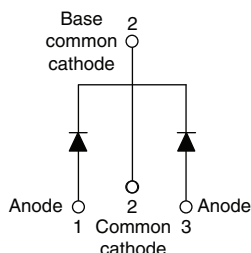




High Performance Schottky Rectifier, 2 x 10 A



TO-220AB



FEATURES

- 150 °C T_J operation
- Low forward voltage drop
- High frequency operation
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Guard ring for enhanced ruggedness and long term reliability
- AEC-Q101 qualified meets JESD 201 class 2 whisker test
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

PRODUCT SUMMARY

| | |
|-----------------|-----------------|
| $I_{F(AV)}$ | 2 x 10 A |
| V_R | 35 V, 45 V |
| V_F at I_F | 0.57 V |
| I_{RM} max. | 15 mA at 125 °C |
| T_J max. | 150 °C |
| E_{AS} | 8 mJ |
| Package | TO-220AB |
| Diode variation | Common cathode |

DESCRIPTION

This center tap Schottky rectifier has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 150 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
|-------------|-------------------------------------|------------|-------|
| $I_{F(AV)}$ | Rectangular waveform (per device) | 20 | A |
| V_{RRM} | | 35/45 | V |
| I_{FRM} | $T_C = 135$ °C (per leg) | 20 | A |
| I_{FSM} | $t_p = 5$ μ s sine | 1060 | |
| V_F | 10 A _{pk} , $T_J = 125$ °C | 0.57 | V |
| T_J | Range | -65 to 150 | °C |

VOLTAGE RATINGS

| PARAMETER | SYMBOL | VS-MBR2035CTHN3 | VS-MBR2045CTHN3 | UNITS |
|--------------------------------------|-----------|-----------------|-----------------|-------|
| Maximum DC reverse voltage | V_R | 35 | 45 | V |
| Maximum working peak reverse voltage | V_{RWM} | | | |

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|-------------|---|---|--------|-------|
| Maximum average forward current | $I_{F(AV)}$ | $T_C = 135$ °C, rated V_R | | 10 | A |
| | | | | 20 | |
| Peak repetitive forward current per leg | I_{FRM} | Rated V_R , square wave, 20 kHz, $T_C = 135$ °C | | 20 | |
| Non-repetitive peak surge current | I_{FSM} | 5 μ s sine or 3 μ s rect. pulse | Following any rated load condition and with rated V_{RRM} applied | 1060 | |
| | | Surge applied at rated load condition half wave, single phase, 60 Hz | | 150 | |
| Repetitive avalanche current per leg | I_{AR} | Current decaying linearly to zero in 1 μ s Frequency limited by T_J maximum $V_A = 1.5 \times V_R$ typical | | 2 | |
| Non-repetitive avalanche energy per leg | E_{AS} | $T_J = 25$ °C, $I_{AS} = 2$ A, $L = 4$ mH | | 8 | mJ |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---------------------------------------|----------------|---|-------------------------------------|--------|------------|
| Maximum forward voltage drop | $V_{FM}^{(1)}$ | 20 A | $T_J = 25\text{ }^{\circ}\text{C}$ | 0.84 | V |
| | | 10 A | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.57 | |
| | | 20 A | | 0.72 | |
| Maximum instantaneous reverse current | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$ | Rated DC voltage | 0.1 | mA |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | | 15 | |
| Threshold voltage | $V_{F(TO)}$ | $T_J = T_J$ maximum | | 0.354 | V |
| Forward slope resistance | r_t | | | 17.6 | $m\Omega$ |
| Maximum junction capacitance | C_T | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^{\circ}\text{C}$ | | 600 | pF |
| Typical series inductance | L_S | Measured from top of terminal to mounting plane | | 8.0 | nH |
| Maximum voltage rate of change | dV/dt | Rated V_R | | 10 000 | V/ μ s |

Note(1) Pulse width < 300 μ s, duty cycle < 2 %**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|--|-------------------|--|------------|------------------------|
| Maximum junction temperature range | T _J | | -65 to 150 | °C |
| Maximum storage temperature range | T _{Stg} | | -65 to 175 | |
| Maximum thermal resistance, junction to case per leg | R _{thJC} | DC operation | 2.0 | °C/W |
| Typical thermal resistance, case to heatsink | R _{thCS} | Mounting surface, smooth and greased (only for TO-220) | 0.50 | |
| Approximate weight | | | 2 | g |
| | | | 0.07 | oz. |
| Mounting torque | minimum | Non-lubricated threads | 6 (5) | kgf · cm (lbf · in) |
| | maximum | | 12 (10) | |
| Marking device | | Case style TO-220AB | MBR2035CTH | |
| | | | MBR2045CTH | |

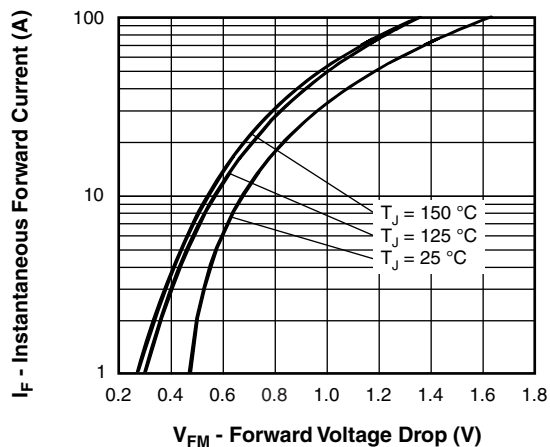


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

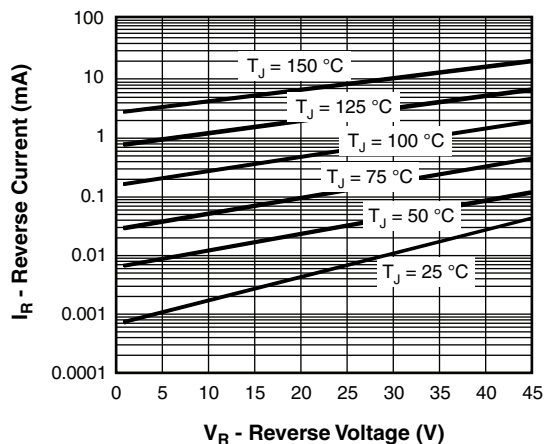


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

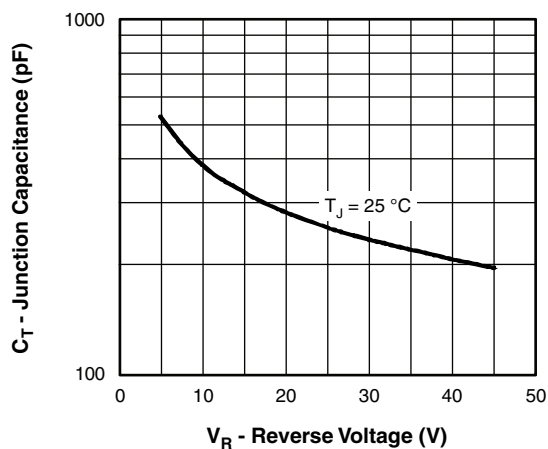
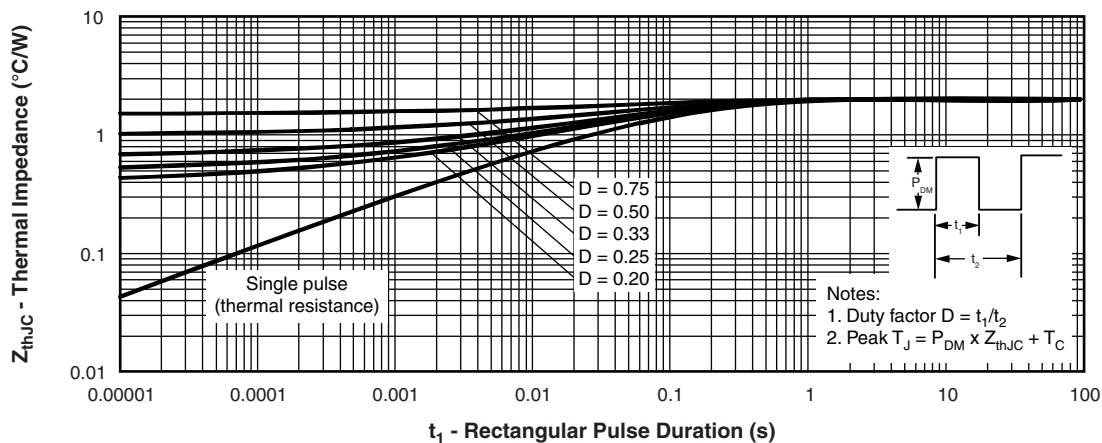


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

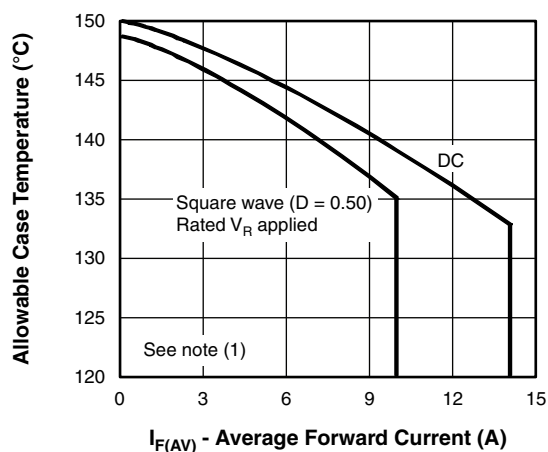


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

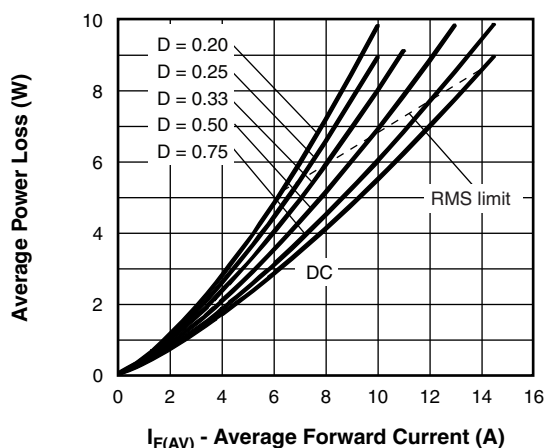


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

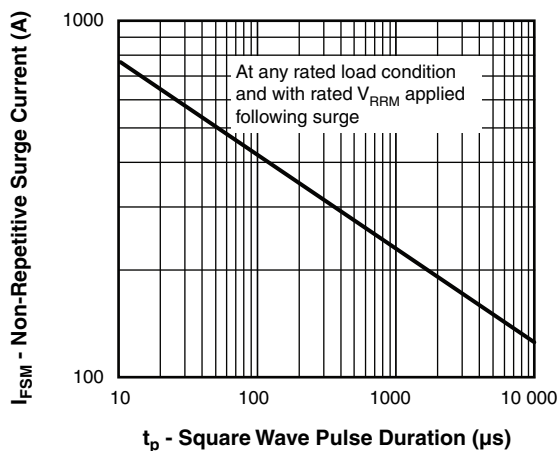


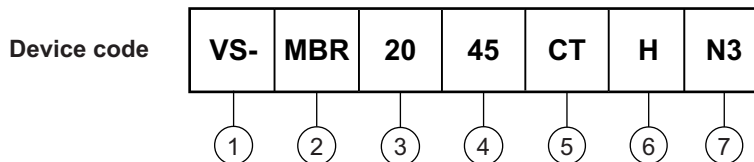
Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

Note

- (1) Formula used: $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$;
 P_d = Forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
 P_{dREV} = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = Rated V_R



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Schottky MBR series
- 3** - Current rating (20 = 20 A)
- 4** - Voltage ratings

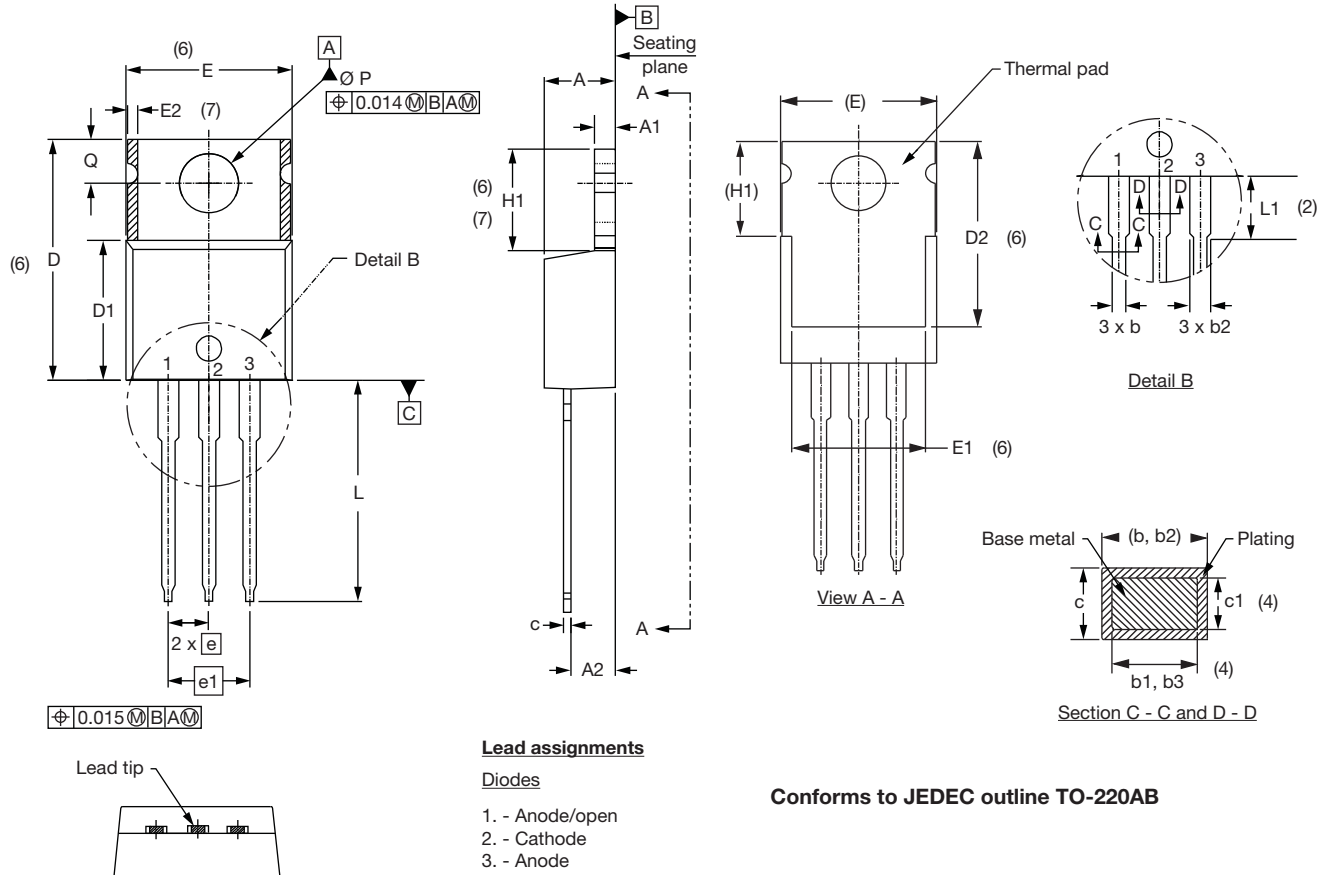
| |
|-----------|
| 35 = 35 V |
| 45 = 45 V |
- 5** - CT = Essential part number
- 6** - H = AEC-Q101 qualified
- 7** - Environmental digit
 - N3 = Halogen-free, RoHS-compliant, and totally lead (Pb)-free

| ORDERING INFORMATION (Example) | | | |
|--------------------------------|------------------|------------------------|-------------------------|
| PREFERRED P/N | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-MBR2035CTHN3 | 50 | 1000 | Antistatic plastic tube |
| VS-MBR2045CTHN3 | 50 | 1000 | Antistatic plastic tube |

| LINKS TO RELATED DOCUMENTS | |
|--------------------------------------|--|
| Dimensions | www.vishay.com/doc?95222 |
| Part marking information TO-220AB-N3 | www.vishay.com/doc?95028 |
| SPIICE model | www.vishay.com/doc?95295 |

TO-220AB

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 |

| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|------------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| 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



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