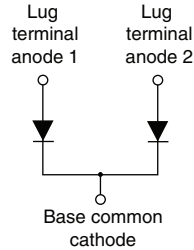


# FRED Pt<sup>®</sup>, Ultrafast Soft Recovery Diode Module, 400 A



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	$I_{F(AV)}$	$T_C = 25\text{ °C}$	330	A
		$T_C = 85\text{ °C}$	230	
		$T_C = 97\text{ °C}$	200	
Single pulse forward current per diode	$I_{FSM}$		1200	
Maximum power dissipation	$P_D$	$T_C = 25\text{ °C}$	660	W
		$T_C = 97\text{ °C}$	280	
Operating junction and storage temperatures	$T_J, T_{Stg}$		-40 to 150	°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	$V_{FM}$	$I_F = 200\text{ A}$	-	1.45	2.0	
		$I_F = 400\text{ A}$	-	1.67	2.3	
		$I_F = 200\text{ A}, T_J = 150\text{ °C}$	-	1.13	1.4	
		$I_F = 400\text{ A}, T_J = 150\text{ °C}$	-	1.39	1.8	
Reverse leakage current	$I_{RM}$	$T_J = 150\text{ °C}, V_R = V_R\text{ rated}$	-	0.3	1.38	mA
Series inductance	$L_S$	From top of terminal hole to mounting plane	-	5	-	nH



<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	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 200\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$	-	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	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
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)		
Mounting torque center hole		12 (1.4)	-	18 (2.1)		lbf · in (N · m)
Terminal torque		30 (3.4)	-	40 (4.6)		
Vertical pull		-	-	80		lbf · in
2" lever pull		-	-	35		
Case style		TO-244 (TO-244AB)				

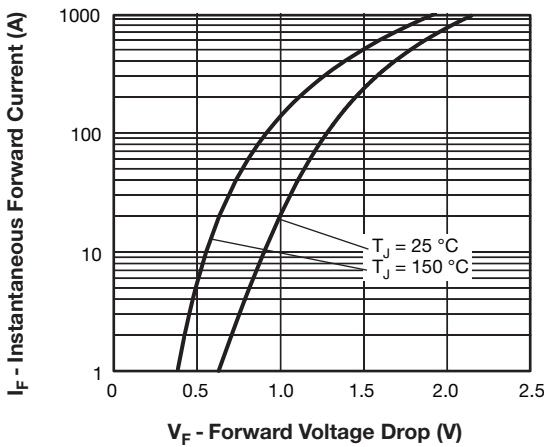


Fig. 1 - Typical Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

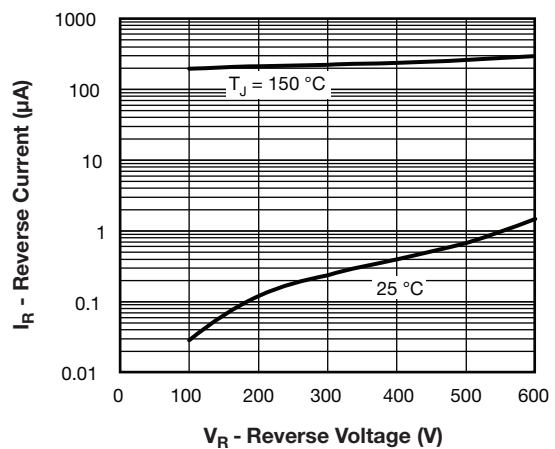


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

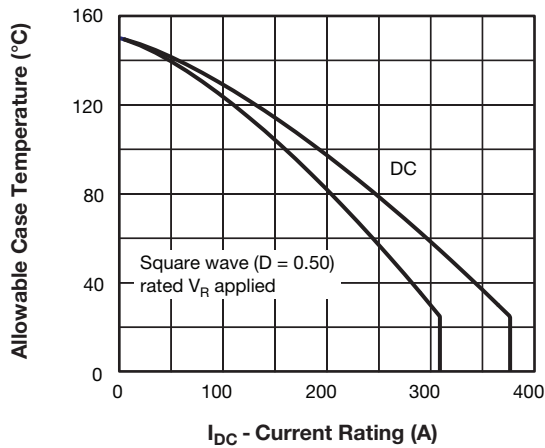


Fig. 3 - Maximum Current Rating Capability (Per Leg)

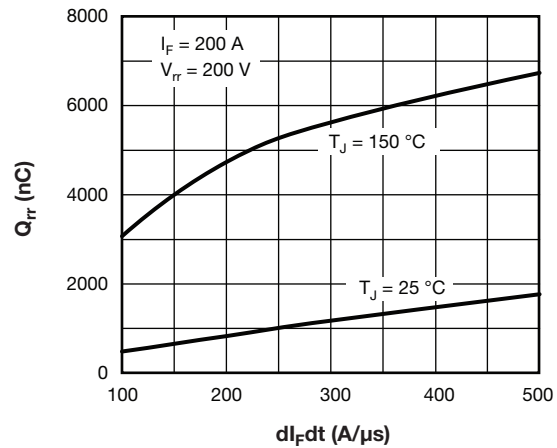


Fig. 6 - Typical Reverse Recovery Charge vs.  $di_F/dt$  (Per Leg)

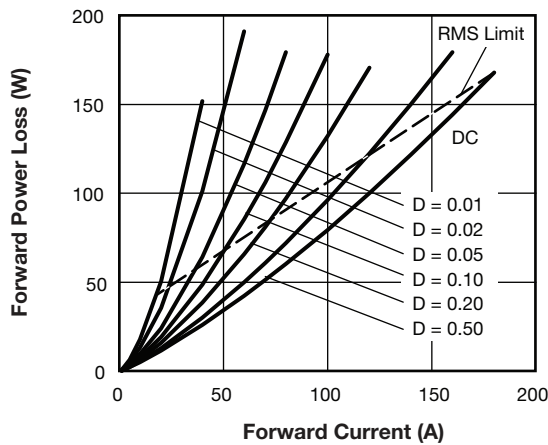


Fig. 4 - Forward Power Loss Characteristics

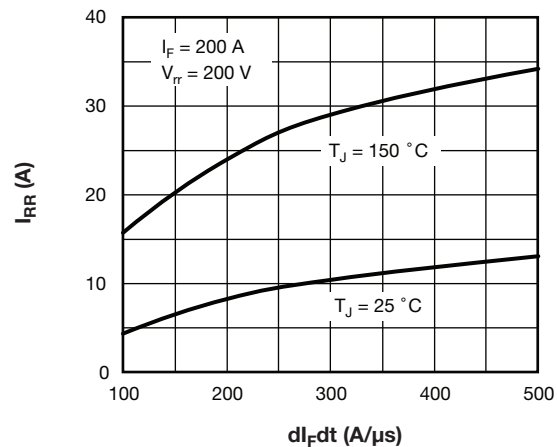


Fig. 7 - Typical Reverse Recovery Current vs.  $di_F/dt$  (Per Leg)

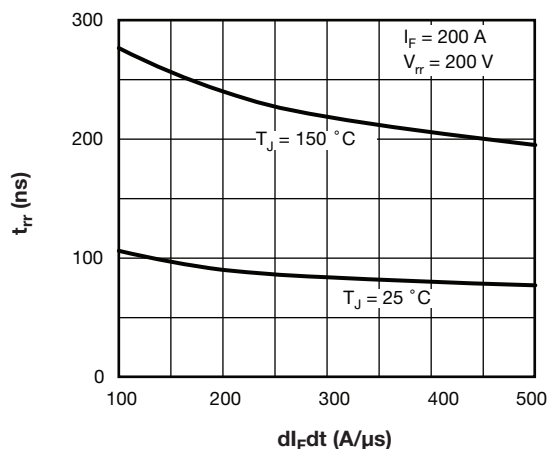


Fig. 5 - Typical Reverse Recovery Time vs.  $di_F/dt$  (Per Leg)

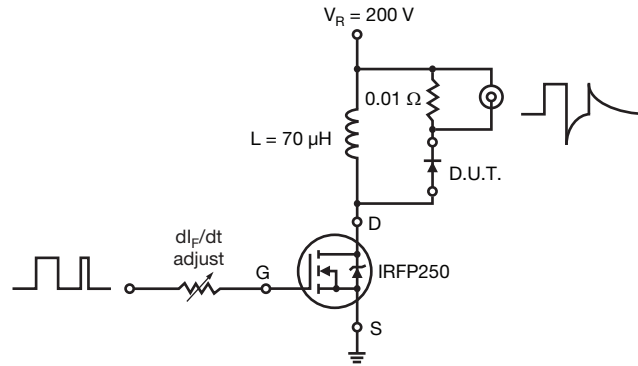


Fig. 8 - Reverse Recovery Parameter Test Circuit

**ORDERING INFORMATION TABLE**

Device code	<b>VS-VS</b>	<b>UD</b>	<b>400</b>	<b>C</b>	<b>W</b>	<b>60</b>
	①	②	③	④	⑤	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)

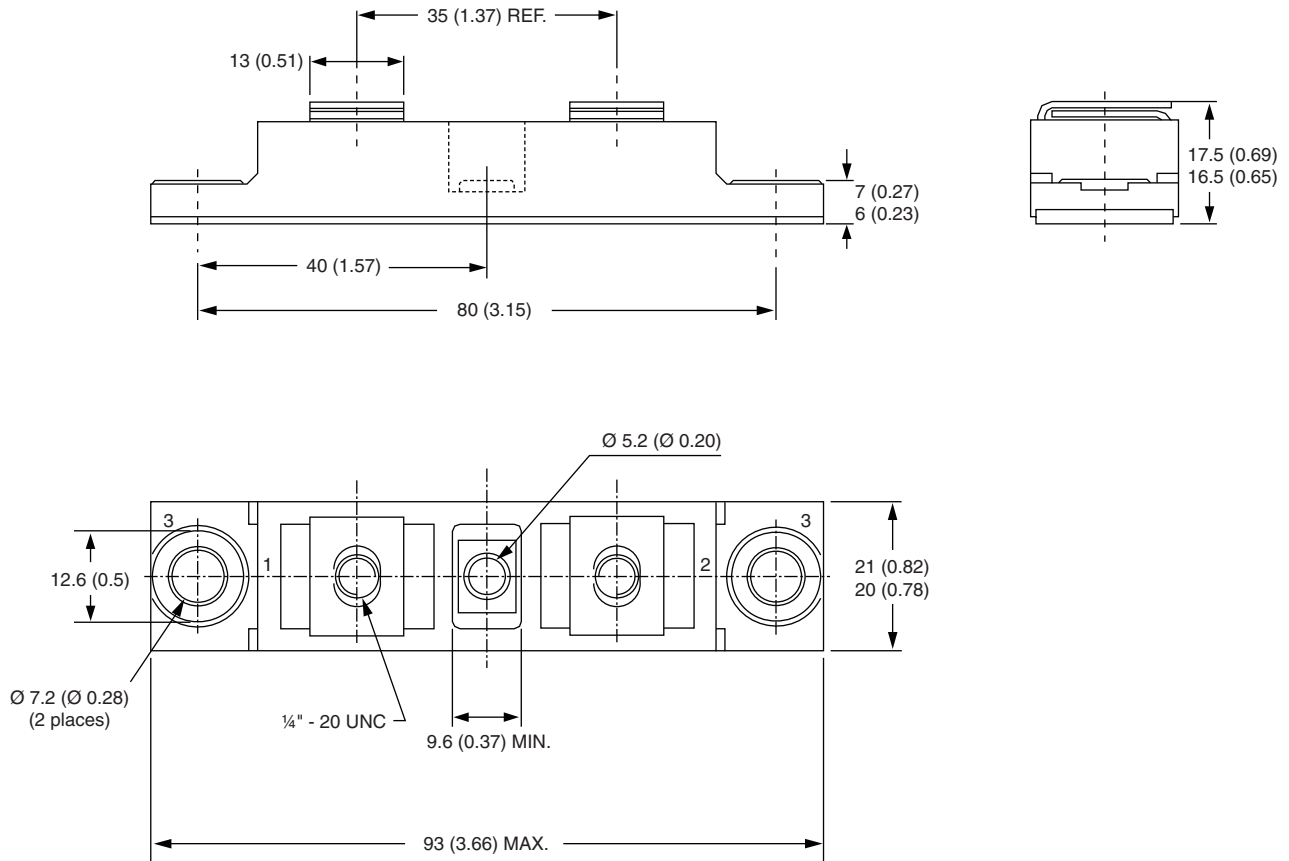
CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Two diodes common cathodes	C	

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)





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**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**

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