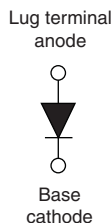


# High Performance Schottky Rectifier, 120 A


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


## FEATURES

- 150 °C T<sub>J</sub> 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

## PRIMARY CHARACTERISTICS

|                       |                 |
|-----------------------|-----------------|
| I <sub>F(AV)</sub>    | 120 A           |
| V <sub>R</sub>        | 45 V            |
| Package               | HALF-PAK (D-67) |
| Circuit configuration | Single          |

## DESCRIPTION

The VS-120NQ.. 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 150 °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 <sub>F(AV)</sub> | Rectangular waveform                          | 120         | A     |
| V <sub>RRM</sub>   |                                               | 45          | V     |
| I <sub>FSM</sub>   | t <sub>p</sub> = 5 μs sine                    | 26 000      | A     |
| V <sub>F</sub>     | 120 A <sub>pk</sub> , T <sub>J</sub> = 125 °C | 0.62        | V     |
| T <sub>J</sub>     | Range                                         | -55 to +150 | °C    |

## VOLTAGE RATINGS

| PARAMETER                            | SYMBOL           | VS-120NQ045PbF | UNITS |
|--------------------------------------|------------------|----------------|-------|
| Maximum DC reverse voltage           | V <sub>R</sub>   | 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> = 105 °C, rectangular waveform                                                                       | 120    | 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                                                                                                          | 26 000 |       |
|                                                                      |                    | 10 ms sine or 6 ms rect. pulse                                                                                                         | 1550   |       |
| Non-repetitive avalanche energy                                      | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 13 A, L = 1 mH                                                                               | 81     | 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 | 13     | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                     | SYMBOL         | TEST CONDITIONS                                                                           | VALUES | UNITS      |
|-----------------------------------------------|----------------|-------------------------------------------------------------------------------------------|--------|------------|
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 120 A                                                                                     | 0.63   | V          |
|                                               |                | 240 A                                                                                     | 0.86   |            |
|                                               |                | 120 A                                                                                     | 0.62   |            |
|                                               |                | 240 A                                                                                     | 0.81   |            |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                        | 10     | mA         |
|                                               |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                       | 500    |            |
| 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/ $\mu$ s |

**Note**<sup>(1)</sup> 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 150      | °C                  |
| Maximum thermal resistance, junction to case   | R <sub>thJC</sub>                 | DC operation<br>See fig. 4            | 0.38            | °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 |                     |

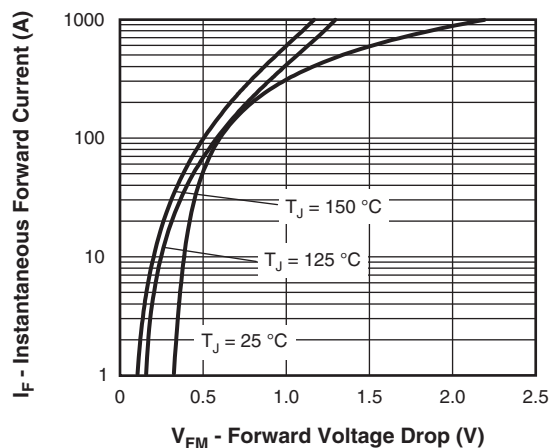


Fig. 1 - Maximum Forward Voltage Drop Characteristics

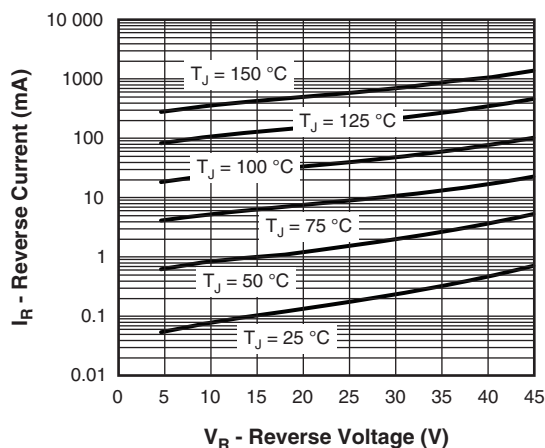


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

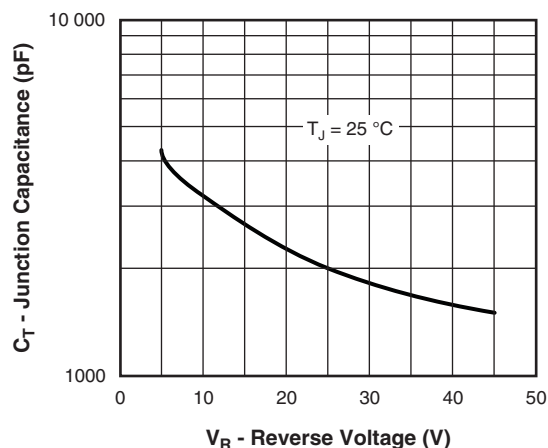


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

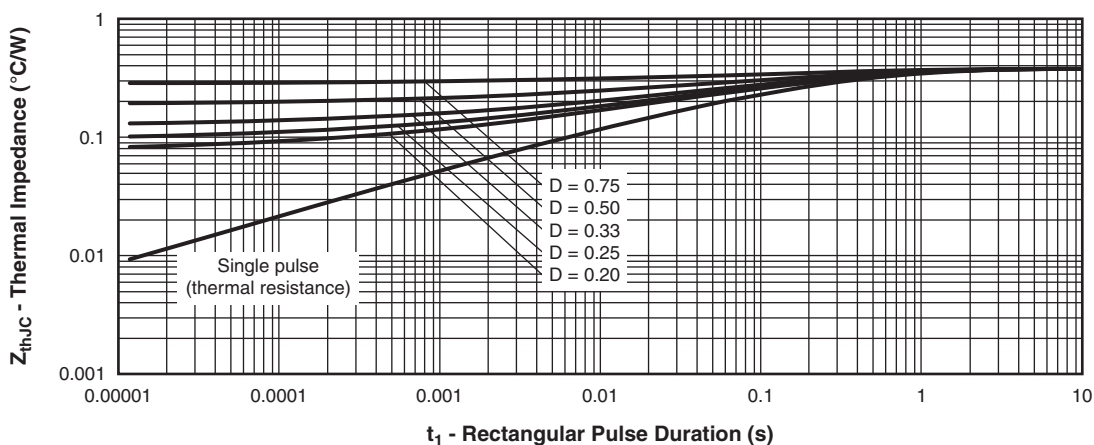


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

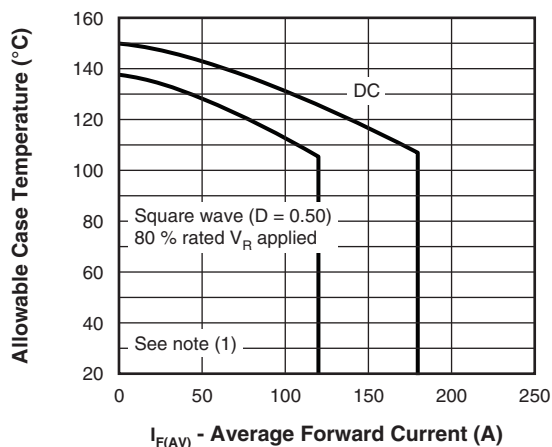


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

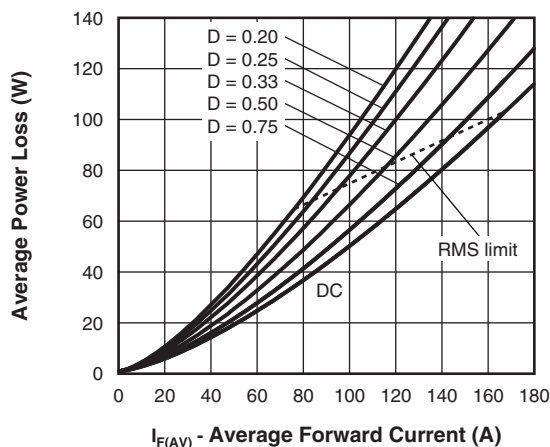


Fig. 6 - Forward Power Loss Characteristics

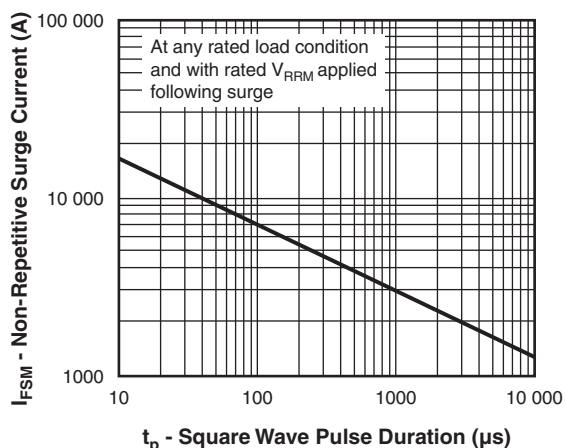


Fig. 7 - Maximum Non-Repetitive Surge Current

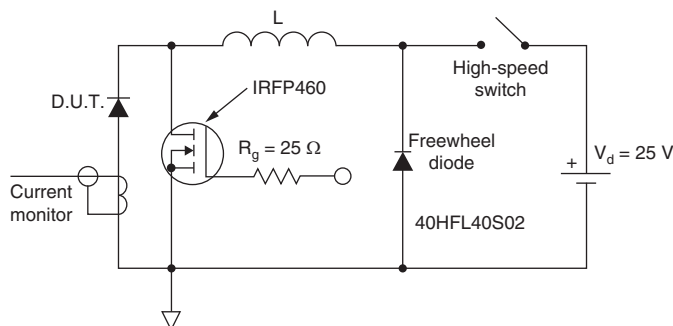


Fig. 8 - Unclamped Inductive Test Circuit

**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 | VS-                            | 12 | 0 | N | Q | 045 | PbF |
|-------------|--------------------------------|----|---|---|---|-----|-----|
|             | 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                 |    |   |   |   |     |     |

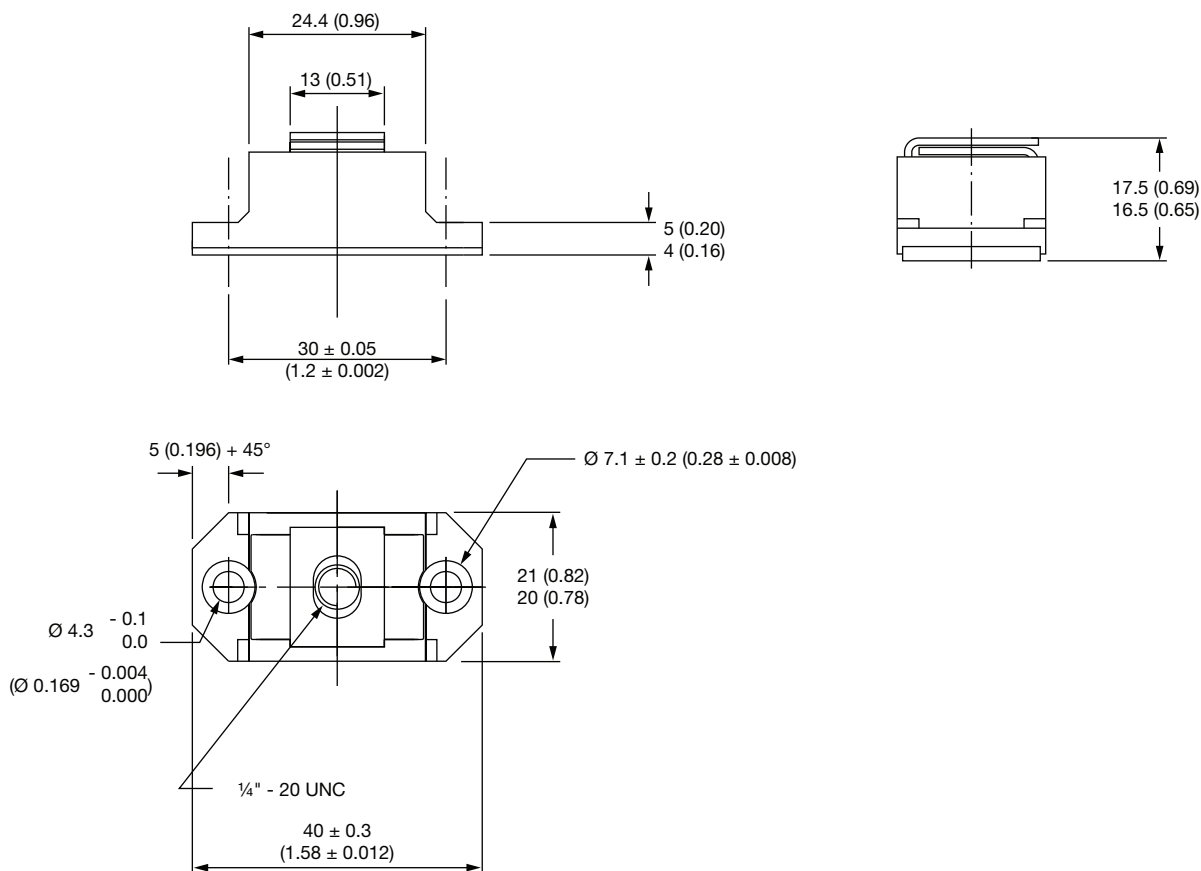
**LINKS TO RELATED DOCUMENTS**

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



## D-67 HALF-PAK

**DIMENSIONS** in millimeters (inches)





## Disclaimer

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