

## 600 V power Schottky silicon carbide diode

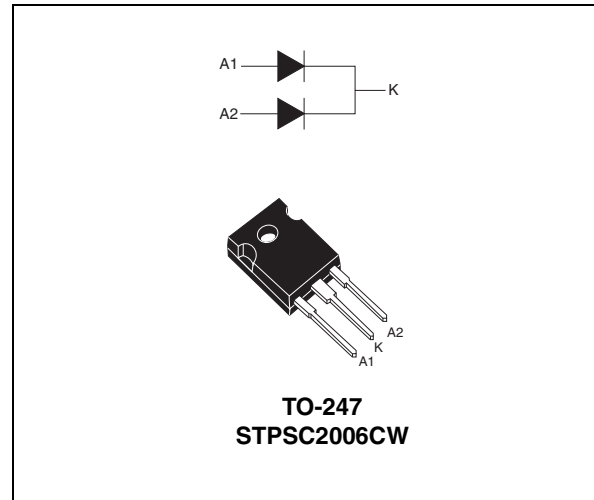
### Features

- 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 <sub>th(j-c)</sub>	Junction to case	Per diode	2	°C/W
		Total	1.2	°C/W
R <sub>th(c)</sub>	Coupling		0.4	°C/W

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

Symbol	Parameter	Tests conditions		Min.	Typ.	Max.	Unit
I <sub>R</sub> (1)	Reverse leakage current	T <sub>j</sub> = 25 °C	V <sub>R</sub> = V <sub>RRM</sub>	-	30	150	μA
		T <sub>j</sub> = 150 °C		-	210	1500	
V <sub>F</sub> (2)	Forward voltage drop	T <sub>j</sub> = 25 °C	I <sub>F</sub> = 10 A	-	1.4	1.7	V
		T <sub>j</sub> = 150 °C		-	1.6	2.1	

1. t<sub>p</sub> = 10 ms, δ < 2%

2. t<sub>p</sub> = 500 μs, δ < 2%

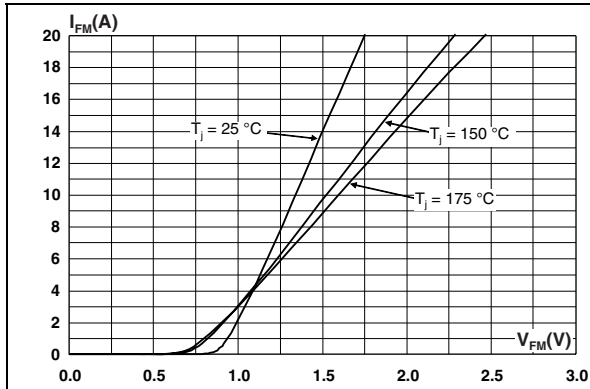
To evaluate the conduction losses use the following equation:

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

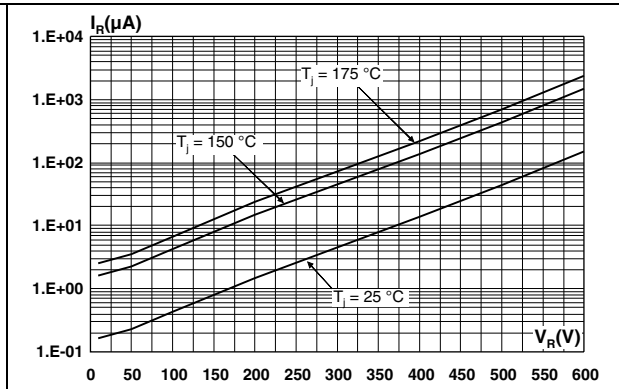
**Table 5. Other parameters per diode**

Symbol	Parameter	Test conditions	Typ.	Unit
Q <sub>c</sub>	Total capacitive charge	V <sub>r</sub> = 400 V, I <sub>F</sub> = 10 A, di <sub>F</sub> /dt = -200 A/μs T <sub>j</sub> = 150 °C	12	nC
C	Total capacitance	V <sub>r</sub> = 0 V, T <sub>C</sub> = 25 °C, F = 1 Mhz	650	pF

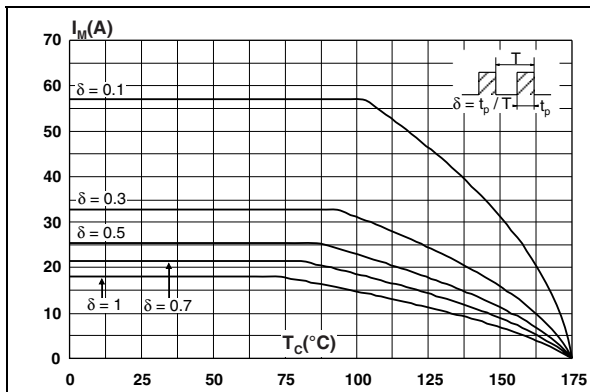
**Figure 1. Forward voltage drop versus forward current (typical values, per diode)**



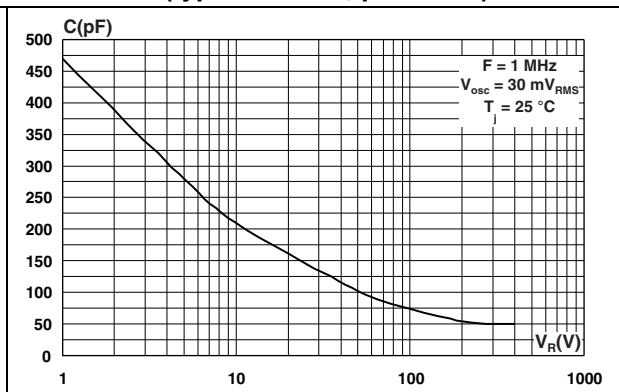
**Figure 2. Reverse leakage current versus reverse voltage applied (maximum values, per diode)**



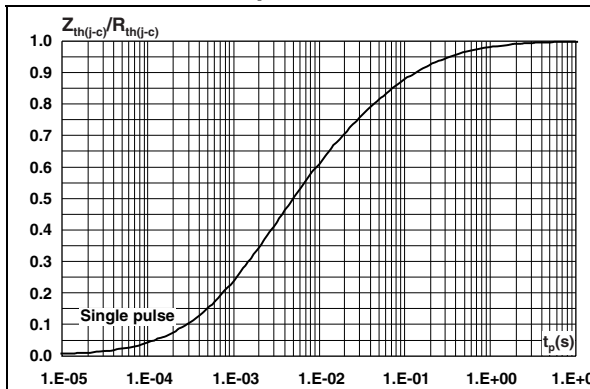
**Figure 3. Peak forward current versus case temperature (per diode)**



**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)**

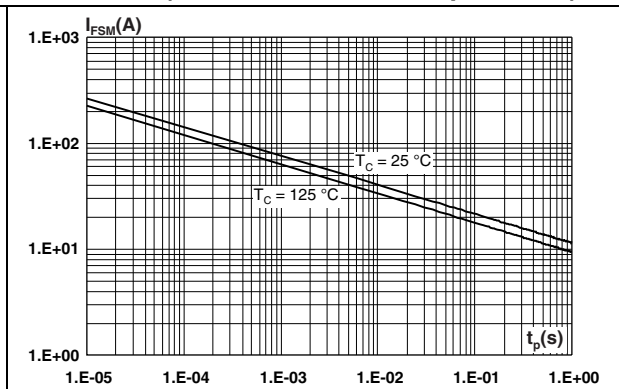
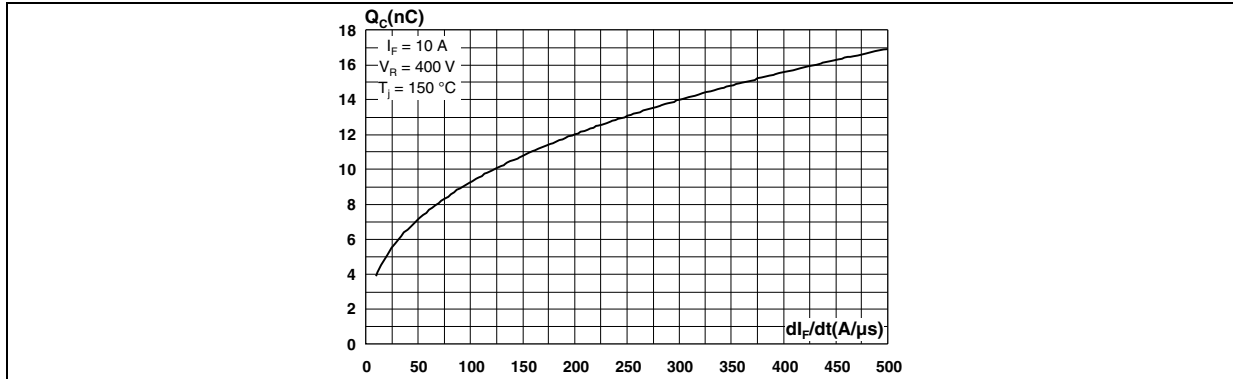


Figure 7. Total capacitive charge versus  $di_F/dt$  (typical values, per diode)



## 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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