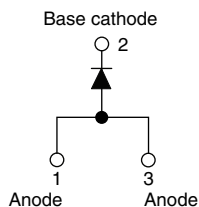




## Input Rectifier Diode, 20 A



D<sup>2</sup>PAK



### FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Compliant to RoHS directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- Designed and qualified for industrial level



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### APPLICATIONS

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

### DESCRIPTION

The VS-20ETS...SPbF rectifier High Voltage 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

|               |              |
|---------------|--------------|
| $V_F$ at 10 A | < 1 V        |
| $I_{FSM}$     | 300 A        |
| $V_{RRM}$     | 800 V/1200 V |

### OUTPUT CURRENT IN TYPICAL APPLICATIONS

| APPLICATIONS  | SINGLE-PHASE BRIDGE | THREE-PHASE BRIDGE | UNITS |
|---|---------------------|--------------------|-------|
| Capacitive input filter $T_A = 55\text{ °C}$ , $T_J = 125\text{ °C}$<br>common heatsink of 1 °C/W | 16.3                | 21                 | A     |

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS            | VALUES      | UNITS |
|-------------|----------------------------|-------------|-------|
| $I_{F(AV)}$ | Sinusoidal waveform        | 20          | A     |
| $V_{RRM}$   |                            | 800/1200    | V     |
| $I_{FSM}$   |                            | 300         | A     |
| $V_F$       | 20 A, $T_J = 25\text{ °C}$ | 1.1         | V     |
| $T_J$       |                            | - 40 to 150 | °C    |

### VOLTAGE RATINGS

| PART NUMBER    | $V_{RRM}$ , MAXIMUM PEAK<br>REVERSE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM NON-REPETITIVE<br>PEAK REVERSE VOLTAGE<br>V | $I_{RRM}$ AT 150 °C<br>mA |
|----------------|--|---|---------------------------|
| VS-20ETS08SPbF | 800  | 900   | 1                         |
| VS-20ETS12SPbF | 1200   | 1300  |                           |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER  | SYMBOL        | TEST CONDITIONS  | VALUES | UNITS             |
|--|---------------|--|--------|-------------------|
| Maximum average forward current                        | $I_{F(AV)}$   | $T_C = 105\text{ °C}$ , 180° conduction half sine wave | 20     | A                 |
| Maximum peak one cycle<br>non-repetitive surge current | $I_{FSM}$     | 10 ms sine pulse, rated $V_{RRM}$ applied              | 250    |                   |
|  |               | 10 ms sine pulse, no voltage reapplied                 | 300    |                   |
| Maximum $I^2t$ for fusing                              | $I^2t$        | 10 ms sine pulse, rated $V_{RRM}$ applied              | 316    | A <sup>2</sup> s  |
|  |               | 10 ms sine pulse, no voltage reapplied                 | 442    |                   |
| Maximum $I^2\sqrt{t}$ for fusing                       | $I^2\sqrt{t}$ | $t = 0.1\text{ ms}$ to 10 ms, no voltage reapplied     | 4420   | A <sup>2</sup> √s |

# VS-20ETS08SPbF, VS-20ETS12SPbF High Voltage Series

Vishay Semiconductors

Input Rectifier Diode, 20 A



| ELECTRICAL SPECIFICATIONS       |                    |                              |   |        |       |
|---------------------------------|--------------------|------------------------------|---|--------|-------|
| PARAMETER                       | SYMBOL             | TEST CONDITIONS              |   | VALUES | UNITS |
| Maximum forward voltage drop    | V <sub>FM</sub>    | 20 A, T <sub>J</sub> = 25 °C |   | 1.1    | V     |
| Forward slope resistance        | r <sub>t</sub>     | T <sub>J</sub> = 150 °C      |   | 10.4   | mΩ    |
| Threshold voltage               | V <sub>F(TO)</sub> |                              |   | 0.85   | V     |
| Maximum reverse leakage current | I <sub>RM</sub>    | T <sub>J</sub> = 25 °C       | V <sub>R</sub> = Rated V <sub>RRM</sub> | 0.1    | mA    |
|                                 |                    | T <sub>J</sub> = 150 °C      |   | 1.0    |       |

| 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                            | 1.3         | °C/W                   |
| Maximum thermal resistance, junction to ambient | R <sub>thJA</sub> <sup>(1)</sup>  | For D <sup>2</sup> PAK version          | 62          |                        |
| Typical thermal resistance, case to heatsink    | R <sub>thCS</sub>                 | Mounting surface, smooth and greased    | 0.5         |                        |
| Approximate weight                              |                                   |   | 2           | g                      |
|   |                                   |   | 0.07        | oz.                    |
| Mounting torque                                 | minimum                           |   | 6.0 (5.0)   | kgf · cm<br>(lbf · in) |
|   | maximum                           |   | 12 (10)     |                        |
| Marking device                                  |                                   | Case style D <sup>2</sup> PAK (SMD-220) | 20ETS08S    |                        |
|   |                                   |   | 20ETS12S    |                        |

## 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



# VS-20ETS08SPbF, VS-20ETS12SPbF High Voltage Series

Input Rectifier Diode, 20 A

Vishay Semiconductors

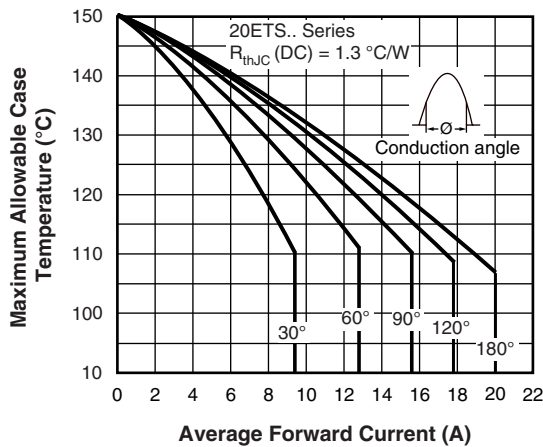


Fig. 1 - Current Rating Characteristics

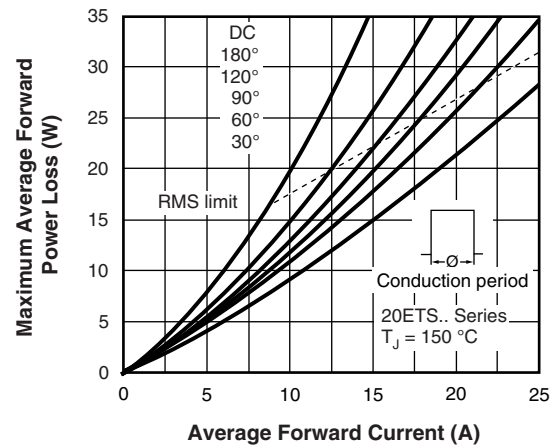


Fig. 4 - Forward Power Loss Characteristics

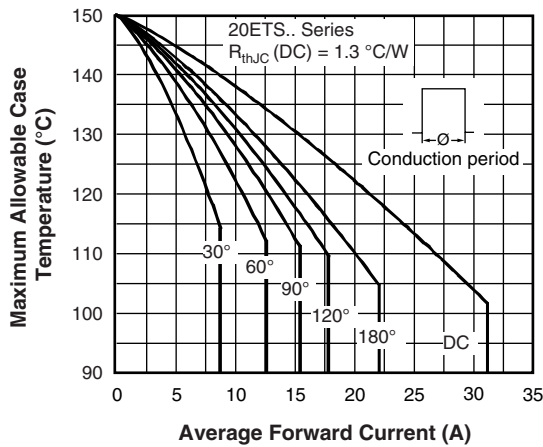


Fig. 2 - Current Rating Characteristics

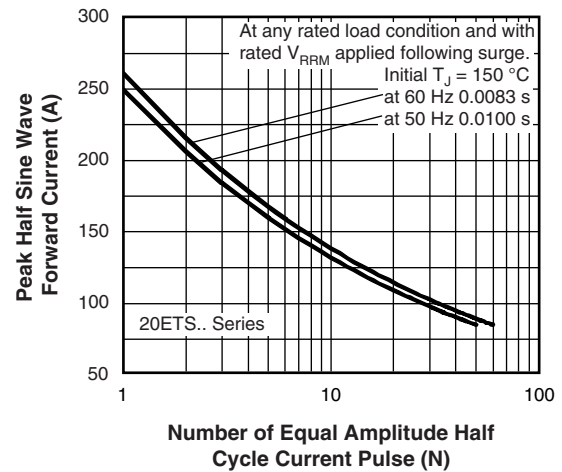


Fig. 5 - Maximum Non-Repetitive Surge Current

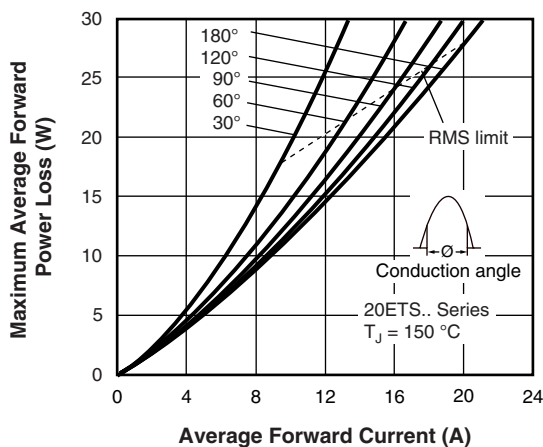


Fig. 3 - Forward Power Loss Characteristics

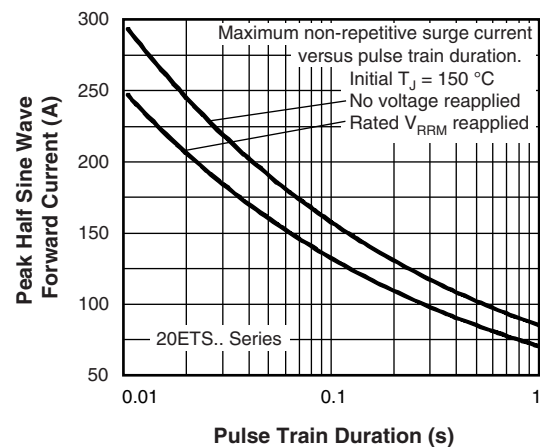


Fig. 6 - Maximum Non-Repetitive Surge Current

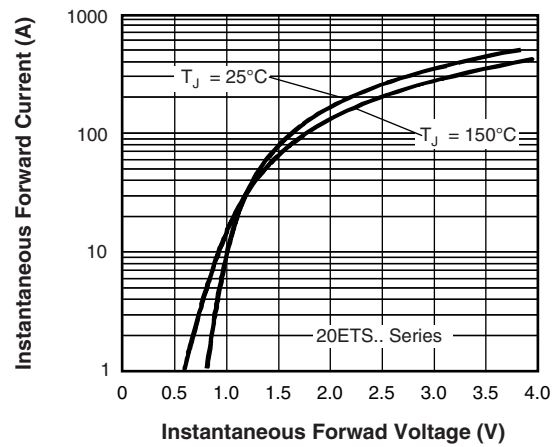


Fig. 7 - Forward Voltage Drop Characteristics

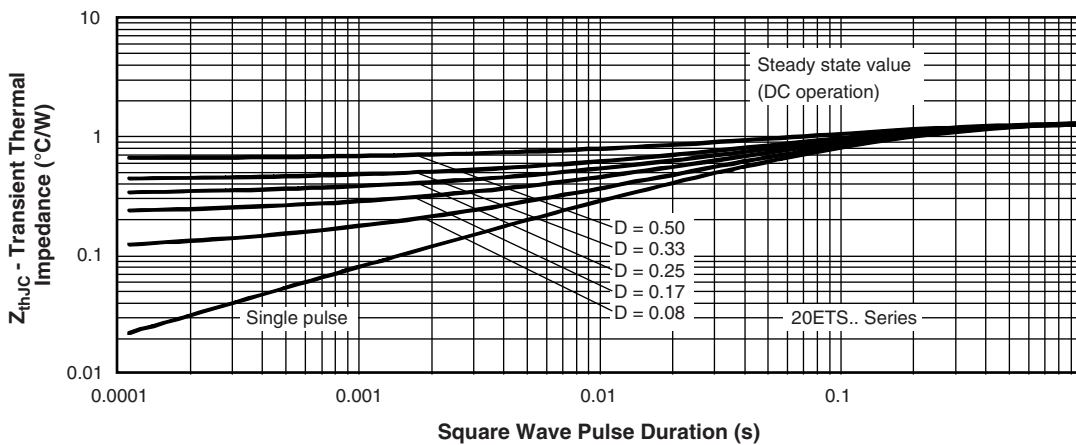


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics



# VS-20ETS08SPbF, VS-20ETS12SPbF High Voltage Series

Input Rectifier Diode, 20 A

Vishay Semiconductors

## ORDERING INFORMATION TABLE

| Device code | VS- | 20 | E | T | S | 12 | S | TRL | PbF |
|-------------|-----|----|---|---|---|----|---|-----|-----|
|             | 1   | 2  | 3 | 4 | 5 | 6  | 7 | 8   | 9   |

- 1** - HPP product suffix
- 2** - Current rating (20 = 20 A)
- 3** - Circuit configuration  
E = Single diode
- 4** - Package:  
T = TO-220AC
- 5** - Type of silicon:  
S = Standard recovery rectifier
- 6** - Voltage code x 100 =  $V_{RRM}$
- 7** - S = TO-220 D<sup>2</sup>PAK (SMD-220) version
- 8** -
  - None = Tube
  - TRL = Tape and reel (left oriented)
  - TRR = Tape and reel (right oriented)
- 9** - PbF = Lead (Pb)-free

|                           |
|---------------------------|
| 08 = 800 V<br>12 = 1200 V |
|---------------------------|

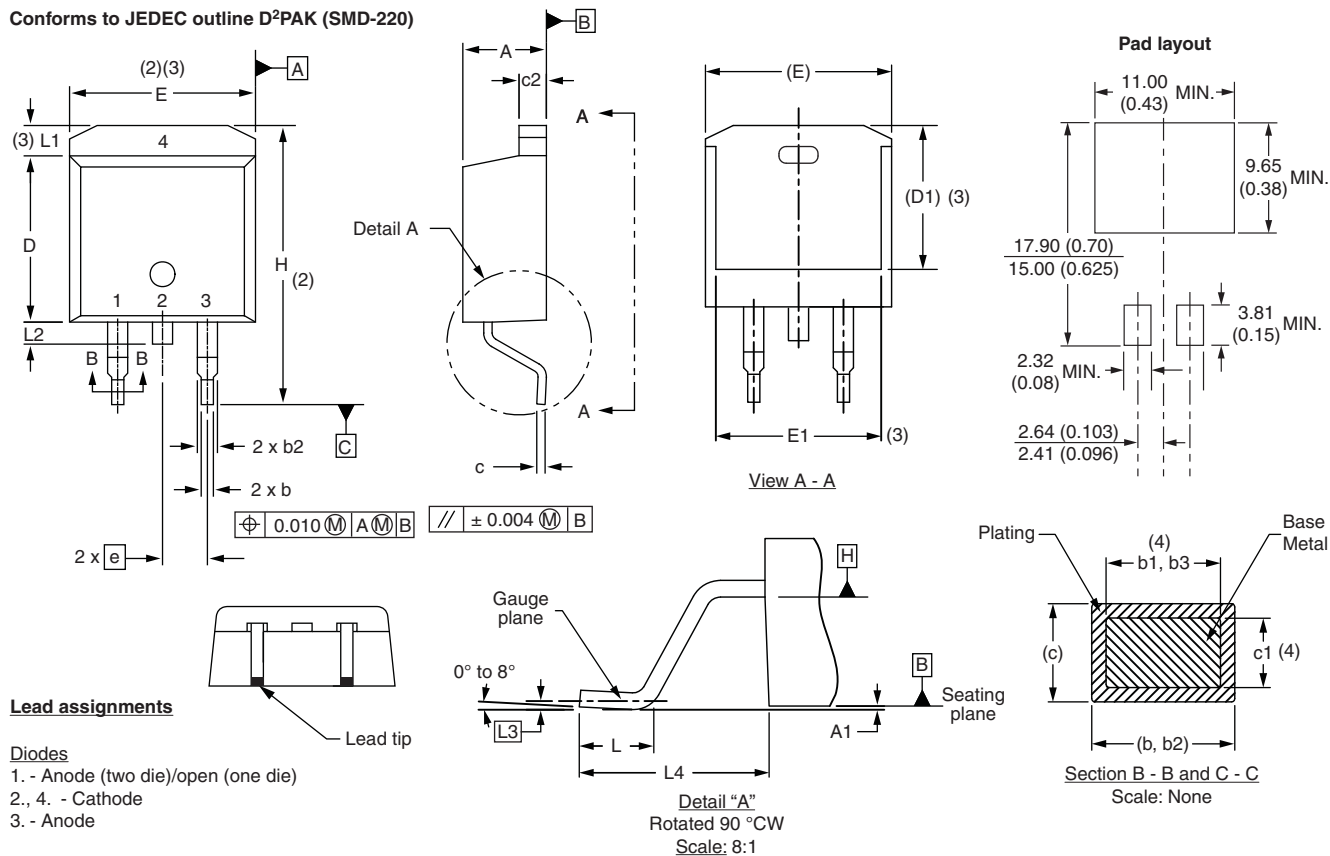
### LINKS TO RELATED DOCUMENTS

|                          |  |
|--------------------------|--|
| 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> |
| SPICE model              | <a href="http://www.vishay.com/doc?95409">www.vishay.com/doc?95409</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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