

## High Performance Schottky Rectifier, 120 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)


**RoHS  
COMPLIANT**

### PRODUCT SUMMARY

|             |                 |
|-------------|-----------------|
| $I_{F(AV)}$ | 120 A           |
| $V_R$       | 45 V            |
| Package     | HALF-PAK (D-67) |
| Circuit     | Single diode    |

### DESCRIPTION

The VS-121NQ.. 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                                     | 120        | A     |
| $V_{RRM}$   |  | 45         | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                                     | 16 000     | A     |
| $V_F$       | 120 A <sub>pk</sub> , $T_J = 125 \text{ }^\circ\text{C}$ | 0.6        | V     |
| $T_J$       | Range  | -55 to 175 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-121NQ045PbF | 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 $T_C = 137 \text{ }^\circ\text{C}$ , rectangular waveform  | 120    | 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   | 16 000 | A     |
|  |             | 10 ms sine or 6 ms rect. pulse  |        |       |
| Non-repetitive avalanche energy                                      | $E_{AS}$    | $T_J = 25 \text{ }^\circ\text{C}$ , $I_{AS} = 13 \text{ A}$ , $L = 1 \text{ mH}$                                    | 81     | 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 | 13     | A     |



| ELECTRICAL SPECIFICATIONS                     |                |   |                                   |        |                  |
|---|----------------|---|-----------------------------------|--------|------------------|
| PARAMETER                                     | SYMBOL         | TEST CONDITIONS   |                                   | VALUES | UNITS            |
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 120 A   | $T_J = 25\text{ }^\circ\text{C}$  | 0.65   | V                |
|   |                | 240 A   |                                   | 0.82   |                  |
|   |                | 120 A   | $T_J = 125\text{ }^\circ\text{C}$ | 0.6    |                  |
|   |                | 240 A   |                                   | 0.76   |                  |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}$       | $T_J = 25\text{ }^\circ\text{C}$  | $V_R = \text{Rated } V_R$         | 10     | mA               |
|   |                | $T_J = 125\text{ }^\circ\text{C}$   |                                   | 90     |                  |
| Maximum junction capacitance                  | $C_T$          | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^\circ\text{C}$ |                                   | 5200   | pF               |
| Typical series inductance                     | $L_S$          | From top of terminal hole to mounting plane   |                                   | 7.0    | nH               |
| Maximum voltage rate of change                | dV/dt          | Rated $V_R$   |                                   | 10 000 | V/ $\mu\text{s}$ |

**Note**

(1) Pulse width = 500  $\mu\text{s}$

| THERMAL - MECHANICAL SPECIFICATIONS            |                |                                      |            |                           |                 |  |
|--|----------------|--------------------------------------|------------|---------------------------|-----------------|--|
| PARAMETER                                      | SYMBOL         | TEST CONDITIONS                      | VALUES     | UNITS                     |                 |  |
| Maximum junction and storage temperature range | $T_J, T_{Stg}$ |                                      | -55 to 175 | $^\circ\text{C}$          |                 |  |
| Maximum thermal resistance, junction to case   | $R_{thJC}$     | DC operation<br>See fig. 4           | 0.38       | $^\circ\text{C}/\text{W}$ |                 |  |
| Typical thermal resistance, case to heatsink   | $R_{thCS}$     | 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 |  |

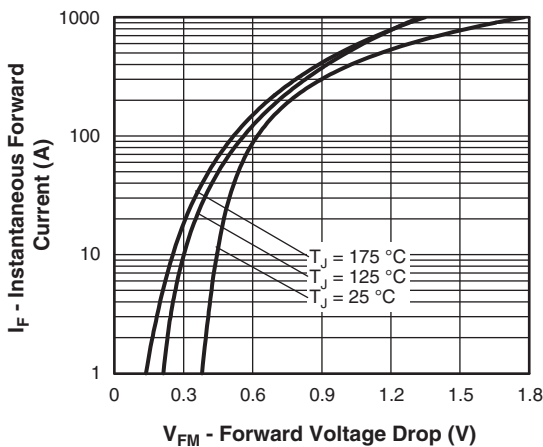


Fig. 1 - Maximum Forward Voltage Drop Characteristics

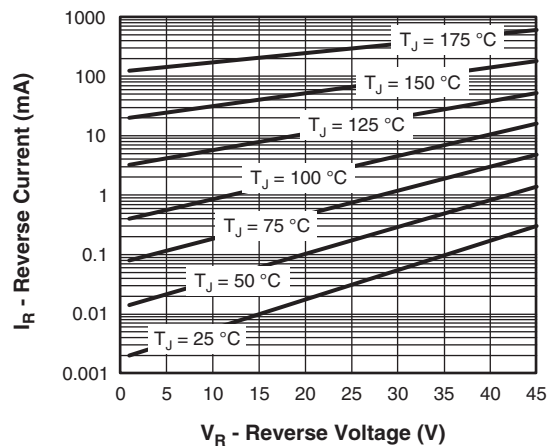


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

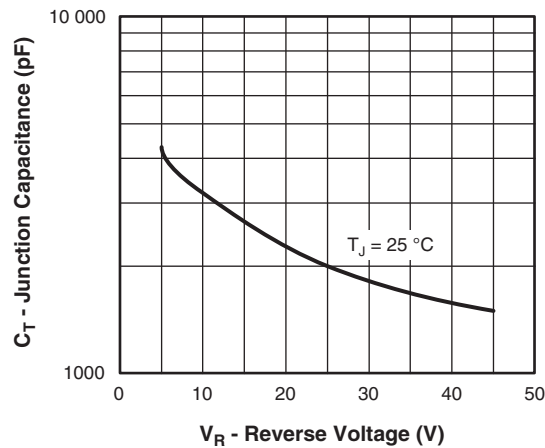


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

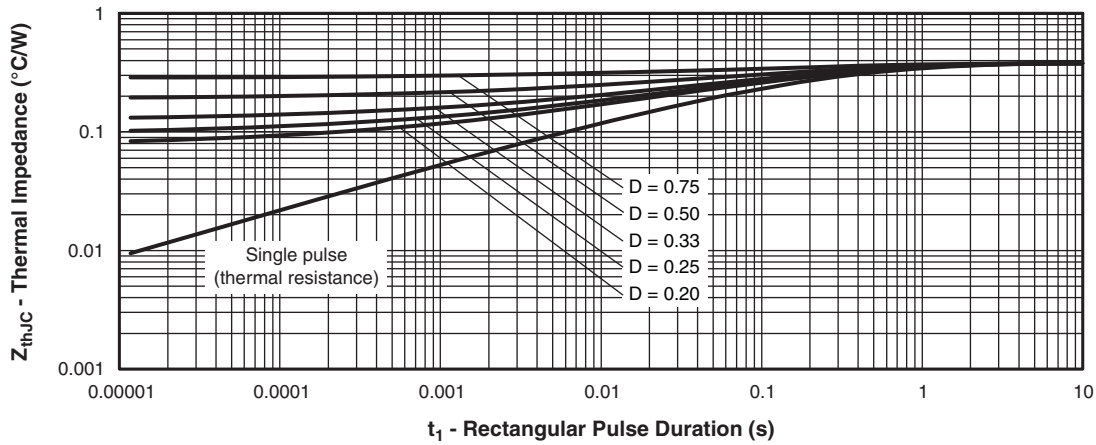


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

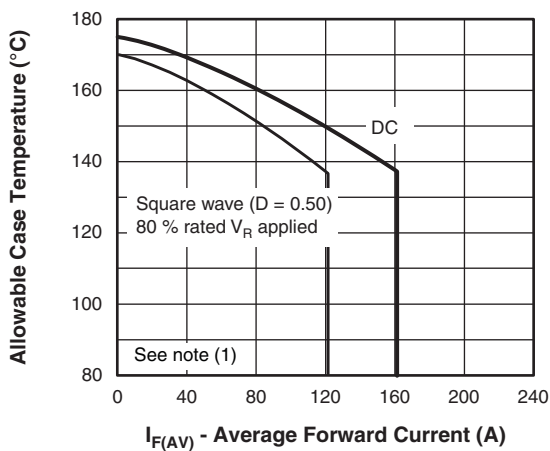


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

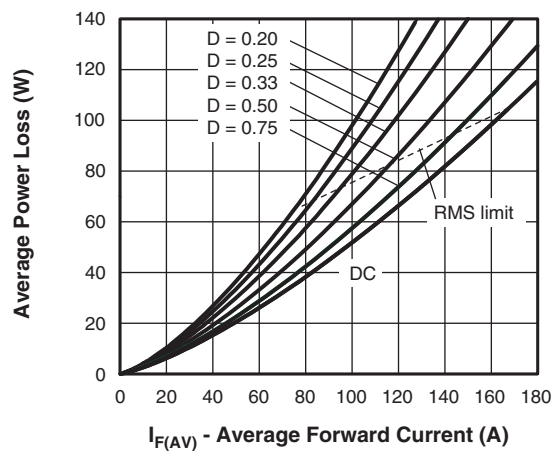


Fig. 6 - Forward Power Loss Characteristics

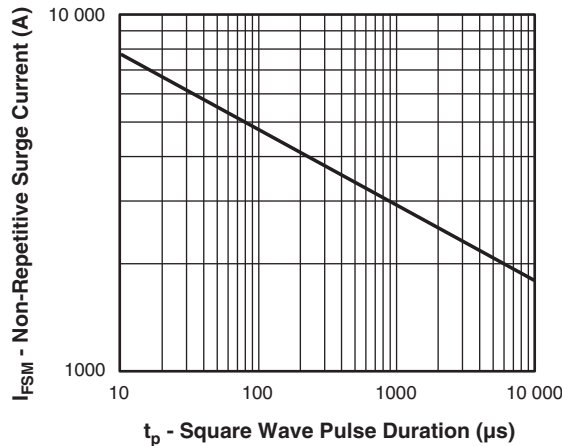


Fig. 7 - Maximum Non-Repetitive Surge Current

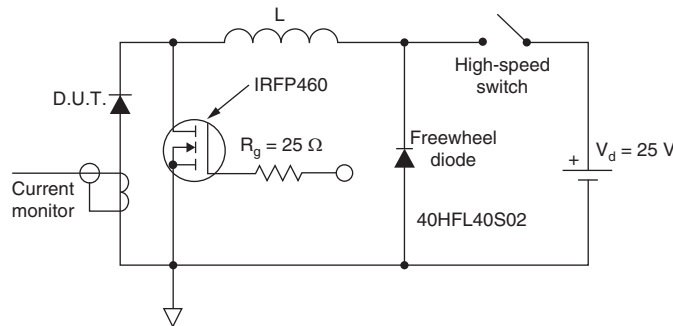


Fig. 8 - Unclamped Inductive Test Circuit

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;  
 $P_d = \text{Forward power loss} = I_{F(AV)} \times V_{FM} \text{ at } (I_{F(AV)}/D) \text{ (see fig. 6);}$   
 $P_{d_{REV}} = \text{Inverse power loss} = V_{R1} \times I_R (1 - D); I_R \text{ at } V_{R1} = \text{Rated } V_R$

**ORDERING INFORMATION TABLE**

|             |            |           |          |          |          |            |            |
|-------------|------------|-----------|----------|----------|----------|------------|------------|
| Device code | <b>VS-</b> | <b>12</b> | <b>1</b> | <b>N</b> | <b>Q</b> | <b>045</b> | <b>PbF</b> |
|             | ①          | ②         | ③        | ④        | ⑤        | ⑥          | ⑦          |

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

**LINKS TO RELATED DOCUMENTS**

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





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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А