

# Ultrafast Soft Recovery Diode, 80 A FRED Pt®



PowerTab®


**FEATURES**

- Ultrafast recovery time
- 175 °C max. operating junction temperature
- Screw mounting only
- Designed and qualified according to JEDEC®-JESD 47
- PowerTab® package
- 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
- 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 |                    |
|-----------------|--------------------|
| Package         | PowerTab®          |
| $I_{F(AV)}$     | 80 A               |
| $V_R$           | 200 V              |
| $V_F$ at $I_F$  | 0.79 V             |
| $t_{rr}$ (typ.) | See recovery table |
| $T_J$ max.      | 175 °C             |
| Diode variation | Single die         |

| ABSOLUTE MAXIMUM RATINGS                    |                |                       |             |       |
|---------------------------------------------|----------------|-----------------------|-------------|-------|
| PARAMETER                                   | SYMBOL         | TEST CONDITIONS       | MAX.        | UNITS |
| Cathode to anode voltage                    | $V_R$          |                       | 200         | V     |
| Continuous forward current                  | $I_{F(AV)}$    | $T_C = 112\text{ °C}$ | 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                                          | $V_{BR}, V_r$ | $I_R = 50\text{ }\mu\text{A}$                | 200  | -    | -    | V             |
|                                                                              |               | $I_F = 80\text{ A}$                          | -    | 0.98 | 1.13 |               |
| Forward voltage                                                              | $V_F$         | $I_F = 80\text{ A}, T_J = 175\text{ °C}$     | -    | 0.79 | 0.92 |               |
|                                                                              |               |                                              |      |      |      |               |
| Reverse leakage current                                                      | $I_R$         | $V_R = V_R$ rated                            | -    | -    | 50   | $\mu\text{A}$ |
|                                                                              |               | $T_J = 150\text{ °C}, V_R = V_R$ rated       | -    | -    | 2    | mA            |
| Junction capacitance                                                         | $C_T$         | $V_R = 200\text{ V}$                         | -    | 89   | -    | pF            |
| Series inductance                                                            | $L_S$         | Measured lead to lead 5 mm from package body | -    | 3.5  | -    | nH            |

| <b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified) |           |                                                                                   |                                                                                     |      |      |      |       |
|--------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|------|-------|
| PARAMETER                                                                                              | SYMBOL    | TEST CONDITIONS                                                                   |                                                                                     | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time                                                                                  | $t_{rr}$  | $I_F = 1.0\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ |                                                                                     | -    | -    | 35   | ns    |
|                                                                                                        |           | $T_J = 25\text{ }^\circ\text{C}$                                                  |                                                                                     | -    | 32   | -    |       |
|                                                                                                        |           | $T_J = 125\text{ }^\circ\text{C}$                                                 |                                                                                     | -    | 52   | -    |       |
| Peak recovery current                                                                                  | $I_{RRM}$ | $T_J = 25\text{ }^\circ\text{C}$                                                  | $I_F = 80\text{ A}$<br>$V_R = 160\text{ V}$<br>$di_F/dt = 200\text{ A}/\mu\text{s}$ | -    | 4.4  | -    | A     |
|                                                                                                        |           | $T_J = 125\text{ }^\circ\text{C}$                                                 |                                                                                     | -    | 8.8  | -    |       |
| Reverse recovery charge                                                                                | $Q_{rr}$  | $T_J = 25\text{ }^\circ\text{C}$                                                  |                                                                                     | -    | 70   | -    | nC    |
|                                                                                                        |           | $T_J = 125\text{ }^\circ\text{C}$                                                 |                                                                                     | -    | 240  | -    |       |

| <b>THERMAL - MECHANICAL SPECIFICATIONS</b> |            |                                            |  |             |      |             |                                                              |
|--------------------------------------------|------------|--------------------------------------------|--|-------------|------|-------------|--------------------------------------------------------------|
| PARAMETER                                  | SYMBOL     | TEST CONDITIONS                            |  | MIN.        | TYP. | MAX.        | UNITS                                                        |
| Thermal resistance, junction to case       | $R_{thJC}$ |                                            |  | -           | -    | 0.70        | $^\circ\text{C}/\text{W}$                                    |
| 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) | $\text{N} \cdot \text{m}$<br>( $\text{lb} \cdot \text{in}$ ) |
| Marking device                             |            | Case style PowerTab®                       |  | 80EBU02     |      |             |                                                              |

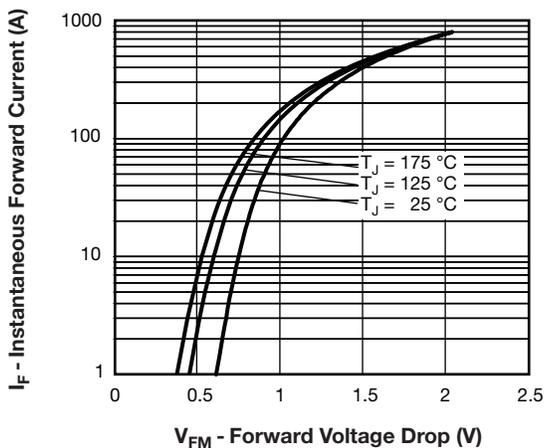


Fig. 1 - Maximum Forward Voltage Drop Characteristics

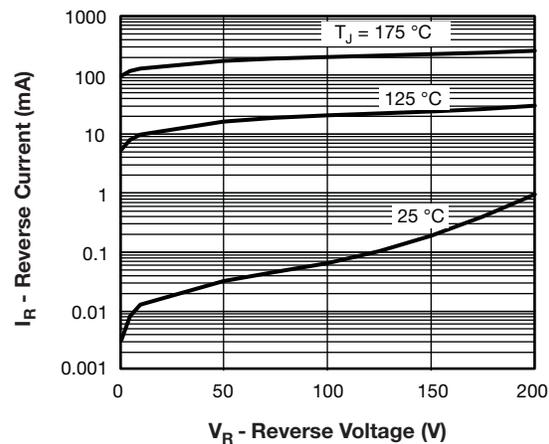


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

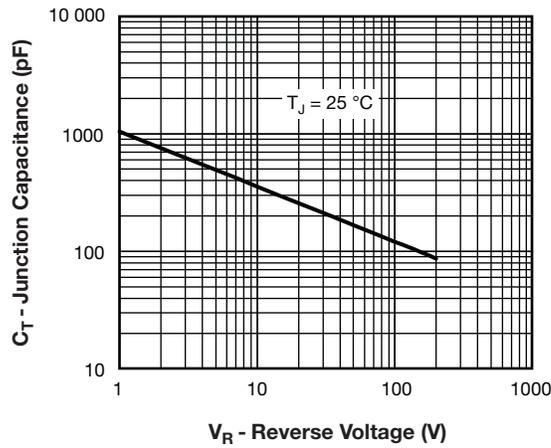


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

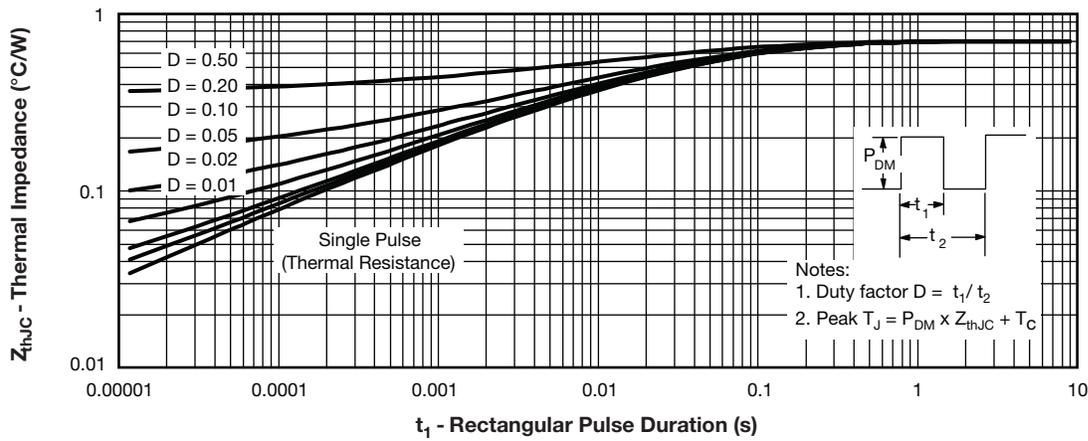


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

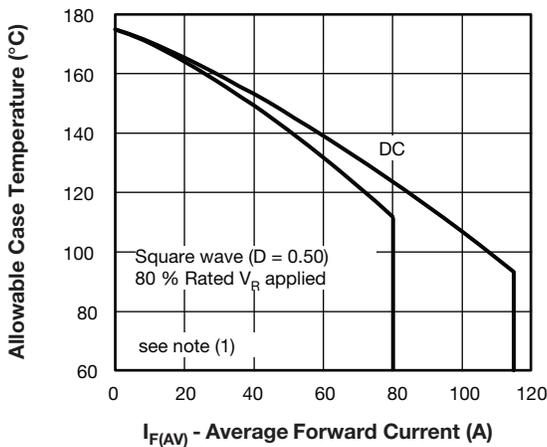


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

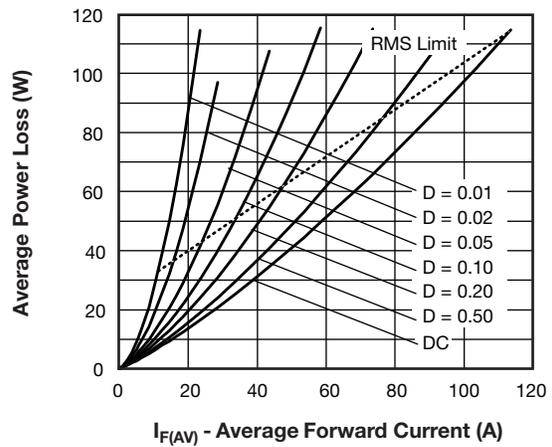


Fig. 6 - Forward Power Loss Characteristics

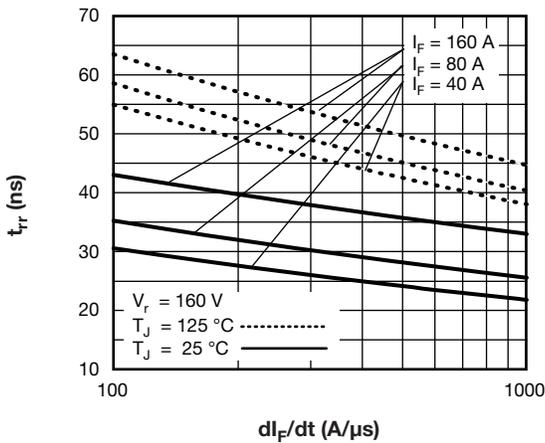


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

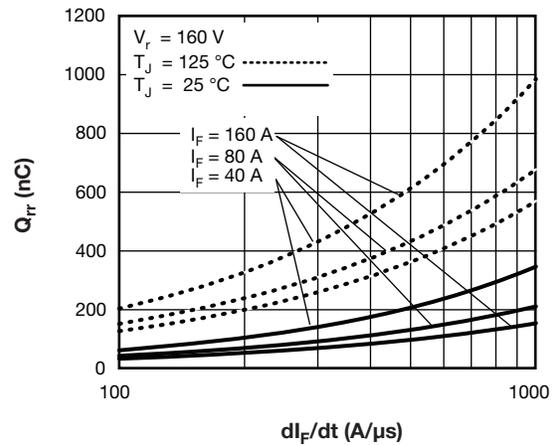


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$

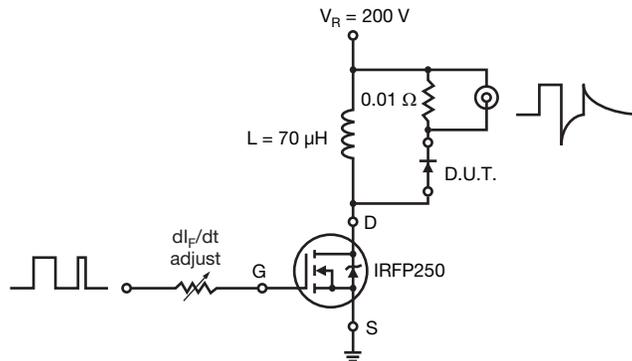
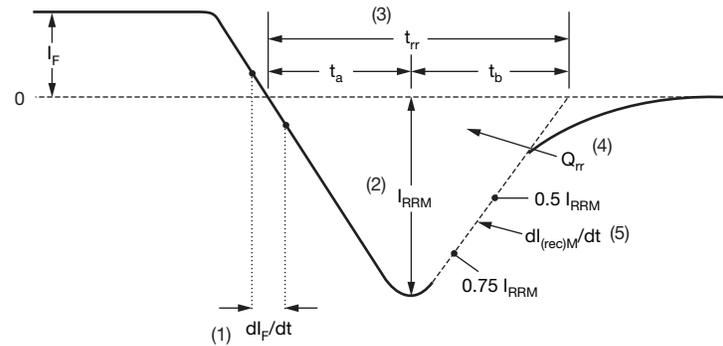


Fig. 9 - Reverse Recovery Parameter Test Circuit

**Note**

- (1) Formula used:  $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$ ;
- $Pd$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);
- $Pd_{REV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1} = 80\%$  rated  $V_R$



(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 | VS- | 80 | E | B | U | 02 |
|-------------|-----|----|---|---|---|----|
|             | 1   | 2  | 3 | 4 | 5 | 6  |
|             | 1   | 2  | 3 | 4 | 5 | 6  |
|             | 1   | 2  | 3 | 4 | 5 | 6  |
|             | 1   | 2  | 3 | 4 | 5 | 6  |
|             | 1   | 2  | 3 | 4 | 5 | 6  |
|             | 1   | 2  | 3 | 4 | 5 | 6  |

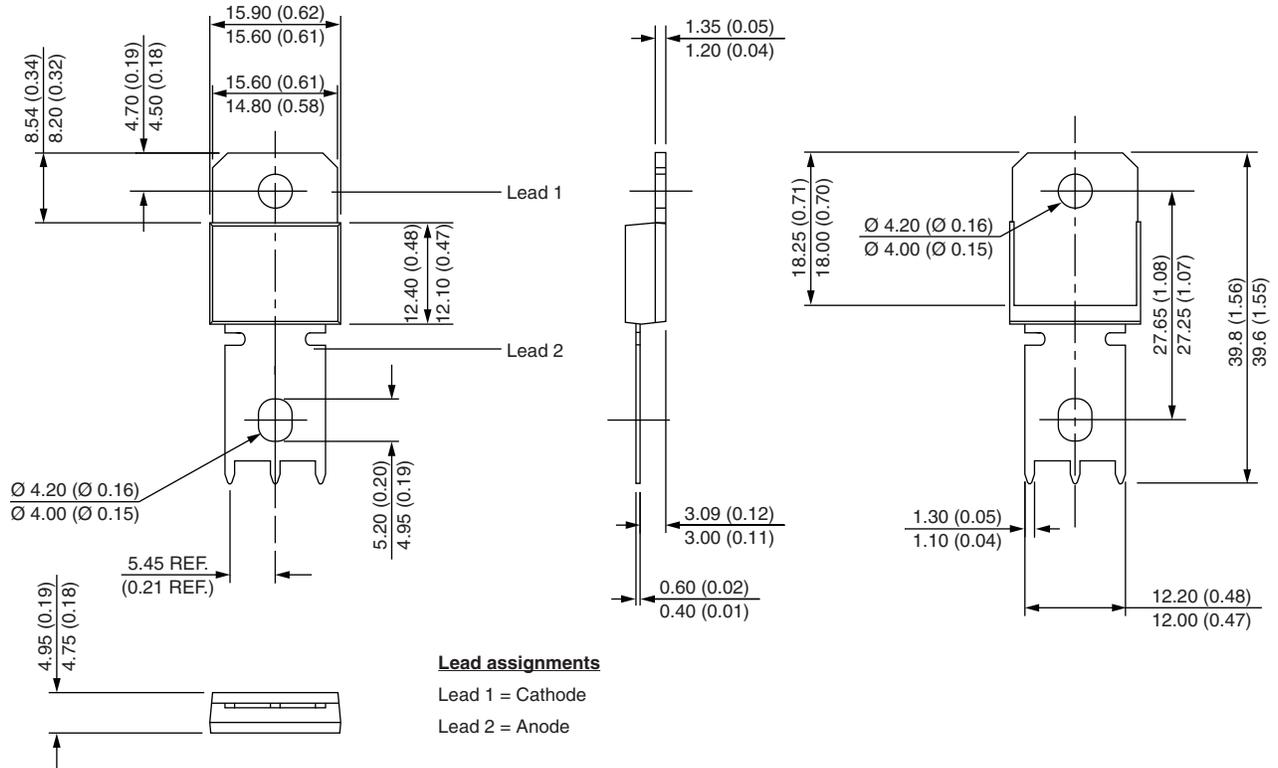
- 1** - Vishay Semiconductors product
- 2** - Current rating (80 = 80 A)
- 3** - Single diode
- 4** - PowerTab® (ultrafast/hyperfast only)
- 5** - Ultrafast recovery
- 6** - Voltage rating (02 = 200 V)

| 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> |



## PowerTab®

**DIMENSIONS** in millimeters (inches)





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