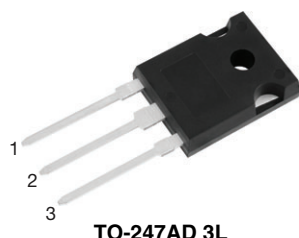
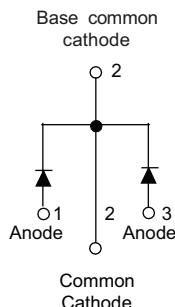


# 650 V Power SiC Gen 3 Merged PIN Schottky Diode, 2 x 20 A


**TO-247AD 3L**


## FEATURES

- 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 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**

## LINKS TO ADDITIONAL RESOURCES


[3D Models](#)

[Application Notes](#)

## PRIMARY CHARACTERISTICS

|                          |                |
|--------------------------|----------------|
| $I_{F(AV)}$              | 2 x 20 A       |
| $V_R$                    | 650 V          |
| $V_F$ at $I_F$ at 150 °C | 1.5 V          |
| $T_J$ max.               | 175 °C         |
| $I_R$ at $V_R$ at 175 °C | 9 $\mu$ A      |
| $Q_C$ ( $V_R = 400$ V)   | 53 nC          |
| Package                  | TO-247AD 3L    |
| Circuit configuration    | Common cathode |

## 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

## 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         | $I_{F(AV)}$          | $T_C = 127$ °C (DC)                                | 20          | A                |
| DC blocking voltage                                | $V_{DC}$             |                                                    | 650         | V                |
| Repetitive peak forward current                    | $I_{FRM}$            | $T_C = 25$ °C, $f = 50$ Hz, square wave, DC = 25 % | 65          | A                |
| Non-repetitive peak forward surge current, per leg | $I_{FSM}$            | $T_C = 25$ °C, $t_p = 10$ ms, half sine wave       | 110         |                  |
|                                                    |                      | $T_C = 110$ °C, $t_p = 10$ ms, half sine wave      | 104         |                  |
| Power dissipation, per leg                         | $P_{tot}^{(1)}$      | $T_C = 25$ °C                                      | 125         | W                |
|                                                    |                      | $T_C = 110$ °C                                     | 54          |                  |
| $I^2t$ value, per leg                              | $\int i^2 dt$        | $T_C = 25$ °C                                      | 60.5        | A <sup>2</sup> s |
|                                                    |                      | $T_C = 110$ °C                                     | 54          |                  |
| 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:  $dP_D/dT_J < 1/R_{thJA}$

| <b>ELECTRICAL SPECIFICATIONS</b> ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified) |        |                                                             |      |      |      |               |
|---------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------|------|------|------|---------------|
| PARAMETER                                                                                         | SYMBOL | TEST CONDITIONS                                             | MIN. | TYP. | MAX. | UNITS         |
| Forward voltage, per leg                                                                          | $V_F$  | $I_F = 20\text{ A}$                                         | -    | 1.3  | 1.5  | V             |
|                                                                                                   |        | $I_F = 20\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$      | -    | 1.5  | 1.85 |               |
|                                                                                                   |        | $I_F = 20\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$      | -    | 1.6  | -    |               |
| Reverse leakage current, per leg                                                                  | $I_R$  | $V_R = V_R\text{ rated}$                                    | -    | 1.3  | 100  | $\mu\text{A}$ |
|                                                                                                   |        | $V_R = V_R\text{ rated}, T_J = 150\text{ }^{\circ}\text{C}$ | -    | 5.5  | 250  |               |
|                                                                                                   |        | $V_R = V_R\text{ rated}, T_J = 175\text{ }^{\circ}\text{C}$ | -    | 9    | -    |               |
| Total capacitance, per leg                                                                        | C      | $V_R = 1\text{ V}, f = 1\text{ MHz}$                        | -    | 845  | -    | pF            |
|                                                                                                   |        | $V_R = 400\text{ V}, f = 1\text{ MHz}$                      | -    | 82   | -    |               |
| Total capacitive charge, per leg                                                                  | $Q_C$  | $V_R = 400\text{ V}, f = 1\text{ MHz}$                      | -    | 53   | -    | nC            |

| <b>THERMAL - MECHANICAL SPECIFICATIONS</b> ( $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise specified) |            |            |                 |           |      |      |                      |
|-------------------------------------------------------------------------------------------------------------|------------|------------|-----------------|-----------|------|------|----------------------|
| PARAMETER                                                                                                   |            | SYMBOL     | TEST CONDITIONS | MIN.      | TYP. | MAX. | UNITS                |
| Thermal resistance, junction-to-case                                                                        | per leg    | $R_{thJC}$ |                 | -         | 0.9  | 1.2  | $^{\circ}\text{C/W}$ |
|                                                                                                             | per device |            |                 | -         | 0.45 | 0.6  | $^{\circ}\text{C/W}$ |
| Marking device                                                                                              |            |            |                 | 3C40CP07L |      |      |                      |

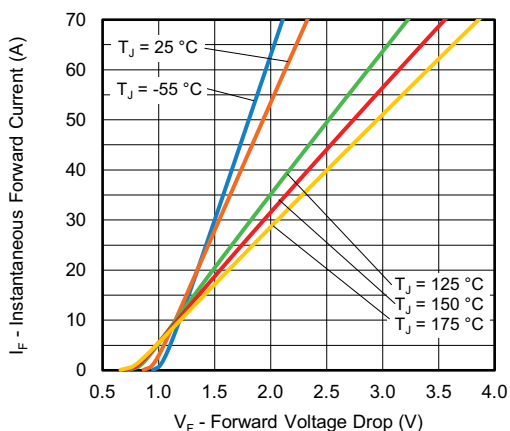


Fig. 1 - Typical Forward Voltage Drop Characteristics, Per Leg

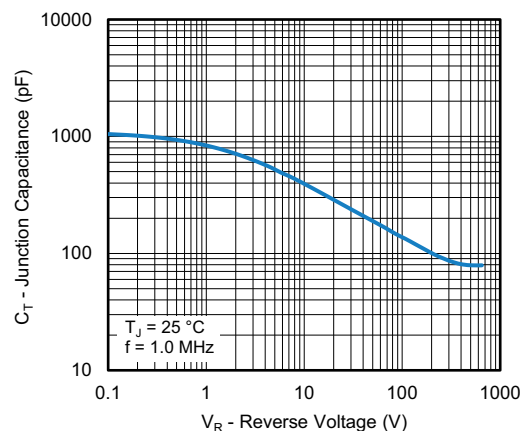


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, Per Leg

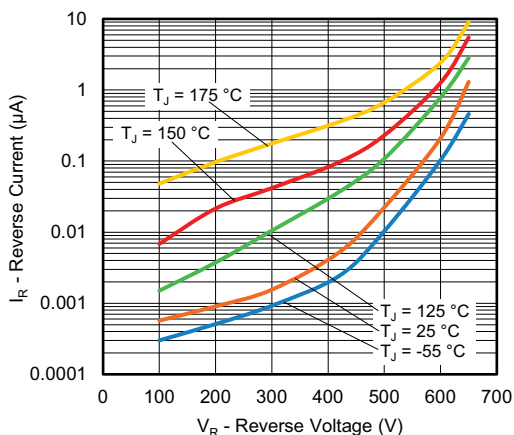


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage, Per Leg

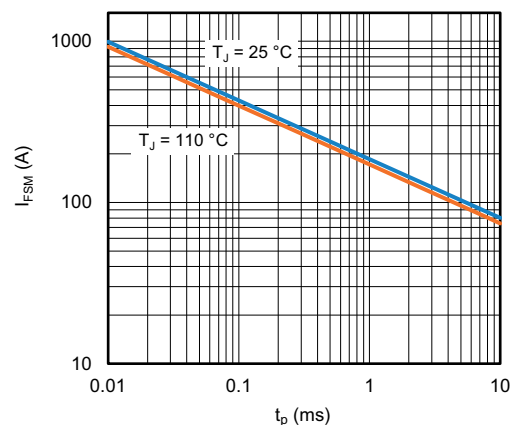


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration, Per Leg (Square Wave)

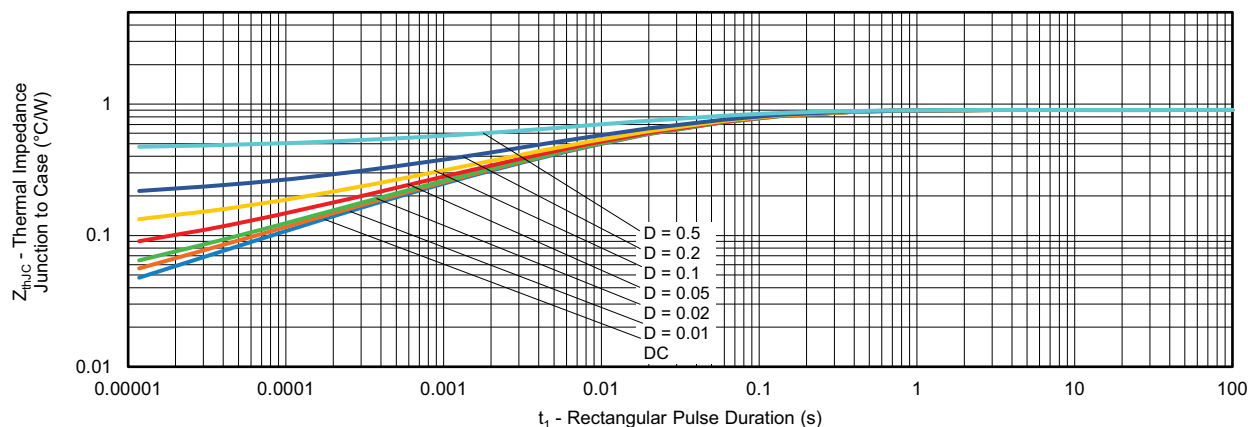


Fig. 5 - Typical Thermal Impedance  $Z_{thJC}$  Characteristics, Per Leg

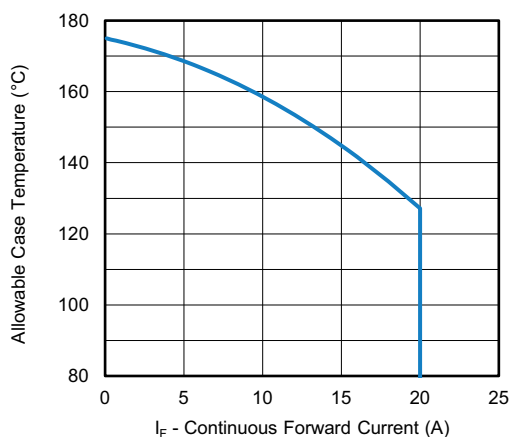


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current, Per Leg

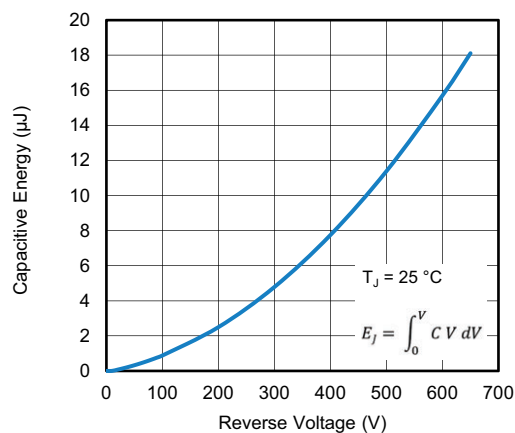


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage, Per Leg

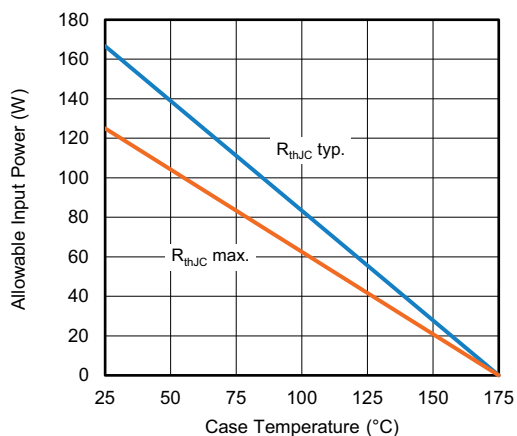


Fig. 7 - Forward Power Loss Characteristics, Per Leg

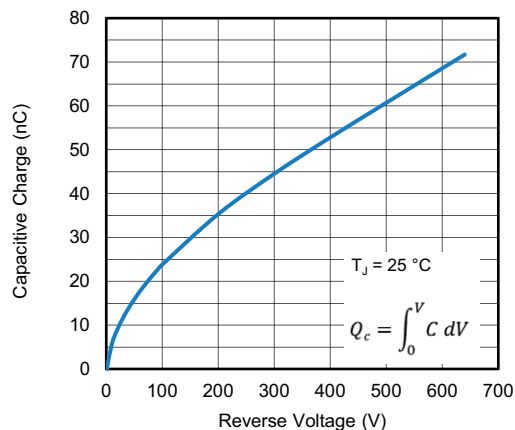


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage, Per Leg

**ORDERING INFORMATION TABLE**

|             |            |           |           |          |          |           |          |            |
|-------------|------------|-----------|-----------|----------|----------|-----------|----------|------------|
| Device code | <b>VS-</b> | <b>3C</b> | <b>40</b> | <b>C</b> | <b>P</b> | <b>07</b> | <b>L</b> | <b>-M3</b> |
|             | 1          | 2         | 3         | 4        | 5        | 6         | 7        | 8          |

- |          |   |                                                                    |
|----------|---|--------------------------------------------------------------------|
| <b>1</b> | - | Vishay Semiconductors product                                      |
| <b>2</b> | - | 3C = SiC diode, Generation 3                                       |
| <b>3</b> | - | Current rating (40 = 40 A)                                         |
| <b>4</b> | - | C = common cathode                                                 |
| <b>5</b> | - | P = package TO-247                                                 |
| <b>6</b> | - | Voltage rating: (07 = 650 V)                                       |
| <b>7</b> | - | L = long lead                                                      |
| <b>8</b> | - | Environmental digit:                                               |
|          |   | -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free |

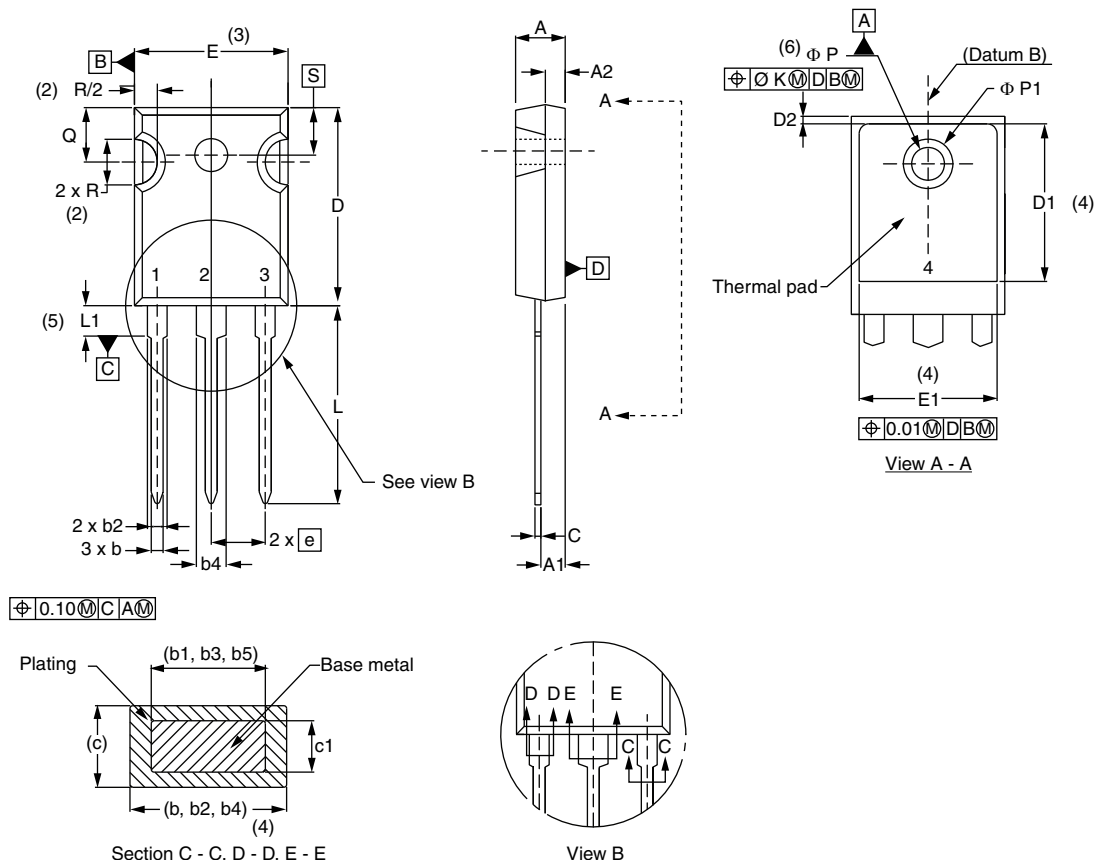
| <b>ORDERING INFORMATION</b> |               |                          |
|-----------------------------|---------------|--------------------------|
| PREFERRED P/N               | BASE QUANTITY | PACKAGING DESCRIPTION    |
| VS-3C40CP07L-M3             | 25/tube       | Antistatic plastic tubes |

| <b>LINKS TO RELATED DOCUMENTS</b> |                                                                        |
|-----------------------------------|------------------------------------------------------------------------|
| 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> |



### TO-247AD 3L

**DIMENSIONS** in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.65        | 5.31  | 0.183  | 0.209 |       |
| A1     | 2.21        | 2.59  | 0.087  | 0.102 |       |
| A2     | 1.50        | 2.49  | 0.059  | 0.098 |       |
| b      | 0.99        | 1.40  | 0.039  | 0.055 |       |
| b1     | 0.99        | 1.35  | 0.039  | 0.053 |       |
| b2     | 1.65        | 2.39  | 0.065  | 0.094 |       |
| b3     | 1.65        | 2.34  | 0.065  | 0.092 |       |
| b4     | 2.59        | 3.43  | 0.102  | 0.135 |       |
| b5     | 2.59        | 3.38  | 0.102  | 0.133 |       |
| c      | 0.38        | 0.89  | 0.015  | 0.035 |       |
| c1     | 0.38        | 0.84  | 0.015  | 0.033 |       |
| D      | 19.71       | 20.70 | 0.776  | 0.815 | 3     |
| D1     | 13.08       | -     | 0.515  | -     | 4     |

| SYMBOL    | MILLIMETERS |       | INCHES    |       | NOTES |
|-----------|-------------|-------|-----------|-------|-------|
|           | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D2        | 0.51        | 1.30  | 0.020     | 0.051 |       |
| E         | 15.29       | 15.87 | 0.602     | 0.625 | 3     |
| E1        | 13.46       | -     | 0.53      | -     |       |
| e         | 5.46 BSC    |       | 0.215 BSC |       |       |
| $\Phi K$  | 0.254       |       | 0.010     |       |       |
| L         | 19.81       | 20.32 | 0.780     | 0.800 |       |
| L1        | 3.71        | 4.29  | 0.146     | 0.169 |       |
| $\Phi P$  | 3.56        | 3.66  | 0.14      | 0.144 |       |
| $\Phi P1$ | -           | 6.98  | -         | 0.275 |       |
| Q         | 5.31        | 5.69  | 0.209     | 0.224 |       |
| R         | 4.52        | 5.49  | 0.178     | 0.216 |       |
| S         | 5.51 BSC    |       | 0.217 BSC |       |       |

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6)  $\Phi P$  to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4



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