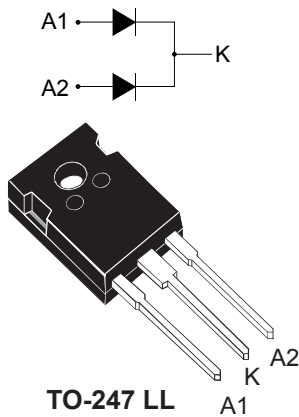


650 V, dual 10 A, power Schottky silicon carbide diode



Product label



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	$T_j = 25\text{ °C}$	$V_R = 650\text{ V}$	-	7	130	μA
		$T_j = 150\text{ °C}$		-	53	900	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 10\text{ A}$	-	1.30	1.45	V
		$T_j = 150\text{ °C}$		-	1.45	1.65	
		$T_j = 25\text{ °C}$	$I_F = 20\text{ A}$	-		1.88	
		$T_j = 150\text{ °C}$		-	2.00	2.33	

1. $t_p = 5\text{ ms}$, $\delta < 2\%$

2. $t_p = 500\text{ }\mu\text{s}$, $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

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

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	$V_R = 400\text{ V}$	34	nC
C_j	Total capacitance	$V_R = 0\text{ V}, T_c = 25\text{ °C}, F = 1\text{ MHz}$	670	pF
		$V_R = 400\text{ V}, T_c = 25\text{ °C}, F = 1\text{ MHz}$	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)

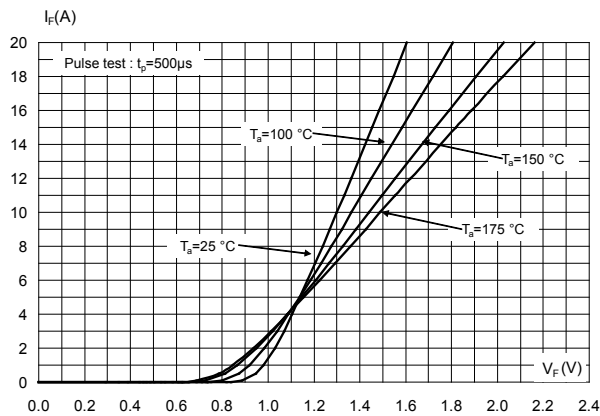


Figure 2. Reverse leakage current versus reverse voltage
applied (typical values, per diode)

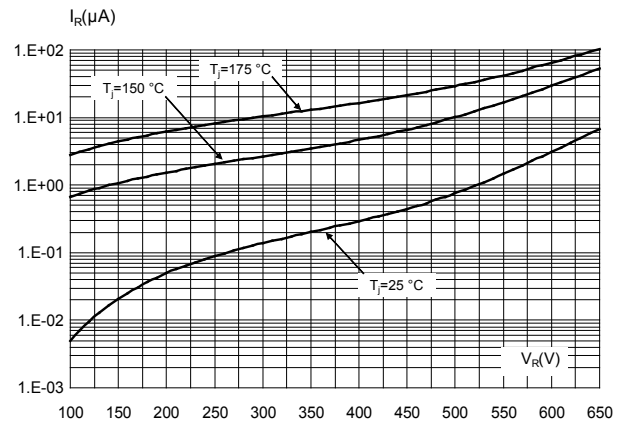


Figure 3. Peak forward current versus case temperature
(per diode)

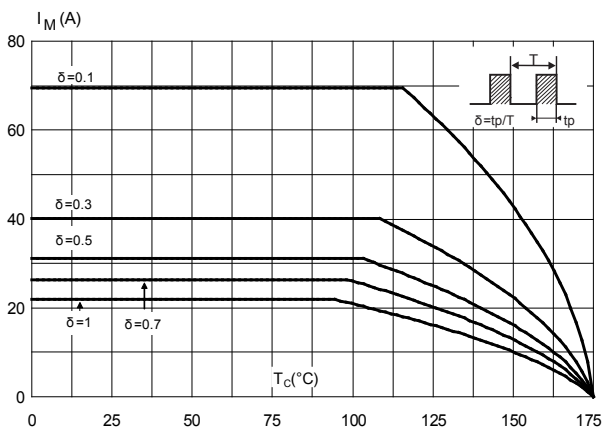


Figure 4. Junction capacitance versus reverse voltage
applied (typical values, per diode)

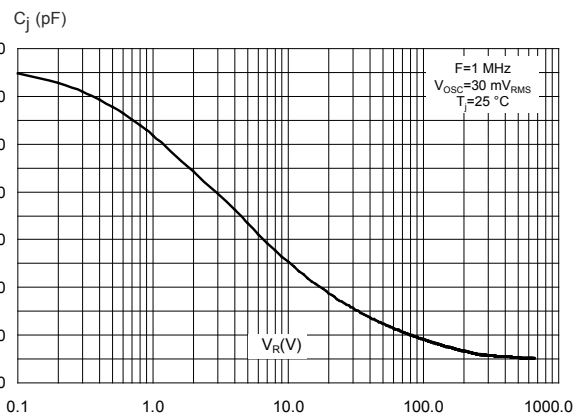


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

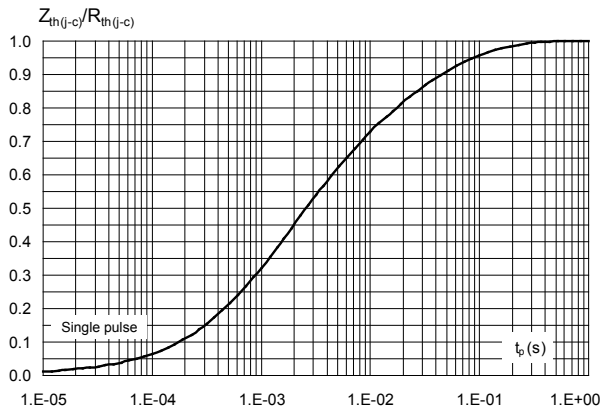


Figure 6. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform, per diode)

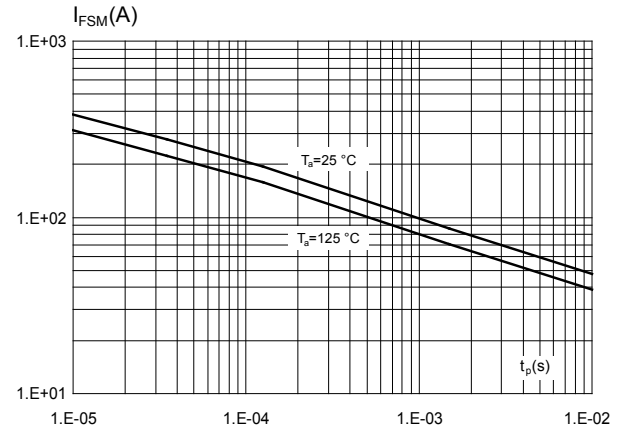
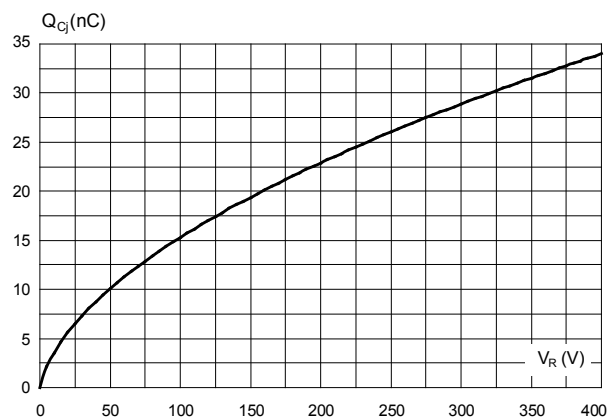


Figure 7. Total capacitive charges versus reverse voltage applied (typical values, per diode)



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

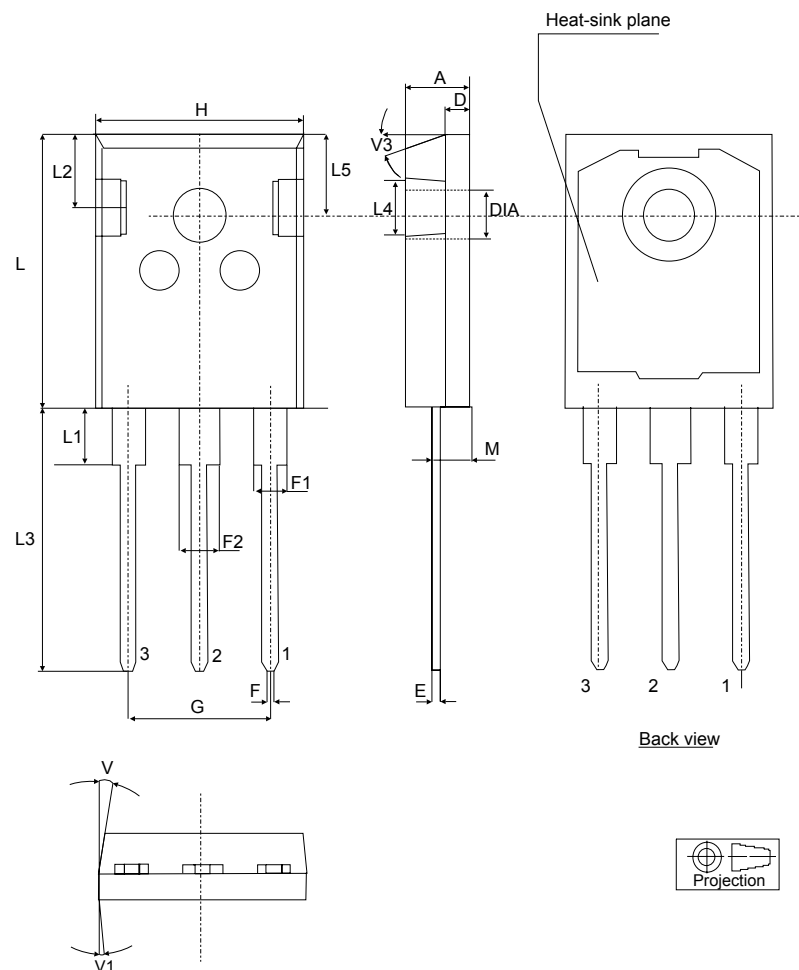


Table 5. TO-247 long leads package mechanical data

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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