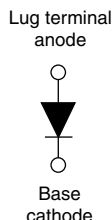


# HEXFRED® Ultrafast Soft Recovery Diode, 180 A


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


## FEATURES

- Very low  $Q_{rr}$  and  $t_{rr}$
- 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

## BENEFITS

- Reduced RFI and EMI
- Reduced snubbing

## DESCRIPTION

HEXFRED® diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems. An extensive characterization of the recovery behavior for different values of current, temperature and  $di_F/dt$  simplifies the calculations of losses in the operating conditions. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for power converters, motors drives and other applications where switching losses are significant portion of the total losses.

## PRIMARY CHARACTERISTICS

|                       |                 |
|-----------------------|-----------------|
| $I_{F(AV)}$           | 180 A           |
| $V_R$                 | 400 V           |
| $I_{F(DC)}$ at $T_C$  | 200 A at 100 °C |
| Package               | HALF-PAK (D-67) |
| Circuit configuration | Single diode    |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                        | SYMBOL         | TEST CONDITIONS                                                    | MAX.        | UNITS |
|--------------------------------------------------|----------------|--------------------------------------------------------------------|-------------|-------|
| Cathode to anode voltage                         | $V_R$          |                                                                    | 400         | V     |
| Continuous forward current                       | $I_F$          | $T_C = 25\text{ °C}$                                               | 395         | A     |
|                                                  |                | $T_C = 100\text{ °C}$                                              | 200         |       |
| Single pulse forward current                     | $I_{FSM}$      | Limited by junction temperature                                    | 1200        |       |
| Non-repetitive avalanche energy                  | $E_{AS}$       | $L = 100\text{ }\mu\text{H}$ , duty cycle limited by maximum $T_J$ | 1.4         | mJ    |
| Maximum power dissipation                        | $P_D$          | $T_C = 25\text{ °C}$                                               | 657         | W     |
|                                                  |                | $T_C = 100\text{ °C}$                                              | 263         |       |
| Operating junction and storage temperature range | $T_J, T_{Stg}$ |                                                                    | -55 to +150 | °C    |

## ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)

| PARAMETER                          | SYMBOL   | TEST CONDITIONS                             | MIN. | TYP. | MAX. | UNITS |
|------------------------------------|----------|---------------------------------------------|------|------|------|-------|
| Cathode to anode breakdown voltage | $V_{BR}$ | $I_R = 100\text{ }\mu\text{A}$              | 400  | -    | -    | V     |
| Maximum forward voltage            | $V_{FM}$ | $I_F = 180\text{ A}$                        | -    | 1.08 | 1.46 |       |
|                                    |          | $I_F = 360\text{ A}$                        | -    | 1.22 | 1.8  |       |
|                                    |          | $I_F = 180\text{ A}, T_J = 125\text{ °C}$   | -    | 0.99 | 1.34 |       |
| Maximum reverse leakage current    | $I_{RM}$ | $T_J = 125\text{ °C}, V_R = 400\text{ V}$   | -    | -    | 4    | mA    |
| Junction capacitance               | $C_T$    | $V_R = 200\text{ V}$                        | -    | 370  | 500  | pF    |
| Series inductance                  | $L_S$    | From top of terminal hole to mounting plane | -    | 6.0  | -    | nH    |

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| PARAMETER                                   | SYMBOL           | TEST CONDITIONS                                                           | MIN. | TYP.        | MAX.        | UNITS            |
|---------------------------------------------|------------------|---------------------------------------------------------------------------|------|-------------|-------------|------------------|
| Reverse recovery time<br>See fig. 5         | $t_{rr}$         | $T_J = 25\text{ }^{\circ}\text{C}$<br>$T_J = 125\text{ }^{\circ}\text{C}$ | -    | 90<br>280   | 140<br>440  | ns               |
| Peak recovery current<br>See fig. 6         | $I_{RRM}$        | $T_J = 25\text{ }^{\circ}\text{C}$<br>$T_J = 125\text{ }^{\circ}\text{C}$ | -    | 9<br>18     | 16<br>32    | A                |
| Reverse recovery charge<br>See fig. 7       | $Q_{rr}$         | $T_J = 25\text{ }^{\circ}\text{C}$<br>$T_J = 125\text{ }^{\circ}\text{C}$ | -    | 300<br>2650 | 950<br>6300 | nC               |
| Peak rate of recovery current<br>See fig. 8 | $di_{(rec)M}/dt$ | $T_J = 25\text{ }^{\circ}\text{C}$<br>$T_J = 125\text{ }^{\circ}\text{C}$ | -    | 300<br>290  | -<br>-      | A/ $\mu\text{s}$ |

**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           | 0.19        | °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                           |                                      | 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 (D-67)                      |             |                     |

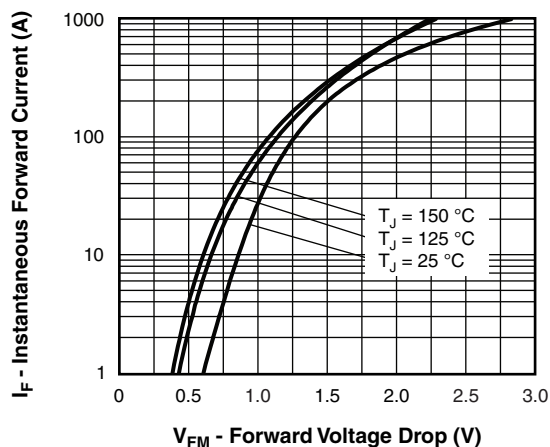


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

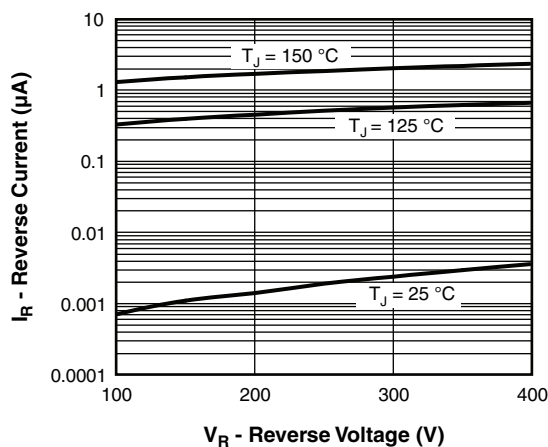


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

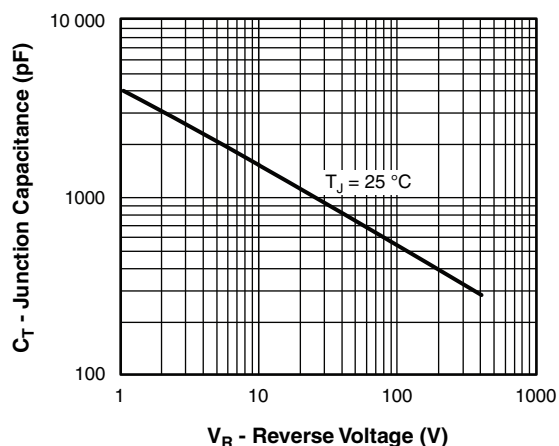


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

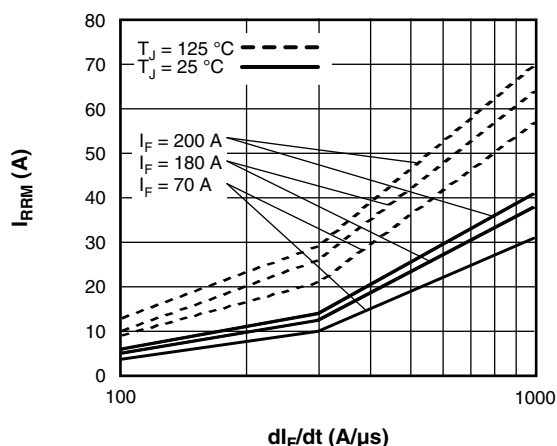


Fig. 6 - Typical Recovery Current vs.  $dI_F/dt$

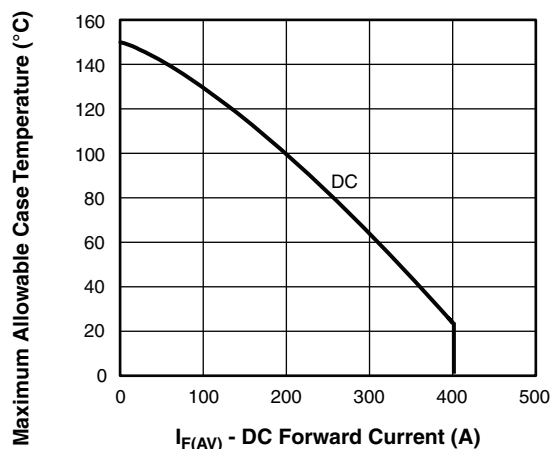


Fig. 4 - Maximum Allowable Case Temperature vs. DC Forward Current

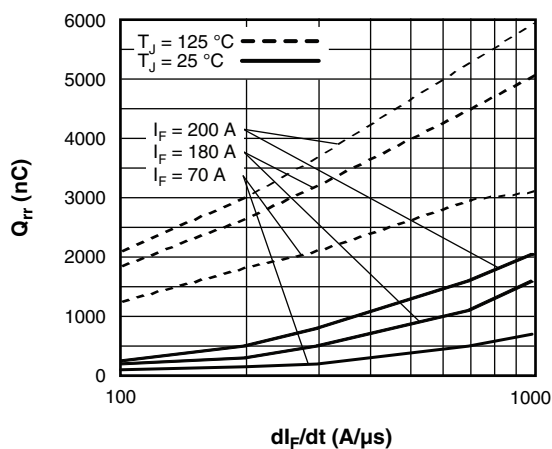


Fig. 7 - Typical Stored Charge vs.  $dI_F/dt$

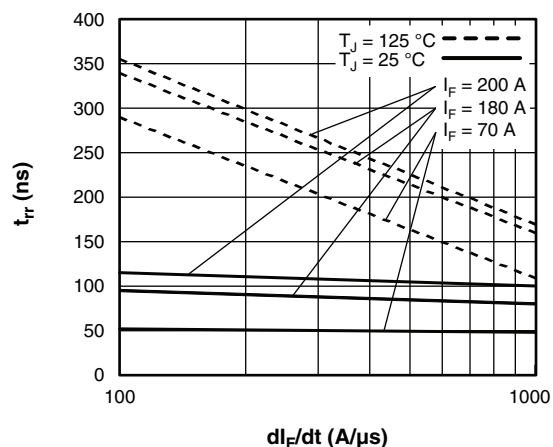


Fig. 5 - Typical Reverse Recovery Time vs.  $dI_F/dt$

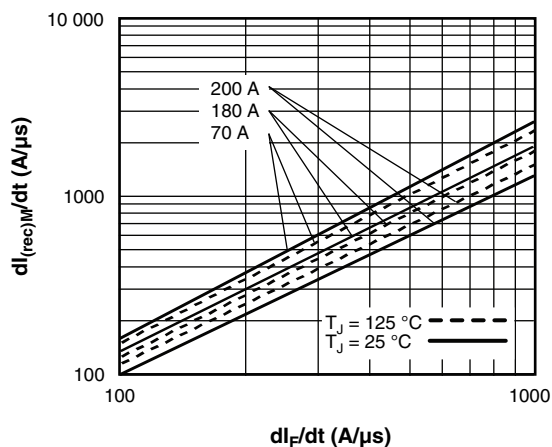


Fig. 8 - Typical  $dI_{(rec)M}/dt$  vs.  $dI_F/dt$

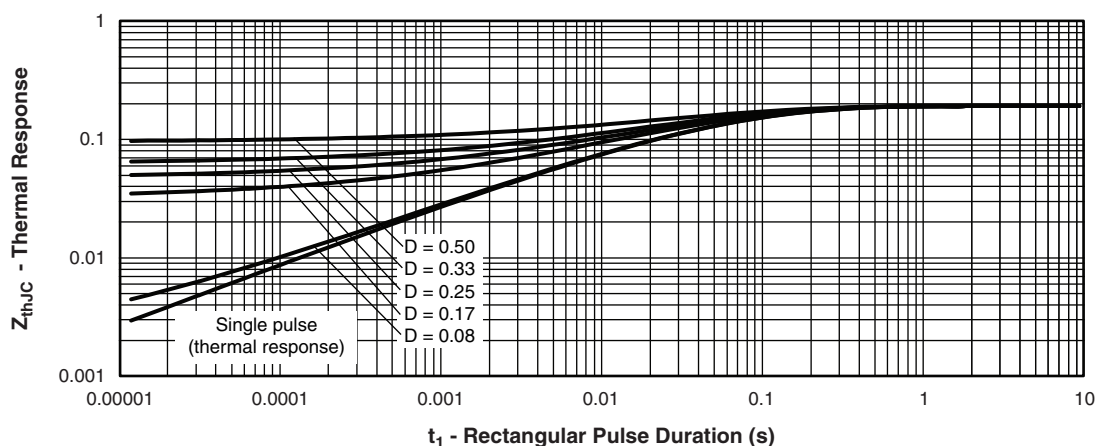


Fig. 9 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

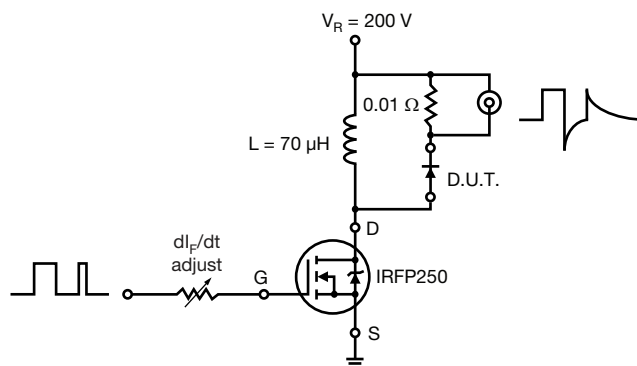


Fig. 10 - Reverse Recovery Parameter Test Circuit

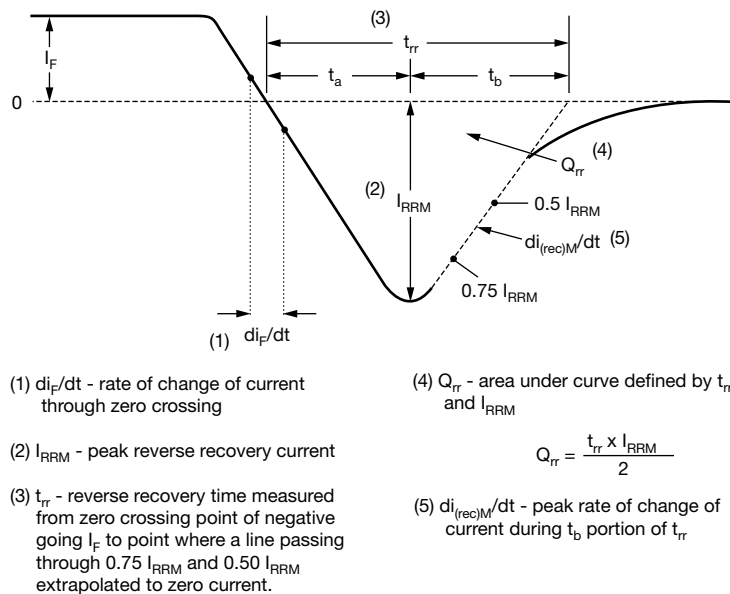


Fig. 11 - Reverse Recovery Waveform and Definitions

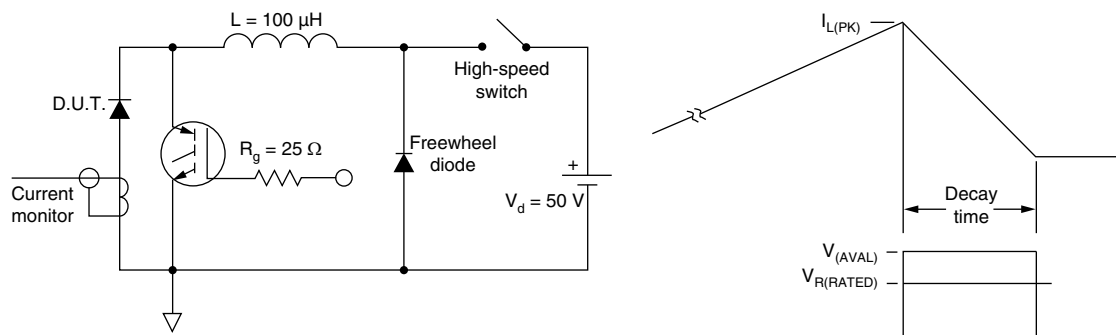


Fig. 12 - Avalanche Test Circuit and Waveforms

## ORDERING INFORMATION TABLE

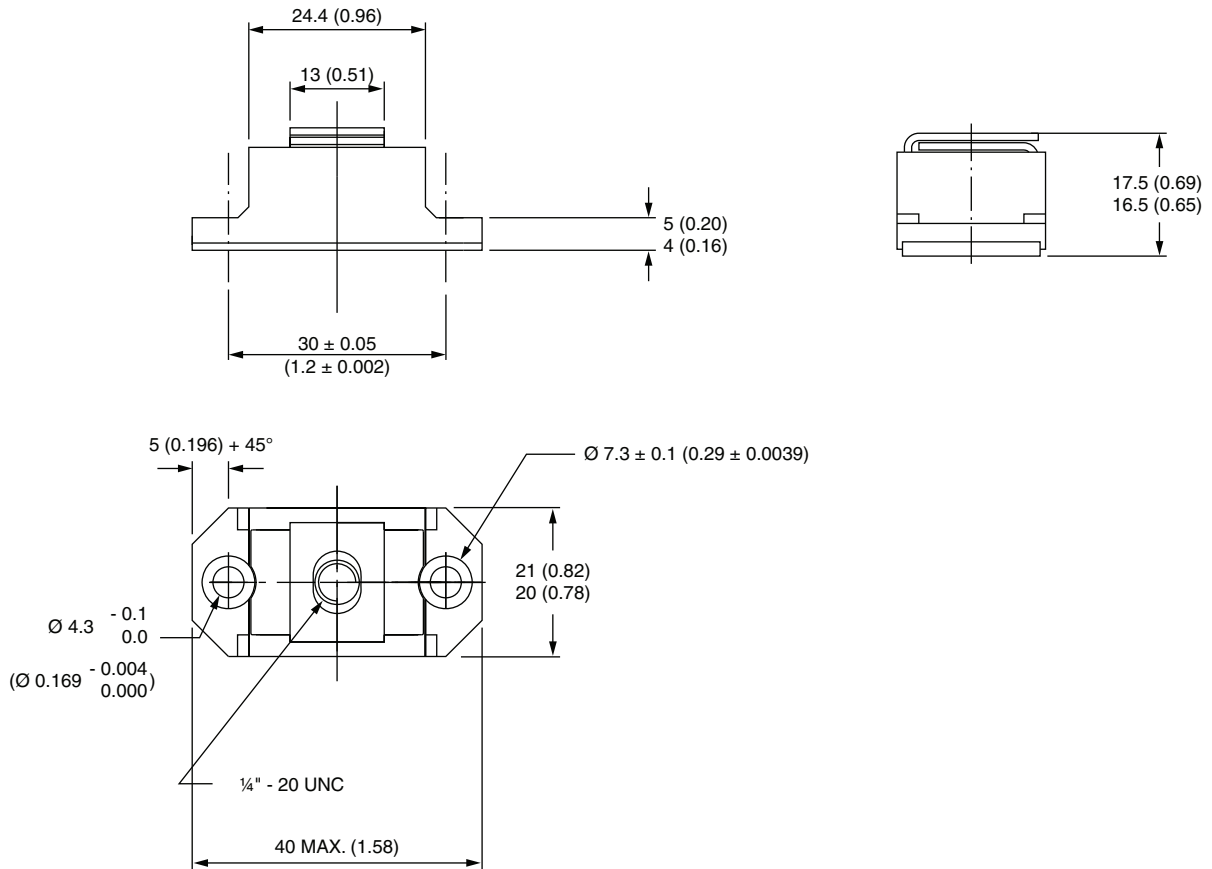
| Device code | VS- | HFA | 180 | N | H | 40 | PbF |
|-------------|-----|-----|-----|---|---|----|-----|
|             | 1   | 2   | 3   | 4 | 5 | 6  | 7   |
|             | 1   | 2   | 3   | 4 | 5 | 6  | 7   |
|             | 1   | 2   | 3   | 4 | 5 | 6  | 7   |
|             | 1   | 2   | 3   | 4 | 5 | 6  | 7   |
|             | 1   | 2   | 3   | 4 | 5 | 6  | 7   |
|             | 1   | 2   | 3   | 4 | 5 | 6  | 7   |
|             | 1   | 2   | 3   | 4 | 5 | 6  | 7   |

- 1 - Vishay Semiconductors product
- 2 - HEXFRED® family, electron irradiated
- 3 - Average current rating
- 4 - N = not isolated
- 5 - H = HALF-PAK (D-67)
- 6 - Voltage rating (400 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)





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