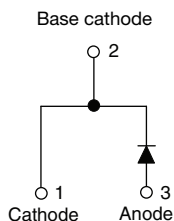
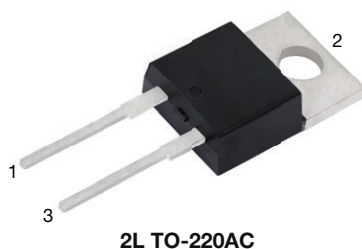


High Voltage, Input Rectifier Diode, 20 A



FEATURES

- Glass passivated pellet chip junction
- AEC-Q101 qualified
- Meets JESD 201 class 1A whisker test
- Flexible solution for reliable AC power rectification
- High surge, low V_F rugged blocking diode for DC charging stations
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- On-board and off-board EV/HEV battery chargers
- Input rectification

DESCRIPTION

High voltage rectifiers optimized for very low forward voltage drop with moderate leakage.

These devices are intended for use in main rectification (single or three phase bridge).

PRIMARY CHARACTERISTICS

| | |
|-----------------------|-------------|
| $I_{F(AV)}$ | 20 A |
| V_R | 1600 V |
| V_F at I_F | 1.1 V |
| I_{FSM} | 300 A |
| T_J max. | 150 °C |
| Package | 2L TO-220AC |
| 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} | | 1600 | V |
| I_{FSM} | | 300 | A |
| V_F | 10 A, $T_J = 25$ °C | 1.0 | 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-20ETS16THM3 | 1600 | 1700 | 1 |

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---------------|--|--------|---------------|
| Maximum average forward current | $I_{F(AV)}$ | $T_C = 105\text{ }^\circ\text{C}$, 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 | |
| | | 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 | $I^2\sqrt{t}$ | $t = 0.1\text{ ms to }10\text{ ms}$, no voltage reapplied | 4420 | $A^2\sqrt{s}$ |

ELECTRICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---------------------------------|-------------|--|--------|-----------|
| Maximum forward voltage drop | V_{FM} | 20 A, $T_J = 25\text{ }^\circ\text{C}$ | 1.1 | V |
| Forward slope resistance | r_t | $T_J = 150\text{ }^\circ\text{C}$ | 10.4 | $m\Omega$ |
| Threshold voltage | $V_{F(TO)}$ | | 0.85 | V |
| Maximum reverse leakage current | I_{RM} | $T_J = 25\text{ }^\circ\text{C}$ | 0.1 | mA |
| | | $T_J = 150\text{ }^\circ\text{C}$ | 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 |
| 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 (5) | kgf · cm (lbf · in) |
| | maximum | | 12 (10) | |
| Marking device | | Case style 2L TO-220AC | 20ETS16TH | |

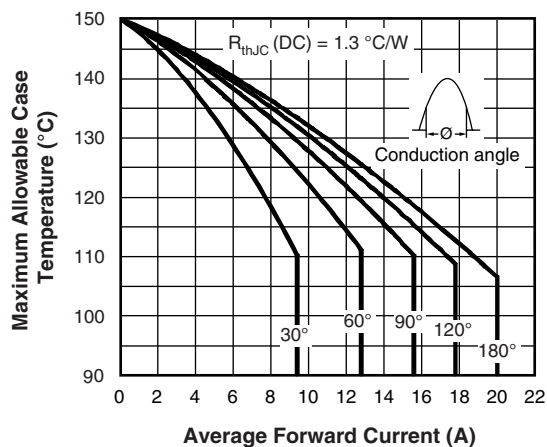


Fig. 1 - Current Rating Characteristics

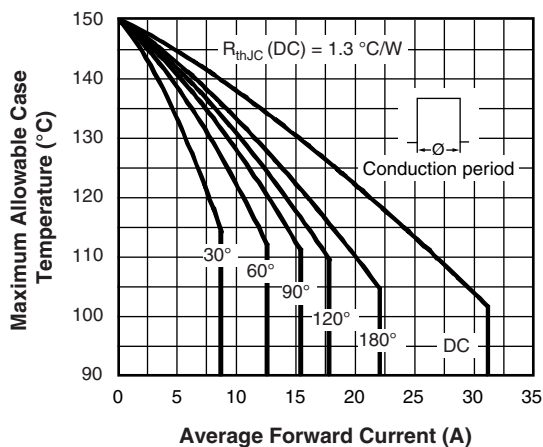


Fig. 2 - Current Rating Characteristics

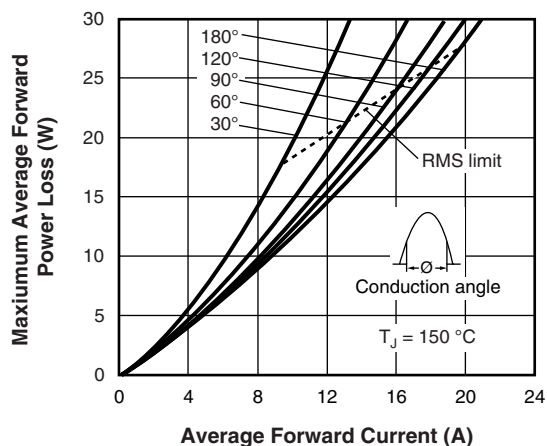


Fig. 3 - Forward Power Loss Characteristics

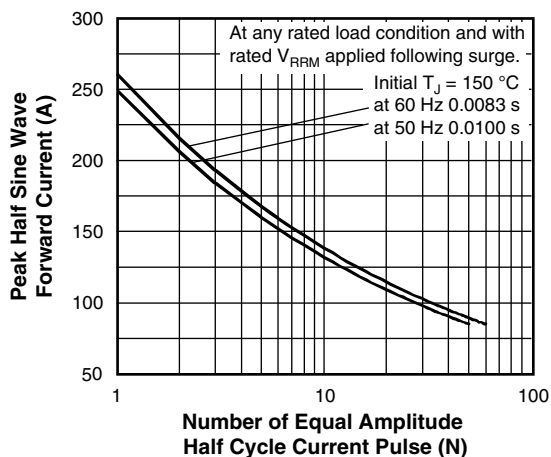


Fig. 5 - Maximum Non-Repetitive Surge Current

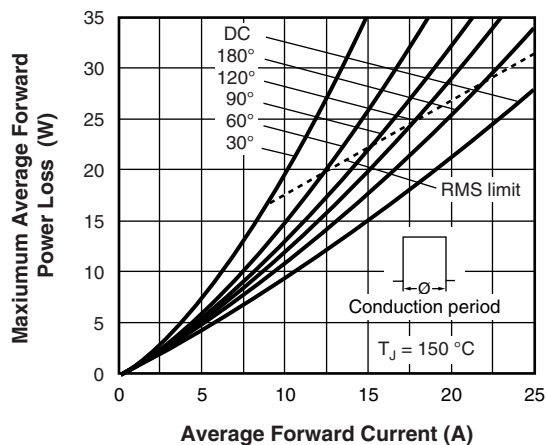


Fig. 4 - Forward Power Loss Characteristics

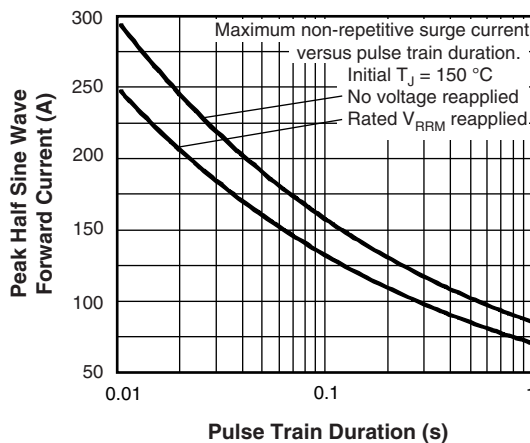


Fig. 6 - Maximum Non-Repetitive Surge Current

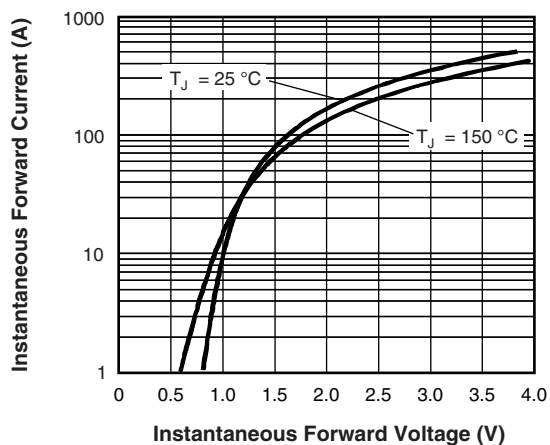
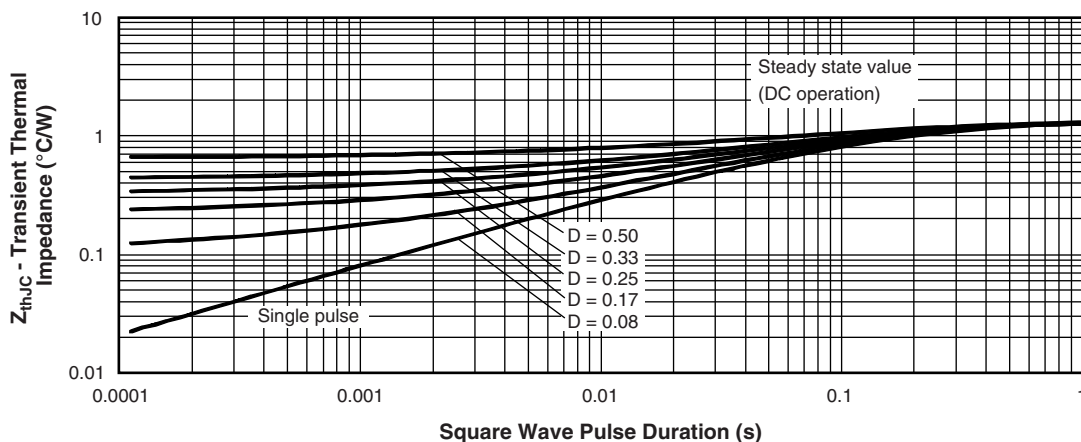


Fig. 7 - Forward Voltage Drop Characteristics


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

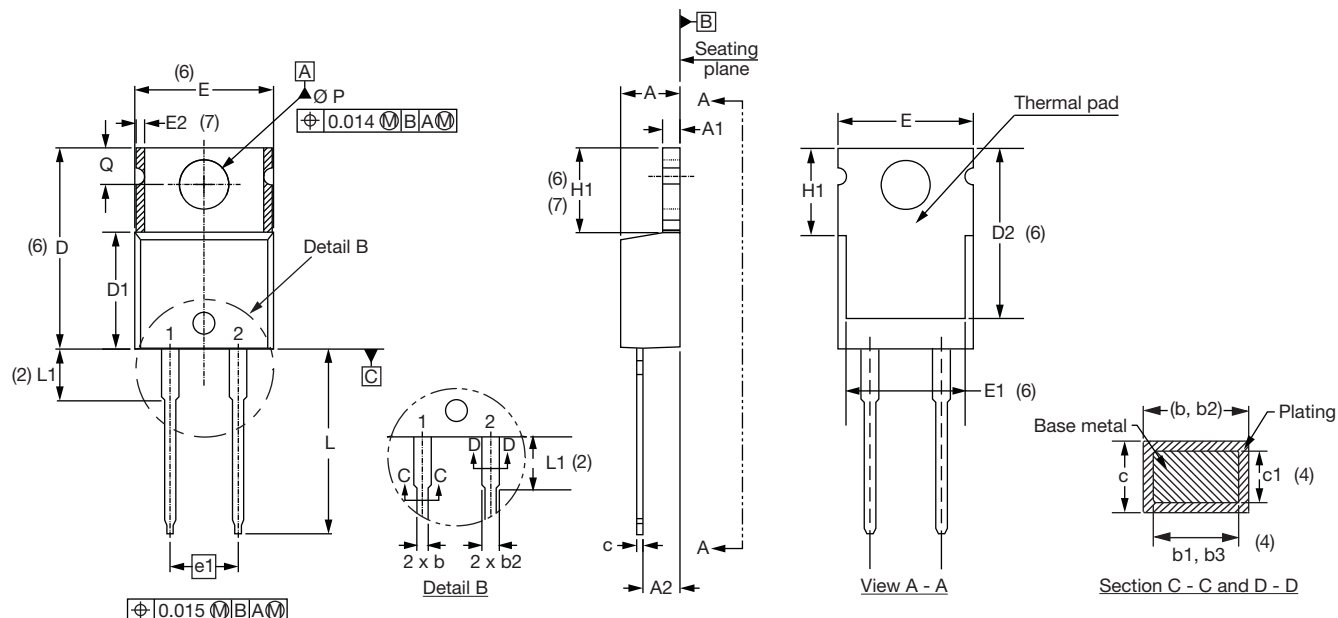
| Device code | VS- | 20 | E | T | S | 16 | T | H | M3 |
|-------------|--|----|---|---|---|----|---|---|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | Vishay Semiconductors product | | | | | | | | |
| 2 | Current rating (20 = 20 A) | | | | | | | | |
| 3 | Circuit configuration: E = 2L TO-220AC | | | | | | | | |
| 4 | Package: T = TO-220 | | | | | | | | |
| 5 | Type of silicon: S = standard recovery rectifier | | | | | | | | |
| 6 | Voltage code x 100 = V_{RRM} ——— 16 = 1600 V | | | | | | | | |
| 7 | <ul style="list-style-type: none"> None = TO-220AB T = True pin TO-220 | | | | | | | | |
| 8 | H = AEC-Q101 qualified | | | | | | | | |
| 9 | Environmental digit: M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free | | | | | | | | |

| ORDERING INFORMATION (Example) | | | |
|--------------------------------|------------------|------------------------|--------------------------|
| PREFERRED P/N | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-20ETS16THM3 | 50 | 1000 | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?96069 |
| Part marking information | www.vishay.com/doc?95391 |

2L TO-220AC

DIMENSIONS in millimeters and inches



| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 4.25 | 4.65 | 0.167 | 0.183 | |
| A1 | 1.14 | 1.40 | 0.045 | 0.055 | |
| A2 | 2.56 | 2.92 | 0.101 | 0.115 | |
| b | 0.69 | 1.01 | 0.027 | 0.040 | |
| b1 | 0.38 | 0.97 | 0.015 | 0.038 | 4 |
| b2 | 1.20 | 1.73 | 0.047 | 0.068 | |
| b3 | 1.14 | 1.73 | 0.045 | 0.068 | 4 |
| c | 0.36 | 0.61 | 0.014 | 0.024 | |
| c1 | 0.36 | 0.56 | 0.014 | 0.022 | 4 |
| D | 14.85 | 15.25 | 0.585 | 0.600 | 3 |
| D1 | 8.38 | 9.02 | 0.330 | 0.355 | |
| D2 | 11.68 | 12.88 | 0.460 | 0.507 | 6 |
| E | 10.11 | 10.51 | 0.398 | 0.414 | 3, 6 |

| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| E1 | 6.86 | 8.89 | 0.270 | 0.350 | 6 |
| E2 | - | 0.76 | - | 0.030 | 7 |
| e | 2.41 | 2.67 | 0.095 | 0.105 | |
| e1 | 4.88 | 5.28 | 0.192 | 0.208 | |
| H1 | 6.09 | 6.48 | 0.240 | 0.255 | 6, 7 |
| L | 13.52 | 14.02 | 0.532 | 0.552 | |
| L1 | 3.32 | 3.82 | 0.131 | 0.150 | 2 |
| Ø P | 3.54 | 3.73 | 0.139 | 0.147 | |
| Q | 2.60 | 3.00 | 0.102 | 0.118 | |

Notes

- Dimensioning and tolerancing as per ASME Y14.5M-1994
- Lead dimension and finish uncontrolled in L1
- Dimension D, D1 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 outermost extremes of the plastic body
- Dimension b1, b3 and c1 apply to base metal only
- Controlling dimension: inches
- Thermal pad contour optional within dimensions E, H1, D2 and E1
- Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- Outline conforms to JEDEC® TO-220, except D2, where JEDEC® minimum is 0.480".



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