STPSC20H065C

650 V power Schottky silicon carbide diode

Datasheet — production data

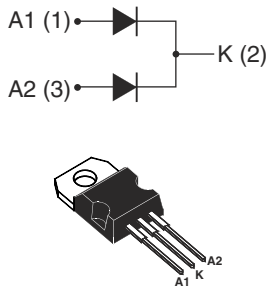
Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- Dedicated to PFC applications
- High forward surge capability

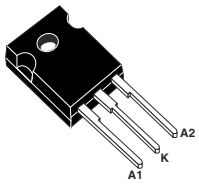
Description

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 650 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.

Especially suited for use in PFC applications, this ST SiC diode will boost the performance in hard switching conditions. Its high forward surge capability ensures a good robustness during transient phases.



TO-220AB
STPSC20H065CT



TO-247
STPSC20H065CW

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	2 x 10 A
V_{RRM}	650 V
T_j (max)	175 °C

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		650	V
$I_{F(RMS)}$	Forward rms current		22	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	T_c = 120 °C, per diode	10	A
		T_c = 105 °C, per device	20	
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, T_c = 25 °C t_p = 10 ms sinusoidal, T_c = 125 °C t_p = 10 µs square, T_c = 25 °C	90 80 470	A
I_{FRM}	Repetitive peak forward current	T_c = 120 °C,T_j = 150 °C, $\delta = 0.1$	36	A
T_{stg}	Storage temperature range		-55 to +175	°C
T_j	Operating junction temperature(1)		-40 to +175	°C

1. $\frac{dPtot}{dTj} < \frac{1}{Rth(j-a)}$ condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal resistance (typical values)

Symbol	Parameter			Value		Unit
				Typ.	Max.	
$R_{th(j-c)}$	Junction to case per diode	Per diode	TO-247	1.25	1.5	°C/W
			TO-220AB			
		Total	TO-247	0.83	0.95	
			TO-220AB			
$R_{th(c)}$	Coupling				0.4	

When the two diodes 1 and 2 are used simultaneously:

ΔT_j(diode 1) = P(diode 1) x $R_{th(j-c)}$(Per diode) + P(diode 2) x $R_{th(c)}$

Table 4. Static electrical characteristics per diode

Symbol	Parameter	Tests conditions		Min.	Typ.	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	9	100	µA
		T_j = 150 °C		-	85	425	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 10 A	-	1.56	1.75	V
		T_j = 150 °C		-	1.98	2.5	

1. t_p = 10 ms, $\delta < 2\%$
2. t_p = 500 µs, $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$P = 1.35 \times I_{F(AV)} + 0.115 \times I_{F}^{2}{}_{(RMS)}$

Table 5. Dynamic electrical characteristics per diode

Symbol	Parameter	Test conditions	Typ.	Unit
Q_{cj} (1)	Total capacitive charge	V_R = 400 V	28.5	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	480	pF
		V_R = 400 V, T_c = 25 °C, F = 1 MHz	48	

1. Most accurate value for the capacitive charge: $Q_{cj} = \int_0^{V_{OUT}} c_j(v_R).dv_R$

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

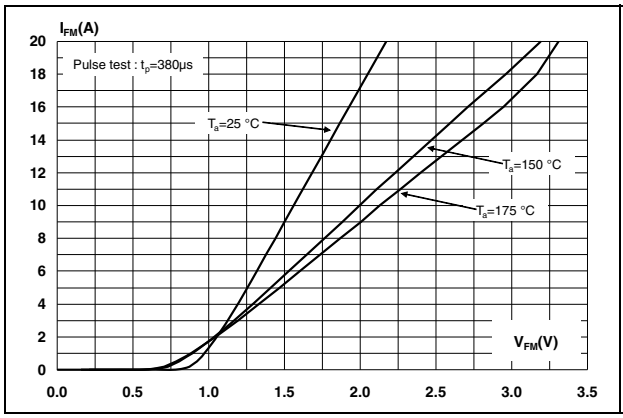


Figure 2. Forward voltage drop versus forward current (typical values per diode, high level)

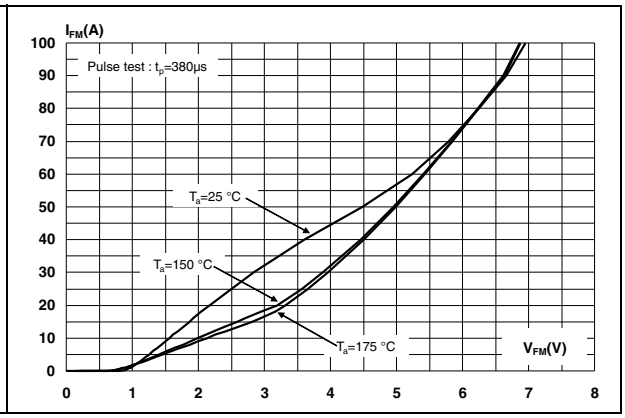


Figure 3. Reverse leakage current versus reverse voltage applied (typical values per diode)

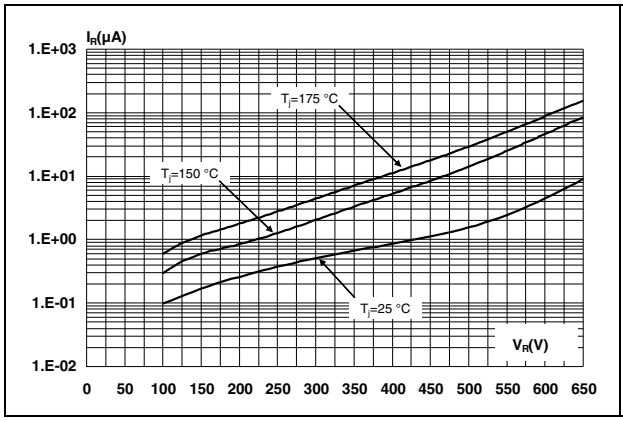
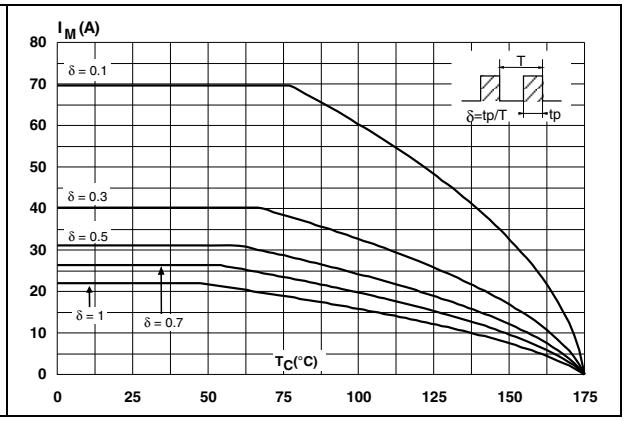


Figure 4. Peak forward current versus case temperature, per diode



3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPSC20H065CT	STPSC20H065C	TO-220AB	1.86 g	50	Tube
STPSC20H065CW	STPSC20H065CW	TO-247	4.43 g	30	Tube