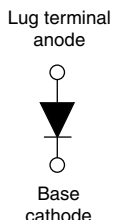


# **FRED Pt®** **Ultrafast Soft Recovery Diode Module, 200 A**


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


## **FEATURES**

- 175 °C T<sub>J</sub> operation
- Very low Q<sub>rr</sub> and t<sub>rr</sub>
- 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
- Higher frequency operation
- Reduced snubbing

## **DESCRIPTION / APPLICATIONS**

These diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for HF welding, power converters and other applications where switching losses are significant portion of the total losses.

### **PRIMARY CHARACTERISTICS**

|                           |                           |
|---------------------------|---------------------------|
| I <sub>F(AV)</sub>        | 200 A                     |
| V <sub>R</sub>            | 600 V                     |
| Q <sub>rr</sub> (typical) | 463 nC                    |
| t <sub>rr</sub>           | 109 ns                    |
| Type                      | Modules - diode, FRED Pt® |
| Package                   | HALF-PAK (D-67)           |
| Circuit configuration     | Single                    |

### **ABSOLUTE MAXIMUM RATINGS**

| PARAMETER                                        | SYMBOL                            | TEST CONDITIONS         | MAX.        | UNITS |
|--------------------------------------------------|-----------------------------------|-------------------------|-------------|-------|
| Cathode to anode voltage                         | V <sub>R</sub>                    |                         | 600         | V     |
| Continuous forward current                       | I <sub>F(DC)</sub>                | T <sub>C</sub> = 25 °C  | 460         | A     |
|                                                  |                                   | T <sub>C</sub> = 100 °C | 280         |       |
| Maximum average forward current                  | I <sub>F(AV)</sub>                | T <sub>C</sub> = 125 °C | 200         |       |
| Single pulse forward current                     | I <sub>FSM</sub>                  | T <sub>J</sub> = 25 °C  | 1260        |       |
| Maximum power dissipation                        | P <sub>D</sub>                    | T <sub>C</sub> = 25 °C  | 789         | W     |
|                                                  |                                   | T <sub>C</sub> = 100 °C | 394         |       |
| Operating junction and storage temperature range | T <sub>J</sub> , T <sub>Stg</sub> |                         | -40 to +175 | °C    |

### **ELECTRICAL SPECIFICATIONS (T<sub>J</sub> = 25 °C unless otherwise specified)**

| PARAMETER                          | SYMBOL          | TEST CONDITIONS                                 | MIN. | TYP. | MAX. | UNITS |
|------------------------------------|-----------------|-------------------------------------------------|------|------|------|-------|
| Cathode to anode breakdown voltage | V <sub>BR</sub> | I <sub>R</sub> = 100 µA                         | 600  | -    | -    | V     |
| Maximum forward voltage            | V <sub>FM</sub> | I <sub>F</sub> = 200 A                          | -    | 1.38 | 1.70 |       |
|                                    |                 | I <sub>F</sub> = 400 A                          | -    | 1.58 | 1.95 |       |
|                                    |                 | I <sub>F</sub> = 200 A, T <sub>J</sub> = 125 °C | -    | 1.16 | -    |       |
|                                    |                 | I <sub>F</sub> = 400 A, T <sub>J</sub> = 125 °C | -    | 1.39 | -    |       |
| Maximum reverse leakage current    | I <sub>RM</sub> | T <sub>J</sub> = 150 °C, V <sub>R</sub> = 400 V | -    | 0.3  | 1.38 | mA    |
| Series inductance                  | L <sub>S</sub>  | From top of terminal hole to mounting plane     | -    | 5    | -    | nH    |

#### **Note**

(1) Pulse width 500 µs

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

| PARAMETER               | SYMBOL    | TEST CONDITIONS                     |                                                                                   | MIN. | TYP. | MAX. | UNITS |
|-------------------------|-----------|-------------------------------------|-----------------------------------------------------------------------------------|------|------|------|-------|
| Reverse recovery time   | $t_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$  | $I_F = 50\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 400\text{ V}$ | -    | 109  | 150  | ns    |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$ | $I_F = 50\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$ | -    | 189  | 265  |       |
| Peak recovery current   | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$  | $I_F = 50\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 400\text{ V}$ | -    | 8.5  | 14.5 | A     |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$ | $I_F = 50\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$ | -    | 21.5 | 42.5 |       |
| Reverse recovery charge | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$  | $I_F = 50\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 400\text{ V}$ | -    | 463  | 950  | nC    |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$ | $I_F = 50\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$ | -    | 2031 | 3750 |       |

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                      | SYMBOL            | TEST CONDITIONS                      | VALUES      | UNITS                       |
|------------------------------------------------|-------------------|--------------------------------------|-------------|-----------------------------|
| Maximum junction and storage temperature range | $T_J$ , $T_{Stg}$ |                                      | -40 to +150 | $^{\circ}\text{C}$          |
| Maximum thermal resistance, junction to case   | $R_{thJC}$        | DC operation                         | 0.19        | $^{\circ}\text{C}/\text{W}$ |
| 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           |                                      | 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)                      |             |                             |

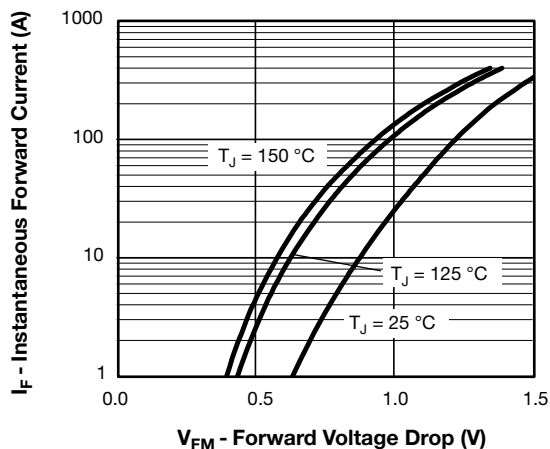


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

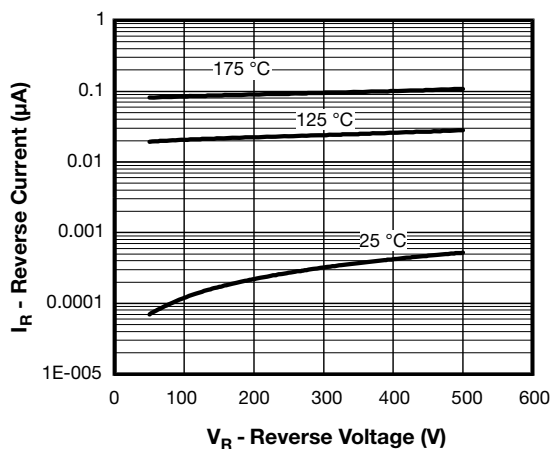


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

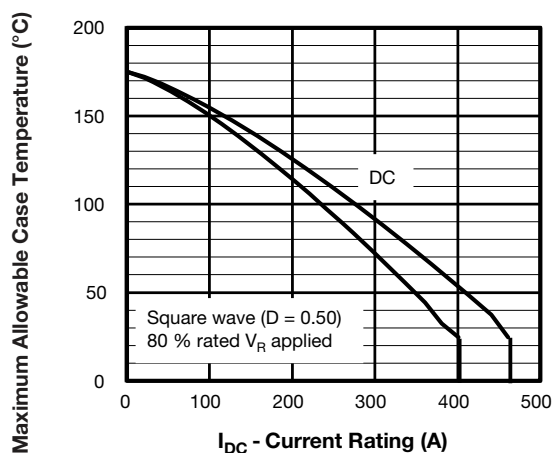


Fig. 3 - Maximum Current Rating Capability

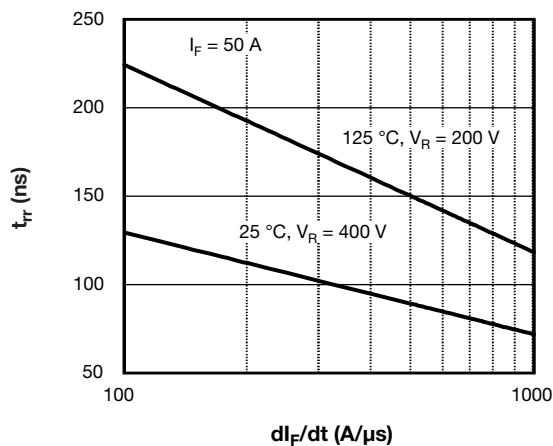
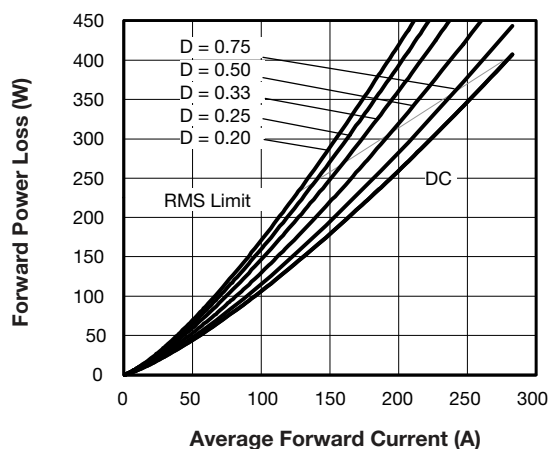
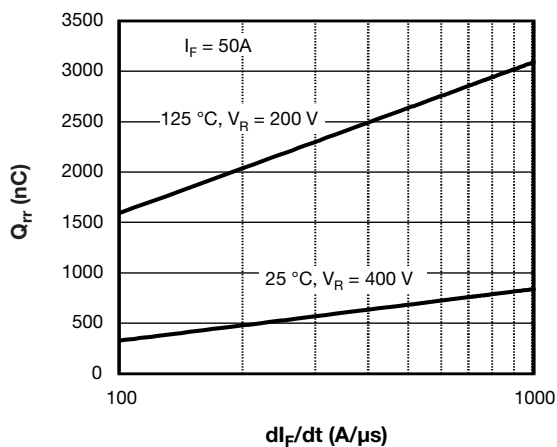
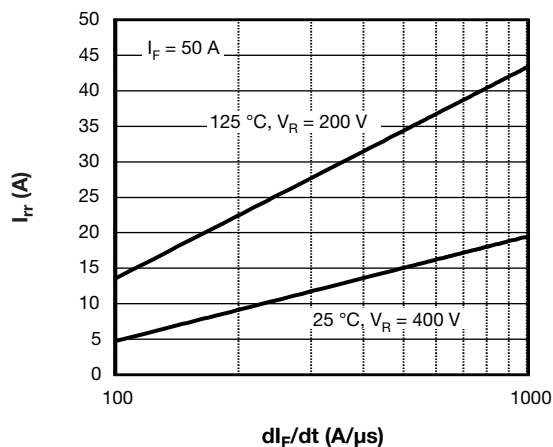

Fig. 5 - Typical Reverse Recovery Time vs.  $di_F/dt$ 


Fig. 4 - Forward Power Loss Characteristics


Fig. 6 - Typical Reverse Recovery Charge vs.  $di_F/dt$ 

Fig. 7 - Typical Reverse Recovery Current vs.  $di_F/dt$

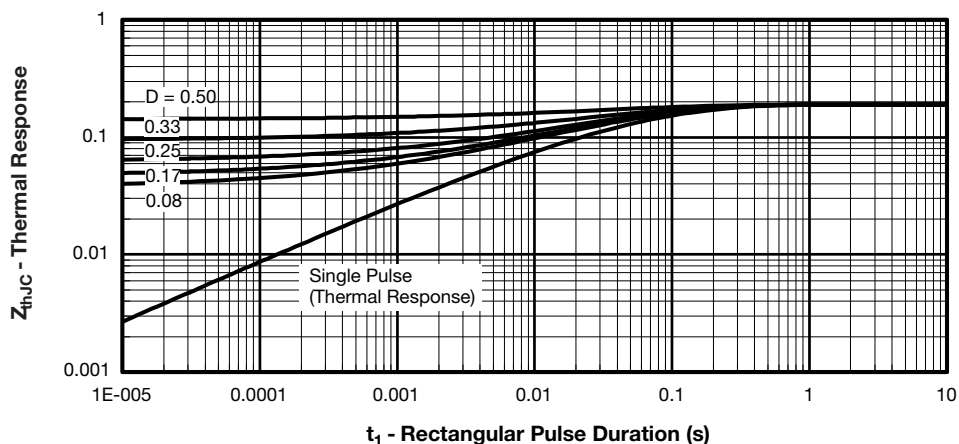


Fig. 8 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

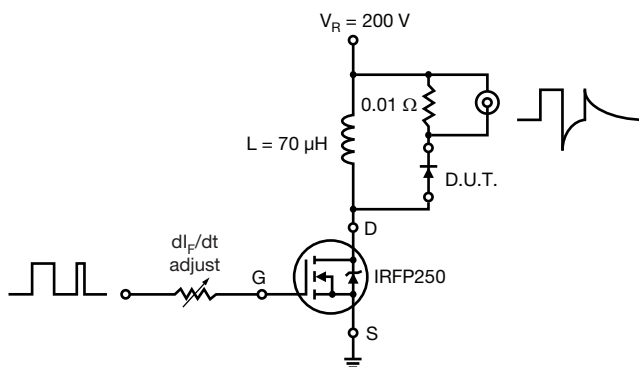


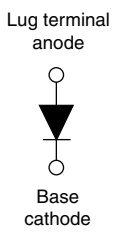
Fig. 9 - Reverse Recovery Parameter Test Circuit  
(All recovery characteristics have been determined using test circuit shown)



## ORDERING INFORMATION TABLE

|             |       |    |     |   |   |    |     |
|-------------|-------|----|-----|---|---|----|-----|
| Device code | VS-VS | UD | 200 | C | H | 60 | PbF |
|             | 1     | 2  | 3   | 4 | 5 | 6  | 7   |

- 1** - Vishay Semiconductors product
- 2** - Ultrafast diode
- 3** - Current rating
- 4** - Circuit configuration:  
C = Not isolated
- 5** - Type of device:  
H = HALF-PAK (D-67)
- 6** - Voltage rating (60 = 600 V)
- 7** - Lead (Pb)-free

| CIRCUIT CONFIGURATION |                            |                                                                                       |
|-----------------------|----------------------------|---------------------------------------------------------------------------------------|
| CIRCUIT               | CIRCUIT CONFIGURATION CODE | CIRCUIT DRAWING                                                                       |
| Single diode          | C                          |  |

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



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