PD -2.469 rev. B 02/99

International
IOR Rectifier

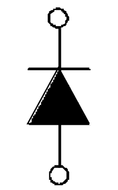
HFA90NH40R

HEXFRED™

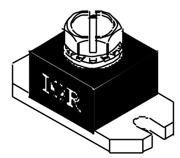
Ultrafast, Soft Recovery Diode

Features

- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters



V_R = 400V
V_F(typ.)③ = 1V
$I_{F(AV)}$ = 90A
Q_{rr} (typ.) = 420nC
I_{RRM}(typ.) = 9.3A
t_{rr}(typ.) = 36ns
$di_{(rec)M}/dt$ (typ.)③ = 260A/μs



HALF-PAK

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.

Absolute Maximum Ratings (per Leg)

	Parameter	Max.	Units
V_R	Cathode-to-Anode Voltage	400	V
I_F @ T_C = 25°C	Continuous Forward Current	148	A
I_F @ T_C = 100°C	Continuous Forward Current	72	
I_{FSM}	Single Pulse Forward Current ①	600	
E_{AS}	Non-Repetitive Avalanche Energy ②	1.4	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	260	W
P_D @ T_C = 100°C	Maximum Power Dissipation	104	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C

Thermal - Mechanical Characteristics

	Parameter	Min.	Typ.	Max.	Units
R_{thJC}	Junction-to-Case	——	——	0.48	°C/W K/W
R_{thCS}	Case-to-Sink, Flat, Greased Surface	——	0.15	——	
Wt	Weight	——	26 (0.9)	——	g (oz)
	Mounting Torque ④	15 (1.7)	——	25 (2.8)	lbf•in (N•m)
	Terminal Torque	30 (3.4)	——	40 (4.6)	
	Vertical Pull	——	——	80	lbf•in
	2 inch Lever Pull	——	——	40	

Note: ① Limited by junction temperature
② L = 100μH, duty cycle limited by max T_J
③ 125°C

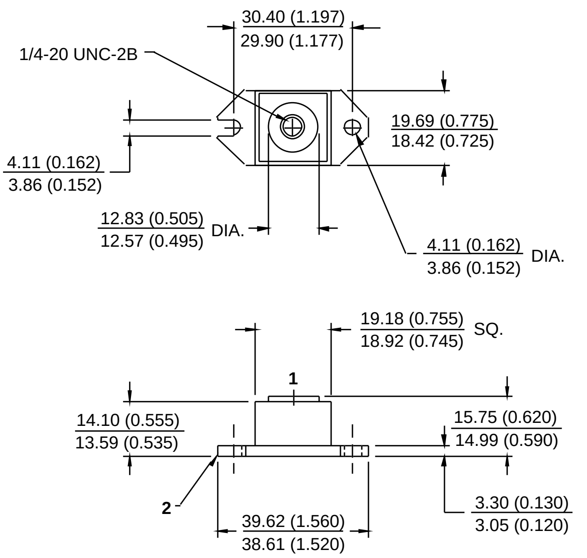
④ Mounting surface must be smooth, flat, free or burrs or other protrusions. Apply a thin even film or thermal grease to mounting surface. Gradually tighten each mounting bolt in 5-10 lbf•in steps until desired or maximum torque limits are reached. Module

Electrical Characteristics (per Leg) @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
V_{BR}	Cathode Anode Breakdown Voltage	400	——	——	V	I_R = 100µA
V_{FM}	Max Forward Voltage	——	1.1	1.3	V	I_F = 90A
	See Fig. 1	——	1.3	1.5		I_F = 180A
		——	1.0	1.2		I_F = 90A, T_J = 125°C
I_{RM}	Max Reverse Leakage Current	——	1.0	6.0	µA	V_R = V_R Rated
	See Fig. 2	——	1.5	8.0	mA	T_J = 125°C, V_R = 400V
C_T	Junction Capacitance See Fig. 3	——	180	260	pF	V_R = 200V
L_S	Series Inductance	——	7.0	——	nH	From top of terminal hole to mounting plane

Dynamic Recovery Characteristics (per Leg) @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions	
t_{rr}	Reverse Recovery Time	——	36	——	ns	I_F = 1.0A, di_f /dt = 200A/µs, V_R = 30V	
t_{rr1}	See Fig. 5	——	90	140		T_J = 25°C	I_F = 90A
t_{rr2}		——	160	240		T_J = 125°C	
I_{RRM1}	Peak Recovery Current	——	9.3	17	A	T_J = 25°C	
I_{RRM2}	See Fig. 6	——	15	30		T_J = 125°C	V_R = 200V
Q_{rr1}	Reverse Recovery Charge	——	420	1100	nC	T_J = 25°C	
Q_{rr2}	See Fig. 7	——	1200	3200		T_J = 125°C	di_f /dt = 200A/µs
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current	——	360	——	A/µs	T_J = 25°C	
$di_{(rec)M}/dt2$	During t_b See Fig. 8	——	260	——		T_J = 125°C	



LEAD ASSIGNMENTS
1 - CATHODE
2 - ANODE

HALF-PAK
Dimensions in millimeters and inches

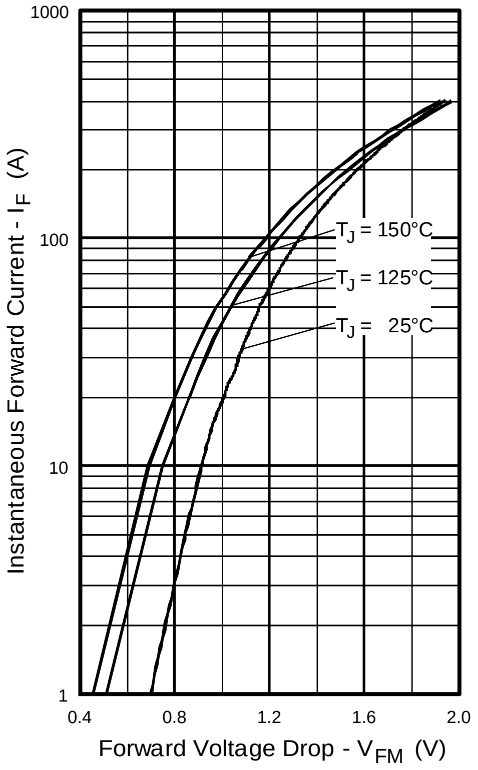


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

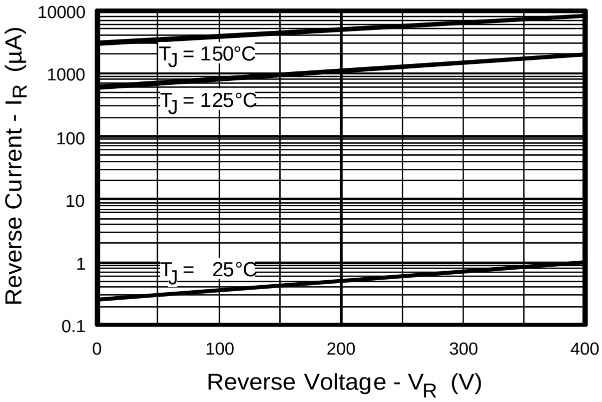


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

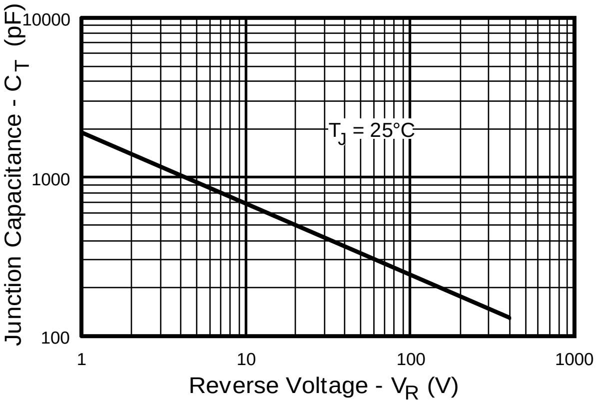


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

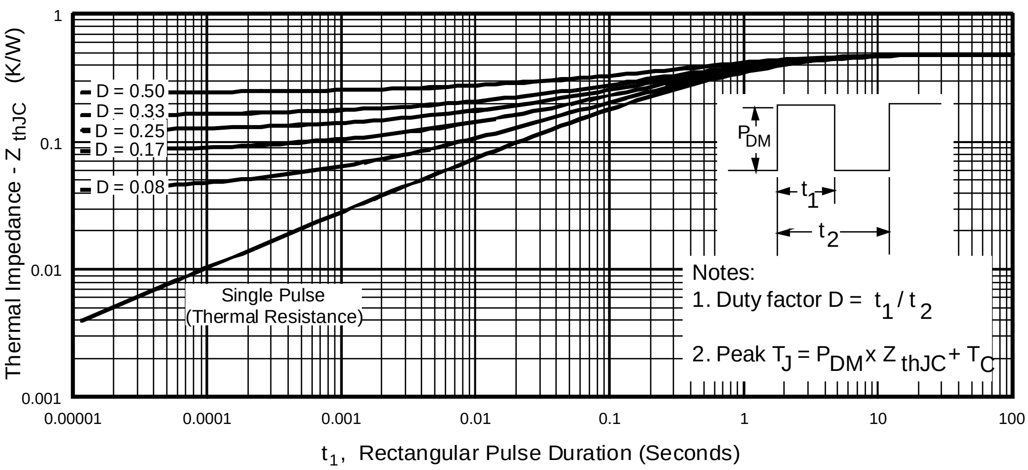


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

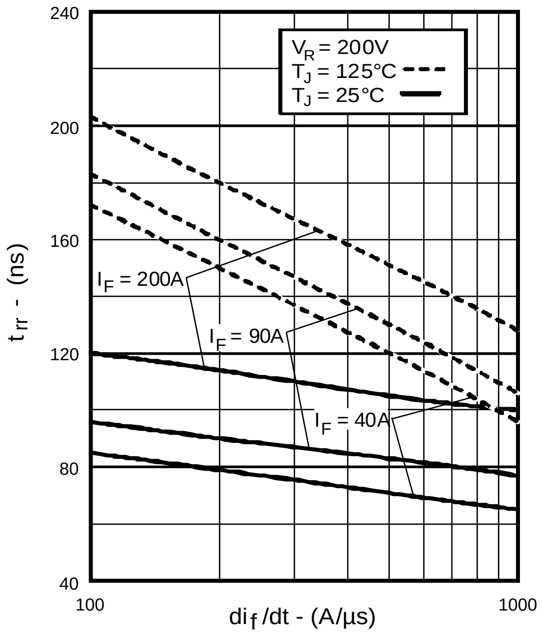


Fig. 5 - Typical Reverse Recovery vs. di_f/dt

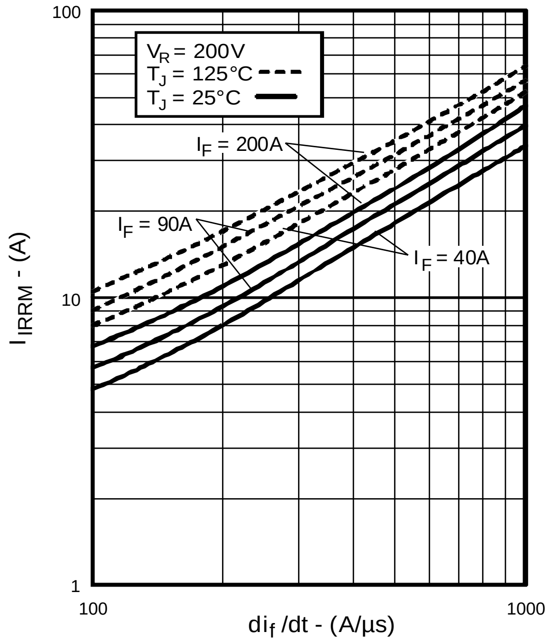


Fig. 6 - Typical Recovery Current vs. di_f/dt

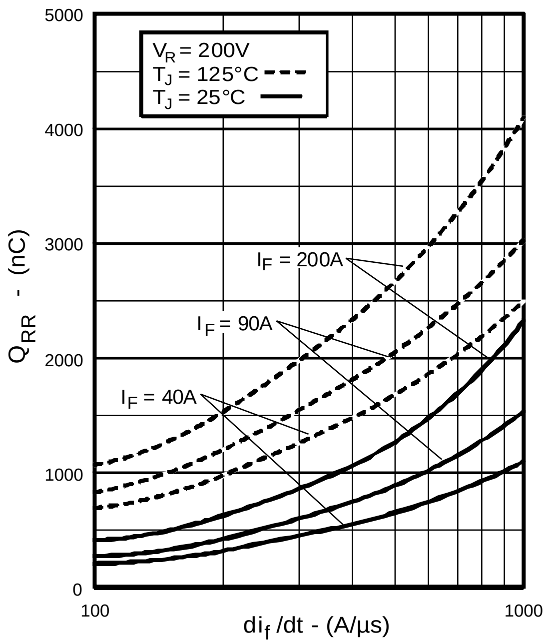


Fig. 7 - Typical Stored Charge vs. di_f/dt

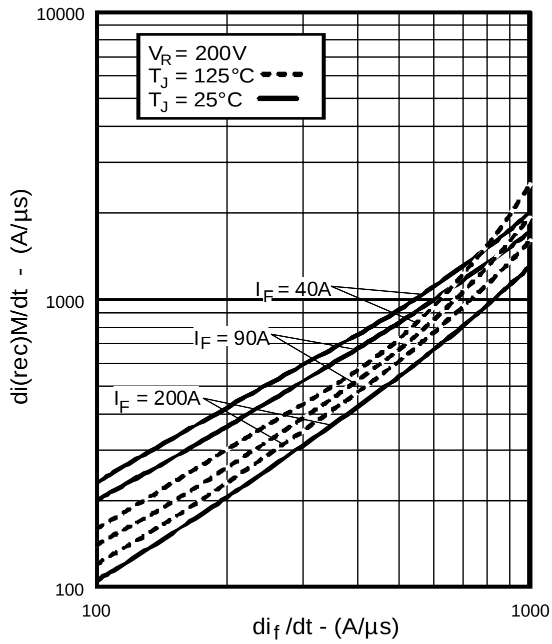


Fig. 8 - Typical $di_{(rec)M}$/dt vs. di_f/dt

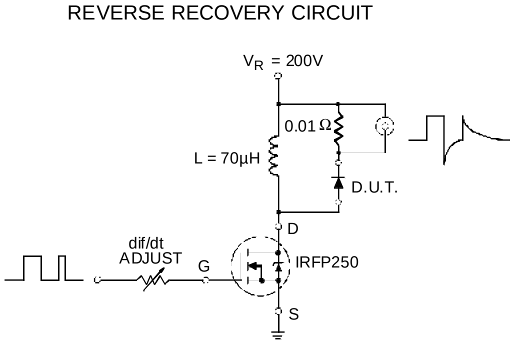
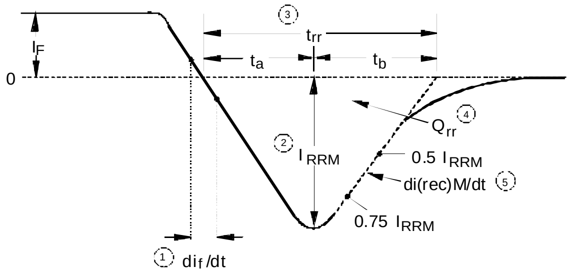


Fig. 9 - Reverse Recovery Parameter Test Circuit

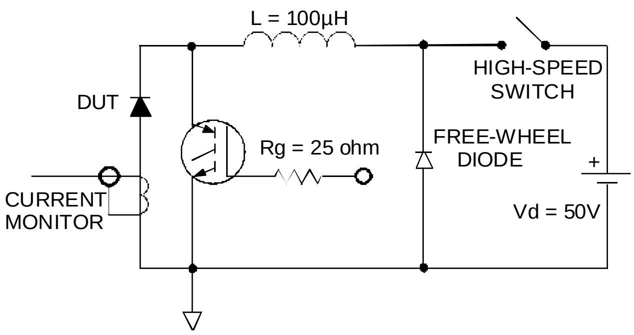


1. di_f/dt - Rate of change of current through zero crossing
2. I_{RRM} - Peak reverse recovery current
3. trr - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current
4. Q_{rr} - Area 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



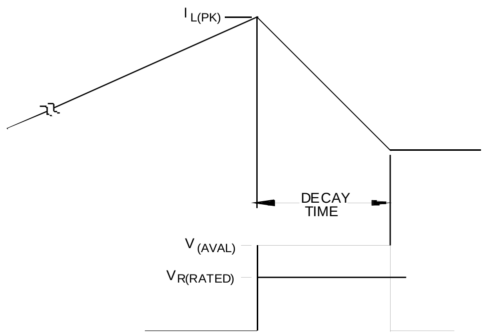


Fig. 11 - Avalanche Test Circuit and Waveforms

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