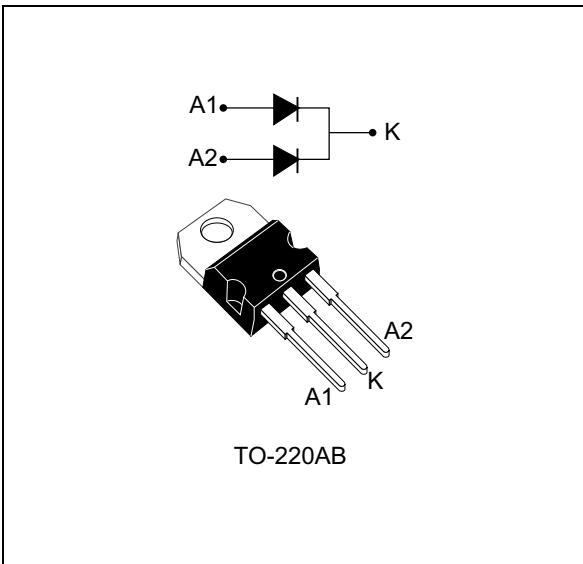


650 V power Schottky silicon carbide diode

Datasheet - production data



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 650 V rating. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimized capacitive charge at turn-off behavior is independent of temperature.

Especially suited for use in interleaved or bridgeless topologies, this dual-diode rectifier will boost the performance in hard switching conditions. Its high forward surge capability ensures a good robustness during transient phases.

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	2 x 6 A
V_{RRM}	650 V
T_j (max)	175 °C

Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- High forward surge capability
- ECOPACK®2 compliant component

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	T _c = 135 °C ⁽¹⁾ , DC	Per diode	6	A
		T _c = 135 °C ⁽²⁾ , DC	Per device	12	A
I _{FSM}	Surge non repetitive forward current	t _p = 10 ms sinusoidal, T _c = 25 °C		60	
		t _p = 10 ms sinusoidal, T _c = 125 °C		52	
		t _p = 10 µs square, T _c = 25 °C		400	A
I _{FRM}	Repetitive peak forward current	T _c = 135 °C ⁽¹⁾ , T _j = 175 °C, δ = 0.1		25	A
T _{stg}	Storage temperature range			-65 to +175	°C
T _j	Operating junction temperature ⁽³⁾			-40 to +175	°C

1. Value based on R_{th(j-c)} max (per diode)2. Value based on R_{th(j-c)} max (per device)3. $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$ condition to avoid thermal runaway for a diode on its own heatsink**Table 3. Thermal resistance parameters**

Symbol	Parameter		Typ.	Max.	Unit
R _{th(j-c)}	Junction to case	Per diode	1.6	2.4	°C/W
		Per device	0.875	1.275	
R _{th(c)}	Coupling		-	0.15	

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j(\text{diode 1}) = P(\text{diode1}) \times R_{th(j-c)}(\text{Per diode}) + P(\text{diode2}) \times R_{th(c)}$$

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}	-	5	60	µA
		T _j = 150 °C		-	50	250	
V _F ⁽²⁾	Forward voltage drop	T _j = 25 °C	I _F = 6 A	-	1.56	1.75	V
		T _j = 150 °C		-	1.98	2.5	

1. t_p = 10 ms, δ < 2%2. t_p = 500 µs, δ < 2%

To evaluate the conduction losses use the following equation:

$$P = 1.35 \times I_{F(AV)} + 0.192 \times I_F^2(\text{RMS})$$

Table 5. Dynamic electrical characteristics (per diode)

Symbol	Parameter	Test conditions	Typ.	Unit
$Q_{cj}^{(1)}$	Total capacitive charge	$V_R = 400 \text{ V}$	18	nC
C_j	Total capacitance	$V_R = 0 \text{ V}, T_C = 25^\circ\text{C}, F = 1 \text{ MHz}$	300	pF
		$V_R = 400 \text{ V}, T_C = 25^\circ\text{C}, F = 1 \text{ MHz}$	30	

1. Most accurate value for the capacitive charge: $Q_{cj} = \int_0^{V_{OUT}} C_j(V_R) dV_R$

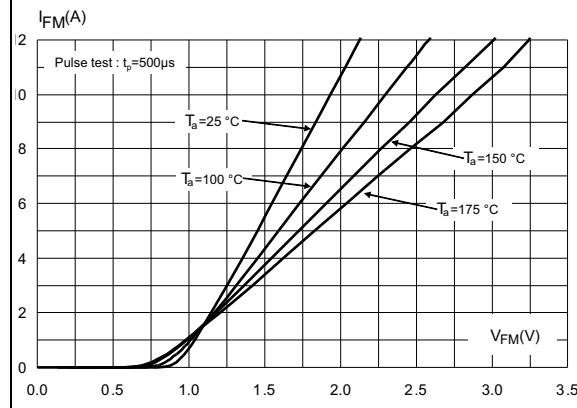
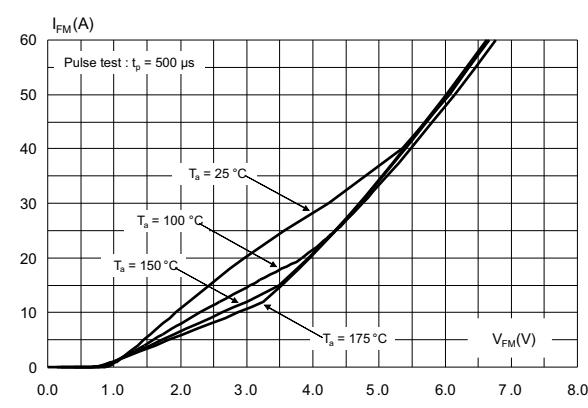
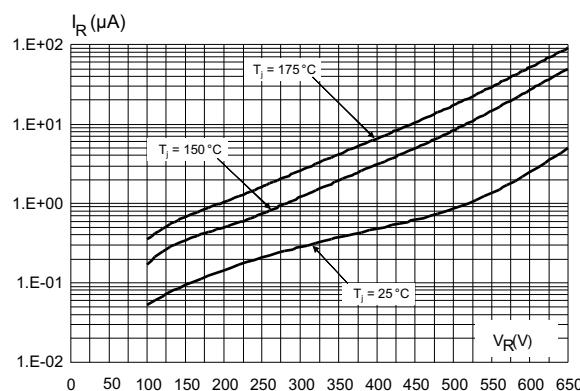
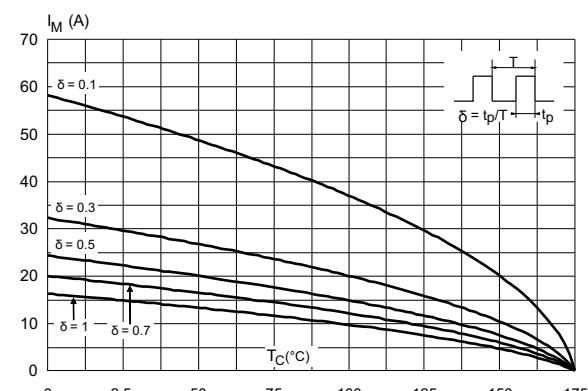
Figure 1. Forward voltage drop versus forward current (typical values, low level, per diode)**Figure 2. Forward voltage drop versus forward current (typical values, high level, per diode)****Figure 3. Reverse leakage current versus reverse voltage applied (typical values, per diode)****Figure 4. Peak forward current versus case temperature**

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

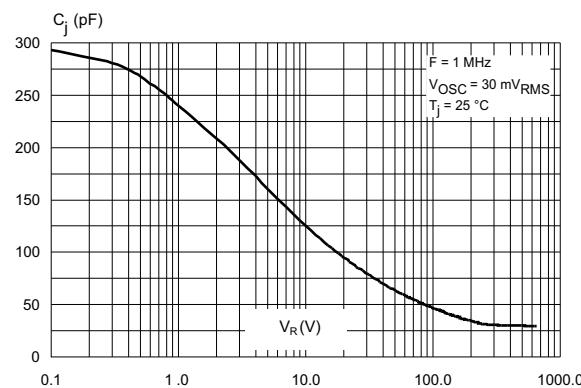


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

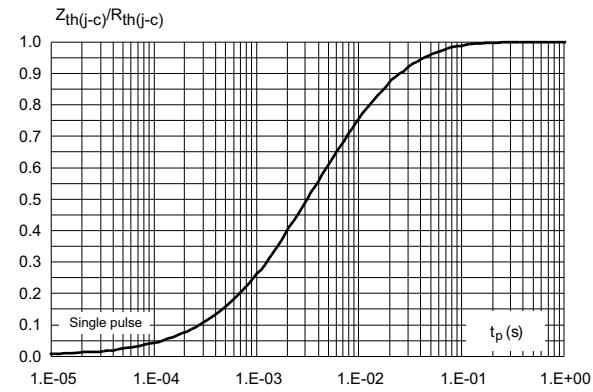


Figure 7. Non-respective peak surge forward current versus pulse duration (sinusoidal waveform, per diode)

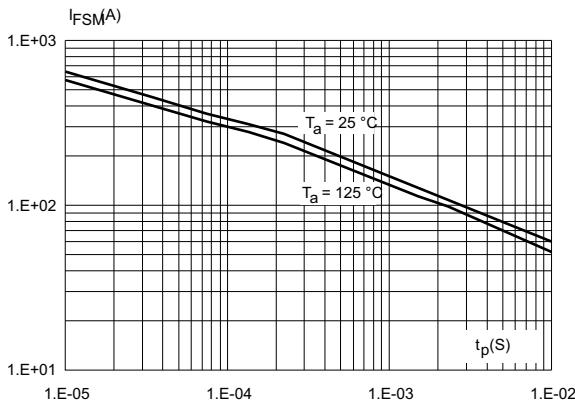
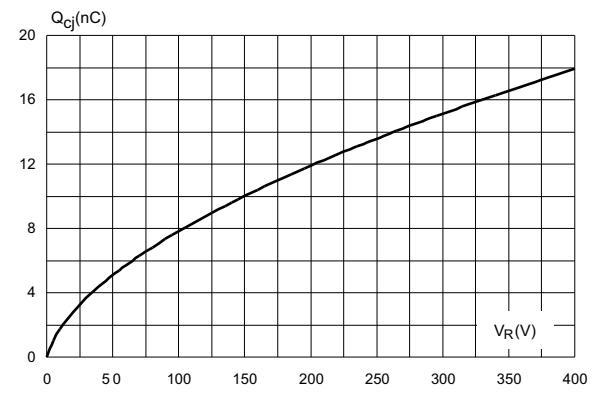


Figure 8. Total capacitive charges versus reverse voltage applied (typical values, per diode)



2 Package information

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

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2.1 TO-220AB package information

Figure 9. TO-220AB package outline

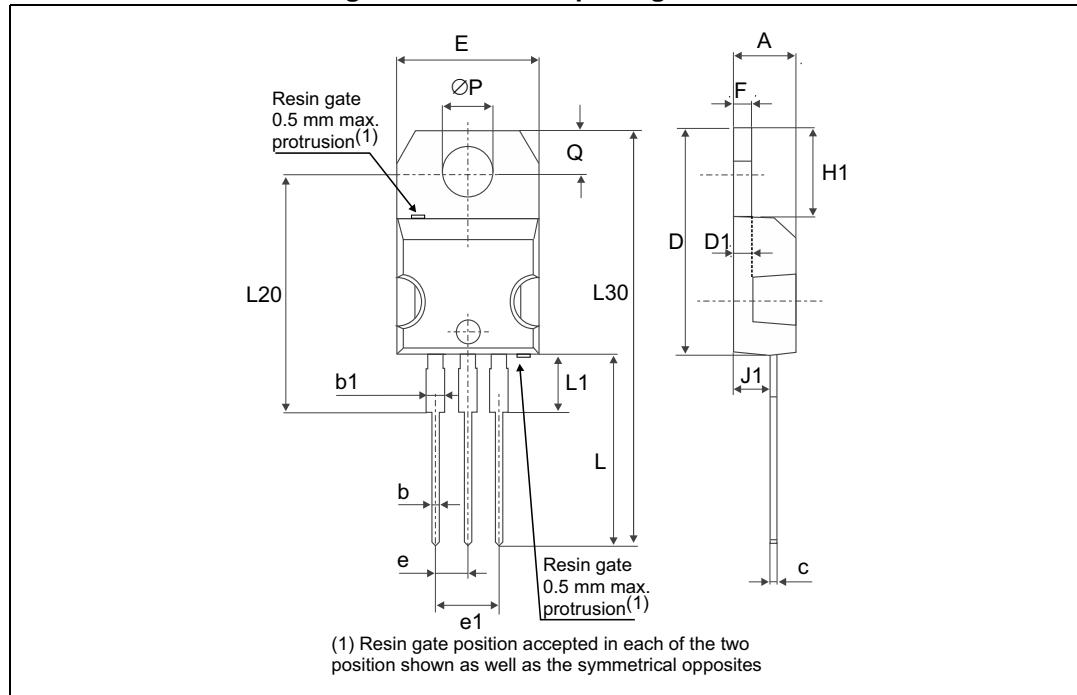


Table 6. TO-220AB package mechanical data

Ref.	Dimensions					
	Millimeters			Inches ⁽¹⁾		
	Typ.	Min.	Max.	Typ.	Min.	Max.
A		4.40	4.60		0.17	0.18
b		0.61	0.88		0.024	0.035
b1		1.14	1.70		0.045	0.067
c		0.48	0.70		0.019	0.027
D		15.25	15.75		0.60	0.62
D1	1.27			0.05		
E		10	10.40		0.39	0.41
e		2.40	2.70		0.094	0.106
e1		4.95	5.15		0.19	0.20
F		1.23	1.32		0.048	0.052
H1		6.20	6.60		0.24	0.26
J1		2.40	2.72		0.094	0.107
L		13	14		0.51	0.55
L1		3.50	3.93		0.137	0.154
L20	16.40			0.64		
L30	28.90			1.13		
ØP		3.75	3.85		0.147	0.151
Q		2.65	2.95		0.104	0.116

1. Values in inches are converted from mm and rounded to 4 decimal digits.

3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPSC12H065CT	PSC12H065CT	TO-220AB	1.86 g	50	Tube

4 Revision history

Table 8. Document revision history

Date	Revision	Changes
24-Jun-2013	1	First issue.
07-Nov-2013	2	Updated Figure 1 and Figure 2.
10-Dec-2015	3	Updated cover page and Table 7 . Format updated to current standard.

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