

# High Performance Schottky Rectifier, 1.5 A



DO-214AC (SMA)



## FEATURES

- Surface mountable
- Extremely low forward voltage
- Compact size
- Improved reverse blocking voltage capability relative to other similar size Schottky
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## APPLICATIONS

- Switching power supplies
- Meter protection
- Reverse protection for power input to PC board circuits
- Battery isolation and charging
- Low threshold voltage diode
- Freewheeling or by-pass diode
- Low voltage clamp

## DESCRIPTION

The VS-15MQ040NPbF Schottky rectifier is designed to be used for low power applications where a reverse voltage of 40 V is encountered and surface mountable is required.

| PRODUCT SUMMARY |                 |
|-----------------|-----------------|
| Package         | DO-214AC (SMA)  |
| $I_{F(AV)}$     | 1.5 A           |
| $V_R$           | 40 V            |
| $V_F$ at $I_F$  | 0.43 V          |
| $I_{RM}$        | 20 mA at 125 °C |
| $T_J$ max.      | 150 °C          |
| Diode variation | Single die      |
| $E_{AS}$        | 6.0 mJ          |

| MAJOR RATINGS AND CHARACTERISTICS |   |             |       |
|-----------------------------------|---|-------------|-------|
| SYMBOL                            | CHARACTERISTICS                                 | VALUES      | UNITS |
| $I_{F(AV)}$                       | Rectangular waveform                            | 1.5         | A     |
| $V_{RRM}$                         |   | 40          | V     |
| $I_{FSM}$                         | $t_p = 5 \mu s$ sine                            | 330         | A     |
| $V_F$                             | $2 A_{pk}$ , $T_J = 125 \text{ }^\circ\text{C}$ | 0.43        | V     |
| $T_J$                             | Range   | -40 to +150 | °C    |

| VOLTAGE RATINGS                      |           |                |       |
|--------------------------------------|-----------|----------------|-------|
| PARAMETER                            | SYMBOL    | VS-15MQ040NPbF | 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<br>See fig. 4                        | $I_{F(AV)}$ | 50 % duty cycle at $T_L = 105 \text{ }^\circ\text{C}$ , rectangular waveform<br>On PC board 9 mm <sup>2</sup> island (0.013 mm thick copper pad area) | 2.1    | A     |
|  | $I_{F(AV)}$ | 50 % duty cycle at $T_L = 114 \text{ }^\circ\text{C}$ , rectangular waveform<br>On PC board 9 mm <sup>2</sup> island (0.013 mm thick copper pad area) | 1.5    |       |
| Maximum peak one cycle<br>non-repetitive surge current<br>See fig. 6 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse   | 330    | A     |
|  |             | 10 ms sine or 6 ms rect. pulse  | 140    |       |
| Non-repetitive avalanche energy                                      | $E_{AS}$    | $T_J = 25 \text{ }^\circ\text{C}$ , $I_{AS} = 1 \text{ A}$ , $L = 12 \text{ mH}$  | 6.0    | 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   |                                   | VALUES | UNITS      |
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 1 A   | $T_J = 25\text{ }^\circ\text{C}$  | 0.42   | V          |
|   |                | 2 A   |                                   | 0.49   |            |
|   |                | 1 A   | $T_J = 125\text{ }^\circ\text{C}$ | 0.34   |            |
|   |                | 2 A   |                                   | 0.43   |            |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$  | $V_R = \text{Rated } V_R$         | 0.5    | mA         |
|   |                | $T_J = 125\text{ }^\circ\text{C}$   |                                   | 20     |            |
| Threshold voltage                             | $V_{F(TO)}$    | $T_J = T_J \text{ maximum}$   |                                   | 0.26   | V          |
| Forward slope resistance                      | $r_t$          |   |                                   | 64.6   | m $\Omega$ |
| Typical junction capacitance                  | $C_T$          | $V_R = 10\text{ V}_{DC}$ , $T_J = 25\text{ }^\circ\text{C}$ , test signal = 1 MHz |                                   | 134    | 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  | $T_J^{(1)}$ , $T_{Stg}$ |                               |  | -40 to +150 | $^\circ\text{C}$   |
| Maximum thermal resistance, junction to ambient | $R_{thJA}$              | DC operation                  |  | 80          | $^\circ\text{C/W}$ |
| Approximate weight                              |                         |                               |  | 0.07        | g                  |
|   |                         |                               |  | 0.002       | oz.                |
| Marking device                                  |                         | Case style SMA (similar D-64) |  | XF          |                    |

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

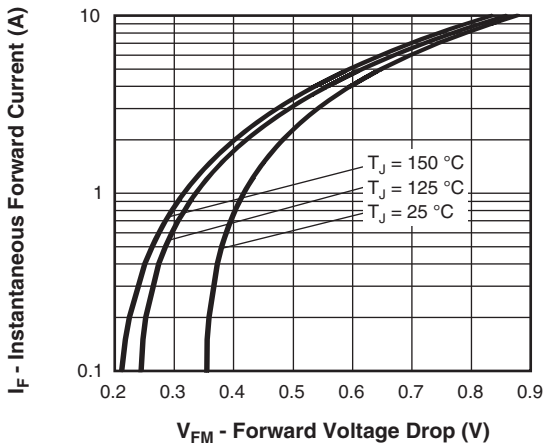


Fig. 1 - Maximum Forward Voltage Drop Characteristics

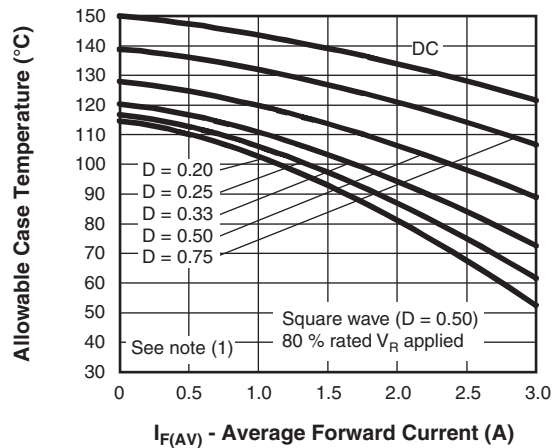


Fig. 4 - Maximum Average Forward Current vs. Allowable Lead Temperature

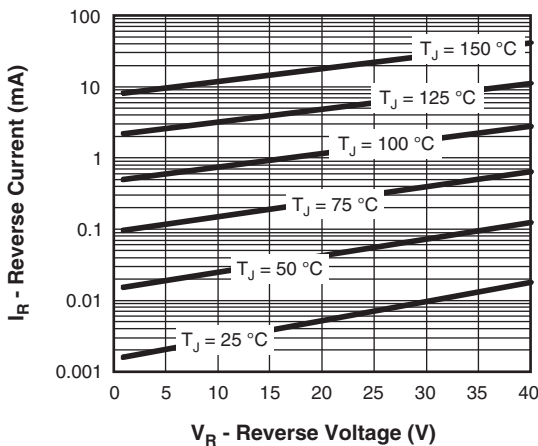


Fig. 2 - Typical Peak Reverse Current vs. Reverse Voltage

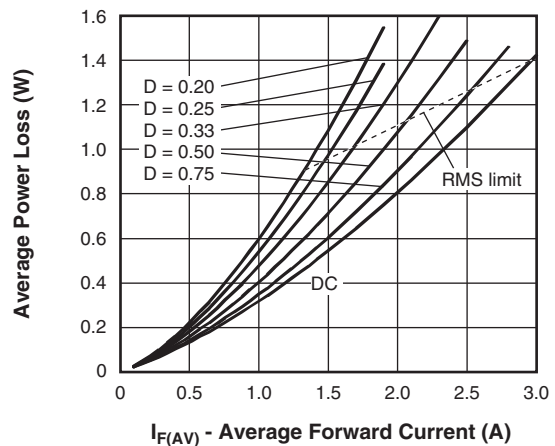


Fig. 5 - Maximum Average Forward Dissipation vs. Average Forward Current

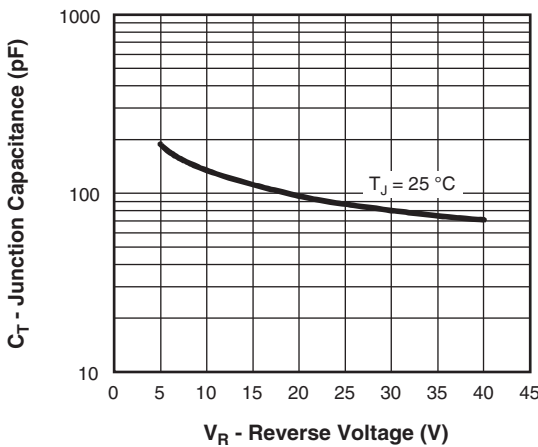


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

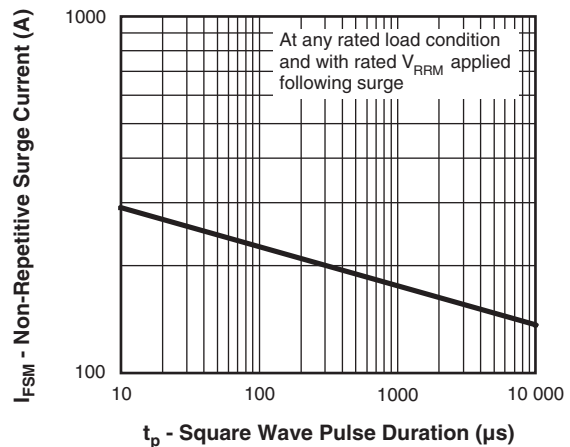


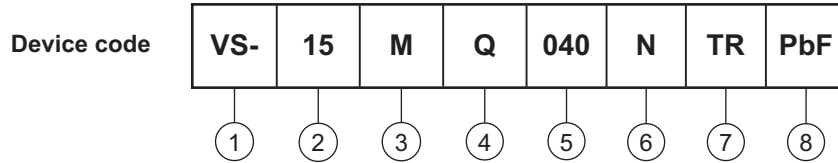
Fig. 6 - Maximum Peak Surge Forward Current vs. Pulse Duration

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



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors products
- 2** - Current rating (15 = 1.5 A)
- 3** - M = SMA
- 4** - Q = Schottky "Q" series
- 5** - Voltage rating (040 = 40 V)
- 6** - N = new SMA
- 7** - TR = tape and reel
- 8** - PbF = lead (Pb)-free

| ORDERING INFORMATION (Example) |                        |                        |                                    |
|--------------------------------|------------------------|------------------------|------------------------------------|
| PREFERRED P/N                  | PREFERRED PACKAGE CODE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION              |
| VS-15MQ040NTRPbF               | 5AT                    | 7500                   | 13" diameter plastic tape and reel |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?95400">www.vishay.com/doc?95400</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?95273">www.vishay.com/doc?95273</a> |

## SMA

**DIMENSIONS** in inches (millimeters)





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