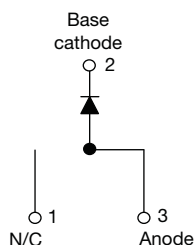


## High Performance Schottky Rectifier, 10 A


D<sup>2</sup>PAK


### FEATURES

- 175 °C T<sub>J</sub> 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
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- 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**

### PRODUCT SUMMARY

|                                  |                               |
|----------------------------------|-------------------------------|
| I <sub>F(AV)</sub>               | 10 A                          |
| V <sub>R</sub>                   | 35 V, 45 V                    |
| V <sub>F</sub> at I <sub>F</sub> | 0.49 V                        |
| I <sub>RM</sub> max.             | 15 mA at 125 °C               |
| T <sub>J</sub> max.              | 175 °C                        |
| E <sub>AS</sub>                  | 13 mJ                         |
| Package                          | TO-263AB (D <sup>2</sup> PAK) |
| Diode variation                  | Single die                    |

### DESCRIPTION

The VS-10TQ...S-M3 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 <sub>F(AV)</sub> | Rectangular waveform                         | 10         | A     |
| V <sub>RRM</sub>   |                                              | 35/45      | V     |
| I <sub>FSM</sub>   | t <sub>p</sub> = 5 μs sine                   | 1050       | A     |
| V <sub>F</sub>     | 10 A <sub>pk</sub> , T <sub>J</sub> = 125 °C | 0.49       | V     |
| T <sub>J</sub>     | Range                                        | -55 to 175 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL           | VS-10TQ035S-M3 | VS-10TQ045S-M3 | UNITS |
|--------------------------------------|------------------|----------------|----------------|-------|
| Maximum DC reverse voltage           | V <sub>R</sub>   | 35             | 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> = 151 °C, rectangular waveform                                                                       | 10     | A     |
| Maximum peak one cycle<br>non-repetitive surge current<br>See fig. 7 | I <sub>FSM</sub>   | 5 μs sine or 3 μs rect. pulse                                                                                                          | 1050   | A     |
|                                                                      |                    | 10 ms sine or 6 ms rect. pulse                                                                                                         | 280    |       |
| Non-repetitive avalanche energy                                      | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 2 A, L = 6.5 mH                                                                              | 13     | 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      | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                     | SYMBOL         | TEST CONDITIONS                                                                            | VALUES | UNITS            |
|-----------------------------------------------|----------------|--------------------------------------------------------------------------------------------|--------|------------------|
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 10 A                                                                                       | 0.57   | V                |
|                                               |                | 20 A                                                                                       |        |                  |
|                                               |                | 10 A                                                                                       | 0.49   |                  |
|                                               |                | 20 A                                                                                       | 0.61   |                  |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 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 D <sup>2</sup> PAK        | 10TQ035S<br>10TQ045S |                        |

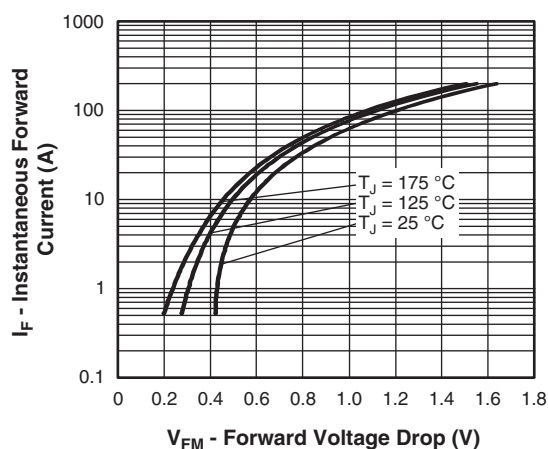


Fig. 1 - Maximum Forward Voltage Drop Characteristics

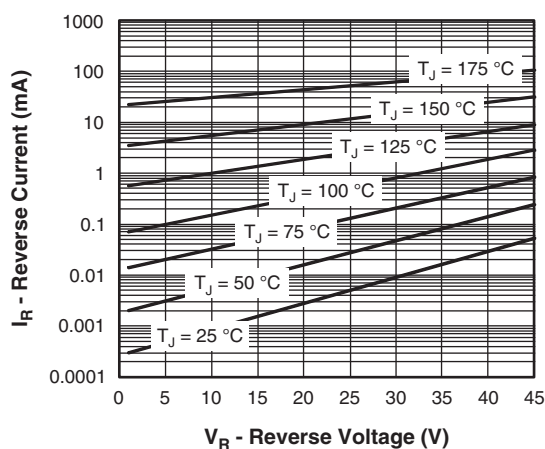


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

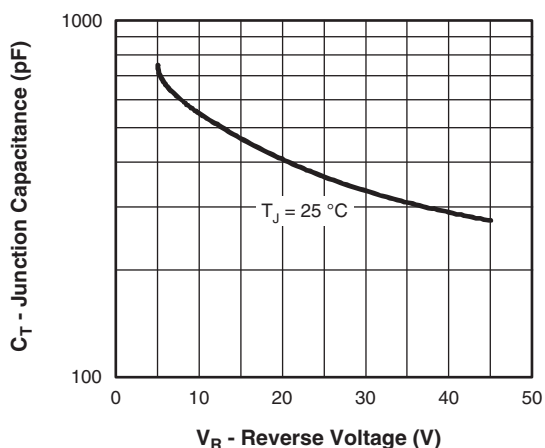


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

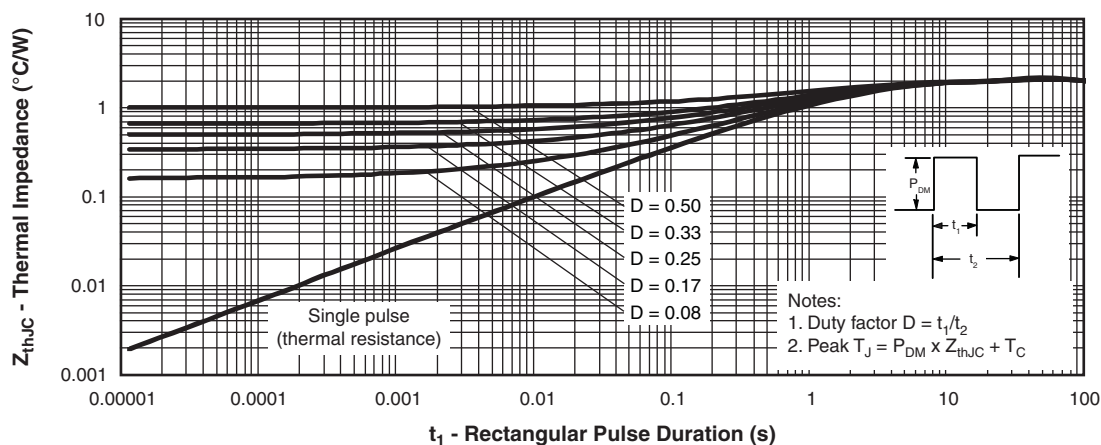
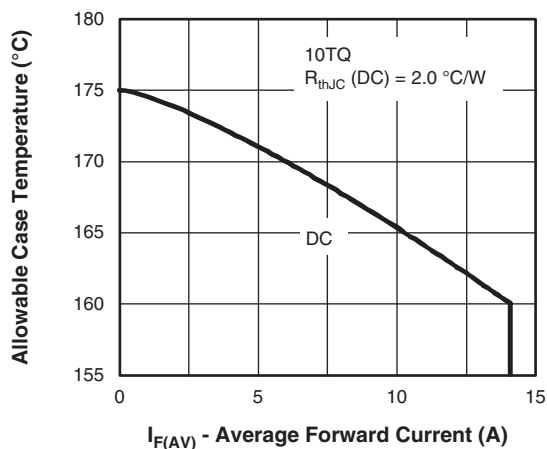

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics


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

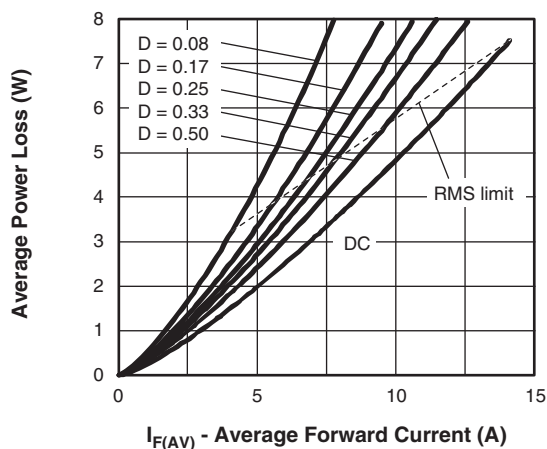


Fig. 6 - Forward Power Loss Characteristics

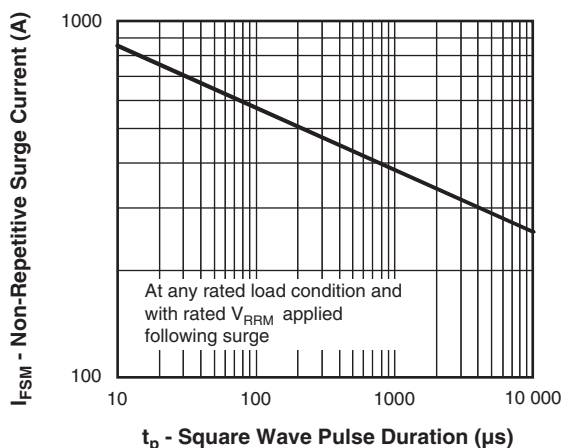


Fig. 7 - Maximum Non-Repetitive Surge Current

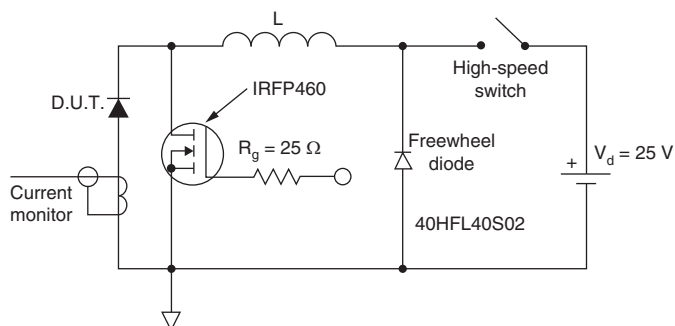


Fig. 8 - Unclamped Inductive Test Circuit

## ORDERING INFORMATION TABLE

| Device code | VS-                                                                                                                                                      | 10 | T | Q | 045 | S | TRL | -M3 |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|-----|---|-----|-----|
|             | 1                                                                                                                                                        | 2  | 3 | 4 | 5   | 6 | 7   | 8   |
| 1           | Vishay Semiconductors product                                                                                                                            |    |   |   |     |   |     |     |
| 2           | Current rating (10 A)                                                                                                                                    |    |   |   |     |   |     |     |
| 3           | Circuit configuration: T = TO-220                                                                                                                        |    |   |   |     |   |     |     |
| 4           | Schottky "Q" series                                                                                                                                      |    |   |   |     |   |     |     |
| 5           | Voltage ratings                                                                                                                                          |    |   |   |     |   |     |     |
| 6           | S = D <sup>2</sup> PAK                                                                                                                                   |    |   |   |     |   |     |     |
| 7           | <ul style="list-style-type: none"> <li>None = Tube</li> <li>TRL = Tape and reel (left oriented)</li> <li>TRR = Tape and reel (right oriented)</li> </ul> |    |   |   |     |   |     |     |
| 8           | -M3 = Halogen-free, RoHS-compliant and termination lead (Pb)-free                                                                                        |    |   |   |     |   |     |     |

**ORDERING INFORMATION**

| PREFERRED P/N     | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION    |
|-------------------|------------------|------------------------|--------------------------|
| VS-10TQ035S-M3    | 50               | 1000                   | Antistatic plastic tubes |
| VS-10TQ035STRR-M3 | 800              | 800                    | 13" diameter reel        |
| VS-10TQ035STRL-M3 | 800              | 800                    | 13" diameter reel        |
| VS-10TQ045S-M3    | 50               | 1000                   | Antistatic plastic tubes |
| VS-10TQ045STRR-M3 | 800              | 800                    | 13" diameter reel        |
| VS-10TQ045STRL-M3 | 800              | 800                    | 13" diameter reel        |

**LINKS TO RELATED DOCUMENTS**

|                          |                                                                        |
|--------------------------|------------------------------------------------------------------------|
| Dimensions               | <a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a> |
| Part marking information | <a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a> |
| Packaging information    | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a> |

### D<sup>2</sup>PAK

#### DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (SMD-220)



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160  | 0.190 |       |
| A1     | 0.00        | 0.254 | 0.000  | 0.010 |       |
| b      | 0.51        | 0.99  | 0.020  | 0.039 |       |
| b1     | 0.51        | 0.89  | 0.020  | 0.035 | 4     |
| b2     | 1.14        | 1.78  | 0.045  | 0.070 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     |
| c      | 0.38        | 0.74  | 0.015  | 0.029 |       |
| c1     | 0.38        | 0.58  | 0.015  | 0.023 | 4     |
| c2     | 1.14        | 1.65  | 0.045  | 0.065 |       |
| D      | 8.51        | 9.65  | 0.335  | 0.380 | 2     |

| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| H      | 14.61       | 15.88 | 0.575     | 0.625 |       |
| L      | 1.78        | 2.79  | 0.070     | 0.110 |       |
| L1     | -           | 1.65  | -         | 0.066 | 3     |
| L2     | 1.27        | 1.78  | 0.050     | 0.070 |       |
| L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |

#### Notes

- Dimensioning and tolerancing per ASME Y14.5 M-1994
- Dimension D 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 outmost extremes of the plastic body
- Thermal pad contour optional within dimension E, L1, D1 and E1
- Dimension b1 and c1 apply to base metal only
- Datum A and B to be determined at datum plane H
- Controlling dimension: inch
- Outline conforms to JEDEC® outline TO-263AB



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