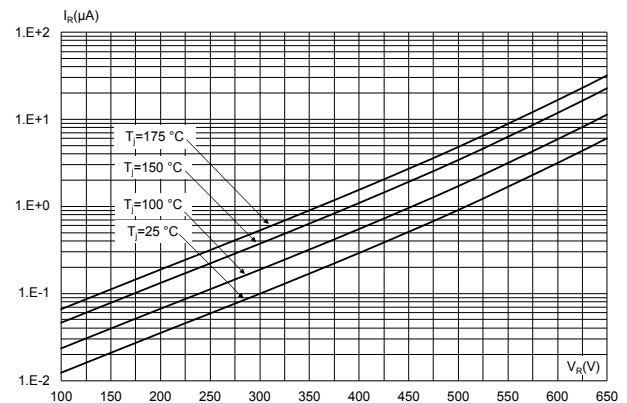
| Ref.      | Value (K/W) | Ref.      | Value (J/K) |
|-----------|-------------|-----------|-------------|
| $R_{th1}$ | 111.79 m    | $C_{th1}$ | 0.31 m      |
| $R_{th2}$ | 945.08 m    | $C_{th2}$ | 0.47 m      |
| $R_{th3}$ | 579.94 m    | $C_{th3}$ | 1.72 m      |
| $R_{th4}$ | 375.22 m    | $C_{th4}$ | 9.99 m      |
| $R_{th5}$ | 87.97 m     | $C_{th5}$ | 153.2 m     |

## 1.1 Characteristics (curves)

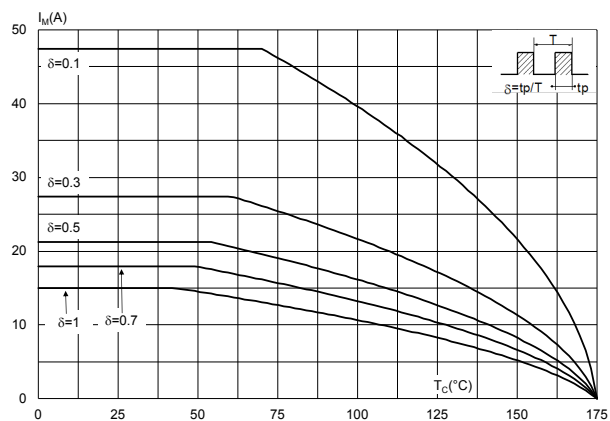
**Figure 2. Forward voltage drop versus forward current (typical values)**



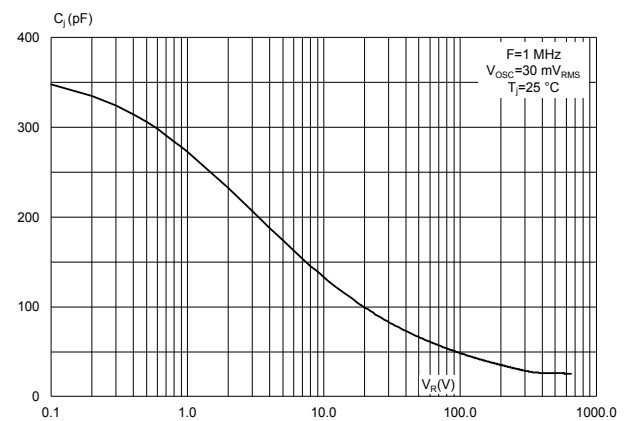
**Figure 3. Reverse leakage current versus reverse voltage applied (typical values)**



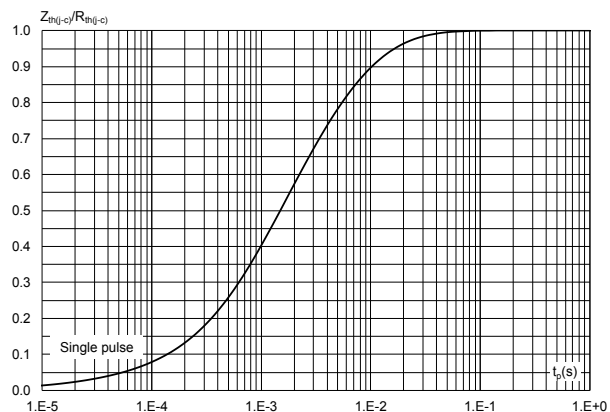
**Figure 4. Peak forward current versus case temperature ( $f_{sw} > 10$  kHz)**



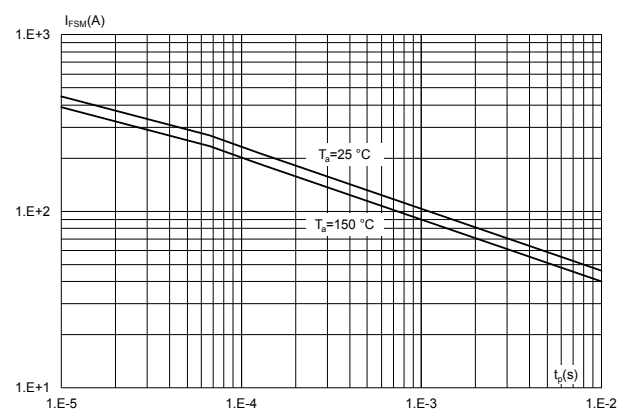
**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**



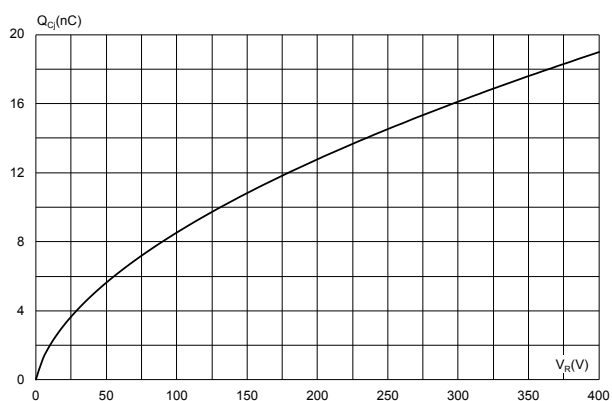
**Figure 6. Relative variation of thermal impedance junction to case versus pulse duration**



**Figure 7. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)**



**Figure 8. Total capacitive charges versus reverse voltage applied (typical values)**



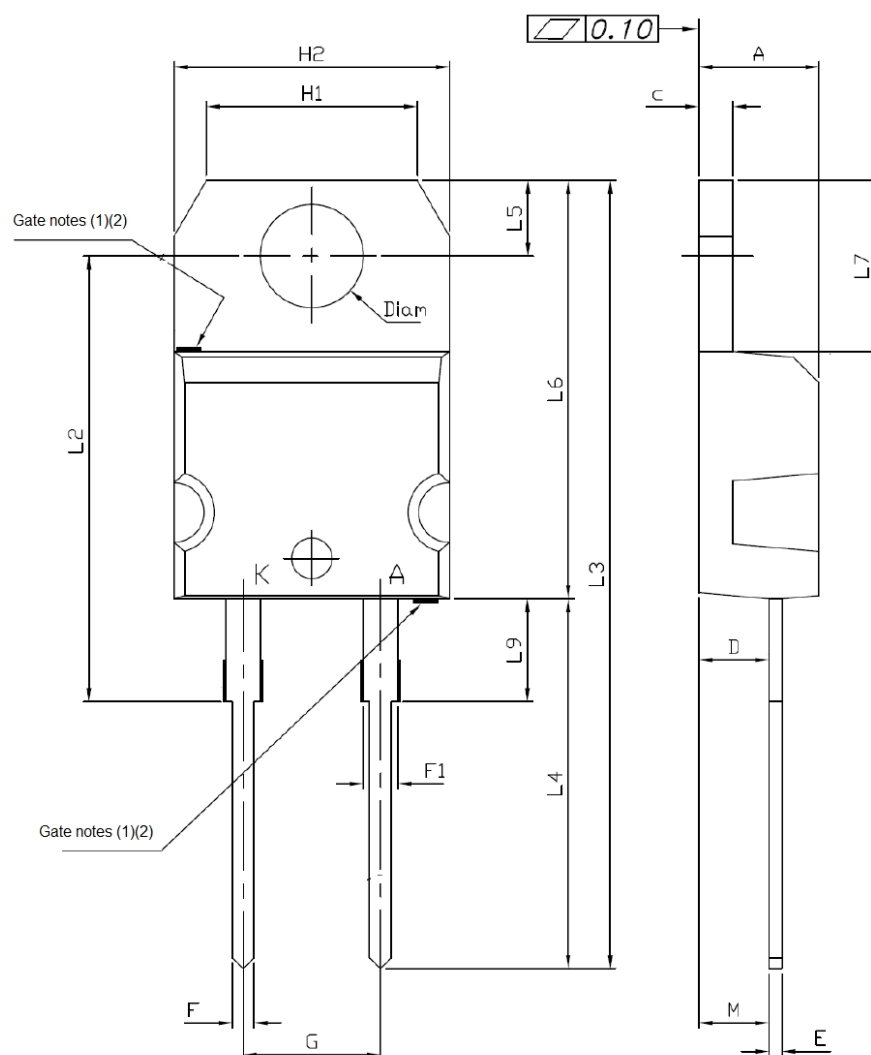
## 2 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 TO-220AC package information

- Epoxy meets UL 94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

**Figure 9. TO-220AC package outline**



- (1) : Max resin gate protusion 0.5 mm  
 (2) : Resin gate position is accepted in each of the two positions shown on the drawings or their symmetrical

0015990\_15

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

**Table 6. TO-220AC package mechanical data**

| Ref.          | Dimensions  |       |       |                             |       |       |
|---------------|-------------|-------|-------|-----------------------------|-------|-------|
|               | Millimeters |       |       | Inches (for reference only) |       |       |
|               | Min.        | Typ.  | Max.  | Min.                        | Typ.  | Max.  |
| A             | 4.40        |       | 4.60  | 0.173                       |       | 0.181 |
| C             | 1.23        |       | 1.32  | 0.048                       |       | 0.051 |
| D             | 2.40        |       | 2.72  | 0.094                       |       | 0.107 |
| E             | 0.49        |       | 0.70  | 0.019                       |       | 0.027 |
| F             | 0.61        |       | 0.88  | 0.024                       |       | 0.034 |
| F1            | 1.14        |       | 1.70  | 0.044                       |       | 0.066 |
| G             | 4.95        |       | 5.15  | 0.194                       |       | 0.202 |
| H2            | 10.00       |       | 10.40 | 0.393                       |       | 0.409 |
| L2            |             | 16.40 |       |                             | 0.645 |       |
| L4            | 13.00       |       | 14.00 | 0.511                       |       | 0.551 |
| L5            | 2.65        |       | 2.95  | 0.104                       |       | 0.116 |
| L6            | 15.25       |       | 15.75 | 0.600                       |       | 0.620 |
| L7            | 6.20        |       | 6.60  | 0.244                       |       | 0.259 |
| L9            | 3.50        |       | 3.93  | 0.137                       |       | 0.154 |
| M             |             | 2.60  |       |                             | 0.102 |       |
| Diam          | 3.75        |       | 3.85  | 0.147                       |       | 0.151 |
| Slug flatness |             | 0.03  | 0.10  |                             | 0.001 | 0.004 |

**Note:** For packing information, inner box dimensions and tube dimensions, refer to [TN1173](#).



### 3 Ordering information

**Table 7. Ordering information**

| Order code  | Marking   | Package  | Weight | Base qty. | Delivery mode |
|-------------|-----------|----------|--------|-----------|---------------|
| STPSC6G065D | PSC6G065D | TO-220AC | 1.86   | 50        | Tube          |

## Revision history

**Table 8. Document revision history**

| Date        | Revision | Changes                                                       |
|-------------|----------|---------------------------------------------------------------|
| 26-Jun-2025 | 1        | Initial release.                                              |
| 15-Jul-2025 | 2        | Updated <a href="#">Section 1: Characteristics</a> reference. |

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