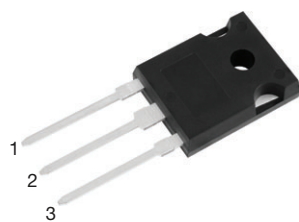
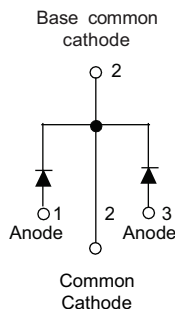


# 650 V Power SiC Merged PIN Schottky Diode, 2 x 10 A


**TO-247AD 3L**


## FEATURES

- Majority carrier diode using Schottky technology on SiC wide band gap material
- 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 1A whisker test
- Solder Bath temperature 275 °C maximum, 10 s per JESD 22-B106
- 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:** TO-247AD 3L

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

**Mounting torque:** 10 in-lbs maximum

| PRIMARY CHARACTERISTICS  |                |
|--------------------------|----------------|
| $I_{F(AV)}$              | 2 x 10 A       |
| $V_R$                    | 650 V          |
| $V_F$ at $I_F$ at 150 °C | 1.75 V         |
| $T_J$ max.               | 175 °C         |
| $I_R$ at $V_R$ at 175 °C | 10 $\mu$ A     |
| $Q_C$ ( $V_R = 400$ V)   | 29 nC          |
| Package                  | TO-247AD 3L    |
| Circuit configuration    | Common cathode |

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise specified) |                      |                                                    |             |                  |
|----------------------------------------------------------------------|----------------------|----------------------------------------------------|-------------|------------------|
| PARAMETER                                                            | SYMBOL               | TEST CONDITIONS                                    | VALUES      | UNITS            |
| Peak repetitive reverse voltage                                      | $V_{RRM}$            |                                                    | 650         | V                |
| Average rectified forward current, per leg                           | $I_{F(AV)}$          | $T_C = 133$ °C (DC)                                | 10          | A                |
| DC blocking voltage                                                  | $V_{DC}$             |                                                    | 650         | V                |
| Repetitive peak surge current, per leg                               | $I_{FRM}$            | $T_C = 25$ °C, $f = 50$ Hz, square wave, DC = 25 % | 39          | A                |
| Non-repetitive peak forward surge current, per leg                   | $I_{FSM}$            | $T_C = 25$ °C, $t_p = 10$ ms, half sine wave       | 64          |                  |
|                                                                      |                      | $T_C = 110$ °C, $t_p = 10$ ms, half sine wave      | 50          |                  |
| Power dissipation, per leg                                           | $P_{tot}^{(1)}$      | $T_C = 25$ °C                                      | 71          | W                |
|                                                                      |                      | $T_C = 110$ °C                                     | 31          |                  |
| $I^2t$ value, per leg                                                | $\int i^2 dt$        | $T_C = 25$ °C                                      | 20          | A <sup>2</sup> s |
|                                                                      |                      | $T_C = 110$ °C                                     | 13          |                  |
| Operating junction and storage temperatures                          | $T_J^{(2)}, T_{Stg}$ |                                                    | -55 to +175 | °C               |

### Notes

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

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

| ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified) |        |                                                             |      |      |      |               |
|--------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------|------|------|------|---------------|
| PARAMETER                                                                                  | SYMBOL | TEST CONDITIONS                                             | MIN. | TYP. | MAX. | UNITS         |
| Forward voltage, per leg                                                                   | $V_F$  | $I_F = 10\text{ A}$                                         | -    | 1.50 | 1.80 | V             |
|                                                                                            |        | $I_F = 10\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$      | -    | 1.75 | 1.95 |               |
|                                                                                            |        | $I_F = 10\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$      | -    | 1.85 | -    |               |
| Reverse leakage current, per leg                                                           | $I_R$  | $V_R = V_R\text{ rated}$                                    | -    | -    | 55   | $\mu\text{A}$ |
|                                                                                            |        | $V_R = V_R\text{ rated}, T_J = 150\text{ }^{\circ}\text{C}$ | -    | -    | 125  |               |
|                                                                                            |        | $V_R = V_R\text{ rated}, T_J = 175\text{ }^{\circ}\text{C}$ | -    | 10   | -    |               |
| Total capacitance, per leg                                                                 | C      | $V_R = 1\text{ V}, f = 1\text{ MHz}$                        | -    | 430  | -    | pF            |
|                                                                                            |        | $V_R = 400\text{ V}, f = 1\text{ MHz}$                      | -    | 45   | -    |               |
| Total capacitive charge, per leg                                                           | $Q_C$  | $V_R = 400\text{ V}, f = 1\text{ MHz}$                      | -    | 29   | -    | 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-case                                                                 | per leg    | $R_{thJC}$ |                 | -        | 1.5  | 2.1  | $^{\circ}\text{C/W}$ |
|                                                                                                      | per device |            |                 | -        | 0.9  | 1.3  | $^{\circ}\text{C/W}$ |
| Marking device                                                                                       |            |            |                 | C20CP07L |      |      |                      |

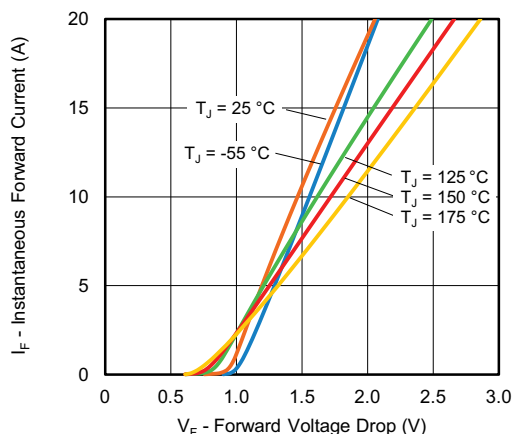


Fig. 1 - Typical Forward Voltage Drop Characteristics, Per leg

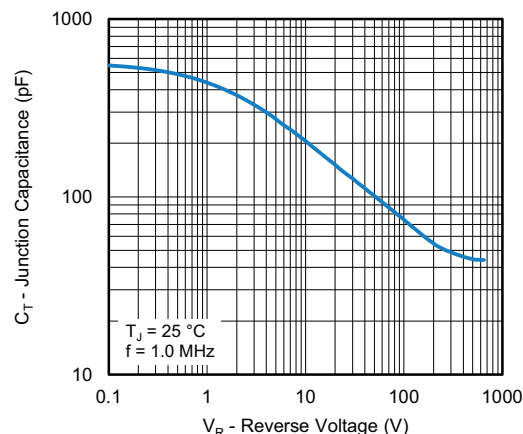


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, Per leg

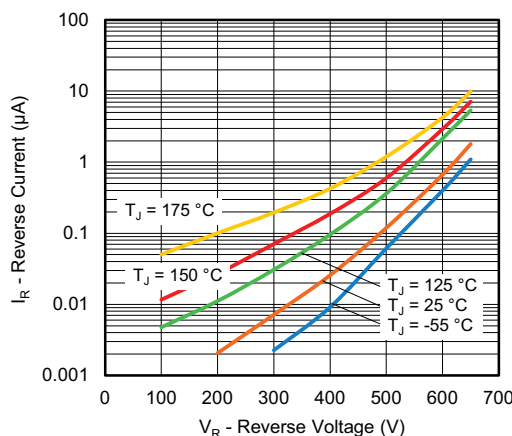


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage, Per leg

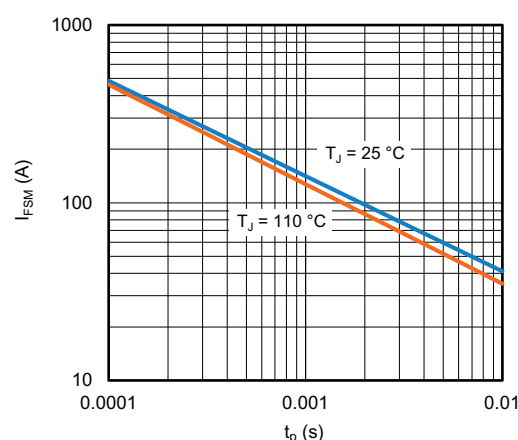


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration, Per Leg (Square Wave)

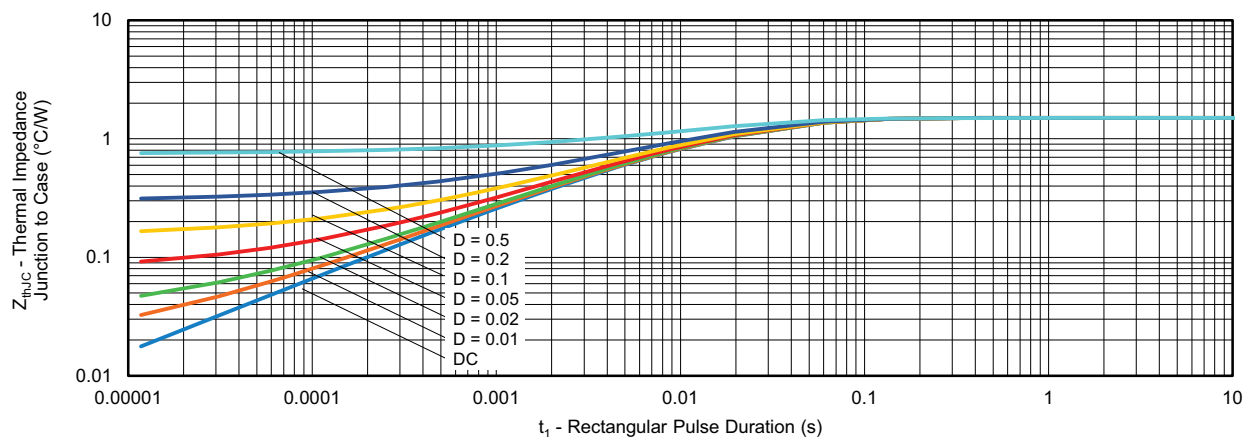


Fig. 5 - Typical Thermal Impedance  $Z_{thJC}$  Characteristics, per leg

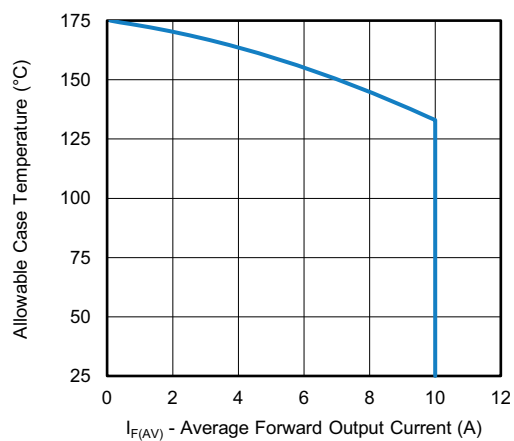


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current, per leg

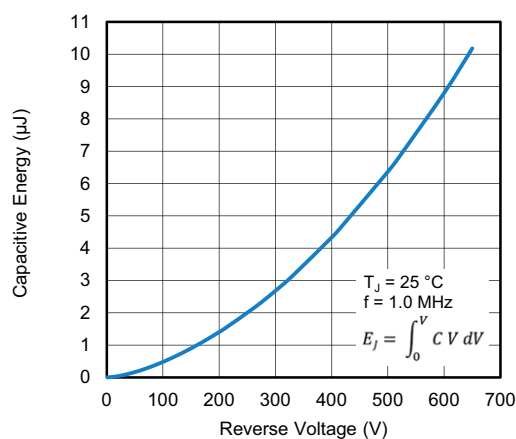


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage, per leg

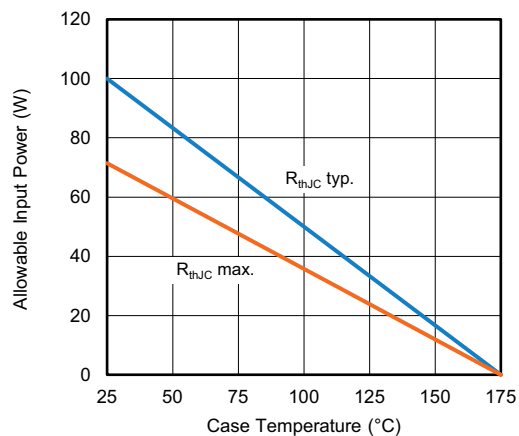


Fig. 7 - Forward Power Loss Characteristics, per leg

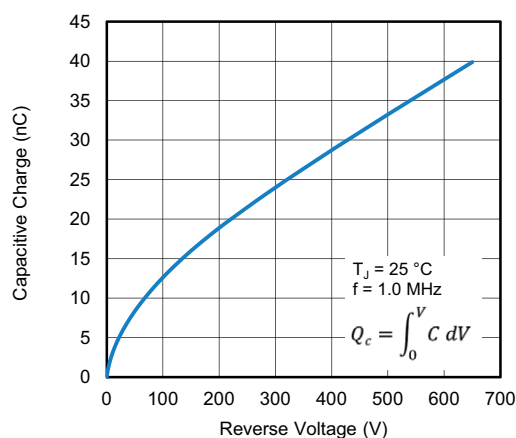


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage, per leg



## ORDERING INFORMATION TABLE

| Device code | VS- | C | 20                                                                 | C | P | 07 | L | -M3 |
|-------------|-----|---|--------------------------------------------------------------------|---|---|----|---|-----|
|             | 1   | 2 | 3                                                                  | 4 | 5 | 6  | 7 | 8   |
|             | 1   | - | Vishay Semiconductors product                                      |   |   |    |   |     |
|             | 2   | - | C = SiC diode                                                      |   |   |    |   |     |
|             | 3   | - | Current rating (20 = 20 A)                                         |   |   |    |   |     |
|             | 4   | - | C = common cathode                                                 |   |   |    |   |     |
|             | 5   | - | P = package TO-247                                                 |   |   |    |   |     |
|             | 6   | - | Voltage rating: (07 = 650 V)                                       |   |   |    |   |     |
|             | 7   | - | L = long lead                                                      |   |   |    |   |     |
|             | 8   | - | Environmental digit:                                               |   |   |    |   |     |
|             |     |   | -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free |   |   |    |   |     |

| ORDERING INFORMATION |               |                        |                          |
|----------------------|---------------|------------------------|--------------------------|
| PREFERRED P/N        | BASE QUANTITY | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION    |
| VS-C20CP07L-M3       | 25/tube       | 500                    | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95626">www.vishay.com/doc?95626</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a> |



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