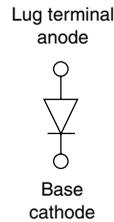


## HEXFRED®

### Ultrafast Soft Recovery Diode, 210 A


**HALF-PAK (D-67)**

**FEATURES**

- Very low  $Q_{rr}$  and  $t_{rr}$
- Lead (Pb)-free
- Designed and qualified for industrial level


**RoHS**  
COMPLIANT

**BENEFITS**

- Reduced RFI and EMI
- Reduced snubbing

**DESCRIPTION**

HEXFRED® diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems. An extensive characterization of the recovery behavior for different values of current, temperature and  $di/dt$  simplifies the calculations of losses in the operating conditions. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for power converters, motors drives and other applications where switching losses are significant portion of the total losses.

**PRODUCT SUMMARY**

$I_F$ (maximum)	210 A
$V_R$	400 V
$I_{F(DC)}$ at $T_C$	106 A at 100 °C

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	$V_R$		400	V
Continuous forward current	$I_F$	$T_C = 25\text{ °C}$	210	A
		$T_C = 100\text{ °C}$	106	
Single pulse forward current	$I_{FSM}$	Limited by junction temperature	600	
Non-repetitive avalanche energy	$E_{AS}$	$L = 100\text{ }\mu\text{H}$ , duty cycle limited by maximum $T_J$	1.4	mJ
Maximum power dissipation	$P_D$	$T_C = 25\text{ °C}$	329	W
		$T_C = 100\text{ °C}$	132	
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	$V_{BR}$	$I_R = 100\text{ }\mu\text{A}$	400	-	-	V	
Maximum forward voltage	$V_{FM}$	$I_F = 90\text{ A}$	-	1.06	1.45		
		$I_F = 180\text{ A}$	-	1.2	1.67		
		$I_F = 90\text{ A}, T_J = 125\text{ °C}$	-	0.96	1.23		
Maximum reverse leakage current	$I_{RM}$	$T_J = 125\text{ °C}, V_R = 400\text{ V}$	See fig. 2	-	0.6	2	mA
Junction capacitance	$C_T$	$V_R = 200\text{ V}$	See fig. 3	-	180	260	pF
Series inductance	$L_S$	From top of terminal hole to mounting plane	-	7.0	-	nH	

DYNAMIC RECOVERY CHARACTERISTICS ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time See fig. 5	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 90\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 200\text{ V}$	-	90	140	ns
		$T_J = 125\text{ }^\circ\text{C}$		-	158	240	
Peak recovery current See fig. 6	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$		-	9	17	A
		$T_J = 125\text{ }^\circ\text{C}$		-	15	30	
Reverse recovery charge See fig. 7	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$		-	420	1100	nC
		$T_J = 125\text{ }^\circ\text{C}$		-	1200	3200	
Peak rate of recovery current See fig. 8	$di_{(rec)M}/dt$	$T_J = 25\text{ }^\circ\text{C}$	-	370	-	A/ $\mu\text{s}$	
		$T_J = 125\text{ }^\circ\text{C}$	-	270	-		

THERMAL - MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		- 55 to 150	$^\circ\text{C}$
Maximum thermal resistance, junction to case	$R_{thJC}$	DC operation See fig. 4	0.38	$^\circ\text{C}/\text{W}$
Typical thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, flat, smooth and greased	0.05	
Approximate weight			30	g
			1.06	oz.
Mounting torque	minimum	Non-lubricated threads	3 (26.5)	N · m (lbf · in)
	maximum		4 (35.4)	
Terminal torque	minimum		3.4 (30)	
	maximum		5 (44.2)	
Case style		HALF-PAK module		



## HEXFRED® Ultrafast Soft Recovery Diode, 210 A

Vishay High Power Products

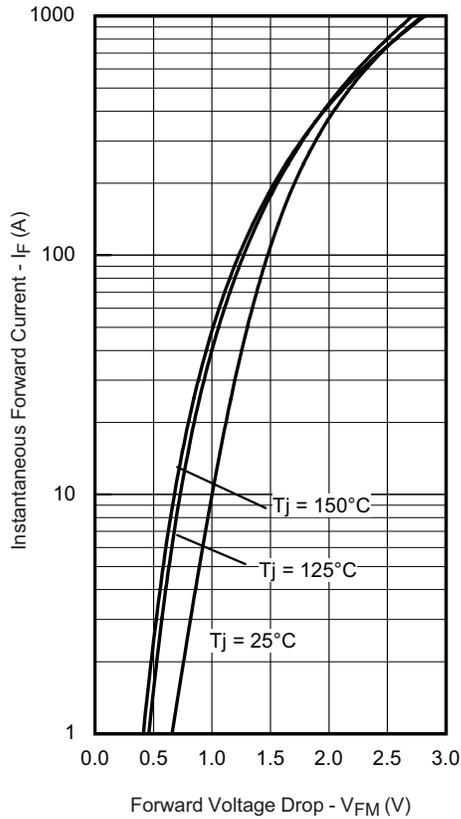


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

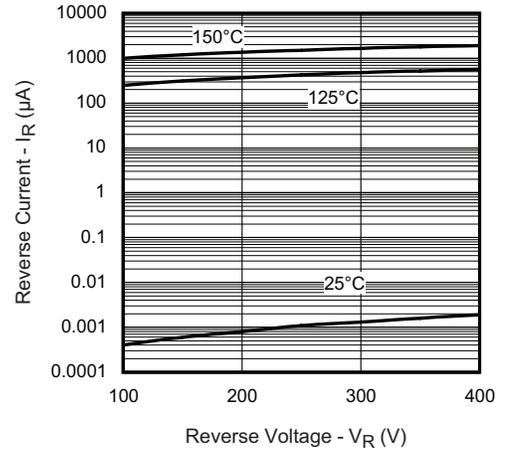


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

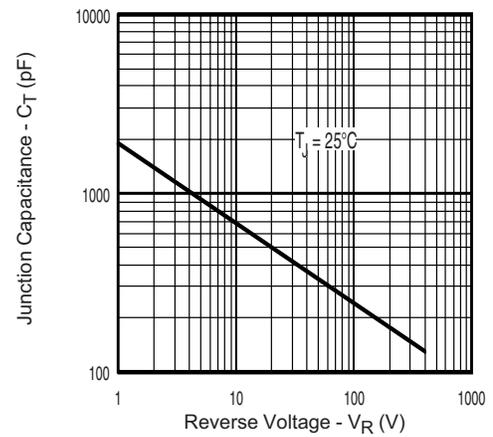


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

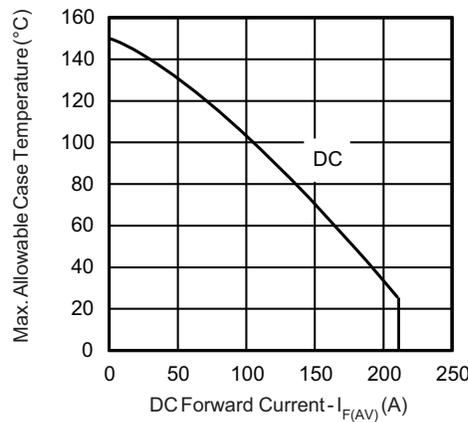


Fig. 4 - Maximum Allowable Case Temperature vs. DC Forward Current

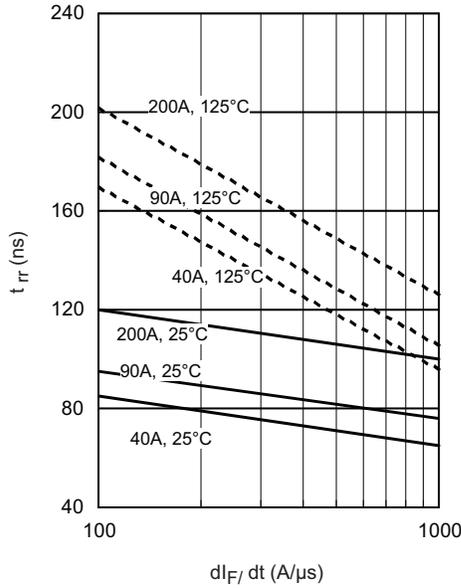


Fig. 5 - Typical Reverse Recovery Time vs.  $dI_F/dt$

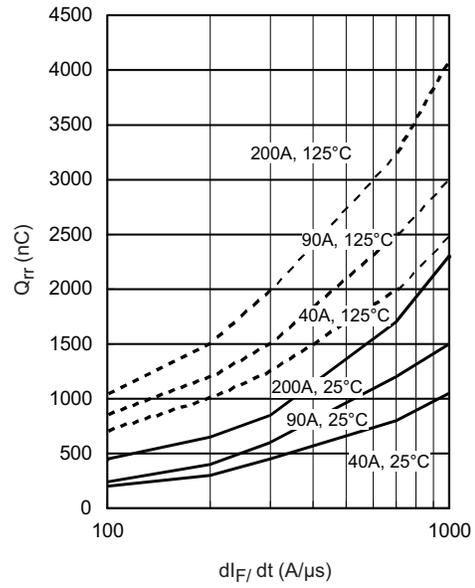


Fig. 7 - Typical Stored Charge vs.  $dI_F/dt$

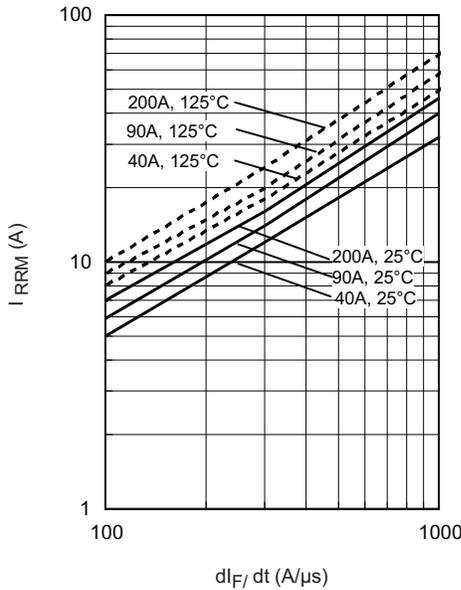


Fig. 6 - Typical Recovery Current vs.  $dI_F/dt$

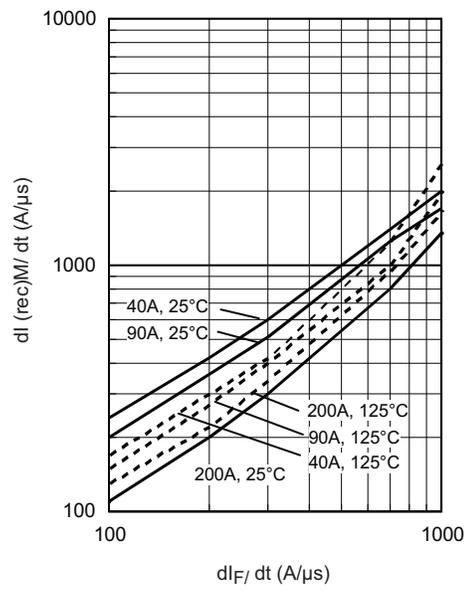


Fig. 8 - Typical  $dI_{(rec)M}/dt$  vs.  $dI_F/dt$

**HEXFRED®**  
**Ultrafast Soft Recovery Diode, 210 A**

Vishay High Power Products

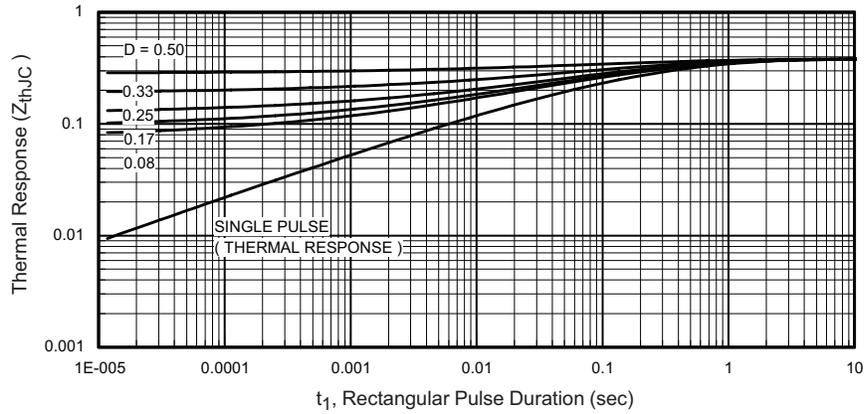
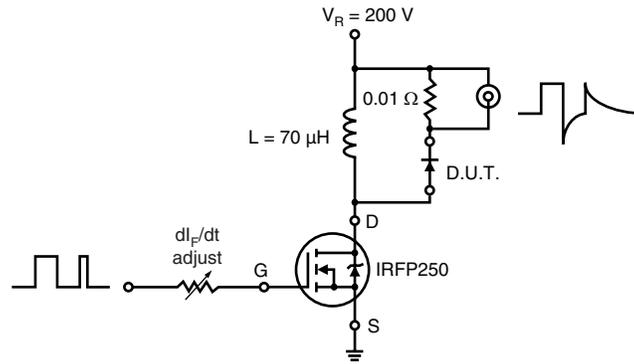
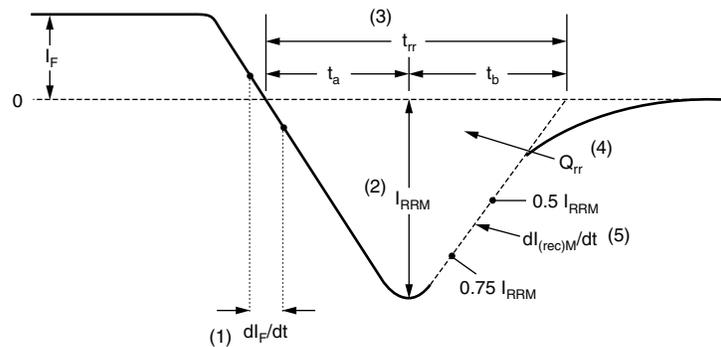

 Fig. 9 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)


Fig. 10 - Reverse Recovery Parameter Test Circuit


 (1)  $di_P/dt$  - 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)  $dl_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$ 

Fig. 11 - Reverse Recovery Waveform and Definitions

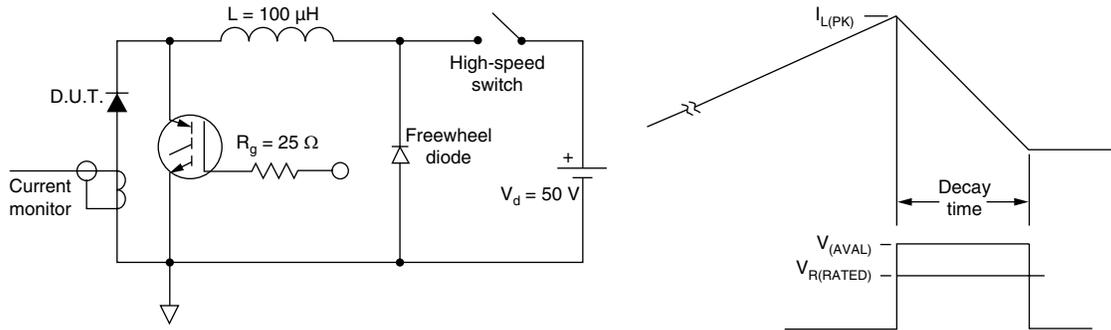


Fig. 12 - Avalanche Test Circuit and Waveforms

## ORDERING INFORMATION TABLE

Device code	<b>HFA</b>	<b>90</b>	<b>N</b>	<b>H</b>	<b>40</b>	<b>PbF</b>
	①	②	③	④	⑤	⑥
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	- HEXFRED® family	- Average current rating	- N = Not isolated	- H = HALF-PAK	- Voltage rating (400 V)	- Lead (Pb)-free

### LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?95020">http://www.vishay.com/doc?95020</a>
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