International
IOR Rectifier

PD -2.448 rev. B 02/99

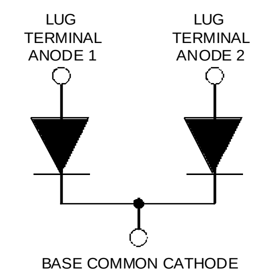
HFA210NJ60C

HEXFRED™

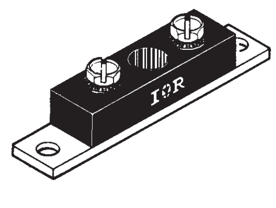
Ultrafast, Soft Recovery Diode

Features

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



V_R = 600V
V_F(typ.)③ = 1.2V
$I_{F(AV)}$ = 210A
Q_{rr} (typ.) = 450nC
I_{RRM}(typ.) = 10A
t_{rr}(typ.) = 35ns
$di_{(rec)M}/dt$ (typ.)③ = 240A/µs



TO-244AB

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	600	V
I_F @ T_C = 25°C	Continuous Forward Current	171	A
I_F @ T_C = 100°C	Continuous Forward Current	85	
I_{FSM}	Single Pulse Forward Current ①	600	
E_{AS}	Non-Repetitive Avalanche Energy ②	220	µJ
P_D @ T_C = 25°C	Maximum Power Dissipation	463	W
P_D @ T_C = 100°C	Maximum Power Dissipation	185	
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, Single Leg Conducting	——	——	0.27	°C/W K/W
	Junction-to-Case, Both Legs Conducting	——	——	0.135	
R_{thCS}	Case-to-Sink, Flat, Greased Surface	——	0.10	——	
Wt	Weight	——	79 (2.8)	——	g (oz)
	Mounting Torque ④	30 (3.4)	——	40 (4.6)	lbf•in (N•m)
	Mounting Torque Center Hole	12 (1.4)	——	18 (2.1)	
	Terminal Torque	30 (3.4)	——	40 (4.6)	
	Vertical Pull	——	——	80	lbf•in
	2 inch Lever Pull	——	——	35	

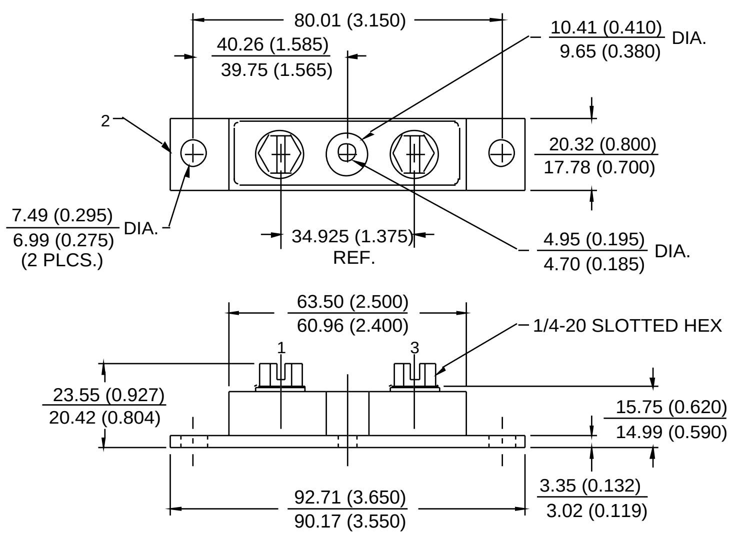
Note: ① Limited by junction temperature
② L = 100µH, duty cycle limited by max T_J
③ 125°C
④ Mounting surface must be smooth, flat, free or burrs or other protrusions. Apply a thin even film or thermal grease to mounting surface. Gradually tighten each mounting bolt in 5-10 lbf•in steps until desired 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	600	—	—	V	I_R = 100µA	
V_{FM}	Max Forward Voltage	—	1.3	1.5	V	I_F = 105A	See Fig. 1
		—	1.5	1.7		I_F = 210A	
		—	1.2	1.4		I_F = 105A, T_J = 125°C	
I_{RM}	Max Reverse Leakage Current	—	6.0	30	µA	V_R = V_R Rated	See Fig. 2
		—	1.5	6.0	mA	T_J = 125°C, V_R = 480V	
C_T	Junction Capacitance	—	200	300	pF	V_R = 200V	See Fig. 3
L_S	Series Inductance	—	6.0	—	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	—	35	—	ns	I_F = 1.0A, di_f/dt = 200A/µs, V_R = 30V	
t_{rr1}		—	90	140		T_J = 25°C	I_F = 105A
t_{rr2}		—	160	240		T_J = 125°C	
I_{RRM1}	Peak Recovery Current	—	10	18	A	T_J = 25°C	V_R = 200V
I_{RRM2}		—	15	30		T_J = 125°C	
Q_{rr1}	Reverse Recovery Charge	—	450	1300	nC	T_J = 25°C	di_f/dt = 200A/µs
Q_{rr2}		—	1200	3600		T_J = 125°C	
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current	—	310	—	A/µs	T_J = 25°C	
$di_{(rec)M}/dt2$	During t_b	—	240	—		T_J = 125°C	



LEAD ASSIGNMENTS
1 - ANODE
2 - CATHODE
3 - ANODE

CONFORMS TO JEDEC OUTLINE TO-244AB

Dimensions in Millimeters and (Inches)

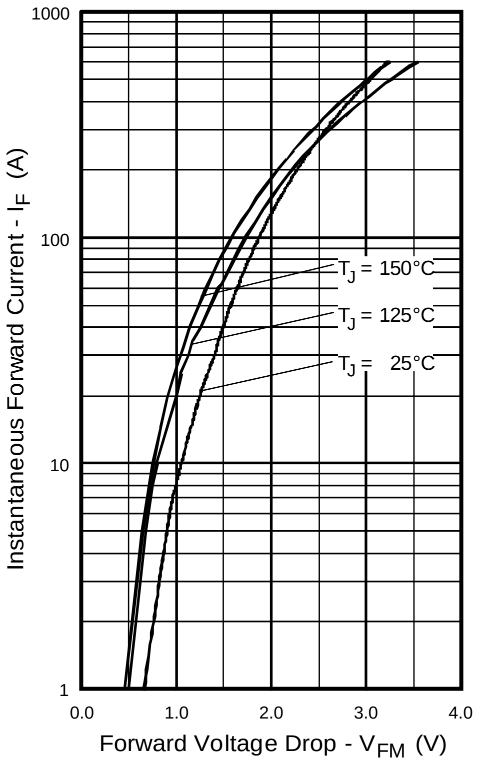


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current, (per Leg)

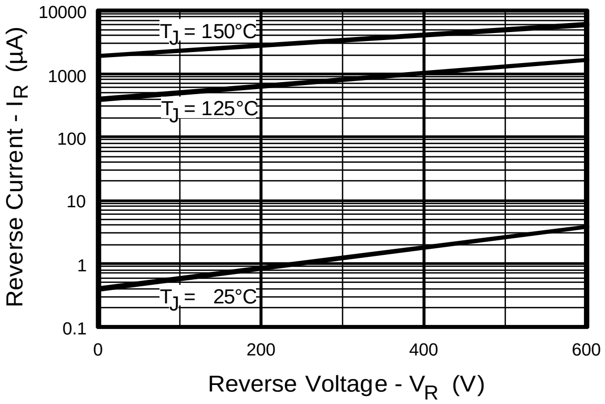


Fig. 2 - Typical Reverse Current vs. Reverse Voltage, (per Leg)

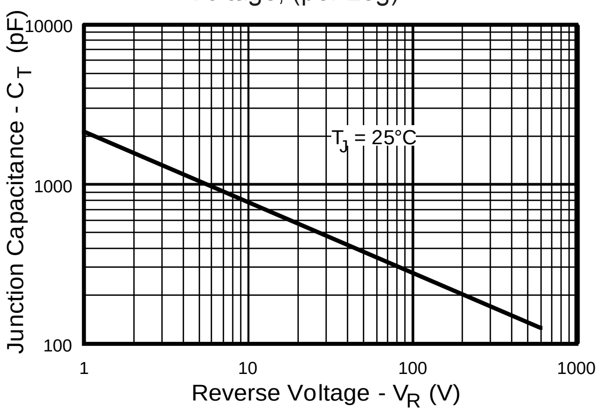


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)

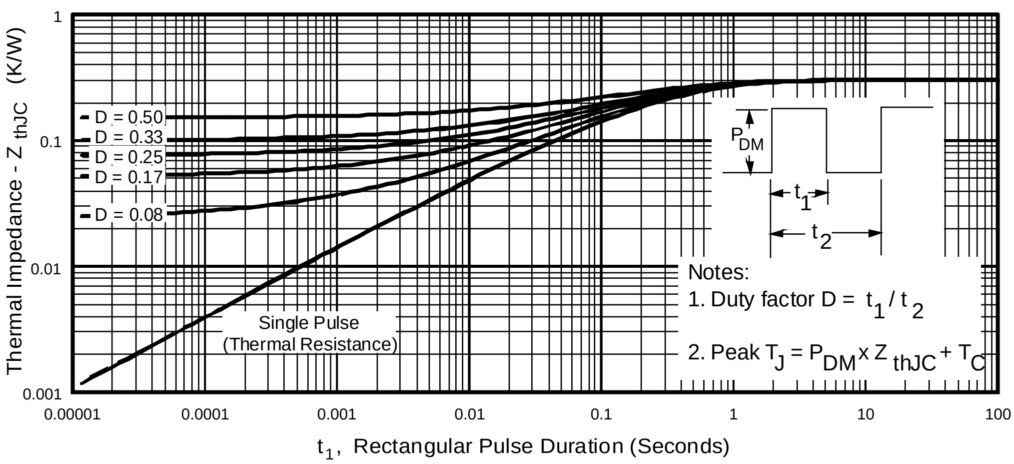


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics, (per Leg)

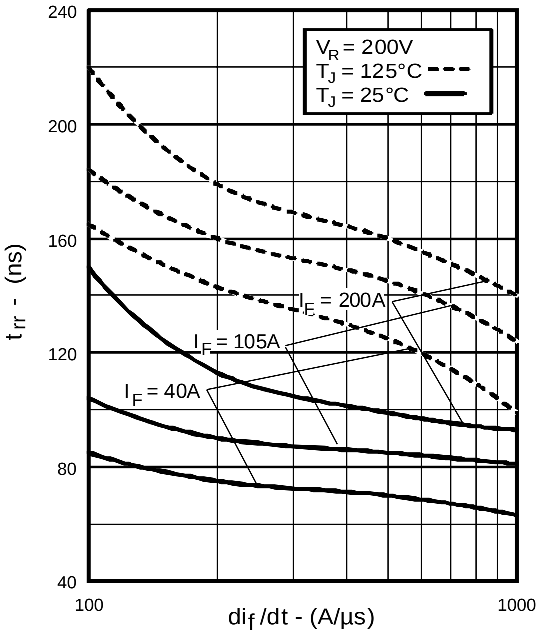


Fig. 5 - Typical Reverse Recovery vs. dif/dt, (per Leg)

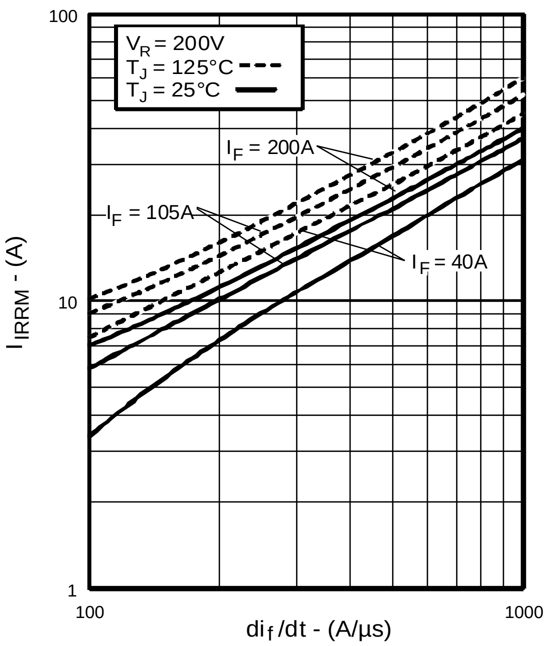


Fig. 6 - Typical Recovery Current vs. dif/dt, (per Leg)

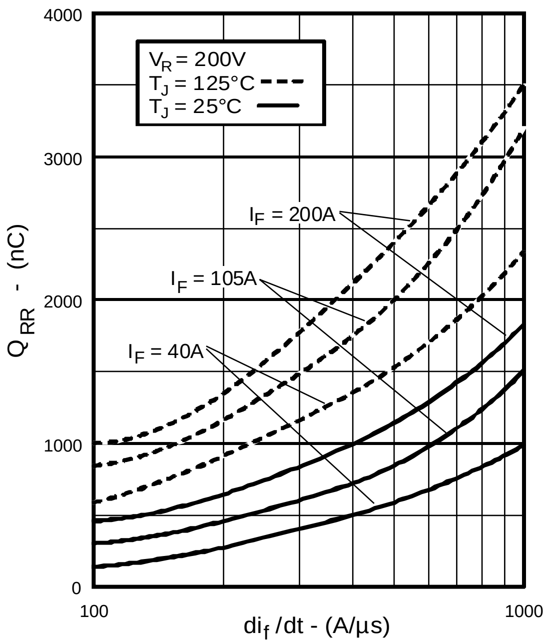


Fig. 7 - Typical Stored Charge vs. dif/dt, (per Leg)

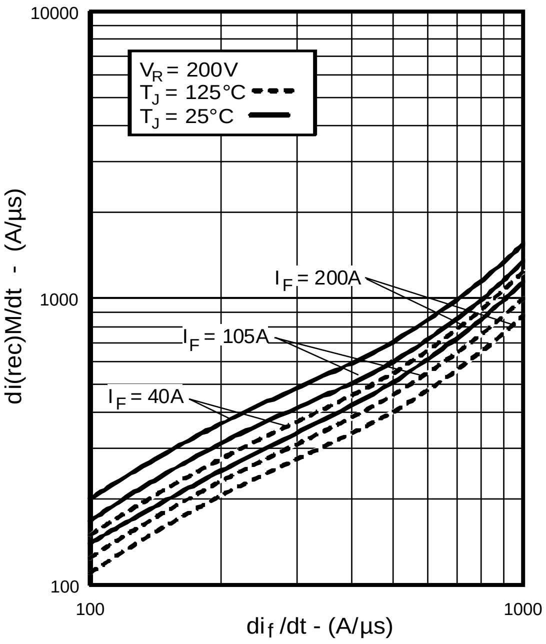


Fig. 8 - Typical $di_{(rec)M}/dt$ vs. dif/dt, (per Leg)

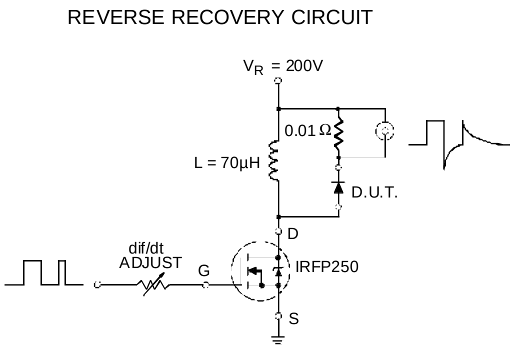
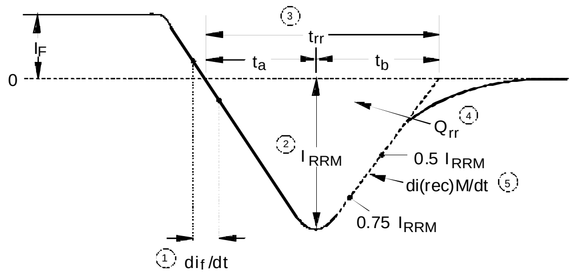


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

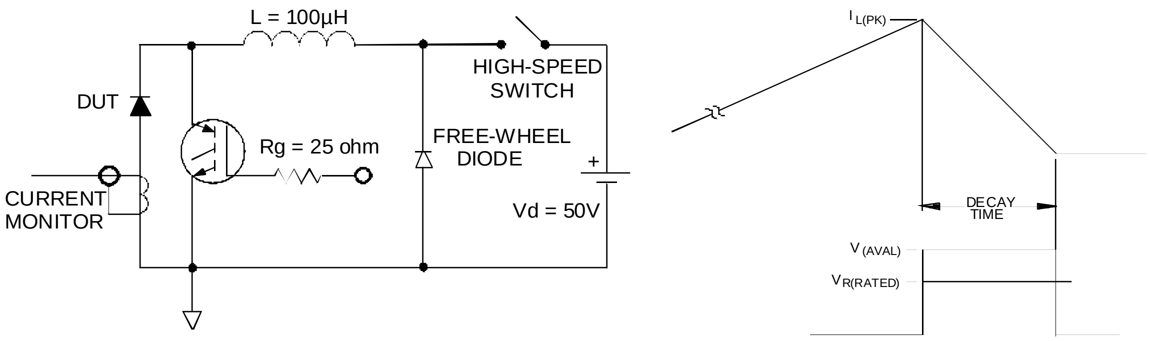


Fig. 11 - Avalanche Test Circuit and Waveforms

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