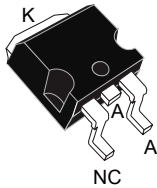


650 V, 30 A high surge silicon carbide power Schottky diode

A  K



D²PAK HV



Product label



Product status link

[STPSC30G065G2Y](#)

Product summary

$I_{F(AV)}$	30 A
V_{RRM}	650 V
$T_j(max.)$	175 °C
$V_F(typ.)$	1.30 V

Features

- AEC-Q101 qualified and PPAP capable 
- No 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

- On board chargers
- DC-DC converters
- PFC stage

Description

The SiC diode **STPSC30G065G2Y**, available in D2PAK HV, 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. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimal capacitive turn-off behaviour is independent of temperature.

Based on technology optimization, this diode has an improved forward surge current capability, making it ideal for use in PFC, where this ST SiC diode boost 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 robustness to the application design.

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		63	A
$I_{F(AV)}$	Average forward current	$T_c = 135\text{ °C}$, $\delta = 1$	30	A
I_{FRM}	Repetitive peak forward current	$T_c = 135\text{ °C}$, $T_j = 175\text{ °C}$, $\delta = 0.1$, $f_{sw} > 10\text{ kHz}$	129	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	0.50	0.71	°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	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-	25	300	μA
		$T_j = 175\text{ °C}$		-	150	1200	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 30\text{ A}$	-	1.30	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:

$$P = 0.879 \times I_{F(AV)} + 0.027 \times I_F^2_{(RMS)}$$

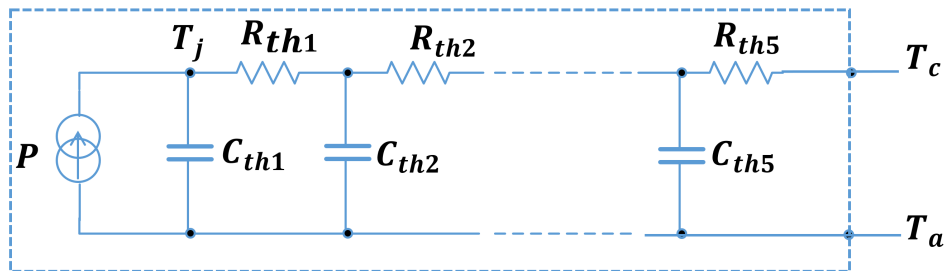
For more information, you can refer to the following application notes related to the power losses:

- [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	$V_R = 400\text{ V}$	-	86	-	nC
C_j	Total capacitance	$V_R = 0\text{ V}, T_c = 25\text{ °C}, F = 1\text{ MHz}$	-	1890	-	pF
		$V_R = 400\text{ V}, T_c = 25\text{ °C}, F = 1\text{ MHz}$	-	120	-	

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}	18.71m	C_{th1}	1.22m
R_{th2}	139.81m	C_{th2}	1.43m
R_{th3}	195.71m	C_{th3}	5.91m
R_{th4}	118.51m	C_{th4}	28.94m
R_{th5}	27.25m	C_{th5}	427.97m

1.1 Characteristics (curves)

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

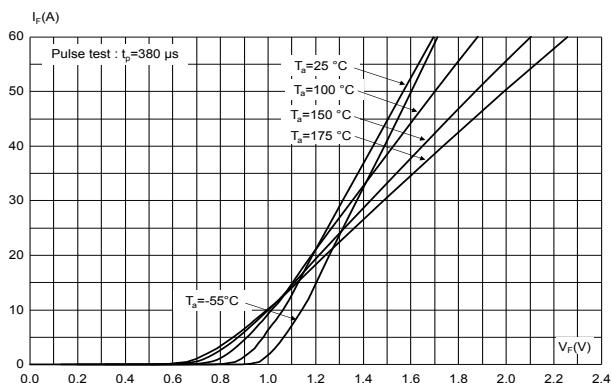


Figure 3. Reverse leakage current versus reverse voltage applied (typical values)

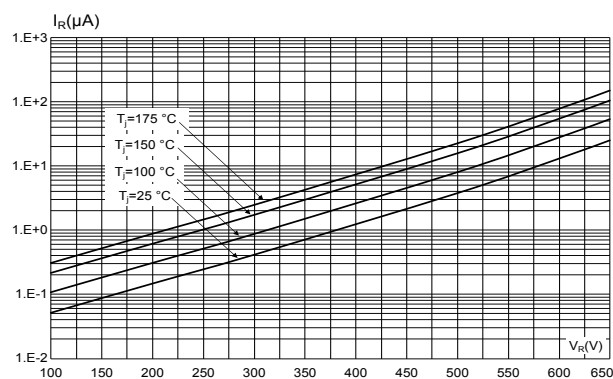


Figure 4. Peak forward current versus case temperature ($f_{sw} > 10$ kHz)

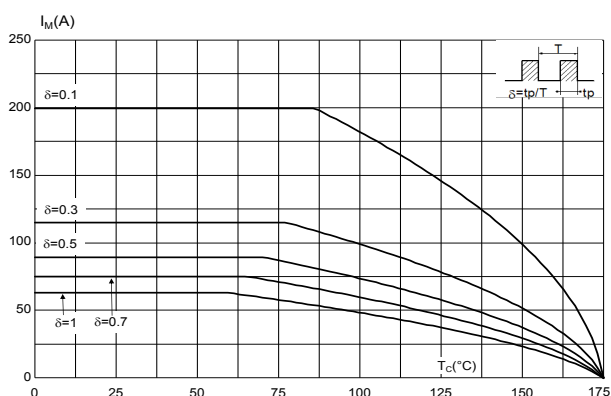


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

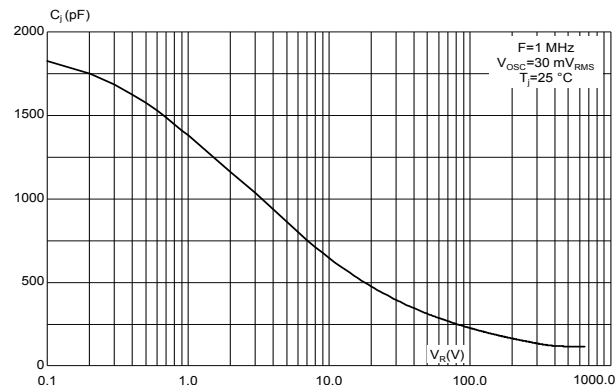


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

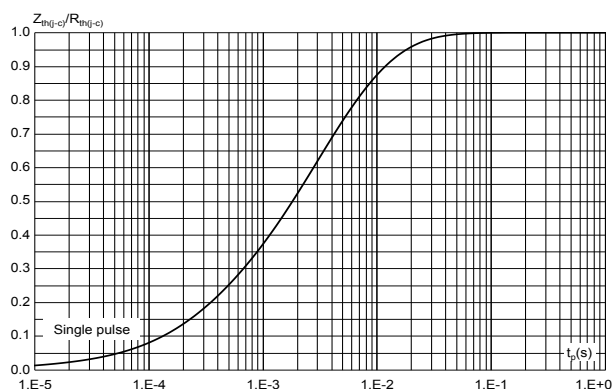


Figure 7. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

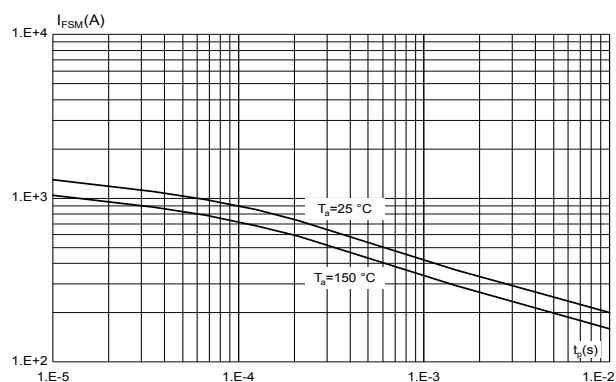


Figure 8. Total capacitive charges versus reverse voltage applied (typical values)

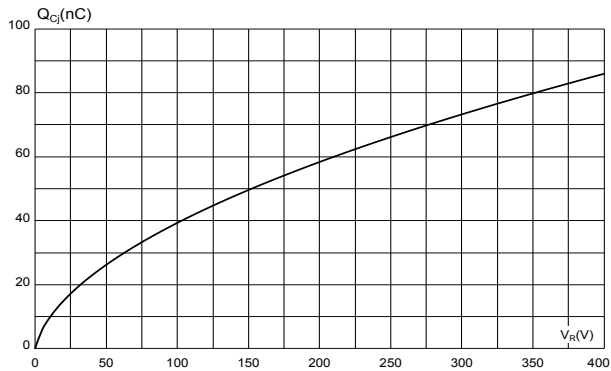
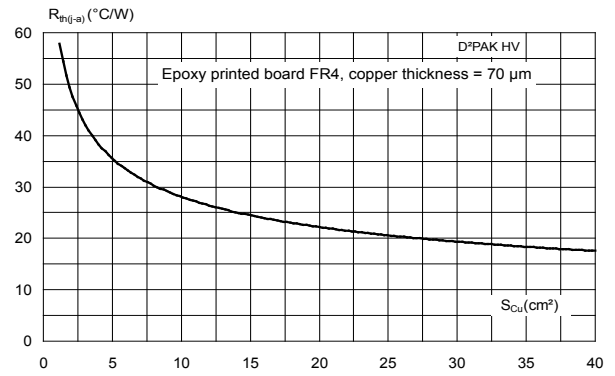


Figure 9. Thermal resistance junction to ambient versus copper surface under tab (typical values)



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 D²PAK high voltage package information

- Epoxy meets UL94, V0

Figure 10. D²PAK high voltage package outline

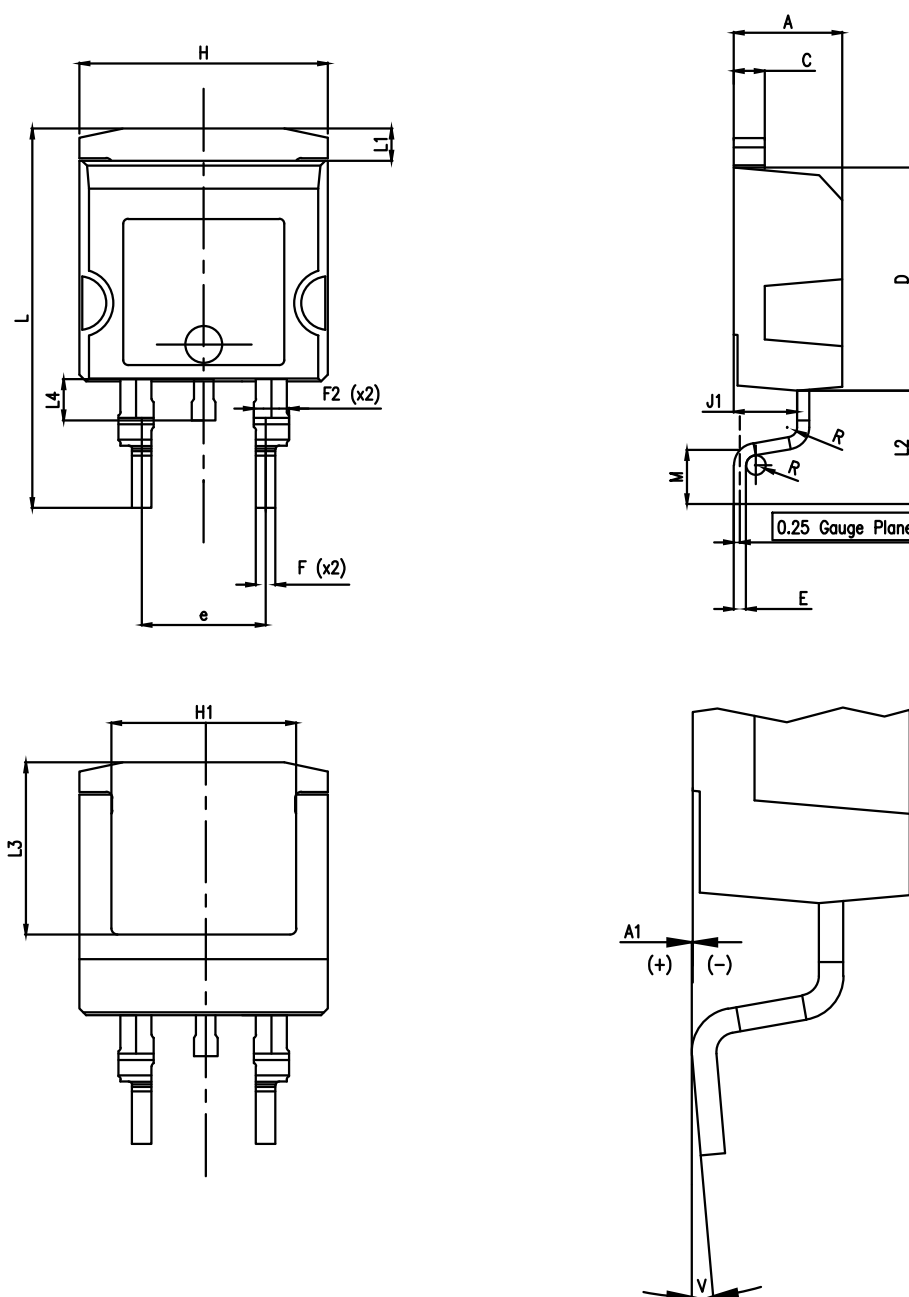
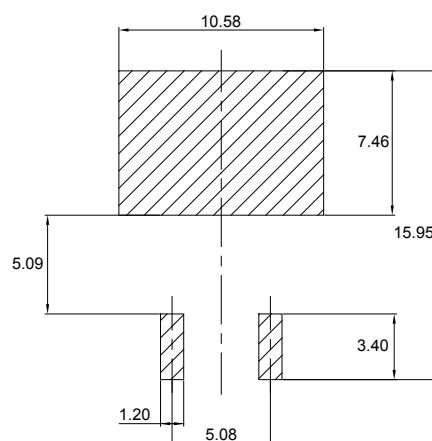


Table 6. D²PAK high voltage package mechanical data

Ref.	Dimensions		
	Min.	Typ.	Max.
A	4.30	-	4.70
A1	0.03	-	0.20
C	1.17	-	1.37
D	8.95	-	9.35
e	4.98	-	5.18
E	0.50	-	0.90
F	0.78	-	0.85
F2	1.14	-	1.70
H	10.00	-	10.40
H1	7.40	-	7.80
J1	2.49	-	2.69
L	15.30	-	15.80
L1	1.27	-	1.40
L2	4.93	-	5.23
L3	6.85	-	7.25
L4	1.50	-	1.7
M	2.60	-	2.9
R	0.20	-	0.60
V	0°	-	8°

Figure 11. D²PAK high voltage footprint in mm


Note: For package and tape orientation, reel and inner box dimensions and tape outline you can check [TN1173](#).

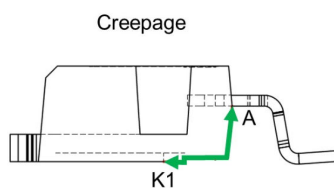
2.2 Creepage distance between anode and cathode

Table 7. Creepage distance between anode and cathode

Symbol	Parameter		Value	Unit
Cd_{A-K1}	Minimum creepage distance between A and K1 (with top coating)	D ² PAK HV	5.38	mm
Cd_{A-K2}	Minimum creepage distance between A and K2 (without top coating)		3.48	

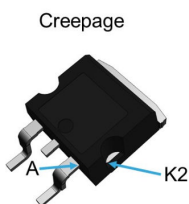
Note: D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

Figure 12. Creepage with top coating



Minimum distance between A & K1 = 5.38 mm (with top coating)

Figure 13. Creepage without top coating



Minimum distance between A & K2 = 3.48 mm (without top coating)

3 Ordering information

Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC30G065G2Y	PSC30G065Y	D ² PAK HV	1.48 g	1000	Tape and reel 13"

Revision history

Table 9. Document revision history

Date	Revision	Changes
25-Apr-2024	1	Initial release.

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