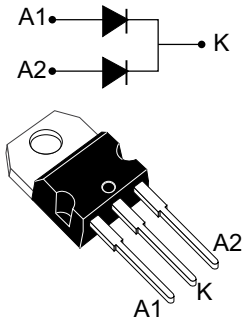
STPSC12H065C

650 V power Schottky silicon carbide diode

Datasheet - production data



TO-220AB

Features

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

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 bridge-less 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

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 t_p = 10 ms sinusoidal, T_c = 125 °C t_p = 10 µs square, T_c = 25 °C		60 52 400	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. $\frac{dPtot}{dTj} < \frac{1}{Rth(j-a)}$ 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:

ΔT_j(diode 1) = P(diode1) x $R_{th(j-c)}$(Per diode) + P(diode2) 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	$V_R = V_{RRM}$	-	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 x $I_{F(AV)}$ + 0.192 x $I_F{}^2{}_{(RMS)}$

Table 5. Dynamic electrical characteristics (per diode)

Symbol	Parameter	Test conditions	Typ.	Unit
Q_{cj}(1)	Total capacitive charge	V_R = 400 V	18	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	300	pF
		V_R = 400 V, T_c = 25 °C, F = 1 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)

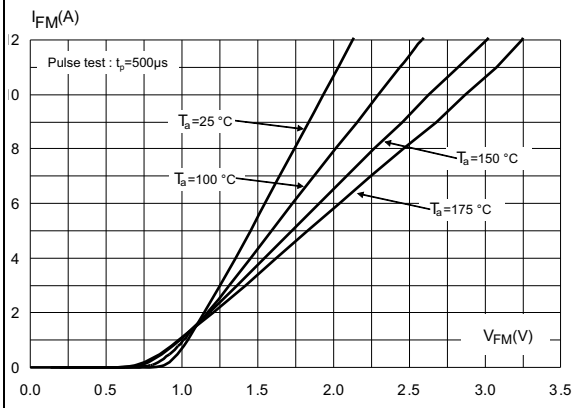


Figure 2. Forward voltage drop versus forward current (typical values, high level, per diode)

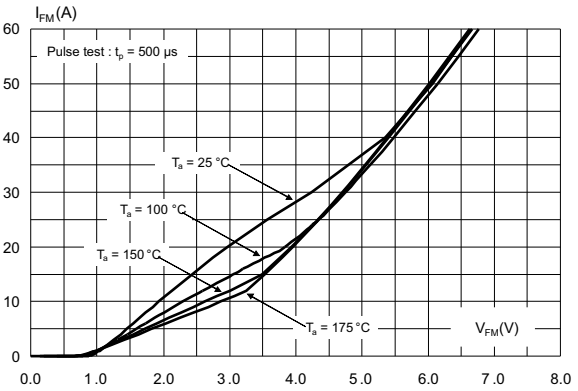


Figure 3. Reverse leakage current versus reverse voltage applied (typical values, per diode)

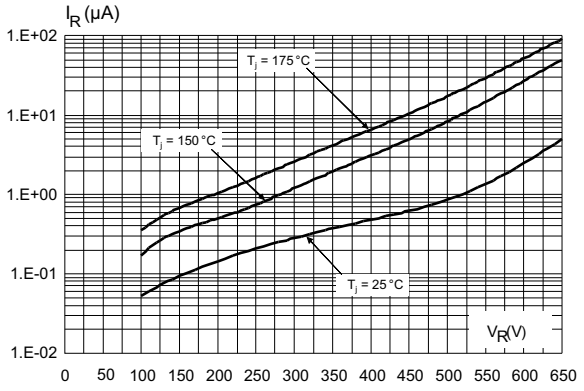


Figure 4. Peak forward current versus case temperature

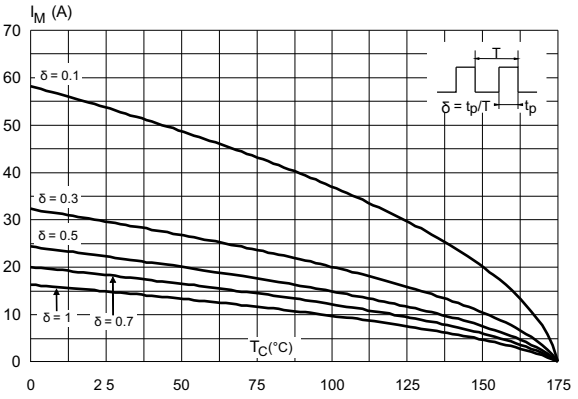


Figure 5. Junction capacitance versus reverse voltage applied (typical values, per diode)

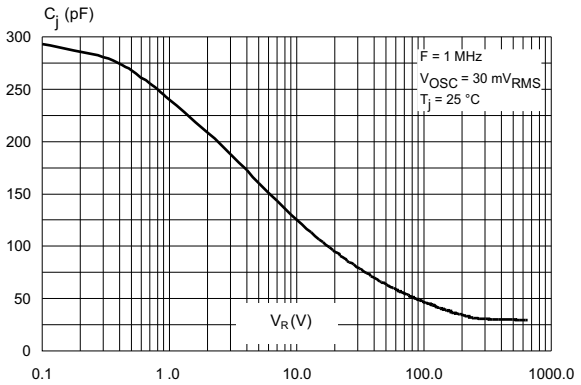


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

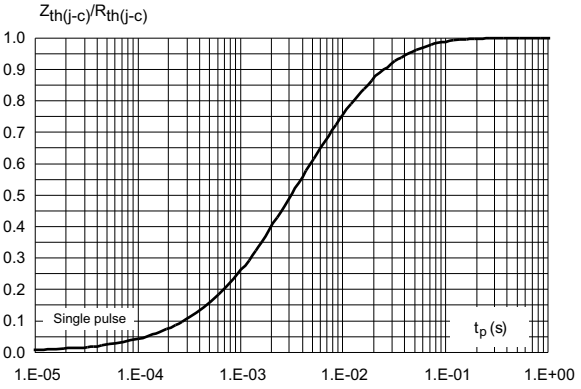


Figure 7. Non-respective peak surge forward current versus pulse duration (sinusoidal waveform, per diode)

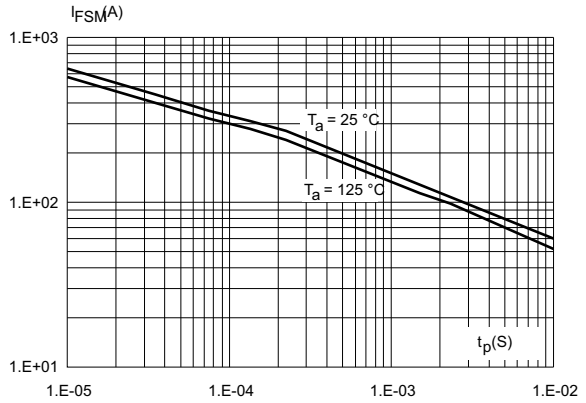
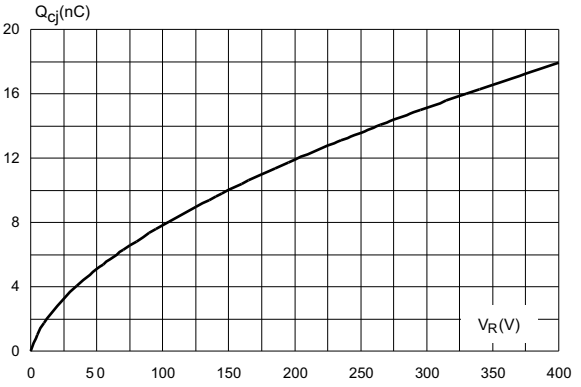


Figure 8. Total capacitive charges versus reverse voltage applied (typical values, per diode)



2 Package information

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

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at:*www.st.com.* ECOPACK® is an ST trademark.

2.1 TO-220AB package information

Figure 9. TO-220AB package outline

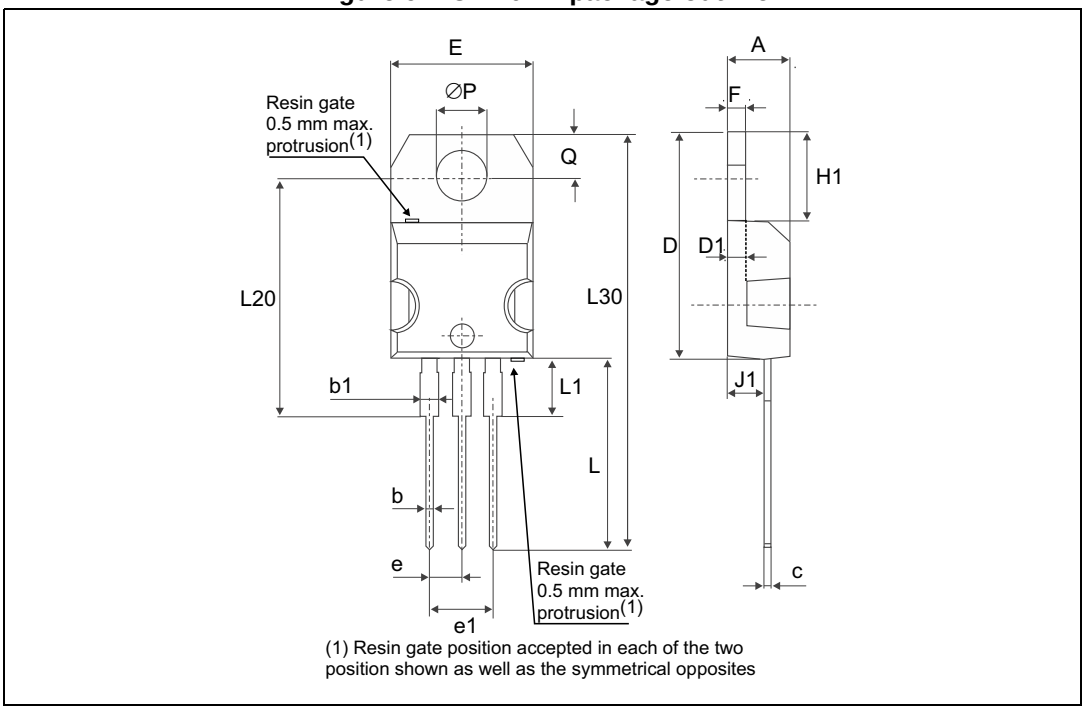


Table 6. TO-220AB package mechanical data

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		
∅P		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.