

## Ultrafast Soft Recovery Diode, 80 A FRED Pt™


**PowerTab™**


### FEATURES

- Ultrafast recovery
- 175 °C operating junction temperature
- Screw mounting only
- Lead (Pb)-free plating
- Designed and qualified for industrial level
- Compliant to RoHS directive 2002/95/EC


**RoHS**  
COMPLIANT

### BENEFITS

- Reduced RFI and EMI
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

### 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 not significant portion of the total losses.

### PRODUCT SUMMARY

|                    |       |
|--------------------|-------|
| $t_{rr}$ (typical) | 50 ns |
| $I_{F(AV)}$        | 80 A  |
| $V_R$              | 400 V |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                   | SYMBOL         | TEST CONDITIONS       | MAX.        | UNITS |
|---------------------------------------------|----------------|-----------------------|-------------|-------|
| Cathode to anode voltage                    | $V_R$          |                       | 400         | V     |
| Continuous forward current                  | $I_{F(AV)}$    | $T_C = 101\text{ °C}$ | 80          | A     |
| Single pulse forward current                | $I_{FSM}$      | $T_C = 25\text{ °C}$  | 800         |       |
| Maximum repetitive forward current          | $I_{FRM}$      | Square wave, 20 kHz   | 160         |       |
| Operating junction and storage temperatures | $T_J, T_{Stg}$ |                       | - 55 to 175 | °C    |

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

| PARAMETER                           | SYMBOL        | TEST CONDITIONS                               | MIN. | TYP. | MAX. | UNITS         |
|-------------------------------------|---------------|-----------------------------------------------|------|------|------|---------------|
| Breakdown voltage, blocking voltage | $V_{BR}, V_r$ | $I_R = 100\text{ }\mu\text{A}$                | 400  | -    | -    | V             |
| Forward voltage                     | $V_F$         | $I_F = 80\text{ A}$                           | -    | 1.1  | 1.3  |               |
|                                     |               | $I_F = 80\text{ A}, T_J = 175\text{ °C}$      | -    | 0.92 | 1.08 |               |
|                                     |               | $I_F = 80\text{ A}, T_J = 125\text{ °C}$      | -    | 0.98 | 1.15 |               |
| Reverse leakage current             | $I_R$         | $V_R = V_R\text{ rated}$                      | -    | -    | 50   | $\mu\text{A}$ |
|                                     |               | $T_J = 150\text{ °C}, V_R = V_R\text{ rated}$ | -    | -    | 2    | mA            |
| Junction capacitance                | $C_T$         | $V_R = 200\text{ V}$                          | -    | 50   | -    | pF            |
| Series inductance                   | $L_S$         | Measured lead to lead 5 mm from package body  | -    | 3.5  | -    | 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   | $t_{rr}$  | $I_F = 1\text{ A}$ , $dI_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 50   | 60   | ns    |
|                         |           | $T_J = 25\text{ }^{\circ}\text{C}$                                              | -    | 87   | -    |       |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                             | -    | 151  | -    |       |
| Peak recovery current   | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                              | -    | 9.3  | -    | A     |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                             | -    | 17.2 | -    |       |
| Reverse recovery charge | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                              | -    | 405  | -    | nC    |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                             | -    | 1300 | -    |       |

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                | SYMBOL     | TEST CONDITIONS                            | MIN.        | TYP. | MAX.        | UNITS               |
|------------------------------------------|------------|--------------------------------------------|-------------|------|-------------|---------------------|
| Thermal resistance, junction to case     | $R_{thJC}$ |                                            | -           | -    | 0.70        | K/W                 |
| Thermal resistance, junction to heatsink | $R_{thCS}$ | Mounting surface, flat, smooth and greased | -           | 0.2  | -           |                     |
| Weight                                   |            |                                            | -           | -    | 5.02        | g                   |
|                                          |            |                                            | -           | 0.18 | -           | oz.                 |
| Mounting torque                          |            |                                            | 1.2<br>(10) | -    | 2.4<br>(20) | N · m<br>(lbf · in) |
| Marking device                           |            | Case style PowerTab™                       | 80EBU04     |      |             |                     |

# Ultrafast Soft Recovery Diode, Vishay High Power Products

## 80 A FRED P<sub>t</sub><sup>™</sup>

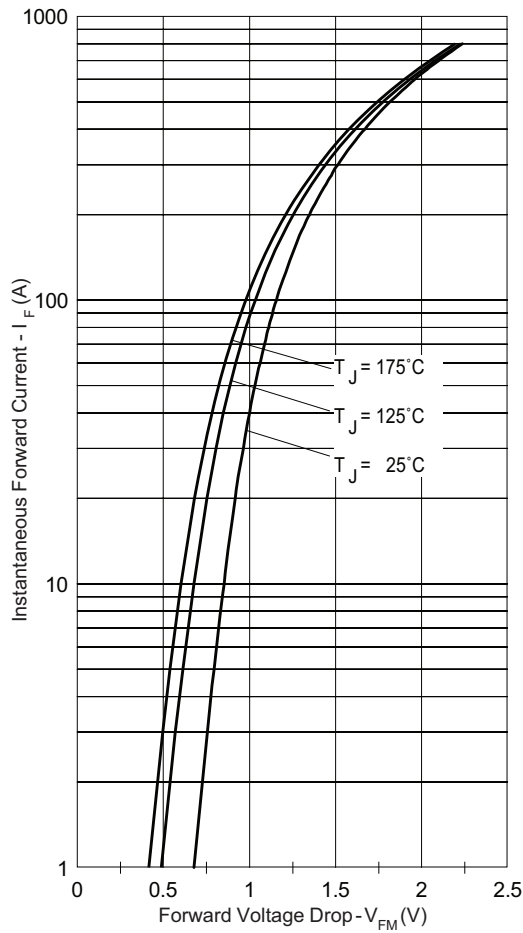


Fig. 1 - Maximum Forward Voltage Drop Characteristics

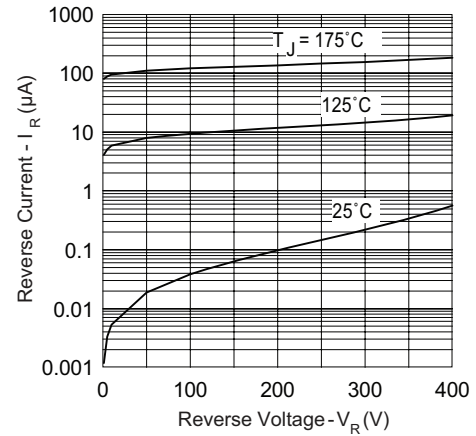


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

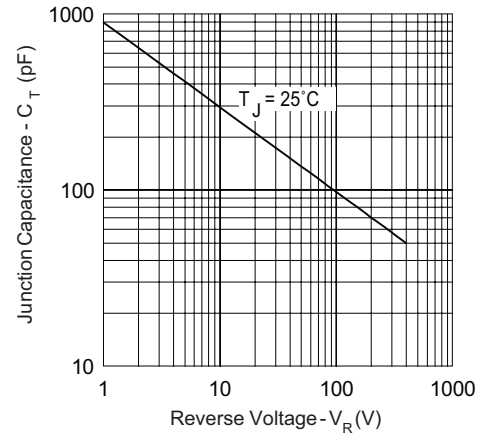


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

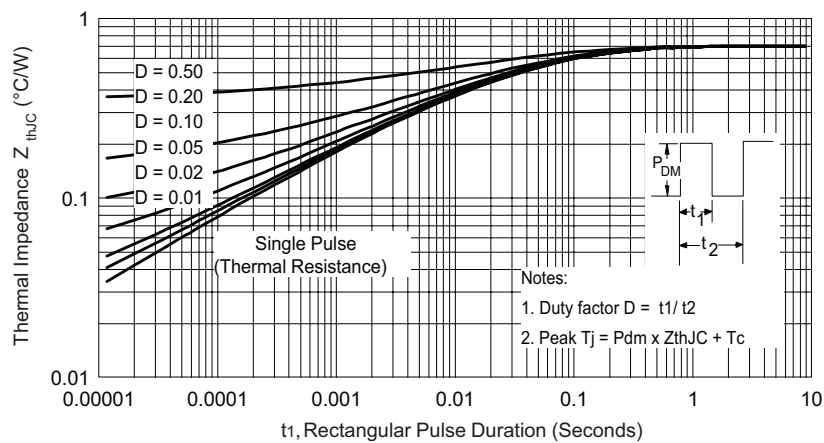


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

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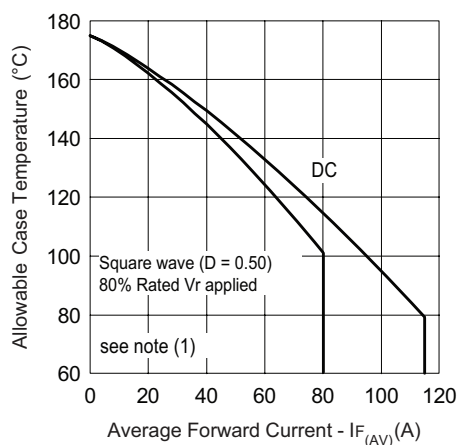


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

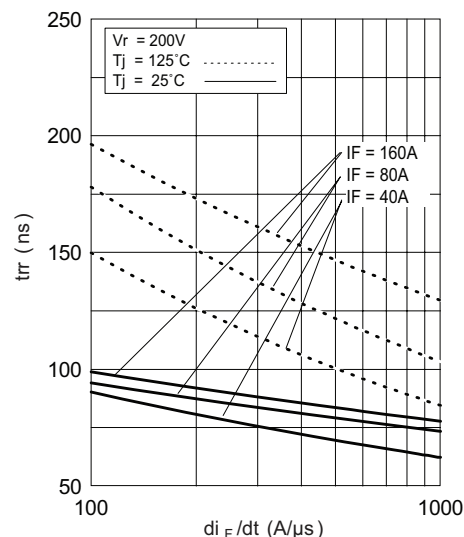


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

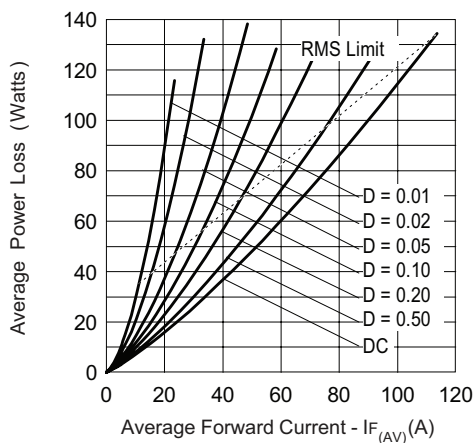


Fig. 6 - Forward Power Loss Characteristics

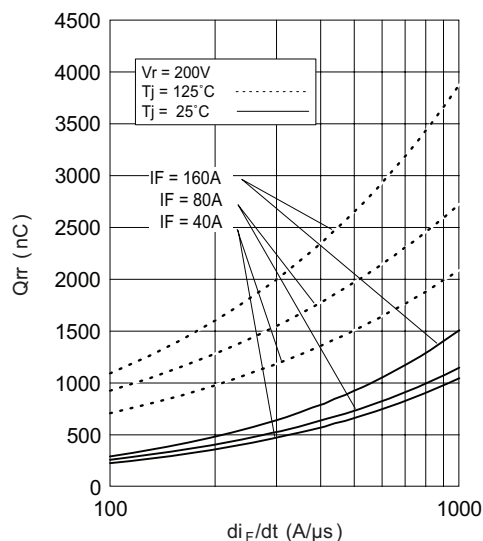


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$

## 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  $V_{R1} = 80\%$  rated  $V_R$

# Ultrafast Soft Recovery Diode, Vishay High Power Products 80 A FRED Pt™

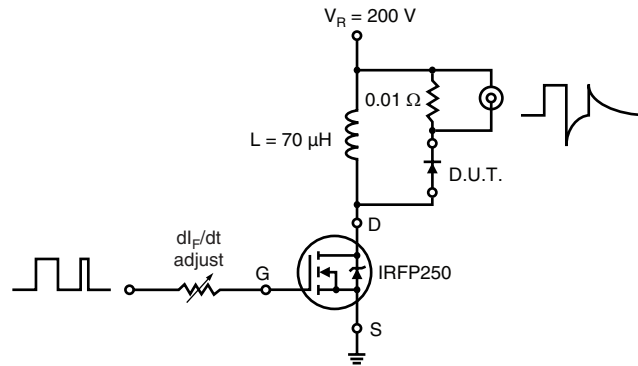
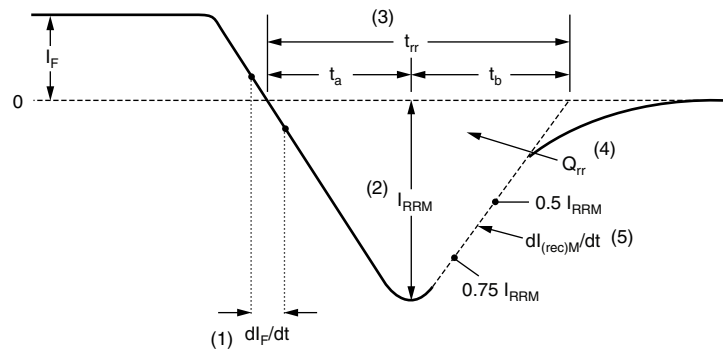


Fig. 9 - Reverse Recovery Parameter Test Circuit



(1)  $di_F/dt$  - rate of change of current through zero crossing

(2)  $I_{RRM}$  - peak reverse recovery current

(3)  $t_{rr}$  - reverse recovery time measured from zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.50 I_{RRM}$  extrapolated to zero current.

(4)  $Q_{rr}$  - area under curve defined by  $t_{rr}$  and  $I_{RRM}$

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(5)  $di_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

Fig. 10 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE

|             |    |   |                                      |   |    |
|-------------|----|---|--------------------------------------|---|----|
| Device code | 80 | E | B                                    | U | 04 |
|             | ①  | ② | ③                                    | ④ | ⑤  |
|             | 1  | - | Current rating (80 = 80 A)           |   |    |
|             | 2  | - | Single diode                         |   |    |
|             | 3  | - | PowerTab™ (ultrafast/hyperfast only) |   |    |
|             | 4  | - | Ultrafast recovery                   |   |    |
|             | 5  | - | Voltage rating (04 = 400 V)          |   |    |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95240">www.vishay.com/doc?95240</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95370">www.vishay.com/doc?95370</a> |
| Application note           | <a href="http://www.vishay.com/doc?95179">www.vishay.com/doc?95179</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