

# Ultrafast Soft Recovery Diode, 150 A FRED Pt<sup>®</sup>


 PowerTab<sup>®</sup>


## FEATURES

- Ultrafast recovery time
- 175 °C max. operating junction temperature
- Screw mounting only
- Designed and qualified according to JEDEC<sup>®</sup>-JESD 47
- PowerTab<sup>®</sup> package
- 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

These 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 not significant portion of the total losses.

### PRODUCT SUMMARY

Package	PowerTab <sup>®</sup>
$I_{F(AV)}$	150 A
$V_R$	400 V
$V_F$ at $I_F$	0.9 V
$t_{rr}$ (typ.)	See recovery table
$T_J$ max.	175 °C
Diode variation	Single die

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	$V_R$		400	V
Continuous forward current	$I_{F(AV)}$	$T_C = 104\text{ °C}$	150	A
Single pulse forward current	$I_{FSM}$	$T_C = 25\text{ °C}$	1500	
Maximum repetitive forward current	$I_{FRM}$	Square wave, 20 kHz	300	
Operating junction and storage temperatures	$T_J, T_{Stg}$		-55 to +175	°C

### ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 200\ \mu\text{A}$	400	-	-	V
Forward voltage	$V_F$	$I_F = 150\text{ A}$	-	1.07	1.3	
		$I_F = 150\text{ A}, T_J = 175\text{ °C}$	-	0.9	1.1	
		$I_F = 150\text{ A}, T_J = 125\text{ °C}$	-	0.96	1.17	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	50	$\mu\text{A}$
		$T_J = 150\text{ °C}, V_R = V_R$ rated	-	-	4	mA
Junction capacitance	$C_T$	$V_R = 400\text{ V}$	-	100	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	3.5	-	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	$t_{rr}$	$I_F = 1.0\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$		-	-	60	ns
		$T_J = 25\text{ }^\circ\text{C}$		-	93	-	
		$T_J = 125\text{ }^\circ\text{C}$		-	172	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 150\text{ A}$ $V_R = 200\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$	-	11	-	A
		$T_J = 125\text{ }^\circ\text{C}$		-	20	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$		-	490	-	nC
		$T_J = 125\text{ }^\circ\text{C}$		-	1740	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	$R_{thJC}$		-	-	0.35	K/W
Thermal resistance, junction to heatsink	$R_{thCS}$	Mounting surface, flat, smooth and greased	-	0.2	-	
Weight			-	-	5.02	g
			-	0.18	-	oz.
Mounting torque			1.2 (10)	-	2.4 (20)	N · m (lbf · in)
Marking device		Case style PowerTab®	150EBU04			

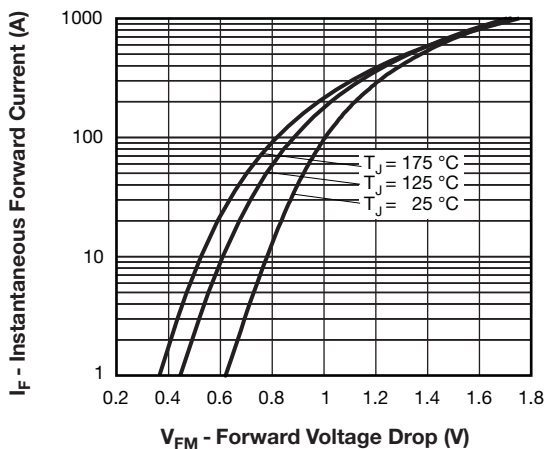


Fig. 1 - Maximum Forward Voltage Drop Characteristics

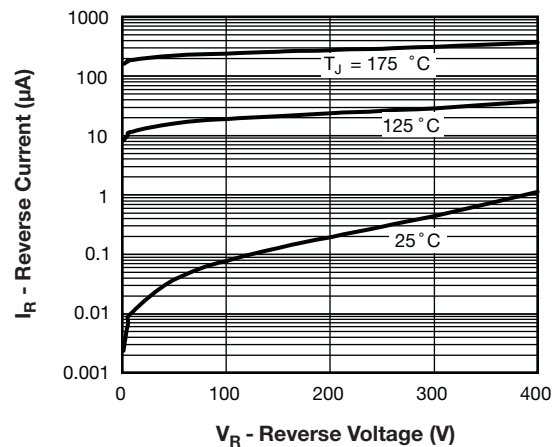


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

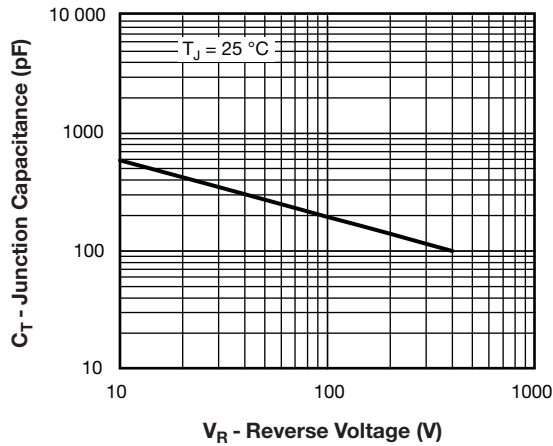


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

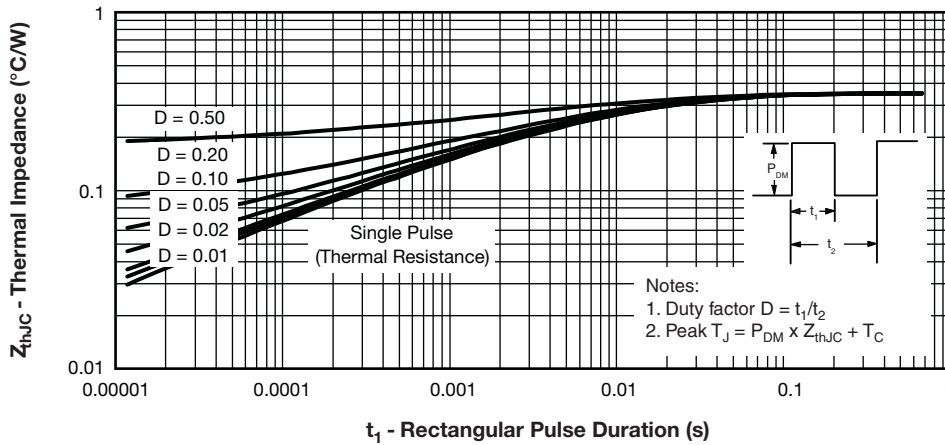


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

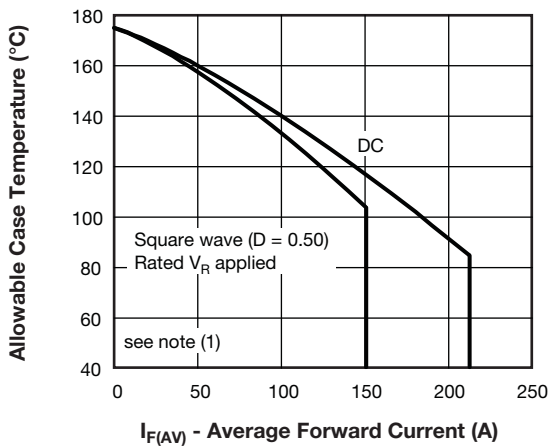


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

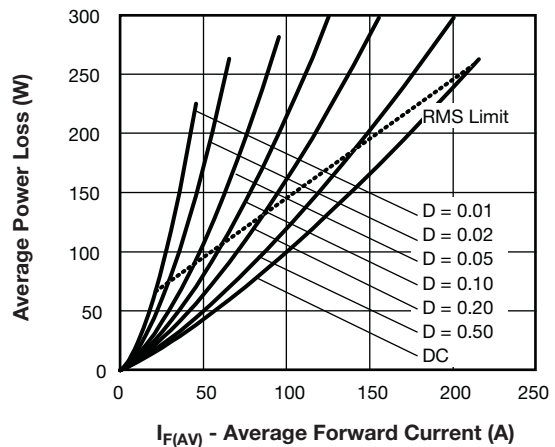


Fig. 6 - Forward Power Loss Characteristics

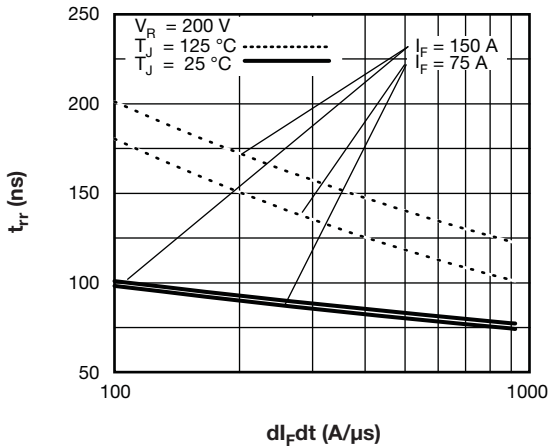


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

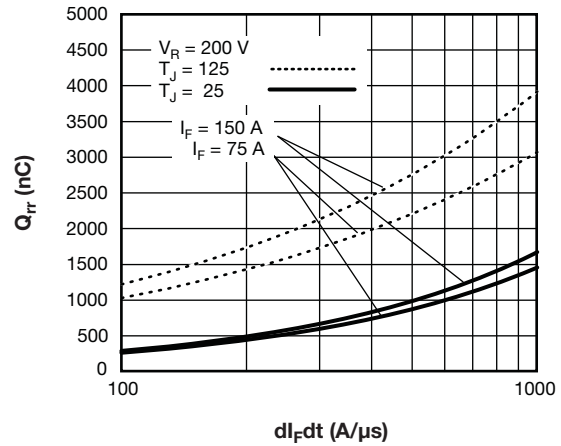


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;  
 $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{d_{REV}}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = Rated  $V_R$

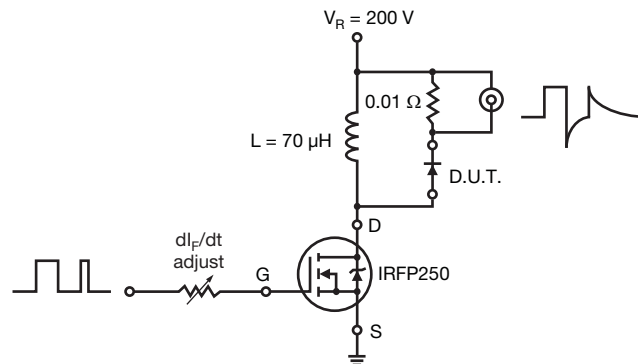
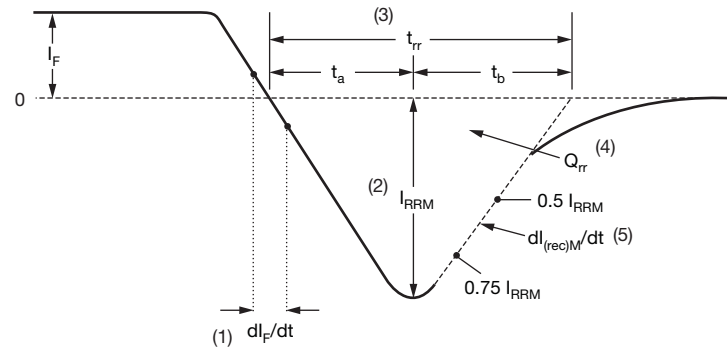


Fig. 9 - Reverse Recovery Parameter Test Circuit



(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. 10 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code	<b>VS-</b>	<b>150</b>	<b>E</b>	<b>B</b>	<b>U</b>	<b>04</b>
	①	②	③	④	⑤	⑥
	<b>1</b>	-	Vishay Semiconductors product			
	<b>2</b>	-	Current rating (150 = 150 A)			
	<b>3</b>	-	Single diode			
	<b>4</b>	-	PowerTab® (ultrafast / hyperfast only)			
	<b>5</b>	-	Ultrafast recovery			
	<b>6</b>	-	Voltage rating (04 = 400 V)			

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95240">www.vishay.com/doc?95240</a>
Part marking information	<a href="http://www.vishay.com/doc?95370">www.vishay.com/doc?95370</a>
Application note	<a href="http://www.vishay.com/doc?95179">www.vishay.com/doc?95179</a>
SPICE model	<a href="http://www.vishay.com/doc?95623">www.vishay.com/doc?95623</a>



## PowerTab®

**DIMENSIONS** in millimeters (inches)





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