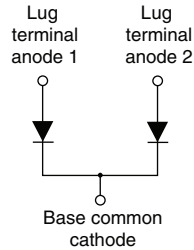


FRED Pt[®], Ultrafast Soft Recovery Diode Module, 400 A


TO-244

FEATURES

- Ultrafast recovery
- Designed for industrial level
- UL approved file E222165
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912


**RoHS
COMPLIANT**
BENEFITS

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

DESCRIPTION / APPLICATIONS

FRED Pt[®] 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 | |
|-------------------------|---------------------------------------|
| $I_{F(AV)}$ | 400 A |
| V_R | 600 V |
| Q_{rr} (typical) | 5100 nC |
| t_{rr} | 215 ns |
| Type | Modules - diode, FRED Pt [®] |
| Package | TO-244 |
| Circuit configuration | Two diodes common cathode |

| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|----------------|-----------------------|-------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
| Cathode to anode voltage | V_R | | 600 | V |
| Continuous forward current per diode | $I_{F(DC)}$ | $T_C = 25\text{ °C}$ | 572 | A |
| | | $T_C = 85\text{ °C}$ | 397 | |
| | | $T_C = 137\text{ °C}$ | 200 | |
| Single pulse forward current per diode | I_{FSM} | $T_C = 25\text{ °C}$ | 3330 | |
| Maximum power dissipation | P_D | $T_C = 25\text{ °C}$ | 789 | W |
| | | $T_C = 137\text{ °C}$ | 200 | |
| Operating junction and storage temperatures | T_J, T_{Stg} | | -40 to +175 | °C |

| ELECTRICAL SPECIFICATIONS PER LEG ($T_J = 25\text{ °C}$ 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} | $I_F = 200\text{ A}$ | - | 1.0 | 1.2 | |
| | | $I_F = 400\text{ A}$ | - | 1.12 | 1.37 | |
| | | $I_F = 200\text{ A}, T_J = 175\text{ °C}$ | - | 0.83 | 1.0 | |
| | | $I_F = 400\text{ A}, T_J = 175\text{ °C}$ | - | 0.98 | 1.21 | |
| Reverse leakage current | I_{RM} | $T_J = 175\text{ °C}, V_R = V_R$ rated | - | 0.3 | 3.0 | 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} | $T_J = 25\text{ }^\circ\text{C}$ | $I_F = 50\text{ A,}$ $di_F/dt = 500\text{ A}/\mu\text{s,}$ $V_R = 200\text{ V}$ | - | 215 | - | ns |
| | | $T_J = 150\text{ }^\circ\text{C}$ | | - | 432 | - | |
| Peak recovery current | I_{RRM} | $T_J = 25\text{ }^\circ\text{C}$ | | - | 48 | - | A |
| | | $T_J = 150\text{ }^\circ\text{C}$ | | - | 70 | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^\circ\text{C}$ | | - | 5100 | - | nC |
| | | $T_J = 150\text{ }^\circ\text{C}$ | | - | 15 100 | - | |

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

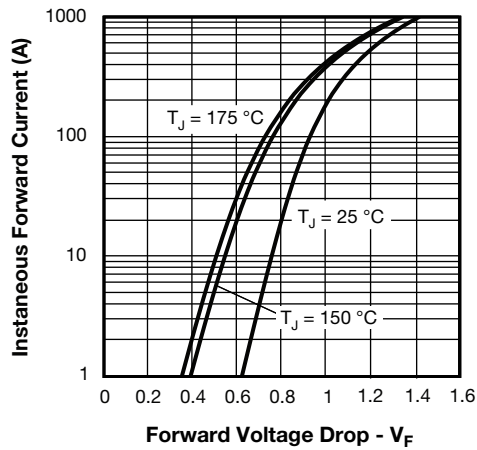


Fig. 1 - Typical Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

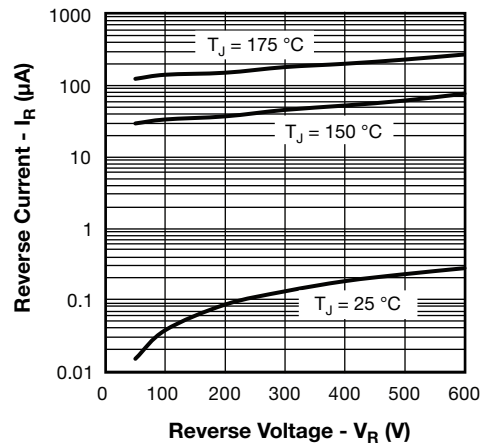


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

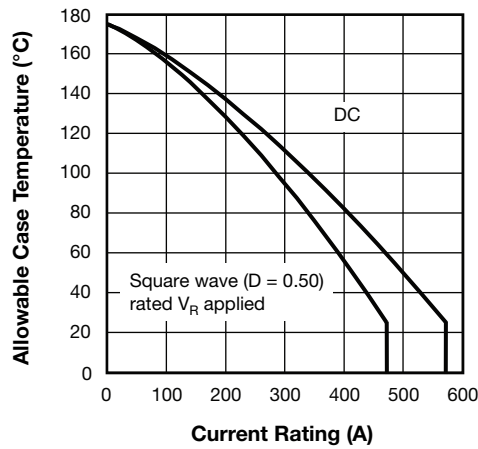


Fig. 3 - Maximum Current Rating Capability (Per Leg)

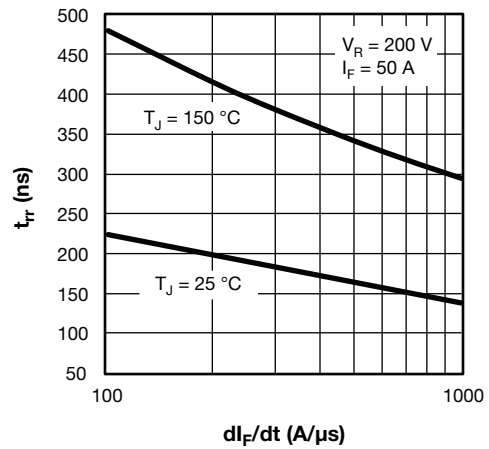


Fig. 5 - Typical Reverse Recovery Time vs. di_F/dt

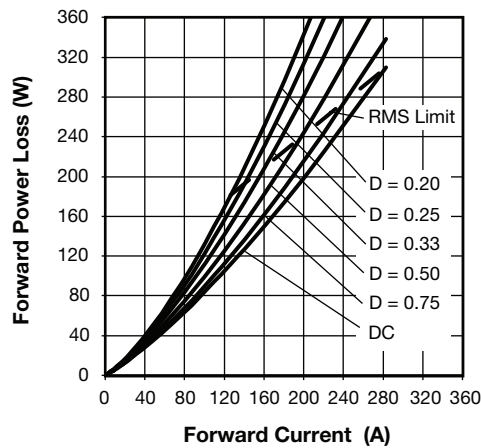


Fig. 4 - Forward Power Loss Characteristics

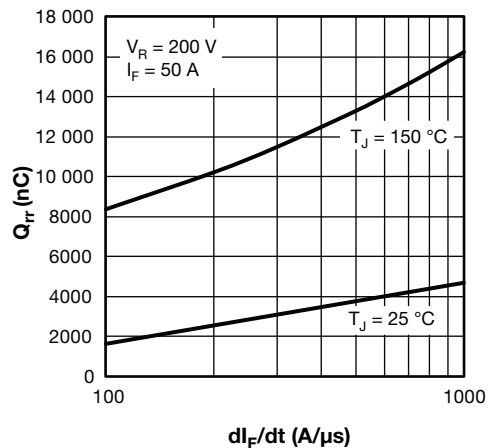


Fig. 6 - Typical Reverse Recovery Charge vs. di_F/dt

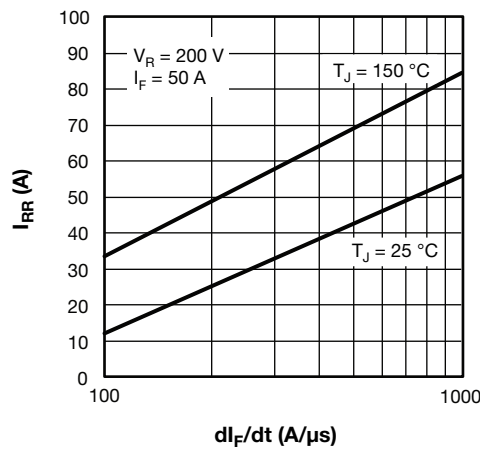


Fig. 7 - Typical Reverse Recovery Current vs. di_F/dt

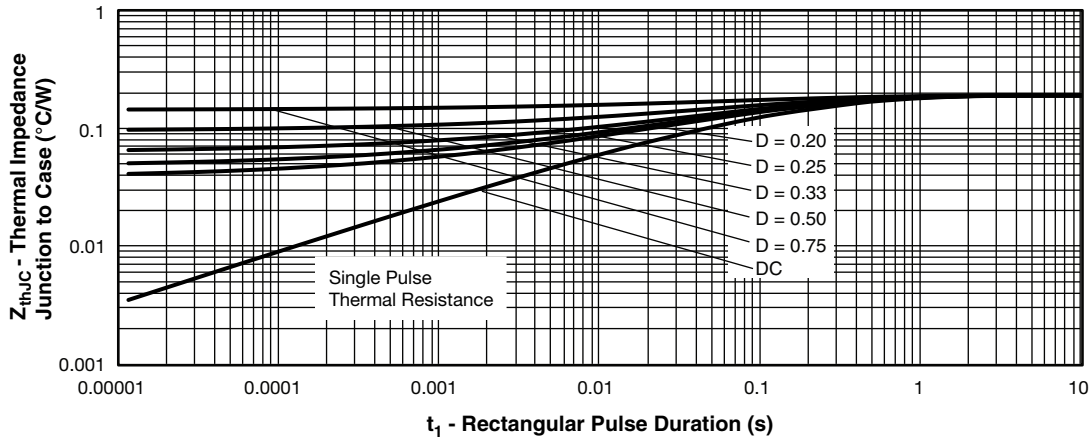


Fig. 8 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

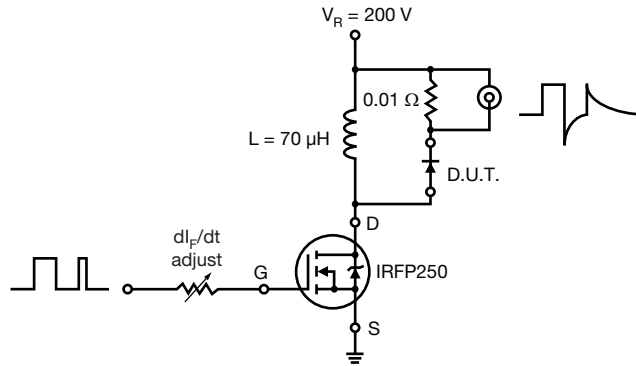


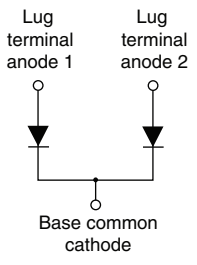
Fig. 9 - Reverse Recovery Parameter Test Circuit

ORDERING INFORMATION TABLE

| | | | | | | |
|-------------|--------------|-----------|------------|----------|----------|-----------|
| Device code | VS-VS | UD | 410 | C | W | 60 |
| | ① | ② | ③ | ④ | ⑤ | ⑥ |

- 1** - Vishay Semiconductors product
- 2** - UD = FRED Pt[®]
- 3** - Current rating (410 = 400 A)
- 4** - Circuit configuration:
C = two diodes 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 cathode | C |  |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?95021 |



TO-244

DIMENSIONS in millimeters (inches)





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