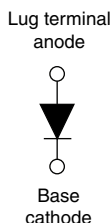


# High Performance Schottky Rectifier, 240 A


**HALF-PAK (D-67)**


## FEATURES

- 175 °C  $T_J$  operation
- Low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Designed and qualified for industrial level
- UL approved file E222165 
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



## PRIMARY CHARACTERISTICS

|                       |                 |
|-----------------------|-----------------|
| $I_{F(AV)}$           | 240 A           |
| $V_R$                 | 45 V            |
| Package               | HALF-PAK (D-67) |
| Circuit configuration | Single diode    |

## DESCRIPTION

The VS-241NQ.. high current Schottky rectifier module 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 high current switching power supplies, plating power supplies, UPS systems, converters, freewheeling diodes, welding, and reverse battery protection.

## MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS                           | VALUES      | UNITS |
|-------------|-------------------------------------------|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform                      | 240         | A     |
| $V_{RRM}$   |                                           | 45          | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                      | 25 000      | A     |
| $V_F$       | 240 A <sub>pk</sub> , $T_J = 125^\circ C$ | 0.64        | V     |
| $T_J$       | Range                                     | -55 to +175 | °C    |

## VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-241NQ045PbF | UNITS |
|--------------------------------------|-----------|----------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 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 $T_C = 144^\circ C$ , rectangular waveform                                                       | 240    | A     |
| Maximum peak one cycle<br>non-repetitive surge current<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse                                                                             | 25 000 |       |
|                                                                      |             | 10 ms sine or 6 ms rect. pulse                                                                                      | 3450   |       |
| Non-repetitive avalanche energy                                      | $E_{AS}$    | $T_J = 25^\circ C$ , $I_{AS} = 26 A$ , $L = 1 mH$                                                                   | 324    | 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 | 48     | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                     | SYMBOL         | TEST CONDITIONS                                                                           | VALUES | UNITS      |
|-----------------------------------------------|----------------|-------------------------------------------------------------------------------------------|--------|------------|
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 240 A                                                                                     | 0.80   | V          |
|                                               |                | 480 A                                                                                     | 1.11   |            |
|                                               |                | 240 A                                                                                     | 0.64   |            |
|                                               |                | 480 A                                                                                     | 0.86   |            |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                        | 20     | mA         |
|                                               |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                       | 1120   |            |
| Maximum junction capacitance                  | $C_T$          | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^{\circ}\text{C}$ | 14 800 | pF         |
| Typical series inductance                     | $L_S$          | From top of terminal hole to mounting plane                                               | 5.0    | nH         |
| Maximum voltage rate of change                | $dV/dt$        | Rated $V_R$                                                                               | 10 000 | V/ $\mu$ s |

**Note**(1) Pulse width < 500  $\mu$ s**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           | 0.19            | °C/W                |
| Typical thermal resistance, case to heatsink   | R <sub>thCS</sub>                 | Mounting surface, smooth and greased | 0.05            |                     |
| Approximate weight                             |                                   |                                      | 30              | g                   |
|                                                |                                   |                                      | 1.06            | oz.                 |
| Mounting torque                                | minimum                           | Non-lubricated threads               | 3 (26.5)        | N · m<br>(lbf · in) |
|                                                | maximum                           |                                      | 4 (35.4)        |                     |
| Terminal torque                                | minimum                           |                                      | 3.4 (30)        |                     |
|                                                | maximum                           |                                      | 5 (44.2)        |                     |
| Case style                                     |                                   |                                      | HALF-PAK module |                     |

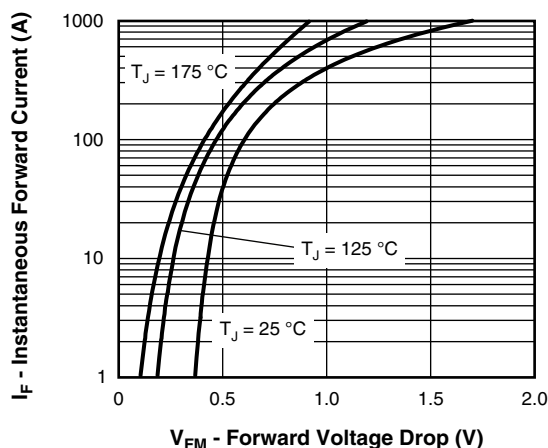


Fig. 1 - Maximum Forward Voltage Drop Characteristics

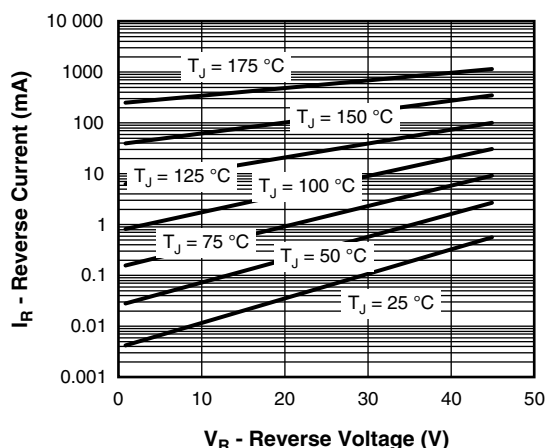


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

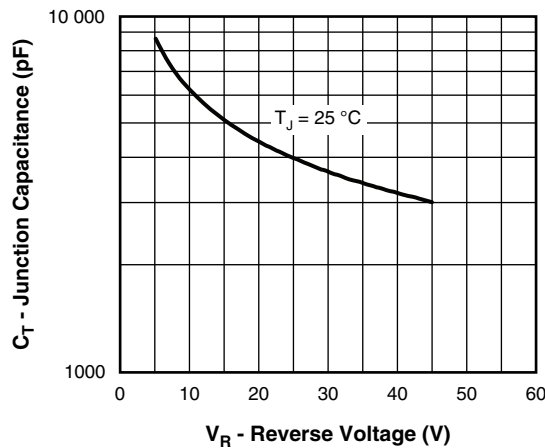


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

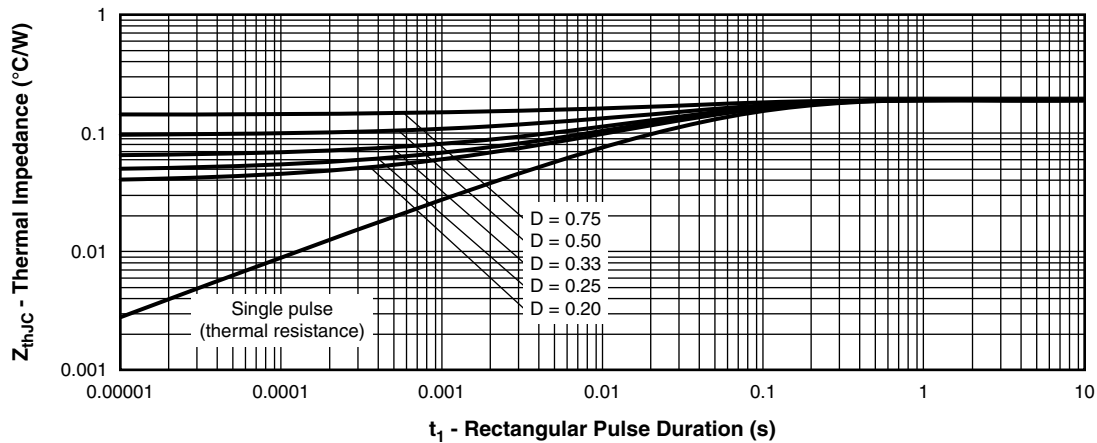


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

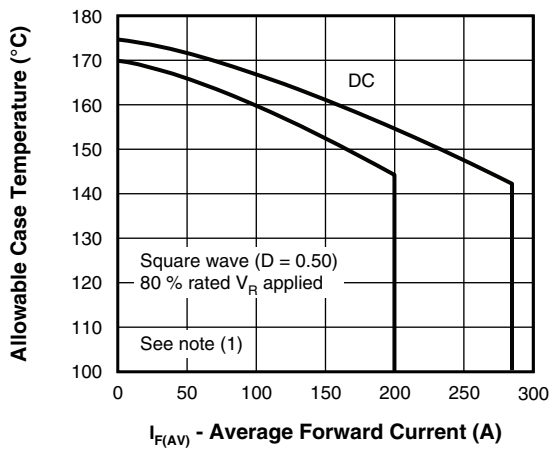


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

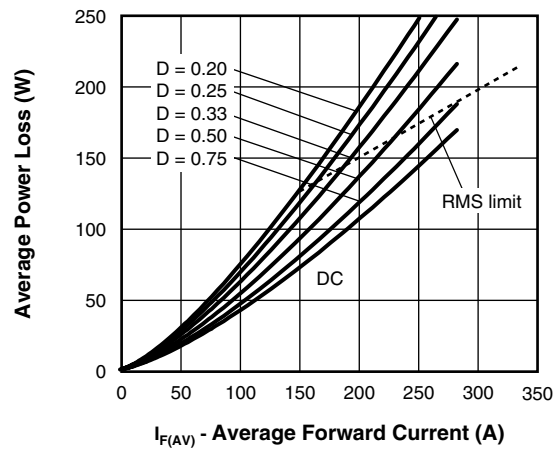


Fig. 6 - Forward Power Loss Characteristics

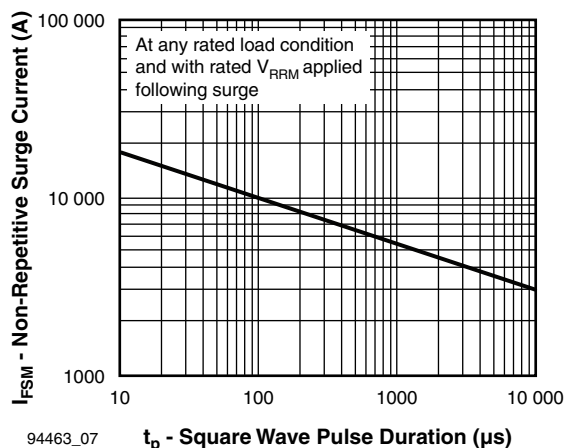


Fig. 7 - Maximum Non-Repetitive Surge Current

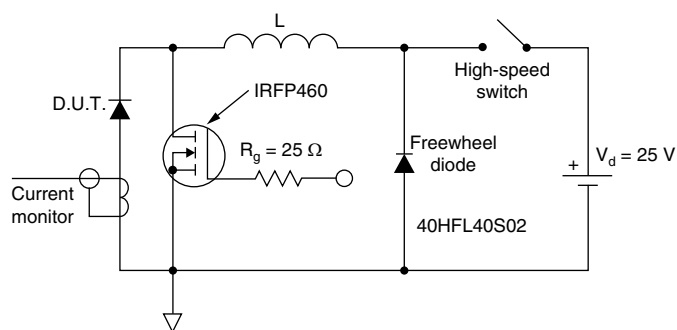


Fig. 8 - Unclamped Inductive Test Circuit

### Note

(1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$

## ORDERING INFORMATION TABLE

| Device code | <b>VS-</b> | <b>24</b> | <b>1</b> | <b>N</b> | <b>Q</b> | <b>045</b> | <b>PbF</b> |
|-------------|------------|-----------|----------|----------|----------|------------|------------|
|             | ①          | ②         | ③        | ④        | ⑤        | ⑥          | ⑦          |

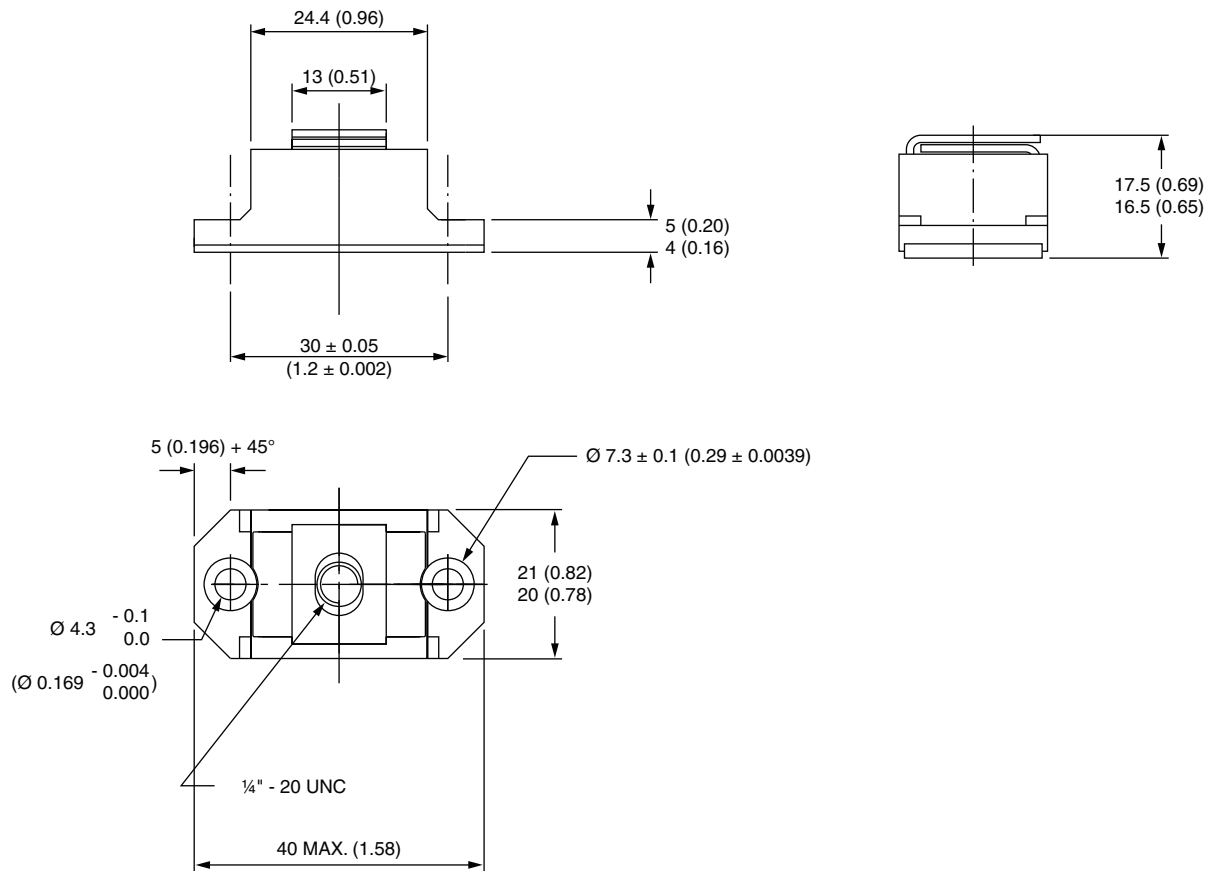
|          |                                  |
|----------|----------------------------------|
| <b>1</b> | - Vishay Semiconductors product  |
| <b>2</b> | - Average current rating (x 10)  |
| <b>3</b> | - Product silicon identification |
| <b>4</b> | - N = not isolated               |
| <b>5</b> | - Q = Schottky rectifier diode   |
| <b>6</b> | - Voltage rating (045 = 45 V)    |
| <b>7</b> | - Lead (Pb)-free                 |

## LINKS TO RELATED DOCUMENTS

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95020">www.vishay.com/doc?95020</a> |

## D-67 HALF-PAK

**DIMENSIONS** in millimeters (inches)





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