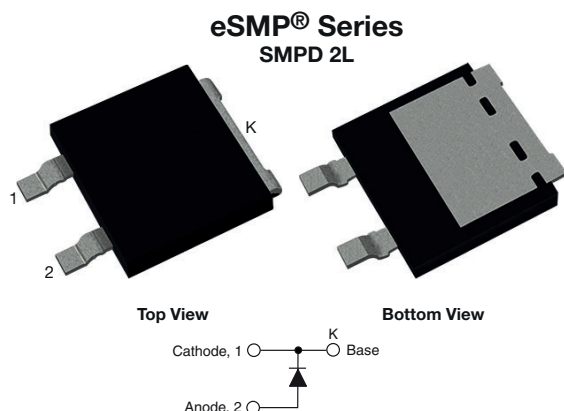


# 650 V Power SiC Gen 3 Merged PIN Schottky Diode, 6 A



## FEATURES

- Creepage and clearance distance 3.6 mm minimum
- Very low profile – typical height of 1.7mm
- Majority carrier diode using Schottky technology on SiC wide band gap material
- Improved  $V_F$  and efficiency by thin wafer technology
- Positive  $V_F$  temperature coefficient for easy paralleling
- Virtually no recovery tail and no switching losses
- Temperature invariant switching behavior
- 175 °C maximum operating junction temperature
- MPS structure for high ruggedness to forward current surge events
- Meets JESD 201 class 2 whisker test
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## LINKS TO ADDITIONAL RESOURCES



| PRIMARY CHARACTERISTICS  |            |
|--------------------------|------------|
| $I_F$                    | 6 A        |
| $V_R$                    | 650 V      |
| $V_F$ at $I_F$ at 25 °C  | 1.30 V     |
| $T_J$ max.               | 175 °C     |
| $I_R$ at $V_R$ at 175 °C | 16 $\mu$ A |
| $Q_C$ ( $V_R = 400$ V)   | 17 nC      |
| Package                  | SMPD 2L    |
| Circuit configuration    | Single     |

## DESCRIPTION / APPLICATIONS

Wide band gap SiC based 650 V Schottky diode, designed for high performance and ruggedness.

Optimum choice for high speed hard switching and efficient operation over a wide temperature range, it is also recommended for all applications suffering from Silicon ultrafast recovery behavior.

Typical applications include AC/DC PFC and DC/DC ultra high frequency output rectification in FBPS and LLC converters.

## MECHANICAL DATA

**Case:** SMPD 2L

Molding compound meets UL 94 V-0 flammability rating Base P/N-M3 - halogen-free, RoHS-compliant

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

| MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise specified) |                      |                                                    |             |                  |
|-------------------------------------------------------------|----------------------|----------------------------------------------------|-------------|------------------|
| PARAMETER                                                   | SYMBOL               | TEST CONDITIONS                                    | VALUES      | UNITS            |
| Peak repetitive reverse voltage                             | $V_{RRM}$            |                                                    | 650         | V                |
| Continuous forward current                                  | $I_F$                | $T_M = 154$ °C (DC)                                | 6           | A                |
| DC blocking voltage                                         | $V_{DC}$             |                                                    | 650         | V                |
| Repetitive peak surge current                               | $I_{FRM}$            | $T_M = 25$ °C, $f = 50$ Hz, square wave, DC = 25 % | 35          | A                |
| Non-repetitive peak forward surge current                   | $I_{FSM}$            | $T_M = 25$ °C, $t_p = 10$ ms, half sine wave       | 42          | A                |
|                                                             |                      | $T_M = 110$ °C, $t_p = 10$ ms, half sine wave      | 40          |                  |
| Power dissipation                                           | $P_{tot}^{(1)}$      | $T_M = 25$ °C                                      | 72          | W                |
|                                                             |                      | $T_M = 110$ °C                                     | 31          |                  |
|                                                             | $P_{tot}^{(2)}$      | $T_M = 25$ °C                                      | 87          | W                |
|                                                             |                      | $T_M = 110$ °C                                     | 38          |                  |
| $I^2t$ value                                                | $\int i^2 dt$        | $T_M = 25$ °C                                      | 9           | A <sup>2</sup> s |
|                                                             |                      | $T_M = 110$ °C                                     | 8           |                  |
| Operating junction and storage temperatures                 | $T_J^{(3)}, T_{Stg}$ |                                                    | -55 to +175 | °C               |

## Notes

(1) Based on maximum  $R_{th}$

(2) Based on typical  $R_{th}$

(3) The heat generated must be less than the thermal conductivity from junction-to-ambient:  $dP_D/dT_J < 1/R_{\theta JA}$

**ELECTRICAL SPECIFICATIONS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| PARAMETER               | SYMBOL | TEST CONDITIONS                                             | MIN. | TYP. | MAX. | UNITS         |
|-------------------------|--------|-------------------------------------------------------------|------|------|------|---------------|
| Forward voltage         | $V_F$  | $I_F = 6\text{ A}$                                          | -    | 1.3  | 1.5  | V             |
|                         |        | $I_F = 6\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$       | -    | 1.50 | 1.75 |               |
|                         |        | $I_F = 6\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$       | -    | 1.58 | -    |               |
| Reverse leakage current | $I_R$  | $V_R = V_R\text{ rated}$                                    | -    | 0.25 | 47   | $\mu\text{A}$ |
|                         |        | $V_R = V_R\text{ rated}, T_J = 150\text{ }^{\circ}\text{C}$ | -    | 5.5  | 100  |               |
|                         |        | $V_R = V_R\text{ rated}, T_J = 175\text{ }^{\circ}\text{C}$ | -    | 16   | -    |               |
| Total capacitance       | C      | $V_R = 1\text{ V}, f = 1\text{ MHz}$                        | -    | 255  | -    | pF            |
|                         |        | $V_R = 400\text{ V}, f = 1\text{ MHz}$                      | -    | 27   | -    |               |
| Total capacitive charge | $Q_C$  | $V_R = 400\text{ V}, f = 1\text{ MHz}$                      | -    | 17   | -    | nC            |

**THERMAL - MECHANICAL SPECIFICATIONS** ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| PARAMETER                             | SYMBOL     | TEST CONDITIONS | MIN. | TYP.      | MAX. | UNITS                |
|---------------------------------------|------------|-----------------|------|-----------|------|----------------------|
| Thermal resistance, junction-to-mount | $R_{thJM}$ |                 | -    | 1.72      | 2.1  | $^{\circ}\text{C/W}$ |
| Marking device                        |            |                 |      | 3C06ED07T |      |                      |

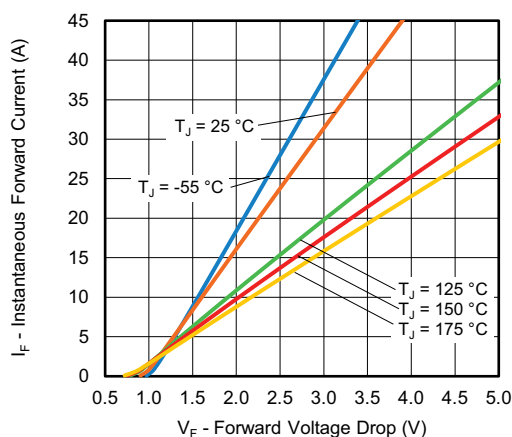


Fig. 1 - Typical Forward Voltage Drop Characteristics

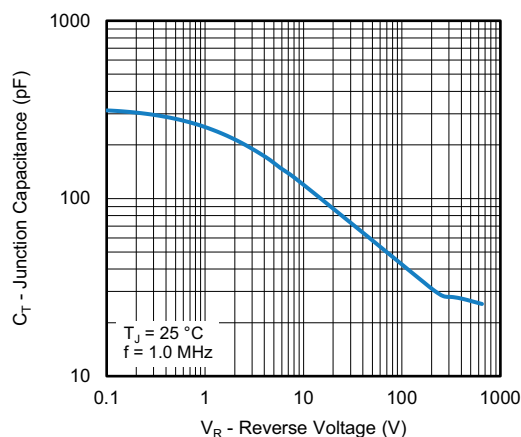


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

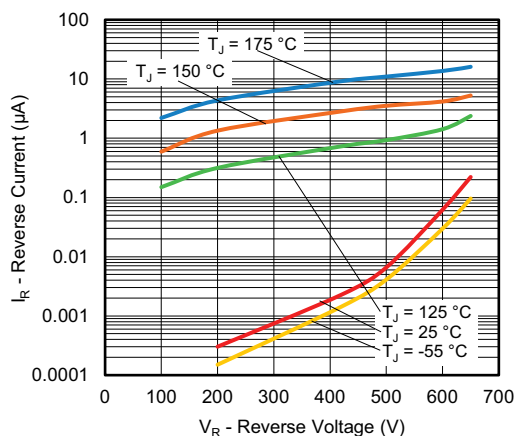


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

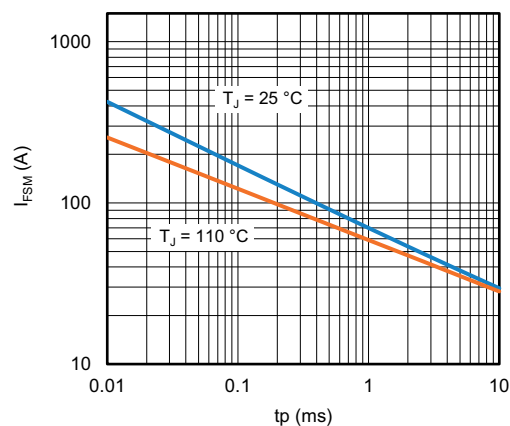


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

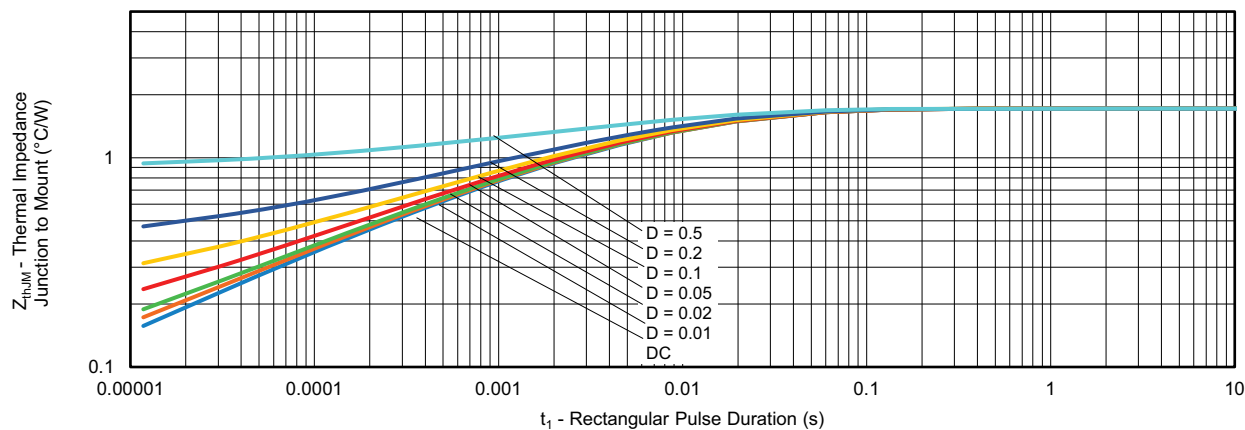
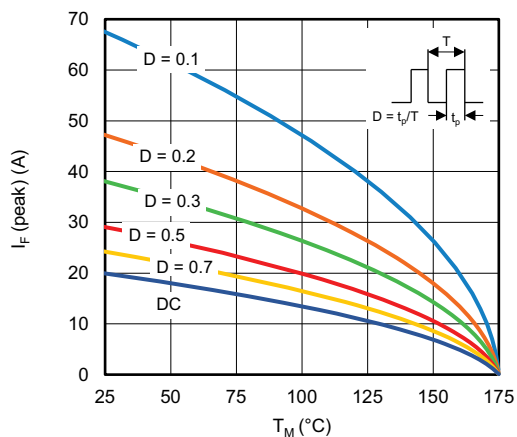

Fig. 5 - Typical Thermal Impedance  $Z_{thJM}$  Characteristics


Fig. 6 - Peak Forward Current vs. Maximum Allowable Mount Temperature

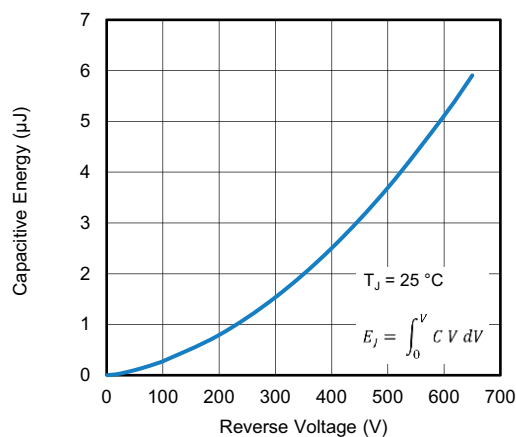


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

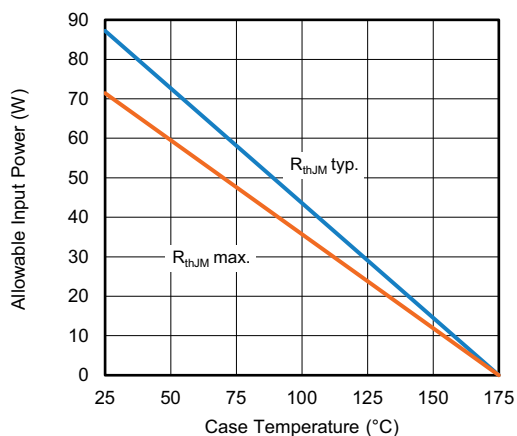


Fig. 7 - Forward Power Loss Characteristics

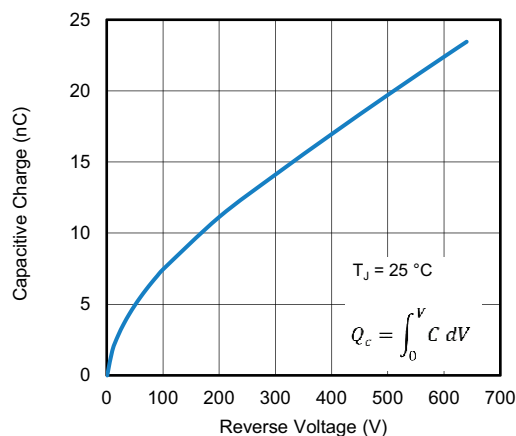


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage

**ORDERING INFORMATION TABLE**

|             |                                                                                              |           |           |          |          |           |          |            |
|-------------|----------------------------------------------------------------------------------------------|-----------|-----------|----------|----------|-----------|----------|------------|
| Device code | <b>VS-</b>                                                                                   | <b>3C</b> | <b>06</b> | <b>E</b> | <b>D</b> | <b>07</b> | <b>T</b> | <b>-M3</b> |
|             | ①                                                                                            | ②         | ③         | ④        | ⑤        | ⑥         | ⑦        | ⑧          |
| ①           | - Vishay Semiconductors product                                                              |           |           |          |          |           |          |            |
| ②           | - 3C = SiC diode, Generation 3                                                               |           |           |          |          |           |          |            |
| ③           | - Current rating (06 = 6 A)                                                                  |           |           |          |          |           |          |            |
| ④           | - E = single diode                                                                           |           |           |          |          |           |          |            |
| ⑤           | - D = Package SMPD 2L                                                                        |           |           |          |          |           |          |            |
| ⑥           | - Voltage rating: (07 = 650 V)                                                               |           |           |          |          |           |          |            |
| ⑦           | - T = true 2 pin                                                                             |           |           |          |          |           |          |            |
| ⑧           | - Environmental digit:<br>-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free |           |           |          |          |           |          |            |

**ORDERING INFORMATION** (Example)

| ORDERING P/N      | UNIT WEIGHT (g) | PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
|-------------------|-----------------|--------------|---------------|------------------------------------|
| VS-3C06ED07T-M3/I | 0.52            | I            | 2000 / reel   | 13" diameter plastic tape and reel |

**LINKS TO RELATED DOCUMENTS**

|                          |                                                                        |
|--------------------------|------------------------------------------------------------------------|
| Dimensions               | <a href="http://www.vishay.com/doc?97059">www.vishay.com/doc?97059</a> |
| Part marking information | <a href="http://www.vishay.com/doc?97105">www.vishay.com/doc?97105</a> |
| Packaging information    | <a href="http://www.vishay.com/doc?88869">www.vishay.com/doc?88869</a> |



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