

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.

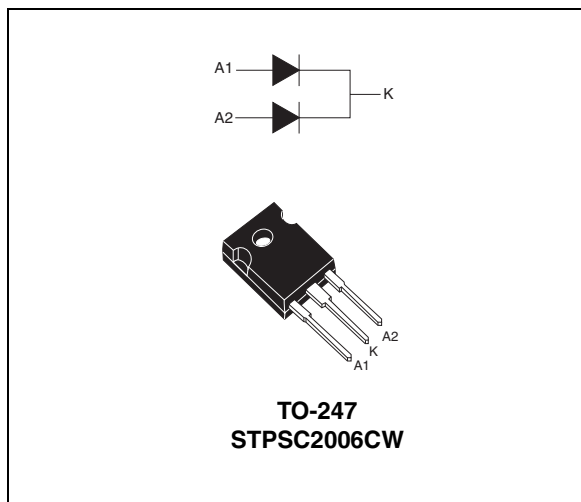


Table 1. Device summary

| 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 _{RRM} | Repetitive peak reverse voltage | | | 600 | V |
| I _{F(RMS)} | Forward rms current | | | 18 | A |
| I _{F(AV)} | Average forward current | T _c = 115 °C, δ = 0.5 | Per diode | 10 | A |
| | | T _c = 100 °C, δ = 0.5 | Per device | 20 | A |
| I _{FSM} | Surge non repetitive forward current | t _p = 10 ms sinusoidal, T _c = 25 °C | | 40 | A |
| | | t _p = 10 ms sinusoidal, T _c = 125 °C | | 32 | |
| | | t _p = 10 μs square, T _c = 25 °C | | 160 | |
| I _{FRM} | Repetitive peak forward current | δ = 0.1, T _c = 110 °C, T _j = 150 °C | | 40 | A |
| T _{stg} | Storage temperature range | | | -55 to +175 | °C |
| T _j | 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 | μA |
| | | $T_j = 150\text{ °C}$ | | - | 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 | $V_r = 400\text{ V}, I_F = 10\text{ A}, di_F/dt = -200\text{ A}/\mu\text{s}$ $T_j = 150\text{ °C}$ | 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)

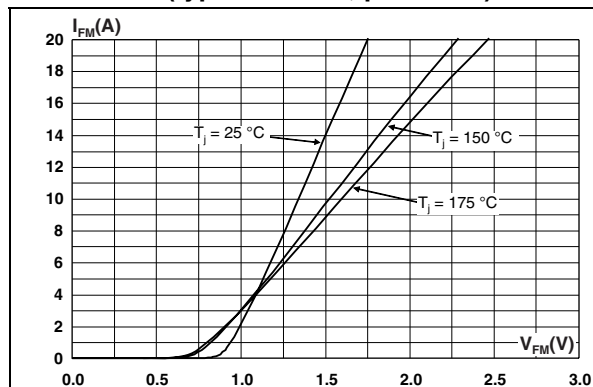


Figure 2. Reverse leakage current versus reverse voltage applied (maximum values, per diode)

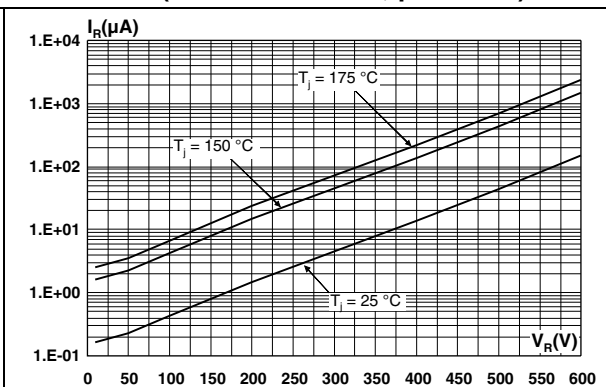


Figure 3. Peak forward current versus case temperature (per diode)

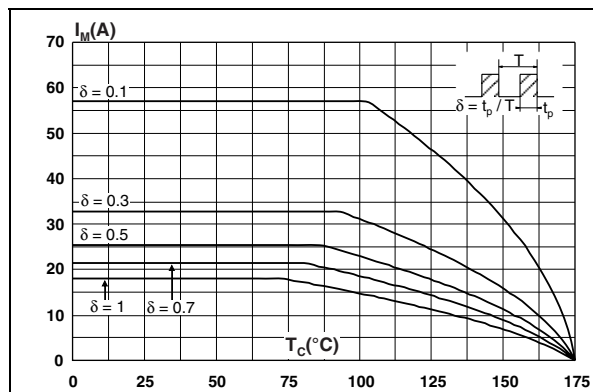


Figure 4. Junction capacitance versus reverse voltage applied (typical values, per diode)

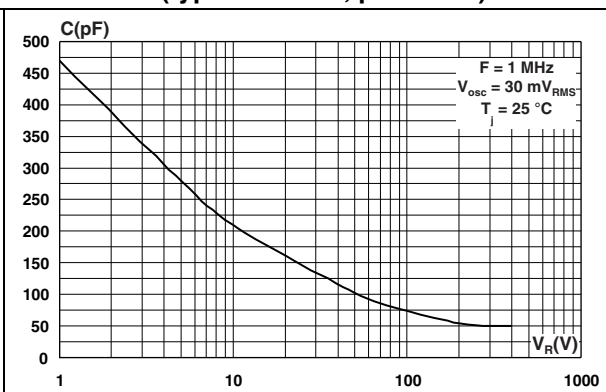


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

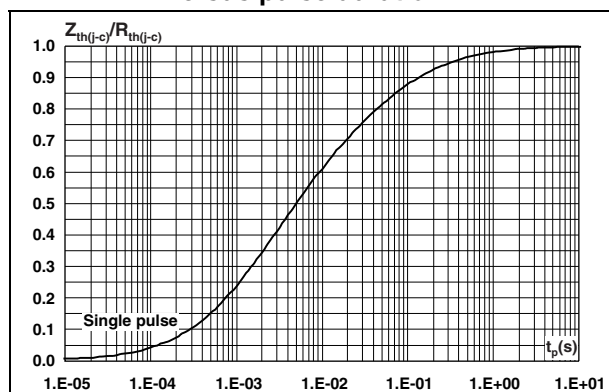


Figure 6. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform, per diode)

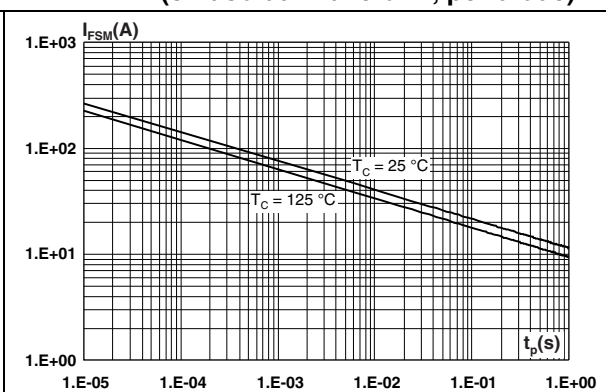
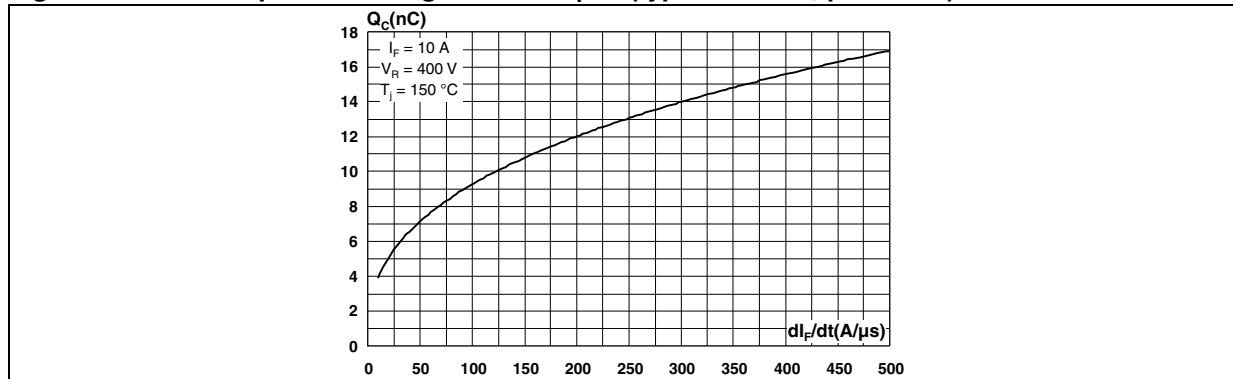


Figure 7. Total capacitive charge versus di_F/dt (typical values, per diode)

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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