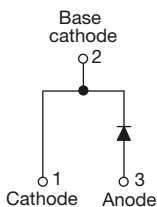




## High Performance Schottky Rectifier, 10 A



TO-220AC 2L



## FEATURES

- 175 °C  $T_J$  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
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## PRIMARY CHARACTERISTICS

|                       |                  |
|-----------------------|------------------|
| $I_{F(AV)}$           | 10 A             |
| $V_R$                 | 35 V, 40 V, 45 V |
| $V_F$ at $I_F$        | 0.49 V           |
| $I_{RM}$              | 15 mA at 125 °C  |
| $T_J$ max.            | 175 °C           |
| $E_{AS}$              | 13 mJ            |
| Package               | TO-220AC 2L      |
| Circuit configuration | Single           |

## DESCRIPTION

The VS-10TQ... Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175 °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 |
|-------------|-------------------------------------|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform                | 10          | A     |
| $V_{RRM}$   |                                     | 35 to 45    | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                | 1050        | A     |
| $V_F$       | 10 A <sub>pk</sub> , $T_J = 125$ °C | 0.49        | V     |
| $T_J$       | Range                               | -55 to +175 | °C    |

## VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-10TQ035-M3 | VS-10TQ040-M3 | VS-10TQ045-M3 | UNITS |
|--------------------------------------|-----------|---------------|---------------|---------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 35            | 40            | 45            | V     |
| Maximum working peak reverse voltage | $V_{RWM}$ |               |               |               |       |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                                         | SYMBOL      | TEST CONDITIONS                                                                                                     | VALUES | UNITS |
|-------------------------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------|--------|-------|
| Maximum average forward current<br>See fig. 5                     | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 151$ °C, rectangular waveform                                                             | 10     | A     |
| Maximum peak one cycle non-repetitive surge current<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse                                                                             | 1050   |       |
|                                                                   |             | 10 ms sine or 6 ms rect. pulse                                                                                      | 280    |       |
| Non-repetitive avalanche energy                                   | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 2$ A, $L = 6.5$ mH                                                                         | 13     | 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 | 2      | A     |



| ELECTRICAL SPECIFICATIONS                     |                |                                                                                           |                                     |        |                  |      |
|-----------------------------------------------|----------------|-------------------------------------------------------------------------------------------|-------------------------------------|--------|------------------|------|
| PARAMETER                                     | SYMBOL         | TEST CONDITIONS                                                                           |                                     | VALUES | UNITS            |      |
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 10 A                                                                                      | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.57   | V                |      |
|                                               |                | 20 A                                                                                      |                                     | 0.67   |                  |      |
|                                               |                | 10 A                                                                                      | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.49   |                  | 0.61 |
|                                               |                | 20 A                                                                                      |                                     |        |                  |      |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                        | $V_R = \text{Rated } V_R$           | 2      | mA               |      |
|                                               |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                       |                                     | 15     |                  |      |
| Maximum junction capacitance                  | $C_T$          | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^{\circ}\text{C}$ |                                     | 900    | pF               |      |
| Typical series inductance                     | $L_S$          | Measured lead to lead 5 mm from package body                                              |                                     | 8.0    | nH               |      |
| Maximum voltage rate of change                | dV/dt          | Rated $V_R$                                                                               |                                     | 10 000 | V/ $\mu\text{s}$ |      |

**Note**<sup>(1)</sup> Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %

| THERMAL - MECHANICAL SPECIFICATIONS            |         |                                   |                                       |             |                        |
|------------------------------------------------|---------|-----------------------------------|---------------------------------------|-------------|------------------------|
| PARAMETER                                      |         | SYMBOL                            | TEST CONDITIONS                       | VALUES      | UNITS                  |
| Maximum junction and storage temperature range |         | T <sub>J</sub> , T <sub>Stg</sub> |                                       | -55 to +175 | °C                     |
| Maximum thermal resistance, junction to case   |         | R <sub>thJC</sub>                 | DC operation<br>See fig. 4            | 2.0         | °C/W                   |
| Typical thermal resistance, case to heatsink   |         | R <sub>thCS</sub>                 | Mounting surface, smooth, and greased | 0.50        |                        |
| Approximate weight                             |         |                                   |                                       | 2           | g                      |
|                                                |         |                                   |                                       | 0.07        | oz.                    |
| Mounting torque                                | minimum |                                   |                                       | 6 (5)       | kgf · cm<br>(lbf · in) |
|                                                | maximum |                                   |                                       | 12 (10)     |                        |
| Marking device                                 |         |                                   | Case style TO-220AC 2L                | 10TQ035     |                        |
|                                                |         |                                   |                                       | 10TQ045     |                        |

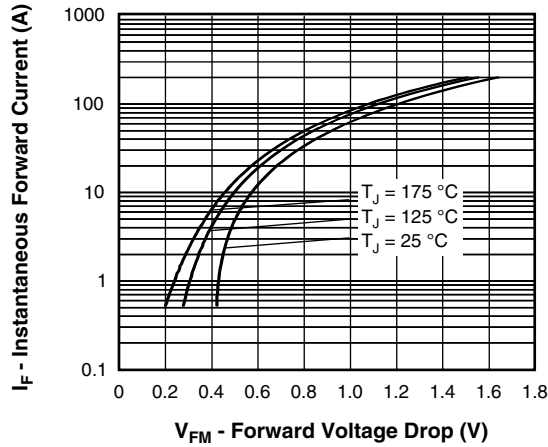


Fig. 1 - Maximum Forward Voltage Drop Characteristics

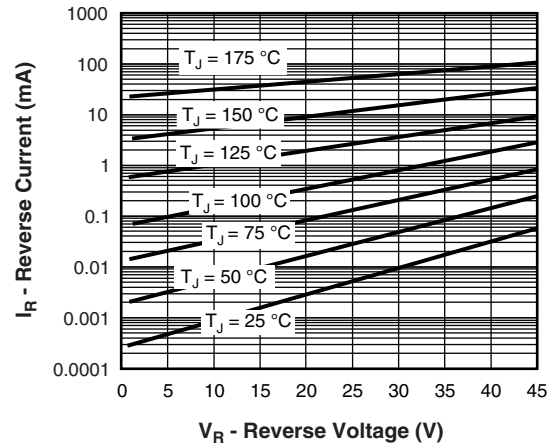


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

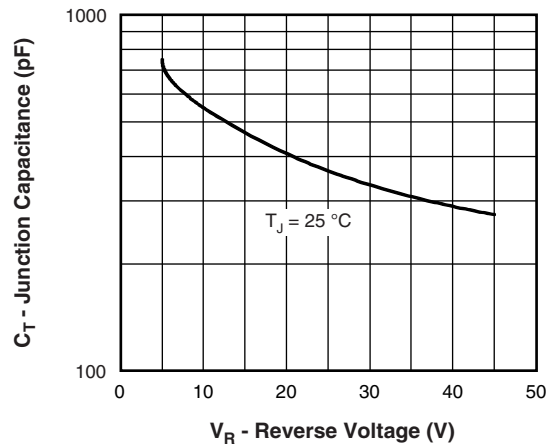


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

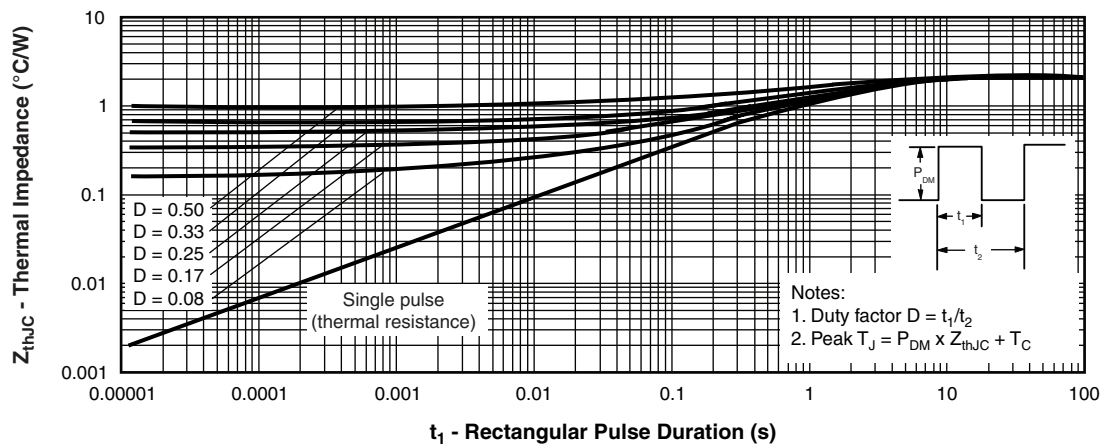


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

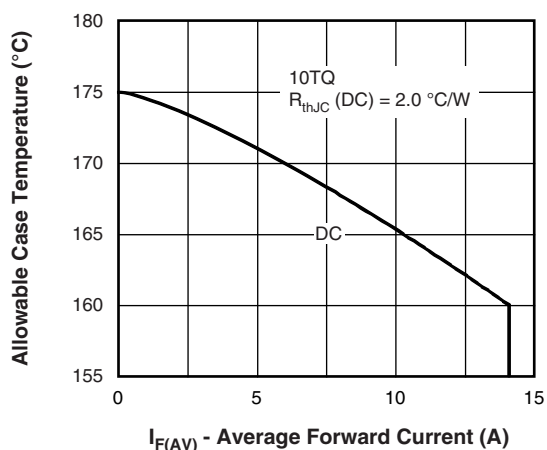


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

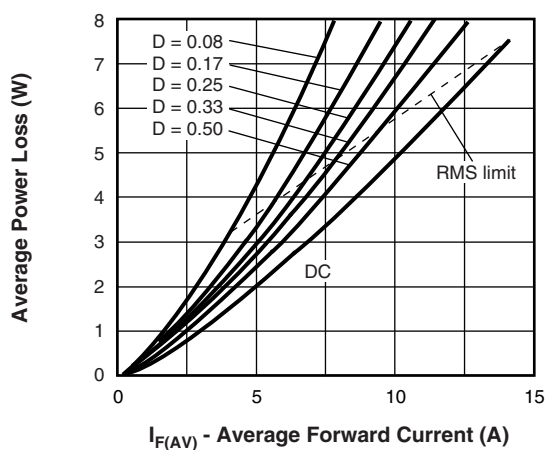


Fig. 6 - Forward Power Loss Characteristics

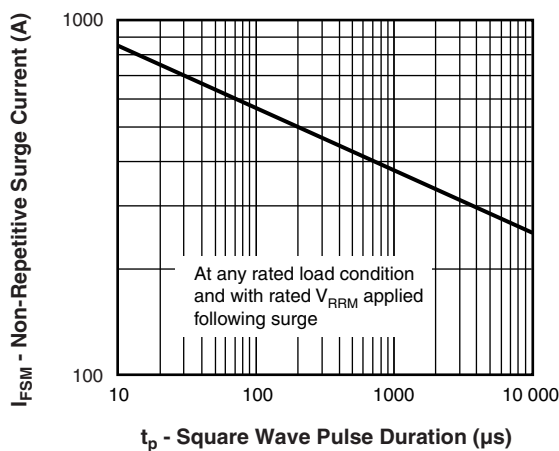


Fig. 7 - Maximum Non-Repetitive Surge Current

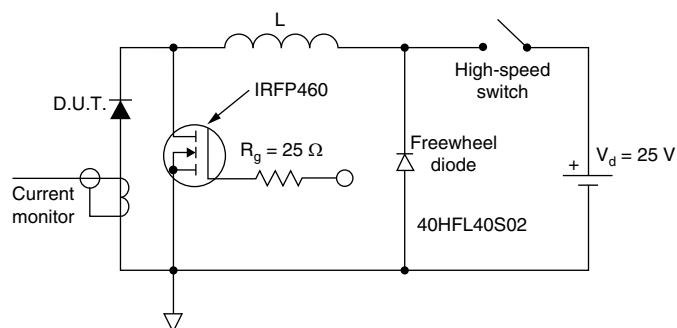
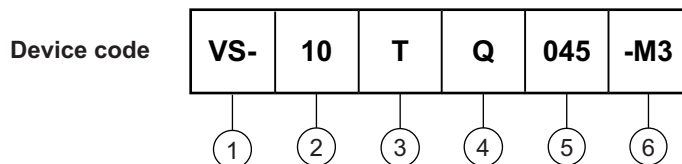


Fig. 8 - Unclamped Inductive Test Circuit



## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (10 = 10 A)
- 3** - Package:  
T = TO-220
- 4** - Schottky "Q" series
- 5** - Voltage ratings
- 6** - Environmental digit  
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

|            |
|------------|
| 035 = 35 V |
| 040 = 40 V |
| 045 = 45 V |

| ORDERING INFORMATION (Example) |               |                          |
|--------------------------------|---------------|--------------------------|
| PREFERRED P/N                  | BASE QUANTITY | PACKAGING DESCRIPTION    |
| VS-10TQ035-M3                  | 50            | Antistatic plastic tubes |
| VS-10TQ040-M3                  | 50            | Antistatic plastic tubes |
| VS-10TQ045-M3                  | 50            | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?96156">www.vishay.com/doc?96156</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95391">www.vishay.com/doc?95391</a> |



### TO-220AC 2L

**DIMENSIONS** in millimeters and inches



Conforms to JEDEC® outline TO-220AC

| 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     | 2.50        | 2.92  | 0.098  | 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       | 15.35 | 0.585  | 0.604 | 3     |
| D1     | 8.38        | 9.02  | 0.330  | 0.355 |       |
| D2     | 11.68       | 13.30 | 0.460  | 0.524 | 6, 7  |
| E      | 10.11       | 10.51 | 0.398  | 0.414 | 3, 6  |
| E1     | 6.86        | 8.89  | 0.270  | 0.350 | 6     |
| 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     |
| L      | 13.52       | 14.02 | 0.532  | 0.552 |       |
| L1     | 3.32        | 3.82  | 0.131  | 0.150 | 2     |
| Ø P    | 3.54        | 3.91  | 0.139  | 0.154 |       |
| Q      | 2.60        | 3.00  | 0.102  | 0.118 |       |

#### Notes

- Dimensioning and tolerancing as per ASME Y14.5M-1994
- Lead dimension and finish uncontrolled in L1
- 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
- Dimension b1, b3, and c1 apply to base metal only
- Controlling dimensions: inches
- Thermal pad contour optional within dimensions E, H1, D2, and E1
- Outline conforms to JEDEC® TO-220, except D2



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