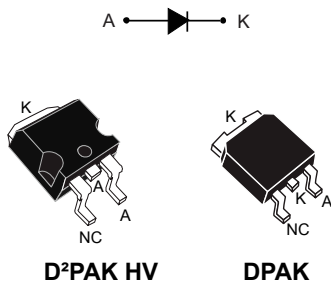



Automotive 650 V, 8 A high surge silicon carbide power Schottky diode



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

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.

Product label



Product status

STPSC8H065-Y

Product summary

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

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 | 75 | A |
| | | t _p = 10 ms sinusoidal, T _c = 125 °C | 69 | |
| | | t _p = 10 μs square, T _c = 25 °C | 420 | |
| 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 |
|-------------------------------|-------------------------|-------------------------|-----------------------------------|------|------|------|------|
| | | T _j | V _R | | | | |
| 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:

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

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)

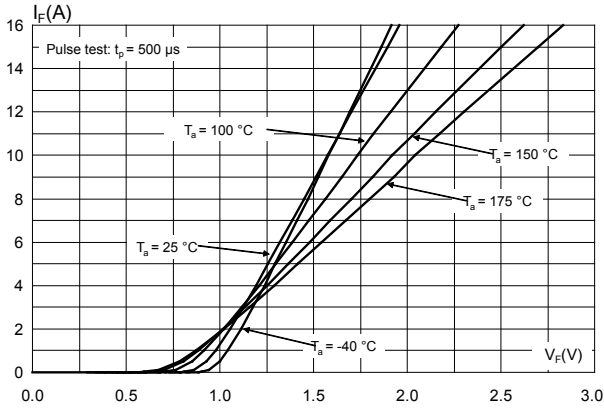


Figure 2. Forward voltage drop versus forward current (typical values, high level)

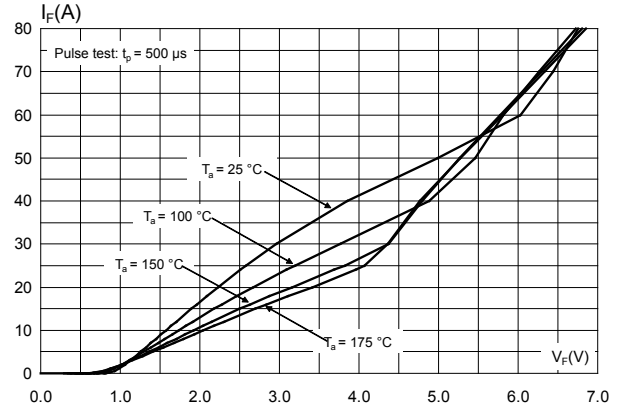


Figure 3. Reverse leakage current versus reverse voltage applied (typical values)

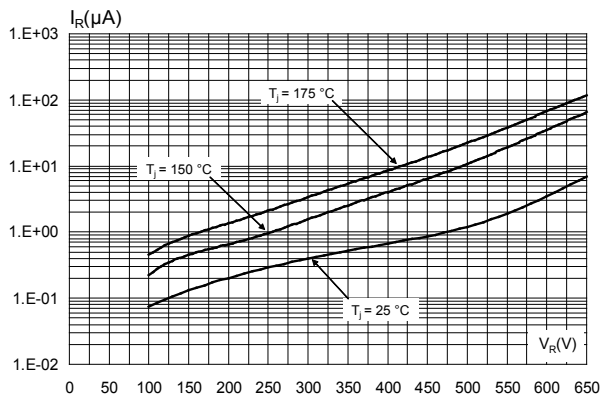


Figure 4. Peak forward current versus case temperature

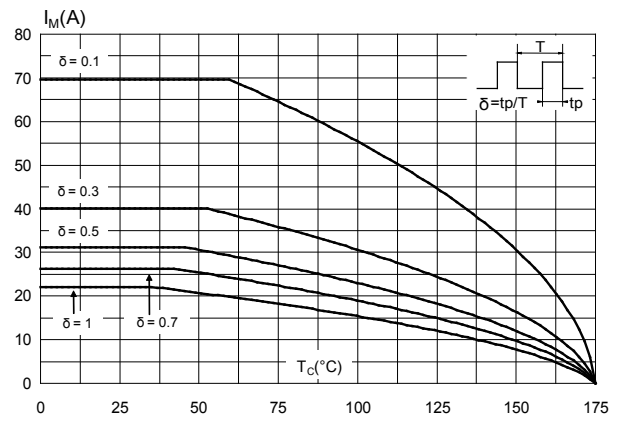


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

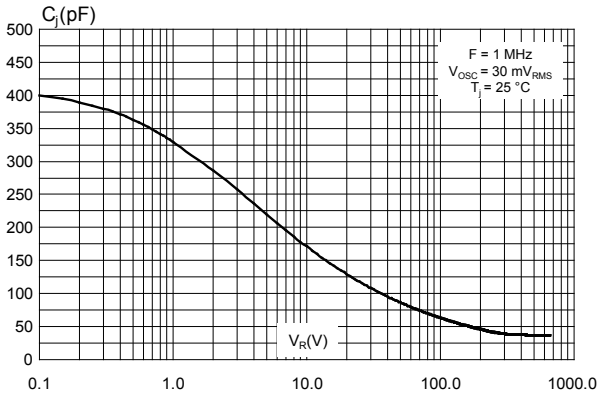


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

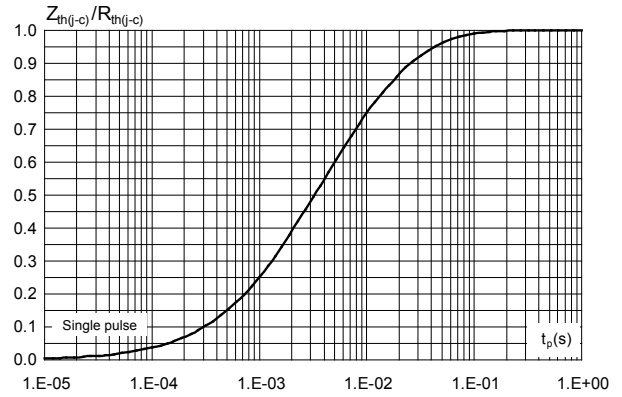


Figure 7. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

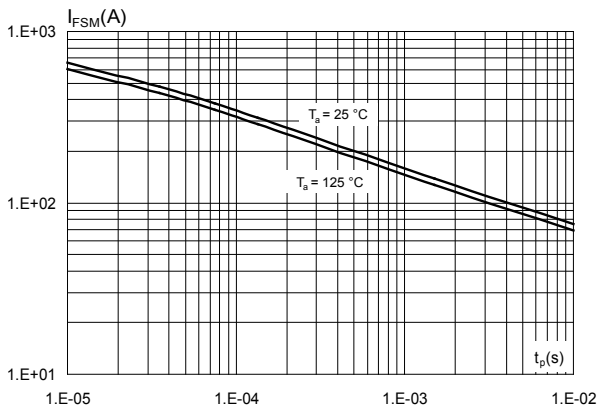


Figure 8. Total capacitive charges versus reverse voltage applied (typical values)

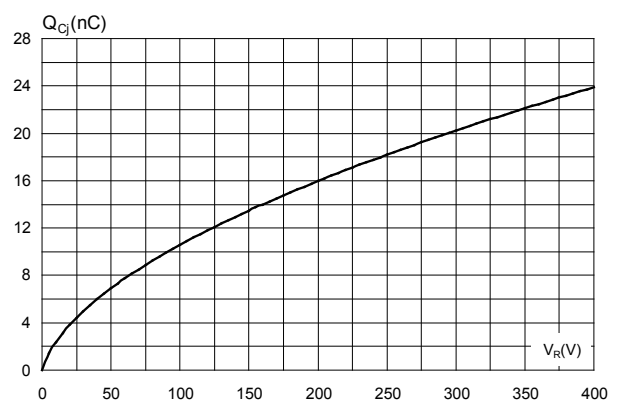
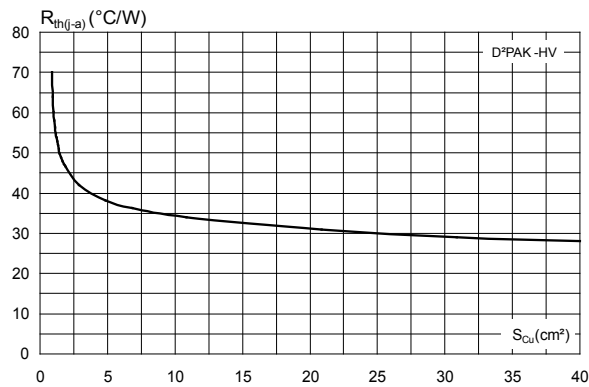


Figure 9. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4, eCu = 35 µm) (D²PAK-HV)



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

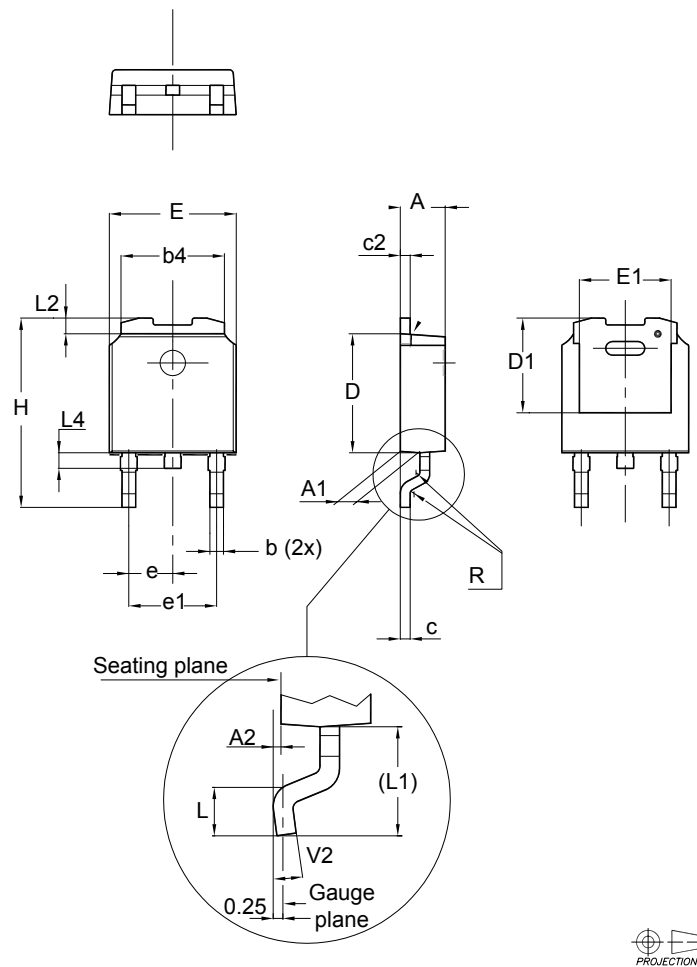
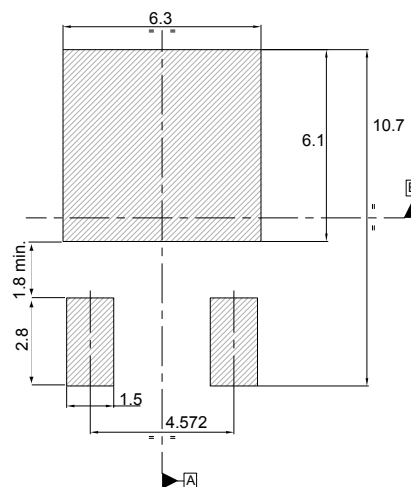


Table 5. DPAK mechanical data

| 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 $\Phi 0.05 \text{ A B}$

2.2 D²PAK HV package information

Figure 12. D²PAK high voltage package outline

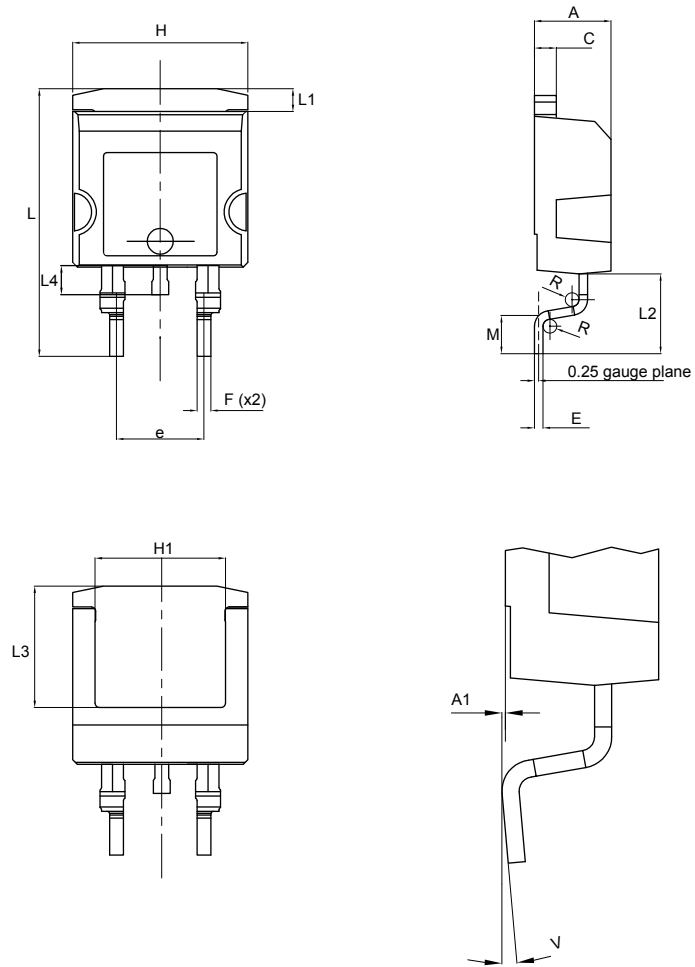
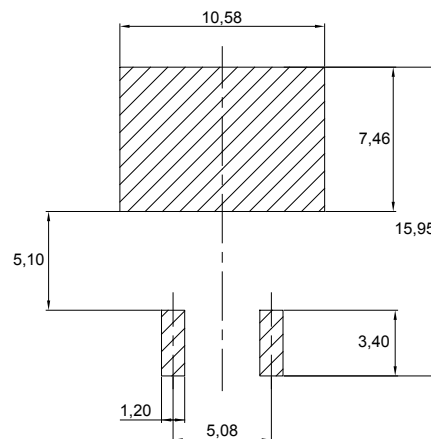


Table 6. D²PAK high voltage package mechanical data

| 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



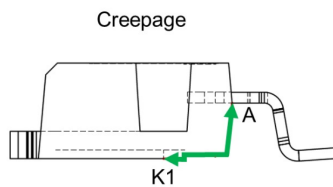
2.2.1 Creepage distance between anode and cathode

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) | D ² PAK HV | 5.38 | mm |
| Cd _{A-K2} | Minimum creepage distance between A and K2 (without top coating) | | 3.48 | |

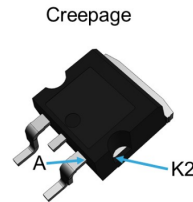
Note: D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

Figure 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 | D ² PAK 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 D ² PAK 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. |

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