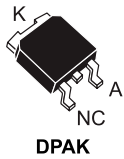


## Automotive 650 V power Schottky silicon carbide diode



### Features

- AEC-Q101 qualified
- No reverse recovery charge in application current range
- Switching behavior independent of temperature
- Recommended to PFC applications
- PPAP capable
- ECOPACK®2 compliant component

### Description

The 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 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.

Especially suited for use in PFC applications, this ST SiC diode will boost performance in hard switching conditions.

| Product status  |        |
|-----------------|--------|
| STPSC6H065BY-TR |        |
| Product summary |        |
| Symbol          | Value  |
| $I_{F(AV)}$     | 6 A    |
| $V_{RRM}$       | 650 V  |
| $T_{j(max.)}$   | 175 °C |

# 1 Characteristics

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

| Symbol       | Parameter                                           |                                                                      | Value       | Unit |
|--------------|-----------------------------------------------------|----------------------------------------------------------------------|-------------|------|
| $V_{RRM}$    | Repetitive peak reverse voltage                     | $T_J = -40\text{ °C to } +175\text{ °C}$                             | 650         | V    |
| $I_{F(RMS)}$ | Forward rms current                                 |                                                                      | 22          | A    |
| $I_{F(AV)}$  | Average forward current                             | $T_C = 145\text{ °C}^{(1)}$ , DC                                     | 6           | A    |
| $I_{FSM}$    | Surge non repetitive forward current                | $t_p = 10\text{ ms sinusoidal}$ , $T_C = 25\text{ °C}$               | 60          | A    |
|              |                                                     | $t_p = 10\text{ ms sinusoidal}$ , $T_C = 125\text{ °C}$              | 52          |      |
|              |                                                     | $t_p = 10\text{ }\mu\text{s square}$ , $T_C = 25\text{ °C}$          | 400         |      |
| $I_{FRM}$    | Repetitive peak forward current                     | $T_C = 145\text{ °C}^{(1)}$ , $T_J = 175\text{ °C}$ , $\delta = 0.1$ | 23          | A    |
| $T_{stg}$    | Storage temperature range                           |                                                                      | -55 to +175 | °C   |
| $T_J$        | Operating junction temperature range <sup>(2)</sup> |                                                                      | -40 to +175 | °C   |

1. Value based on  $R_{th(j-c)}$  max.

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

**Table 2. Thermal parameters**

| Symbol        | Parameter        | Typ. value | Max. value | Unit |
|---------------|------------------|------------|------------|------|
| $R_{th(j-c)}$ | Junction to case | 1.6        | 2.4        | °C/W |

**Table 3. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions       |                    | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|--------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_J = 25\text{ °C}$  | $V_R = V_{RRM}$    | -    | 5    | 60   | $\mu\text{A}$ |
|             |                         | $T_J = 150\text{ °C}$ |                    | -    | 50   | 250  |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_J = 25\text{ °C}$  | $I_F = 6\text{ A}$ | -    | 1.45 | 1.65 | V             |
|             |                         | $T_J = 150\text{ °C}$ |                    | -    | 1.7  | 2.05 |               |

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

2.  $t_p = 500\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

$$P = 0.972 \times I_{F(AV)} + 0.180 \times I_{F(RMS)}^2$$

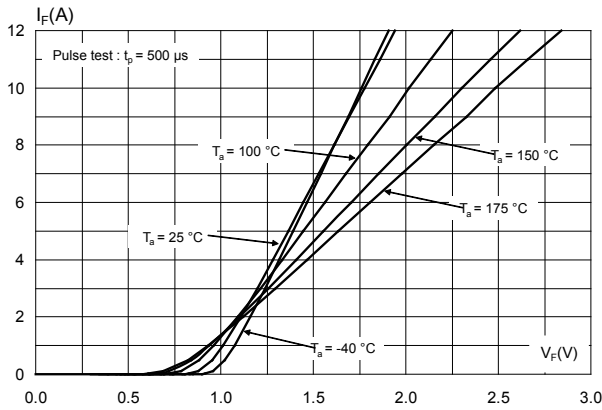
**Table 4. Dynamic electrical characteristics**

| Symbol         | Parameter               | Test conditions                                                  | Typ. | Unit |
|----------------|-------------------------|------------------------------------------------------------------|------|------|
| $Q_{cj}^{(1)}$ | Total capacitive charge | $V_R = 400\text{ V}$                                             | 18   | nC   |
| $C_j$          | Total capacitance       | $V_R = 0\text{ V}$ , $T_C = 25\text{ °C}$ , $F = 1\text{ MHz}$   | 300  | pF   |
|                |                         | $V_R = 400\text{ V}$ , $T_C = 25\text{ °C}$ , $F = 1\text{ MHz}$ | 30   |      |

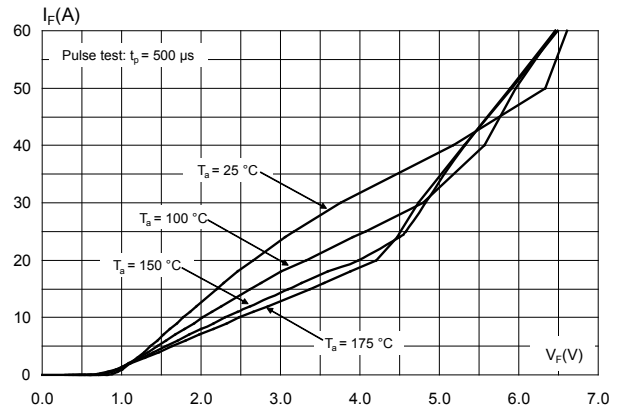
1. Most accurate value for the capacitive charge:  $Q_{cj} = \int_0^{V_{OUT}} c_j(V_R) \times dV_R$

## 1.1 Characteristics (curves)

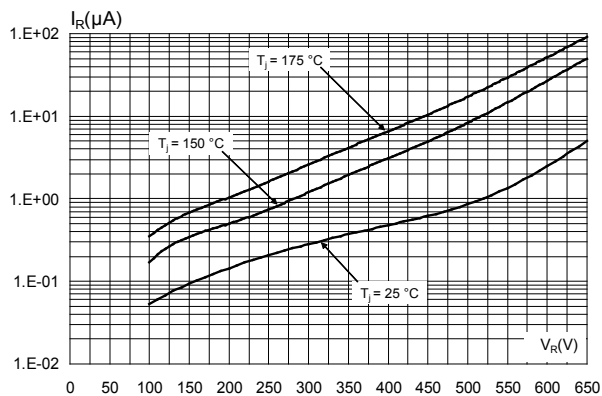
**Figure 1. Forward voltage drop versus forward current (typical values, low level)**



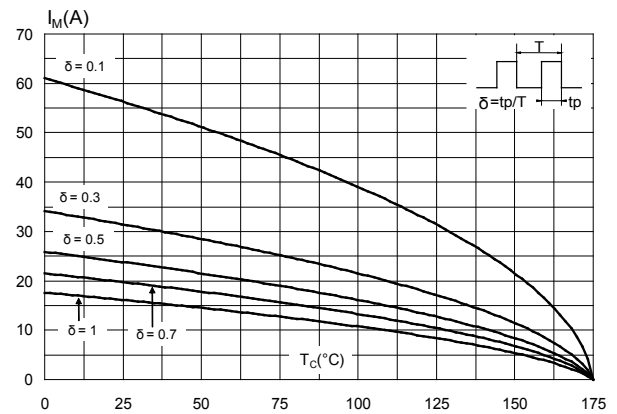
**Figure 2. Forward voltage drop versus forward current (typical values, high level)**



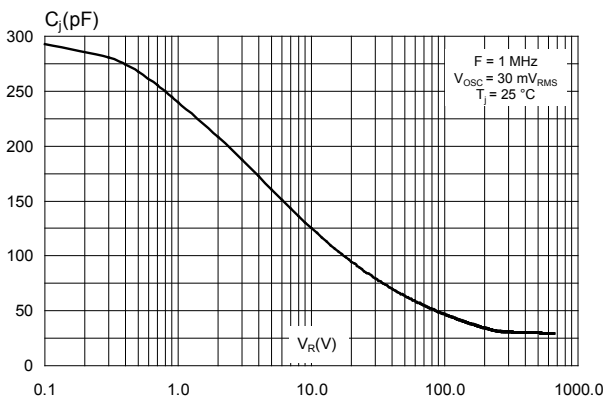
**Figure 3. Reverse leakage current versus reverse voltage applied (typical values)**



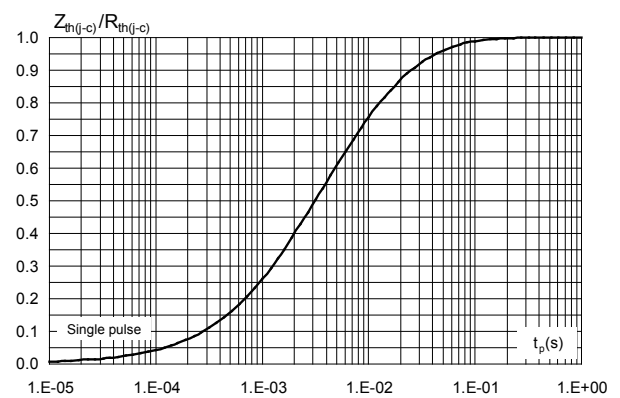
**Figure 4. Peak forward current versus case temperature**



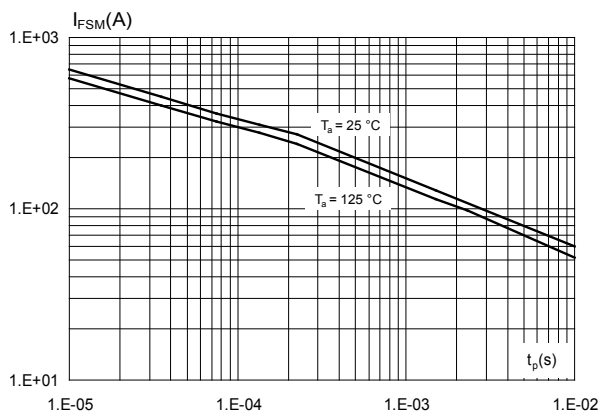
**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**



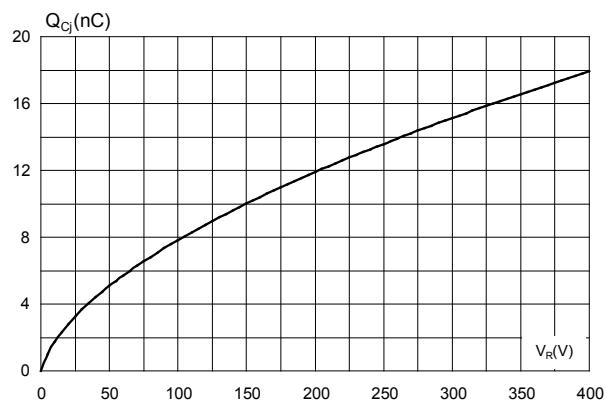
**Figure 6. Relative variation of thermal impedance junction to case versus pulse duration**



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



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



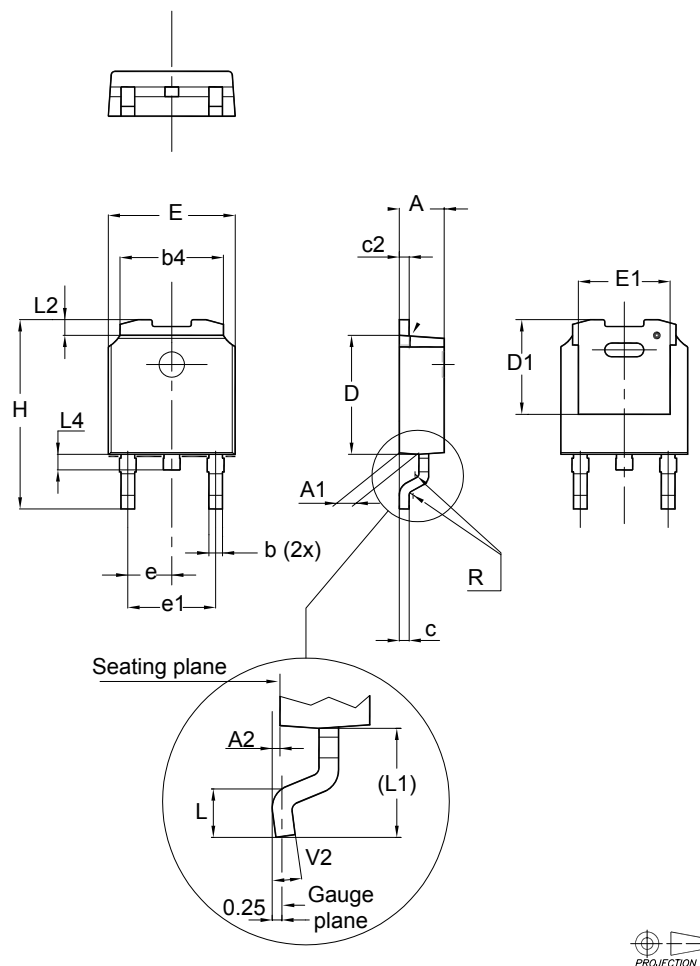
## 2 Package information

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

### 2.1 DPAK package information

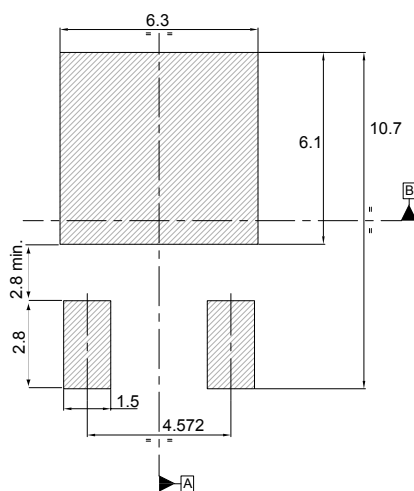
- Epoxy meets UL94, V0
- Cooling method: by conduction (C)

Figure 9. DPAK package outline



**Table 5. DPAK mechanical data**

| Dim. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 2.20        |      | 2.40  | 0.087  |       | 0.094 |
| A1   | 0.90        |      | 1.10  | 0.035  |       | 0.043 |
| A2   | 0.03        |      | 0.23  | 0.001  |       | 0.009 |
| b    | 0.64        |      | 0.90  | 0.025  |       | 0.035 |
| b4   | 5.20        |      | 5.40  | 0.205  |       | 0.213 |
| c    | 0.45        |      | 0.60  | 0.018  |       | 0.024 |
| c2   | 0.48        |      | 0.60  | 0.019  |       | 0.024 |
| D    | 6.00        |      | 6.20  | 0.236  |       | 0.244 |
| D1   | 4.95        | 5.10 | 5.25  | 0.195  | 0.201 | 0.207 |
| E    | 6.40        |      | 6.60  | 0.252  |       | 0.260 |
| E1   | 4.60        | 4.70 | 4.80  | 0.181  | 0.185 | 0.189 |
| e    | 2.16        | 2.28 | 2.40  | 0.085  | 0.090 | 0.094 |
| e1   | 4.40        |      | 4.60  | 0.173  |       | 0.181 |
| H    | 9.35        |      | 10.10 | 0.368  |       | 0.398 |
| L    | 1.00        |      | 1.50  | 0.039  |       | 0.059 |
| (L1) | 2.60        | 2.80 | 3.00  | 0.102  | 0.110 | 0.118 |
| L2   | 0.65        | 0.80 | 0.95  | 0.026  | 0.031 | 0.037 |
| L4   | 0.60        |      | 1.00  | 0.024  |       | 0.039 |
| R    |             | 0.20 |       |        | 0.008 |       |
| V2   | 0°          |      | 8°    | 0°     |       | 8°    |

**Figure 10. DPAK recommended footprint (dimensions are in mm)**

 The device must be positioned within  $\Phi 0.05 \text{ A B}$

### 3 Ordering Information

**Table 6. Ordering information**

| Order code      | Marking    | Package | Weight | Base qty. | Delivery mode |
|-----------------|------------|---------|--------|-----------|---------------|
| STPSC6H065BY-TR | PSC6H 065Y | DPAK    | 0.32 g | 2500      | Tape and reel |

## Revision history

**Table 7. Document revision history**

| Date        | Version | Changes          |
|-------------|---------|------------------|
| 13-Mar-2018 | 1       | Initial release. |

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