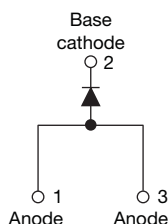


# High Voltage Surface Mount Input Rectifier Diode, 10 A


**D<sup>2</sup>PAK**


## FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Designed and qualified according to JEDEC-JESD47
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


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HALOGEN  
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## APPLICATIONS

- Input rectification
- Vishay switches and output rectifiers which are available in identical package outlines

## DESCRIPTION

The VS-10ETS..SPbF rectifier series has been optimized for very low forward voltage drop, with moderate leakage. The glass passivation technology used has reliable operation up to 150 °C junction temperature.

## PRODUCT SUMMARY

|                                  |                               |
|----------------------------------|-------------------------------|
| Package                          | TO-263AB (D <sup>2</sup> PAK) |
| I <sub>F(AV)</sub>               | 10 A                          |
| V <sub>R</sub>                   | 800 V, 1000 V, 1200 V         |
| V <sub>F</sub> at I <sub>F</sub> | 1.1 V                         |
| I <sub>FSM</sub>                 | 160 A                         |
| T <sub>J</sub> max.              | 150 °C                        |
| Diode variation                  | Single die                    |

## OUTPUT CURRENT IN TYPICAL APPLICATIONS

| APPLICATIONS   | SINGLE-PHASE BRIDGE | THREE-PHASE BRIDGE | UNITS |
|--|---------------------|--------------------|-------|
| Capacitive input filter T <sub>A</sub> = 55 °C, T <sub>J</sub> = 125 °C<br>common heatsink of 1 °C/W | 12.0                | 16.0               | A     |

## MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL             | CHARACTERISTICS              | VALUES      | UNITS |
|--------------------|------------------------------|-------------|-------|
| I <sub>F(AV)</sub> | Sinusoidal waveform          | 10          | A     |
| V <sub>RRM</sub>   |                              | 800/1200    | V     |
| I <sub>FSM</sub>   |                              | 160         | A     |
| V <sub>F</sub>     | 10 A, T <sub>J</sub> = 25 °C | 1.1         | V     |
| T <sub>J</sub>     |                              | - 40 to 150 | °C    |

## VOLTAGE RATINGS

| PART NUMBER    | V <sub>RRM</sub> , MAXIMUM PEAK REVERSE VOLTAGE<br>V | V <sub>RSM</sub> , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE<br>V | I <sub>RRM</sub><br>AT 150 °C<br>mA |
|----------------|--|---|-------------------------------------|
| VS-10ETS08SPbF | 800  | 900   | 0.5                                 |
| VS-10ETS10SPbF | 1000   | 1100  |                                     |
| VS-10ETS12SPbF | 1200   | 1300  |                                     |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER   | SYMBOL             | TEST CONDITIONS   | VALUES | UNITS             |
|---|--------------------|---|--------|-------------------|
| Maximum average forward current                     | I <sub>F(AV)</sub> | T <sub>C</sub> = 105 °C, 180° conduction half sine wave | 10     | A                 |
| Maximum peak one cycle non-repetitive surge current | I <sub>FSM</sub>   | 10 ms sine pulse, rated V <sub>RRM</sub> applied        | 135    |                   |
|   |                    | 10 ms sine pulse, no voltage reapplied                  | 160    |                   |
| Maximum I <sup>2</sup> t for fusing                 | I <sup>2</sup> t   | 10 ms sine pulse, rated V <sub>RRM</sub> applied        | 91     | A <sup>2</sup> s  |
|   |                    | 10 ms sine pulse, no voltage reapplied                  | 130    |                   |
| Maximum I <sup>2</sup> √t for fusing                | I <sup>2</sup> √t  | t = 0.1 ms to 10 ms, no voltage reapplied               | 1290   | A <sup>2</sup> √s |



| ELECTRICAL SPECIFICATIONS       |             |  |                               |        |                  |
|---------------------------------|-------------|--|-------------------------------|--------|------------------|
| PARAMETER                       | SYMBOL      | TEST CONDITIONS                          |                               | VALUES | UNITS            |
| Maximum forward voltage drop    | $V_{FM}$    | 10 A, $T_J = 25\text{ }^{\circ}\text{C}$ |                               | 1.1    | V                |
| Forward slope resistance        | $r_t$       | $T_J = 150\text{ }^{\circ}\text{C}$      |                               | 20     | $\text{m}\Omega$ |
| Threshold voltage               | $V_{F(TO)}$ |  |                               | 0.82   | V                |
| Maximum reverse leakage current | $I_{RM}$    | $T_J = 25\text{ }^{\circ}\text{C}$       | $V_R = \text{Rated } V_{RRM}$ | 0.05   | mA               |
|                                 |             | $T_J = 150\text{ }^{\circ}\text{C}$      |                               | 0.50   |                  |

| THERMAL - MECHANICAL SPECIFICATIONS                         |                                   |   |             |       |
|---|-----------------------------------|---|-------------|-------|
| PARAMETER   | SYMBOL                            | TEST CONDITIONS                         | VALUES      | UNITS |
| Maximum junction and storage temperature range              | T <sub>J</sub> , T <sub>Stg</sub> |   | - 40 to 150 | °C    |
| Maximum thermal resistance, junction to case                | R <sub>thJC</sub>                 | DC operation                            | 2.5         | °C/W  |
| Maximum thermal resistance, junction to ambient (PCB mount) | R <sub>thJA</sub> <sup>(1)</sup>  |   | 62          |       |
| Soldering temperature                                       | T <sub>S</sub>                    |   | 260         | °C    |
| Approximate weight  |                                   |   | 2           | g     |
|   |                                   |   | 0.07        | oz.   |
| Marking device  |                                   | Case style D <sup>2</sup> PAK (SMD-220) | 10ETS08S    |       |
|   |                                   |   | 10ETS10S    |       |
|   |                                   |   | 10ETS12S    |       |

**Note**

<sup>(1)</sup> When mounted on 1" square (650 mm<sup>2</sup>) PCB of FR-4 or G-10 material 4 oz. (140  $\mu\text{m}$ ) copper 40  $^{\circ}\text{C}/\text{W}$   
For recommended footprint and soldering techniques refer to application note #AN-994

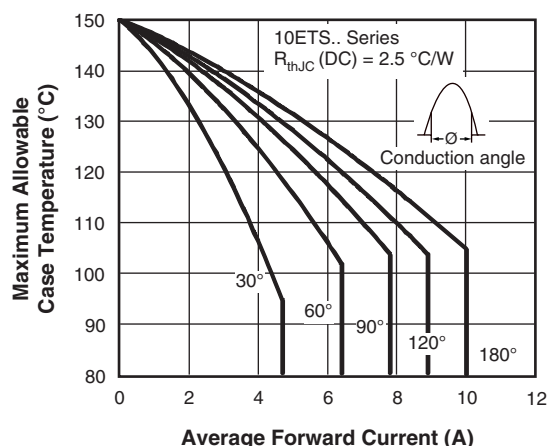


Fig. 1 - Current Rating Characteristics

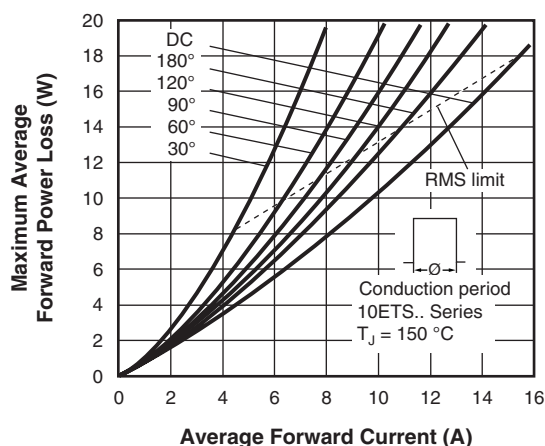


Fig. 4 - Forward Power Loss Characteristics

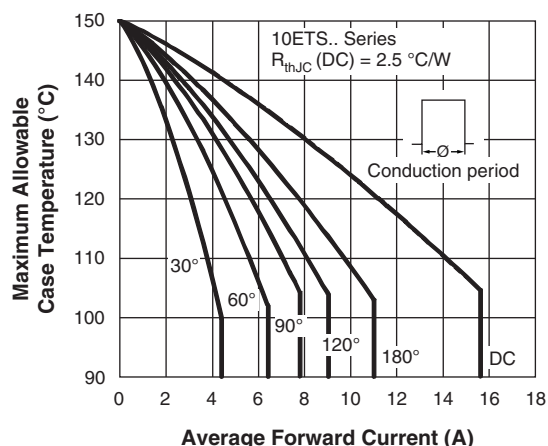


Fig. 2 - Current Rating Characteristics

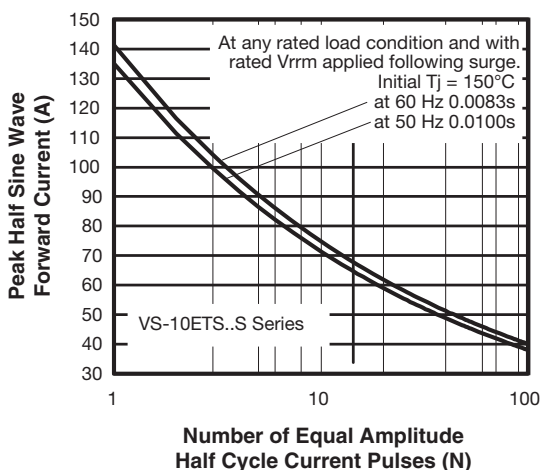


Fig. 5 - Maximum Non-Repetitive Surge Current

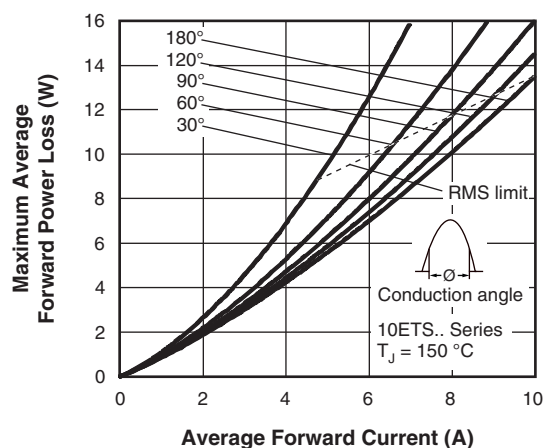


Fig. 3 - Forward Power Loss Characteristics

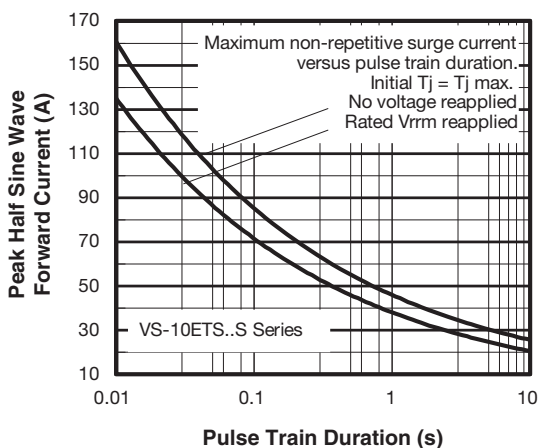


Fig. 6 - Maximum Non-Repetitive Surge Current

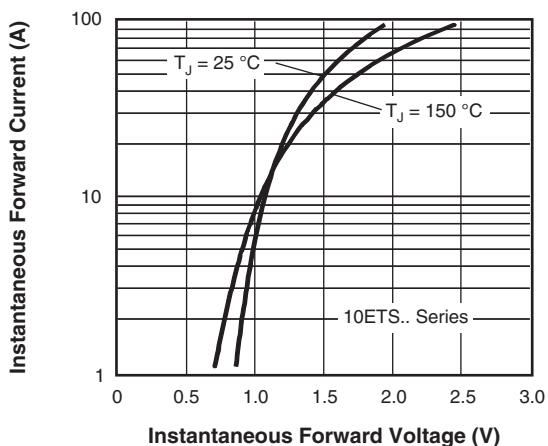
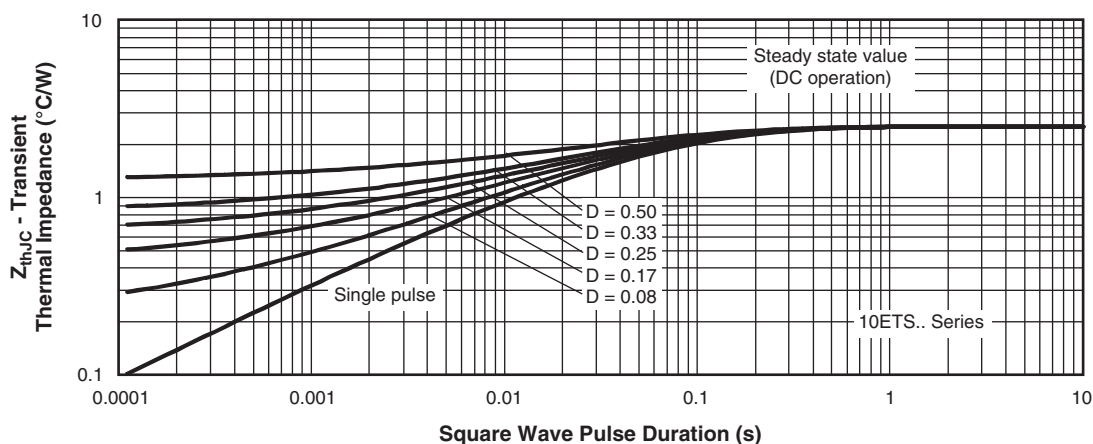


Fig. 7 - Forward Voltage Drop Characteristics


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

**ORDERING INFORMATION TABLE**

| Device code | VS- | 10 | E | T | S | 12 | S | TRL | PbF |
|-------------|-----|----|---|---|---|----|---|-----|-----|
|             | 1   | 2  | 3 | 4 | 5 | 6  | 7 | 8   | 9   |

- |          |   |   |             |
|----------|---|---|-------------|
| <b>1</b> | - | Vishay Semiconductors product                   |             |
| <b>2</b> | - | Current rating (10 = 10 A)                      |             |
| <b>3</b> | - | Circuit configuration:                          |             |
|          |   | E = Single diode                                |             |
| <b>4</b> | - | Package:  |             |
|          |   | T = TO-220AC                                    |             |
| <b>5</b> | - | Type of silicon:                                |             |
|          |   | S = Standard recovery rectifier                 |             |
| <b>6</b> | - | Voltage code x 100 = $V_{RRM}$                  | 08 = 800 V  |
| <b>7</b> | - | S = TO-220 D <sup>2</sup> PAK (SMD-220) version | 10 = 1000 V |
|          |   |   | 12 = 1200 V |
| <b>8</b> | - | • None = Tube                                   |             |
|          |   | • TRL = Tape and reel (left oriented)           |             |
|          |   | • TRR = Tape and reel (right oriented)          |             |
| <b>9</b> | - | PbF = Lead (Pb)-free                            |             |

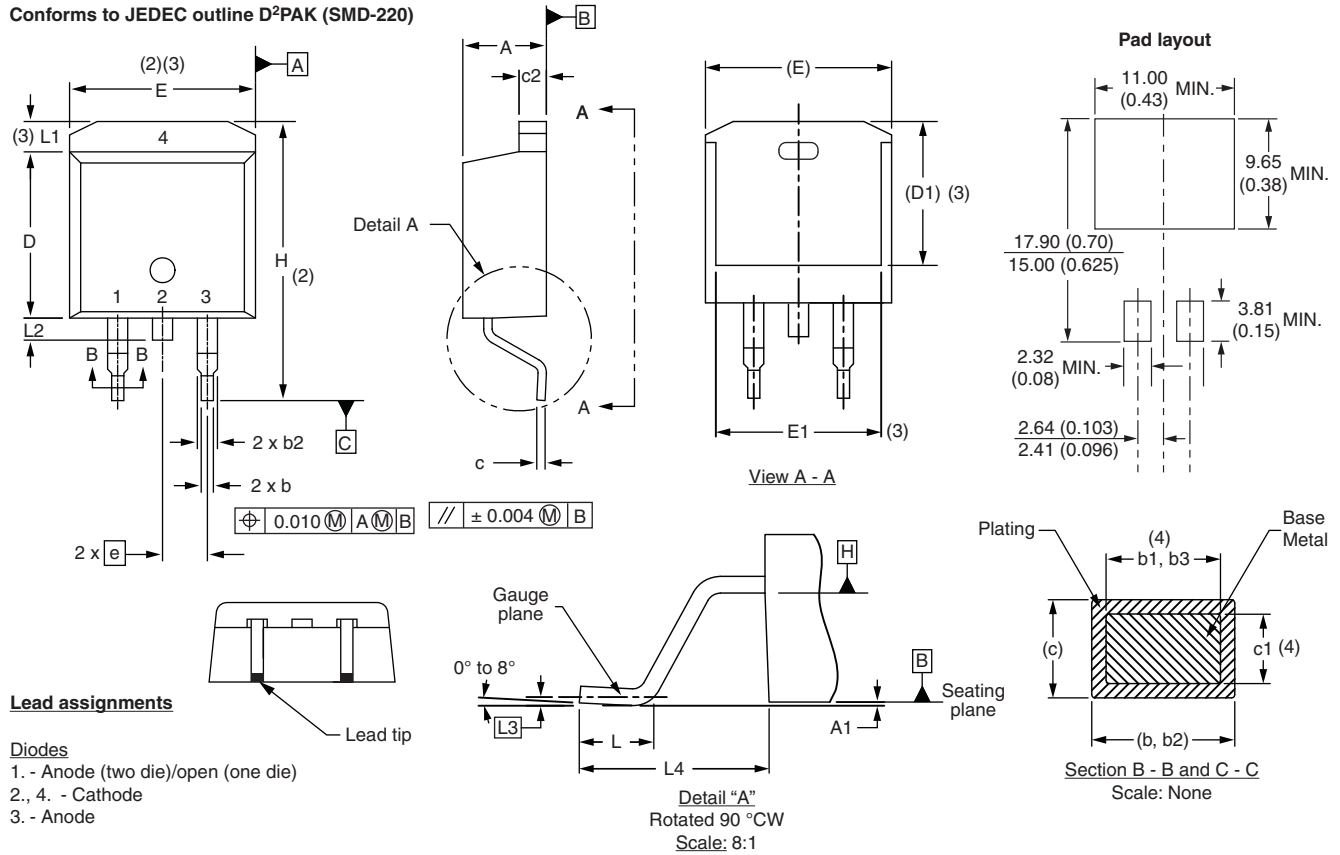
| ORDERING INFORMATION (Example) |                   |                        |                         |
|--------------------------------|-------------------|------------------------|-------------------------|
| PREFERRED P/N                  | QUANTITY PER TUBE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
| VS-10ETS08SPbF                 | 50                | 1000                   | Antistatic plastic tube |
| VS-10ETS08STRRPbF              | 800               | 800                    | 13" diameter reel       |
| VS-10ETS08STRLPbF              | 800               | 800                    | 13" diameter reel       |
| VS-10ETS10SPbF                 | 50                | 1000                   | Antistatic plastic tube |
| VS-10ETS10STRRPbF              | 800               | 800                    | 13" diameter reel       |
| VS-10ETS10STRLPbF              | 800               | 800                    | 13" diameter reel       |
| VS-10ETS12SPbF                 | 50                | 1000                   | Antistatic plastic tube |
| VS-10ETS12STRRPbF              | 800               | 800                    | 13" diameter reel       |
| VS-10ETS12STRLPbF              | 800               | 800                    | 13" diameter reel       |
| VS-10ETS08SPbF                 | 50                | 1000                   | Antistatic plastic tube |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95054">www.vishay.com/doc?95054</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a> |

### D<sup>2</sup>PAK

#### DIMENSIONS in millimeters and inches

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



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160  | 0.190 |       |
| A1     | 0.00        | 0.254 | 0.000  | 0.010 |       |
| b      | 0.51        | 0.99  | 0.020  | 0.039 |       |
| b1     | 0.51        | 0.89  | 0.020  | 0.035 | 4     |
| b2     | 1.14        | 1.78  | 0.045  | 0.070 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     |
| c      | 0.38        | 0.74  | 0.015  | 0.029 |       |
| c1     | 0.38        | 0.58  | 0.015  | 0.023 | 4     |
| c2     | 1.14        | 1.65  | 0.045  | 0.065 |       |
| D      | 8.51        | 9.65  | 0.335  | 0.380 | 2     |

| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| H      | 14.61       | 15.88 | 0.575     | 0.625 |       |
| L      | 1.78        | 2.79  | 0.070     | 0.110 |       |
| L1     | -           | 1.65  | -         | 0.066 | 3     |
| L2     | 1.27        | 1.78  | 0.050     | 0.070 |       |
| L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |

#### 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 outline TO-263AB



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