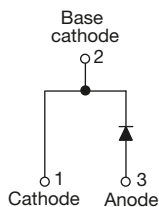


High Performance Schottky Rectifier, 10 A



TO-220AC 2L



FEATURES

- 150 °C T_J operation
- High frequency operation
- Low forward voltage drop
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Guard ring for enhanced ruggedness and long term reliability
- 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

DESCRIPTION

This 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.

PRIMARY CHARACTERISTICS

| | |
|----------------------------------|-----------------|
| I _{F(AV)} | 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-220AC 2L |
| Circuit configuration | Single |

MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
|--------------------|--|-------------|-------|
| I _{F(AV)} | Rectangular waveform | 10 | A |
| I _{FRM} | T _C = 135 °C | 20 | |
| V _{RRM} | | 35/45 | V |
| I _{FSM} | t _p = 5 µs sine | 1060 | A |
| V _F | 10 A _{pk} , T _J = 125 °C | 0.57 | V |
| T _J | Range | -65 to +150 | °C |

VOLTAGE RATINGS

| PARAMETER | SYMBOL | VS-MBR1035-M3 | VS-MBR1045-M3 | 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 |
| Peak repetitive forward current | I _{FRM} | Rated V _R , square wave, 20 kHz, T _C = 135 °C | 20 | |
| Non-repetitive peak surge current | I _{FSM} | 5 µs sine or 3 µs rect. pulse | 1060 | A |
| | | Following any rated load condition and with rated V _{RRM} applied | | |
| | | Surge applied at rated load conditions halfwave, single phase, 60 Hz | 150 | |
| Non-repetitive avalanche energy | E _{AS} | T _J = 25 °C, I _{AS} = 2 A, L = 4 mH | 8 | mJ |
| Repetitive avalanche current | I _{AR} | Current decaying linearly to zero in 1 µs Frequency limited by T _J maximum V _A = 1.5 x V _R typical | 2 | A |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---------------------------------------|----------------|---|-------------------------------------|--------|-------|
| Maximum forward voltage drop | $V_{FM}^{(1)}$ | 20 A | $T_J = 25\text{ }^{\circ}\text{C}$ | 0.84 | 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 | mΩ |
| 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/μs |

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 | R _{thJC} | DC operation | 2.0 | °C/W |
| Typical thermal resistance, case to heatsink | R _{thCS} | Mounting surface, smooth and greased | 0.50 | |
| Approximate weight | | | 2 | g |
| | | | 0.07 | oz. |
| Mounting torque | minimum | | 6 (5) | kgf · cm (lbf · in) |
| | maximum | | 12 (10) | |
| Marking device | | Case style TO-220AC 2L | MBR1035 | |
| | | | MBR1045 | |

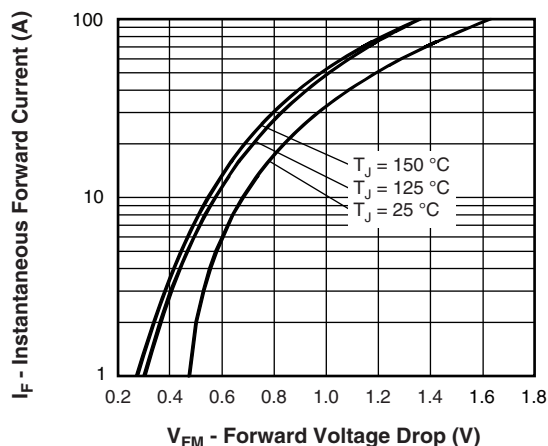


Fig. 1 - Maximum Forward Voltage Drop Characteristics

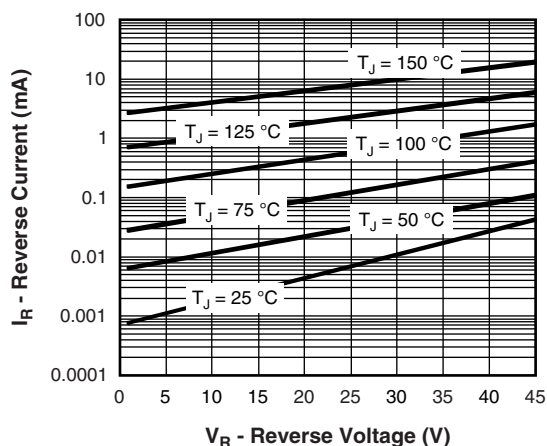


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

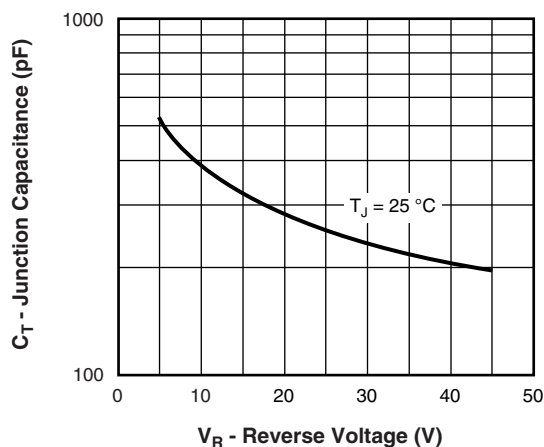
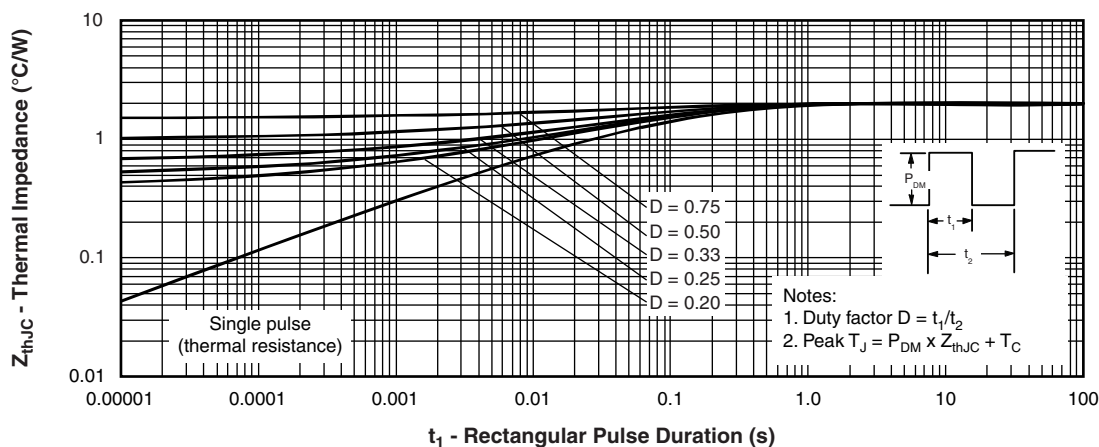


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

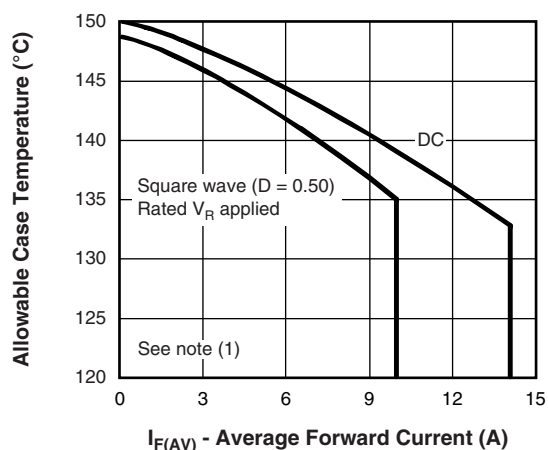


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

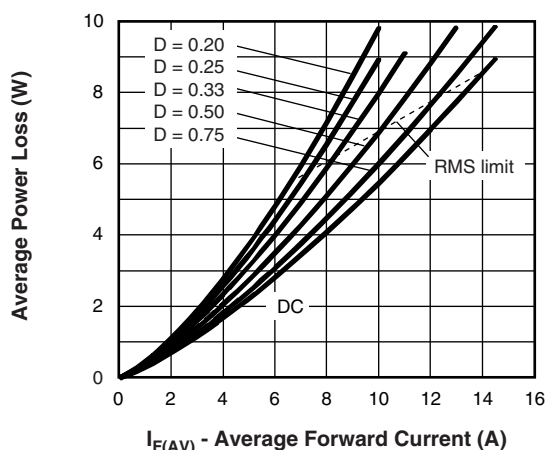


Fig. 6 - Forward Power Loss Characteristics

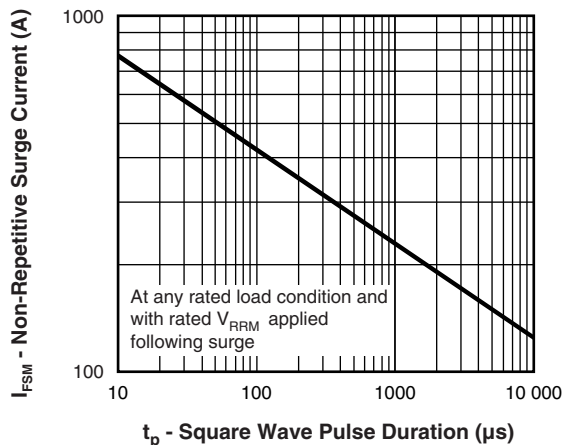


Fig. 7 - Maximum Non-Repetitive Surge Current

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**

| | | | | | |
|-------------|------------|------------|-------------------------------|------------------------|--|
| Device code | VS- | MBR | 10 | 45 | -M3 |
| | 1 | 2 | 3 | 4 | 5 |
| | 1 | - | Vishay Semiconductors product | | |
| | 2 | - | Schottky MBR series | | |
| | 3 | - | Current rating (10 = 10 A) | | |
| | 4 | - | Voltage ratings | 35 = 35 V 45 = 45 V | |
| | 5 | - | Environmental digit | | |
| | | | | | -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free |

| ORDERING INFORMATION (Example) | | |
|---------------------------------------|----------------------|------------------------------|
| PREFERRED P/N | BASE QUANTITY | PACKAGING DESCRIPTION |
| VS-MBR1035-M3 | 50 | Antistatic plastic tubes |
| VS-MBR1045-M3 | 50 | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS | |
|-----------------------------------|--|
| Dimensions | www.vishay.com/doc?96156 |
| Part marking information | www.vishay.com/doc?95391 |
| SPICE model | www.vishay.com/doc?95293 |

TO-220AC 2L

DIMENSIONS in millimeters and inches



Conforms to JEDEC® outline TO-220AC

| SYMBOL | MILLIMETERS | | INCHES | | NOTES | | SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|--|--------|-------------|-------|--------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | | | | MIN. | MAX. | | | |
| A | 4.25 | 4.65 | 0.167 | 0.183 | | | D2 | 11.68 | 13.30 | 0.460 | 0.524 | 6, 7 |
| A1 | 1.14 | 1.40 | 0.045 | 0.055 | | | E | 10.11 | 10.51 | 0.398 | 0.414 | 3, 6 |
| A2 | 2.50 | 2.92 | 0.098 | 0.115 | | | E1 | 6.86 | 8.89 | 0.270 | 0.350 | 6 |
| b | 0.69 | 1.01 | 0.027 | 0.040 | | | e | 2.41 | 2.67 | 0.095 | 0.105 | |
| b1 | 0.38 | 0.97 | 0.015 | 0.038 | 4 | | e1 | 4.88 | 5.28 | 0.192 | 0.208 | |
| b2 | 1.20 | 1.73 | 0.047 | 0.068 | | | H1 | 6.09 | 6.48 | 0.240 | 0.255 | 6 |
| b3 | 1.14 | 1.73 | 0.045 | 0.068 | 4 | | L | 13.52 | 14.02 | 0.532 | 0.552 | |
| c | 0.36 | 0.61 | 0.014 | 0.024 | | | L1 | 3.32 | 3.82 | 0.131 | 0.150 | 2 |
| c1 | 0.36 | 0.56 | 0.014 | 0.022 | 4 | | Ø P | 3.54 | 3.91 | 0.139 | 0.154 | |
| D | 14.85 | 15.35 | 0.585 | 0.604 | 3 | | Q | 2.60 | 3.00 | 0.102 | 0.118 | |
| D1 | 8.38 | 9.02 | 0.330 | 0.355 | | | | | | | | |

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) Outline conforms to JEDEC® TO-220, except D2



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