

600 V power Schottky silicon carbide diode

Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- Dedicated to PFC boost diode

Description

The SiC diode is an ultrahigh performance power Schottky diode. It is manufactured using a silicon carbide substrate. The wide bandgap 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.

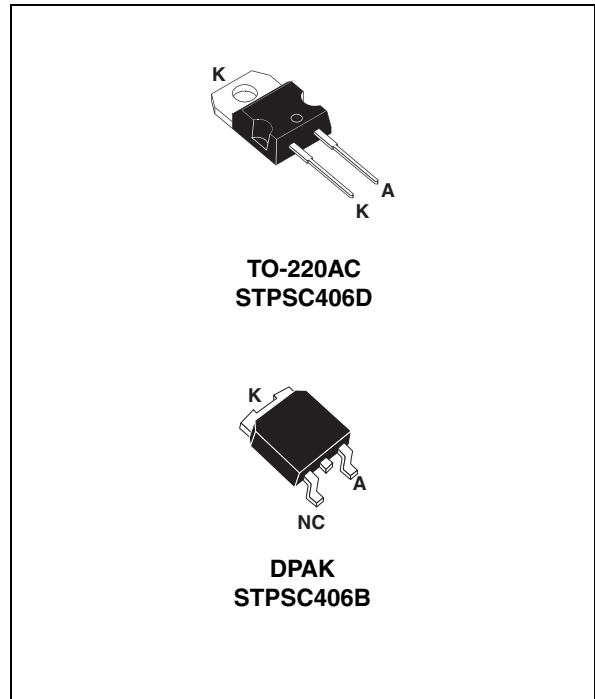


Table 1. Device summary

$I_{F(AV)}$	4 A
V_{RRM}	600 V
$T_J (max)$	175 °C
$Q_C (typ)$	3 nC

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		600	V
$I_{F(RMS)}$	Forward rms current		11	A
$I_{F(AV)}$	Average forward current	DPAK, $T_c = 110\text{ °C}$, $\delta = 0.5$	4	A
		TO-220AC, $T_c = 95\text{ °C}$, $\delta = 0.5$		
I_{FSM}	Surge non repetitive forward current	$t_p = 10\text{ ms}$ sinusoidal, $T_c = 25\text{ °C}$	14	A
		$t_p = 10\text{ ms}$ sinusoidal, $T_c = 125\text{ °C}$	10	
		$t_p = 10\text{ }\mu\text{s}$ square, $T_c = 25\text{ °C}$	40	
I_{FRM}	Repetitive peak forward current	DPAK, $T_c = 115\text{ °C}$, $T_j = 150\text{ °C}$, $\delta = 0.1$	14	A
		TO-220AC, $T_c = 105\text{ °C}$, $T_j = 150\text{ °C}$, $\delta = 0.1$		
T_{stg}	Storage temperature range		-55 to +175	°C
T_j	Operating junction temperature ⁽¹⁾		-40 to +175	°C

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

Table 3. Thermal resistance

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC	5.5	°C/W
		DPAK	4.5	

Table 4. Static electrical characteristics

Symbol	Parameter	Tests conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-	10	50	μA
		$T_j = 150\text{ °C}$		-	60	500	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 4\text{ A}$	-	1.55	1.9	V
		$T_j = 150\text{ °C}$		-	1.9	2.4	

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:

$$P = 1.20 \times I_{F(AV)} + 0.3 \times I_{F(RMS)}^2$$

Table 5. Other parameters

Symbol	Parameter	Test conditions	Typ.	Unit
Q_c	Total capacitive charge	$V_r = 400\text{ V}$, $I_F = 4\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$ $T_j = 150\text{ °C}$	3	nC
C	Total capacitance	$V_r = 0\text{ V}$, $T_c = 25\text{ °C}$, $F = 1\text{ Mhz}$	200	pF
		$V_r = 400\text{ V}$, $T_c = 25\text{ °C}$, $F = 1\text{ Mhz}$	20	

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

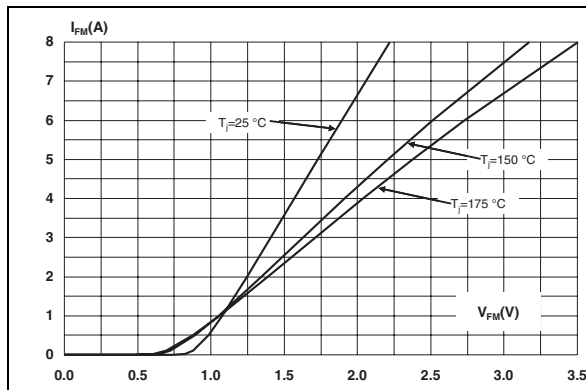


Figure 2. Reverse leakage current versus reverse voltage applied (maximum values)

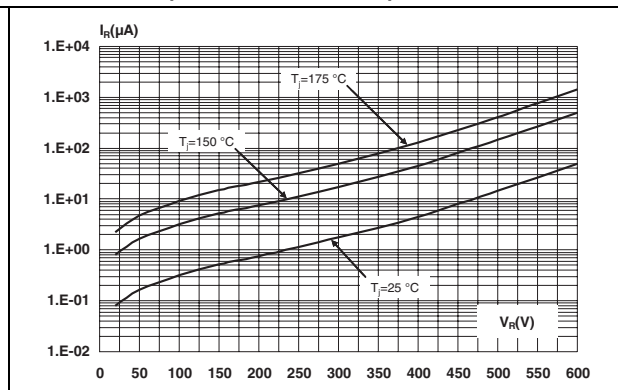


Figure 3. Peak forward current versus case temperature (TO-220AC)

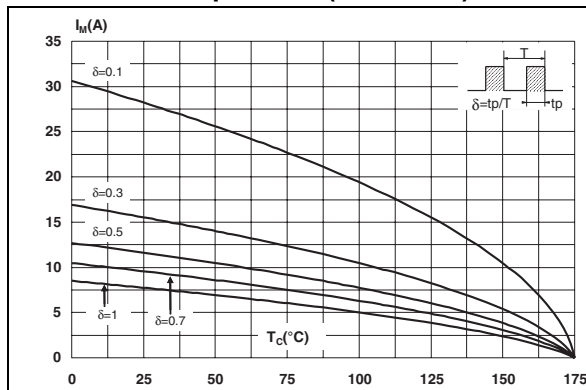


Figure 4. Peak forward current versus case temperature (DPAK)

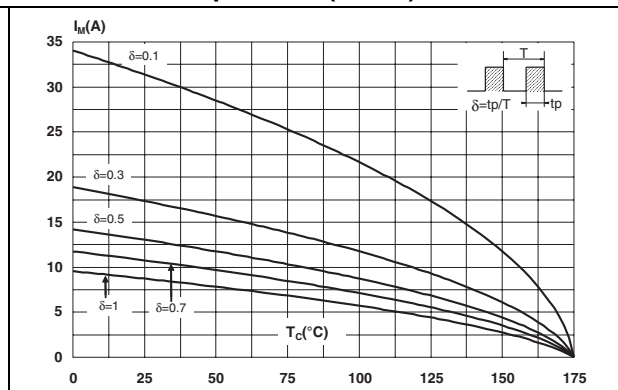


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

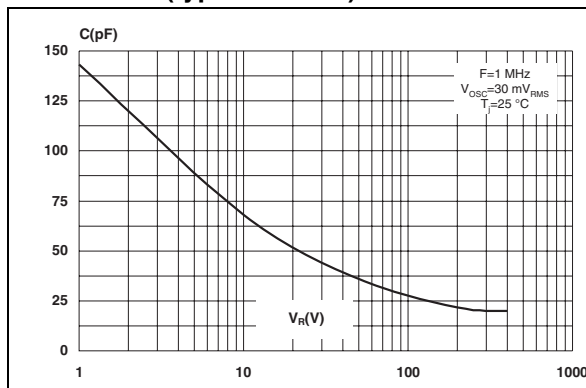
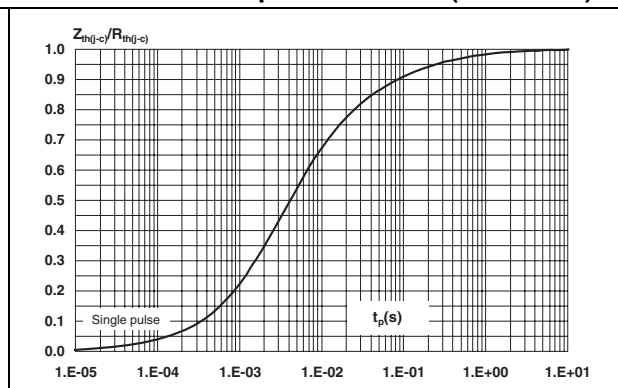


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC)



3 **Ordering information**

Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPSC406D	STPSC406D	TO-220AC	1.86 g	50	Tube
STPSC406B-TR	STPSC406B	DPAK	0.3g	2500	Tape and reel