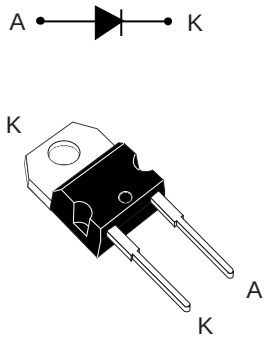
STPSC12065-Y

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
- Operating T_j from -40 °C to 175 °C
- ECOPACK® 2 compliant component

Description

The SiC diode is a high voltage 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.

Used as a freewheeling or output rectification diode, this rectifier will enhance the performance and form factor of the targeted power supply or inverter.

Table 1: Device summary

Symbol	Value
$I_{F(AV)}$	12 A
V_{RRM}	650 V
T_j (max.)	175 °C
V_F (typ.)	1.30 V

This is information on a product in full production.

www.st.com

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 to +175 °C)		650	V
$I_{F(RMS)}$	Forward rms current		22	A
$I_{F(AV)}$	Average forward current	T_C = 145 °C, DC(1)	12	A
I_{FRM}	Repetitive peak forward current	T_c =145 °C, T_j = 175 °C, δ = 0.1	53	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, T_c = 25 °C	50	A
		t_p = 10 ms sinusoidal, T_c = 125 °C	40	
		t_p = 10 µs square, T_c = 25 °C	220	
T_{stg}	Storage temperature range		-55 to +175	°C
T_j	Operating junction temperature(2)		-40 to +175	°C

Notes:

(1)Value based on $R_{th(j-c)}$ max.

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

Table 3: Thermal parameters

Symbol	Parameter	Value		Unit
		Typ.	Max.	
$R_{th(j-c)}$	Junction to case	0.85	1.25	°C/W

Table 4: Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	15	150	µA
		T_j = 150 °C		-	200	1000	
		T_j = 25 °C	V_R = 600 V	-	8	50	
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 12 A	-	1.30	1.45	V
		T_j = 150 °C		-	1.45	1.65	
		T_j = 175 °C		-	1.50		

Notes:

(1)Pulse test: t_p = 5 ms, δ < 2%

(2)Pulse test: t_p = 500 µs, δ < 2%

To evaluate the conduction losses use the following equation:

$P = 1.02 \times I_{F(AV)} + 0.065 \times I_{F^2(RMS)}$

Table 5: Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Q_{Cj}(1)	Total capacitive charge	V_R = 400 V	-	36	-	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	-	750	-	pF
		V_R = 400 V, T_c = 25 °C, F = 1 MHz	-	60	-	

Notes:

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

1.1 Characteristics (curves)

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

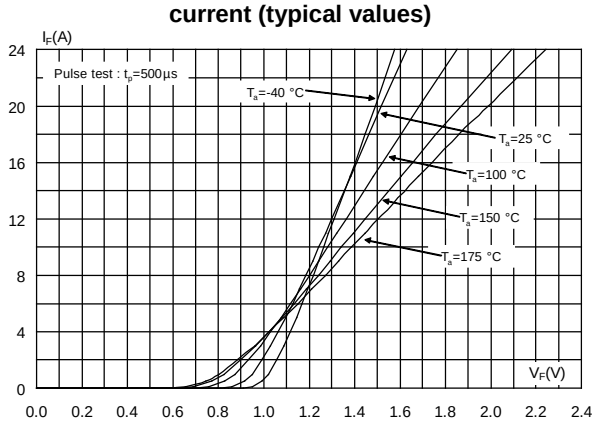


Figure 2: Reverse leakage current versus reverse voltage applied (typical values)

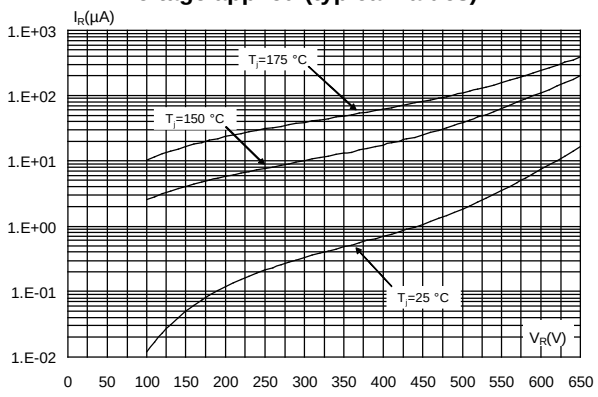


Figure 3: Peak forward current versus case temperature

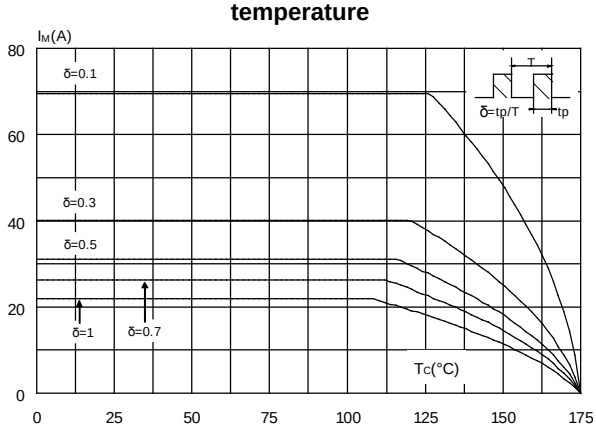


Figure 4: Junction capacitance versus reverse voltage applied (typical values)

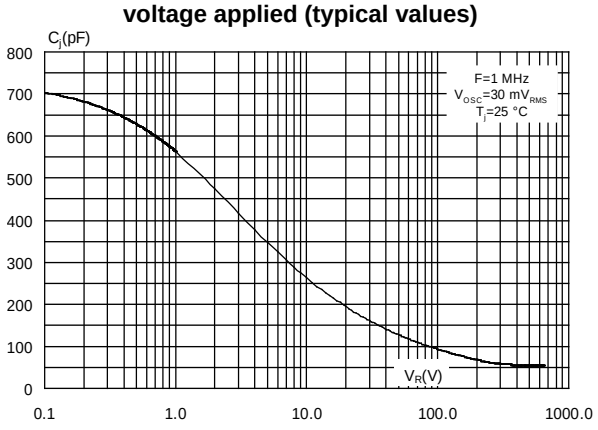


Figure 5: Relative variation of thermal impedance junction to case versus pulse duration

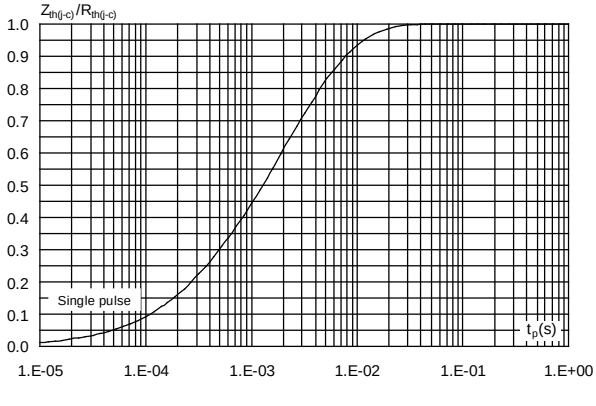


Figure 6: Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

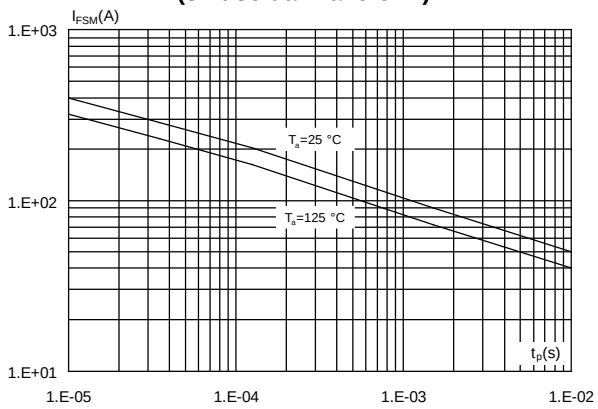
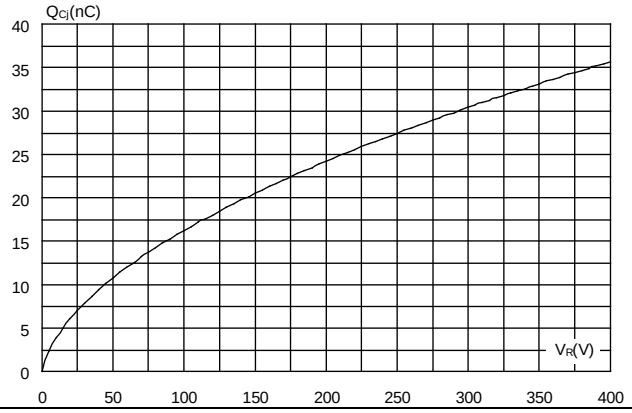


Figure 7: Total capacitive charges versus reverse voltage applied (typical values)



2 Package information

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.

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

2.1 TO-220AC package information

Figure 8: TO-220AC package outline

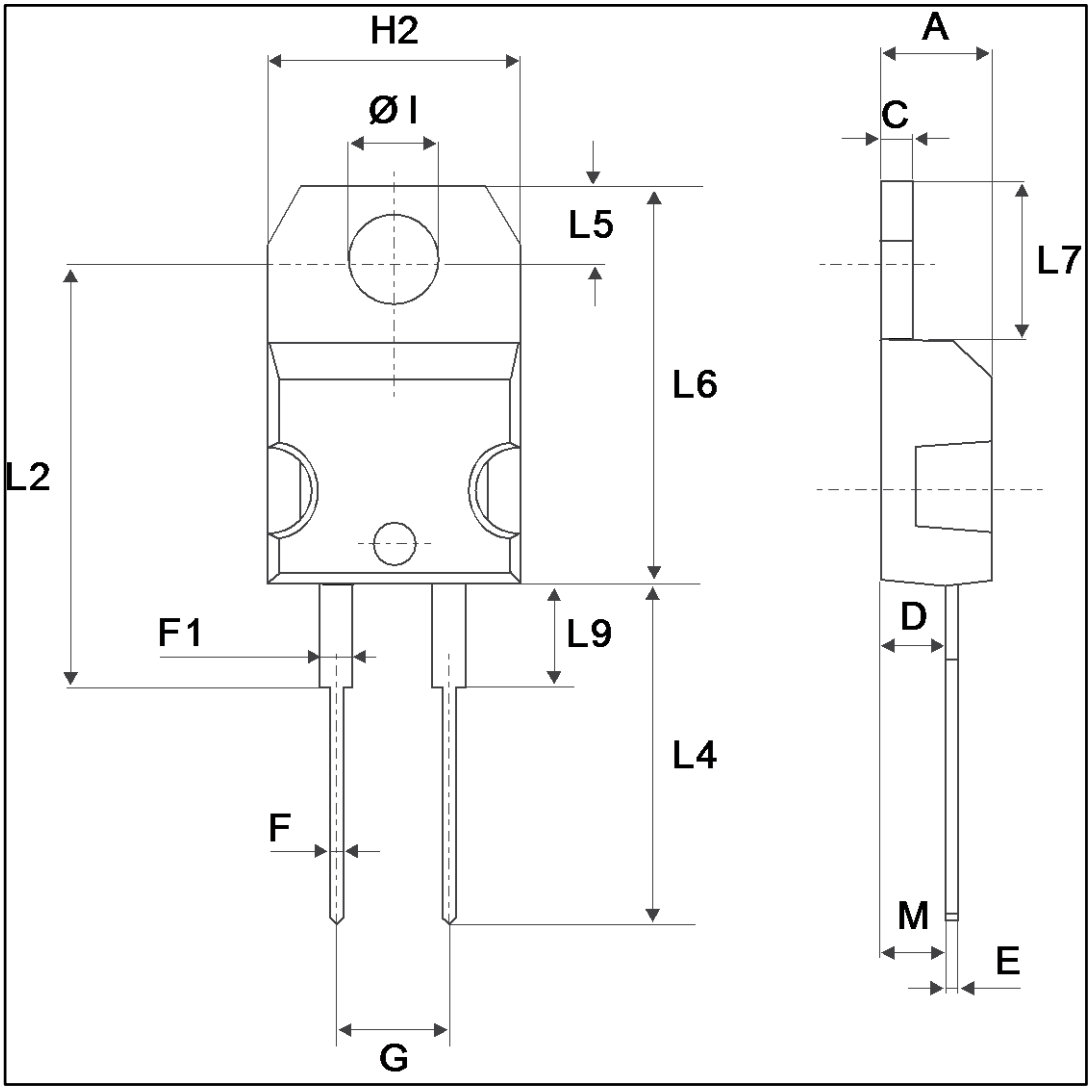


Table 6: TO-220AC package mechanical data

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	3.75	3.85	0.147	0.151

3 Ordering information

Table 7: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC12065DY	PSC12065DY	TO-220AC	1.86 g	50	Tube

4 Revision history

Table 8: Document revision history

Date	Revision	Changes
10-May-2016	1	First issue.

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