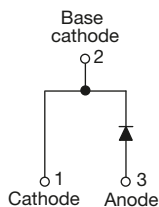


# High Performance Schottky Rectifier, 10 A



TO-220AC 2L



## FEATURES

- 150 °C T<sub>J</sub> 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](http://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 <sub>F(AV)</sub>               | 10 A            |
| V <sub>R</sub>                   | 35 V, 45 V      |
| V <sub>F</sub> at I <sub>F</sub> | 0.57 V          |
| I <sub>RM</sub> max.             | 15 mA at 125 °C |
| T <sub>J</sub> max.              | 150 °C          |
| E <sub>AS</sub>                  | 8 mJ            |
| Package                          | TO-220AC 2L     |
| Circuit configuration            | Single          |

## MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL             | CHARACTERISTICS                              | VALUES      | UNITS |
|--------------------|----------------------------------------------|-------------|-------|
| I <sub>F(AV)</sub> | Rectangular waveform                         | 10          | A     |
| I <sub>FRM</sub>   | T <sub>C</sub> = 135 °C                      | 20          |       |
| V <sub>RRM</sub>   |                                              | 35/45       | V     |
| I <sub>FSM</sub>   | t <sub>p</sub> = 5 µs sine                   | 1060        | A     |
| V <sub>F</sub>     | 10 A <sub>pk</sub> , T <sub>J</sub> = 125 °C | 0.57        | V     |
| T <sub>J</sub>     | Range                                        | -65 to +150 | °C    |

## VOLTAGE RATINGS

| PARAMETER                            | SYMBOL           | VS-MBR1035-M3 | VS-MBR1045-M3 | UNITS |
|--------------------------------------|------------------|---------------|---------------|-------|
| Maximum DC reverse voltage           | V <sub>R</sub>   | 35            | 45            | V     |
| Maximum working peak reverse voltage | V <sub>RWM</sub> |               |               |       |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                         | SYMBOL             | TEST CONDITIONS                                                                                                                        | VALUES | UNITS |
|-----------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------|-------|
| Maximum average forward current   | I <sub>F(AV)</sub> | T <sub>C</sub> = 135 °C, rated V <sub>R</sub>                                                                                          | 10     | A     |
| Peak repetitive forward current   | I <sub>FRM</sub>   | Rated V <sub>R</sub> , square wave, 20 kHz, T <sub>C</sub> = 135 °C                                                                    | 20     |       |
| Non-repetitive peak surge current | I <sub>FSM</sub>   | 5 µs sine or 3 µs rect. pulse                                                                                                          | 1060   | A     |
|                                   |                    | Following any rated load condition and with rated V <sub>RRM</sub> applied                                                             |        |       |
|                                   |                    | Surge applied at rated load conditions halfwave, single phase, 60 Hz                                                                   | 150    |       |
| Non-repetitive avalanche energy   | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 2 A, L = 4 mH                                                                                | 8      | mJ    |
| Repetitive avalanche current      | I <sub>AR</sub>    | Current decaying linearly to zero in 1 µs<br>Frequency limited by T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> 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                     | $V_{F(TO)}$    | $T_J = T_J \text{ maximum}$                                                               |                                     | 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  $\mu$ s, duty cycle < 2 %**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                    | SYMBOL            | TEST CONDITIONS                      | VALUES      | UNITS                  |
|----------------------------------------------|-------------------|--------------------------------------|-------------|------------------------|
| Maximum junction temperature range           | T <sub>J</sub>    |                                      | -65 to +150 | °C                     |
| Maximum storage temperature range            | T <sub>Stg</sub>  |                                      | -65 to +175 |                        |
| Maximum thermal resistance, junction to case | R <sub>thJC</sub> | DC operation                         | 2.0         | °C/W                   |
| Typical thermal resistance, case to heatsink | R <sub>thCS</sub> | Mounting surface, smooth and greased | 0.50        |                        |
| Approximate weight                           |                   |                                      | 2           | g                      |
|                                              |                   |                                      | 0.07        | oz.                    |
| Mounting torque                              | minimum           |                                      | 6 (5)       | kgf · cm<br>(lbf · in) |
|                                              | maximum           |                                      | 12 (10)     |                        |
| Marking device                               |                   | Case style TO-220AC 2L               | MBR1035     |                        |
|                                              |                   |                                      | MBR1045     |                        |

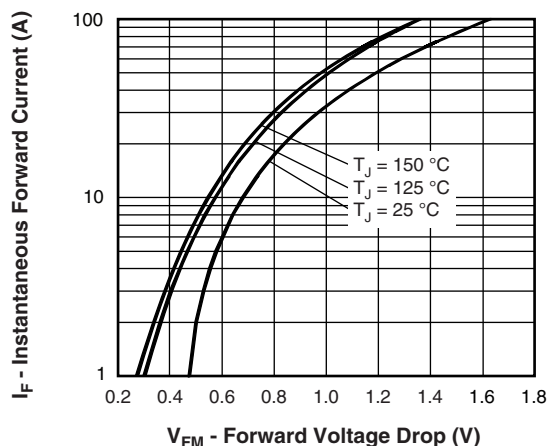


Fig. 1 - Maximum Forward Voltage Drop Characteristics

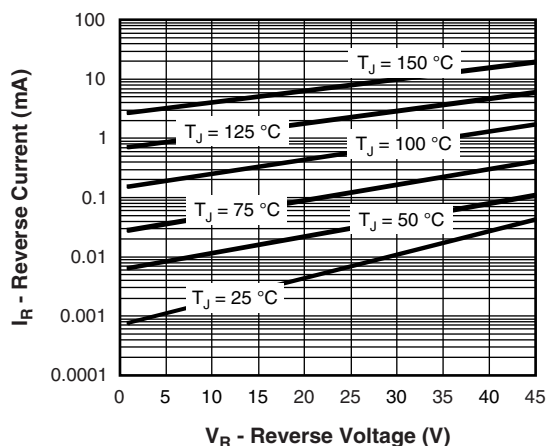


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

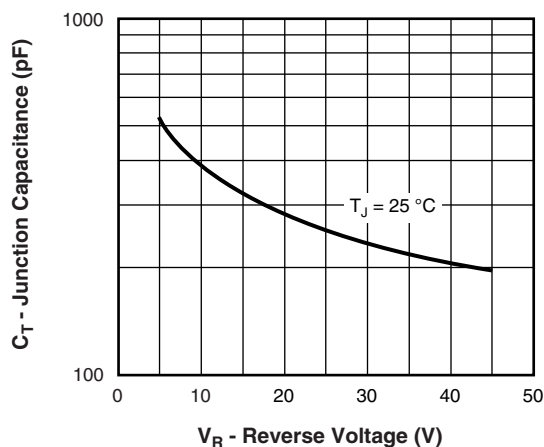
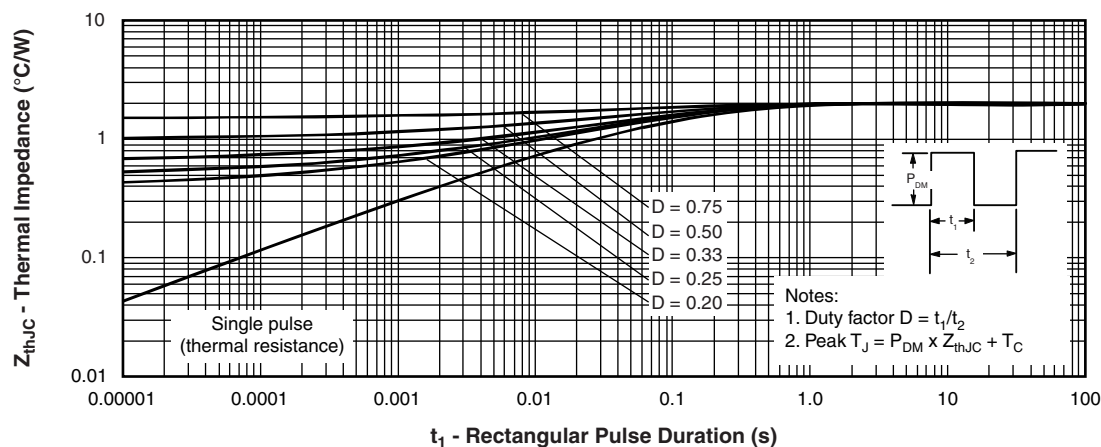


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

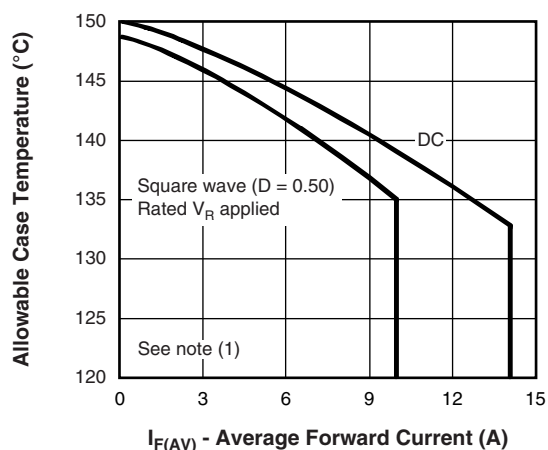


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

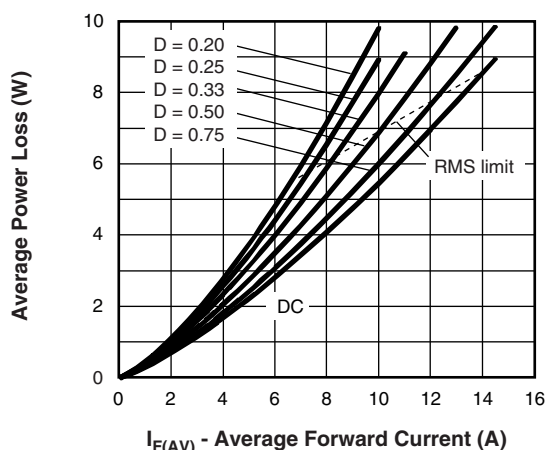


Fig. 6 - Forward Power Loss Characteristics

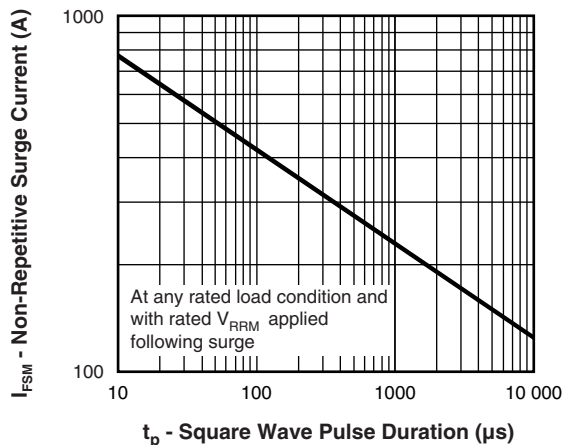


Fig. 7 - Maximum Non-Repetitive Surge Current

#### 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 | <b>VS-</b> | <b>MBR</b> | <b>10</b>                     | <b>45</b>              | <b>-M3</b>                                                         |
|             | 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<br>45 = 45 V |                                                                    |
|             | 5          | -          | Environmental digit           |                        |                                                                    |
|             |            |            |                               |                        | -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free |

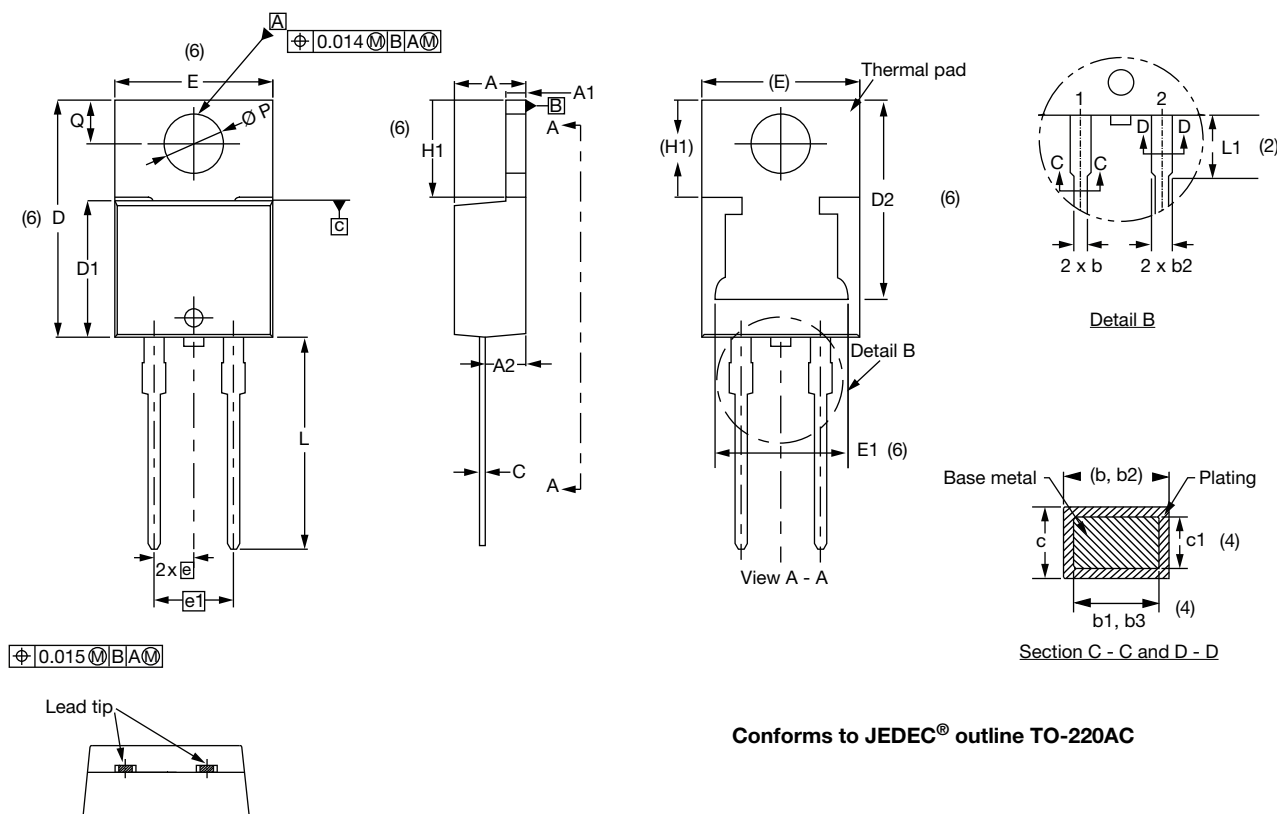
| <b>ORDERING INFORMATION</b> (Example) |                      |                              |
|---------------------------------------|----------------------|------------------------------|
| <b>PREFERRED P/N</b>                  | <b>BASE QUANTITY</b> | <b>PACKAGING DESCRIPTION</b> |
| VS-MBR1035-M3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

| <b>LINKS TO RELATED DOCUMENTS</b> |                                                                        |
|-----------------------------------|------------------------------------------------------------------------|
| Dimensions                        | <a href="http://www.vishay.com/doc?96156">www.vishay.com/doc?96156</a> |
| Part marking information          | <a href="http://www.vishay.com/doc?95391">www.vishay.com/doc?95391</a> |
| SPICE model                       | <a href="http://www.vishay.com/doc?95293">www.vishay.com/doc?95293</a> |



## TO-220AC 2L

**DIMENSIONS** in millimeters and inches



Conforms to JEDEC® outline TO-220AC

| 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     | 2.50        | 2.92  | 0.098  | 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       | 15.35 | 0.585  | 0.604 | 3     |
| D1     | 8.38        | 9.02  | 0.330  | 0.355 |       |

| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| D2     | 11.68       | 13.30 | 0.460  | 0.524 | 6, 7  |
| E      | 10.11       | 10.51 | 0.398  | 0.414 | 3, 6  |
| E1     | 6.86        | 8.89  | 0.270  | 0.350 | 6     |
| 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     |
| L      | 13.52       | 14.02 | 0.532  | 0.552 |       |
| L1     | 3.32        | 3.82  | 0.131  | 0.150 | 2     |
| Ø P    | 3.54        | 3.91  | 0.139  | 0.154 |       |
| Q      | 2.60        | 3.00  | 0.102  | 0.118 |       |

### 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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