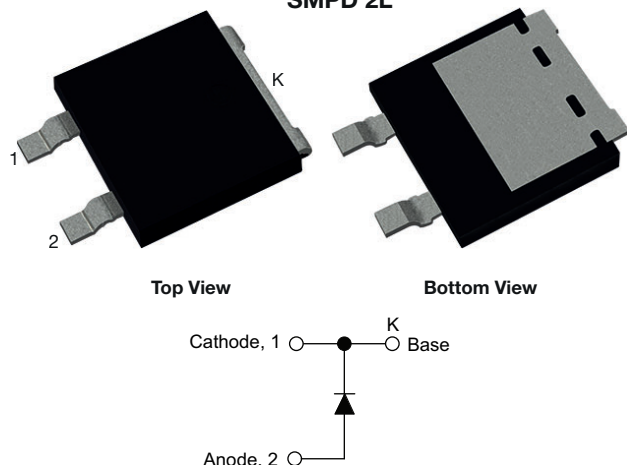


# 650 V Power SiC Gen 3 Merged PIN Schottky Diode, 16 A

## eSMP® Series SMPD 2L



## LINKS TO ADDITIONAL RESOURCES



### PRIMARY CHARACTERISTICS

|                               |            |
|-------------------------------|------------|
| $I_F$                         | 16 A       |
| $V_R$                         | 650 V      |
| $V_F$ at $I_F$ at 25 °C, typ. | 1.30 V     |
| $T_J$ max.                    | 175 °C     |
| $I_R$ at $V_R$ at 175 °C      | 25 $\mu$ A |
| $Q_C$ ( $V_R = 400$ V)        | 44 nC      |
| Package                       | SMPD 2L    |
| Circuit configuration         | Single     |

## 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**

## 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               | NOTES / TEST CONDITIONS                            | VALUES      | UNITS            |
|---------------------------------------------|----------------------|----------------------------------------------------|-------------|------------------|
| Peak repetitive reverse voltage             | $V_{RRM}$            |                                                    | 650         | V                |
| Continuous forward current                  | $I_F$                | $T_M = 141$ °C (DC)                                | 16          | 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 % | 71          | A                |
| Non-repetitive peak forward surge current   | $I_{FSM}$            | $T_M = 25$ °C, $t_p = 10$ ms, half sine wave       | 104         | A                |
|                                             |                      | $T_M = 110$ °C, $t_p = 10$ ms, half sine wave      | 95          |                  |
|                                             | $P_{tot}$ (1)        | $T_M = 25$ °C                                      | 111         | W                |
|                                             |                      | $T_M = 110$ °C                                     | 48          |                  |
|                                             | $P_{tot}$ (2)        | $T_M = 25$ °C                                      | 143         | W                |
|                                             |                      | $T_M = 110$ °C                                     | 62          |                  |
| $I^2t$ value                                | $\int i^2 dt$        | $T_M = 25$ °C                                      | 54          | A <sup>2</sup> s |
|                                             |                      | $T_M = 110$ °C                                     | 46          |                  |
| 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:  $dP_D/dT_J < 1/R_{thJA}$

| <b>ELECTRICAL SPECIFICATIONS</b> ( $T_J = 25^\circ\text{C}$ unless otherwise specified) |        |                                                   |      |      |      |               |
|-----------------------------------------------------------------------------------------|--------|---------------------------------------------------|------|------|------|---------------|
| PARAMETER                                                                               | SYMBOL | TEST CONDITIONS                                   | MIN. | TYP. | MAX. | UNITS         |
| Forward voltage                                                                         | $V_F$  | $I_F = 16\text{ A}$                               | -    | 1.3  | 1.5  | V             |
|                                                                                         |        | $I_F = 16\text{ A}, T_J = 150^\circ\text{C}$      | -    | 1.5  | 1.80 |               |
|                                                                                         |        | $I_F = 16\text{ A}, T_J = 175^\circ\text{C}$      | -    | 1.58 | -    |               |
| Reverse leakage current                                                                 | $I_R$  | $V_R = V_R\text{ rated}$                          | -    | 1.0  | 85   | $\mu\text{A}$ |
|                                                                                         |        | $V_R = V_R\text{ rated}, T_J = 150^\circ\text{C}$ | -    | 14   | 200  |               |
|                                                                                         |        | $V_R = V_R\text{ rated}, T_J = 175^\circ\text{C}$ | -    | 25   | -    |               |
| Total capacitance                                                                       | C      | $V_R = 1\text{ V}, f = 1\text{ MHz}$              | -    | 700  | -    | pF            |
|                                                                                         |        | $V_R = 400\text{ V}, f = 1\text{ MHz}$            | -    | 70   | -    |               |
| Total capacitive charge                                                                 | $Q_C$  | $V_R = 400\text{ V}, f = 1\text{ MHz}$            | -    | 44   | -    | nC            |

| <b>THERMAL - MECHANICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise specified) |            |                 |      |           |      |                    |
|---------------------------------------------------------------------------------------------------|------------|-----------------|------|-----------|------|--------------------|
| PARAMETER                                                                                         | SYMBOL     | TEST CONDITIONS | MIN. | TYP.      | MAX. | UNITS              |
| Thermal resistance, junction-to-mount                                                             | $R_{thJM}$ |                 | -    | 1.05      | 1.35 | $^\circ\text{C/W}$ |
| Marking device                                                                                    |            |                 |      | 3C16ED07T |      |                    |

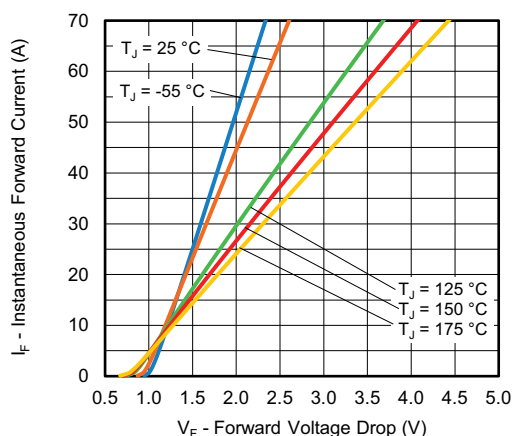


Fig. 1 - Typical Forward Voltage Drop Characteristics

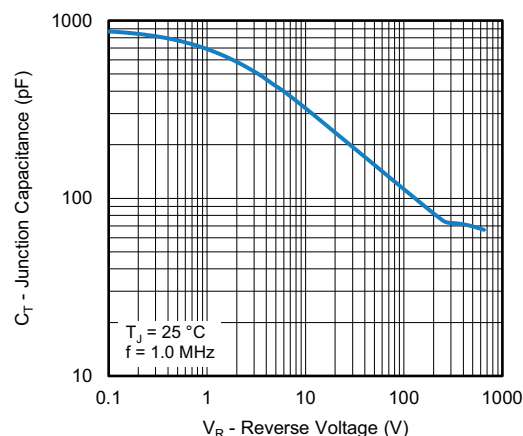


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

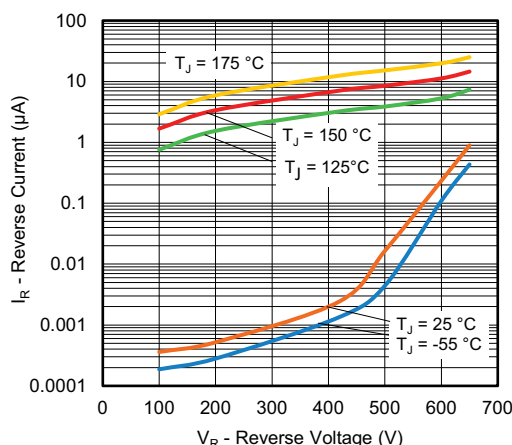


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

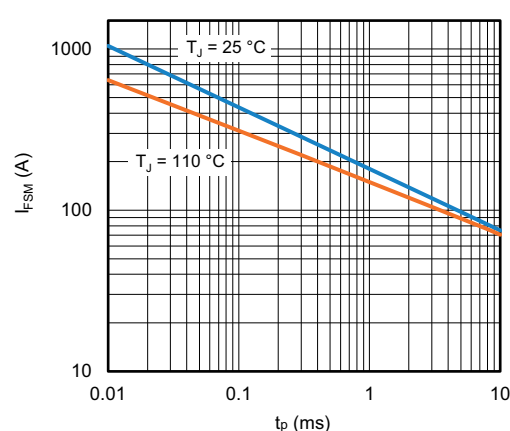


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

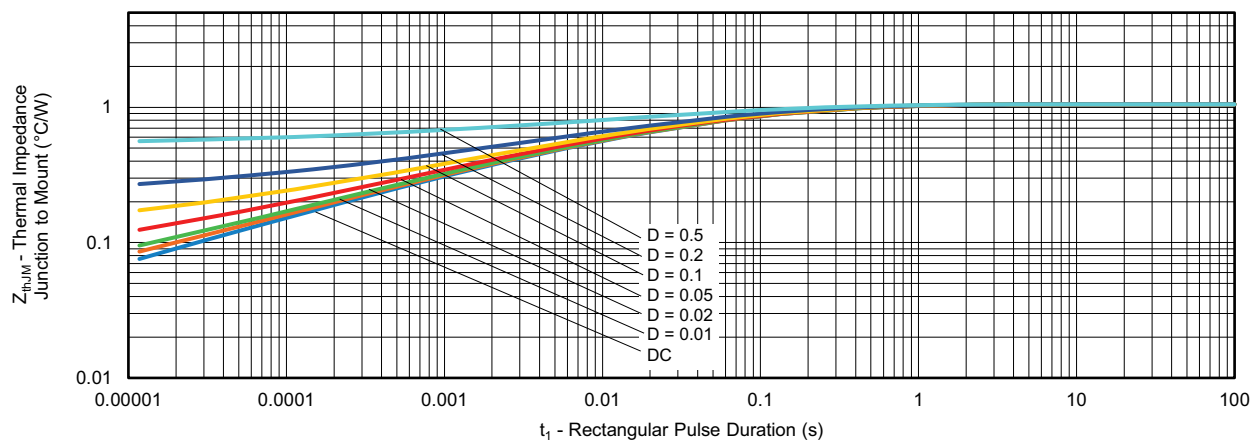
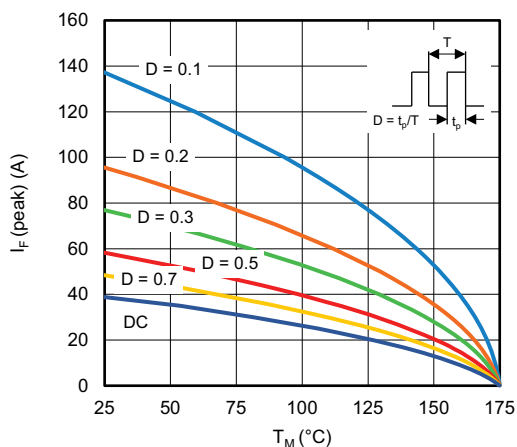

Fig. 5 - Typical Thermal Impedance  $Z_{thJM}$  Characteristics


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

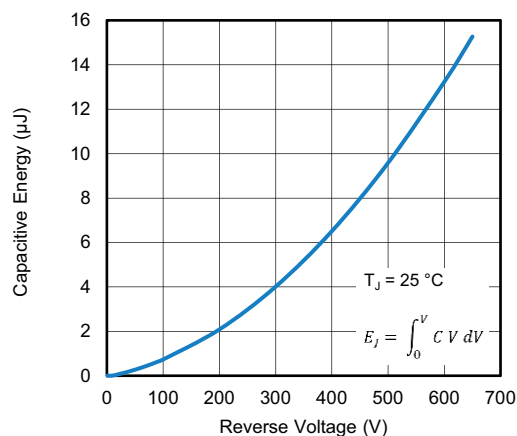


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

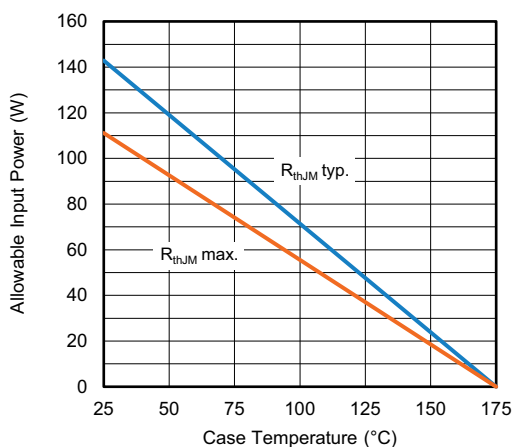


Fig. 7 - Forward Power Loss Characteristics

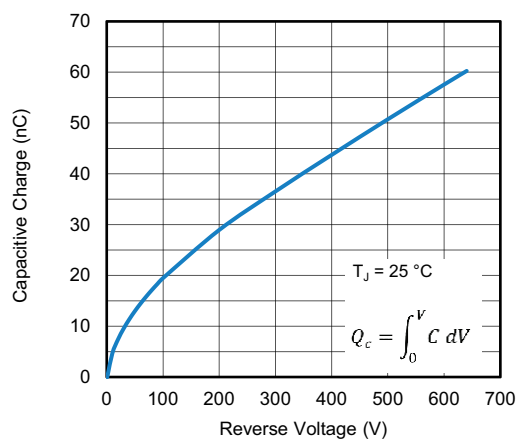


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage



## ORDERING INFORMATION TABLE

|             |     |    |    |   |   |    |   |     |
|-------------|-----|----|----|---|---|----|---|-----|
| Device code | VS- | 3C | 16 | E | D | 07 | T | -M3 |
|             | 1   | 2  | 3  | 4 | 5 | 6  | 7 | 8   |

|   |   |                                                                                            |
|---|---|--------------------------------------------------------------------------------------------|
| 1 | - | Vishay Semiconductors product                                                              |
| 2 | - | 3C = SiC diode, Generation 3                                                               |
| 3 | - | Current rating (16 = 16 A)                                                                 |
| 4 | - | E = single diode                                                                           |
| 5 | - | 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 |             |              |               |                                    |
|----------------------|-------------|--------------|---------------|------------------------------------|
| ORDERING P/N         | UNIT WEIGHT | PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
| VS-3C16ED07T-M3/I    | 0.52 g      | 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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