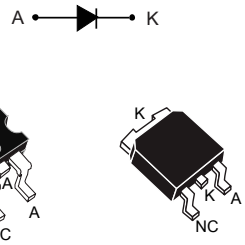
STPSC8H065-Y

Datasheet

Automotive 650 V, 8 A high surge silicon carbide power Schottky diode



D²PAK HV **DPAK**

Features

- AEC-Q101 qualified
- No reverse recovery charge in application current range
- Switching behavior independent of temperature
- Recommended to PFC applications
- PPAP capable
- V_{RRM} guaranteed from -40 to 175 °C
- D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (with top coating)
- ECOPACK®2 compliant component

Product label
SUSTAINABLE TECHNOLOGY

Product status
STPSC8H065-Y

Product summary	
Symbol	**Value**
$I_{F(AV)}$	8 A
V_{RRM}	650 V
$T_{j(max.)}$	175 °C

Applications

- On board charger

Description

The SiC diode 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, the STPSC8H065-Y SiC diode will boost performance in hard switching conditions.

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 °C to + 175 °C	650	V
$I_{F(RMS)}$	Forward rms current		22	A
$I_{F(AV)}$	Average forward current	T_c = 145 °C(1), DC	8	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, T_c = 25 °C t_p = 10 ms sinusoidal, T_c = 125 °C t_p = 10 µs square, T_c = 25 °C	75 69 420	A
I_{FRM}	Repetitive peak forward current	T_c = 145 °C (1), T_j = 175 °C, δ = 0.1	33	A
T_{stg}	Storage temperature range		-55 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	1.3	1.6	°C/W

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	7	80	µA
		T_j = 150 °C		-	65	335	
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 8 A	-	1.45	1.65	V
		T_j = 150 °C		-	1.7	2.05	

1. *t_p = 10 ms, δ < 2%*
2. *t_p = 500 µs, δ < 2%*

To evaluate the conduction losses, use the following equation:

$P = 0.972 \times I_{F(AV)} + 0.135 \times I_F{}^2{}_{(RMS)}$

Table 4. Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Typ.	Unit
Q_{cj}(1)	Total capacitive charge	V_R = 400 V	23.5	nC
C_j	Total capacitance	V_R = 0 V, T_c = 25 °C, F = 1 MHz	414	pF
		V_R = 400 V, T_c = 25 °C, F = 1 MHz	38	

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, low level)

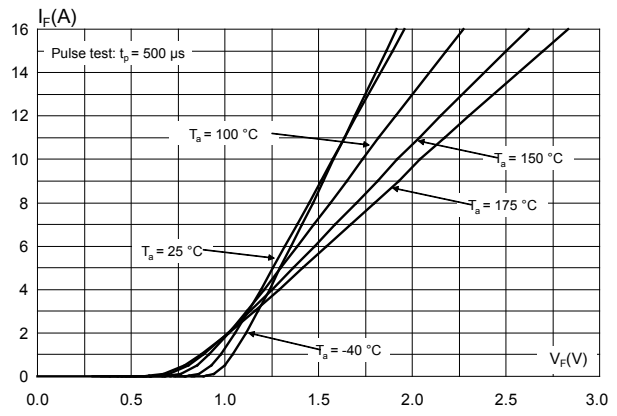


Figure 2. Forward voltage drop versus forward current (typical values, high level)

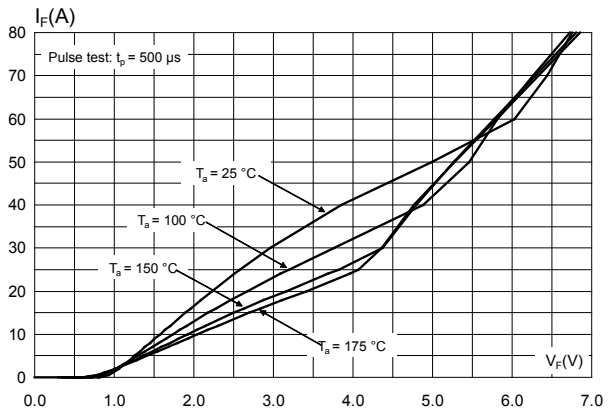


Figure 3. Reverse leakage current versus reverse voltage applied (typical values)

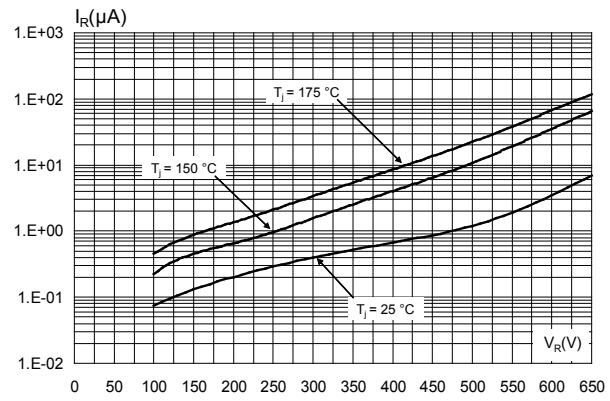


Figure 4. Peak forward current versus case temperature

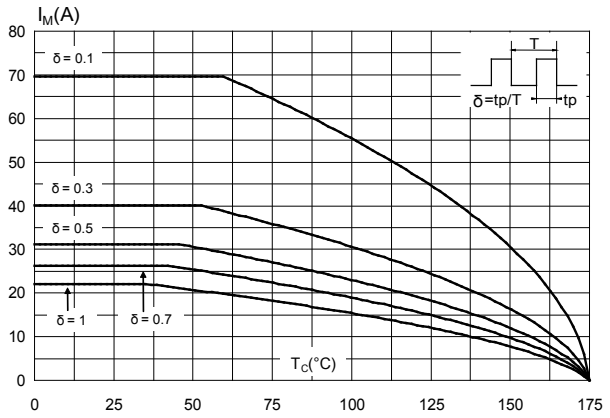


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

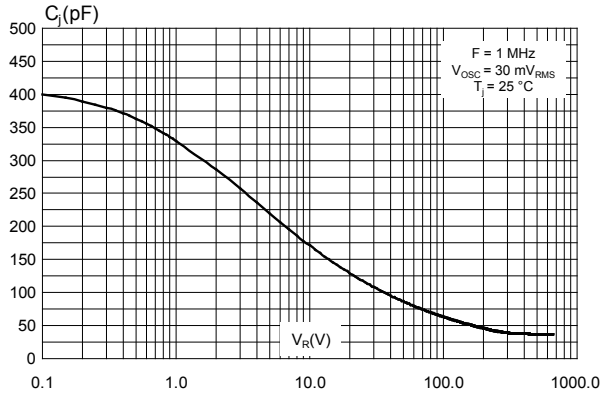


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

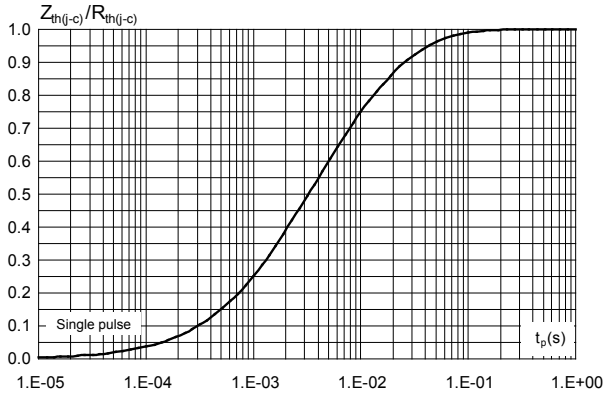


Figure 7. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

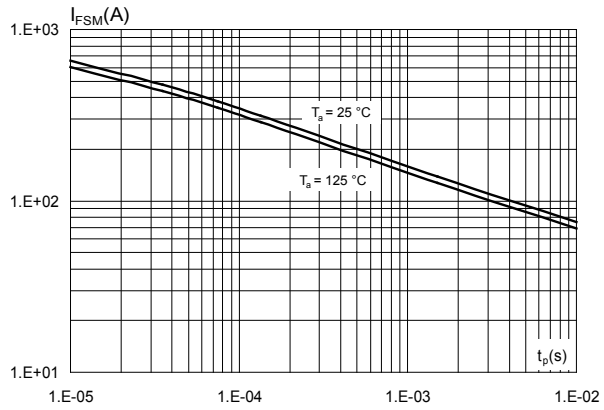


Figure 8. Total capacitive charges versus reverse voltage applied (typical values)

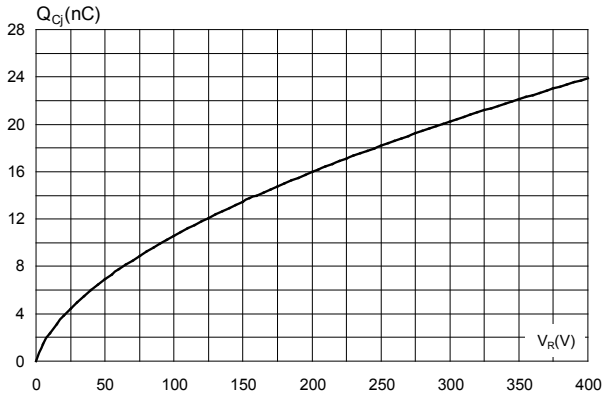
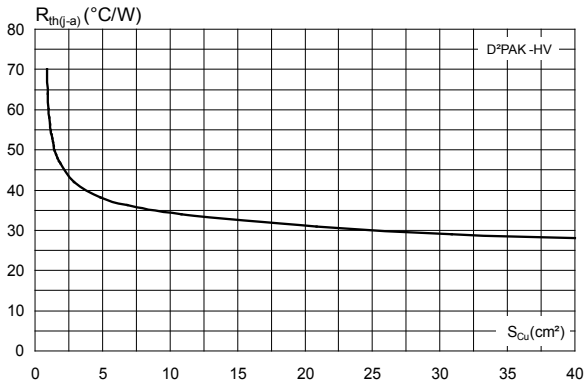


Figure 9. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4, e_{Cu} = 35 µm) (D²PAK-HV)



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 DPAK package information

- Epoxy meets UL94, V0
- Lead-free packages

Figure 10. DPAK package outline

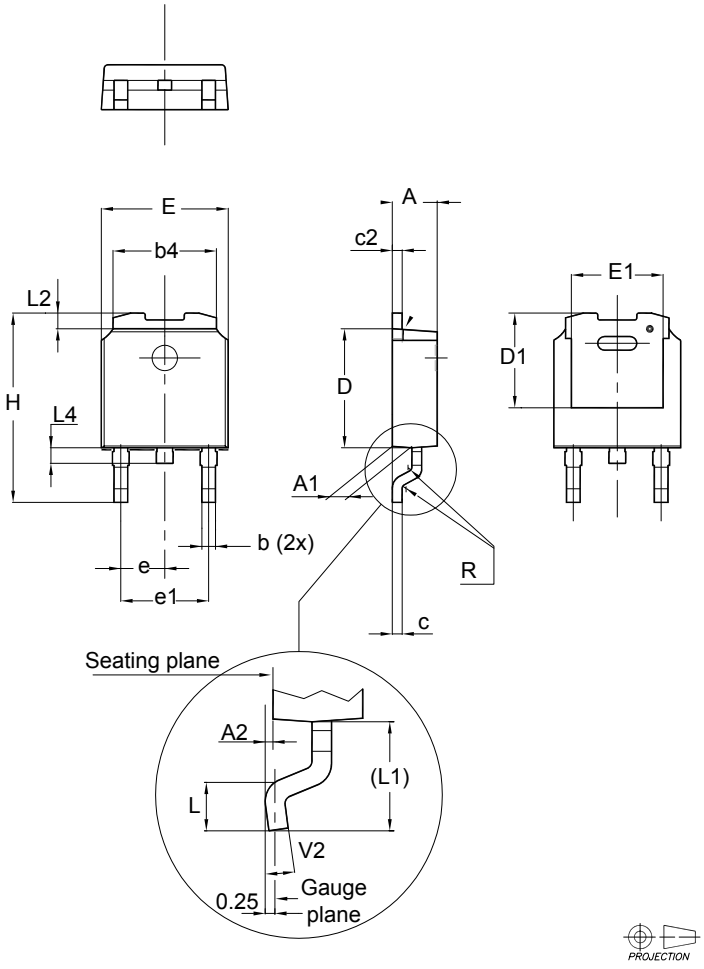
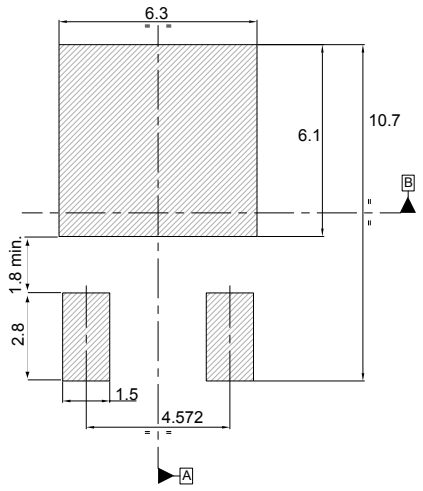


Table 5. DPAK mechanical data

Dim.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
b	0.64		0.90	0.025		0.035
b4	5.20		5.40	0.205		0.213
c	0.45		0.60	0.018		0.024
c2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
D1	4.95	5.10	5.25	0.195	0.201	0.207
E	6.40		6.60	0.252		0.260
E1	4.60	4.70	4.80	0.181	0.185	0.189
e	2.159	2.286	2.413	0.085	0.090	0.095
e1	4.445	4.572	4.699	0.175	0.180	0.185
H	9.35		10.10	0.368		0.398
L	1.00		1.50	0.039		0.059
(L1)	2.60	2.80	3.00	0.102	0.110	0.118
L2	0.65	0.80	0.95	0.026	0.031	0.037
L4	0.60		1.00	0.024		0.039
R		0.20			0.008	
V2	0°		8°	0°		8°

1. *Inches dimensions given for reference only*

Figure 11. DPAK recommended footprint (dimensions are in mm)



The device must be positioned within ⌖ 0.05 A B

2.2 D²PAK HV package information

Figure 12. D²PAK high voltage package outline

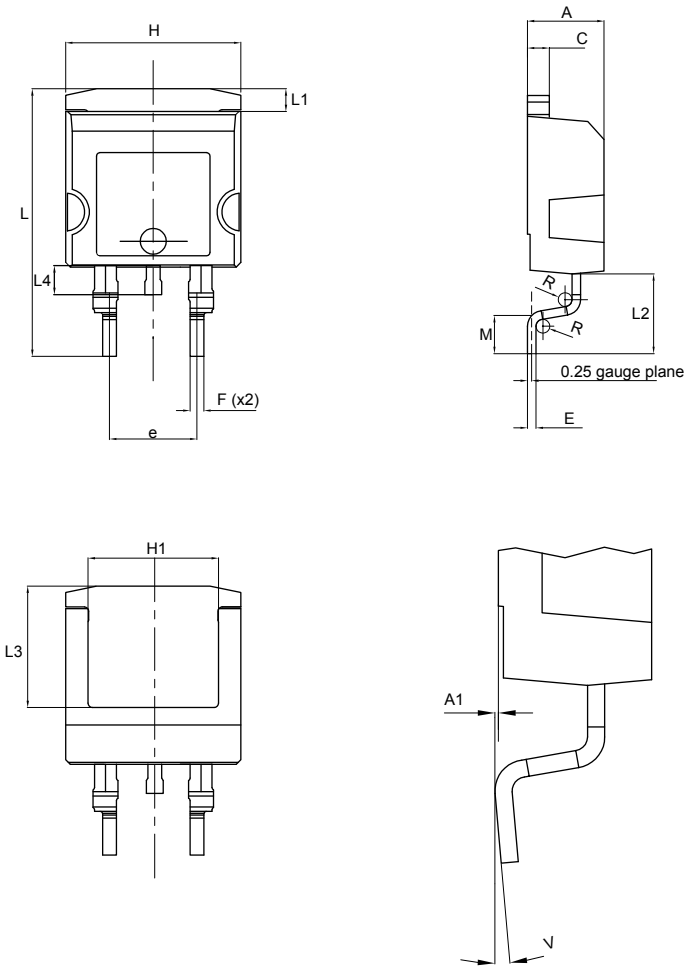
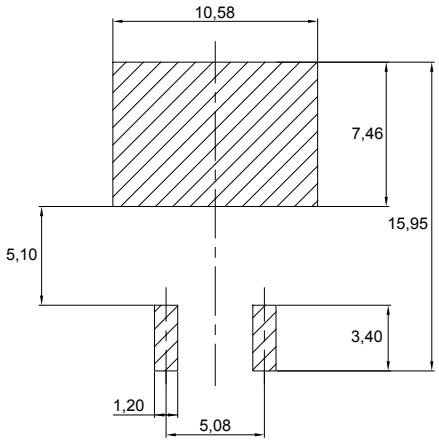


Table 6. D²PAK high voltage package mechanical data

Ref.	Dimensions		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0.03		0.20
C	1.17		1.37
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
H	10.00		10.40
H1	7.40		7.80
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	6.85		7.25
L4	1.5		1.7
M	2.6		2.9
R	0.20		0.60
V	0°		8°

Figure 13. D²PAK High Voltage footprint in mm



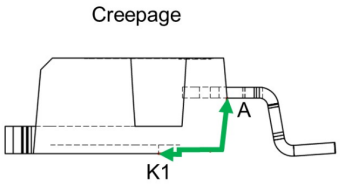
2.2.1 Creepage distance between anode and cathode

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)	D²PAK HV	5.38	mm
Cd_{A-K2}	Minimum creepage distance between A and K2 (without top coating)		3.48	

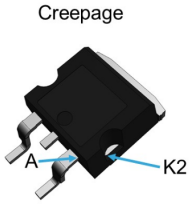
Note: D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

Figure 14. Creepage with top coating



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

Figure 15. 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
STPSC8H065BY-TR	PSC8H 065BY	DPAK	0.32 g	2500	Tape and reel
STPSC8H065G2Y-TR	PSC8H065G2Y	D²PAK HV	1.48 g	1000	Tape and reel

Revision history

Table 9. **Document revision history**

Date	Version	Changes
08-Mar-2018	1	Initial release.
11-Sep-2018	2	Added D²PAK HV package.
06-Dec-2018	3	Updated Section 2.2.1 Creepage distance between anode and cathode. Minor text changes to improve readability. Updated title of document.