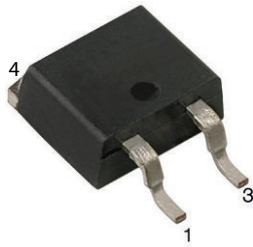
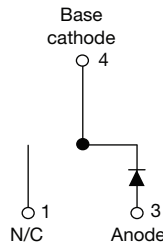


# 650 V Gen 3 Power SiC Merged PIN Schottky Diode, 4 A


**D<sup>2</sup>PAK 2L (TO-263AB 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
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- MPS structure for high ruggedness to forward current surge events
- Meets JESD 201 class 1A whisker test
- 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  |                                     |
|--------------------------|-------------------------------------|
| $I_{F(AV)}$              | 4 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 | 1.3 $\mu$ A                         |
| $Q_C$ ( $V_R = 400$ V)   | 12 nC                               |
| Package                  | D <sup>2</sup> PAK 2L (TO-263AB 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:** D<sup>2</sup>PAK 2L (TO-263AB 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

| 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                                    | $I_{F(AV)}$          | $T_C = 146$ °C (DC)                                | 4           | 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 % | 21          | A                |
| Non-repetitive peak forward surge current                            | $I_{FSM}$            | $T_C = 25$ °C, $t_p = 10$ ms, half sine wave       | 29          |                  |
|  |                      | $T_C = 110$ °C, $t_p = 10$ ms, half sine wave      | 26          |                  |
| Power dissipation  | $P_{tot}^{(1)}$      | $T_C = 25$ °C                                      | 40          | W                |
|  |                      | $T_C = 110$ °C                                     | 17          |                  |
| $I^2t$ value   | $\int i^2 dt$        | $T_C = 25$ °C                                      | 4.1         | A <sup>2</sup> s |
|  |                      | $T_C = 110$ °C                                     | 3.3         |                  |
| 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 <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> = 4 A   | -    | 1.3  | 1.5  | V     |
|   |                | I <sub>F</sub> = 4 A, T <sub>J</sub> = 150 °C                  | -    | 1.5  | 1.85 |       |
|   |                | I <sub>F</sub> = 4 A, T <sub>J</sub> = 175 °C                  | -    | 1.58 | -    |       |
| Reverse leakage current   | I <sub>R</sub> | V <sub>R</sub> = V <sub>R</sub> rated                          | -    | 0.2  | 25   | μA    |
|   |                | V <sub>R</sub> = V <sub>R</sub> rated, T <sub>J</sub> = 150 °C | -    | 0.8  | 50   |       |
|   |                | V <sub>R</sub> = V <sub>R</sub> rated, T <sub>J</sub> = 175 °C | -    | 1.3  | -    |       |
| Total capacitance   | C              | V <sub>R</sub> = 1 V, f = 1 MHz                                | -    | 175  | -    | pF    |
|   |                | V <sub>R</sub> = 400 V, f = 1 MHz                              | -    | 21   | -    |       |
| Total capacitive charge   | Q <sub>C</sub> | V <sub>R</sub> = 400 V, f = 1 MHz                              | -    | 12   | -    | 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> |                 | -         | 2.9  | 3.8  | °C/W  |
| Marking device  |                   |                 | 3C04ET07S |      |      |       |

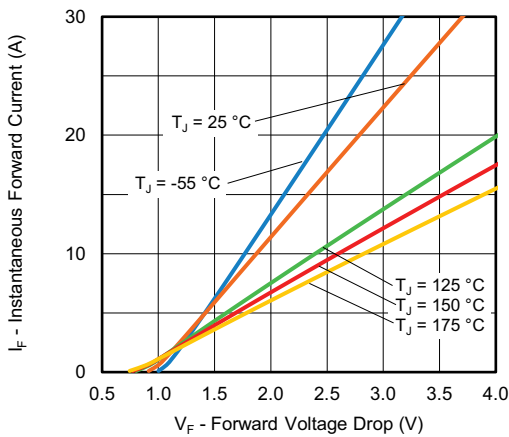


Fig. 1 - Typical Forward Voltage Drop Characteristics

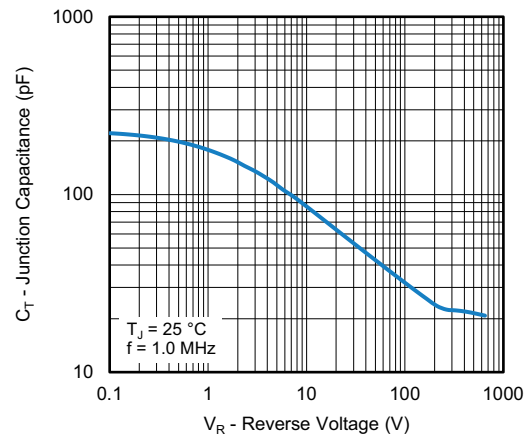


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

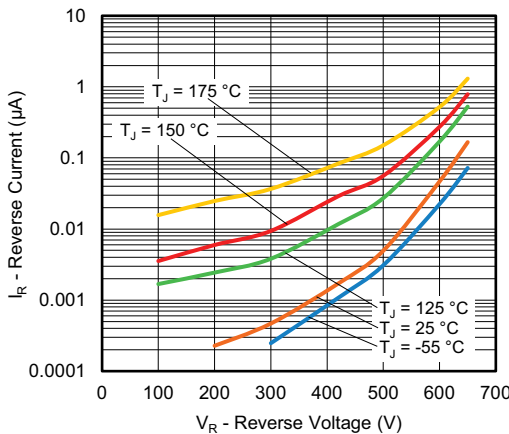


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

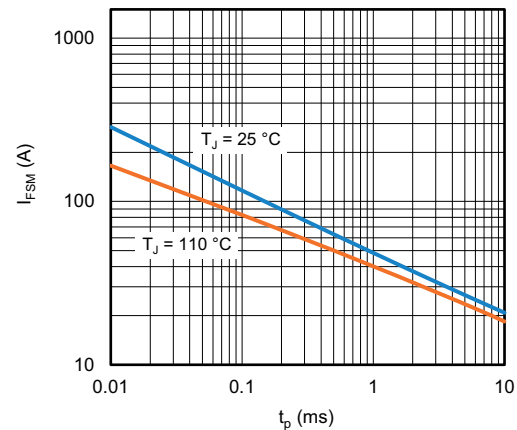


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

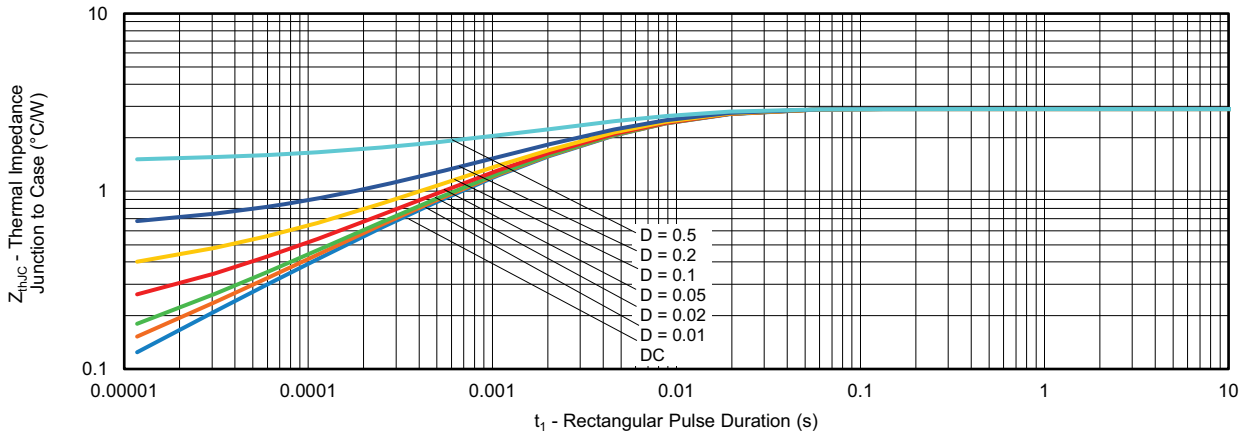


Fig. 5 - Typical Thermal Impedance  $Z_{thJC}$  Characteristics

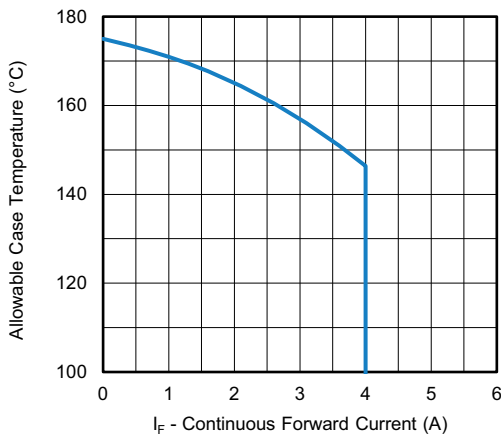


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

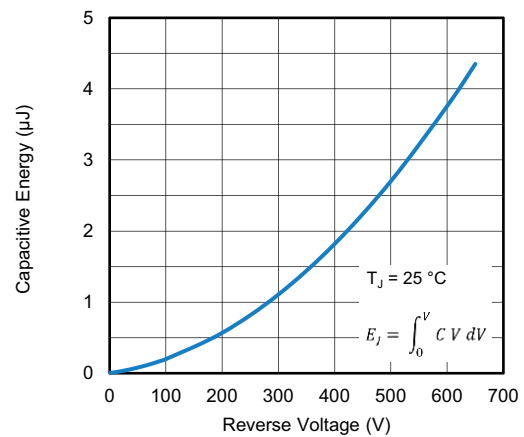


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

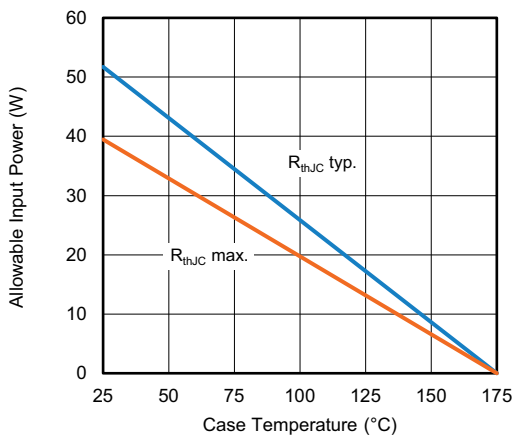


Fig. 7 - Forward Power Loss Characteristics

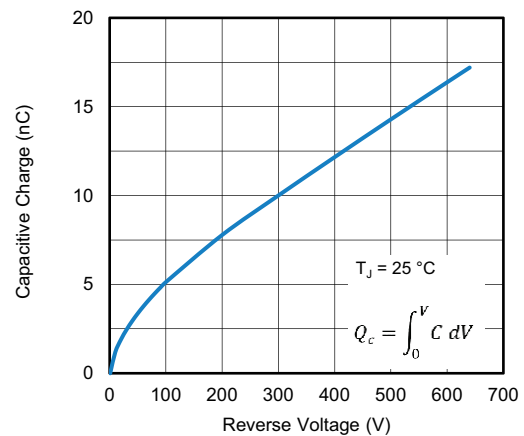
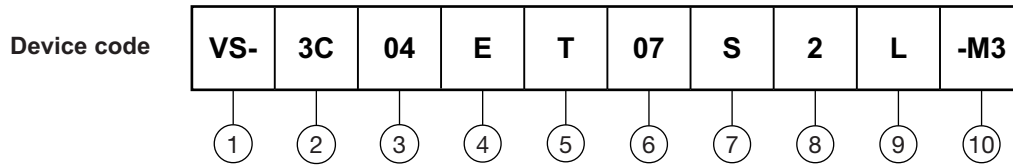


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage



## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - 3C = SiC diode, generation 3
- 3** - Current rating (04 = 4 A)
- 4** - E = single diode
- 5** - T = D<sup>2</sup>PAK package
- 6** - Voltage rating: (07 = 650 V)
- 7** - S = surface mountable
- 8** - 2 = true 2 pin D<sup>2</sup>PAK
- 9** - L = tape and reel (left oriented)
- 10** - Environmental digit:  
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

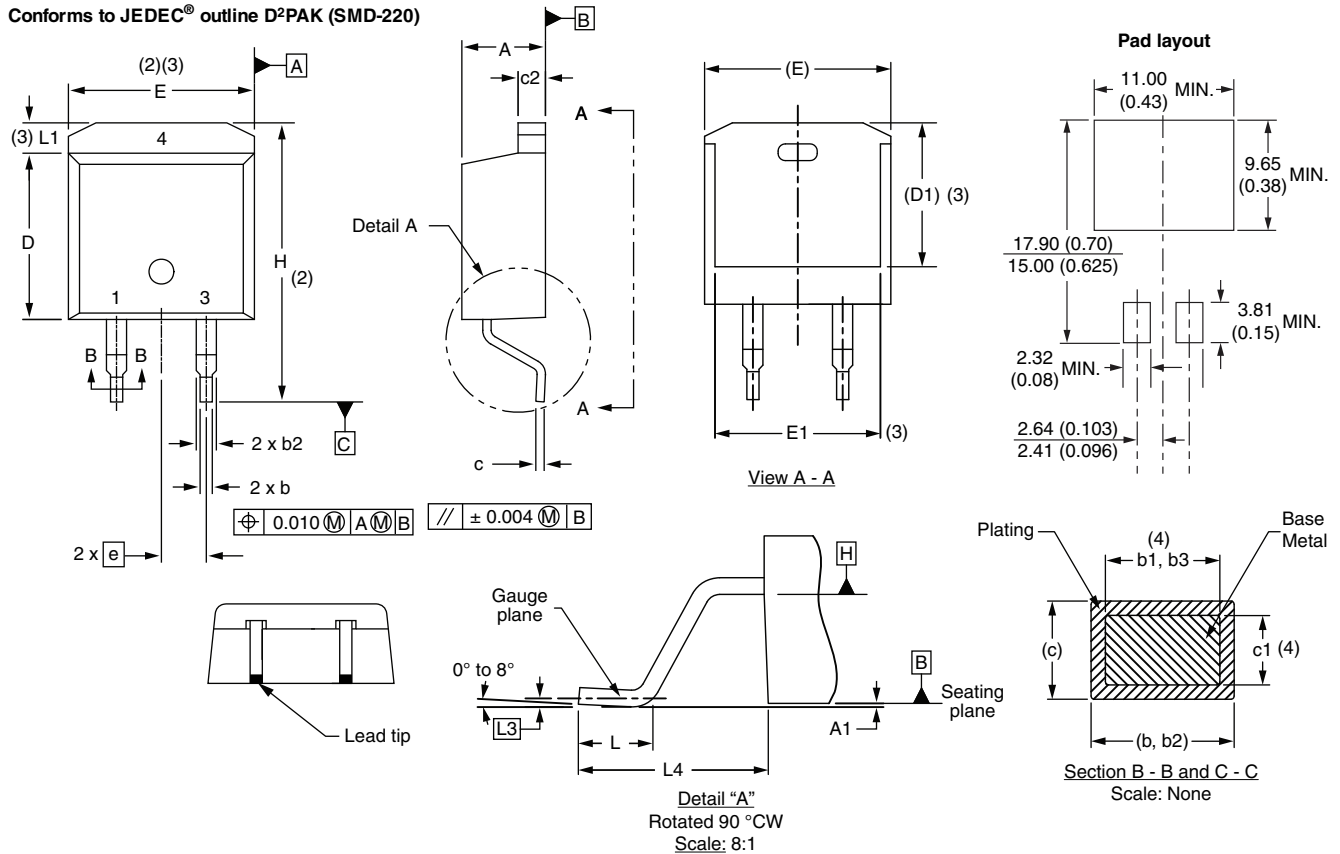
| ORDERING INFORMATION |               |                       |
|----------------------|---------------|-----------------------|
| PREFERRED P/N        | BASE QUANTITY | PACKAGING DESCRIPTION |
| VS-3C04ET07S2L-M3    | 800 per reel  | 13" diameter reel     |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?96683">www.vishay.com/doc?96683</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?96693">www.vishay.com/doc?96693</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a> |

## D<sup>2</sup>PAK 2L (TO-263AB 2L)

### DIMENSIONS in millimeters and inches

Conforms to JEDEC<sup>®</sup> outline D<sup>2</sup>PAK (SMD-220)



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES | SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|--------|-------|-------|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160  | 0.190 |       | D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| A1     | 0.00        | 0.254 | 0.000  | 0.010 |       | E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| b      | 0.51        | 0.99  | 0.020  | 0.039 |       | E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| b1     | 0.51        | 0.89  | 0.020  | 0.035 | 4     | e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| b2     | 1.14        | 1.78  | 0.045  | 0.070 |       | H      | 14.61       | 15.88 | 0.575     | 0.625 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     | L      | 1.78        | 2.79  | 0.070     | 0.110 |       |
| c      | 0.38        | 0.74  | 0.015  | 0.029 |       | L1     | -           | 1.65  | -         | 0.066 | 3     |
| c1     | 0.38        | 0.58  | 0.015  | 0.023 | 4     | L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| c2     | 1.14        | 1.65  | 0.045  | 0.065 |       | L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |
| D      | 8.51        | 9.65  | 0.335  | 0.380 | 2     |        |             |       |           |       |       |

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) Dimension D 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch
- (7) Outline conforms to JEDEC<sup>®</sup> outline TO-263AB



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