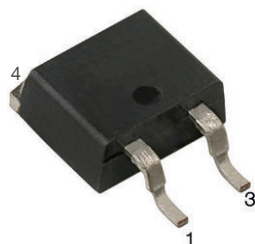
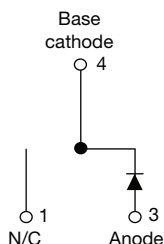


# 650 V Gen 4 Power Silicon Carbide Schottky Diode, 10 A


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


## FEATURES

- 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
- Meets JESD 201 class 1 A 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**

## DESCRIPTION / APPLICATIONS

Wide band gap SiC based 650 V Schottky diode, designed for high performance and ruggedness.

Optimized for extreme high speed hard switching across a wide temperature range. This SiC diode is ideal for applications with high  $dI/dt$  such as high efficiency PFC and ultra-high frequency output rectifiers in AC/DC and DC/DC 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

## LINKS TO ADDITIONAL RESOURCES



3D Models

| PRIMARY CHARACTERISTICS       |                                     |
|-------------------------------|-------------------------------------|
| $I_{F(AV)}$                   | 10 A                                |
| $V_R$                         | 650 V                               |
| $V_F$ at $I_F$ at 25 °C, typ. | 1.3 V                               |
| $T_J$ max.                    | 175 °C                              |
| $I_R$ at $V_R$ at 175 °C      | 50 $\mu$ A                          |
| $Q_C$ ( $V_R = 400$ V)        | 27 nC                               |
| Package                       | D <sup>2</sup> PAK 2L (TO-263AB 2L) |
| Circuit configuration         | Single                              |

| MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise specified) |                      |                                                    |             |                  |
|-------------------------------------------------------------|----------------------|----------------------------------------------------|-------------|------------------|
| PARAMETER                                                   | SYMBOL               | TEST CONDITIONS                                    | VALUES      | UNITS            |
| Peak repetitive reverse voltage                             | $V_{RRM}$            |                                                    | 650         | V                |
| Continuous forward current                                  | $I_F^{(1)}$          | $T_C = 145$ °C (DC)                                | 10          | A                |
|                                                             | $I_F^{(2)}$          | $T_C = 138$ °C (DC)                                | 10          | 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 % | 42          | A                |
| Non-repetitive peak forward surge current                   | $I_{FSM}$            | $T_C = 25$ °C, $t_p = 10$ ms, half sine wave       | 60          |                  |
|                                                             |                      | $T_C = 110$ °C, $t_p = 10$ ms, half sine wave      | 48          |                  |
| Power dissipation                                           | $P_{tot}^{(1)}$      | $T_C = 25$ °C                                      | 79          | W                |
|                                                             |                      | $T_C = 110$ °C                                     | 34          |                  |
|                                                             | $P_{tot}^{(2)}$      | $T_C = 25$ °C                                      | 62.5        | W                |
|                                                             |                      | $T_C = 110$ °C                                     | 27          |                  |
| $I^2t$ value                                                | $\int i^2 dt$        | $T_C = 25$ °C                                      | 18          | A <sup>2</sup> s |
|                                                             |                      | $T_C = 110$ °C                                     | 11.5        |                  |
| Operating junction and storage temperatures                 | $T_J^{(2)}, T_{Stg}$ |                                                    | -55 to +175 | °C               |

### Notes

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

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

(3) 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         | $V_F$  | $I_F = 10\text{ A}$                                         | -    | 1.3  | 1.5  | V             |
|                         |        | $I_F = 10\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$      | -    | 1.45 | 1.75 |               |
|                         |        | $I_F = 10\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$      | -    | 1.55 | -    |               |
| Reverse leakage current | $I_R$  | $V_R = V_R\text{ rated}$                                    | -    | 2    | 80   | $\mu\text{A}$ |
|                         |        | $V_R = V_R\text{ rated}, T_J = 150\text{ }^{\circ}\text{C}$ | -    | 23   | 160  |               |
|                         |        | $V_R = V_R\text{ rated}, T_J = 175\text{ }^{\circ}\text{C}$ | -    | 50   | -    |               |
| Total capacitance       | C      | $V_R = 1\text{ V}, f = 1\text{ MHz}$                        | -    | 440  | -    | pF            |
|                         |        | $V_R = 400\text{ V}, f = 1\text{ MHz}$                      | -    | 38   | -    |               |
| Total capacitive charge | $Q_C$  | $V_R = 400\text{ V}, f = 1\text{ MHz}$                      | -    | 27   | -    | nC            |

**THERMAL AND 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 | $R_{thJC}$ |                 | -         | 1.9  | 2.4  | $^{\circ}\text{C/W}$ |
| Marking device                       |            |                 | 4C10ET07S |      |      |                      |

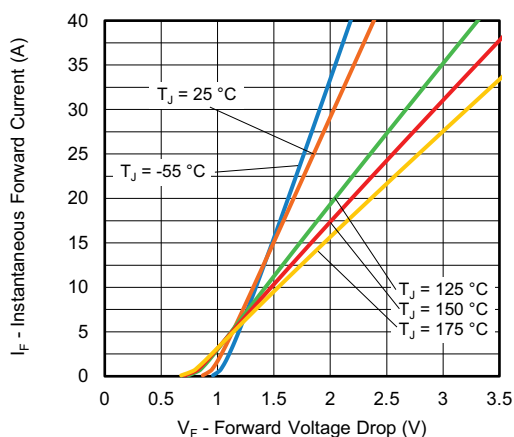


Fig. 1 - Typical Forward Voltage Drop Characteristics

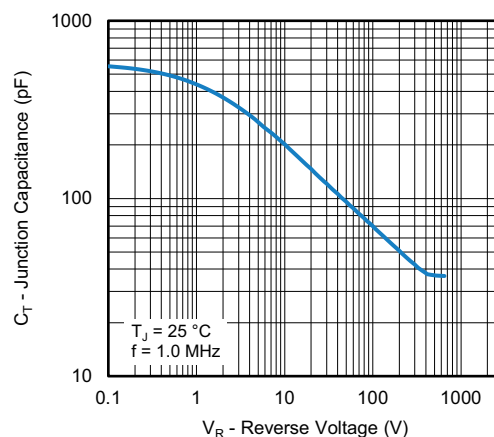


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

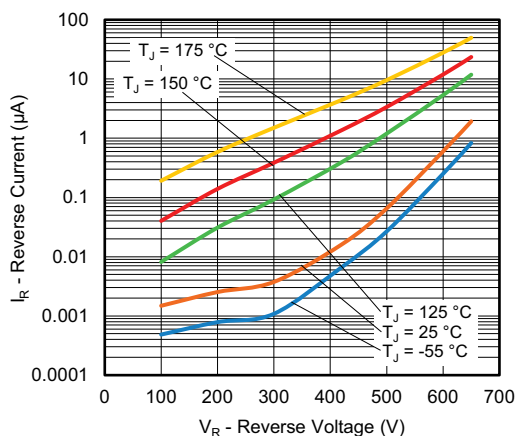


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

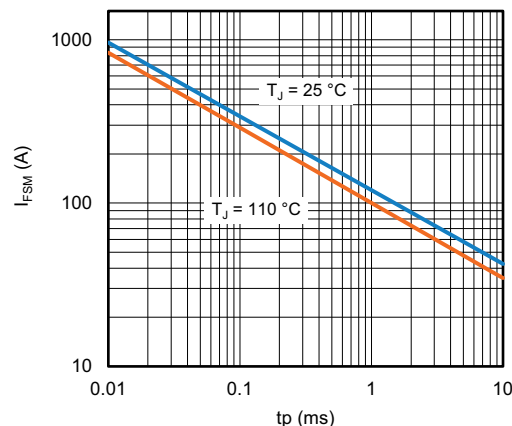


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

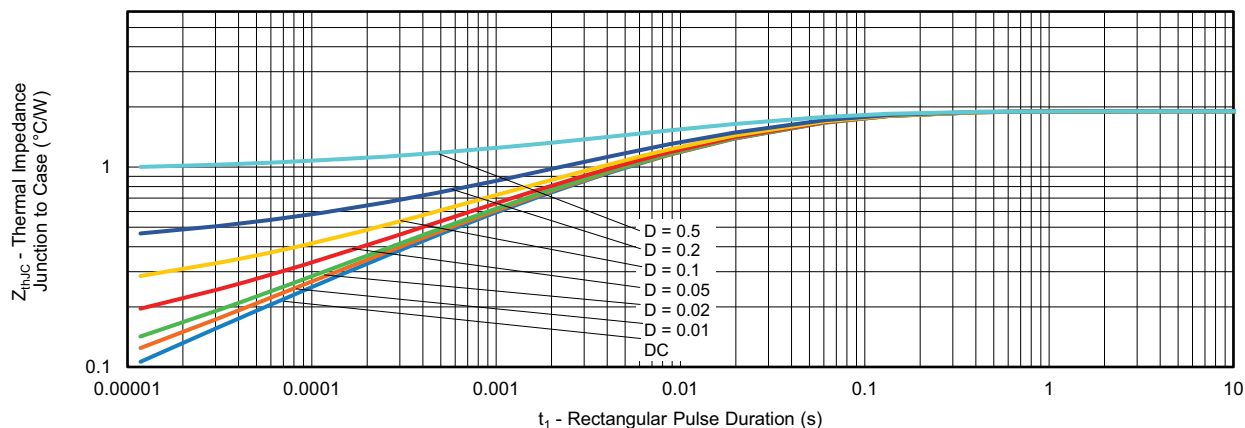
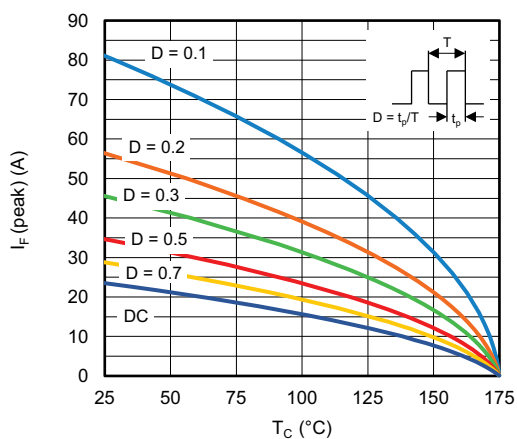

Fig. 5 - Typical Thermal Impedance  $Z_{thJC}$  Characteristics


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

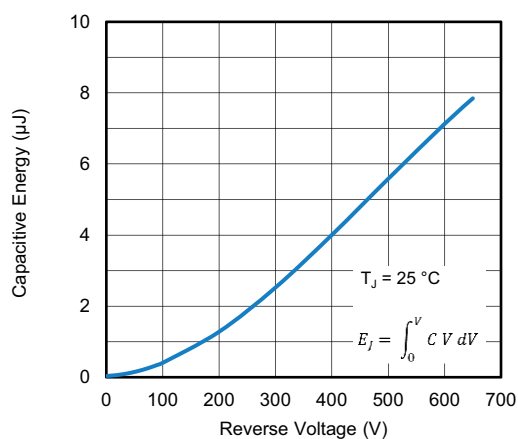


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

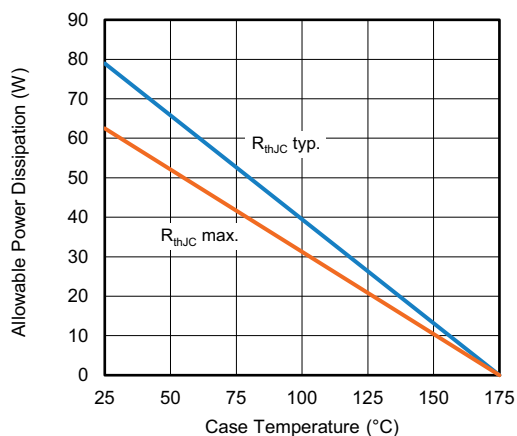


Fig. 7 - Forward Power Loss Characteristics

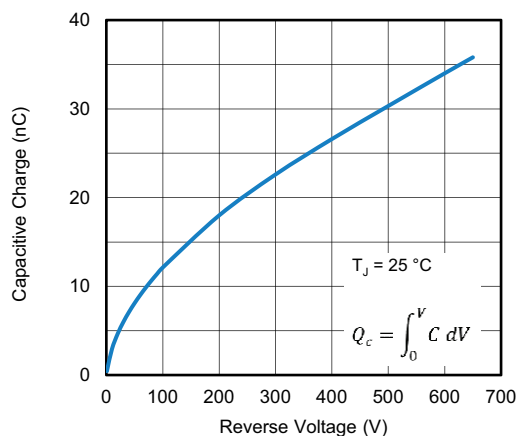


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage

**ORDERING INFORMATION TABLE**

|             |            |           |           |          |          |           |          |          |          |            |
|-------------|------------|-----------|-----------|----------|----------|-----------|----------|----------|----------|------------|
| Device code | <b>VS-</b> | <b>4C</b> | <b>10</b> | <b>E</b> | <b>T</b> | <b>07</b> | <b>S</b> | <b>2</b> | <b>L</b> | <b>-M3</b> |
|             | 1          | 2         | 3         | 4        | 5        | 6         | 7        | 8        | 9        | 10         |

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

**ORDERING INFORMATION**

| PREFERRED P/N     | UNIT WEIGHT | BASE QUANTITY | PACKAGING DESCRIPTION |
|-------------------|-------------|---------------|-----------------------|
| VS-4C10ET07S2L-M3 | 2 g         | 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> |
| SPICE model              | <a href="http://www.vishay.com/doc?97484">www.vishay.com/doc?97484</a> |