

# High Performance Schottky Rectifier, 1.0 A


**SMB (DO-214AA)**


## FEATURES

- Small foot print, surface mountable
- Low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## DESCRIPTION / APPLICATIONS

The VS-MBRS140-M3 surface mount Schottky rectifier has been designed for applications requiring low forward drop and very small foot prints on PC boards. Typical applications are in disk drives, switching power supplies, converters, freewheeling diodes, battery charging, and reverse battery protection.

## PRIMARY CHARACTERISTICS

|                       |                  |
|-----------------------|------------------|
| $I_{F(AV)}$           | 1.0 A            |
| $V_R$                 | 40 V             |
| $V_F$ at $I_F$        | 0.53 V           |
| $I_{RM}$ max.         | 4.0 mA at 150 °C |
| $E_{AS}$              | 3.0 mJ           |
| $T_J$ max.            | 150 °C           |
| Package               | SMB (DO-214AA)   |
| Circuit configuration | Single           |

## MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS                      | VALUES      | UNITS |
|-------------|--------------------------------------|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform                 | 1.0         | A     |
| $V_{RRM}$   |                                      | 40          | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                 | 380         | A     |
| $V_F$       | 1.0 A <sub>pk</sub> , $T_J = 125$ °C | 0.53        | V     |
| $T_J$       | Range                                | -55 to +150 | °C    |

## VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-MBRS140-M3 | UNITS |
|--------------------------------------|-----------|---------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 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 $T_L = 119$ °C, rectangular waveform                                                             | 1.0    | A     |
| Maximum peak one cycle non-repetitive surge current | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse                                                                             | 380    |       |
|                                                     |             | 10 ms sine or 6 ms rect. pulse                                                                                      | 40     |       |
| Non-repetitive avalanche energy                     | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 1$ A, $L = 6$ mH                                                                           | 3.0    | 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    | $V_{FM}^{(1)}$ | 1 A                                                                                        | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.52 | 0.6    | V          |
|                                 |                | 2 A                                                                                        |                                     | 0.70 | 0.77   |            |
|                                 |                | 1 A                                                                                        | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.48 | 0.53   |            |
|                                 |                | 2 A                                                                                        |                                     | 0.63 | 0.71   |            |
| Maximum reverse leakage current | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                         | $V_R = \text{Rated } V_R$           | -    | 0.1    | mA         |
|                                 |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                        |                                     | -    | 4.0    |            |
| Maximum junction capacitance    | $C_T$          | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^{\circ}\text{C}$ |                                     | -    | 80     | pF         |
| Typical series inductance       | $L_S$          | Measured lead to lead 5 mm from package body                                               |                                     | -    | 2.0    | nH         |
| Maximum voltage rate of change  | $dV/dt$        | Rated $V_R$                                                                                |                                     | -    | 10 000 | V/ $\mu$ s |

**Note**(1) Pulse width < 300  $\mu$ s, duty cycle < 2 %**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                       | SYMBOL               | TEST CONDITIONS            | VALUES      | UNITS                |
|-------------------------------------------------|----------------------|----------------------------|-------------|----------------------|
| Maximum junction and storage temperature range  | $T_J^{(1)}, T_{Stg}$ |                            | -55 to +150 | $^{\circ}\text{C}$   |
| Maximum thermal resistance, junction to lead    | $R_{thJL}^{(2)}$     | DC operation<br>See fig. 4 | 36          | $^{\circ}\text{C/W}$ |
| Maximum thermal resistance, junction to ambient | $R_{thJA}$           | DC operation               | 80          |                      |
| Approximate weight                              |                      |                            | 0.10        | g                    |
|                                                 |                      |                            | 0.003       | oz.                  |
| Marking device                                  |                      | Case style SMB (DO-214AA)  | 14          |                      |

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

(2) Mounted 1" square PCB

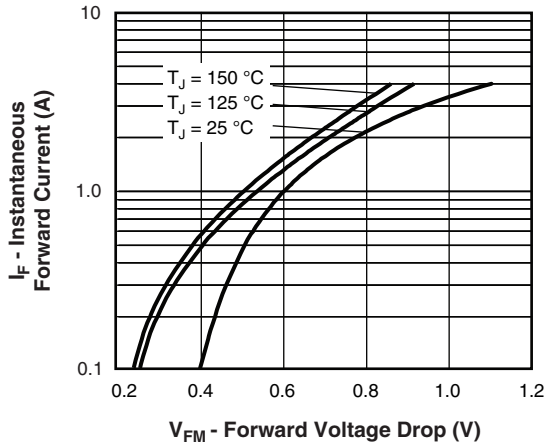


Fig. 1 - Maximum Forward Voltage Drop Characteristics

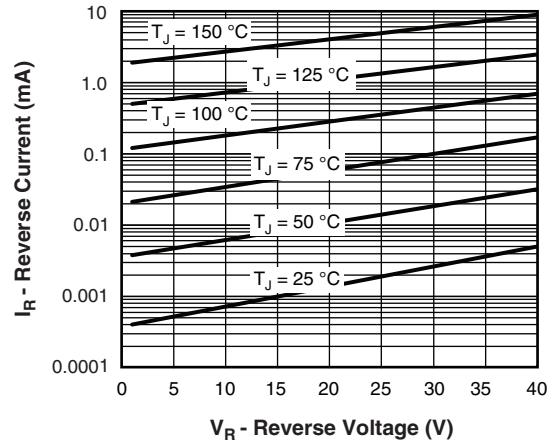


Fig. 2 - Typical Peak Reverse Current vs. Reverse Voltage

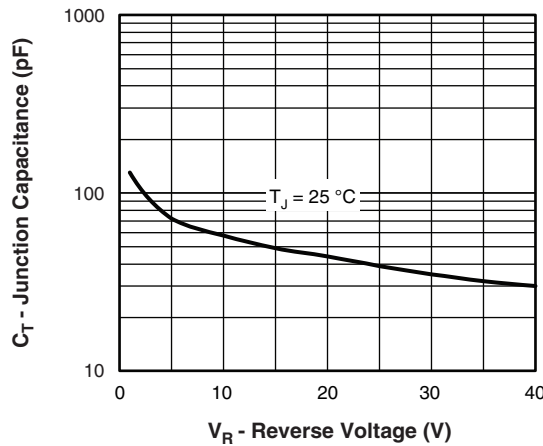


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

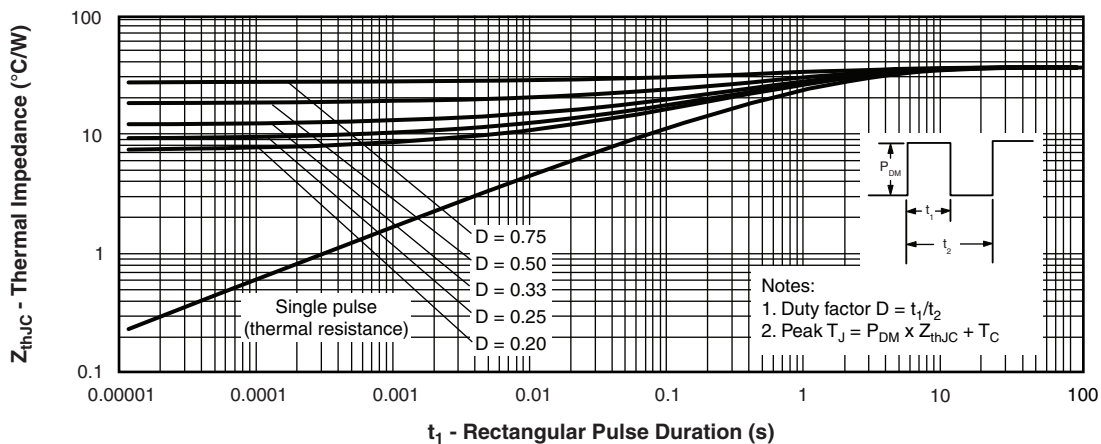


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

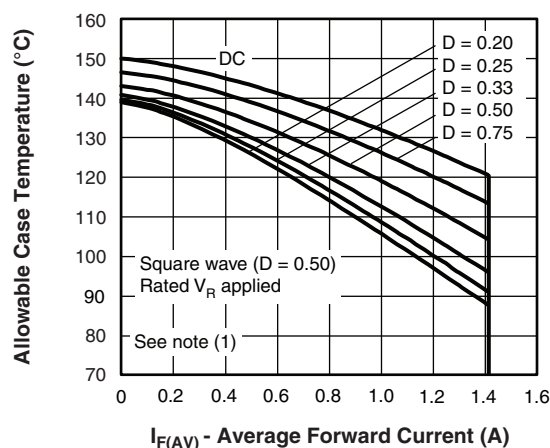


Fig. 5 - Maximum Average Forward Current vs. Allowable Lead Temperature

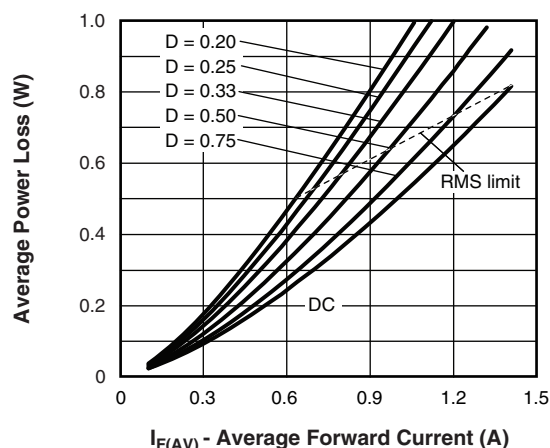


Fig. 6 - Maximum Average Forward Dissipation vs. Average Forward Current

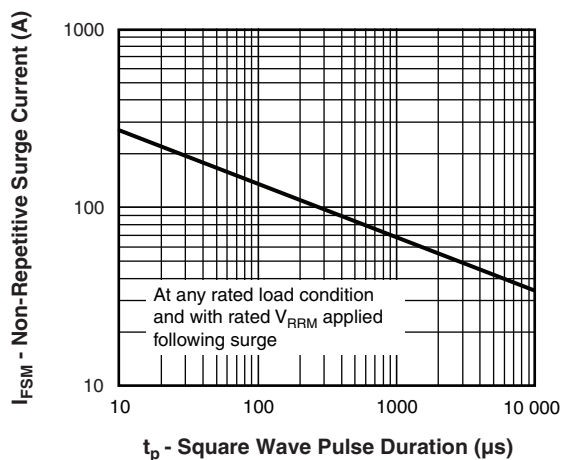


Fig. 7 - Maximum Peak Surge Forward Current vs. Pulse Duration

#### Note

- (3) 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  $V_{R1} = 80\%$  rated  $V_R$

## ORDERING INFORMATION TABLE

Device code

|            |            |          |          |           |            |
|------------|------------|----------|----------|-----------|------------|
| <b>VS-</b> | <b>MBR</b> | <b>S</b> | <b>1</b> | <b>40</b> | <b>-M3</b> |
|------------|------------|----------|----------|-----------|------------|

1 2 3 4 5 6

- 1** - Vishay Semiconductors products
- 2** - Schottky MBR series
- 3** - S = SMB
- 4** - Current rating (1 = 1 A)
- 5** - Voltage rating (40 = 40 V)
- 6** - -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

### ORDERING INFORMATION (Example)

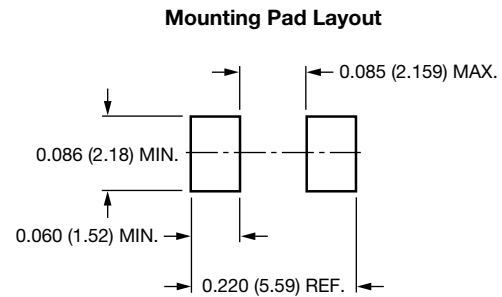
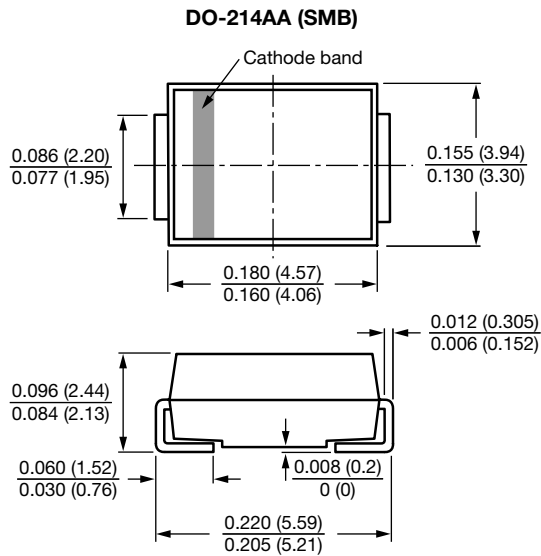
| PREFERRED P/N     | PREFERRED PACKAGE CODE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION              |
|-------------------|------------------------|------------------------|------------------------------------|
| VS-MBRS140-M3/5BT | 5BT                    | 3200                   | 13" diameter plastic tape and reel |

## LINKS TO RELATED DOCUMENTS

|                          |                                                                        |
|--------------------------|------------------------------------------------------------------------|
| Dimensions               | <a href="http://www.vishay.com/doc?95401">www.vishay.com/doc?95401</a> |
| Part marking information | <a href="http://www.vishay.com/doc?95403">www.vishay.com/doc?95403</a> |
| Packaging information    | <a href="http://www.vishay.com/doc?95404">www.vishay.com/doc?95404</a> |
| SPICE model              | <a href="http://www.vishay.com/doc?95299">www.vishay.com/doc?95299</a> |

## SMB

**DIMENSIONS** in inches (millimeters)





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