

## 600 V power Schottky silicon carbide diode

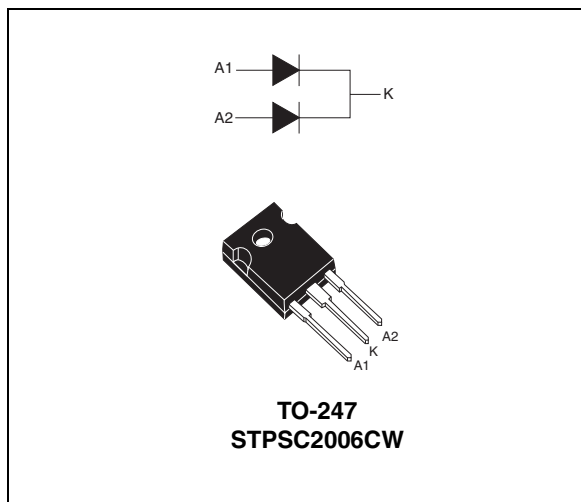
### Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- Particularly suitable in PFC boost diode function

### Description

The SiC diode is an ultrahigh 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 600 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.

ST SiC diodes will boost the performance of PFC operations in hard switching conditions.



**Table 1. Device summary**

| Symbol      | Value    |
|-------------|----------|
| $I_{F(AV)}$ | 2 x 10 A |
| $V_{RRM}$   | 600 V    |
| $T_J (max)$ | 175 °C   |
| $Q_C (typ)$ | 12 nC    |

# 1 Characteristics

**Table 2. Absolute ratings (limiting values at 25 °C unless otherwise specified, per diode)**

| Symbol              | Parameter                                    |                                                            |            | Value       | Unit |
|---------------------|----------------------------------------------|------------------------------------------------------------|------------|-------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage              |                                                            |            | 600         | V    |
| I <sub>F(RMS)</sub> | Forward rms current                          |                                                            |            | 18          | A    |
| I <sub>F(AV)</sub>  | Average forward current                      | T <sub>c</sub> = 115 °C, δ = 0.5                           | Per diode  | 10          | A    |
|                     |                                              | T <sub>c</sub> = 100 °C, δ = 0.5                           | Per device | 20          | A    |
| I <sub>FSM</sub>    | Surge non repetitive forward current         | t <sub>p</sub> = 10 ms sinusoidal, T <sub>c</sub> = 25 °C  |            | 40          | A    |
|                     |                                              | t <sub>p</sub> = 10 ms sinusoidal, T <sub>c</sub> = 125 °C |            | 32          |      |
|                     |                                              | t <sub>p</sub> = 10 μs square, T <sub>c</sub> = 25 °C      |            | 160         |      |
| I <sub>FRM</sub>    | Repetitive peak forward current              | δ = 0.1, T <sub>c</sub> = 110 °C, T <sub>j</sub> = 150 °C  |            | 40          | A    |
| T <sub>stg</sub>    | Storage temperature range                    |                                                            |            | -55 to +175 | °C   |
| T <sub>j</sub>      | Maximum operating junction temperature range |                                                            |            | -40 to +175 | °C   |

**Table 3. Thermal resistance**

| Symbol        | Parameter        |           | Value | Unit |
|---------------|------------------|-----------|-------|------|
| $R_{th(j-c)}$ | Junction to case | Per diode | 2     | °C/W |
|               |                  | Total     | 1.2   | °C/W |
| $R_{th(c)}$   | Coupling         |           | 0.4   | °C/W |

**Table 4. Static electrical characteristics per diode**

| Symbol      | Parameter               | Tests conditions      |                     | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|---------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$     | -    | 30   | 150  | $\mu\text{A}$ |
|             |                         | $T_j = 150\text{ °C}$ |                     | -    | 210  | 1500 |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 10\text{ A}$ | -    | 1.4  | 1.7  | V             |
|             |                         | $T_j = 150\text{ °C}$ |                     | -    | 1.6  | 2.1  |               |

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

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

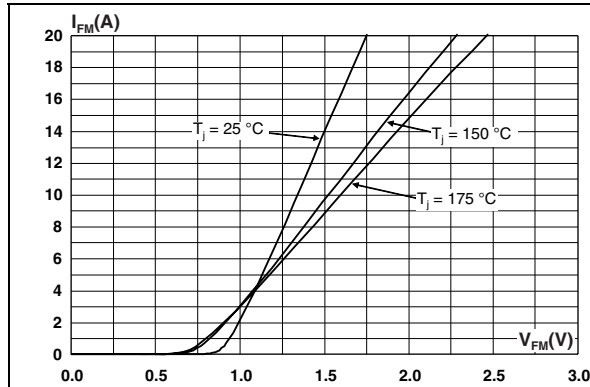
To evaluate the conduction losses use the following equation:

$$P = 1.2 \times I_{F(AV)} + 0.09 \times I_{F(RMS)}^2$$

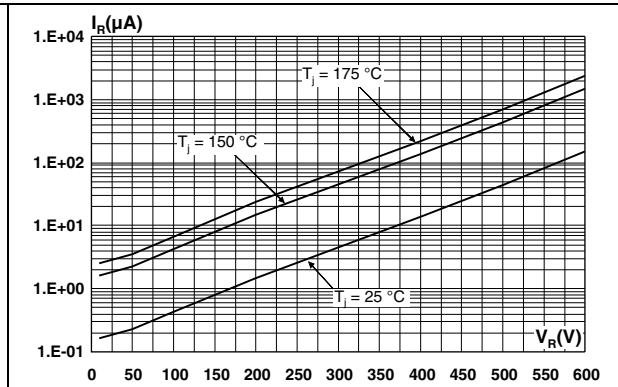
**Table 5. Other parameters per diode**

| Symbol | Parameter               | Test conditions                                                                                       | Typ. | Unit |
|--------|-------------------------|-------------------------------------------------------------------------------------------------------|------|------|
| $Q_c$  | Total capacitive charge | $V_r = 400\text{ V}, I_F = 10\text{ A}, di_F/dt = -200\text{ A}/\mu\text{s}$<br>$T_j = 150\text{ °C}$ | 12   | nC   |
| C      | Total capacitance       | $V_r = 0\text{ V}, T_c = 25\text{ °C}, F = 1\text{ Mhz}$                                              | 650  | pF   |

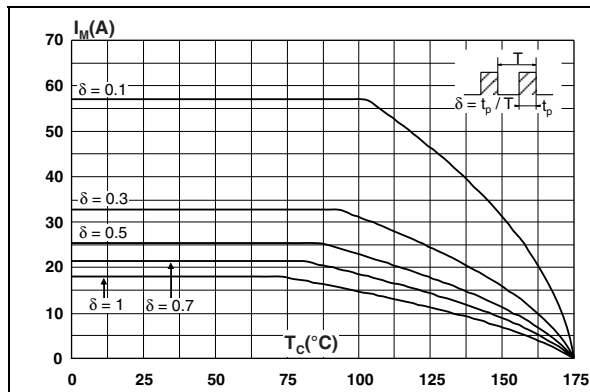
**Figure 1. Forward voltage drop versus forward current (typical values, per diode)**



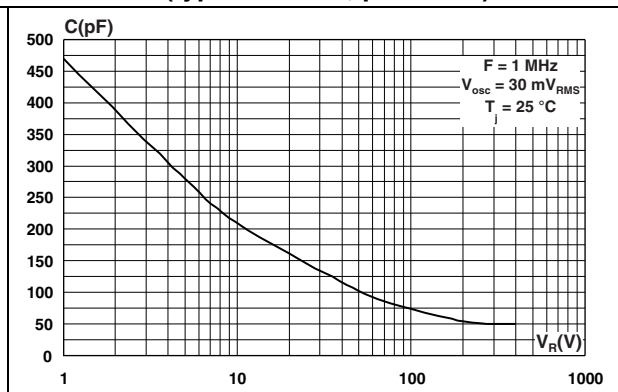
**Figure 2. Reverse leakage current versus reverse voltage applied (maximum values, per diode)**



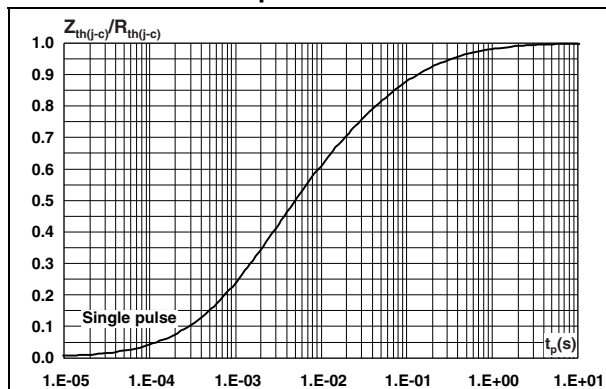
**Figure 3. Peak forward current versus case temperature (per diode)**



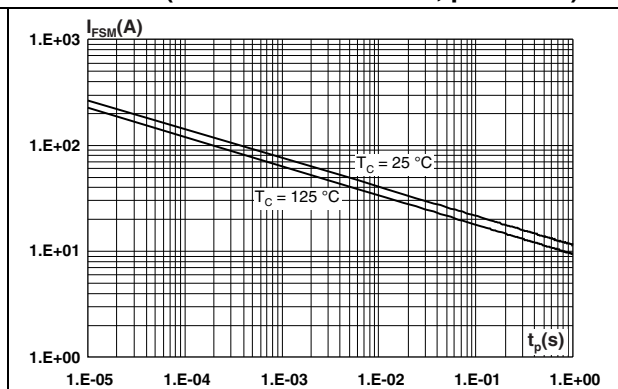
**Figure 4. Junction capacitance versus reverse voltage applied (typical values, per diode)**

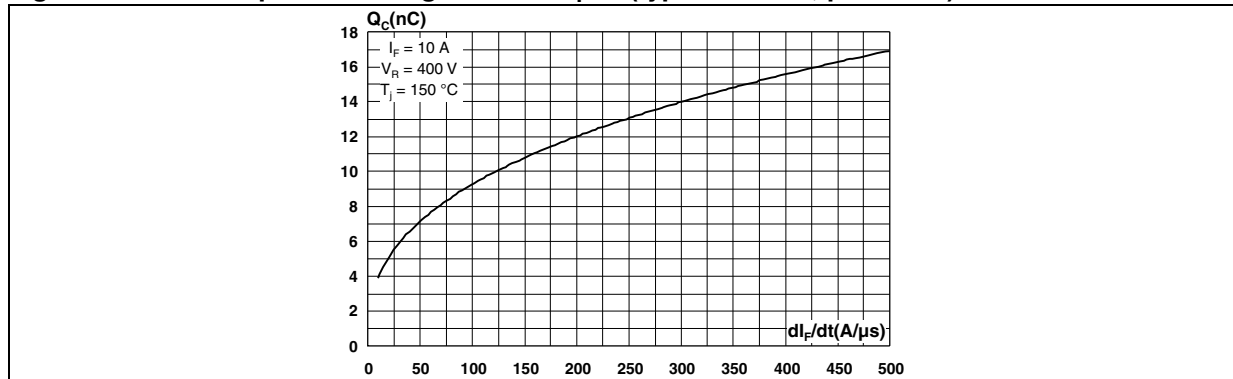


**Figure 5. Relative variation of thermal impedance junction to case versus pulse duration**



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



**Figure 7. Total capacitive charge versus  $di_F/dt$  (typical values, per diode)**

## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: convection (C)
- Recommended torque value: 0.55 to 1.0 N·m

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**Table 6. TO-247 dimensions**

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.85        | 5.16  | 0.191      | 0.203 |
| D    | 2.20        | 2.60  | 0.086      | 0.102 |
| E    | 0.40        | 0.80  | 0.015      | 0.031 |
| F    | 1.00        | 1.40  | 0.039      | 0.055 |
| F1   | 3.00 typ.   |       | 0.118 typ. |       |
| F2   | 2.00 typ.   |       | 0.079 typ. |       |
| F3   | 1.90        | 2.40  | 0.075      | 0.094 |
| F4   | 3.00        | 3.40  | 0.118      | 0.134 |
| G    | 10.90 typ.  |       | 0.429 typ. |       |
| H    | 15.45       | 16.03 | 0.608      | 0.631 |
| L    | 19.85       | 21.09 | 0.781      | 0.830 |
| L1   | 3.70        | 4.30  | 0.146      | 0.169 |
| L2   | 18.30       | 19.13 | 0.720      | 0.753 |
| L3   | 14.20       | 20.30 | 0.559      | 0.799 |
| L4   | 34.05       | 41.38 | 1.341      | 1.629 |
| L5   | 5.35        | 6.30  | 0.211      | 0.248 |
| M    | 2.00        | 3.00  | 0.079      | 0.118 |
| V    | 5° typ.     |       | 5° typ.    |       |
| V2   | 60° typ.    |       | 60° typ.   |       |
| Dia. | 3.55        | 3.65  | 0.140      | 0.144 |

### 3 Ordering information

**Table 7. Ordering information**

| Order code  | Marking     | Package | Weight | Base qty | Delivery mode |
|-------------|-------------|---------|--------|----------|---------------|
| STPSC2006CW | STPSC2006CW | TO-247  | 4.36 g | 30       | Tube          |

### 4 Revision history

**Table 8. Document revision history**

| Date        | Revision | Changes      |
|-------------|----------|--------------|
| 01-Mar-2011 | 1        | First issue. |

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