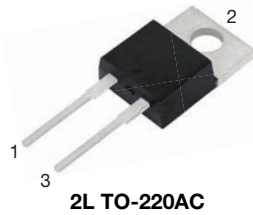
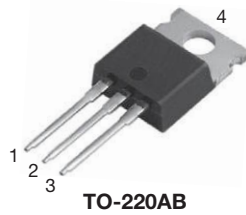
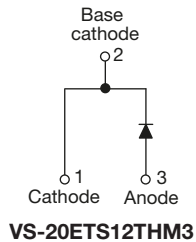
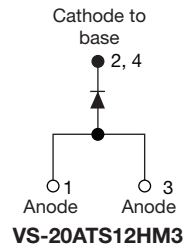


High Voltage, Input Rectifier Diode, 20 A


2L TO-220AC

TO-220AB

VS-20ETS12THM3

VS-20ATS12HM3

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 | 1200 V |
| V_F at I_F | 1.1 V |
| I_{FSM} | 300 A |
| T_J max. | 150 °C |
| Package | 2L TO-220AC, 3L TO-220AB |
| Circuit configuration | Single, common anode |

| 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} | | 1200 | 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-20ETS12THM3, VS-20ATS12HM3 | 1200 | 1300 | 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 | $^\circ\text{C}$ |
| Maximum thermal resistance, junction to case | R_{thJC} | DC operation | 1.3 | $^\circ\text{C/W}$ |
| 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) | $\text{kgf} \cdot \text{cm}$ $(\text{lbf} \cdot \text{in})$ |
| | maximum | | 12 (10) | |
| Marking device | | Case style 2L TO-220AC | 20ETS12TH | |
| | | Case style 3L TO-220AB | 20ATS12H | |

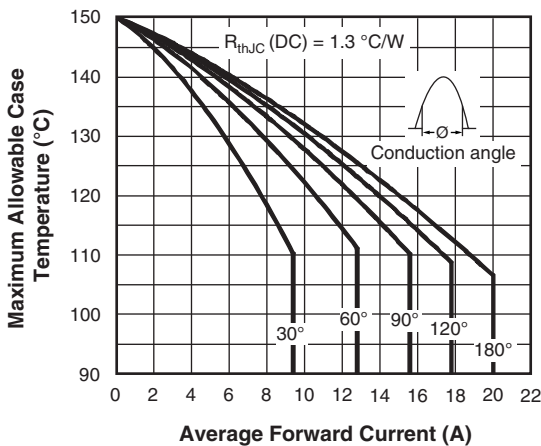


Fig. 1 - Current Rating Characteristics

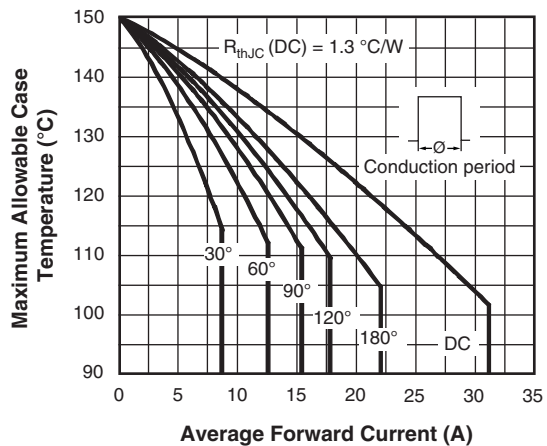


Fig. 2 - Current Rating Characteristics

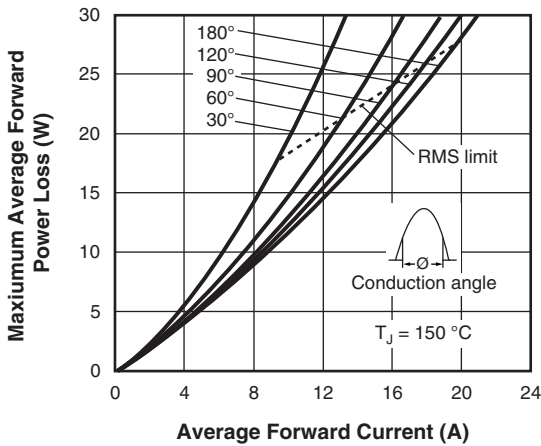


Fig. 3 - Forward Power Loss Characteristics

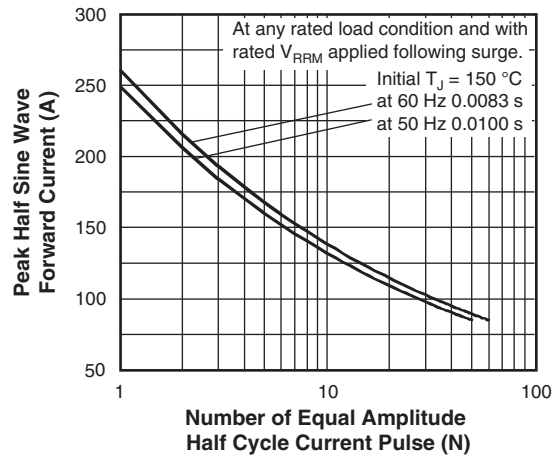


Fig. 5 - Maximum Non-Repetitive Surge Current

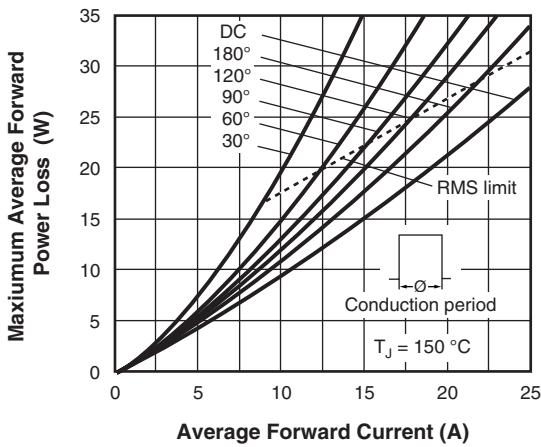


Fig. 4 - Forward Power Loss Characteristics

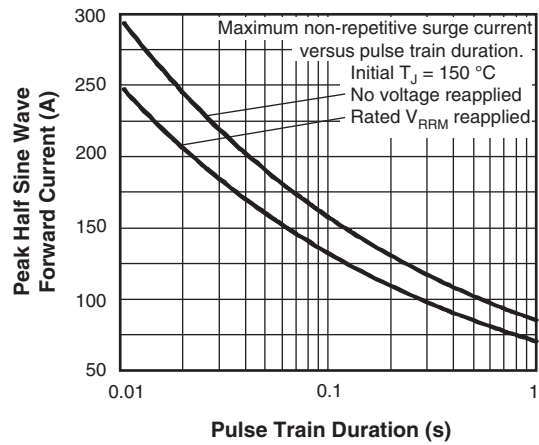


Fig. 6 - Maximum Non-Repetitive Surge Current

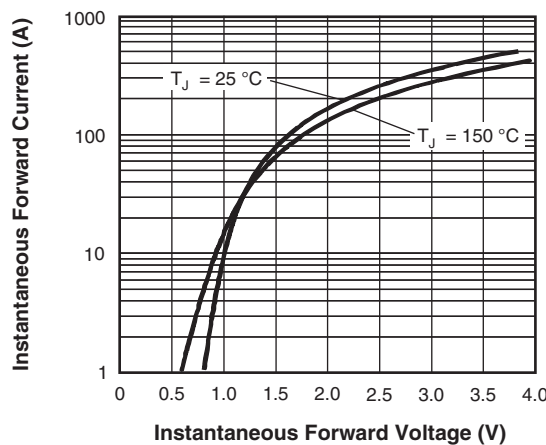
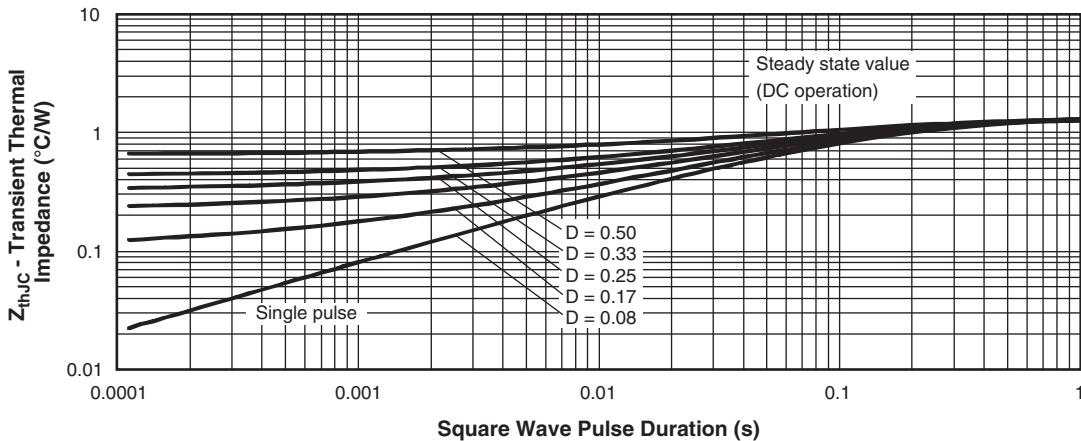


Fig. 7 - Forward Voltage Drop Characteristics


 Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

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

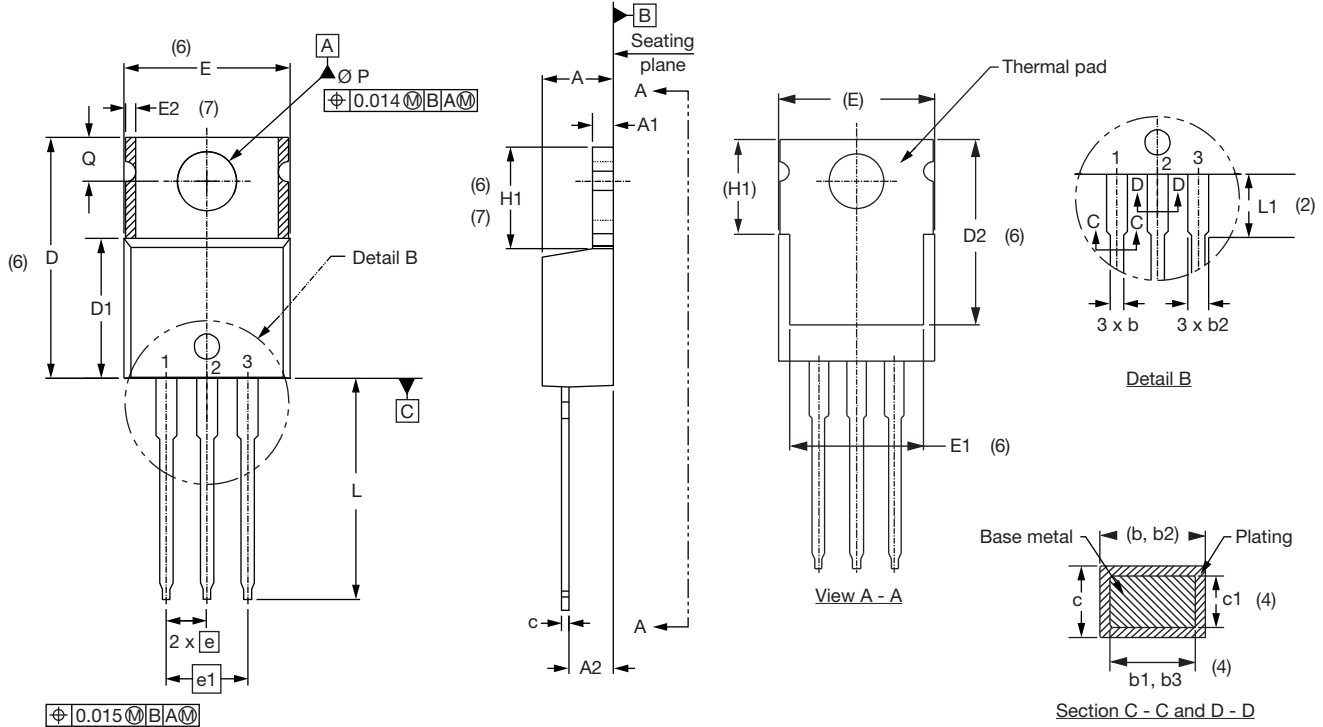
- 1** - Vishay Semiconductors product
- 2** - Current rating (20 = 20 A)
- 3** - Circuit configuration:
E = 2L TO-220AC
A = 3L TO-220AB
- 4** - Package:
T = TO-220
- 5** - Type of silicon:
S = standard recovery rectifier
- 6** - Voltage code x 100 = V_{RRM} ——— **12 = 1200 V**
- 7** -
 - None = TO-220AB
 - 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-20ETS12THM3 | 50 | 1000 | Antistatic plastic tubes |
| VS-20ATS12HM3 | 50 | 1000 | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS | | |
|-----------------------------------|-------------|--|
| Dimensions | 2L TO-220AC | www.vishay.com/doc?95259 |
| | 3L TO-220AB | www.vishay.com/doc?95222 |
| Part marking information | 2L TO-220AC | www.vishay.com/doc?95391 |
| | 3L TO-220AB | www.vishay.com/doc?95028 |
| SPIICE model | | www.vishay.com/doc?96046 |

TO-220AB

DIMENSIONS in millimeters and inches



Lead assignments

Diodes

- 1. - Anode/open
- 2. - Cathode
- 3. - Anode

Conforms to JEDEC outline TO-220AB

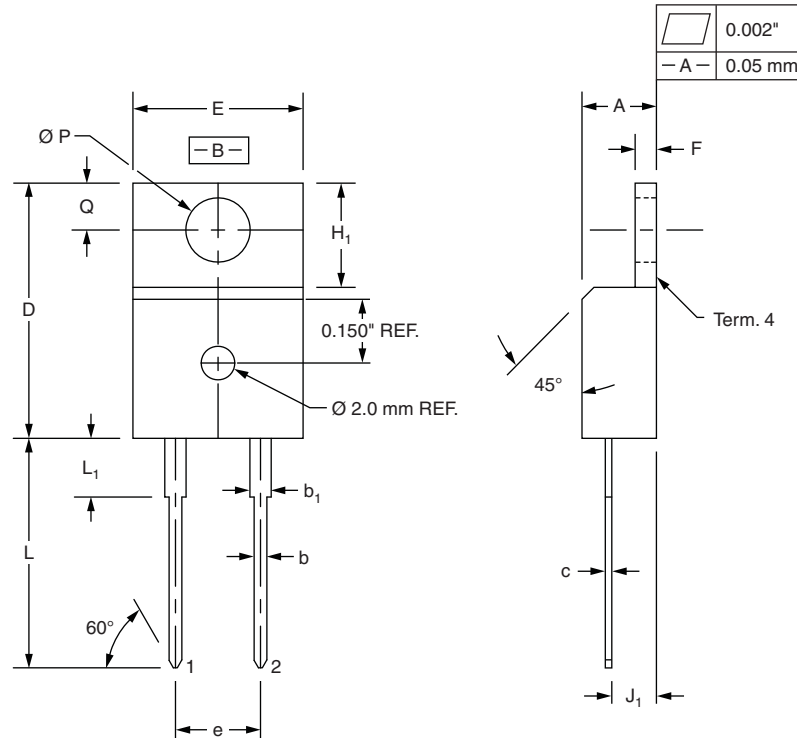
| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|------------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 4.25 | 4.65 | 0.167 | 0.183 | |
| A1 | 1.14 | 1.40 | 0.045 | 0.055 | |
| A2 | 2.56 | 2.92 | 0.101 | 0.115 | |
| b | 0.69 | 1.01 | 0.027 | 0.040 | |
| b1 | 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 |
| 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 | |
| θ | 90° to 93° | | 90° to 93° | | |

Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) 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
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimensions E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, except A2 (maximum) and D2 (minimum) where dimensions are derived from the actual package outline

True 2 Pin TO-220

DIMENSIONS in millimeters and inches



| SYMBOL | MILLIMETERS | | INCHES | |
|-------------------------------|-------------|-------|-----------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.32 | 4.57 | 0.170 | 0.180 |
| b | 0.71 | 0.91 | 0.028 | 0.036 |
| b ₁ | 1.15 | 1.39 | 0.045 | 0.055 |
| c | 0.36 | 0.53 | 0.014 | 0.021 |
| D | 14.99 | 15.49 | 0.590 | 0.610 |
| E | 10.04 | 10.41 | 0.395 | 0.410 |
| e | 5.08 BSC | | 0.200 BSC | |
| F | 1.22 | 1.37 | 0.048 | 0.054 |
| H ₁ | 5.97 | 6.47 | 0.235 | 0.255 |
| J ₁ | 2.54 | 2.79 | 0.100 | 0.110 |
| L | 13.47 | 13.97 | 0.530 | 0.550 |
| L ₁ ⁽¹⁾ | 3.31 | 3.81 | 0.130 | 0.150 |
| Ø P | 3.79 | 3.88 | 0.149 | 0.153 |
| Q | 2.60 | 2.84 | 0.102 | 0.112 |

Notes

⁽¹⁾ Lead dimension and finish uncontrolled in L₁

- These dimensions are within allowable dimensions of JEDEC TO-220AB rev. J outline dated 3-24-87
- Controlling dimension: Inch



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