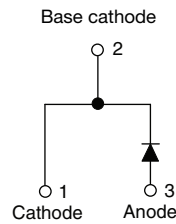


# 1200 V Power SiC Gen 3 Merged PIN Schottky Diode, 5 A


**TO-220AC 2L**


## 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

| PRIMARY CHARACTERISTICS       |             |
|-------------------------------|-------------|
| $I_F$                         | 5 A         |
| $V_R$                         | 1200 V      |
| $V_F$ at $I_F$ at 25 °C, typ. | 1.35 V      |
| $T_J$ max.                    | 175 °C      |
| $I_R$ at $V_R$ at 175 °C      | 3 $\mu$ A   |
| $Q_C$ ( $V_R = 800$ V)        | 28 nC       |
| Package                       | TO-220AC 2L |
| Circuit configuration         | Single      |

## DESCRIPTION / APPLICATIONS

Wide band gap SiC based 1200 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-220AC 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

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

| MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise specified) |                      |  |             |                  |
|---|----------------------|--|-------------|------------------|
| PARAMETER   | SYMBOL               | TEST CONDITIONS                                    | VALUES      | UNITS            |
| Peak repetitive reverse voltage                             | $V_{RRM}$            |  | 1200        | V                |
| Continuous forward current                                  | $I_F^{(1)}$          | $T_C = 152$ °C (DC)                                | 5           | A                |
|   | $I_F^{(2)}$          | $T_C = 157$ °C (DC)                                |             |                  |
| DC blocking voltage   | $V_{DC}$             |  | 1200        | V                |
| Repetitive peak forward current                             | $I_{FRM}$            | $T_C = 25$ °C, $f = 50$ Hz, square wave, DC = 25 % | 27          | A                |
| Non-repetitive peak forward surge current                   | $I_{FSM}$            | $T_C = 25$ °C, $t_p = 10$ ms, half sine wave       | 42          | A                |
|   |                      | $T_C = 110$ °C, $t_p = 10$ ms, half sine wave      | 39          |                  |
| Power dissipation   | $P_{tot}^{(1)}$      | $T_C = 25$ °C                                      | 60          | W                |
|   |                      | $T_C = 110$ °C                                     | 26          |                  |
|   | $P_{tot}^{(2)}$      | $T_C = 25$ °C                                      | 79          | W                |
|   |                      | $T_C = 110$ °C                                     | 34          |                  |
| $I^2t$ value  | $\int i^2 dt$        | $T_C = 25$ °C                                      | 8.7         | A <sup>2</sup> s |
|   |                      | $T_C = 110$ °C                                     | 7.6         |                  |
| 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 <sub>J</sub> = 25 °C unless otherwise specified) |                |  |      |      |      |       |
|---|----------------|--|------|------|------|-------|
| PARAMETER   | SYMBOL         | TEST CONDITIONS  | MIN. | TYP. | MAX. | UNITS |
| Forward voltage   | V <sub>F</sub> | I <sub>F</sub> = 5 A   | -    | 1.35 | 1.5  | V     |
|   |                | I <sub>F</sub> = 5 A, T <sub>J</sub> = 150 °C                  | -    | 1.73 | 2.0  |       |
|   |                | I <sub>F</sub> = 5 A, T <sub>J</sub> = 175 °C                  | -    | 1.85 | -    |       |
| Reverse leakage current   | I <sub>R</sub> | V <sub>R</sub> = V <sub>R</sub> rated                          | -    | 0.3  | 30   | μA    |
|   |                | V <sub>R</sub> = V <sub>R</sub> rated, T <sub>J</sub> = 150 °C | -    | 2.0  | 80   |       |
|   |                | V <sub>R</sub> = V <sub>R</sub> rated, T <sub>J</sub> = 175 °C | -    | 3    | -    |       |
| Total capacitance   | C              | V <sub>R</sub> = 1 V, f = 1 MHz                                | -    | 307  | -    | pF    |
|   |                | V <sub>R</sub> = 800 V, f = 1 MHz                              | -    | 20   | -    |       |
| Total capacitive charge   | Q <sub>C</sub> | V <sub>R</sub> = 800 V, f = 1 MHz                              | -    | 28   | -    | nC    |

| THERMAL - MECHANICAL SPECIFICATIONS (T <sub>A</sub> = 25 °C unless otherwise specified) |                   |                 |           |      |      |       |
|---|-------------------|-----------------|-----------|------|------|-------|
| PARAMETER   | SYMBOL            | TEST CONDITIONS | MIN.      | TYP. | MAX. | UNITS |
| Thermal resistance, junction-to-case  | R <sub>thJC</sub> |                 | -         | 1.9  | 2.50 | °C/W  |
| Marking device  |                   |                 | 3C05ET12T |      |      |       |

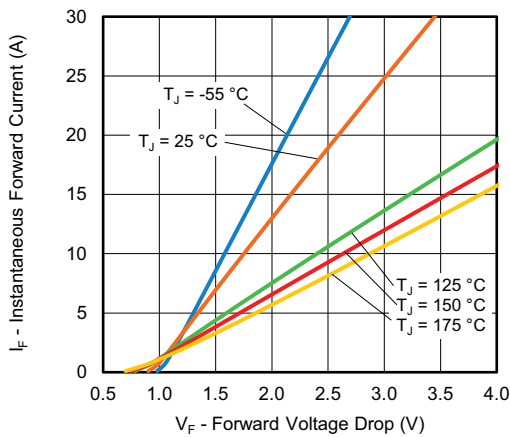


Fig. 1 - Typical Forward Voltage Drop Characteristics

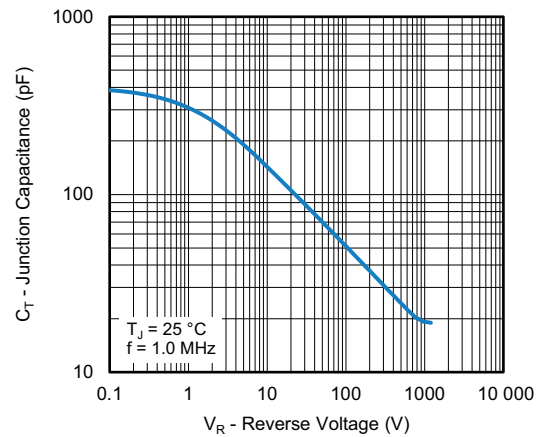


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

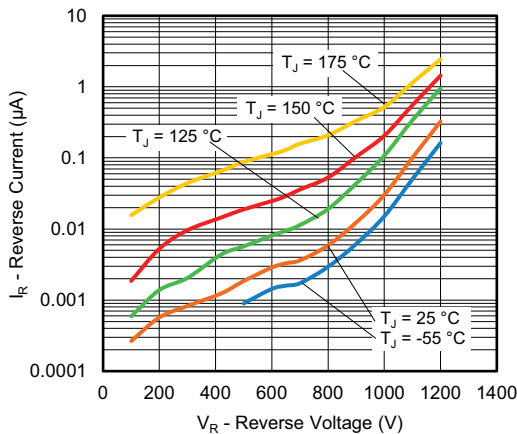


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

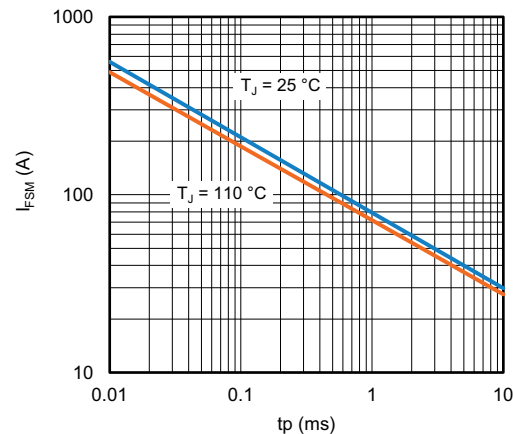


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

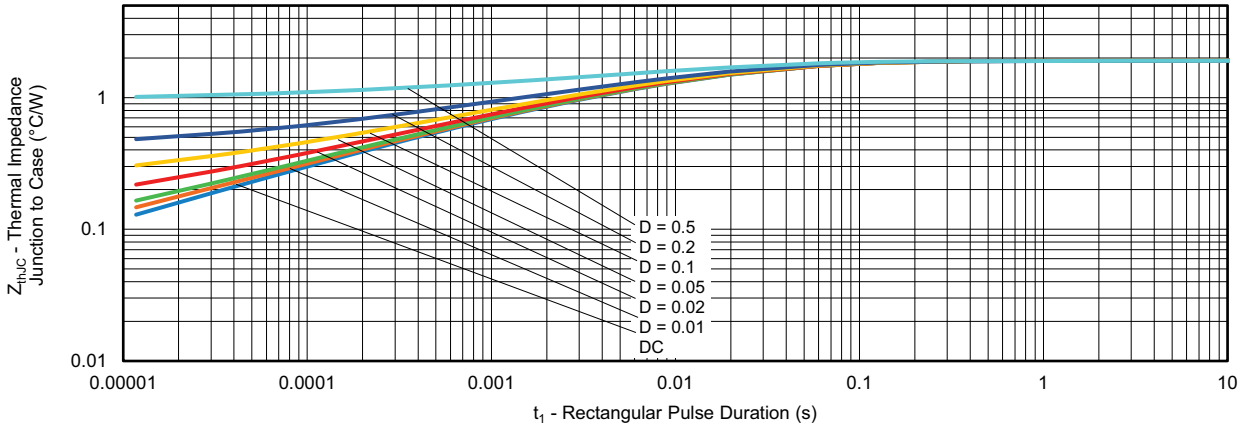


Fig. 5 - Typical Thermal Impedance  $Z_{thJC}$  Characteristics

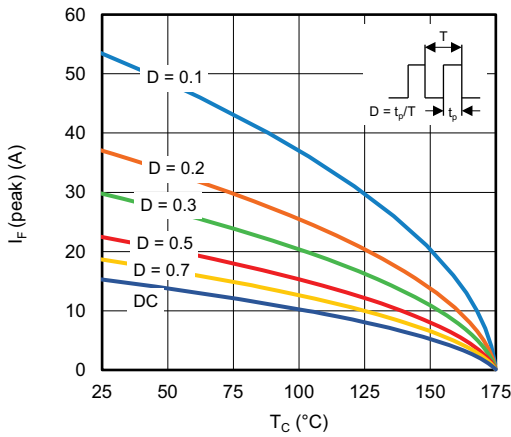


Fig. 6 - Peak Forward Current vs. Maximum Allowable Case Temperature

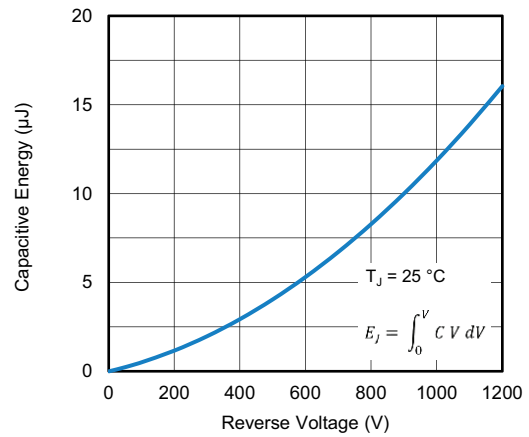


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

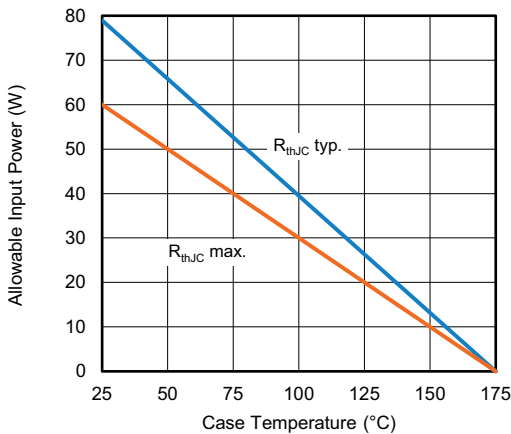


Fig. 7 - Forward Power Loss Characteristics

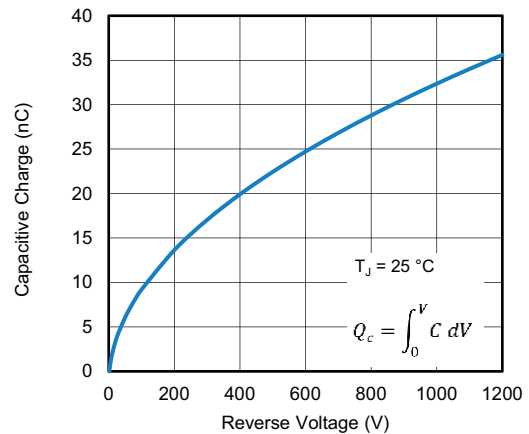
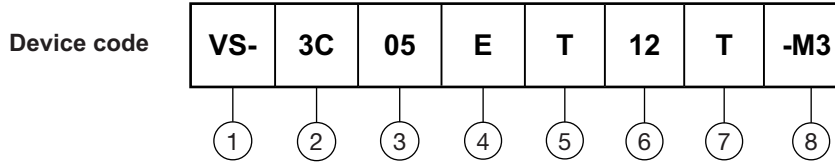


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage



ORDERING INFORMATION TABLE



- 1 - Vishay Semiconductors product
- 2 - 3C = SiC diode, Generation 3
- 3 - Current rating (05 = 5 A)
- 4 - E = single diode
- 5 - Package TO-220
- 6 - Voltage rating: (12 = 1200 V)
- 7 - T = true 2 pin
- 8 - Environmental digit:  
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

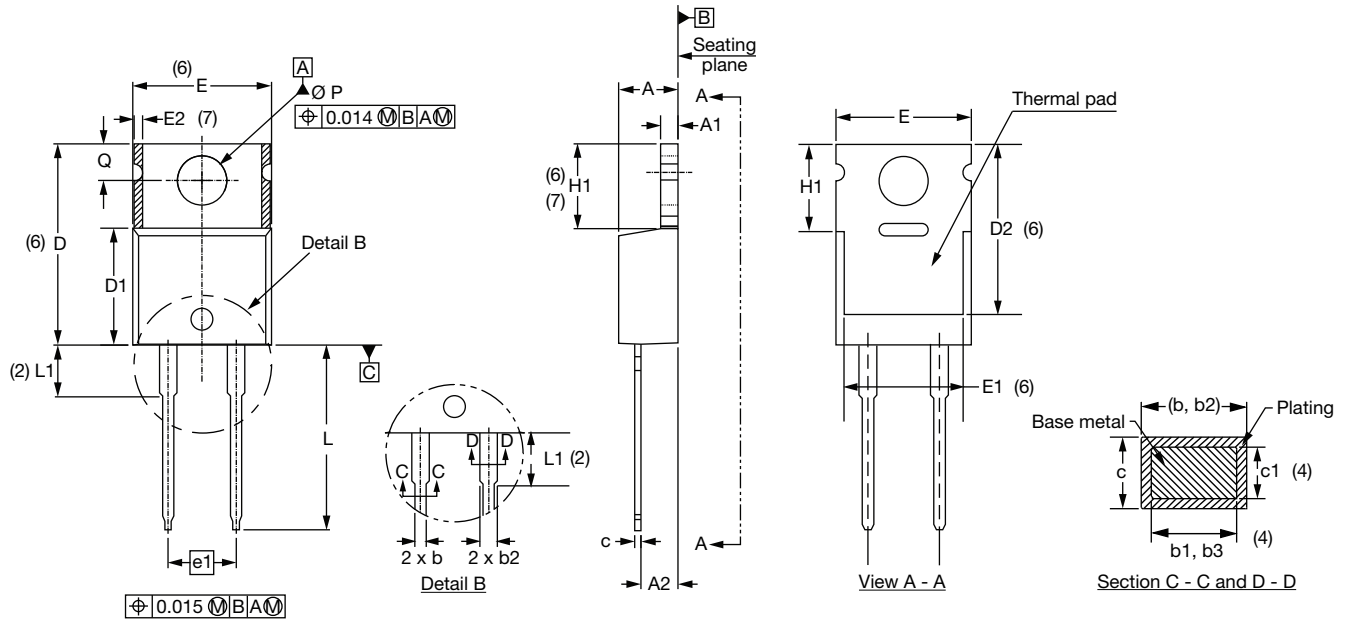
| ORDERING INFORMATION |               |                          |
|----------------------|---------------|--------------------------|
| PREFERRED P/N        | BASE QUANTITY | PACKAGING DESCRIPTION    |
| VS-3C05ET12T-M3      | 50/tube       | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?96069">www.vishay.com/doc?96069</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95391">www.vishay.com/doc?95391</a> |



TO-220AC 2L

**DIMENSIONS** in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.25        | 4.65  | 0.167  | 0.183 |       |
| A1     | 1.14        | 1.40  | 0.045  | 0.055 |       |
| A2     | 2.56        | 2.92  | 0.101  | 0.115 |       |
| b      | 0.69        | 1.01  | 0.027  | 0.040 |       |
| b1     | 0.38        | 0.97  | 0.015  | 0.038 | 4     |
| b2     | 1.20        | 1.73  | 0.047  | 0.068 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     |
| c      | 0.36        | 0.61  | 0.014  | 0.024 |       |
| c1     | 0.36        | 0.56  | 0.014  | 0.022 | 4     |
| D      | 14.85       | 15.25 | 0.585  | 0.600 | 3     |
| D1     | 8.38        | 9.02  | 0.330  | 0.355 |       |
| D2     | 11.68       | 12.88 | 0.460  | 0.507 | 6     |
| E      | 10.11       | 10.51 | 0.398  | 0.414 | 3, 6  |

| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| E1     | 6.86        | 8.89  | 0.270  | 0.350 | 6     |
| E2     | -           | 0.76  | -      | 0.030 | 7     |
| e1     | 4.88        | 5.28  | 0.192  | 0.208 |       |
| H1     | 5.84        | 6.86  | 0.230  | 0.270 | 6, 7  |
| L      | 13.52       | 14.02 | 0.532  | 0.552 |       |
| L1     | 3.32        | 3.82  | 0.131  | 0.150 | 2     |
| Ø P    | 3.54        | 3.73  | 0.139  | 0.147 |       |
| Q      | 2.60        | 3.00  | 0.102  | 0.118 |       |

**Notes**

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC® TO-220, except D2, where JEDEC® minimum is 0.480"



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