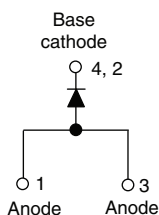


## Schottky Rectifier, 3.0 A



D-PAK (TO-252AA)



### FEATURES

- Popular D-PAK outline
- Small foot print, surface mountable
- Low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Compliant to RoHS Directive 2002/95/EC
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C



RoHS  
COMPLIANT

### PRODUCT SUMMARY

|                 |                  |
|-----------------|------------------|
| Package         | D-PAK (TO-252AA) |
| $I_{F(AV)}$     | 3.0 A            |
| $V_R$           | 20 V, 30 V, 40 V |
| $V_F$ at $I_F$  | 0.49 V           |
| $I_{RM}$        | 20 mA at 125 °C  |
| $T_J$ max.      | 150 °C           |
| Diode variation | Single die       |
| $E_{AS}$        | 8 mJ             |

### DESCRIPTION

The VS-MBRD320PbF, VS-MBRD330PbF, VS-MBRD340PbF surface mount Schottky rectifier has been designed for applications requiring low forward drop and small foot prints on PC boards. Typical applications are in disk drives, switching power supplies, converters, freewheeling diodes, battery charging, and reverse battery protection.

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS            | VALUES      | UNITS |
|-------------|----------------------------|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform       | 3.0         | A     |
| $V_{RRM}$   |                            | 20 to 40    | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine       | 490         | A     |
| $V_F$       | 3 Apk, $T_J = 125^\circ C$ | 0.49        | V     |
| $T_J$       |                            | - 40 to 150 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-MBRD320PbF | VS-MBRD330PbF | VS-MBRD340PbF | UNITS |
|--------------------------------------|-----------|---------------|---------------|---------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 20            | 30            | 40            | V     |
| Maximum working peak reverse voltage | $V_{RWM}$ |               |               |               |       |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                           | SYMBOL      | TEST CONDITIONS                                                                                                     | VALUES | UNITS |
|-----------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------|--------|-------|
| Maximum average forward current                     | $I_{F(AV)}$ | 50 % duty cycle at $T_L = 133^\circ C$ , rectangular waveform                                                       | 3.0    | A     |
| Maximum peak one cycle non-repetitive surge current | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse                                                                             | 490    |       |
|                                                     |             | 10 ms sine or 6 ms rect. pulse                                                                                      | 75     |       |
| Non-repetitive avalanche energy                     | $E_{AS}$    | $T_J = 25^\circ C$ , $I_{AS} = 1 A$ , $L = 16 mH$                                                                   | 8.0    | mJ    |
| Repetitive avalanche current                        | $I_{AR}$    | Current decaying linearly to zero in 1 $\mu s$<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical | 1.0    | A     |

| ELECTRICAL SPECIFICATIONS                     |                                |                                                                                |                                       |      |        |       |
|-----------------------------------------------|--------------------------------|--------------------------------------------------------------------------------|---------------------------------------|------|--------|-------|
| PARAMETER                                     | SYMBOL                         | TEST CONDITIONS                                                                |                                       | TYP. | MAX.   | UNITS |
| Maximum forward voltage drop<br>See fig. 1    | V <sub>FM</sub> <sup>(1)</sup> | 3 A                                                                            | T <sub>J</sub> = 25 °C                | 0.48 | 0.6    | V     |
|                                               |                                | 6 A                                                                            |                                       | 0.58 | 0.7    |       |
|                                               |                                | 3 A                                                                            | T <sub>J</sub> = 125 °C               | 0.41 | 0.49   |       |
|                                               |                                | 6 A                                                                            |                                       | 0.55 | 0.625  |       |
| Maximum reverse leakage current<br>See fig. 2 | I <sub>RM</sub> <sup>(1)</sup> | T <sub>J</sub> = 25 °C                                                         | V <sub>R</sub> = Rated V <sub>R</sub> | 0.02 | 0.2    | mA    |
|                                               |                                | T <sub>J</sub> = 125 °C                                                        |                                       | 10.7 | 20     |       |
| Typical junction capacitance                  | C <sub>T</sub>                 | V <sub>R</sub> = 5 V <sub>DC</sub> (test signal range 100 kHz to 1 MHz), 25 °C |                                       | 189  | -      | pF    |
| Typical series inductance                     | L <sub>S</sub>                 | Measured lead to lead 5 mm from package body                                   |                                       | 5.0  | -      | nH    |
| Maximum voltage rate of change                | dV/dt                          | Rated V <sub>R</sub>                                                           |                                       | -    | 10 000 | V/μs  |

**Note**

<sup>(1)</sup> Pulse width < 300 μs, duty cycle < 2 %

| THERMAL - MECHANICAL SPECIFICATIONS             |             |                                        |             |       |
|-------------------------------------------------|-------------|----------------------------------------|-------------|-------|
| PARAMETER                                       | SYMBOL      | TEST CONDITIONS                        | VALUES      | UNITS |
| Maximum junction temperature range              | $T_J^{(1)}$ |                                        | - 40 to 150 | °C    |
| Maximum storage temperature range               | $T_{Stg}$   |                                        | - 40 to 175 |       |
| Maximum thermal resistance, junction to case    | $R_{thJC}$  | DC operation<br>See fig. 4             | 6.0         | °C/W  |
| Maximum thermal resistance, junction to ambient | $R_{thJA}$  |                                        | 80          |       |
| Approximate weight                              |             |                                        | 0.3         | g     |
|                                                 |             |                                        | 0.01        | oz.   |
| Marking device                                  |             | Case style D-PAK (similar to TO-252AA) | MBRD320     |       |
|                                                 |             |                                        | MBRD330     |       |
|                                                 |             |                                        | MBRD340     |       |

**Note**

<sup>(1)</sup>  $\frac{dP_{tot}}{dT_J} < \frac{1}{R_{thJA}}$  thermal runaway condition for a diode on its own heatsink



# VS-MBRD320PbF, VS-MBRD330PbF, VS-MBRD340PbF

Schottky Rectifier, 3.0 A

Vishay Semiconductors

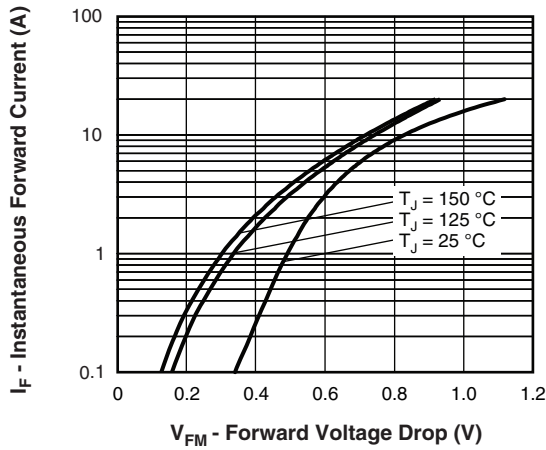


Fig. 1 - Maximum Forward Voltage Drop Characteristics

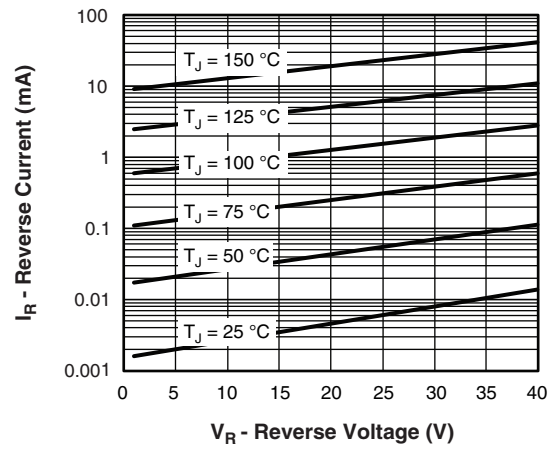


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

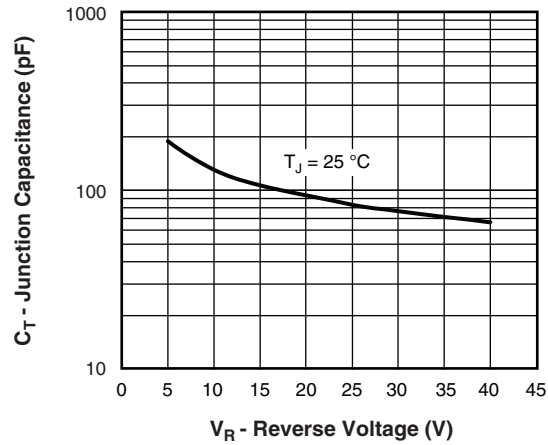


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

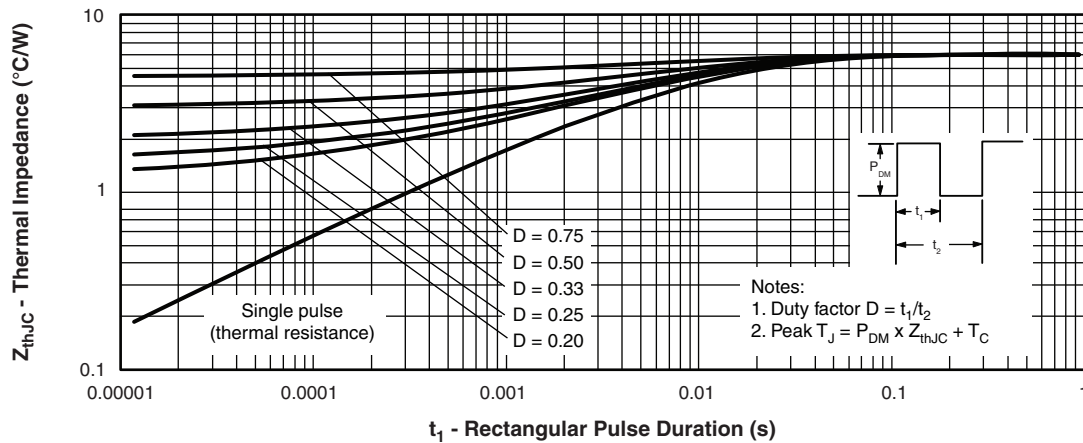


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

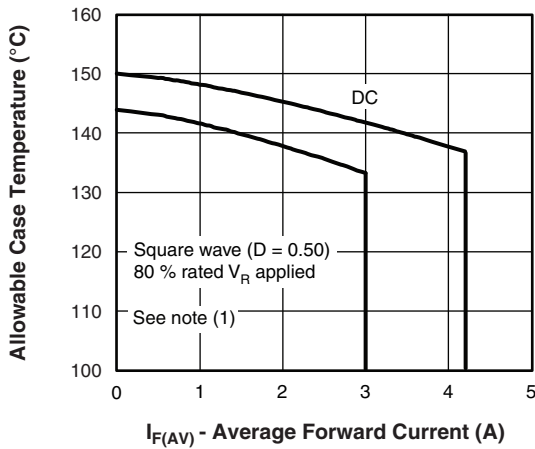


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

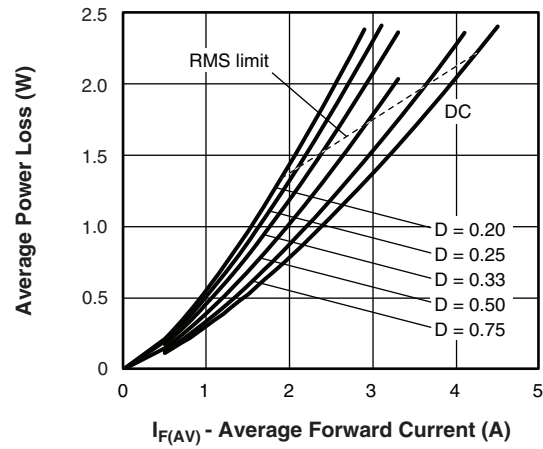


Fig. 6 - Forward Power Loss Characteristics

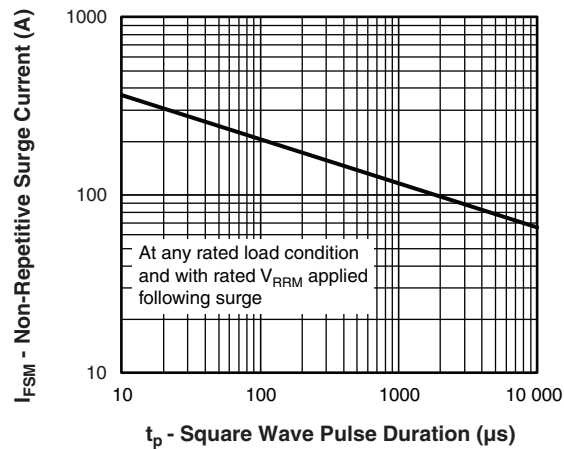


Fig. 7 - Maximum Non-Repetitive Surge Current

## 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  $V_{R1} = 80\%$  rated  $V_R$



# VS-MBRD320PbF, VS-MBRD330PbF, VS-MBRD340PbF

Schottky Rectifier, 3.0 A

Vishay Semiconductors

## ORDERING INFORMATION TABLE

|             |     |     |   |   |    |    |     |
|-------------|-----|-----|---|---|----|----|-----|
| Device code | VS- | MBR | D | 3 | 40 | TR | PbF |
|             | 1   | 2   | 3 | 4 | 5  | 6  | 7   |

- |          |   |                                                                                                                                                                                                     |
|----------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | - | Vishay Semiconductors product                                                                                                                                                                       |
| <b>2</b> | - | Schottky MBR series                                                                                                                                                                                 |
| <b>3</b> | - | D = TO-252AA (D-PAK)                                                                                                                                                                                |
| <b>4</b> | - | Current rating (3 = 3 A)                                                                                                                                                                            |
| <b>5</b> | - | Voltage ratings                                                                                                                                                                                     |
| <b>6</b> | - | <ul style="list-style-type: none"><li>• None = Tube (50 pieces)</li><li>• TR = Tape and reel</li><li>• TRL = Tape and reel (left oriented)</li><li>• TRR = Tape and reel (right oriented)</li></ul> |
| <b>7</b> | - | PbF = Lead (Pb)-free                                                                                                                                                                                |
- 20 = 20 V  
30 = 30 V  
40 = 40 V

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95016">www.vishay.com/doc?95016</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95059">www.vishay.com/doc?95059</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95033">www.vishay.com/doc?95033</a> |

### D-PAK (TO-252AA)

**DIMENSIONS** in millimeters and inches



| SYMBOL | MILLIMETERS |      | INCHES |       | NOTES |
|--------|-------------|------|--------|-------|-------|
|        | MIN.        | MAX. | MIN.   | MAX.  |       |
| A      | 2.18        | 2.39 | 0.086  | 0.094 |       |
| A1     | -           | 0.13 | -      | 0.005 |       |
| b      | 0.64        | 0.89 | 0.025  | 0.035 |       |
| b2     | 0.76        | 1.14 | 0.030  | 0.045 |       |
| b3     | 4.95        | 5.46 | 0.195  | 0.215 | 3     |
| c      | 0.46        | 0.61 | 0.018  | 0.024 |       |
| c2     | 0.46        | 0.89 | 0.018  | 0.035 |       |
| D      | 5.97        | 6.22 | 0.235  | 0.245 | 5     |
| D1     | 5.21        | -    | 0.205  | -     | 3     |
| E      | 6.35        | 6.73 | 0.250  | 0.265 | 5     |
| E1     | 4.32        | -    | 0.170  | -     | 3     |

| SYMBOL | MILLIMETERS |       | INCHES     |       | NOTES |
|--------|-------------|-------|------------|-------|-------|
|        | MIN.        | MAX.  | MIN.       | MAX.  |       |
| e      | 2.29 BSC    |       | 0.090 BSC  |       |       |
| H      | 9.40        | 10.41 | 0.370      | 0.410 |       |
| L      | 1.40        | 1.78  | 0.055      | 0.070 |       |
| L1     | 2.74 BSC    |       | 0.108 REF. |       |       |
| L2     | 0.51 BSC    |       | 0.020 BSC  |       |       |
| L3     | 0.89        | 1.27  | 0.035      | 0.050 | 3     |
| L4     | -           | 1.02  | -          | 0.040 |       |
| L5     | 1.14        | 1.52  | 0.045      | 0.060 | 2     |
| Ø      | 0°          | 10°   | 0°         | 10°   |       |
| Ø1     | 0°          | 15°   | 0°         | 15°   |       |
| Ø2     | 25°         | 35°   | 25°        | 35°   |       |

#### Notes

- Dimensioning and tolerancing as per ASME Y14.5M-1994
- Lead dimension uncontrolled in L5
- Dimension D1, E1, L3 and b3 establish a minimum mounting surface for thermal pad
- Section C - C dimension apply to the flat section of the lead between 0.13 and 0.25 mm (0.005 and 0.010") from the lead tip
- Dimension D, 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
- Dimension b1 and c1 applied to base metal only
- Datum A and B to be determined at datum plane H
- Outline conforms to JEDEC outline TO-252AA



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