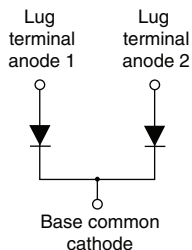


# **FRED Pt<sup>®</sup>, Ultrafast Soft Recovery Diode Module, 500 A**


**TO-244**


## **FEATURES**

- Ultrafast recovery
- Designed for industrial level
-  pending
- 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**

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.

| PRIMARY CHARACTERISTICS |                                       |
|-------------------------|---------------------------------------|
| $I_{F(AV)}$             | 500 A                                 |
| $V_R$                   | 600 V                                 |
| $Q_{rr}$ (typical)      | 1770 nC                               |
| $t_{rr}$                | 270 ns                                |
| Type                    | Modules - diode, FRED Pt <sup>®</sup> |
| 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        | $I_{F(DC)}$    | $T_C = 25\text{ }^{\circ}\text{C}$  | 619         | A                  |
|                                             |                | $T_C = 85\text{ }^{\circ}\text{C}$  | 438         |                    |
|                                             |                | $T_C = 134\text{ }^{\circ}\text{C}$ | 250         |                    |
| Single pulse forward current per diode      | $I_{FSM}$      | $T_C = 150\text{ }^{\circ}\text{C}$ | 4000        |                    |
| Maximum power dissipation                   | $P_D$          | $T_C = 25\text{ }^{\circ}\text{C}$  | 937         | W                  |
|                                             |                | $T_C = 134\text{ }^{\circ}\text{C}$ | 253         |                    |
| Operating junction and storage temperatures | $T_J, T_{Stg}$ |                                     | -40 to +175 | $^{\circ}\text{C}$ |

| ELECTRICAL SPECIFICATIONS PER LEG ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified) |          |                                                             |      |      |       |       |
|----------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------|------|------|-------|-------|
| PARAMETER                                                                                          | SYMBOL   | TEST CONDITIONS                                             | MIN. | TYP. | MAX.  | UNITS |
| Breakdown voltage                                                                                  | $V_{BR}$ | $I_R = 200\text{ }\mu\text{A}$                              | 600  | -    | -     | V     |
| Forward voltage                                                                                    | $V_{FM}$ | $I_F = 250\text{ A}$                                        | -    | 0.97 | 1.170 |       |
|                                                                                                    |          | $I_F = 500\text{ A}$                                        | -    | 1.08 | -     |       |
|                                                                                                    |          | $I_F = 250\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$     | -    | 0.82 | -     |       |
|                                                                                                    |          | $I_F = 500\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$     | -    | 0.97 | -     |       |
| Reverse leakage current                                                                            | $I_{RM}$ | $T_J = 175\text{ }^{\circ}\text{C}, V_R = V_R\text{ rated}$ | -    | 0.33 | -     | mA    |

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

| PARAMETER               | SYMBOL    | TEST CONDITIONS                     | MIN. | TYP. | MAX. | UNITS |
|-------------------------|-----------|-------------------------------------|------|------|------|-------|
| Reverse recovery time   | $t_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$  | -    | 270  | -    | ns    |
|                         |           | $T_J = 150\text{ }^{\circ}\text{C}$ | -    | 590  | -    |       |
| Peak recovery current   | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$  | -    | 9    | -    | A     |
|                         |           | $T_J = 150\text{ }^{\circ}\text{C}$ | -    | 22   | -    |       |
| Reverse recovery charge | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$  | -    | 1770 | -    | nC    |
|                         |           | $T_J = 150\text{ }^{\circ}\text{C}$ | -    | 7820 | -    |       |

**THERMAL - MECHANICAL SPECIFICATIONS**

| THERMAL MECHANICAL SPECIFICATIONS       |            |            |          |      |          |                     |
|-----------------------------------------|------------|------------|----------|------|----------|---------------------|
| PARAMETER                               |            | SYMBOL     | MIN.     | TYP. | MAX.     | UNITS               |
| Thermal resistance,<br>junction to case | per leg    | $R_{thJC}$ | -        | -    | 0.16     | °C/W                |
|                                         | per module |            | -        | -    | 0.08     |                     |
| Thermal resistance, case to heatsink    |            | $R_{thCS}$ | -        | 0.1  | -        |                     |
| 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   |      |          |                     |

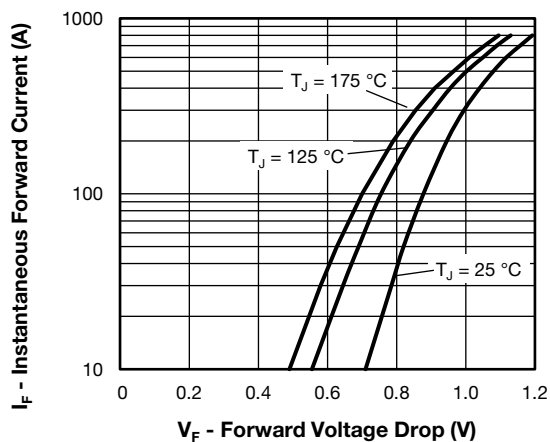


Fig. 1 - Typical Forward Voltage Drop vs. Instantaneous Forward Current (Per Diode)

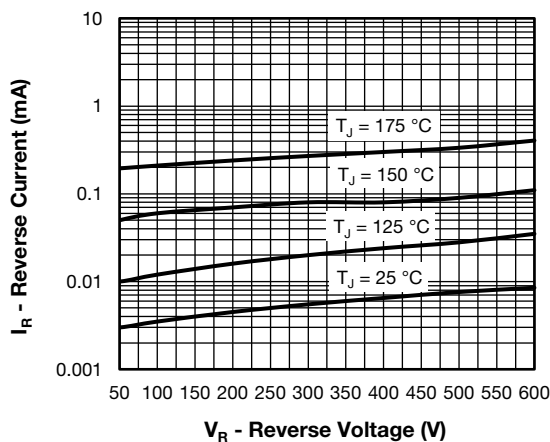


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Diode)

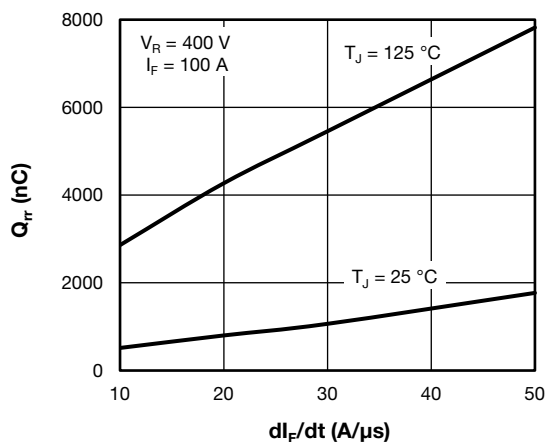


Fig. 3 - Typical Reverse Recovery Charge vs  $dI_F/dt$  (Per Diode)

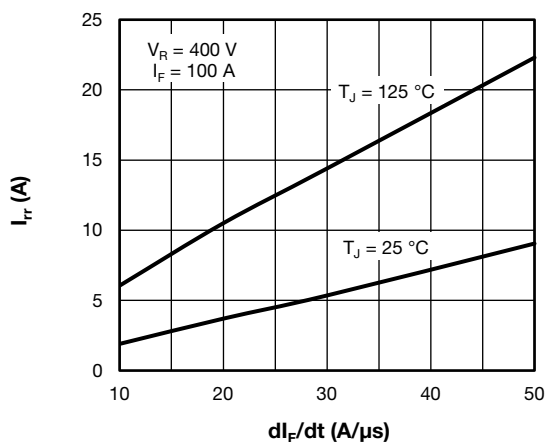


Fig. 5 - Typical Reverse Recovery Current vs.  $dI_F/dt$  (Per Diode)

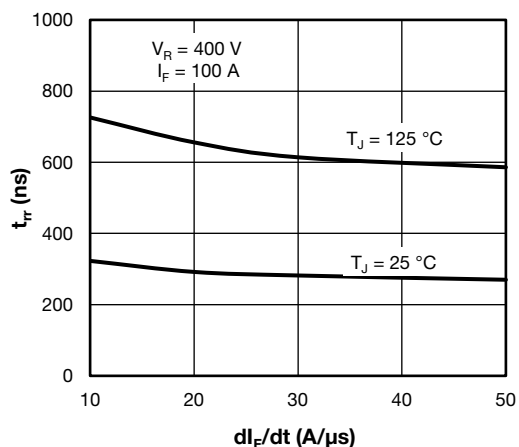


Fig. 4 - Typical Reverse Recovery Time vs  $dI_F/dt$  (Per Diode)

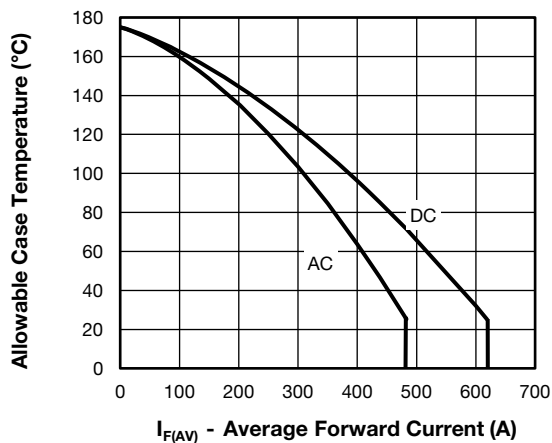


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

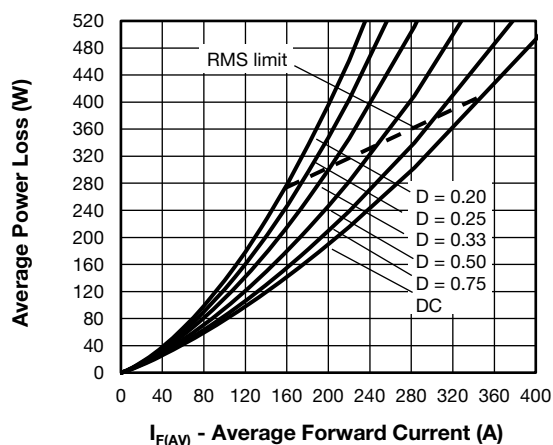


Fig. 7 - Average Power Loss vs. Average Forward Current (Forward Power Loss Characteristics)

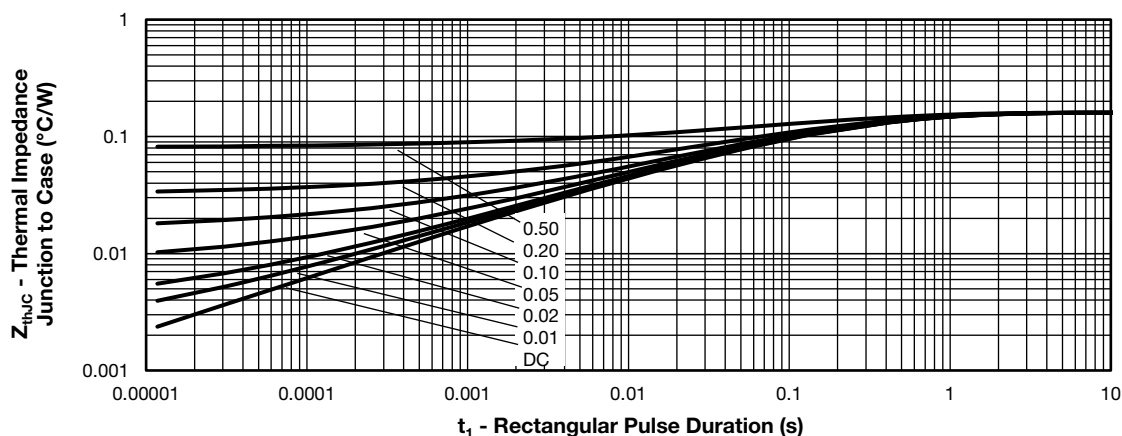


Fig. 8 -  $Z_{thJC}$  - Maximum Thermal Impedance Junction to Case vs.  $t_1$  Rectangular Pulse Duration

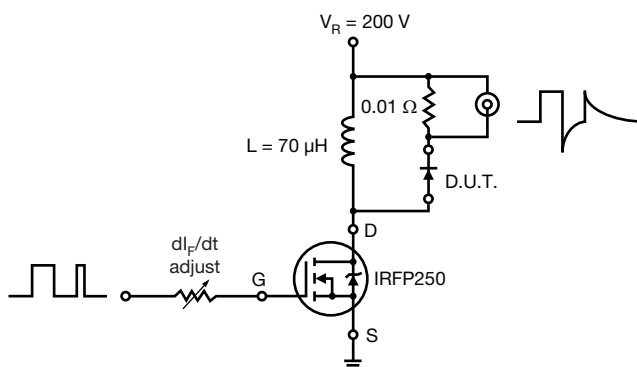
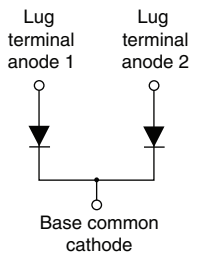


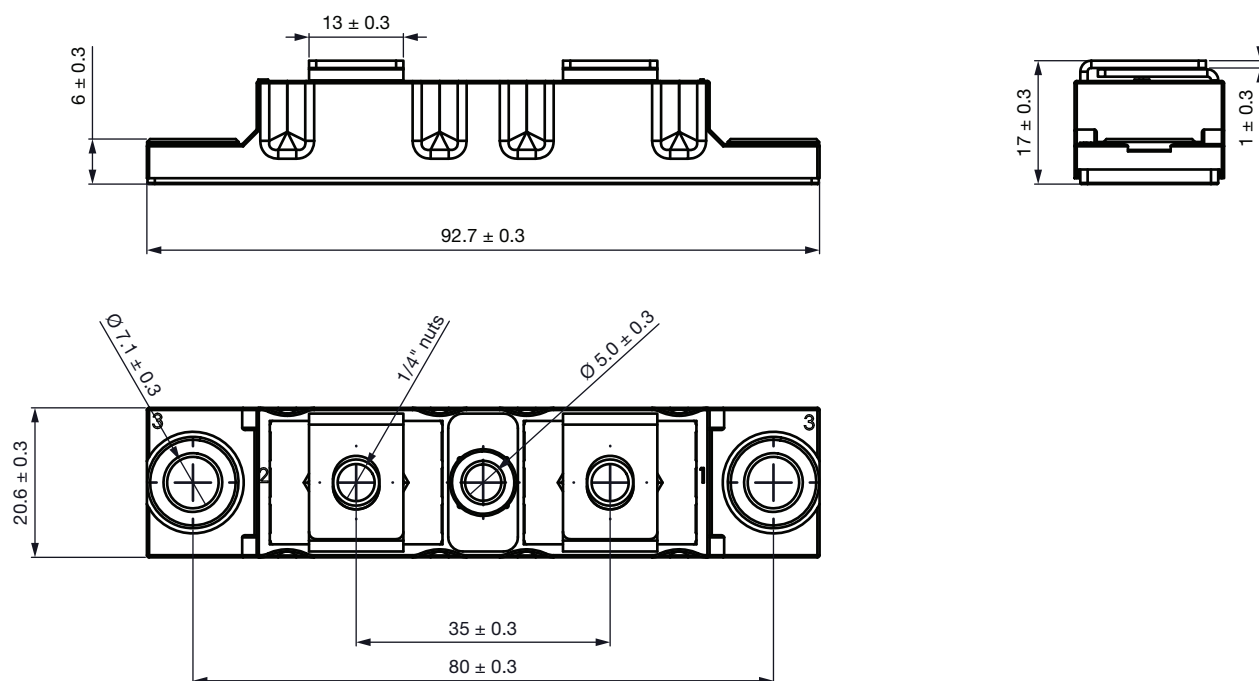
Fig. 9 - Reverse Recovery Parameter Test Circuit

## ORDERING INFORMATION TABLE

| Device code | VS-VS | UD | 510 | C | W | 60 |
|-------------|-------|----|-----|---|---|----|
|             | ①     | ②  | ③   | ④ | ⑤ | ⑥  |

- ① - Vishay Semiconductors product
- ② - UD = FRED Pt®
- ③ - Current rating (510 = 500 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                          |  |

**DIMENSIONS** in millimeters (inches)




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