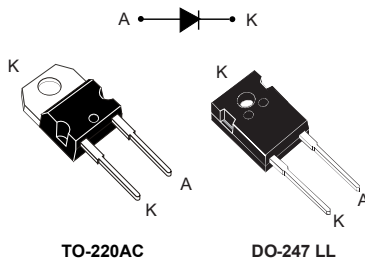


1200 V, 15 A power Schottky silicon carbide diode



Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- Robust high voltage periphery
- Operating from -40 °C to 175 °C
- Low V_F
- ECOPACK2 compliant component


Applications

- EV charging stations
- Solar boost converters
- PV converters

Description

The SiC diode, available in TO-220AC and TO-247 LL, 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 1200 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 and secondary side applications, this ST SiC diode will boost the performance in hard switching conditions. This rectifier will enhance the performance of the targeted application. Its high forward surge capability ensures a good robustness during transient phases.

Product label	
	
Product status	
STPSC15H12	
Product summary	
$I_{F(AV)}$	15 A
V_{RRM}	1200 V
T_j (max.)	175 °C
V_F (typ.)	1.35 V

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage ($T_j = -40\text{ °C}$ to $+175\text{ °C}$)		1200	V
$I_{F(RMS)}$	Forward rms current		38	A
$I_{F(AV)}$	Average forward current	TO-220AC, $T_C = 155\text{ °C}$, DC current ⁽¹⁾	15	A
		DO-247 LL, $T_C = 150\text{ °C}$, DC current ⁽¹⁾		
I_{FRM}	Repetitive peak forward current	TO-220AC, $T_C = 155\text{ °C}$, $T_j = 175\text{ °C}$, $\delta = 0.1$	58	A
		DO-247 LL, $T_C = 150\text{ °C}$, $T_j = 175\text{ °C}$, $\delta = 0.1$	61	
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		-40 to +175	°C

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

Table 2. Thermal parameters

Symbol	Parameter		Typ. value	Max. value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC	0.45	0.6	°C/W
		DO-247 LL	0.50	0.70	

For more information, please 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	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-	7.5	90	μA
		$T_j = 150\text{ °C}$		-	45	600	
V_F ⁽²⁾	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 15\text{ A}$	-	1.35	1.50	V
		$T_j = 150\text{ °C}$		-	1.75	2.25	

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

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

To evaluate the conduction losses use the following equation:

$$P = 1.09 \times I_{F(AV)} + 0.0775 \times I_F^2 (RMS)$$

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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$Q_{Cj}^{(1)}$	Total capacitive charge	$V_R = 800 \text{ V}$	-	94	-	nC
C_j	Total capacitance	$V_R = 0 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	-	1200	-	pF
		$V_R = 800 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	-	78	-	

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)

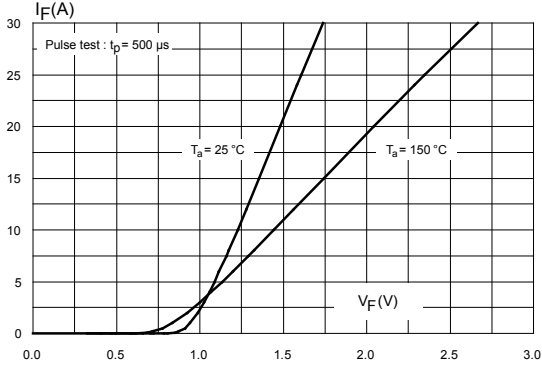


Figure 2. Reverse leakage current versus reverse voltage applied (typical values)

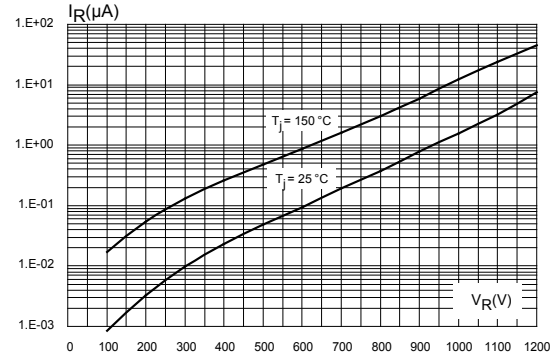


Figure 3. Peak forward current versus case temperature (TO-220AC)

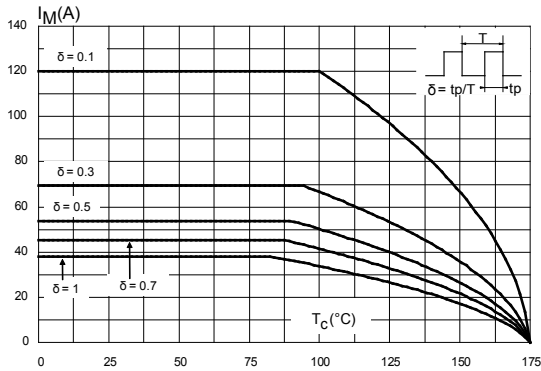


Figure 4. Peak forward current versus case temperature (DO-247 LL)

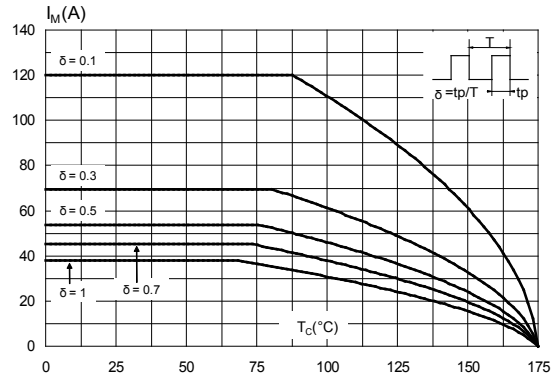


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

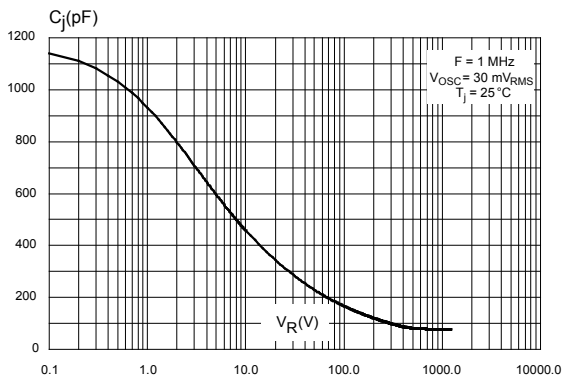


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC)

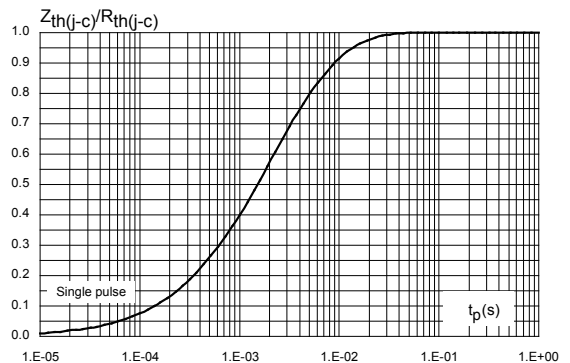


Figure 7. Relative variation of thermal impedance junction to case versus pulse duration (DO-247 LL)

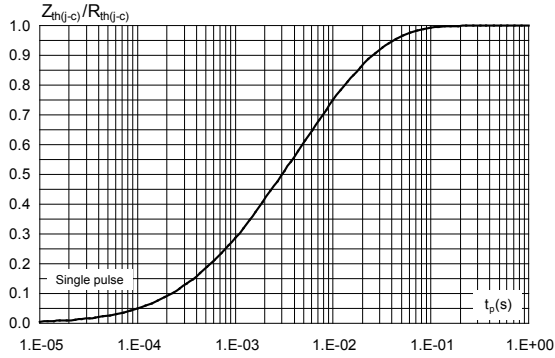


Figure 8. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

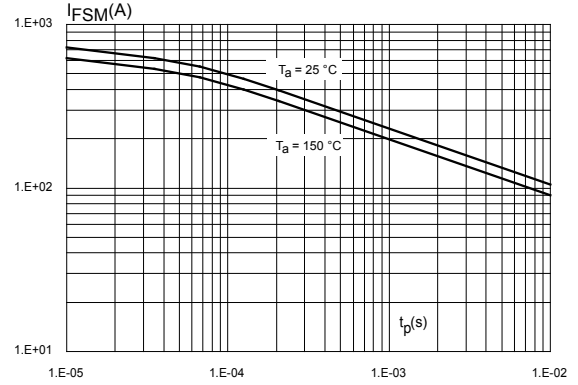
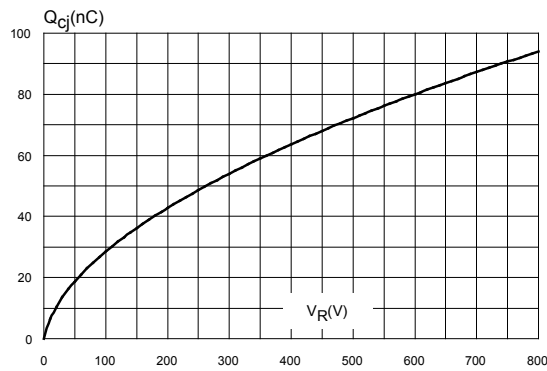


Figure 9. Total capacitive charges versus reverse voltage applied (typical values)



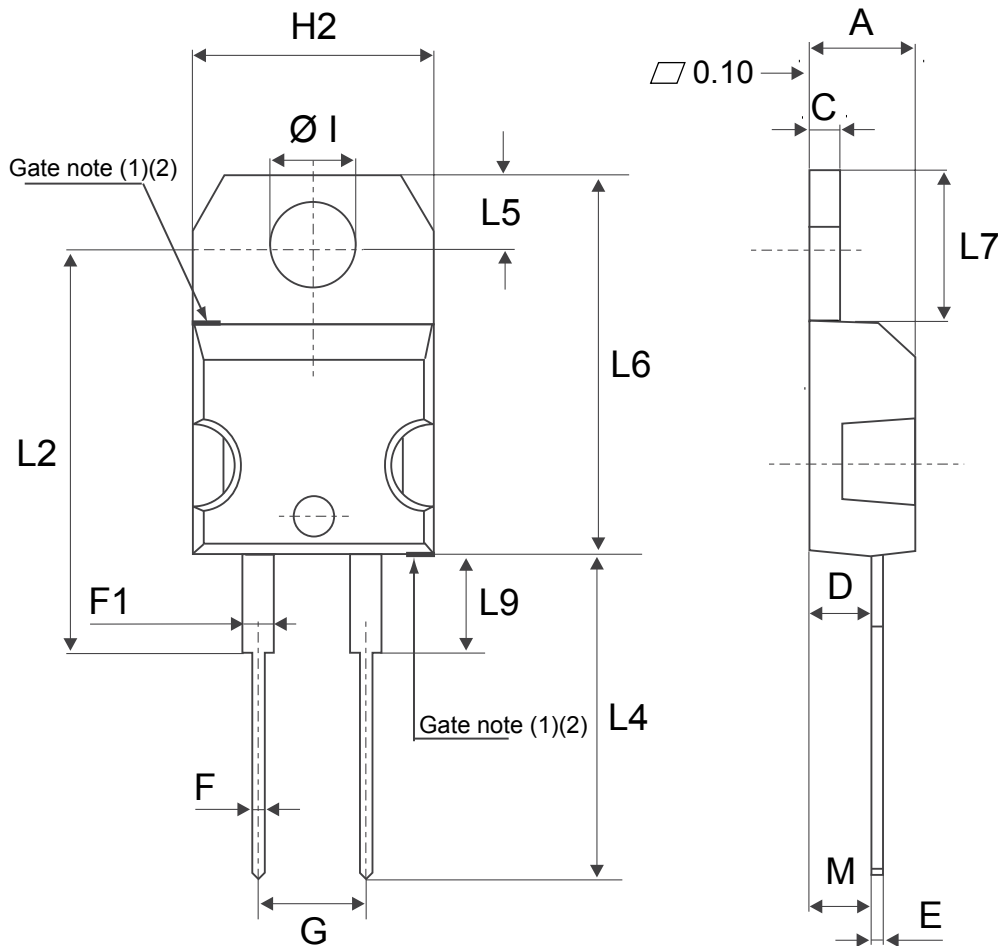
2 Package information

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.

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 10. TO-220AC package outline



(1) :Max resin gate protusion 0.5 mm

(2) :Resin gate position is accepted in each of the two positions shown on the drawings or their symmetrical

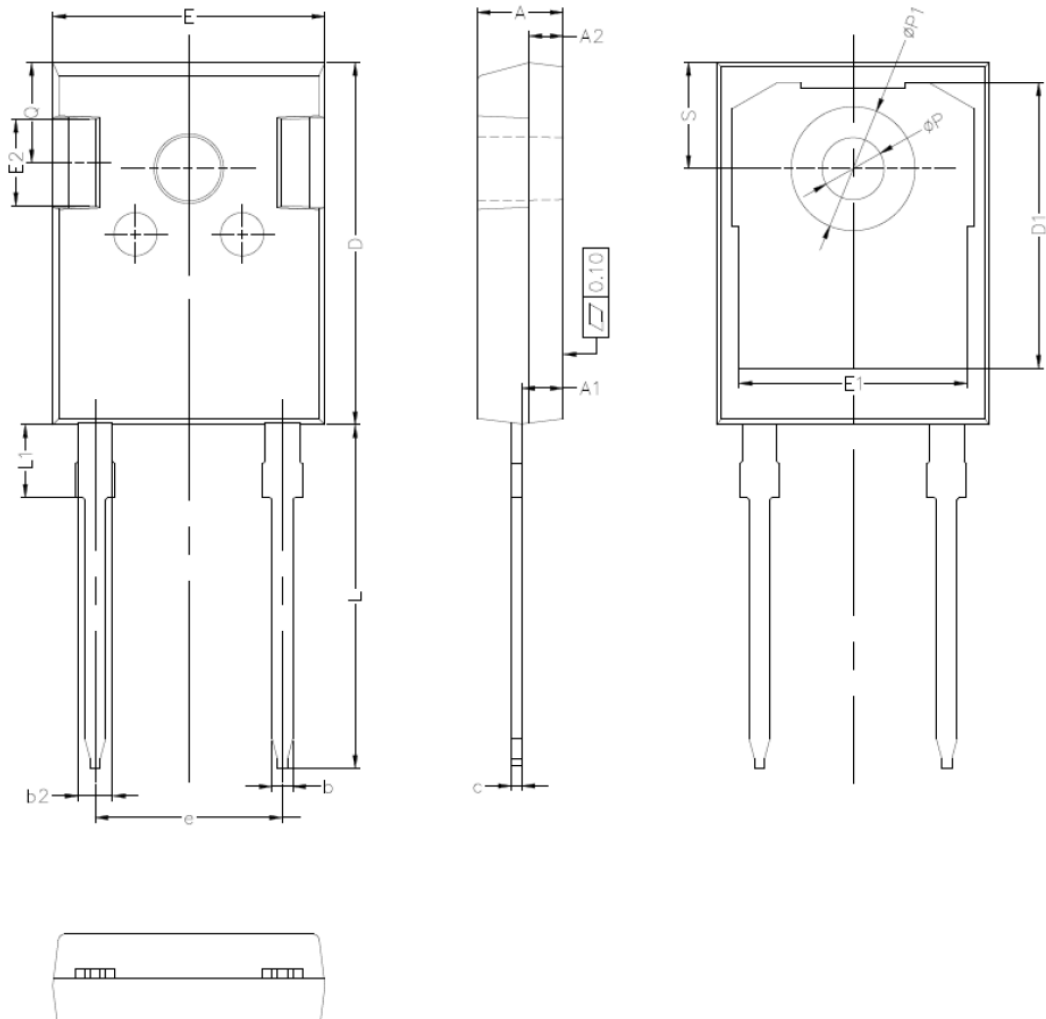
Table 5. TO-220AC package mechanical data

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	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	2.60 typ.		0.102 typ.	
Diam	3.75	3.85	0.147	0.151

2.2 DO-247 LL package information

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

Figure 11. DO-247 LL package outline



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

Table 6. DO-247 LL package mechanical data

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A	4.70	5.31	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
c	0.38	0.89	0.015	0.035
D	20.80	21.46	0.819	0.845
D1	13.08		0.515	
E	15.49	16.26	0.610	0.640
e	10.88 typ.		0.428	
E1	13.06		0.514	
E2	3.43	5.10	0.135	0.200
L	19.80	20.32	0.779	0.800
L1		4.50		0.177
P	3.50	3.70	0.137	0.146
P1	7.00	7.40	0.275	0.292
Q	5.38	6.20	0.219	0.244
S	6.16 typ.		0.243	

3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC15H12D	STPSC15H12D	TO-220AC	1.86 g	50	Tube
STPSC15H12WL	STPSC15H12WL	DO-247 LL	5.9 g	30	Tube

Revision history

Table 8. Document revision history

Date	Revision	Changes
10-May-2016	1	Initial version
05-Sep-2017	2	Added DO-247 LL package. Updated Section "Features", Section 1:"Characteristics" and Table 8: "Ordering information".
03-Apr-2018	3	Updated Section 2.2 DO-247 LL package information.
23-Jun-2021	4	Added Section STPOWER, Section Sustainable technology and Applications. Updated Table 4 and Section 2.2 DO-247 LL package information.

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