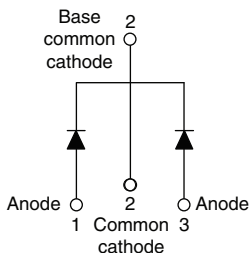


Schottky Rectifier, 2 x 20 A


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
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified according to JEDEC-JESD47
- Halogen-free according to IEC 61249-2-21 definition (-N3 only)



RoHS
COMPLIANT
HALOGEN
FREE
Available

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.

PRODUCT SUMMARY

| | |
|-----------------|-----------------|
| Package | TO-220AB |
| $I_{F(AV)}$ | 2 x 20 A |
| V_R | 45 V |
| V_F at I_F | 0.58 V |
| I_{RM} max. | 95 mA at 125 °C |
| T_J max. | 150 °C |
| Diode variation | Common cathode |
| E_{AS} | 20 mJ |

MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
|-------------|-----------------------------------|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform (per device) | 40 | A |
| V_{RRM} | | 45 | V |
| I_{FRM} | $T_C = 118$ °C (per leg) | 40 | A |
| I_{FSM} | $t_p = 5$ μ s sine | 900 | |
| V_F | 20 A_{pk} , $T_J = 125$ °C | 0.58 | V |
| T_J | Range | - 65 to 150 | °C |

VOLTAGE RATINGS

| PARAMETER | SYMBOL | VS-MBR4045CTPbF | VS-MBR4045CT-N3 | UNITS |
|--------------------------------------|-----------|-----------------|-----------------|-------|
| Maximum DC reverse voltage | V_R | 45 | 45 | V |
| Maximum working peak reverse voltage | V_{RWM} | | | |

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|-------------|---|--------|-------|
| Maximum average forward current per leg per device | $I_{F(AV)}$ | $T_C = 118$ °C, rated V_R | 20 | A |
| | | | 40 | |
| Peak repetitive forward current per leg | I_{FRM} | Rated V_R , square wave, 20 kHz, $T_C = 118$ °C | 40 | |
| Maximum peak one cycle non-repetitive surge current per leg | I_{FSM} | 5 μ s sine or 3 μ s rect. pulse | 900 | |
| | | 10 ms sine or 6 ms rect. pulse | 210 | |
| Non-repetitive avalanche energy per leg | E_{AS} | $T_J = 25$ °C, $I_{AS} = 3$ A, $L = 4.40$ mH | 20 | mJ |
| 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 | 3 | A |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS | |
|---------------------------------------|----------------|---|-------------------------------------|--------|------------|--|
| Maximum forward voltage drop | $V_{FM}^{(1)}$ | 20 A | $T_J = 25\text{ }^{\circ}\text{C}$ | 0.60 | V | |
| | | 40 A | | 0.78 | | |
| | | 20 A | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.58 | | |
| | | 40 A | | 0.75 | | |
| Maximum instantaneous reverse current | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$ | Rated DC voltage | 1 | mA | |
| | | $T_J = 100\text{ }^{\circ}\text{C}$ | | 50 | | |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | | 95 | | |
| Maximum junction capacitance | C_T | $V_R = 5\text{ }V_{DC}$, (test signal range 100 kHz to 1 MHz) $25\text{ }^{\circ}\text{C}$ | | 900 | 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 | 1.5 | °C/W |
| Typical thermal resistance, case to heatsink | R _{thCS} | Mounting surface, smooth and greased (Only for TO-220) | 0.50 | |
| Maximum thermal resistance, junction to ambient | R _{thJA} | DC operation (For D ² PAK and TO-262) | 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 | MBR4045CT | |

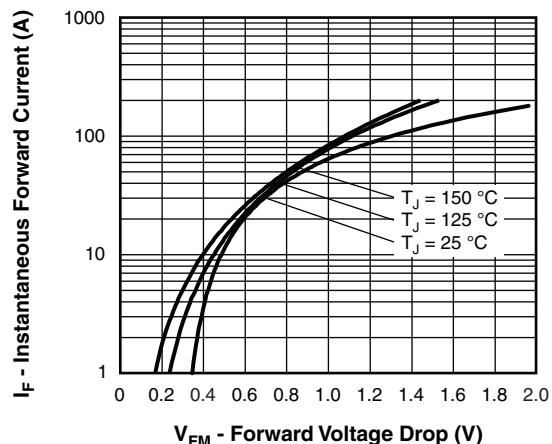


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

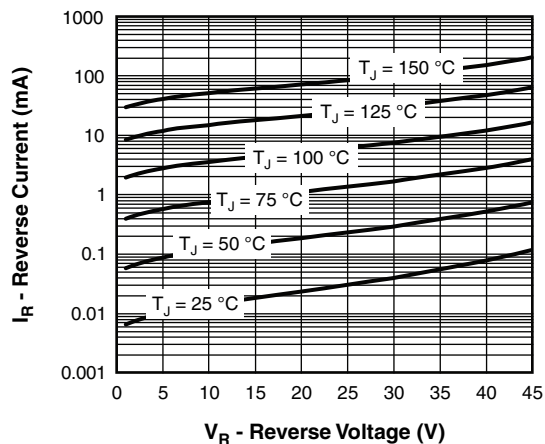


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

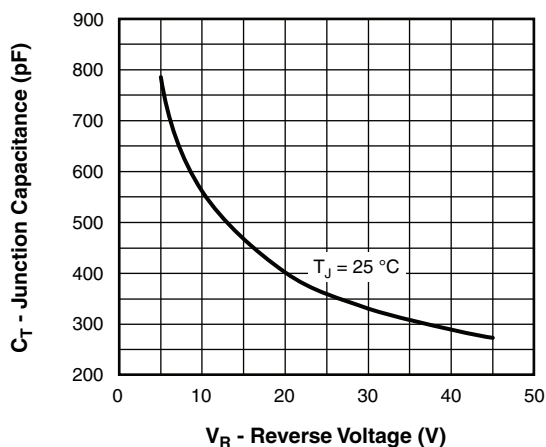


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

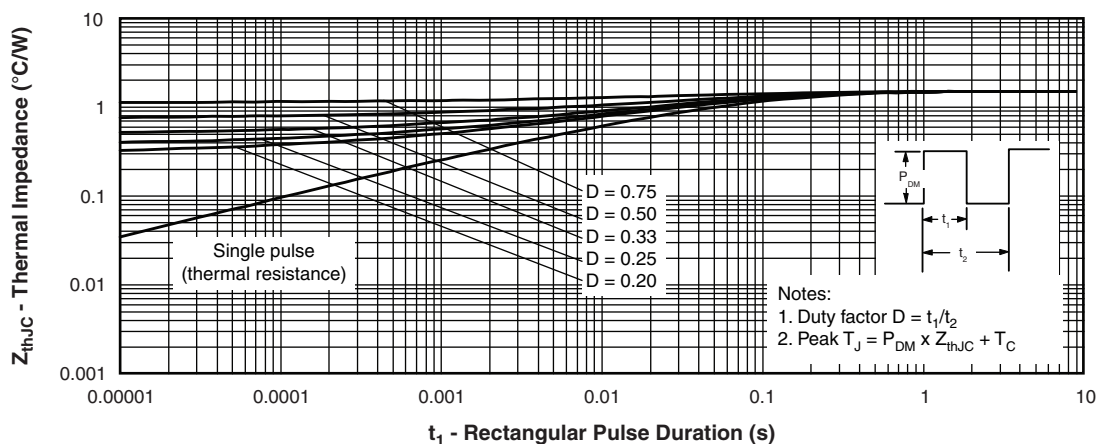


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

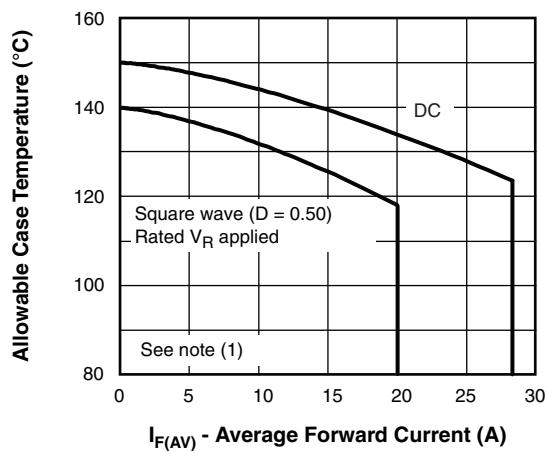


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

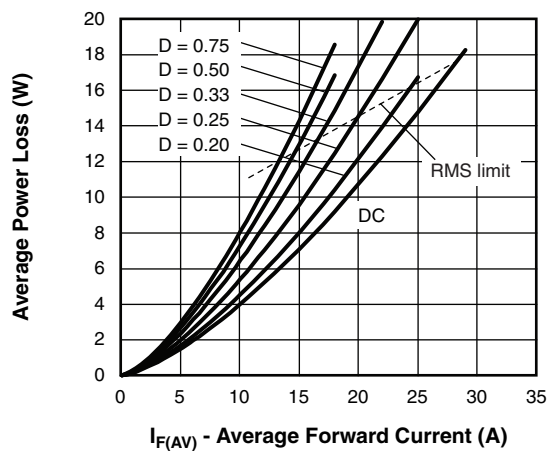


Fig. 6 - Forward Power Loss Characteristics

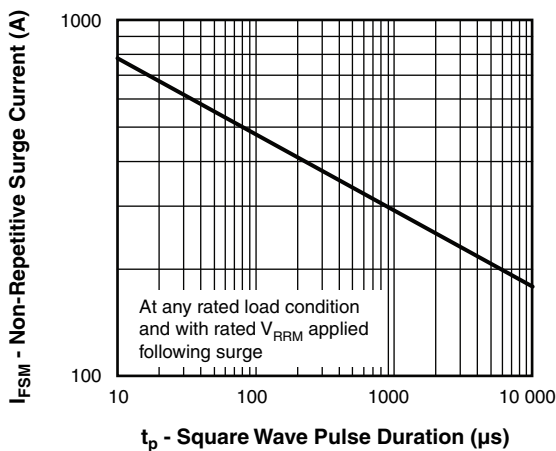


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

Note

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

**ORDERING INFORMATION TABLE**

| | | | | | | |
|-------------|------------|------------|-----------|-----------|-----------|------------|
| Device code | VS- | MBR | 40 | 45 | CT | PbF |
| | ① | ② | ③ | ④ | ⑤ | ⑥ |

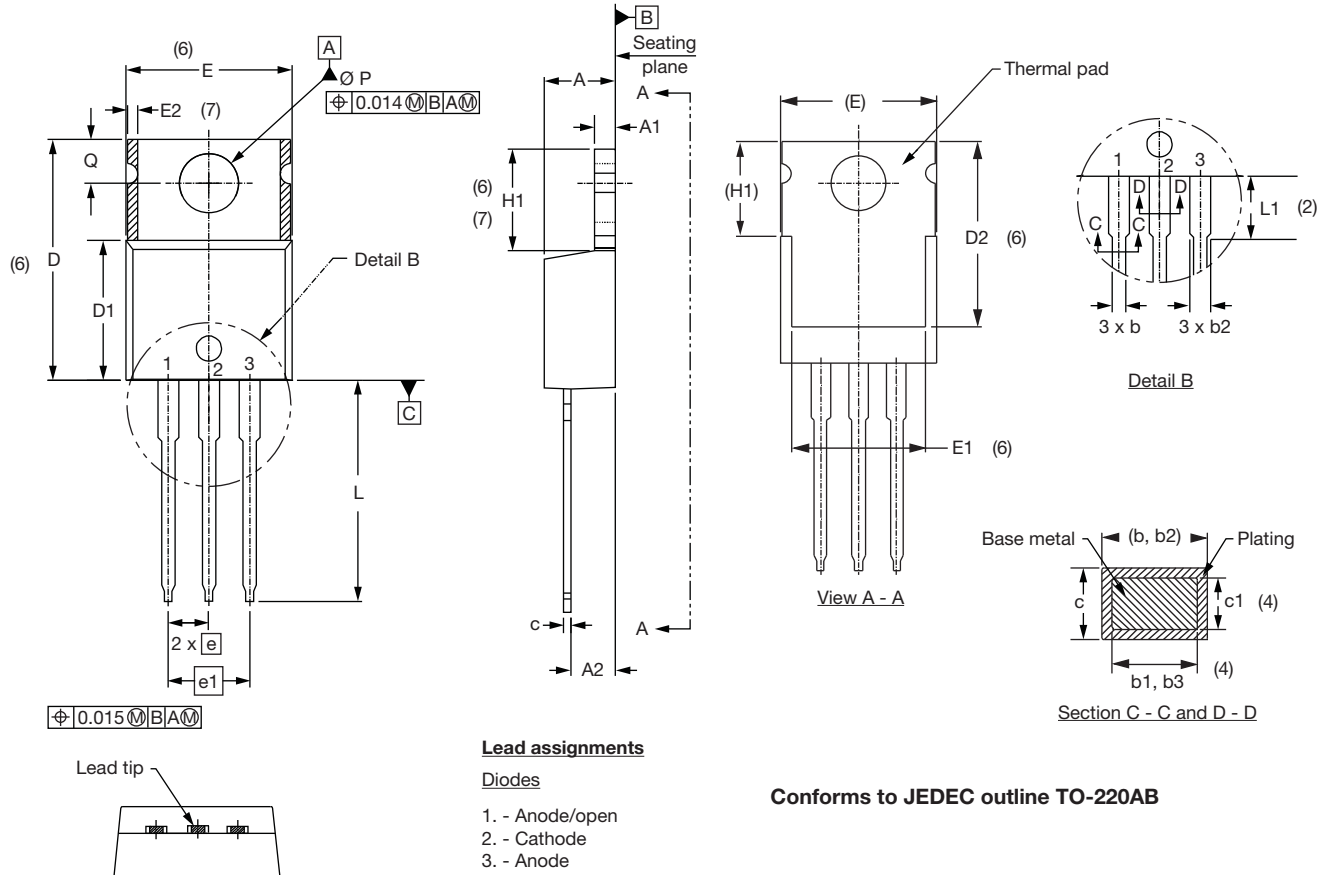
- | | | |
|----------|---|-------------------------------|
| 1 | - | Vishay Semiconductors product |
| 2 | - | Schottky MBR series |
| 3 | - | Current rating (40 = 40 A) |
| 4 | - | Voltage rating (45 = 45 V) |
| 5 | - | CT = Essential part number |
| 6 | - | Environmental digit |
- PbF = Lead (Pb)-free and RoHS compliant
 - -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-MBR4045CTPbF | 50 | 1000 | Antistatic plastic tube |
| VS-MBR4045CT-N3 | 50 | 1000 | Antistatic plastic tube |

| LINKS TO RELATED DOCUMENTS | |
|-----------------------------------|---|
| Dimensions | www.vishay.com/doc?95222 |
| Part marking information | TO-220AB PbF www.vishay.com/doc?95225 |
| | TO-220AB -N3 www.vishay.com/doc?95028 |
| SPIICE model | www.vishay.com/doc?95296 |

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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