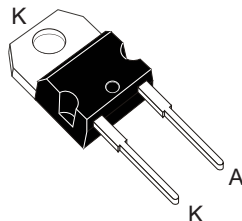


650 V, 4 A high surge silicon carbide power Schottky diode



TO-220AC



Product label



Product status link

[STPSC4G065](#)

Product summary

$I_{F(AV)}$	4 A
V_{RRM}	650 V
$T_j(max.)$	175 °C
$V_F(typ.)$	1.30 V

Features

- None or negligible reverse recovery charge in application current range
- Switching behaviour independent of temperature
- High forward surge capability
- Operating T_j from -55 °C to +175 °C
- **ECOPACK2** compliant component

Application

- Air conditioning equipment
- EV Charging station
- SMPS in telecom power
- Solar converter
- Telecom / Server power equipment
- UPS power supply

Description

The SiC diode, available in TO-220AC, is an ultrahigh performance power Schottky rectifier. It is manufactured using a silicon carbide substrate. The wide band-gap material allows the design of a low V_F Schottky diode structure with a 650 V rating. Thanks 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.

Based on latest technology optimization, this diode has an improved forward surge current capability, making it ideal for use in PFC, where this ST SiC diode boosts the performance in hard switching conditions. Using the latest design improvement of the “G” series of ST SiC diodes, as well as implemented tests in production, this diode is becoming the reference point in the combination of efficiency and application.

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage ($T_j = -55\text{ °C}$ to $+175\text{ °C}$)		650	V
$I_{F(RMS)}$	Forward rms current		15	A
$I_{F(AV)}$	Average forward current	$T_C = 150\text{ °C}$, $\delta = 1$	4	A
I_{FRM}	Repetitive peak forward current	$T_C = 150\text{ °C}$, $T_j = 175\text{ °C}$, $\delta = 0.1$, $f_{sw} > 10\text{ kHz}$	16	A
I_{FSM}	Surge non repetitive forward current	$t_p = 10\text{ ms}$ sinusoidal	$T_C = 25\text{ °C}$	A
			$T_C = 150\text{ °C}$	
		$t_p = 10\text{ }\mu\text{s}$ square	$T_C = 25\text{ °C}$	
T_{stg}	Storage temperature range		-65 to +175	°C
T_j	Operating junction temperature range		-55 to +175	°C

Table 2. Thermal resistance parameters

Symbol	Parameter	Value		Unit
		Typ.	Max.	
$R_{th(j-c)}$	Junction to case	2.45	3.5	°C/W

For more information, you can refer to the following application note:

- [AN5088](#) : Rectifiers thermal management, handling and mounting recommendations

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-	4	40	μA
		$T_j = 175\text{ °C}$		-	23	170	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 4\text{ A}$	-	1.3	1.45	V
		$T_j = 175\text{ °C}$		-	1.49	1.70	

1. Pulse test: $t_p = 10\text{ ms}$, $\delta < 2\%$

2. Pulse test: $t_p = 380\text{ }\mu\text{s}$, $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

$$P = 0.879 \times I_{F(AV)} + 0.206 \times I_F^2{}_{(RMS)}$$

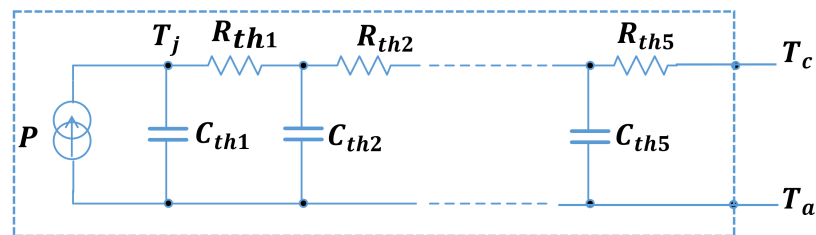
For more information, you can refer to the following application notes related to the power losses:

- [AN604](#): Calculation of conduction losses in a power rectifier
- [AN4021](#): Calculation of reverse losses on a power diode

Table 4. Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$Q_{Cj}^{(1)}$	Total capacitive charge	$V_R = 400 \text{ V}$	-	14.5	-	nC
C_j	Total capacitance	$V_R = 0 \text{ V}, T_c = 25^\circ\text{C}, F = 1 \text{ MHz}$	-	285	-	pF
		$V_R = 400 \text{ V}, T_c = 25^\circ\text{C}, F = 1 \text{ MHz}$	-	20	-	

1. Most accurate value for the capacitive charge: $Q_{Cj}(V_R) = \int_0^{V_R} C_j(V) dV$

Figure 1. Thermal transient impedance model circuit of the diode – $Z_{th(j-c)}$

Table 5. Components typical values of the diode thermal transient impedance model $Z_{th(j-c)}$

Ref.	Value (K/W)	Ref.	Value (J/K)
R_{th1}	83.75 m	C_{th1}	0.38 m
R_{th2}	1221.29 m	C_{th2}	0.20 m
R_{th3}	661.09 m	C_{th3}	1.86 m
R_{th4}	387.85 m	C_{th4}	11.56 m
R_{th5}	95.24 m	C_{th5}	166.42 m

1.1 Characteristics (curves)

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

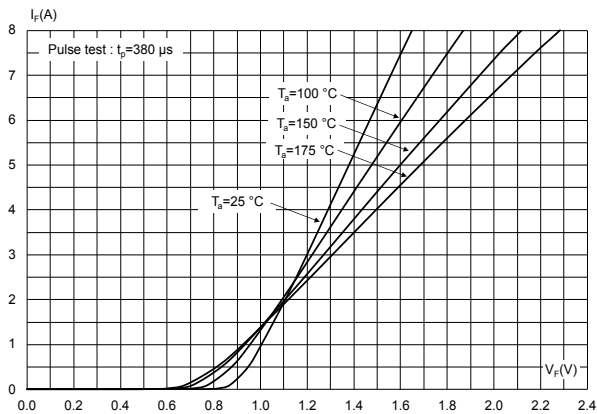


Figure 3. Reverse leakage current versus reverse voltage applied (typical values)

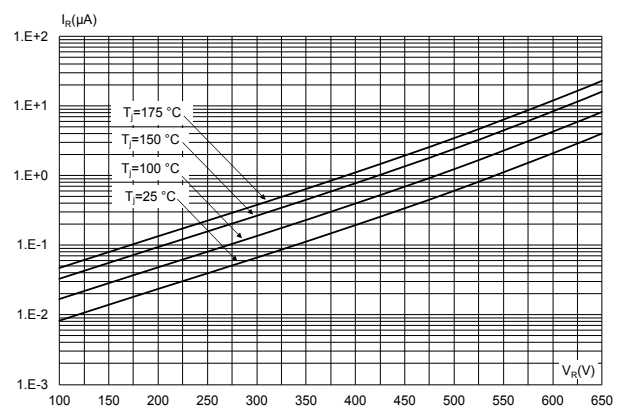


Figure 4. Peak forward current versus case temperature ($f_{sw} > 10$ kHz)

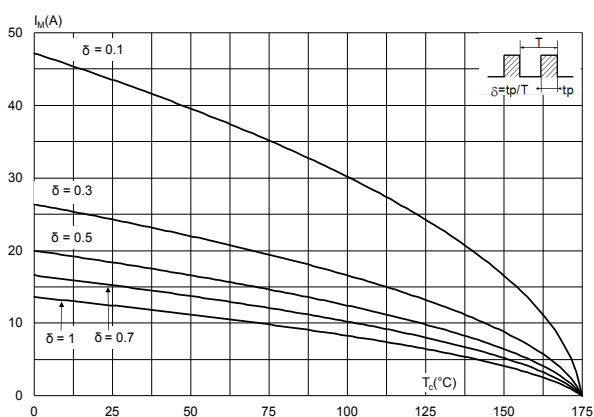


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

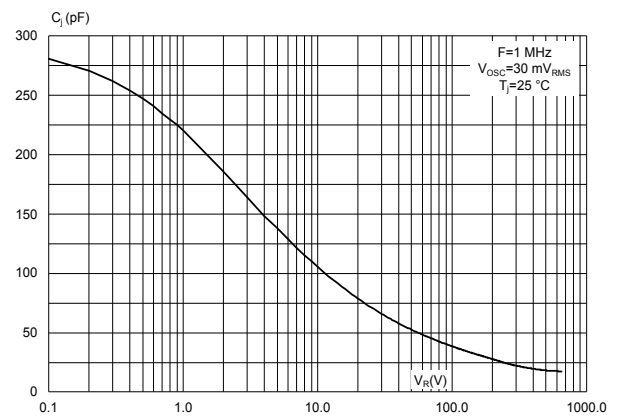


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

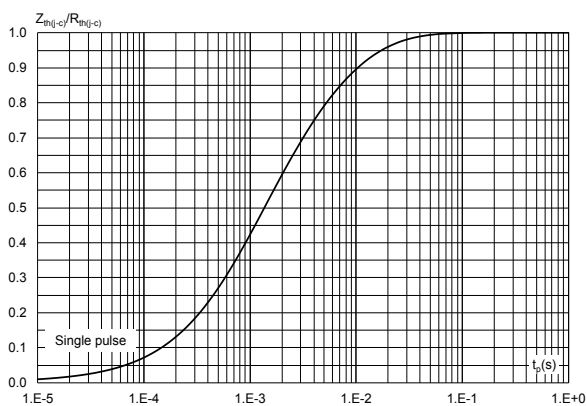


Figure 7. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

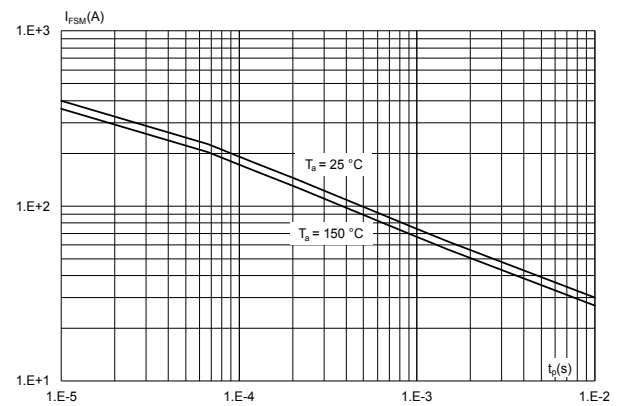
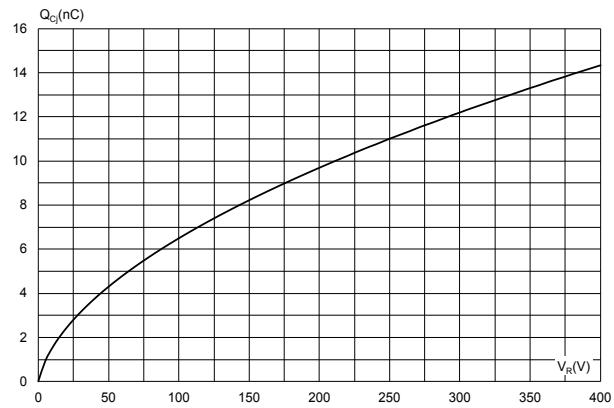


Figure 8. Total capacitive charges versus reverse voltage applied (typical values)



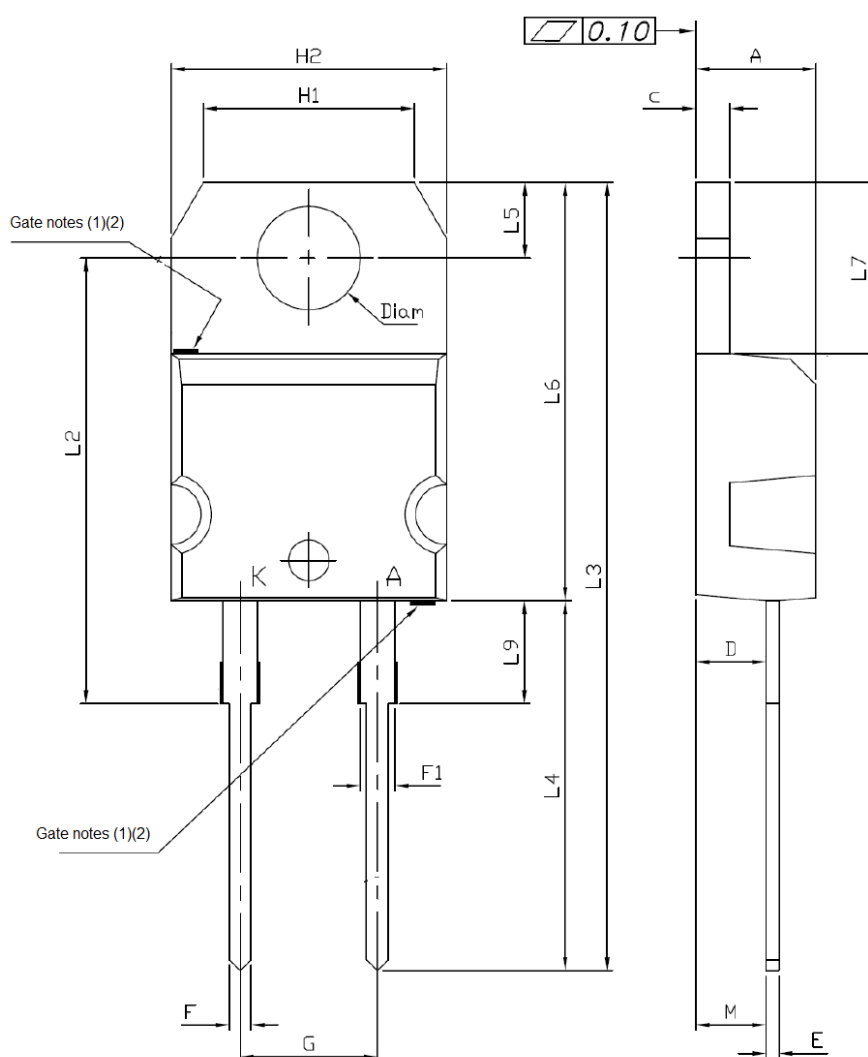
2 Package information

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-220AC package information

- Epoxy meets UL 94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

Figure 9. TO-220AC package outline



- (1) : Max resin gate protrusion 0.5 mm
 (2) : Resin gate position is accepted in each of the two positions shown on the drawings or their symmetrical

Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6. TO-220AC package mechanical data

Ref.	Dimensions					
	Millimeters			Inches (for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	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			0.645	
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		2.60			0.102	
Diam	3.75		3.85	0.147		0.151
Slug flatness		0.03	0.10		0.001	0.004

Note: For packing information, inner box dimensions and tube dimensions, refer to [TN1173](#).



3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC4G065D	PSC4G65D	TO-220AC	1.86 g	50	Tube

Revision history

Table 8. Document revision history

Date	Revision	Changes
20-Mar-2025	1	Initial release.

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