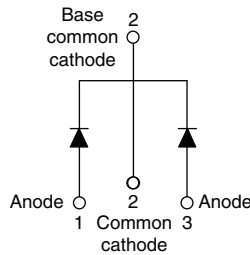




## Schottky Rectifier, 2 x 10 A



TO-220AB



### FEATURES

- 150 °C T<sub>J</sub> 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)



| PRODUCT SUMMARY                  |                   |
|----------------------------------|-------------------|
| Package                          | TO-220AB          |
| I <sub>F(AV)</sub>               | 2 x 10 A          |
| V <sub>R</sub>                   | 80 V, 90 V, 100 V |
| V <sub>F</sub> at I <sub>F</sub> | 0.65 V            |
| I <sub>RM</sub> max.             | 6 mA at 125 °C    |
| T <sub>J</sub> max.              | 150 °C            |
| Diode variation                  | Common cathode    |
| E <sub>AS</sub>                  | 24 mJ             |

### DESCRIPTION

This center tap Schottky rectifier series 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 <sub>F(AV)</sub>                | Rectangular waveform (per device)            | 20          | A     |
| V <sub>RRM</sub>                  |                                              | 80 to 100   | V     |
| I <sub>FRM</sub>                  | T <sub>C</sub> = 133 °C (per leg)            | 20          | A     |
| I <sub>FSM</sub>                  | t <sub>p</sub> = 5 μs sine                   | 850         |       |
| V <sub>F</sub>                    | 10 A <sub>pk</sub> , T <sub>J</sub> = 125 °C | 0.65        | V     |
| T <sub>J</sub>                    | Range                                        | - 65 to 150 | °C    |

| VOLTAGE RATINGS                      |                  |                  |                  |                  |                  |                   |                   |       |
|--------------------------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|-------|
| PARAMETER                            | SYMBOL           | VS-MBR2080CTKPbF | VS-MBR2080CTK-N3 | VS-MBR2090CTKPbF | VS-MBR2090CTK-N3 | VS-MBR20100CTKPbF | VS-MBR20100CTK-N3 | UNITS |
| Maximum DC reverse voltage           | V <sub>R</sub>   | 80               | 80               | 90               | 90               | 100               | 100               | 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> = 133 °C, rated V <sub>R</sub>                         | per leg                                                                    | 10     | A     |
|                                         |                    |                                                                       | per device                                                                 | 20     |       |
| Peak repetitive forward current per leg | I <sub>FRM</sub>   | Rated V <sub>R</sub> , square wave, 20 kHz, T <sub>C</sub> = 133 °C   |                                                                            | 20     |       |
| Non-repetitive peak surge current       | I <sub>FSM</sub>   | 5 μs sine or 3 μs rect. pulse                                         | Following any rated load condition and with rated V <sub>RRM</sub> applied | 850    |       |
|                                         |                    | Surge applied at rated load conditions half wave, single phase, 60 Hz |                                                                            | 150    |       |
| Peak repetitive reverse surge current   | I <sub>RRM</sub>   | 2.0 μs, 1.0 kHz                                                       |                                                                            | 0.5    |       |
| Non-repetitive avalanche energy per leg | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 2 A, L = 12 mH              |                                                                            | 24     | mJ    |



| <b>ELECTRICAL SPECIFICATIONS</b>      |                |                                                                                  |                                   |        |                  |
|---------------------------------------|----------------|----------------------------------------------------------------------------------|-----------------------------------|--------|------------------|
| PARAMETER                             | SYMBOL         | TEST CONDITIONS                                                                  |                                   | VALUES | UNITS            |
| Maximum forward voltage drop          | $V_{FM}^{(1)}$ | 10 A                                                                             | $T_J = 25\text{ }^\circ\text{C}$  | 0.80   | V                |
|                                       |                | 20 A                                                                             |                                   | 0.95   |                  |
|                                       |                | 10 A                                                                             | $T_J = 125\text{ }^\circ\text{C}$ | 0.65   |                  |
|                                       |                | 20 A                                                                             |                                   | 0.80   |                  |
| Maximum instantaneous reverse current | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$                                                 | Rated DC voltage                  | 0.10   | mA               |
|                                       |                | $T_J = 125\text{ }^\circ\text{C}$                                                |                                   | 6      |                  |
| Threshold voltage                     | $V_{F(TO)}$    | $T_J = T_J$ maximum                                                              |                                   | 0.433  | V                |
| Forward slope resistance              | $r_t$          |                                                                                  |                                   | 15.8   | m $\Omega$       |
| Maximum junction capacitance          | $C_T$          | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz) 25 $^\circ\text{C}$ |                                   | 400    | 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/ $\mu\text{s}$ |

**Note**

(1) Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %

| <b>THERMAL - MECHANICAL SPECIFICATIONS</b>           |            |                                      |                        |             |                        |
|------------------------------------------------------|------------|--------------------------------------|------------------------|-------------|------------------------|
| PARAMETER                                            | SYMBOL     | TEST CONDITIONS                      |                        | VALUES      | UNITS                  |
| Maximum junction temperature range                   | $T_J$      |                                      |                        | - 65 to 150 | $^\circ\text{C}$       |
| Maximum storage temperature range                    | $T_{Stg}$  |                                      |                        | - 65 to 175 |                        |
| Maximum thermal resistance, junction to case per leg | $R_{thJC}$ | DC operation                         |                        | 2.0         | $^\circ\text{C/W}$     |
| 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    |                                      | Non-lubricated threads | 6 (5)       | kgf · cm<br>(lbf · in) |
|                                                      | maximum    |                                      |                        | 12 (10)     |                        |
| Marking device                                       |            | Case style TO-220AB                  |                        | MBR2080CTK  |                        |
|                                                      |            |                                      |                        | MBR2090CTK  |                        |
|                                                      |            |                                      |                        | MBR20100CTK |                        |

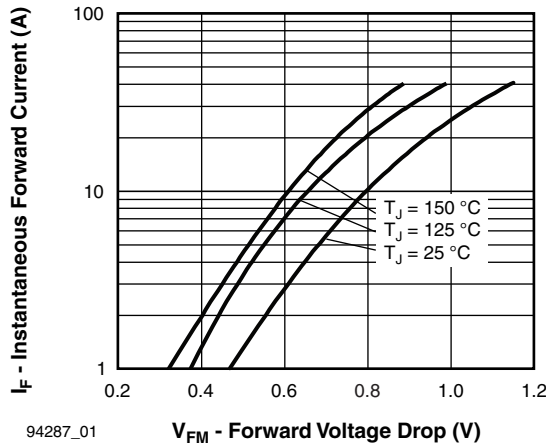


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

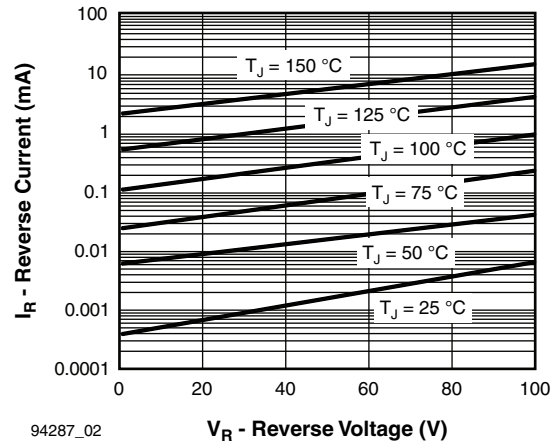


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

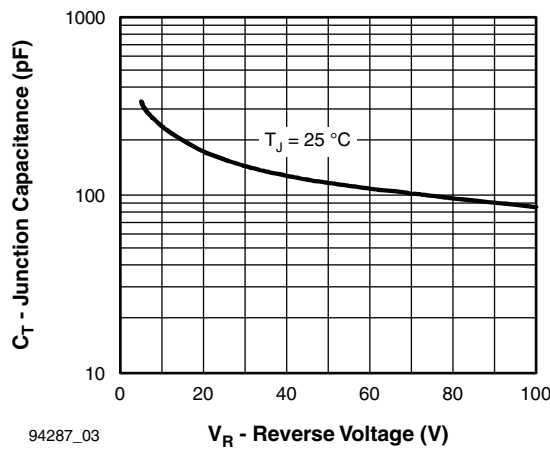


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

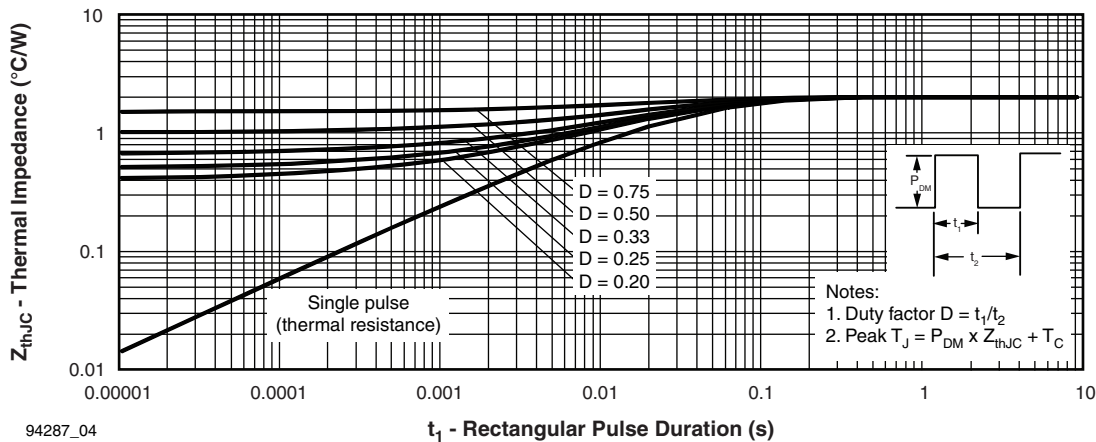


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

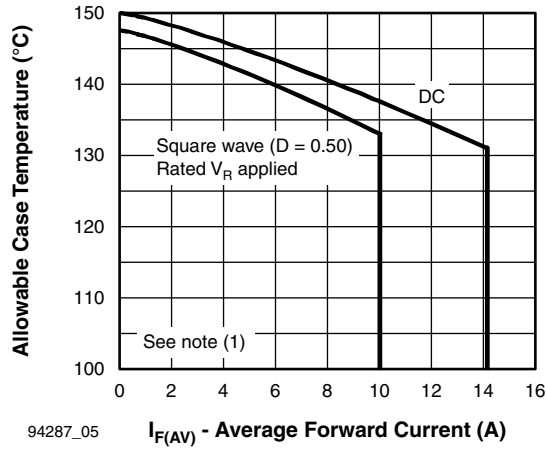


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

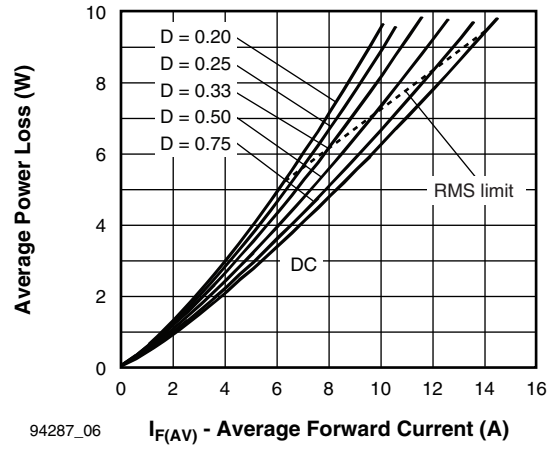


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

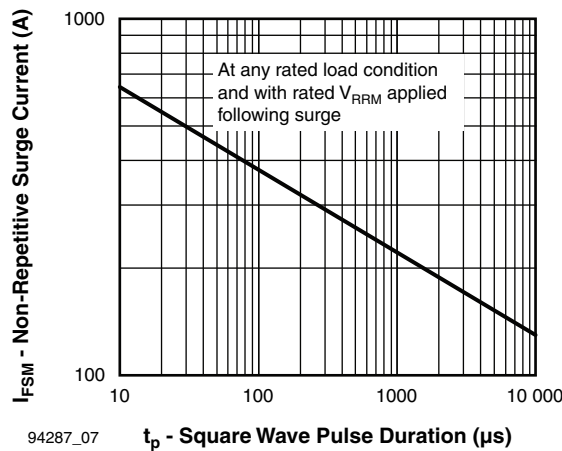


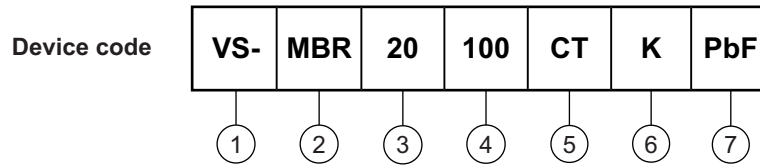
Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;
- $P_d$  = 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



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

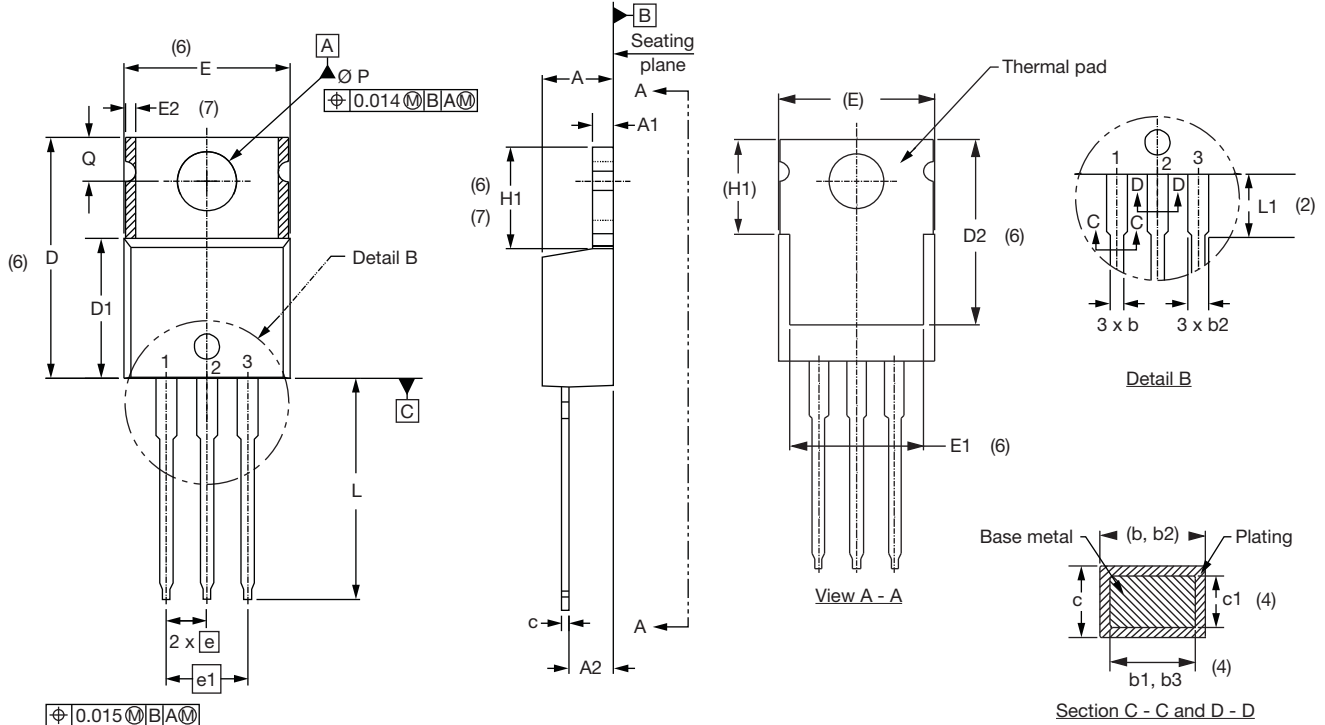
|             |
|-------------|
| 80 = 80 V   |
| 90 = 90 V   |
| 100 = 100 V |
- 5** - CT = Center tap (dual)
- 6** - K = Schottky generation
- 7** - Environmental digit
  - PbF = Lead (Pb)-free and RoHS compliant
  - -N3 = Halogen-free, RoHS compliant, and totally lead (Pb)-free

| ORDERING INFORMATION (Example) |                  |                        |                         |
|--------------------------------|------------------|------------------------|-------------------------|
| PREFERRED P/N                  | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
| VS-MBR2080CTKPbF               | 50               | 1000                   | Antistatic plastic tube |
| VS-MBR2080CTK-N3               | 50               | 1000                   | Antistatic plastic tube |
| VS-MBR2090CTKPbF               | 50               | 1000                   | Antistatic plastic tube |
| VS-MBR2090CTK-N3               | 50               | 1000                   | Antistatic plastic tube |
| VS-MBR20100CTKPbF              | 50               | 1000                   | Antistatic plastic tube |
| VS-MBR20100CTK-N3              | 50               | 1000                   | Antistatic plastic tube |

| LINKS TO RELATED DOCUMENTS |                                                                                     |
|----------------------------|-------------------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95222">www.vishay.com/doc?95222</a>              |
| Part marking information   | TO-220AB PbF <a href="http://www.vishay.com/doc?95225">www.vishay.com/doc?95225</a> |
|                            | TO-220AB -N3 <a href="http://www.vishay.com/doc?95028">www.vishay.com/doc?95028</a> |

## 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



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