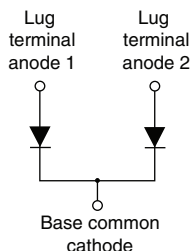



# **FRED Pt<sup>®</sup>, Ultrafast Soft Recovery Diode Module, 400 A**


**TO-244**


## **FEATURES**

- Ultrafast recovery
- UL approved file E222165 
- Designed for industrial level
- 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**

FRED Pt<sup>®</sup> 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.

## **PRODUCT SUMMARY**

|             |                                       |
|-------------|---------------------------------------|
| $I_{F(AV)}$ | 400 A                                 |
| $V_R$       | 600 V                                 |
| $Q_{rr}$    | 4730 nC                               |
| $t_{rr}$    | 90 ns                                 |
| Type        | Modules - Diode, FRED Pt <sup>®</sup> |

## **ABSOLUTE MAXIMUM RATINGS**

| PARAMETER                                   | SYMBOL         | TEST CONDITIONS                    | MAX.       | UNITS              |
|---|----------------|------------------------------------|------------|--------------------|
| Cathode to anode voltage                    | $V_R$          |                                    | 600        | V                  |
| Continuous forward current per diode        | $I_{F(AV)}$    | $T_C = 25\text{ }^{\circ}\text{C}$ | 330        | A                  |
|   |                | $T_C = 85\text{ }^{\circ}\text{C}$ | 230        |                    |
|   |                | $T_C = 97\text{ }^{\circ}\text{C}$ | 200        |                    |
| Single pulse forward current per diode      | $I_{FSM}$      |                                    | 1200       |                    |
| Maximum power dissipation                   | $P_D$          | $T_C = 25\text{ }^{\circ}\text{C}$ | 660        | W                  |
|   |                | $T_C = 97\text{ }^{\circ}\text{C}$ | 280        |                    |
| Operating junction and storage temperatures | $T_J, T_{Stg}$ |                                    | -40 to 150 | $^{\circ}\text{C}$ |

## **ELECTRICAL SPECIFICATIONS PER LEG ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)**

| PARAMETER               | SYMBOL   | TEST CONDITIONS   | MIN. | TYP. | MAX. | UNITS |
|-------------------------|----------|---|------|------|------|-------|
| Breakdown voltage       | $V_{BR}$ | $I_R = 100\text{ }\mu\text{A}$                              | 600  | -    | -    | V     |
| Forward voltage         | $V_{FM}$ | $I_F = 200\text{ A}$  | -    | 1.45 | 2.0  |       |
|                         |          | $I_F = 400\text{ A}$  | -    | 1.67 | 2.3  |       |
|                         |          | $I_F = 200\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$     | -    | 1.13 | 1.4  |       |
|                         |          | $I_F = 400\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$     | -    | 1.39 | 1.8  |       |
| Reverse leakage current | $I_{RM}$ | $T_J = 150\text{ }^{\circ}\text{C}, V_R = V_R\text{ rated}$ | -    | 0.3  | 1.38 | mA    |
| Series inductance       | $L_S$    | From top of terminal hole to mounting plane                 | -    | 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   | $t_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$   | $I_F = 200\text{ A}$ ,<br>$di_F/dt = 200\text{ A}/\mu\text{s}$ ,<br>$V_R = 200\text{ V}$ | -    | 90   | -    | ns    |
|                         |           | $T_J = 150\text{ }^{\circ}\text{C}$  |  | -    | 240  | -    |       |
| Peak recovery current   | $I_{RRM}$ | $I_F = 200\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$                                       |  | -    | 8.3  | -    | A     |
|                         |           | $I_F = 200\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$ , $T_J = 150\text{ }^{\circ}\text{C}$ |  | -    | 24   | -    |       |
| Reverse recovery charge | $Q_{rr}$  | $I_F = 200\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$                                       |  | -    | 830  | -    | nC    |
|                         |           | $I_F = 200\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$ , $T_J = 150\text{ }^{\circ}\text{C}$ |  | -    | 4730 | -    |       |

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                               |            | SYMBOL     | MIN.              | TYP. | MAX.     | UNITS                       |
|---|------------|------------|-------------------|------|----------|-----------------------------|
| Thermal resistance,<br>junction to case | per leg    | $R_{thJC}$ | -                 | -    | 0.19     | $^{\circ}\text{C}/\text{W}$ |
|   | per module |            | -                 | -    | 0.095    |                             |
| Thermal resistance,<br>case to heatsink |            | $R_{thCS}$ | -                 | 0.10 | -        |                             |
| Weight                                  |            |            | -                 | 68   | -        | g                           |
|   |            |            | -                 | 2.4  | -        | oz.                         |
| Mounting torque                         |            |            | 30 (3.4)          | -    | 40 (4.6) | lbf · in<br>(N · m)         |
| Mounting torque center hole             |            |            | 12 (1.4)          | -    | 18 (2.1) |                             |
| Terminal torque                         |            |            | 30 (3.4)          | -    | 40 (4.6) |                             |
| Vertical pull                           |            |            | -                 | -    | 80       | lbf · in                    |
| 2" lever pull                           |            |            | -                 | -    | 35       |                             |
| Case style                              |            |            | TO-244 (TO-244AB) |      |          |                             |

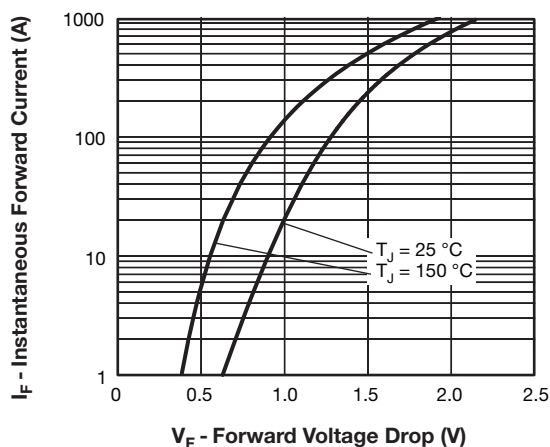


Fig. 1 - Typical Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

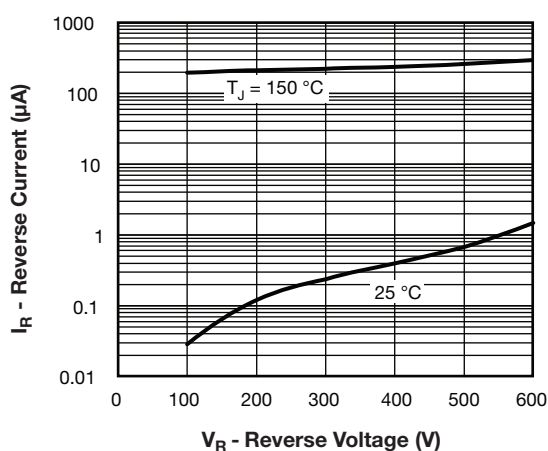


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

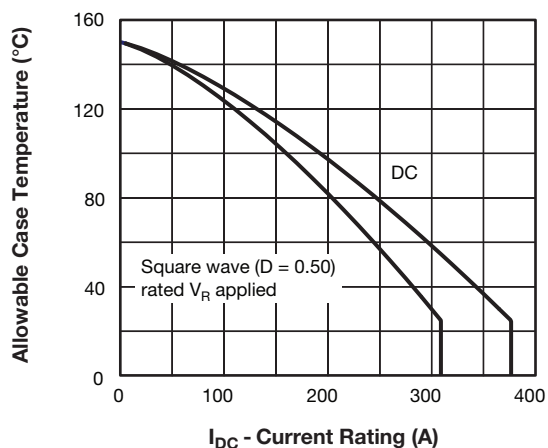


Fig. 3 - Maximum Current Rating Capability (Per Leg)

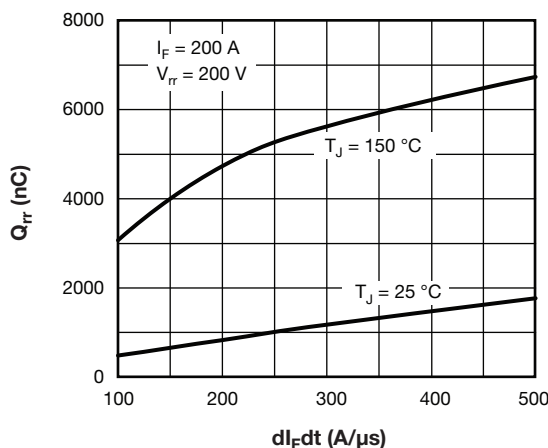
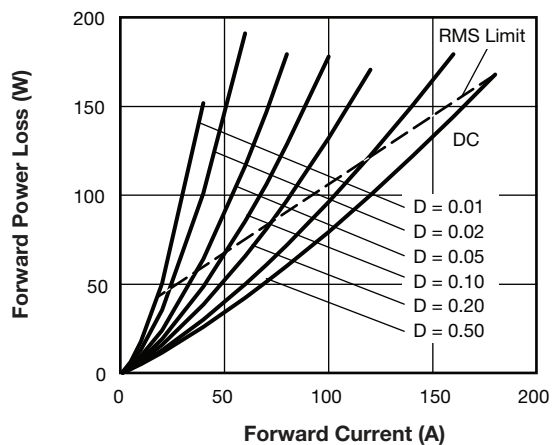
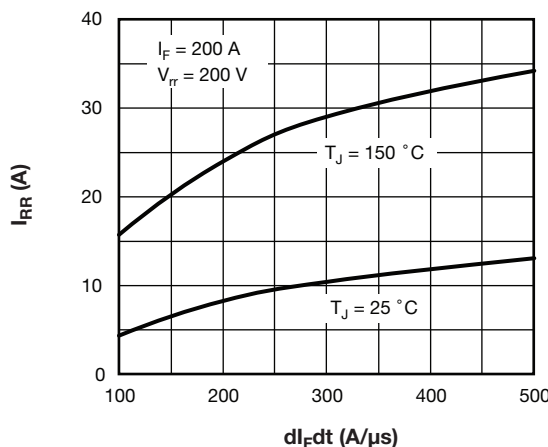
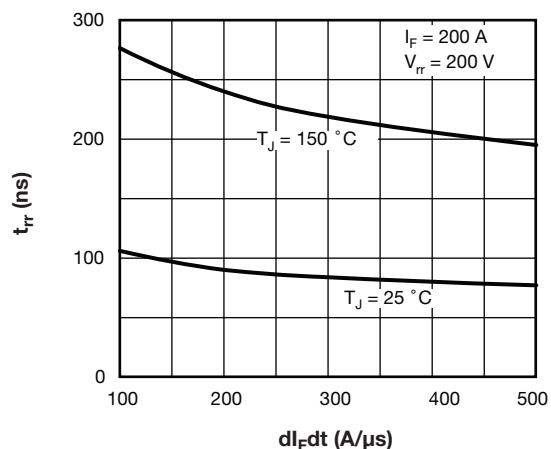

Fig. 6 - Typical Reverse Recovery Charge vs.  $dI_F/dt$  (Per Leg)


Fig. 4 - Forward Power Loss Characteristics


Fig. 7 - Typical Reverse Recovery Current vs.  $dI_F/dt$  (Per Leg)

Fig. 5 - Typical Reverse Recovery Time vs.  $dI_F/dt$  (Per Leg)

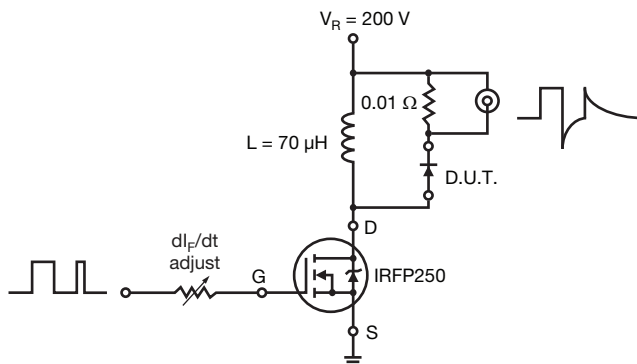


Fig. 8 - Reverse Recovery Parameter Test Circuit

## ORDERING INFORMATION TABLE

Device code structure diagram:

| Segment | Value | Position |
|---------|-------|----------|
| 1       | VS-VS | 1        |
| 2       | UD    | 2        |
| 3       | 400   | 3        |
| 4       | C     | 4        |
| 5       | W     | 5        |
| 6       | 60    | 6        |

- 1 - Vishay Semiconductors product
- 2 - UD = FRED Pt<sup>®</sup>
- 3 - Current rating (400 = 400 A)
- 4 - Circuit configuration:  
C = Common cathode
- 5 - W = TO-244 wire bondable not isolated
- 6 - Voltage rating (60 = 600 V)

| Circuit Configuration      |                            |                 |
|----------------------------|----------------------------|-----------------|
| Circuit                    | Circuit Configuration Code | Circuit Drawing |
| Two diodes common cathodes | C                          |                 |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?95021">www.vishay.com/doc?95021</a> |



## TO-244

**DIMENSIONS** in millimeters (inches)





## Disclaimer

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