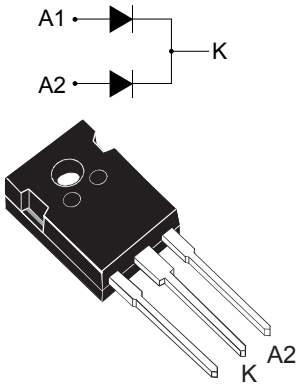
STPSC20065C

Datasheet

650 V, dual 10 A, power Schottky silicon carbide diode



TO-247 LL

Product label
SUSTAINABLE TECHNOLOGY

Product status
STPSC20065C

Product summary	
Symbol	**Value**
$I_{F(AV)}$	2 X 10 A
V_{RRM}	650 V
$T_{j(max.)}$	175 °C
$V_{F(typ.)}$	1.30 V

Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- Low Forward voltage drop
- Operating T_j from -40 °C to +175 °C
- ECOPACK2 compliant component
- Power efficient product

Applications

- Air conditioning equipment
- PFC
- OBC (On board battery chargers)
- Server Power supplies
- Telecom power

Description

The STPSC20065C is an ultra-high 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.

Especially suited for use in PFC applications, this ST SiC diode will boost performance in hard switching conditions. Its high forward surge capability ensures good robustness during transient phases.

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, per diode, 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	Per diode	T_c = 150 °C(1), DC current	10	A
		Per device	T_c = 150 °C(1), DC current	20	
I_{FSM}	Surge non repetitive forward current		t_p = 10 ms sinusoidal, T_c = 25 °C	48	A
			t_p = 10 ms sinusoidal, T_c = 125 °C	39	
			t_p = 10 µs square, T_c = 25 °C	210	
I_{FRM}	Repetitive peak forward current		T_c = 150 °C , T_j = 175 °C, δ = 0.1	42	A
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Operating junction temperature range			-40 to +175	°C

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

Table 2. Thermal resistance parameters

Symbol	Parameter		Typ. value	Max. value	Unit
$R_{th(j-c)}$	Junction to case	Per diode	1.0	1.5	°C/W
		Per device	0.5	0.75	

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

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

Table 3. Static electrical characteristics (per diode)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	V_R = 650 V	-	7	130	µA
		T_j = 150 °C		-	53	900	
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 10 A	-	1.30	1.45	V
		T_j = 150 °C		-	1.45	1.65	
		T_j = 25 °C	I_F = 20 A	-		1.88	
		T_j = 150 °C		-	2.00	2.33	

1. *t_p = 5 ms, δ < 2%*
2. *t_p = 500 µs, δ < 2%*

To evaluate the conduction losses, use the following equation:

$P = 0.97 \times I_{F(AV)} + 0.068 \times I_F{}^2{}_{(RMS)}$

For more information, please 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 (per diode)

Symbol	Parameter	Test conditions	Typ.	Unit
Q_{cj}(1)	Total capacitive charge	V_R = 400 V	34	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	670	pF
		V_R = 400 V, T_c = 25 °C, F = 1 MHz	55	

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

1.1 Characteristics (curves)

Figure 1. Forward voltage drop versus forward current (typical values, per diode)

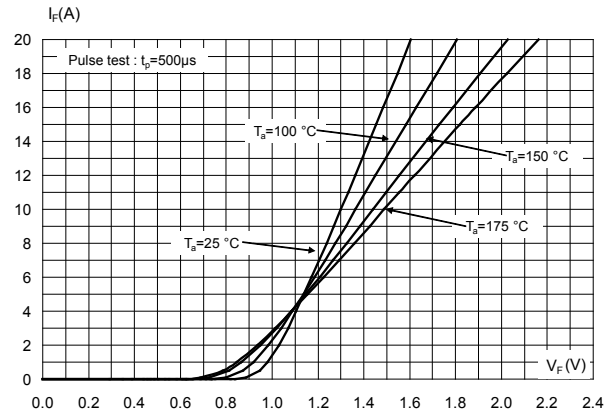


Figure 2. Reverse leakage current versus reverse voltage applied (typical values, per diode)

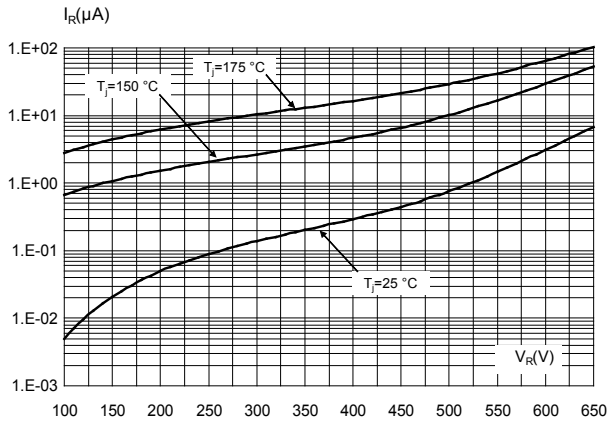


Figure 3. Peak forward current versus case temperature (per diode)

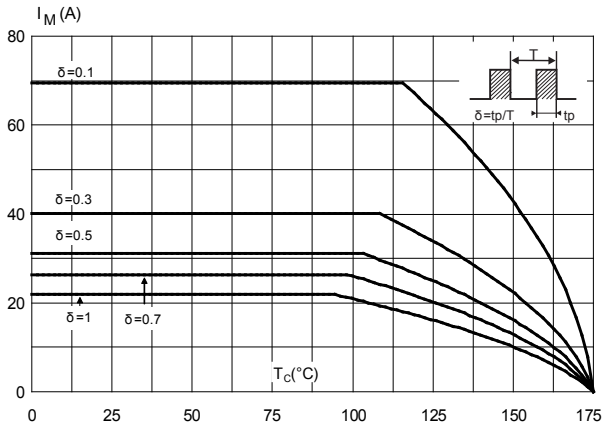


Figure 4. Junction capacitance versus reverse voltage applied (typical values, per diode)

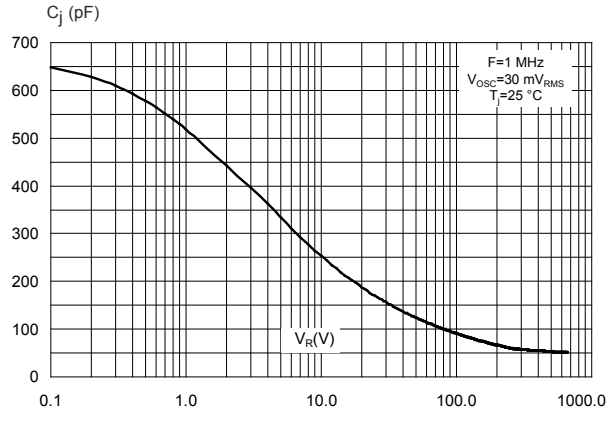


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

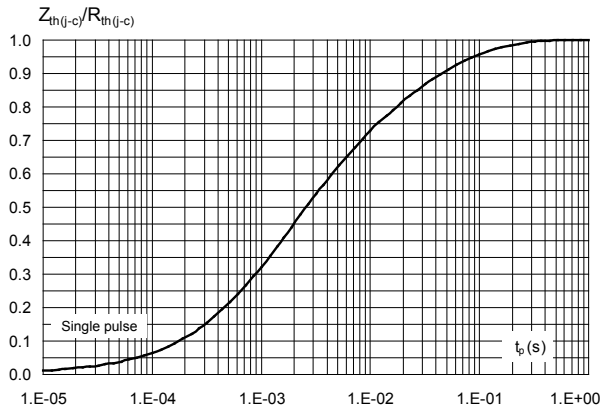


Figure 6. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform, per diode)

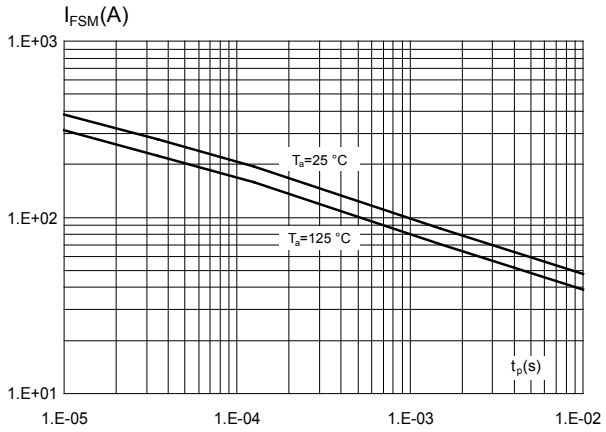
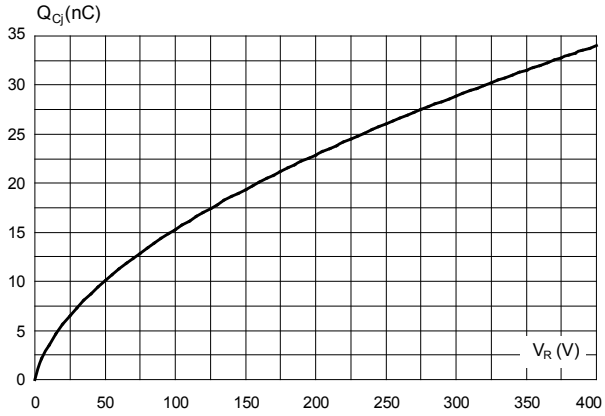


Figure 7. Total capacitive charges versus reverse voltage applied (typical values, per diode)



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.

2.1 TO-247 long leads package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 to 1.0 N·m

Figure 8. TO-247 long leads package outline

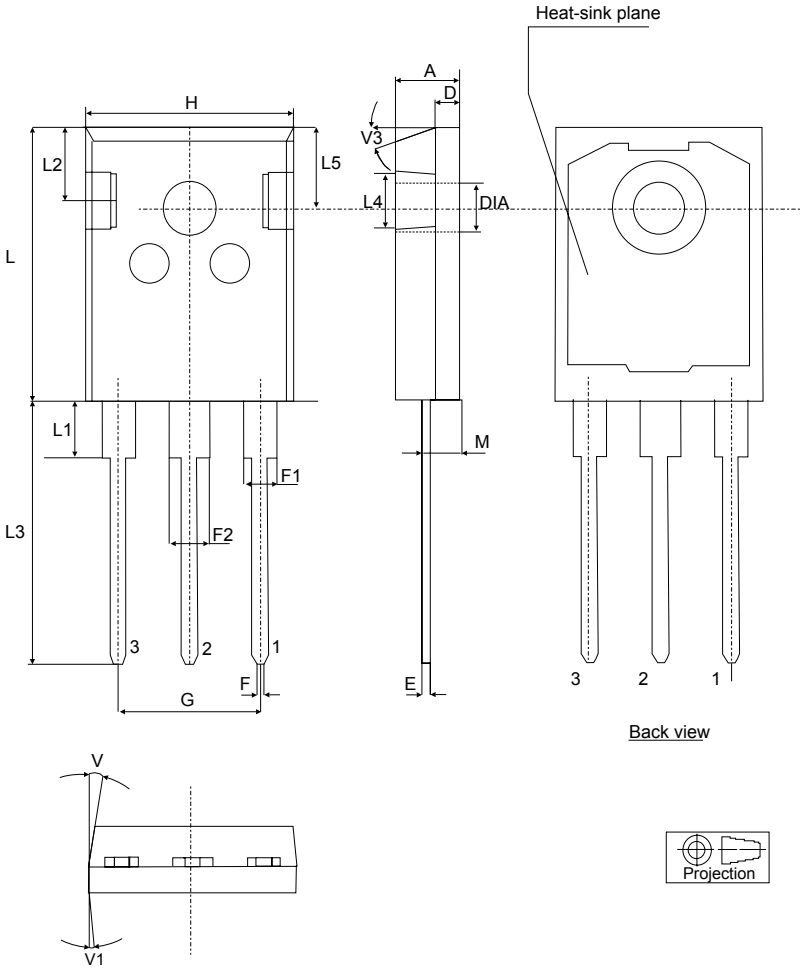


Table 5. **TO-247 long leads package mechanical data**

Dim.	mm.			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.90		5.15	0.192		0.202
D	1.85		2.10	0.072		0.082
E	0.55		0.67	0.021		0.026
F	1.07		1.32	0.042		0.051
F1	1.90		2.38	0.074		0.093
F2	2.87		3.38	0.110		0.133
G		10.90 BSC			0.429 BSC	
H	15.77		16.02	0.620		0.630
L	20.82		21.07	0.810		0.820
L1	4.16		4.47	0.163		0.175
L2	5.49		5.74	0.216		0.225
L3	20.05		20.30	0.789		0.799
L4	3.68		3.93	0.144		0.154
L5	6.04		6.29	0.237		0.247
M	2.25		2.55	0.088		0.100
V		10°			10°	
V1		3°			3°	
V3		20°			20°	
DIA	3.55		3.66	0.139		0.143

3 Ordering Information

Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC20065CWL	PSC20065CWL	TO-247LL	6.084 g	30	Tube

Revision history

Table 7. **Document revision history**

Date	Version	Changes
26-Apr-2019	1	First issue.

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