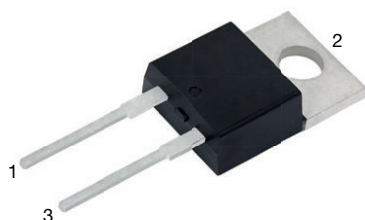
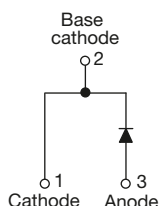


## High Performance Schottky Rectifier, 15 A



TO-220AC 2L



### FEATURES

- 150 °C T<sub>J</sub> operation
- Very 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

### DESCRIPTION

The VS-12TQ... Schottky rectifier series has been optimized for very low forward voltage drop, with moderate leakage. The proprietary barrier technology allows for reliable operation up to 150 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

### PRIMARY CHARACTERISTICS

|                                  |                  |
|----------------------------------|------------------|
| I <sub>F(AV)</sub>               | 15 A             |
| V <sub>R</sub>                   | 35 V, 40 V, 45 V |
| V <sub>F</sub> at I <sub>F</sub> | 0.50 V           |
| I <sub>RM</sub> typ.             | 70 mA at 125 °C  |
| T <sub>J</sub> max.              | 150 °C           |
| E <sub>AS</sub>                  | 16 mJ            |
| Package                          | TO-220AC 2L      |
| Circuit configuration            | Single           |

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL             | CHARACTERISTICS                              | VALUES      | UNITS |
|--------------------|----------------------------------------------|-------------|-------|
| I <sub>F(AV)</sub> | Rectangular waveform                         | 15          | A     |
| V <sub>RRM</sub>   | Range                                        | 35 to 45    | V     |
| I <sub>FSM</sub>   | t <sub>p</sub> = 5 μs sine                   | 990         | A     |
| V <sub>F</sub>     | 15 A <sub>pk</sub> , T <sub>J</sub> = 125 °C | 0.50        | V     |
| T <sub>J</sub>     | Range                                        | -55 to +150 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL           | VS-12TQ035-M3 | VS-12TQ040-M3 | VS-12TQ045-M3 | UNITS |
|--------------------------------------|------------------|---------------|---------------|---------------|-------|
| Maximum DC reverse voltage           | V <sub>R</sub>   | 35            | 40            | 45            | V     |
| Maximum working peak reverse voltage | V <sub>RWM</sub> |               |               |               |       |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                                         | SYMBOL             | TEST CONDITIONS                                                                                                                        | VALUES | UNITS |
|-------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------|-------|
| Maximum average forward current<br>See fig. 5                     | I <sub>F(AV)</sub> | 50 % duty cycle at T <sub>C</sub> = 120 °C, rectangular waveform                                                                       | 15     | A     |
| Maximum peak one cycle non-repetitive surge current<br>See fig. 7 | I <sub>FSM</sub>   | 5 μs sine or 3 μs rect. pulse                                                                                                          | 990    |       |
|                                                                   |                    | 10 ms sine or 6 ms rect. pulse                                                                                                         | 250    |       |
| Non-repetitive avalanche energy                                   | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 2.4 A, L = 5.5 mH                                                                            | 16     | mJ    |
| Repetitive avalanche current                                      | I <sub>AR</sub>    | Current decaying linearly to zero in 1 μs<br>Frequency limited by T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> typical | 2.4    | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                  | SYMBOL         | TEST CONDITIONS                                                                           |                                     | VALUES | UNITS            |
|--------------------------------------------|----------------|-------------------------------------------------------------------------------------------|-------------------------------------|--------|------------------|
| Maximum forward voltage drop<br>See fig. 1 | $V_{FM}^{(1)}$ | 15 A                                                                                      | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.56   | V                |
|                                            |                | 30 A                                                                                      |                                     | 0.71   |                  |
|                                            |                | 15 A                                                                                      | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.50   |                  |
|                                            |                | 30 A                                                                                      |                                     | 0.64   |                  |
| Maximum reverse leakage current            | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                        | $V_R = \text{Rated } V_R$           | 1.75   | mA               |
|                                            |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                       |                                     | 110    |                  |
| Typical reverse leakage current            | $I_{RM}^{(1)}$ | $T_J = 125\text{ }^{\circ}\text{C}$                                                       | $V_R = \text{Rated } V_R$           | 70     | mA               |
| 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 +150 | °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                | 12TQ035     |                        |
|                                                |                                   |                                       | 12TQ040     |                        |
|                                                |                                   |                                       | 12TQ045     |                        |

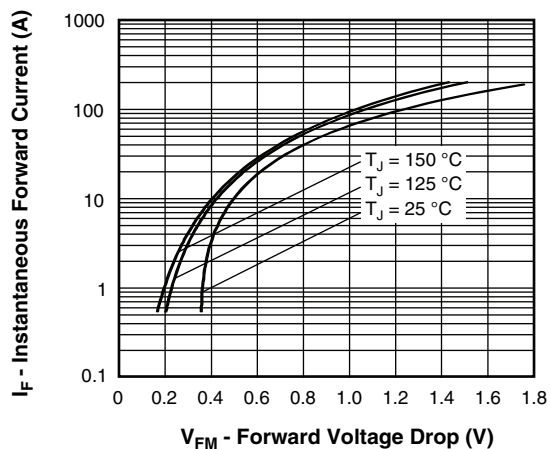


Fig. 1 - Maximum Forward Voltage Drop Characteristics

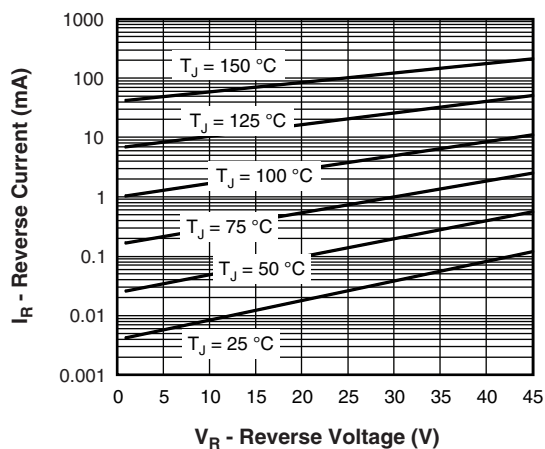


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

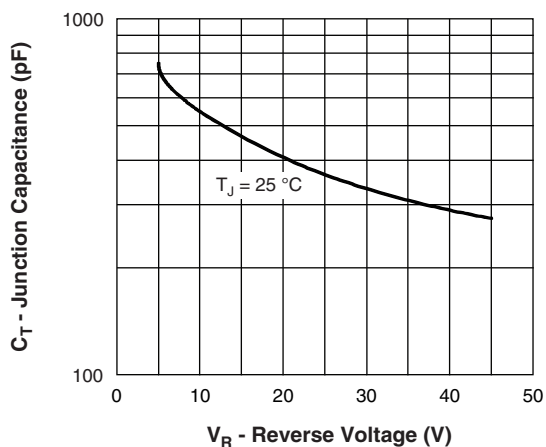
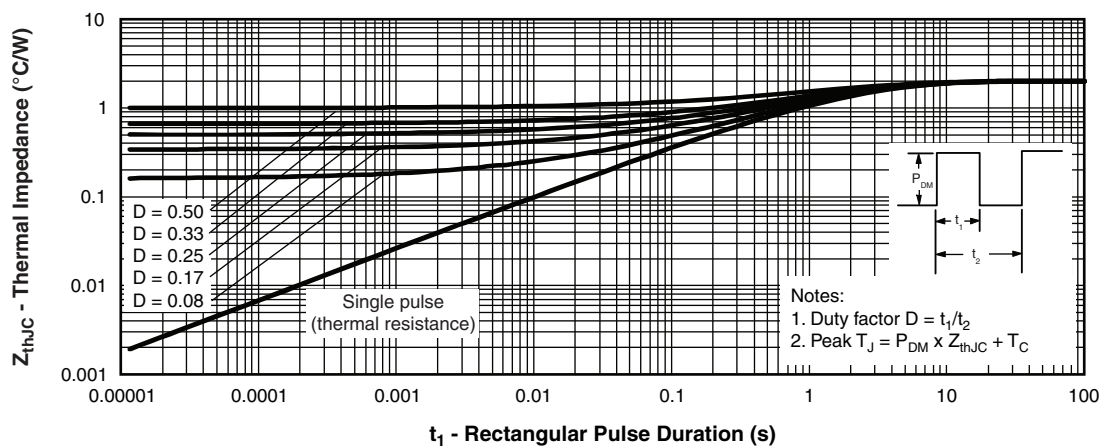


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

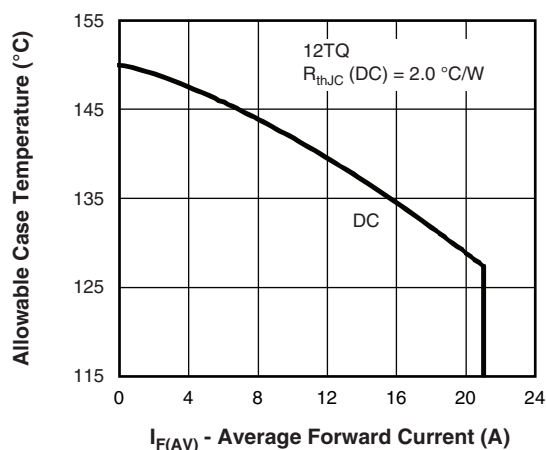


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

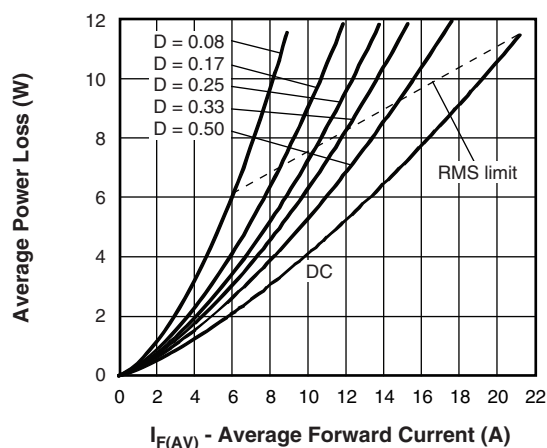


Fig. 6 - Forward Power Loss Characteristics

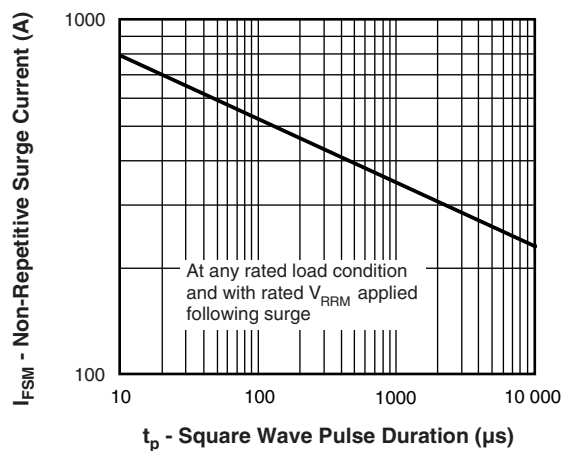


Fig. 7 - Maximum Non-Repetitive Surge Current

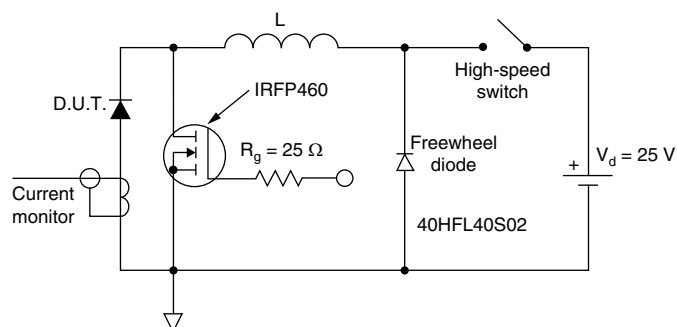


Fig. 8 - Unclamped Inductive Test Circuit



## ORDERING INFORMATION TABLE

|             |            |           |          |          |            |            |
|-------------|------------|-----------|----------|----------|------------|------------|
| Device code | <b>VS-</b> | <b>12</b> | <b>T</b> | <b>Q</b> | <b>045</b> | <b>-M3</b> |
|             | 1          | 2         | 3        | 4        | 5          | 6          |

|          |   |                               |
|----------|---|-------------------------------|
| <b>1</b> | - | Vishay Semiconductors product |
| <b>2</b> | - | Current rating (15 A)         |
| <b>3</b> | - | Package:<br>T = TO-220        |
| <b>4</b> | - | Schottky "Q" series           |
| <b>5</b> | - | Voltage ratings               |
| <b>6</b> | - | Environmental digit           |

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

-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| ORDERING INFORMATION (Example) |               |                          |
|--------------------------------|---------------|--------------------------|
| PREFERRED P/N                  | BASE QUANTITY | PACKAGING DESCRIPTION    |
| VS-12TQ035-M3                  | 50            | Antistatic plastic tubes |
| VS-12TQ040-M3                  | 50            | Antistatic plastic tubes |
| VS-12TQ045-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> |





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