

# STPSC1006

# 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.

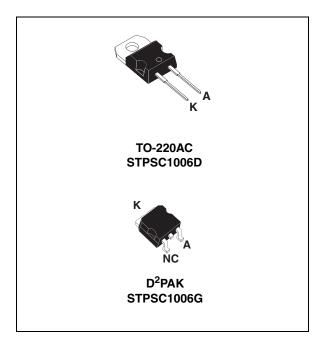


Table 1.Device summary

	•
I <sub>F(AV)</sub>	10 A
V <sub>RRM</sub>	600 V
T <sub>j (max)</sub>	175 °C
Q <sub>C (typ)</sub>	12 nC

# 1 Characteristics

### Table 2. Absolute ratings (limiting values at 25 °C unless otherwise specified)

Symbol	Par	Value	Unit	
V <sub>RRM</sub>	Repetitive peak reverse voltage		600	V
I <sub>F(RMS)</sub>	Forward rms current		18	А
I <sub>F(AV)</sub>	Average forward current	$T_{c} = 115 \ ^{\circ}C, \ \delta = 0.5$	10	А
Surge non repetitive forward	Surge per repetitive ferward	$t_p = 10 \text{ ms} \text{ sinusoidal}, T_c = 25 \text{ °C}$	40	
	current	$t_p = 10 \text{ ms} \text{ sinusoidal}, T_c = 125 ^\circ\text{C}$	32	А
		$t_p$ = 10 µs square, $T_c$ = 25 °C	160	
I <sub>FRM</sub>	Repetitive peak forward current $\begin{cases} \delta = 0.1, T_C = 110 \ ^\circ C, \\ T_j = 150 \ ^\circ C \end{cases}$		40	А
T <sub>stg</sub>	Storage temperature range		-55 to +175	°C
Тj	Operating junction temperature		-40 to +175	°C

#### Table 3. Thermal resistance

	Symbol	Parameter	Value	Unit	
ſ	R <sub>th(j-c)</sub>	Junction to case	2	°C/W	

### Table 4. Static electrical characteristics

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

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

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

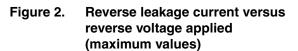
To evaluate the conduction losses use the following equation: P = 1.2 x  $I_{F(AV)}$  + 0.09 x  $I_{F}{}^{2}_{(RMS)}$ 

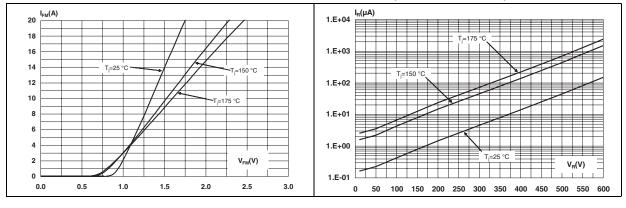
Table 5. Other parameters

Symbol	Parameter	Test conditions	Тур.	Unit
Q <sub>c</sub>	Total capacitive charge	$V_r$ = 400 V, $I_F$ = 10 A $dI_F/dt$ = -200 A/µs $T_j$ = 150 $^\circ C$	12	nC
С	Total canacitance	$V_r = 0 V$ , $T_c = 25 °C$ , $F = 1 Mhz$	650	рF
C Total capacitance	$V_r$ = 400 V, $T_c$ = 25 °C, F = 1 Mhz	50	μL	



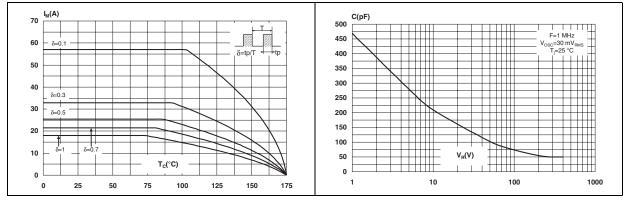
# Figure 1. Forward voltage drop versus forward current (typical values)





# Figure 3. Peak forward current versus case temperature

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





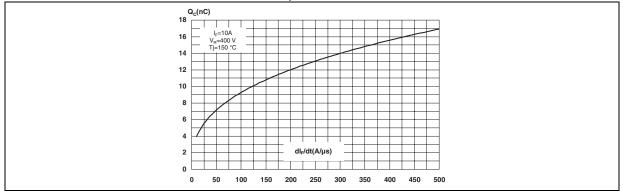
1.E+00

#### **Relative variation of thermal** Figure 6. Non-repetitive peak surge forward Figure 5. current versus pulse duration impedance junction to case versus pulse duration (sinusoidal waveform) I<sub>FSM</sub>(A) ./R... 1.E+03 1.0 0.9 0.8 1 0.7 1.E+02 T\_c=25 0.6 1 0.5 °C 0.4 1.E+01 0.3 0.2 0.1 t<sub>p</sub>(s) Single pulse t<sub>p</sub>(s) \_\_\_\_ +++++ 0.0 1.E+00 1.E-05 1.E-04 1.E-03 1.E-02 1.E-01 1.E+00 1.E+01 1.E-04 1.E-02 1.E-01

1.E-05

1.E-03

Total capacitive charge versus dl<sub>F</sub>/dt (typical values) Figure 7.



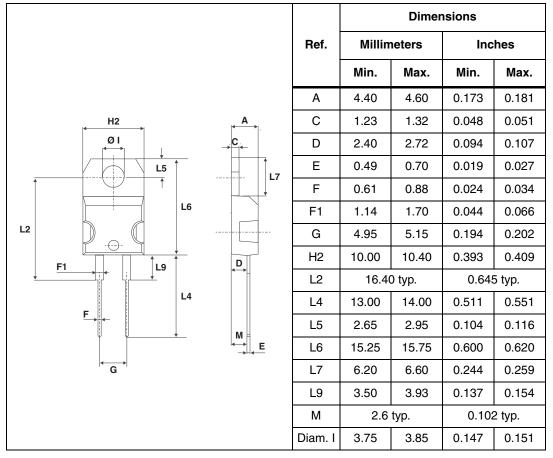


### 2 Package information

- Epoxy meets UL94, V0
- Cooling method: convection (C)
- Recommended torque value: 0.4 to 0.6 N·m

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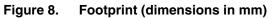
Table 6. TO-220AC dimensions

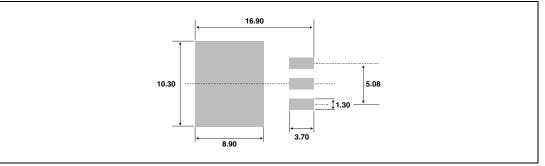




				Dimer	sions	
		Ref.	Millimeters		Inches	
			Min.	Max.	Min.	Max.
		А	4.40	4.60	0.173	0.181
	<u>▲</u>	A1	2.49	2.69	0.098	0.106
	C2→→→	A2	0.03	0.23	0.001	0.009
		В	0.70	0.93	0.027	0.037
L		B2	1.14	1.70	0.045	0.067
		С	0.45	0.60	0.017	0.024
		C2	1.23	1.36	0.048	0.054
→ B2 → B		D	8.95	9.35	0.352	0.368
G		Е	10.00	10.40	0.393	0.409
		G	4.88	5.28	0.192	0.208
		L	15.00	15.85	0.590	0.624
	M↓ ★↓ V2	L2	1.27	1.40	0.050	0.055
	← │ ↓	L3	1.40	1.75	0.055	0.069
		М	2.40	3.20	0.094	0.126
		R	0.40 typ.		0.016 typ.	
		V2	0°	8°	0°	8°

Table 7.D<sup>2</sup>PAK dimensions







# **3** Ordering information

### Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPSC1006D	STPSC1006D	TO-220AC	1.86 g	50	Tube
STPSC1006G-TR	STPSC1006G	D <sup>2</sup> PAK	1.48 g	1000	Tape and reel

# 4 Revision history

### Table 9.Document revision history

Date	Revision	Changes
24-Sep-2009	1	First issue.
16-Jun-2010	2	Added D <sup>2</sup> PAK package.
3-Nov-2010	3	Updated Table 8.



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