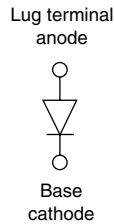


HEXFRED® Ultrafast Soft Recovery Diode, 210 A


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/ μs	
		$T_J = 125\text{ }^\circ\text{C}$	-	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		



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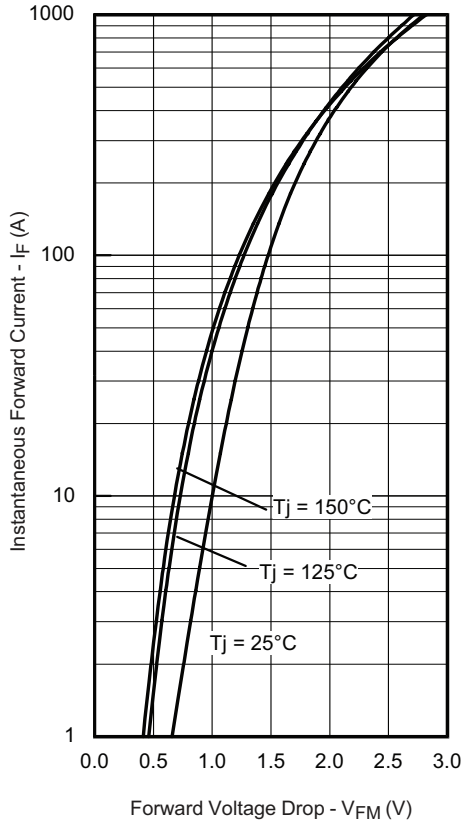


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

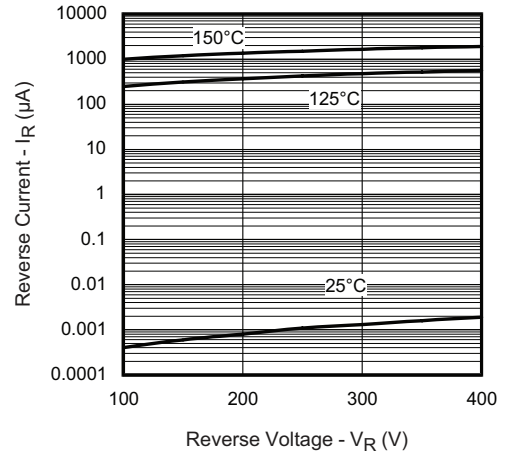


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

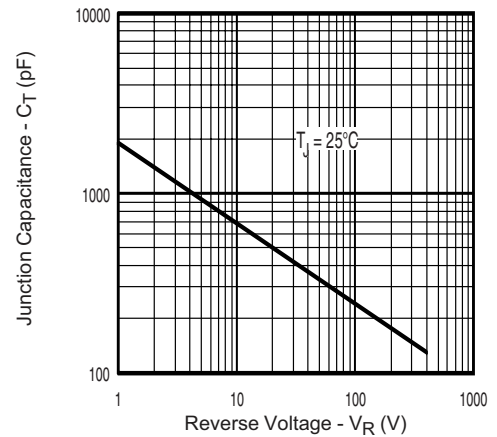


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

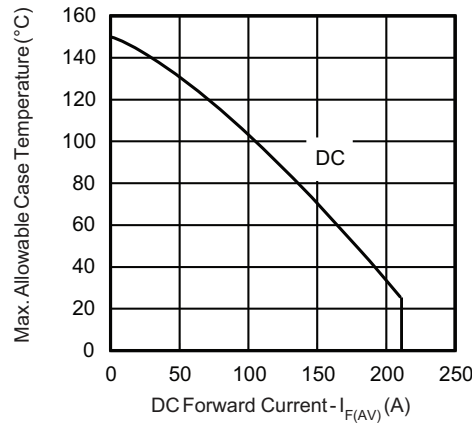


Fig. 4 - Maximum Allowable Case Temperature vs. DC Forward Current

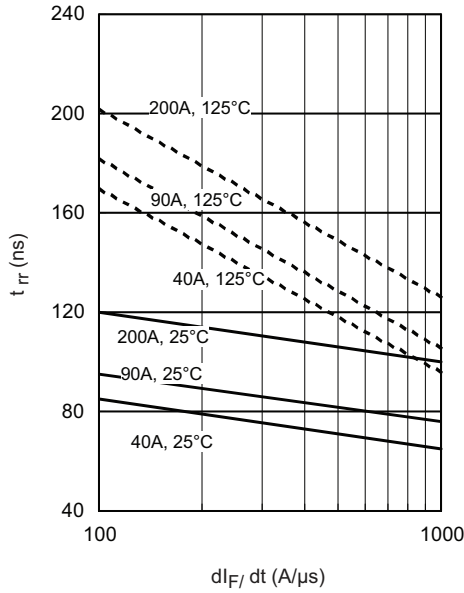


Fig. 5 - Typical Reverse Recovery Time vs. dI_F/dt

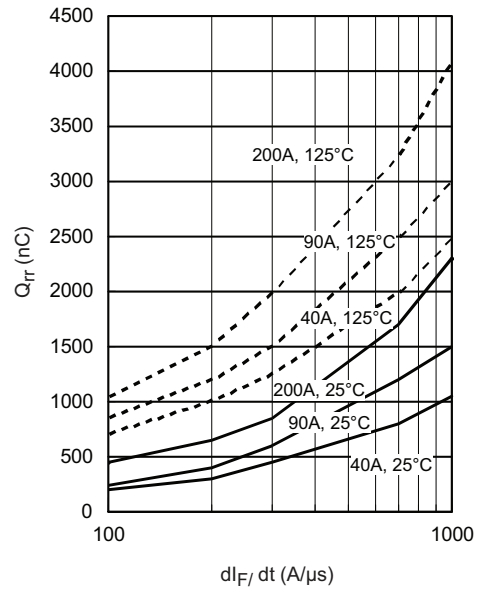


Fig. 7 - Typical Stored Charge vs. dI_F/dt

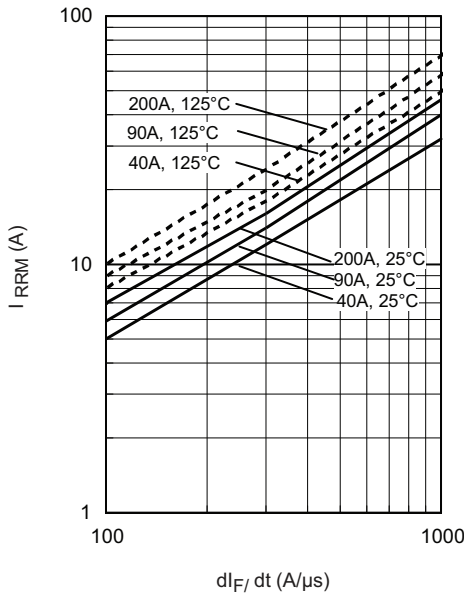


Fig. 6 - Typical Recovery Current vs. dI_F/dt

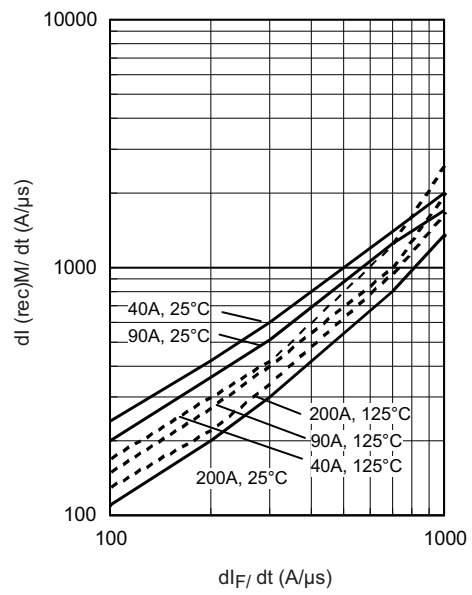


Fig. 8 - Typical $dI_{(rec)M}/dt$ vs. dI_F/dt

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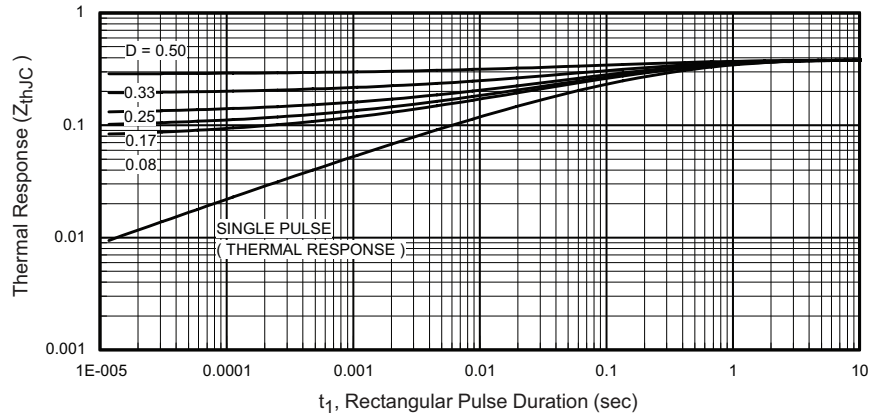
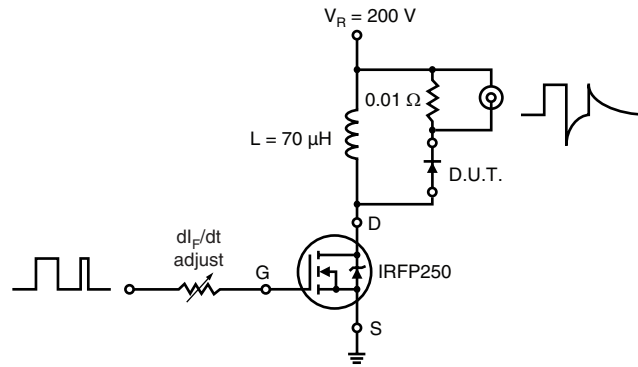
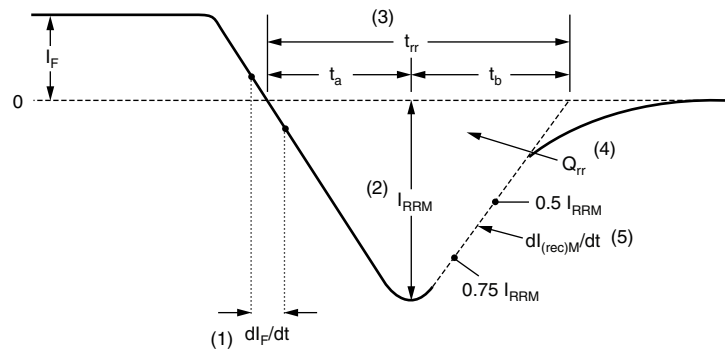

 Fig. 9 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)


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}
- (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

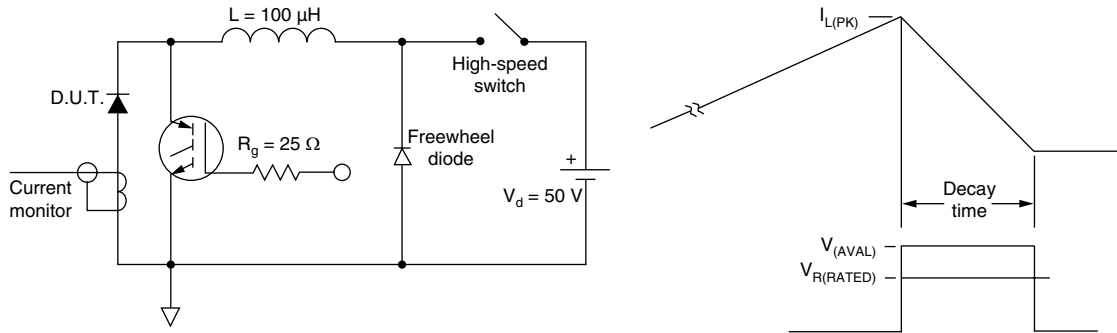


Fig. 12 - Avalanche Test Circuit and Waveforms

ORDERING INFORMATION TABLE

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

LINKS TO RELATED DOCUMENTS

Dimensions	http://www.vishay.com/doc?95020
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