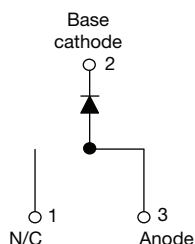


## High Performance Schottky Rectifier, 10 A


**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
- AEC-Q101 qualified
- 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

|                                  |                    |
|----------------------------------|--------------------|
| Package                          | D <sup>2</sup> PAK |
| I <sub>F(AV)</sub>               | 10 A               |
| V <sub>R</sub>                   | 35 V, 40 V, 45 V   |
| V <sub>F</sub> at I <sub>F</sub> | 0.57 V             |
| I <sub>RM</sub>                  | 15 mA at 125 °C    |
| T <sub>J</sub> max.              | 175 °C             |
| Diode variation                  | Single die         |
| E <sub>AS</sub>                  | 13 mJ              |

### DESCRIPTION

The VS-10TQ...SPbF 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-10TQ035SPbF | VS-10TQ045SPbF | 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                                                                                       | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.57   | V          |
|                                               |                | 20 A                                                                                       |                                     | 0.67   |            |
|                                               |                | 10 A                                                                                       | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.49   |            |
|                                               |                | 20 A                                                                                       |                                     | 0.61   |            |
| 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/ $\mu$ 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 <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        | 10TQ045S    |                        |

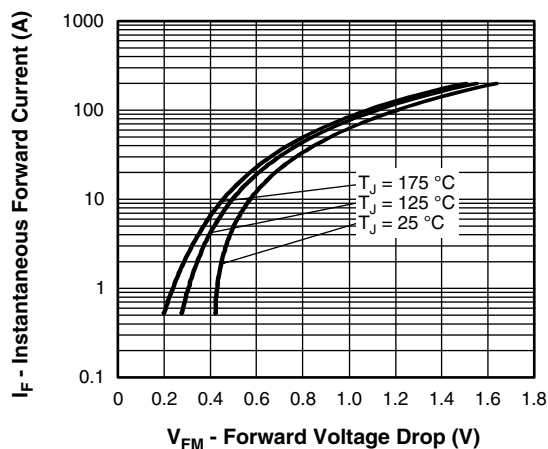


Fig. 1 - Maximum Forward Voltage Drop Characteristics

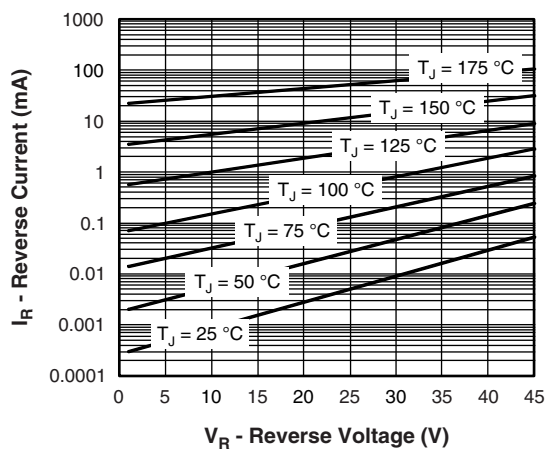


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

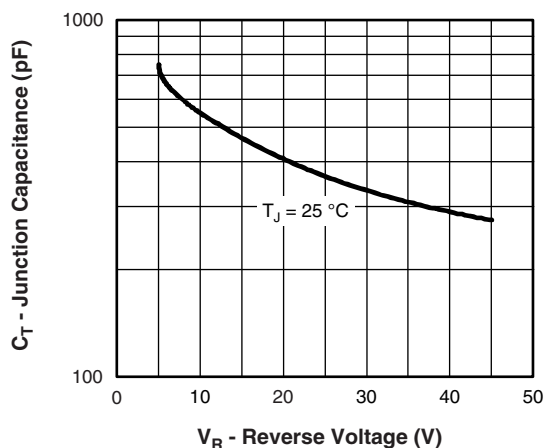


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

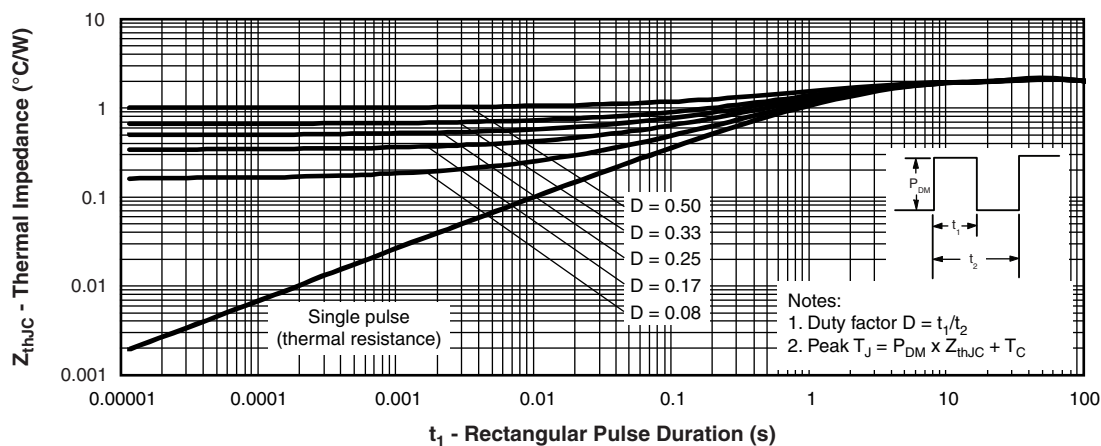


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

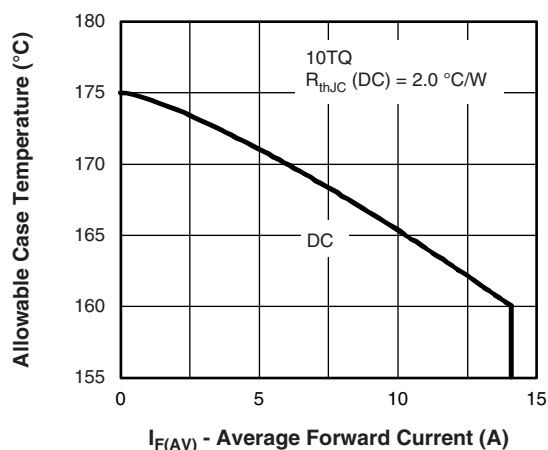


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

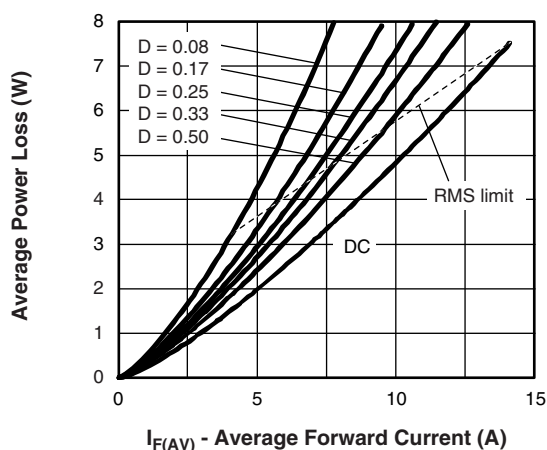


Fig. 6 - Forward Power Loss Characteristics

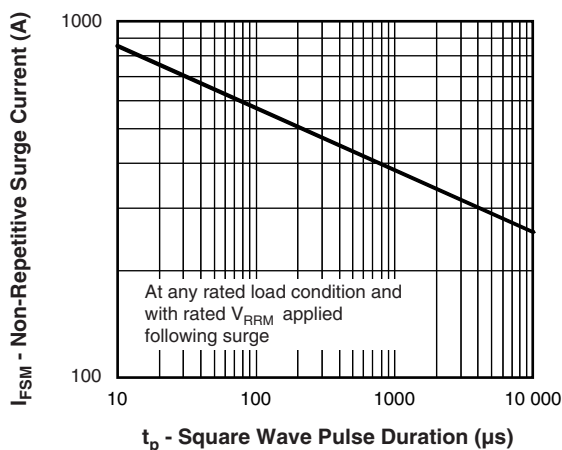


Fig. 7 - Maximum Non-Repetitive Surge Current

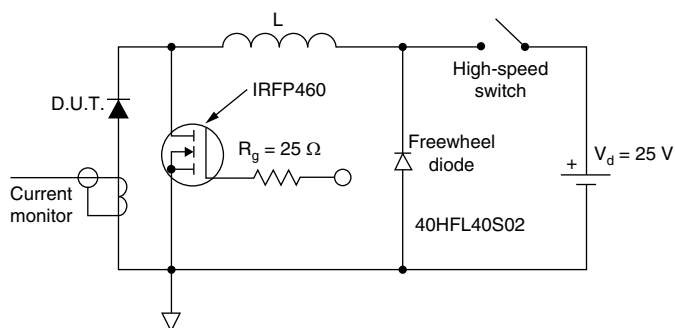


Fig. 8 - Unclamped Inductive Test Circuit



## ORDERING INFORMATION TABLE

| Device code | VS-                                                                                                                                                                      | 10 | T | Q | 045                      | S | TRL | PbF |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|--------------------------|---|-----|-----|
|             | 1                                                                                                                                                                        | 2  | 3 | 4 | 5                        | 6 | 7   | 8   |
| 1           | - Vishay Semiconductors product                                                                                                                                          |    |   |   |                          |   |     |     |
| 2           | - Current rating (10 A)                                                                                                                                                  |    |   |   |                          |   |     |     |
| 3           | - Circuit configuration: T = D <sup>2</sup> PAK                                                                                                                          |    |   |   |                          |   |     |     |
| 4           | - Schottky "Q" series                                                                                                                                                    |    |   |   |                          |   |     |     |
| 5           | - Voltage ratings                                                                                                                                                        |    |   |   | 035 = 35 V<br>045 = 45 V |   |     |     |
| 6           | - S = D <sup>2</sup> PAK                                                                                                                                                 |    |   |   |                          |   |     |     |
| 7           | - <ul style="list-style-type: none"><li>• None = tube (50 pieces)</li><li>• TRL = tape and reel (left oriented)</li><li>• TRR = tape and reel (right oriented)</li></ul> |    |   |   |                          |   |     |     |
| 8           | - PbF = lead (Pb)-free                                                                                                                                                   |    |   |   |                          |   |     |     |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95014">www.vishay.com/doc?95014</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95008">www.vishay.com/doc?95008</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a> |

## D<sup>2</sup>PAK, TO-262

### DIMENSIONS FOR D<sup>2</sup>PAK in millimeters and inches

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



## DIMENSIONS FOR TO-262 in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160     | 0.190 |       |
| A1     | 2.03        | 3.02  | 0.080     | 0.119 |       |
| 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     |
| 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 |       |       |
| L      | 13.46       | 14.10 | 0.530     | 0.555 |       |
| L1     | -           | 1.65  | -         | 0.065 | 3     |
| L2     | 3.56        | 3.71  | 0.140     | 0.146 |       |

### Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) 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
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimension: inches

- (6) Outline conform to JEDEC TO-262 except A1 (maximum), b (minimum) and D1 (minimum) where dimensions derived the actual package outline



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