

# FRED Pt<sup>®</sup>

## Ultrafast Soft Recovery Diode Module, 360 A



TO-244 (TO-244AB)

**FEATURES**

- Very low  $Q_{rr}$  and  $t_{rr}$
- UL approved file E222165
- Designed and qualified 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

**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 a significant portion of the total losses.

PRODUCT SUMMARY	
$I_{F(AV)}$	360 A
$V_R$	400 V
$Q_{rr}$ (typical)	1250 nC
$t_{rr}$	40 ns
Type	Modules - Diode, FRED Pt <sup>®</sup>
Package	TO-244 (TO-244AB)

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	$V_R$		400	V
Continuous forward current per diode	$I_{F(AV)}$	$T_C = 25\text{ }^\circ\text{C}$	510	A
		$T_C = 85\text{ }^\circ\text{C}$	305	
		$T_C = 116\text{ }^\circ\text{C}$	180	
Single pulse forward current per diode	$I_{FSM}$	$T_C = 25\text{ }^\circ\text{C}$	2880	
Maximum power dissipation	$P_D$	$T_C = 25\text{ }^\circ\text{C}$	570	W
		$T_C = 110\text{ }^\circ\text{C}$	180	
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	$V_{BR}$	$I_R = 100\text{ }\mu\text{A}$	400	-	-	V
Forward voltage	$V_{FM}$	$I_F = 180\text{ A}$	-	1.09	1.27	
		$I_F = 360\text{ A}$	-	1.23	1.50	
		$I_F = 180\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	0.88	0.96	
		$I_F = 360\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	1.04	1.18	
Reverse leakage current	$I_{RM}$	$T_J = 150\text{ }^\circ\text{C}, V_R = V_R$ rated	-	0.26	1.28	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	$t_{rr}$	$I_F = 1.0\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	40	69	ns
		$T_J = 25\text{ }^\circ\text{C}$	-	74	-	
		$T_J = 150\text{ }^\circ\text{C}$	-	171	-	
Peak recovery current	$I_{RRM}$	$I_F = 1.0\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	5.1	-	A
		$I_F = 180\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$	-	6.6	-	
		$I_F = 180\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$	-	15.2	-	
Reverse recovery charge	$Q_{rr}$	$I_F = 1.0\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	125	-	nC
		$I_F = 180\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$	-	243	-	
		$I_F = 180\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$	-	1295	-	

<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 (flag greased surface)	$R_{thCS}$	-	0.10	-		
Weight		-	68	-	g	
		-	2.4	-	oz.	
Mounting torque		30 (3.4)	-	40 (4.6)	lbf · in (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)				

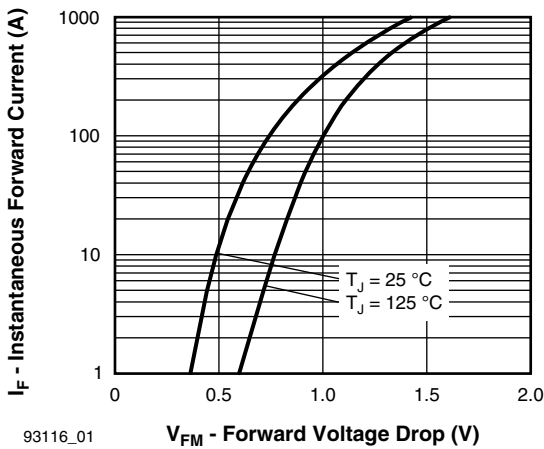


Fig. 1 - Typical Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

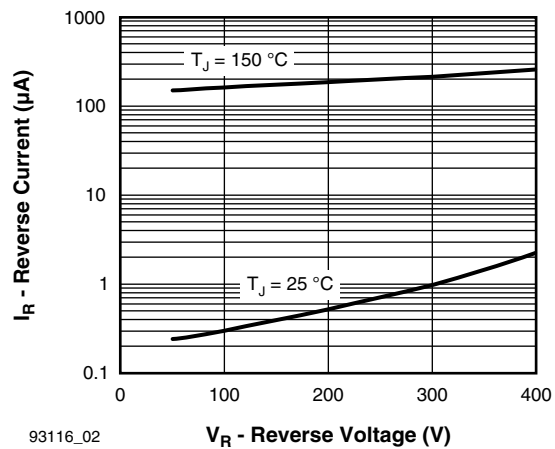
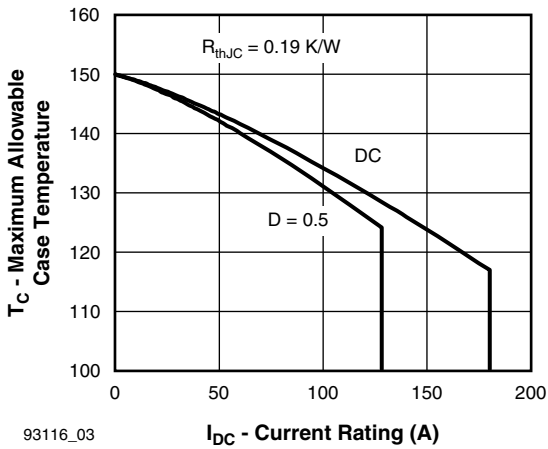
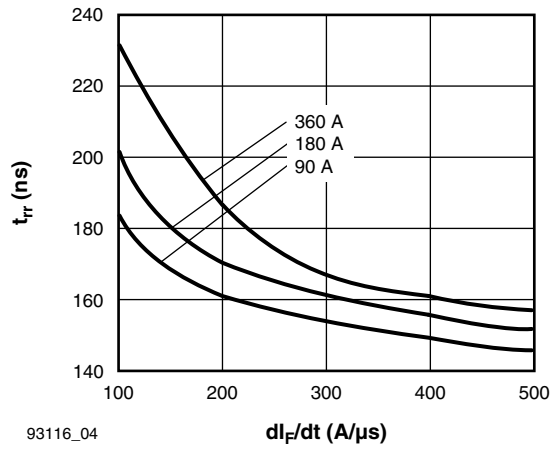


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)



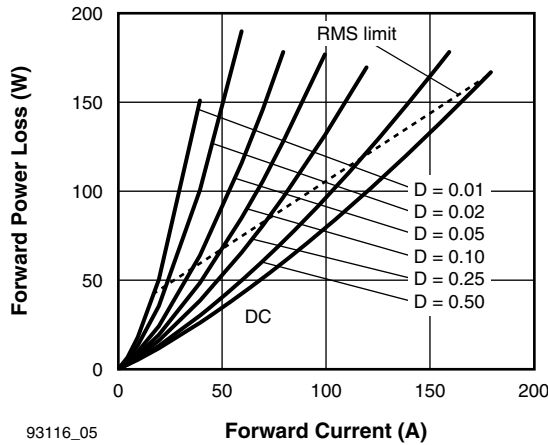
93116\_03

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



93116\_04

Fig. 4 - Typical Reverse Recovery Time vs.  $dI_F/dt$   
 $T_J = 125^\circ\text{C}$  (Per Leg)



93116\_05

Fig. 5 - Forward Power Loss Characteristics

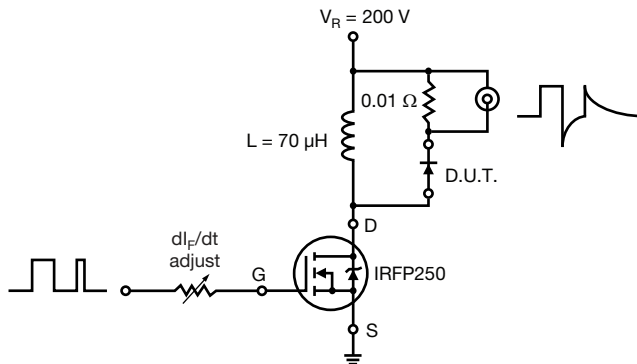
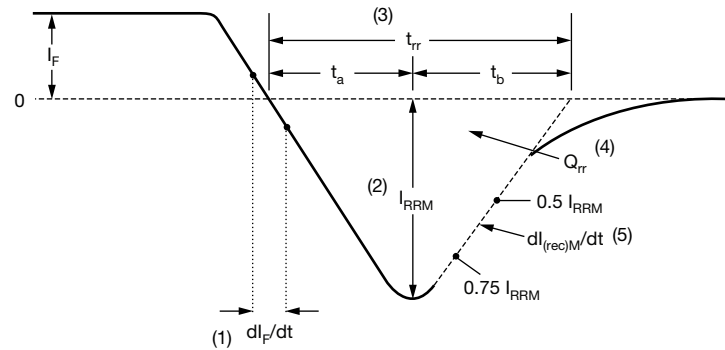


Fig. 6 - Reverse Recovery Parameter Test Circuit



- (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. 7 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

Device code	<b>VS-VS</b>	<b>UD</b>	<b>360</b>	<b>C</b>	<b>W</b>	<b>40</b>
	1	2	3	4	5	6

- 1** - Vishay Semiconductors product
- 2** - Type of device: UD = FRED Pt<sup>®</sup>
- 3** - Current rating (360 = 360 A)
- 4** - Circuit configuration:  
C = common cathode
- 5** - Type of device:  
W = TO-244 wire bondable not insulated
- 6** - Voltage rating (40 = 400 V)

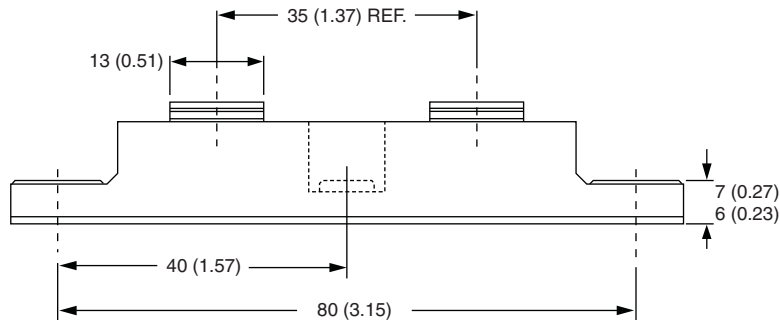
CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Two diodes common cathode	C	

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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