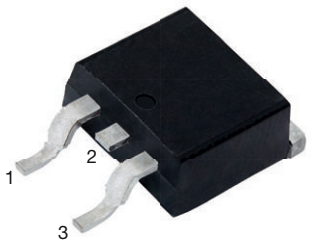
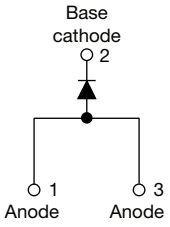
# High Voltage Surface Mount Input Rectifier Diode, 20 A




D²PAK (TO-263AB)




## FEATURES

- Glass passivated pellet chip junction
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

## APPLICATIONS

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

## DESCRIPTION

The VS-20ETS...S-M3 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.

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 20 A |
| $V_R$ | 800 V, 1200 V |
| $V_F$ at $I_F$ | 1.1 V |
| $I_{FSM}$ | 300 A |
| $T_J$ max. | 150 °C |
| Package | D²PAK (TO-263AB) |
| Circuit configuration | Single |

| OUTPUT CURRENT IN TYPICAL APPLICATIONS | | | |
|---|---|---|---|
| APPLICATIONS | SINGLE-PHASE BRIDGE | THREE-PHASE BRIDGE | UNITS |
| Capacitive input filter $T_A$ = 55 °C, $T_J$ = 125 °C 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 °C | 1.1 | V |
| $T_J$ | | -40 to +150 | °C |

| VOLTAGE RATINGS | | | |
|---|---|---|---|
| PART NUMBER | $V_{RRM}$, MAXIMUM PEAK REVERSE VOLTAGE V | $V_{RSM}$, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V | $I_{RRM}$ AT 150 °C mA |
| VS-20ETS08S-M3 | 800 | 900 | 1 |
| VS-20ETS12S-M3 | 1200 | 1300 | |

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


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| ELECTRICAL SPECIFICATIONS | | | | | |
|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | | **VALUES** | **UNITS** |
| Maximum forward voltage drop | $V_{FM}$ | 20 A, $T_J$ = 25 °C | | 1.1 | V |
| Forward slope resistance | $r_t$ | $T_J$ = 150 °C | | 10.4 | mΩ |
| Threshold voltage | $V_{F(TO)}$ | | | 0.85 | V |
| Maximum reverse leakage current | $I_{RM}$ | $T_J$ = 25 °C | $V_R$ = Rated $V_{RRM}$ | 0.1 | mA |
| | | $T_J$ = 150 °C | | 1.0 | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | |
|---|---|---|---|---|---|
| **PARAMETER** | | **SYMBOL** | **TEST CONDITIONS** | **VALUES** | **UNITS** |
| Maximum junction and storage temperature range | | $T_J$, $T_{Stg}$ | | -40 to +150 | °C |
| Maximum thermal resistance, junction to case | | $R_{thJC}$ | DC operation | 1.3 | °C/W |
| Maximum thermal resistance, junction to ambient | | $R_{thJA}$ (1) | For $D^2PAK$ version | 62 | |
| Typical thermal resistance, case to heatsink | | $R_{thCS}$ | Mounting surface, smooth, and greased | 0.5 | |
| Approximate weight | | | | 2 | g |
| | | | | 0.07 | oz. |
| Mounting torque | minimum | | | 6.0 (5.0) | kgf · cm (lbf · in) |
| | maximum | | | 12 (10) | |
| Marking device | | | Case style $D^2PAK$ (TO-263AB) | 20ETS08S | |
| | | | | 20ETS12S | |

**Note**

(1) When mounted on 1" square (650 $mm^2$) PCB of FR-4 or G-10 material 4 oz. (140 µm) copper 40 °C/W
For recommended footprint and soldering techniques refer to application note #AN-994

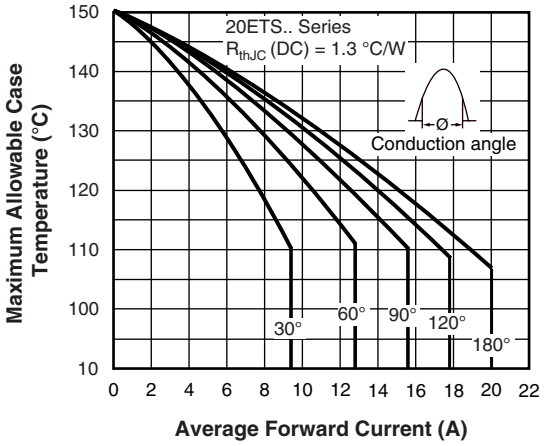



Fig. 1 - Current Rating Characteristics

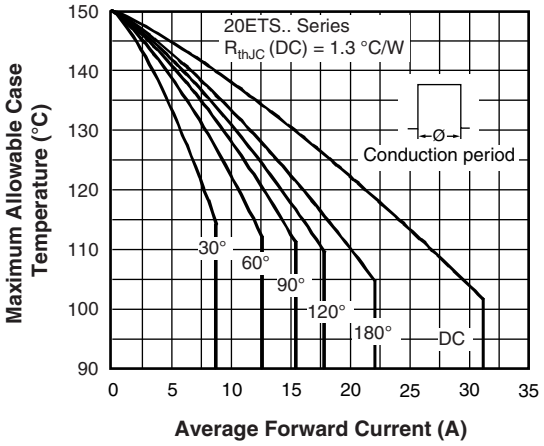



Fig. 2 - Current Rating Characteristics


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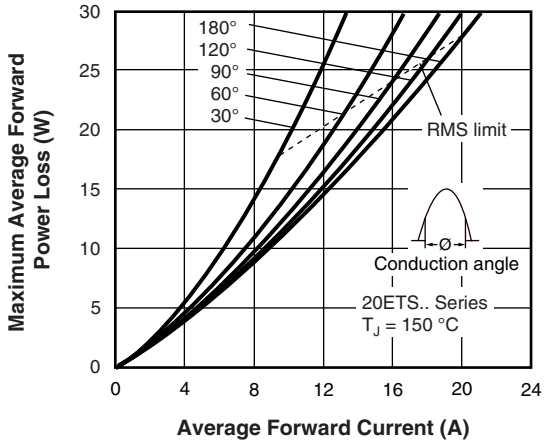



Fig. 3 - Forward Power Loss Characteristics

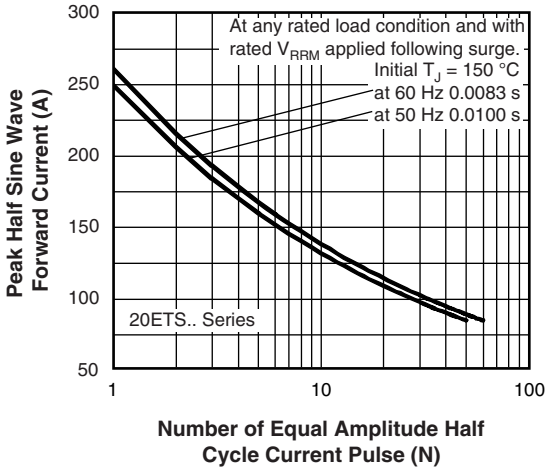



Fig. 5 - Maximum Non-Repetitive Surge Current

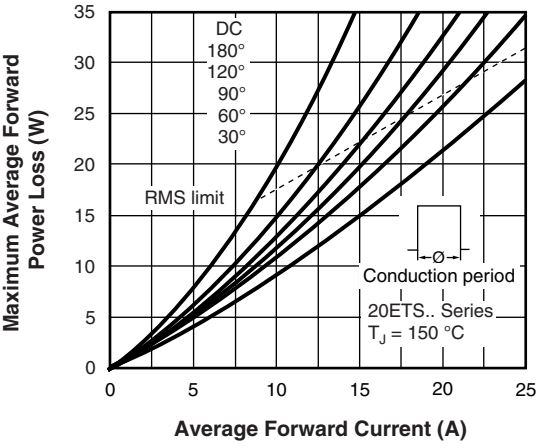



Fig. 4 - Forward Power Loss Characteristics

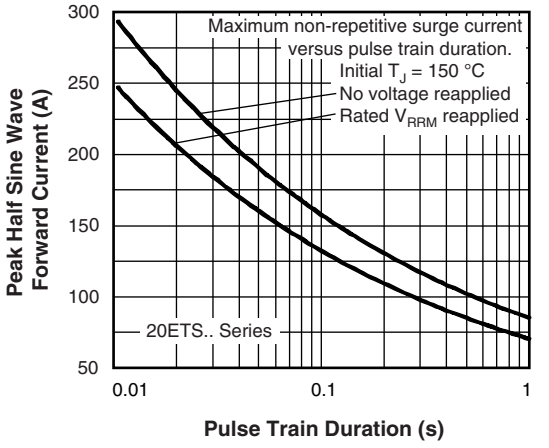



Fig. 6 - Maximum Non-Repetitive Surge Current

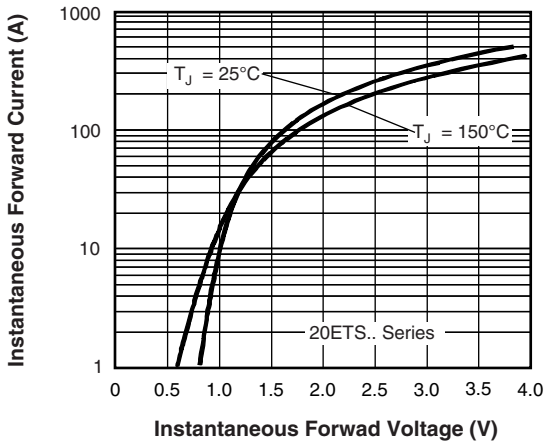



Fig. 7 - Forward Voltage Drop Characteristics


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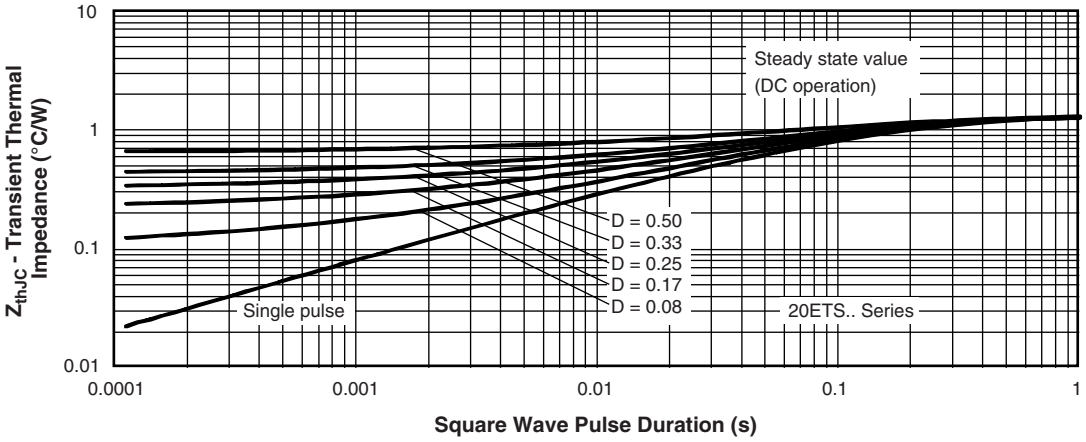



Fig. 8 - Thermal Impedance $Z_{thJC}$ Characteristics

## ORDERING INFORMATION TABLE

**Device code**

| VS- | 20 | E | T | S | 12 | S | TRL | -M3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- 1 - Vishay Semiconductors product
- 2 - Current rating (20 = 20 A)
- 3 - Circuit configuration
  E = single
- 4 - Package:
  T = $D^2PAK$ (TO-263AB)
- 5 - Type of silicon:
  S = standard recovery rectifier
- 6 - Voltage code x 100 = $V_{RRM}$ (08 = 800 V, 12 = 1200 V)
- 7 - S = surface mountable
- 8 - • None = tube
  • TRL = tape and reel (left oriented)
  • TRR = tape and reel (right oriented)
- 9 - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free


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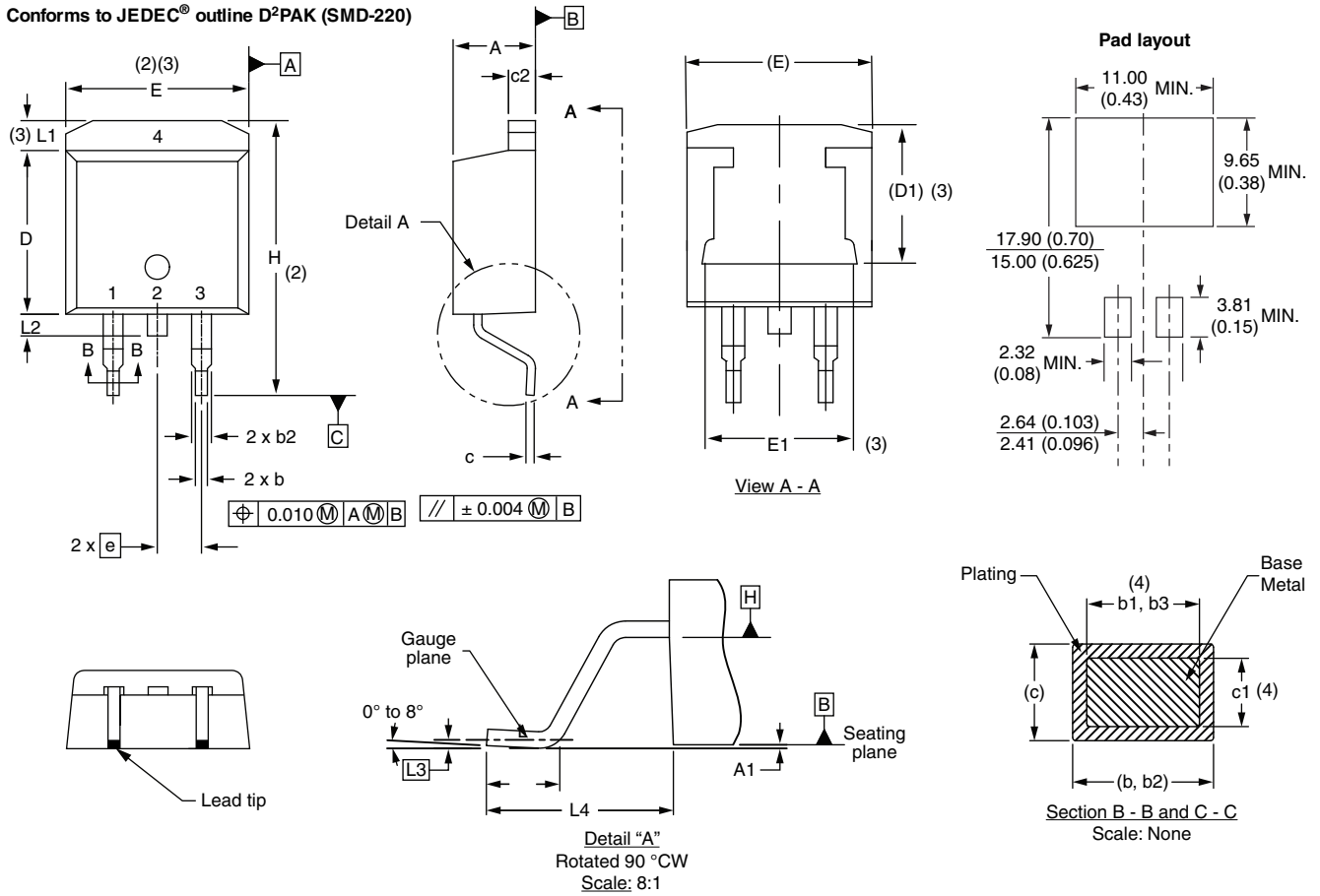
| **ORDERING INFORMATION** (Example) | | |
|---|---|---|
| **PREFERRED P/N** | **BASE QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-20ETS08S-M3 | 50 | Antistatic plastic tube |
| VS-20ETS08STRR-M3 | 800 | 13" diameter reel |
| VS-20ETS08STRL-M3 | 800 | 13" diameter reel |
| VS-20ETS12S-M3 | 50 | Antistatic plastic tube |
| VS-20ETS12STRR-M3 | 800 | 13" diameter reel |
| VS-20ETS12STRL-M3 | 800 | 13" diameter reel |

| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | www.vishay.com/doc?96164 |
| Part marking information | www.vishay.com/doc?95444 |
| Packaging information | www.vishay.com/doc?96424 |
| SPICE model | www.vishay.com/doc?97266 |


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# $D^2PAK$

**DIMENSIONS** in millimeters and inches




| 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: inches

(7) Outline conforms to JEDEC® outline TO-263AB



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