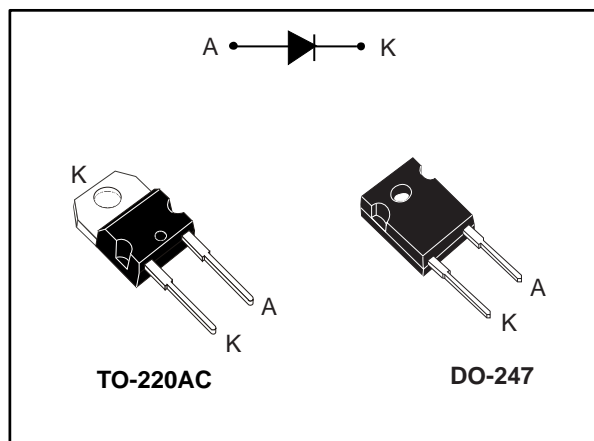


Automotive 650 V power Schottky silicon carbide diode

Datasheet - production data


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.

Features

- No reverse recovery charge in application current range
- Switching behavior independent of temperature
- Dedicated to PFC applications
- High forward surge capability
- ECOPACK®2 compliant component
- AEC-Q101 qualified
- PPAP capable
- Operating T_j from -40 °C to 175 °C

Table 1: Device summary

Symbol	Value
$I_{F(AV)}$	20 A
V_{RRM}	650 V
T_j (max.)	175 °C
V_F (typ.)	1.30 V

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		40	A
I _{F(AV)}	Average forward current	T _c = 140 °C, DC current	20	A
I _{FSM}	Surge non repetitive forward current	t _p = 10 ms sinusoidal, T _c = 25 °C	90	A
		t _p = 10 ms sinusoidal, T _c = 125 °C	70	
		t _p = 10 μs square, T _c = 25 °C	400	
I _{FRM}	Repetitive peak forward current	T _c = 140 °C, T _j = 175 °C, δ = 0.1	87	A
T _{stg}	Storage temperature range		-55 to +175	°C
T _j	Operating junction temperature ⁽¹⁾		-40 to +175	°C

Notes:

⁽¹⁾(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	0.60	0.90	°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}	-	30	300	μA
		T _j = 150 °C		-	280	2000	
		T _j = 25 °C	V _R = 600 V	-	15	150	
V _F ⁽²⁾	Forward voltage drop	T _j = 25 °C	I _F = 20 A	-	1.30	1.45	V
		T _j = 150 °C		-	1.45	1.65	
		T _j = 175 °C		-	1.5		

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:

$$P = 1.02 \times I_{F(AV)} + 0.039 \times I_{F(RMS)}^2$$

Table 5: Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$Q_{Cj}^{(1)}$	Total capacitive charge	$V_R = 400 \text{ V}$	-	62	-	nC
C_j	Total capacitance	$V_R = 0 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	-	1250	-	pF
		$V_R = 400 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	-	100	-	

Notes:

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

1.2 Characteristics (curves)

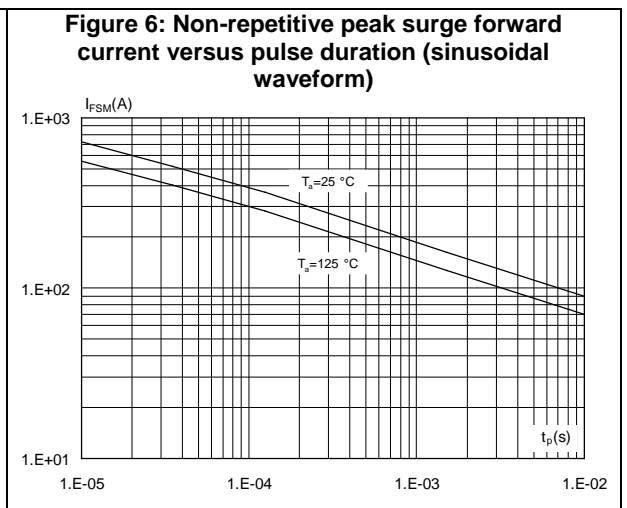
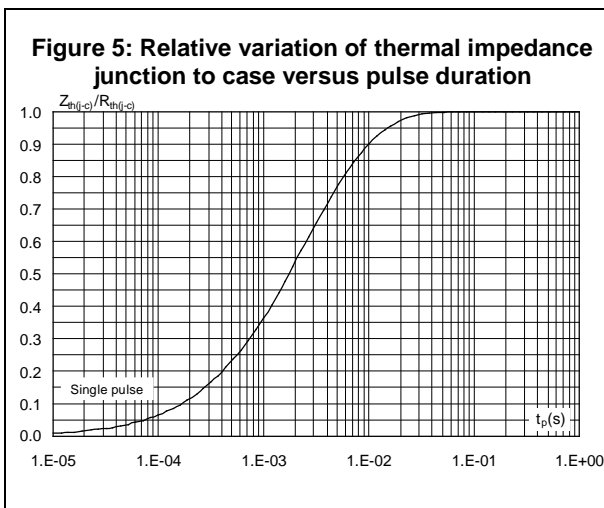
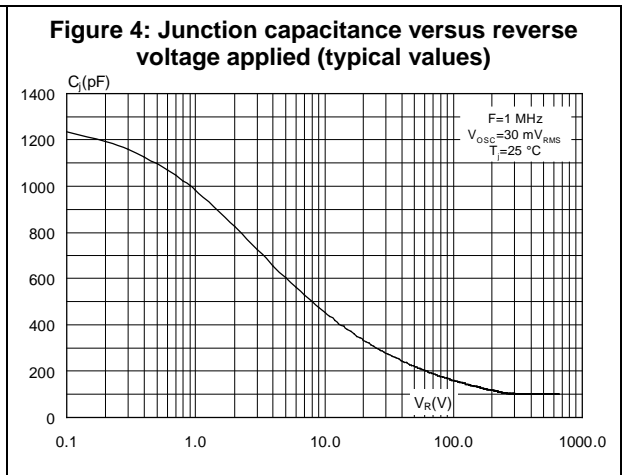
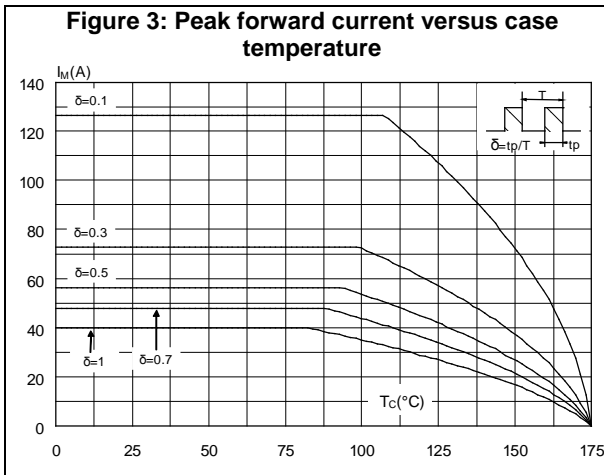
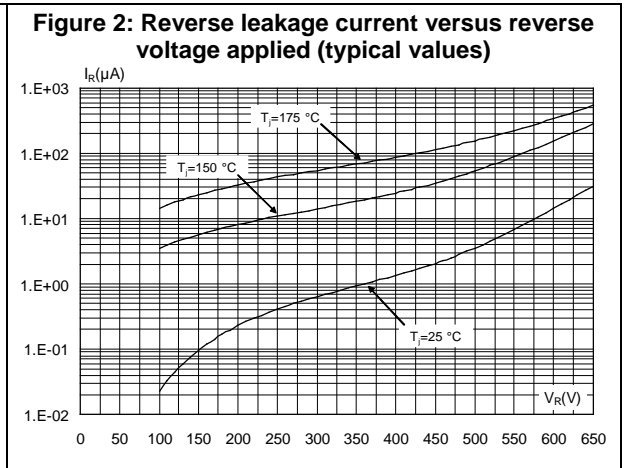
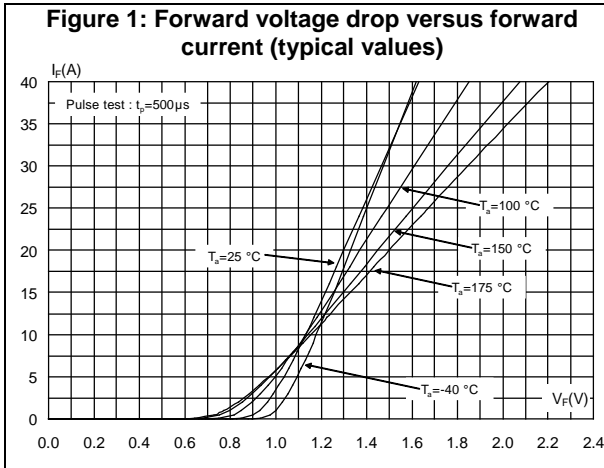
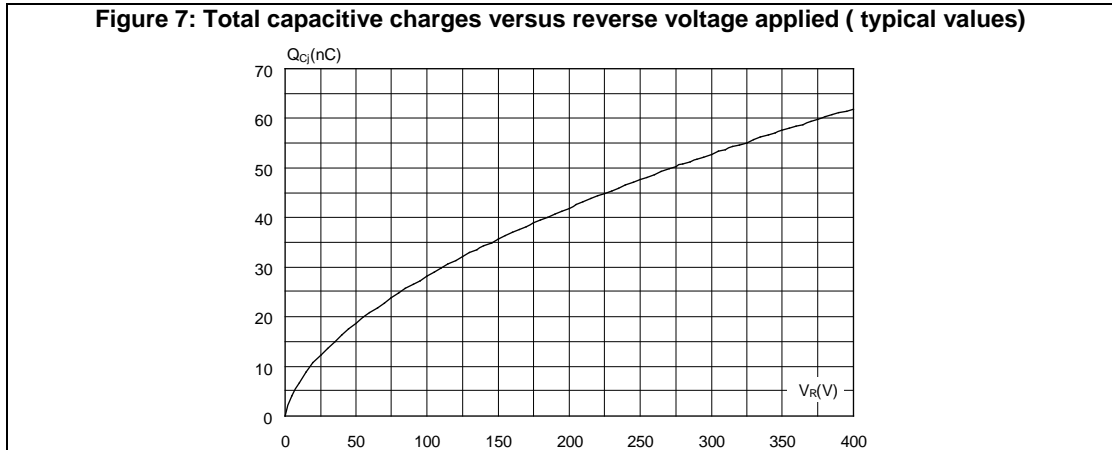


Figure 7: Total capacitive charges versus reverse voltage applied (typical values)



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.

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0
- Recommended torque value: 0.55 N·m for TO-220AC
- Maximum torque value: 0.7 N·m for TO-220AC
- Recommended torque value: 0.8 N·m for DO-247
- Maximum torque value: 1 N·m for DO-247

2.1 TO-220AC package information

Figure 8: TO-220AC package outline

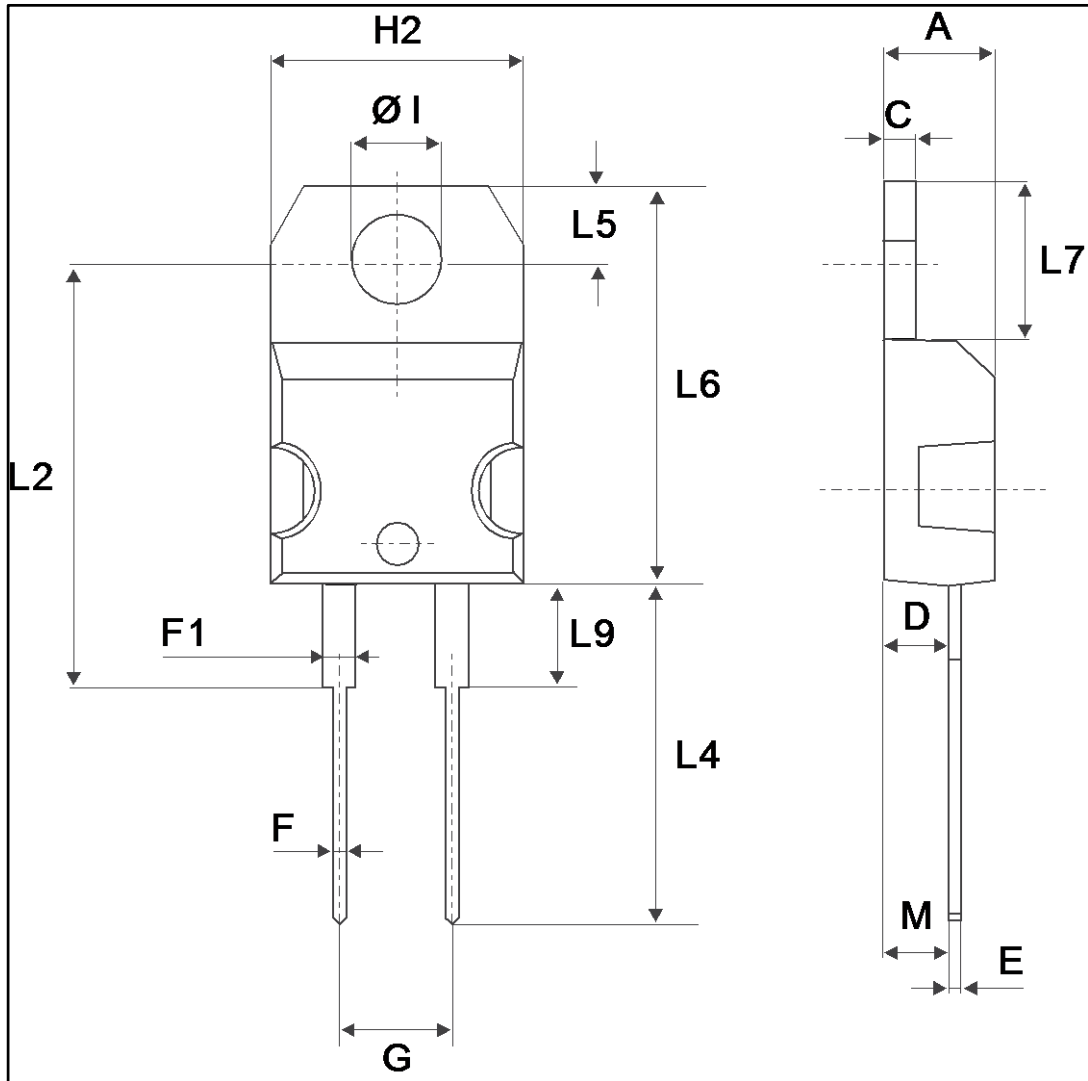


Table 6: TO-220AC package mechanical data

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

2.2 DO-247 package information

Figure 9: DO-247 package outline

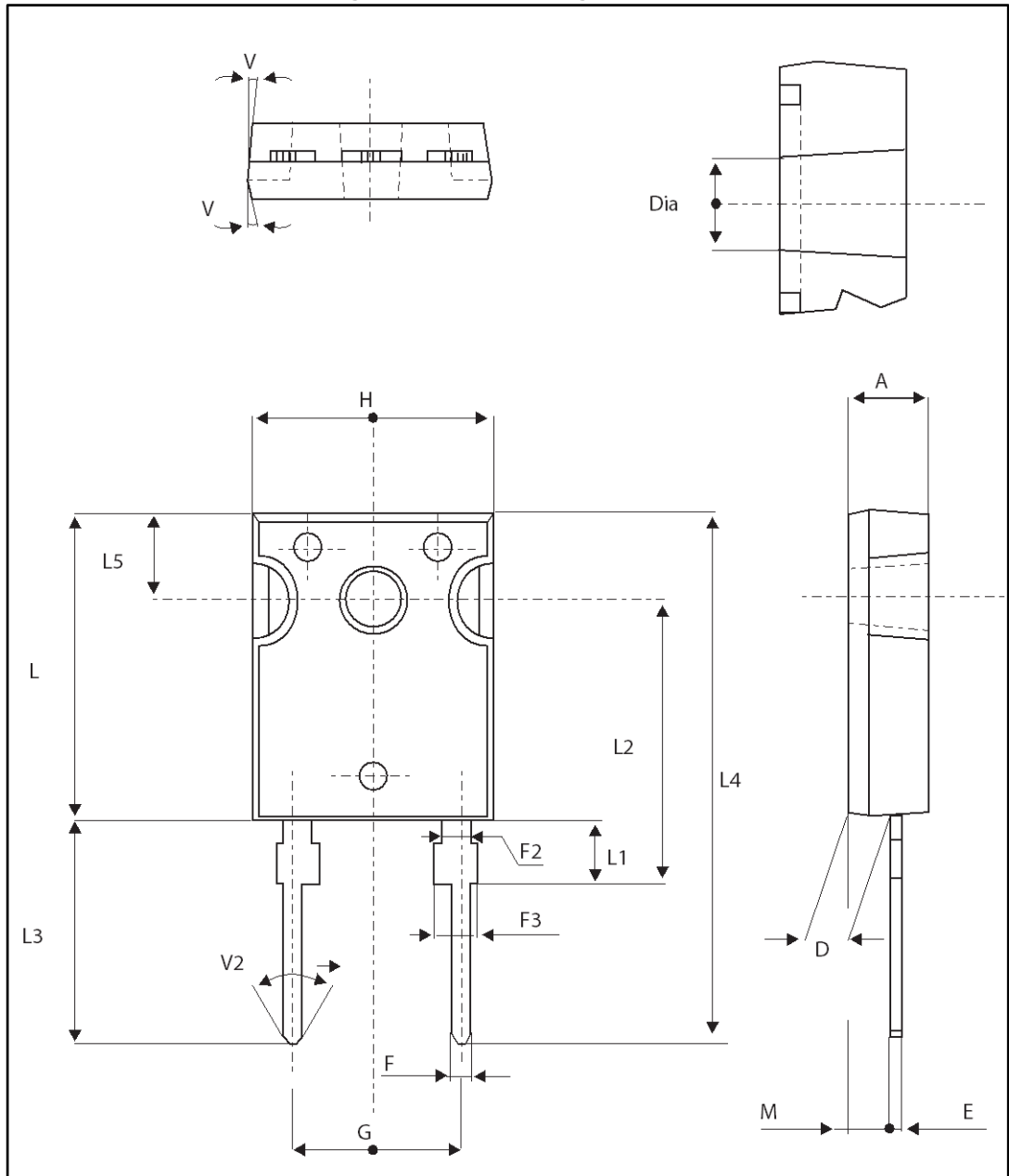


Table 7: DO-247 package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.85	5.15	0.191	0.203
D	2.20	2.60	0.086	0.102
E	0.40	0.80	0.015	0.031
F	1.00	1.40	0.039	0.055
F2	2.00 typ.		0.078 typ.	
F3	2.00	2.40	0.078	0.094
G	10.90 typ.		0.429 typ.	
H	15.45	15.75	0.608	0.620
L	19.85	20.15	0.781	0.793
L1	3.70	4.30	0.145	0.169
L2	18.50 typ.		0.728 typ.	
L3	14.20	14.80	0.559	0.582
L4	34.60 typ.		1.362 typ.	
L5	5.50 typ.		0.216 typ.	
M	2.00	3.00	0.078	0.118
V	5°		5°	
V2	60°		60°	
Dia.	3.55	3.65	0.139	0.143

3 Ordering information

Table 8: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC20065DY	PSC20065DY	TO-220AC	1.86 g	50	Tube
STPSC20065WY	PSC20065WY	DO-247	4.4 g	30	Tube

4 Revision history

Table 9: Document revision history

Date	Revision	Changes
10-May-2016	1	First issue

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