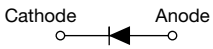
# High Performance Schottky Rectifier, 2 A

SMA (DO-214AC)




## FEATURES

- Low forward voltage drop
- Guard ring for enhanced ruggedness and long term reliability
- Small foot print, surface mountable
- High frequency operation
- 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

RoHS COMPLIANT
HALOGEN FREE

## DESCRIPTION / APPLICATIONS

The VS-20MQ040-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 | |
|---|---|
| $I_{F(AV)}$ | 2 A |
| $V_R$ | 40 V |
| $V_F$ at $I_F$ | 0.63 V |
| $I_{RM}$ | 26 mA at 125 °C |
| $T_J$ max. | 150 °C |
| $E_{AS}$ | 3.0 mJ |
| Package | SMA (DO-214AC) |
| Circuit configuration | Single |

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| $I_{F(AV)}$ | Rectangular waveform | 2 | A |
| $V_{RRM}$ | | 40 | V |
| $I_{FSM}$ | $t_p$ = 5 µs sine | 120 | A |
| $V_F$ | 2 $A_{pk}$, $T_J$ = 125 °C | 0.63 | V |
| $T_J$ | Range | -55 to +150 | °C |

| VOLTAGE RATINGS | | | |
|---|---|---|---|
| PARAMETER | SYMBOL | VS-20MQ040-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<br>See fig. 4 | $I_{F(AV)}$ | 50 % duty cycle at $T_C$ = 110 °C, rectangular waveform<br>On PC board 9 $mm^2$ island (0.013 mm thick copper pad area) | | 2.1 | A |
| | | 50 % duty cycle at $T_C$ = 112 °C, rectangular waveform<br>On PC board 9 $mm^2$ island (0.013 mm thick copper pad area) | | 2 | |
| Maximum peak one cycle non-repetitive surge current<br>See fig. 6 | $I_{FSM}$ | 5 µs sine or 3 µs rect. pulse | Following any rated load condition and with rated $V_{RRM}$ applied | 120 | A |
| | | 10 ms sine or 6 ms rect. pulse | | 30 | |
| Non-repetitive avalanche energy | $E_{AS}$ | $T_J$ = 25 °C, $I_{AS}$ = 1 A, L = 6 mH | | 3 | mJ |
| Repetitive avalanche current | $I_{AR}$ | Current decaying linearly to zero in 1 µs<br>Frequency limited by $T_J$ maximum $V_A$ = 1.5 x $V_R$ typical | | 1.0 | A |

## ELECTRICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|---|---|---|---|---|
| Maximum forward voltage drop See fig. 1 | $V_{FM}$ (1) | 2 A | $T_J$ = 25 °C | 0.69 | V |
| | | 1.5 A | | 0.62 | |
| | | 1 A | | 0.54 | |
| | | 2 A | $T_J$ = 125 °C | 0.63 | |
| | | 1.5 A | | 0.56 | |
| | | 1 A | | 0.49 | |
| Maximum reverse leakage current See fig. 2 | $I_{RM}$ | $T_J$ = 25 °C | $V_R$ = Rated $V_R$ | 0.5 | mA |
| | | $T_J$ = 125 °C | | 26 | |
| Threshold voltage | $V_{F(TO)}$ | $T_J$ = $T_J$ maximum | | 0.36 | V |
| Forward slope resistance | $r_t$ | | | 104 | mΩ |
| Typical junction capacitance | $C_T$ | $V_R$ = 10 $V_{DC}$, $T_J$ = 25 °C, test signal = 1 MHz | | 38 | 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/µs |

**Note**

(1) Pulse width = 300 µs, 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 | °C |
| Maximum thermal resistance, junction to ambient | $R_{thJA}$ | DC operation | 80 | °C/W |
| Approximate weight | | | 0.07 | g |
| | | | 0.002 | oz. |
| Marking device | | Case style SMA (DO-214AC) | 2F | |

**Note**

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

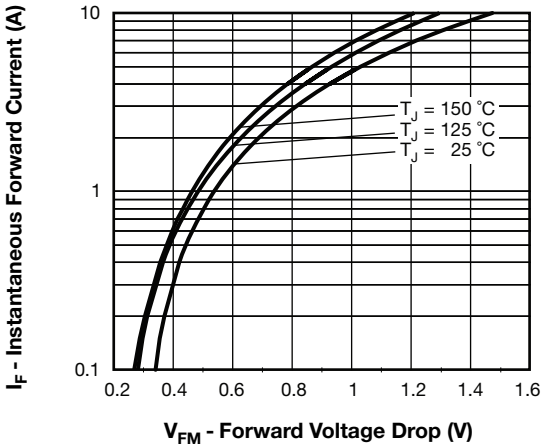



Fig. 1 - Maximum Forward Voltage Drop Characteristics

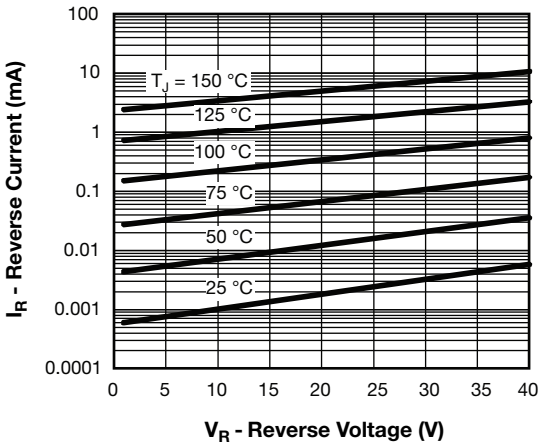



Fig. 2 - Typical Peak Reverse Current vs. Reverse Voltage

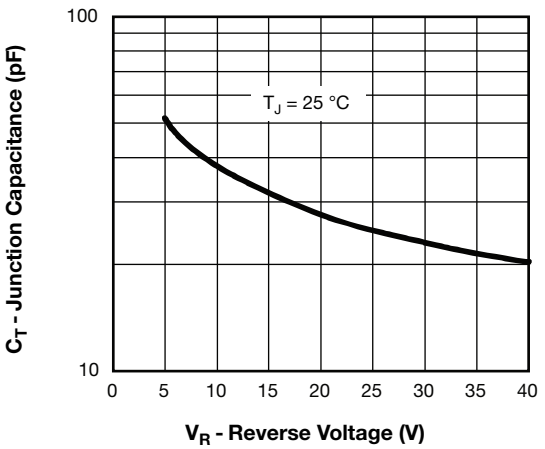



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

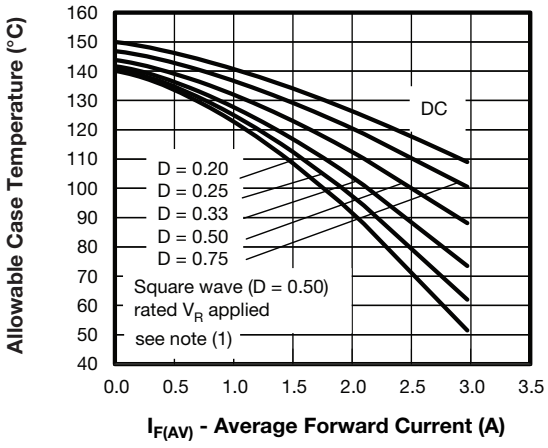



Fig. 4 - Maximum Average Forward Current vs. Allowable Lead Temperature

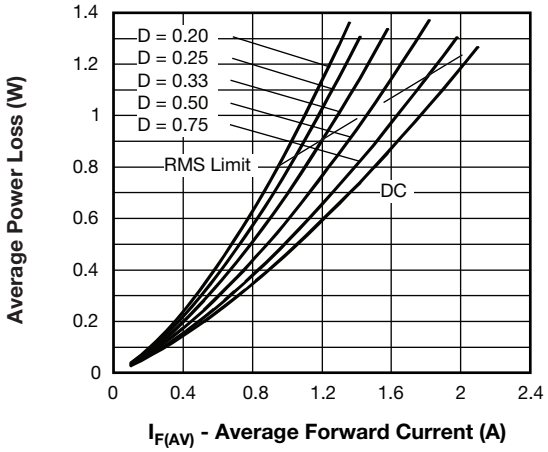



Fig. 5 - Maximum Average Forward Dissipation vs. Average Forward Current

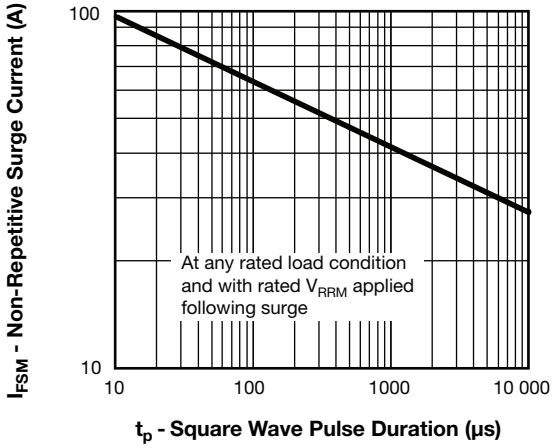


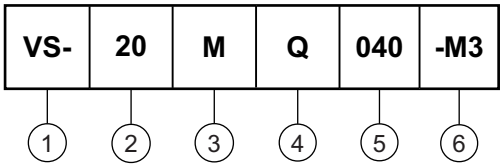

Fig. 6 - Maximum Peak Surge Forward Current vs. Pulse Duration

**Note**

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = Forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}$/D) (see fig. 6);
$Pd_{REV}$ = Inverse power loss = $V_{R1} \times I_R (1 - D)$; $I_R$ at $V_{R1}$ = 80 % rated $V_R$

## ORDERING INFORMATION TABLE

Device code




1 - Vishay Semiconductors product
2 - Current rating
3 - M = SMA
4 - Q = Schottky “Q” series
5 - Voltage rating (040 = 40 V)
6 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

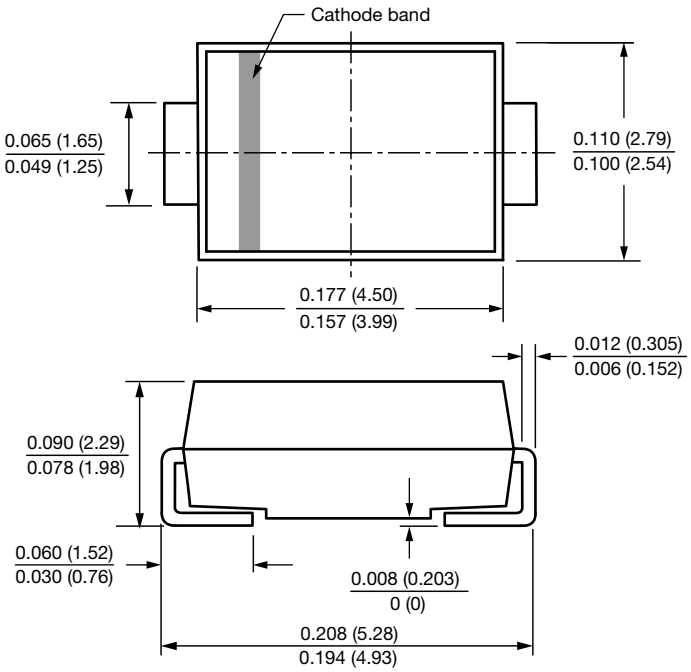
| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **PREFERRED PACKAGE CODE** | **MINIMUM ORDER QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-20MQ040-M3/5AT | 5AT | 7500 | 13" diameter plastic tape and reel |

| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | www.vishay.com/doc?95400 |
| Part marking information | www.vishay.com/doc?95403 |
| Packaging information | www.vishay.com/doc?95404 |
| SPICE model | www.vishay.com/doc?96006 |

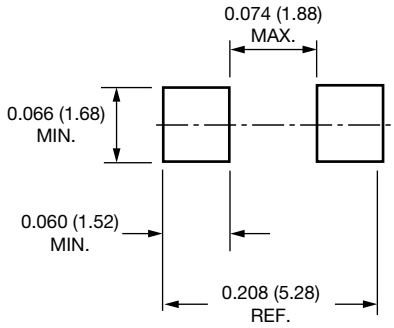
# SMA

**DIMENSIONS** in inches (millimeters)

**DO-214AC (SMA)**




**Mounting Pad Layout**



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