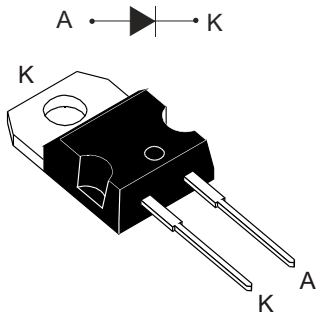
STPSC12C065-Y

Automotive 650 V power Schottky silicon carbide diode

Datasheet - production data



TO-220AC

Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- Dedicated to PFC applications
- High forward surge capability
- AEC-Q101 qualified
- PPAP capable
- 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 minimal capacitive turn-off behavior is independent of temperature and is ideal for automotive applications.

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

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	12 A
V_{RRM}	650 V
T_j (max)	175 °C

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage, T_j = -40 °C		650	V
$I_{F(RMS)}$	Forward rms current		22	A
$I_{F(AV)}$	Average forward current	T_c = 120 °C(1), δ = 0.5	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	92 84 470	A
I_{FRM}	Repetitive peak forward current	T_c = 120 °C(1), T_j = 175 °C, δ = 0.1	51	A
T_{stg}	Storage temperature range		-65 to +175	°C
T_j	Operating junction temperature(2)		-40 to +175	°C

1. Value based on $R_{th(j-c)}$ max.
2. $\frac{dPtot}{dTj} < \frac{1}{Rth(j-a)}$ condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal resistance

Symbol	Parameter	Value		Unit
		Typ.	Max.	
$R_{th(j-c)}$	Junction to case	1.2	1.7	°C/W

Table 4. Static electrical characteristics

Symbol	Parameter	Tests conditions		Min.	Typ.	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	10	120	µA
		T_j = 150 °C		-	100	500	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 12 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:

$P = 1.35 \times I_{F(AV)} + 0.096 \times I_{F}{}^{2}{}_{(RMS)}$

Table 5. Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Typ.	Unit
Q_{cj}(1)	Total capacitive charge	V_R = 400 V	29.3	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	530	pF
		V_R = 300 V, T_c = 25 °C, F = 1 MHz	55	

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)

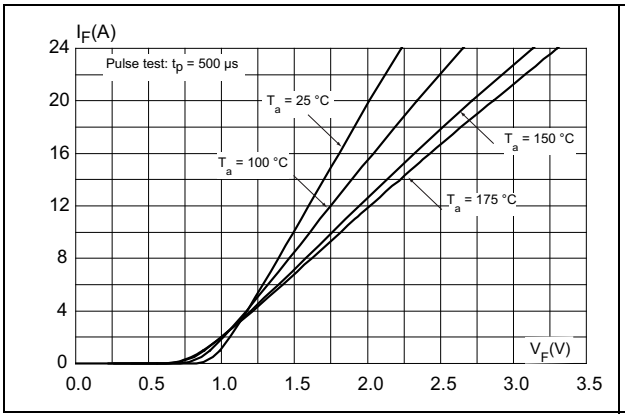


Figure 2. Forward voltage drop versus forward current (typical values, high level)

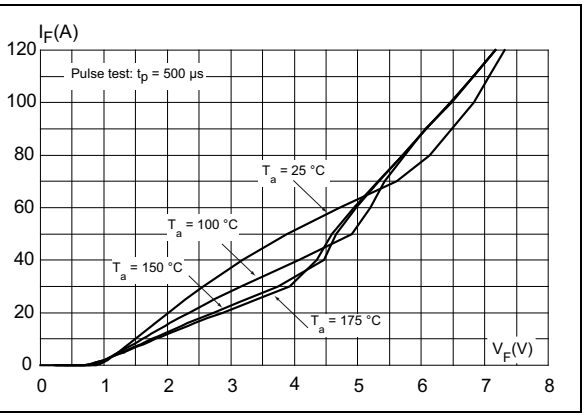


Figure 3. Reverse leakage current versus reverse voltage applied (typical values)

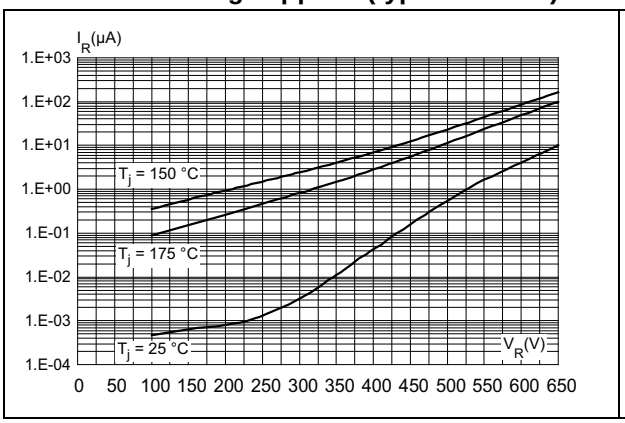


Figure 4. Peak forward current versus case temperature

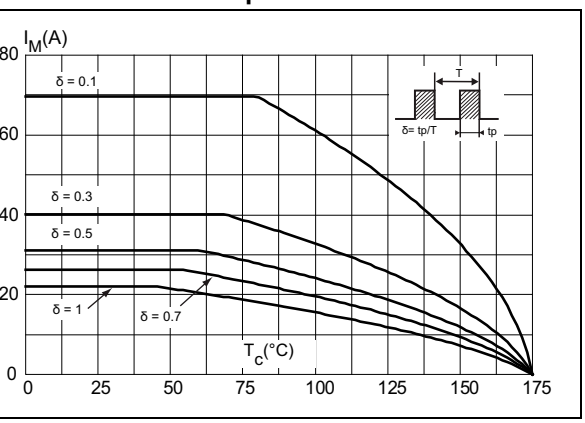


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

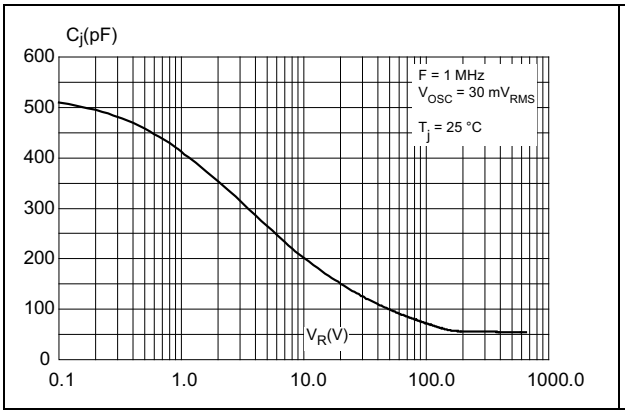


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

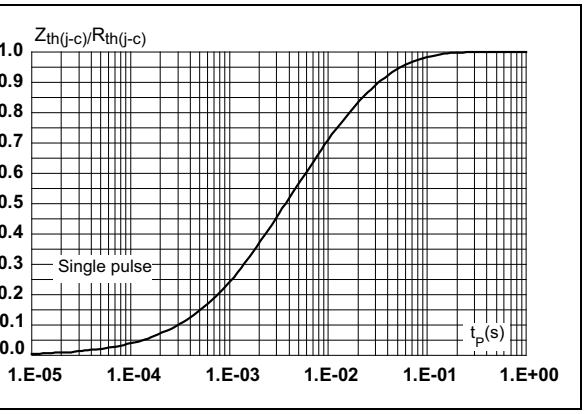


Figure 7. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

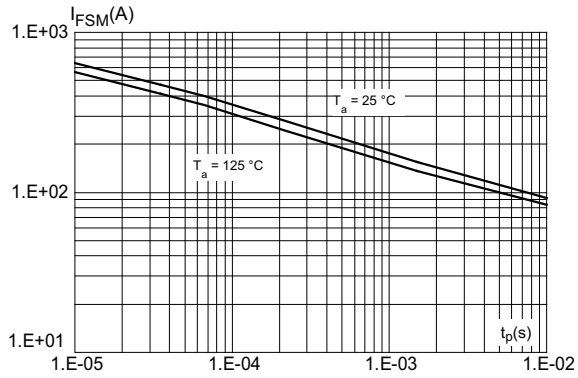
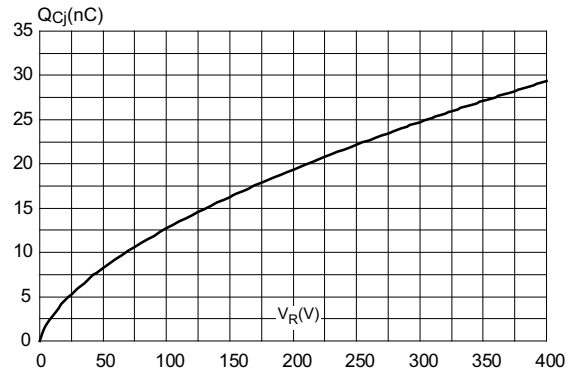


Figure 8. Total capacitive charges versus reverse voltage applied (typical values)



2 Package information

- Epoxy meets UL94, V0
- Recommended torque value (TO-220AC): 0.55 N·m
- Maximum torque value: 0.7 N·m for TO-220AC
- Cooling method: conduction (C)

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.

Figure 9. TO-220AC dimension definitions

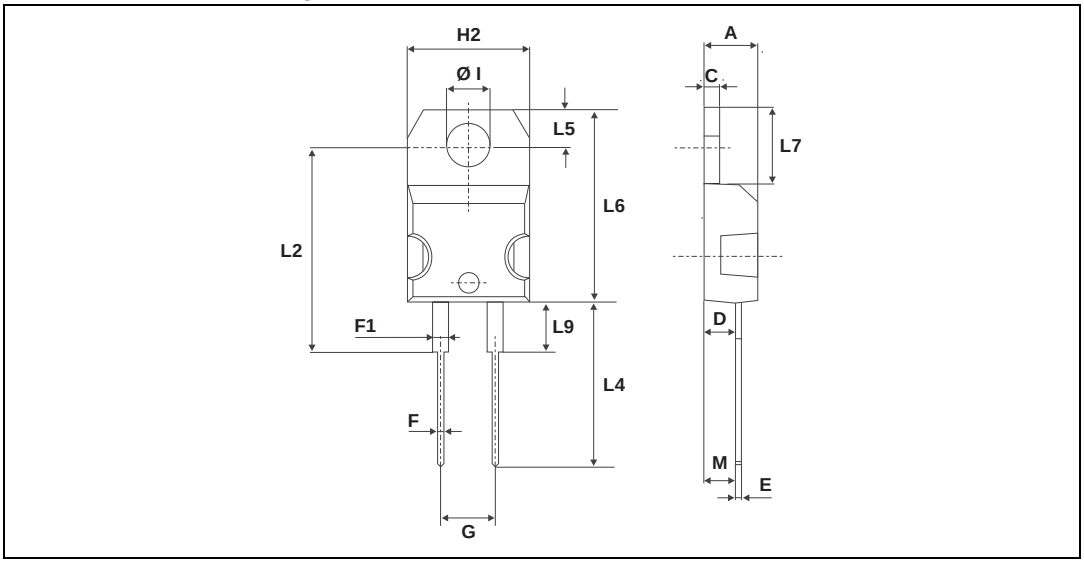


Table 6. TO-220AC dimension values

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
M	2.6 typ.		0.102 typ.	
Diam. I	3.75	3.85	0.147	0.151

3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPSC12C065DY	PSC12C065DY	TO-220AC	1.86 g	50	Tube

4 Revision history

Table 8. Document revision history

Date	Revision	Changes
13-Jan-2015	1	First issue.

Mouser Electronics

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STPSC12C065DY