

# HEXFRED® Ultrafast Soft Recovery Diode, 90 A



SOT-227

## FEATURES

- Fast recovery time characteristic
- Electrically isolated base plate
- Large creepage distance between terminal
- Simplified mechanical designs, rapid assembly
- Designed and qualified for industrial level
- UL approved file E78996 
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

PRIMARY CHARACTERISTICS	
$V_R$	1200 V
$V_F$ (typical)	2.46 V
$t_{rr}$ (typical)	35 ns
$I_{F(AV)}$ per module at $T_C$	90 A at 63 °C
Package	SOT-227

## DESCRIPTION / APPLICATIONS

The dual diode series configuration (VS-HFA90FA120) is used for output rectification or freewheeling/clamping operation and high voltage application.

The semiconductor in the SOT-227 Gen 2 package is isolated from the copper base plate, allowing for common heatsinks and compact assemblies to be built.

These modules are intended for general applications such as HV power supplies, electronic welders, motor control and inverters.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode breakdown voltage	$V_R$		1200	V
Continuous forward current, per leg	$I_F$	$T_C = 83\text{ °C}$	45	A
Single pulse forward current, per leg	$I_{FSM}$	$T_J = 25\text{ °C}$	400	
Maximum power dissipation, per leg	$P_D$	$T_C = 83\text{ °C}$	139	W
		$T_C = 100\text{ °C}$	104	
RMS isolation voltage	$V_{ISOL}$	Any terminal to case, $t = 1\text{ min}$	2500	V
Operating junction and storage temperature range	$T_J, T_{Stg}$		-55 to +150	°C

ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	$V_{BR}$	$I_R = 100\text{ }\mu\text{A}$	1200	-	-	V
Forward voltage	$V_{FM}$	$I_F = 25\text{ A}$	-	2.46	3.0	
		$I_F = 40\text{ A}$	-	2.68	3.3	
		$I_F = 25\text{ A}, T_J = 125\text{ °C}$	-	2.22	-	
		$I_F = 40\text{ A}, T_J = 125\text{ °C}$	-	2.52	-	
		$I_F = 25\text{ A}, T_J = 150\text{ °C}$	-	2.12	2.55	
		$I_F = 40\text{ A}, T_J = 150\text{ °C}$	-	2.43	2.96	
Reverse leakage current	$I_{RM}$	$V_R = V_R\text{ rated}$	-	1.5	75	$\mu\text{A}$
		$T_J = 125\text{ °C}, V_R = V_R\text{ rated}$	-	0.5	2	mA
		$T_J = 150\text{ °C}, V_R = V_R\text{ rated}$	-	2	5	
Junction capacitance	$C_T$	$V_R = 1200\text{ V}$	-	30	-	pF

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1.0\text{ A}$ , $dI_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	35	-	ns
		$T_J = 25\text{ }^{\circ}\text{C}$	-	80	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	130	-	
Peak recovery current	$I_{RRM}$	$I_F = 40\text{ A}$ $dI_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 200\text{ V}$	-	6.8	-	A
		$T_J = 25\text{ }^{\circ}\text{C}$	-	11.5	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	270	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	270	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	740	-	

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction to case, single leg conducting	$R_{thJC}$		-	-	0.48	$^{\circ}\text{C}/\text{W}$
Junction to case, both legs conducting			-	-	0.24	
Case to heatsink	$R_{thCS}$	Flat, greased surface	-	0.10	-	
Weight			-	30	-	g
Mounting torque		Torque to terminal	-	-	1.1 (9.7)	Nm (lbf.in)
		Torque to heatsink	-	-	1.8 (15.9)	Nm (lbf.in)
Case style			SOT-227			

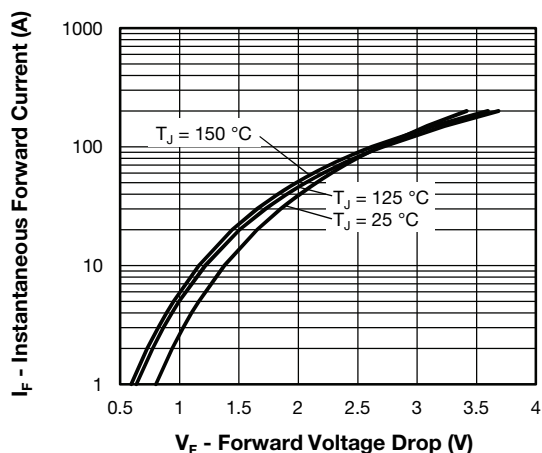


Fig. 1 - Typical Forward Voltage Drop Characteristics (Per Leg)

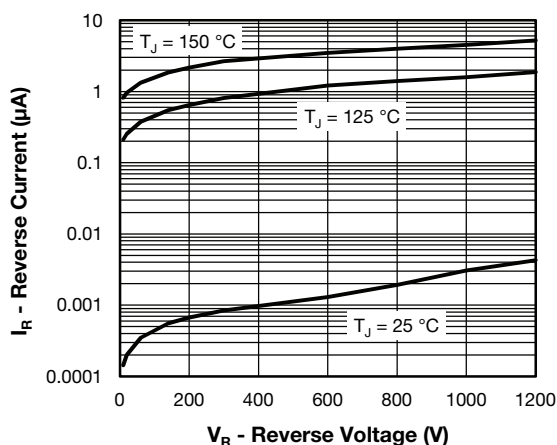


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

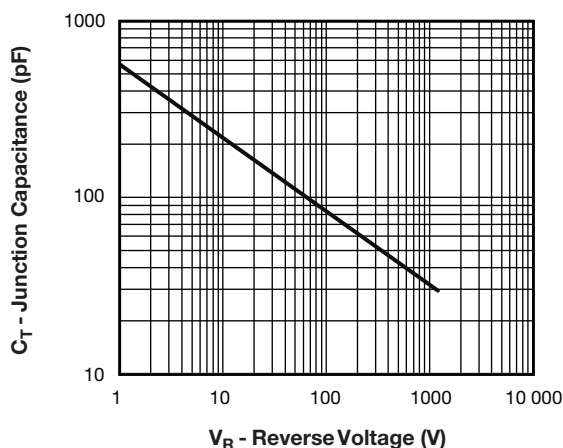


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

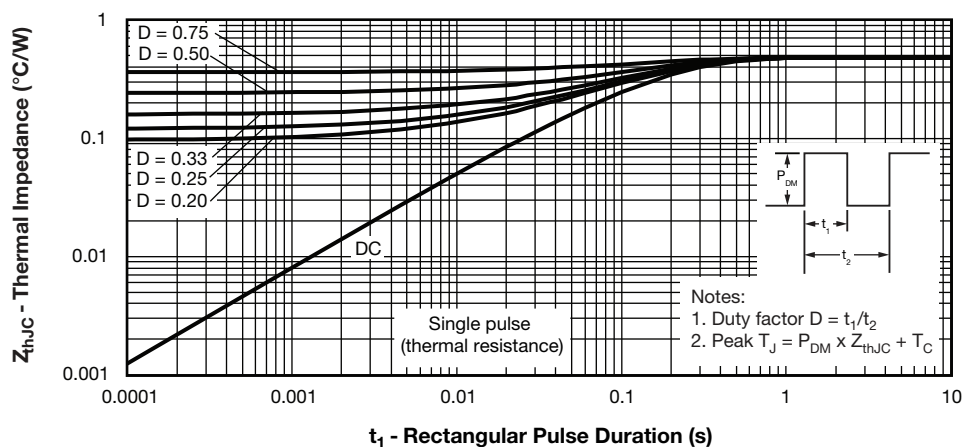
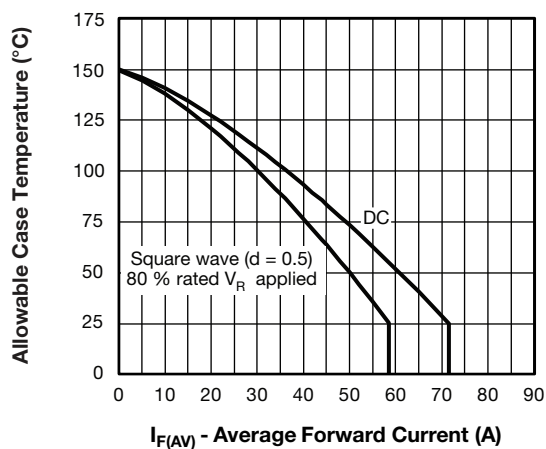

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

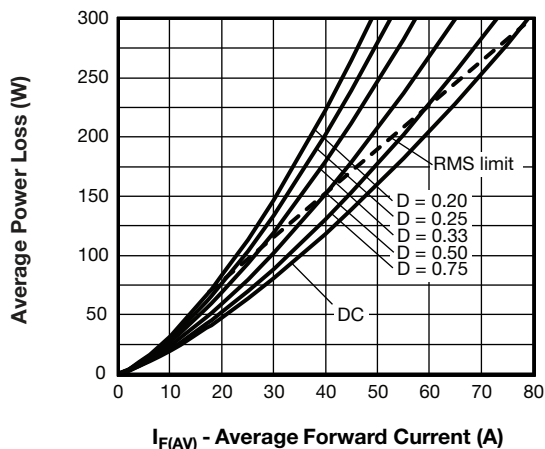


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

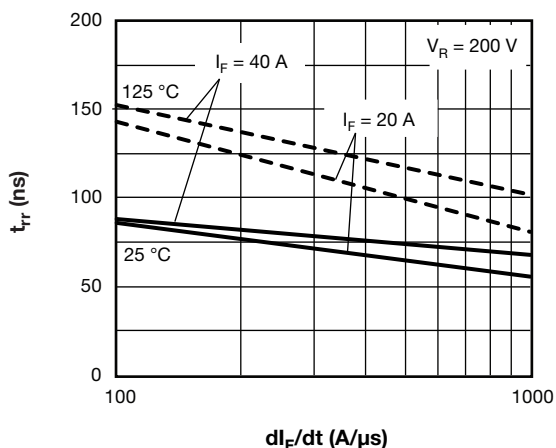
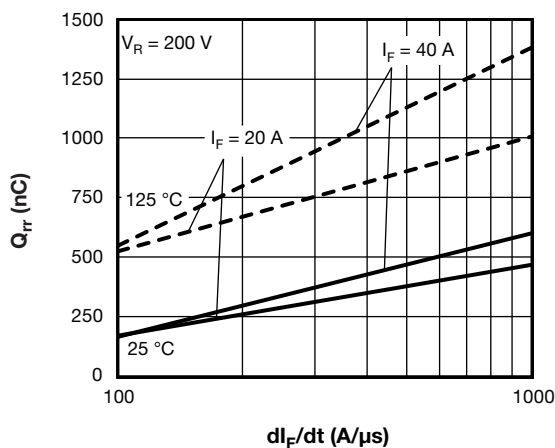
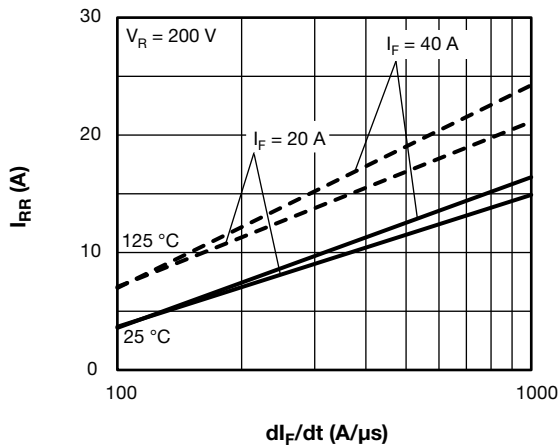
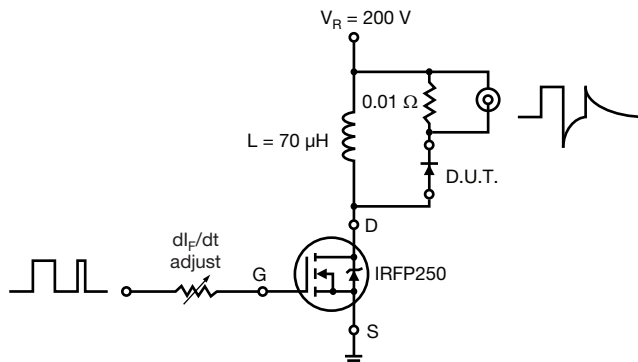
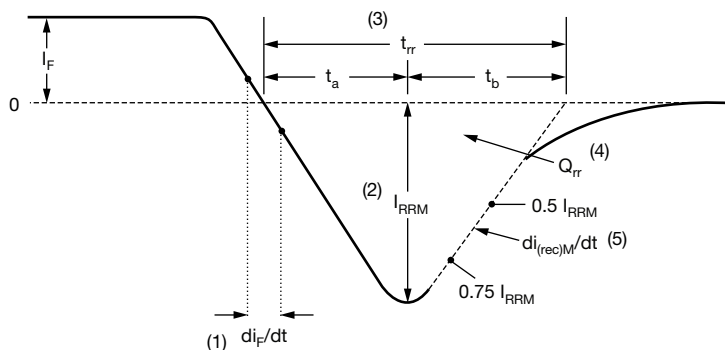

Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$ 

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

Fig. 9 - Typical Reverse Recovery Current vs.  $dI_F/dt$ 


Fig. 10 - 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  $I_{RRM}$
- (5)  $di_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

Fig. 11 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code	VS-	HF	A	90	F	A	120
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7

- 1 - Vishay Semiconductors product
- 2 - HEXFRED® family
- 3 - Process designator (A = electron irradiated)
- 4 - Average current (90 = 90 A)
- 5 - Circuit configuration (two separate diodes, parallel pin-out)
- 6 - Package indicator (SOT-227 standard insulated base)
- 7 - Voltage rating (120 = 1200 V)

CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
two separate diodes, parallel pin-out	F	<p>Lead Assignment</p>

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95423">www.vishay.com/doc?95423</a>
Packaging information	<a href="http://www.vishay.com/doc?95425">www.vishay.com/doc?95425</a>



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