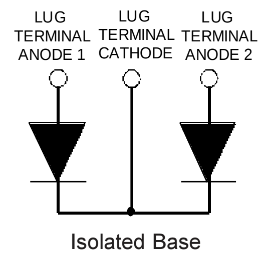
International
IOR Rectifier

HFA200MD40C

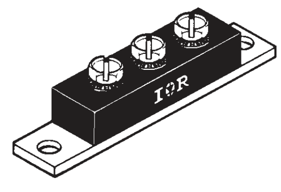
HEXFRED™ Ultrafast, Soft Recovery Diode

Features

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



V_R = 400V
V_F(typ.)③ = 0.9V
$I_{F(AV)}$ = 200A
Q_{rr} (typ.) = 330nC
I_{RRM}(typ.) = 8.1A
t_{rr}(typ.) = 45ns
$di_{(rec)M}/dt$ (typ.)③ = 270A/µs



TO-244AB (ISOLATED)

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	172	A
I_F @ T_C = 100°C	Continuous Forward Current	83	
I_{FSM}	Single Pulse Forward Current ①	1200	
E_{AS}	Non-Repetitive Avalanche Energy ②	1.4	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	278	W
P_D @ T_C = 100°C	Maximum Power Dissipation	111	
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	——	——	0.45	°C/W K/W
	Junction-to-Case, Both Legs Conducting	——	——	0.23	
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)
	Terminal Torque	30 (3.4)	——	40 (4.6)	
	Vertical Pull	——	——	80	lbf•in
	2 inch Lever Pull	——	——	35	

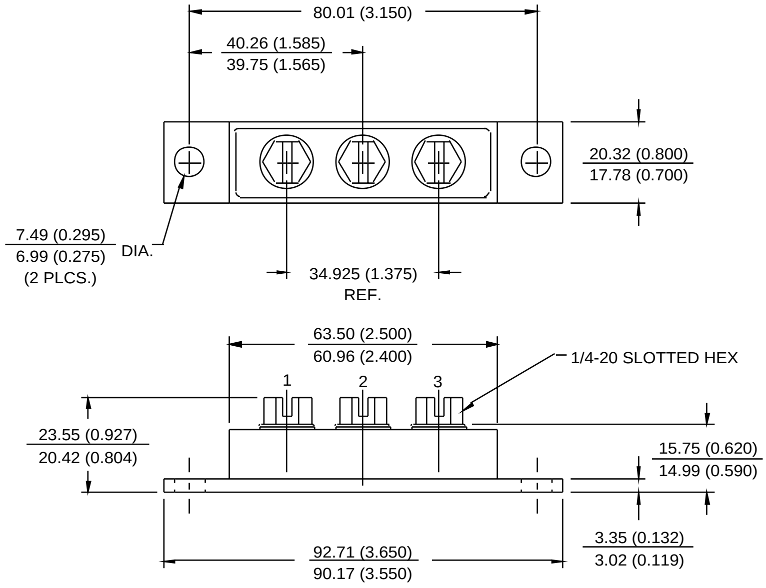
Note: ① Limited by junction temperature
② L = 100µH, duty cycle limited by max T_J
③ 125°C
④ Mounting surface must be smooth, flat, free or burrs or other protrusions. Apply a thin even film or thermal grease to mounting surface. Gradually tighten each mounting bolt in 5-10 lbf•in steps until desired 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	400	——	——	V	I_R = 100µA	
V_{FM}	Max Forward Voltage	——	1.0	1.2	V	I_F = 100A	See Fig. 1
		——	1.2	1.4		I_F = 200A	
		——	0.9	1.1		I_F = 100A, T_J = 125°C	
I_{RM}	Max Reverse Leakage Current	——	2.0	12	µA	V_R = V_R Rated	See Fig. 2
		——	3.0	16	mA	T_J = 125°C, V_R = 320V	
C_T	Junction Capacitance	——	370	500	pF	V_R = 200V	See Fig. 3
L_S	Series Inductance	——	5.0	——	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	——	45	——	ns	I_F = 1.0A, di_f/dt = 200A/µs, V_R = 30V		
t_{rr1}		——	81	120		T_J = 25°C	See Fig.	I_F = 100A
t_{rr2}		——	260	390		T_J = 125°C	5	
I_{RRM1}	Peak Recovery Current	——	8.1	15	A	T_J = 25°C	See Fig.	
I_{RRM2}		——	17	30		T_J = 125°C	6	V_R = 200V
Q_{rr1}	Reverse Recovery Charge	——	330	890	nC	T_J = 25°C	See Fig.	
Q_{rr2}		——	2200	6000		T_J = 125°C	7	di_f/dt = 200A/µs
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current	——	290	——	A/µs	T_J = 25°C	See Fig.	
$di_{(rec)M}/dt2$	During t_b	——	270	——		T_J = 125°C	8	



LEAD ASSIGNMENTS
1 - ANODE
2 - CATHODE
3 - ANODE

OUTLINE TO-244AB (ISOLATED)
Dimensions in Millimeters and (Inches)

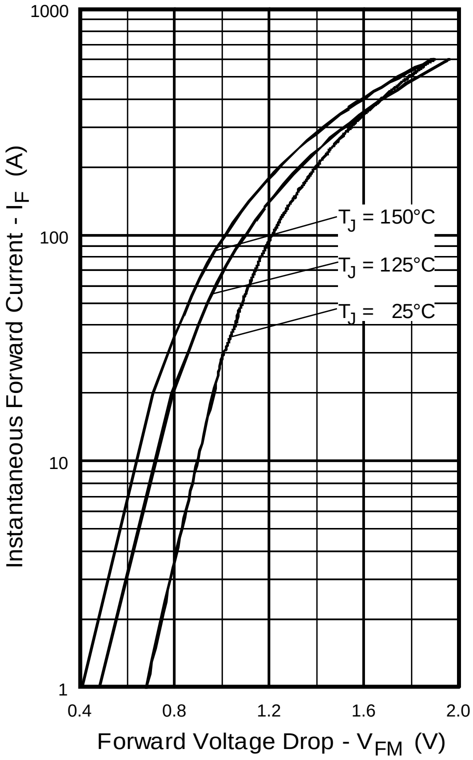


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current, (per Leg)

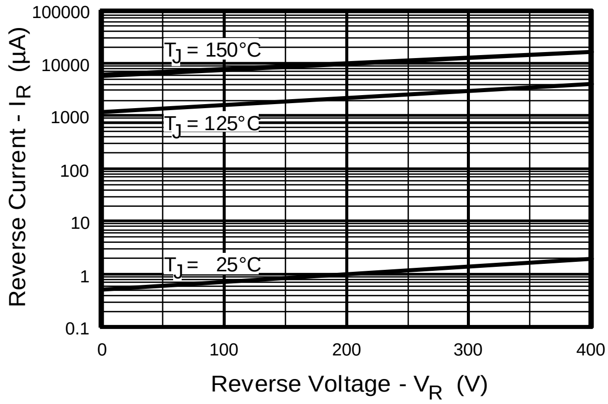


Fig. 2 - Typical Reverse Current vs. Reverse Voltage, (per Leg)

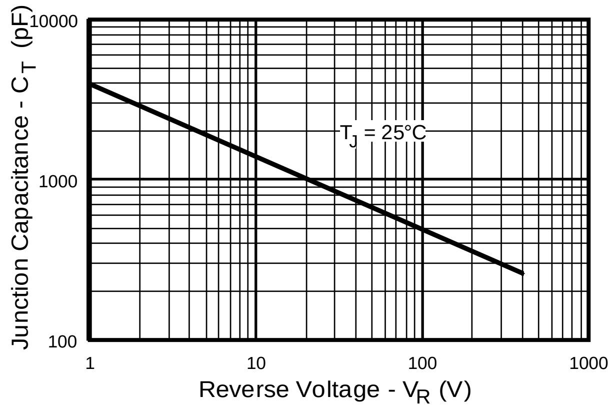


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)

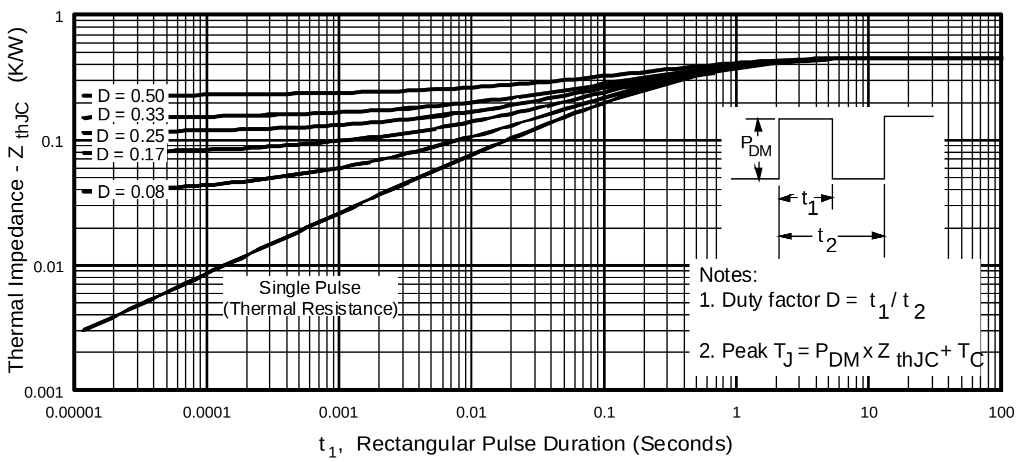


Fig. 4 - Maximum Thermal Impedance Z_{thjc} Characteristics, (per Leg)

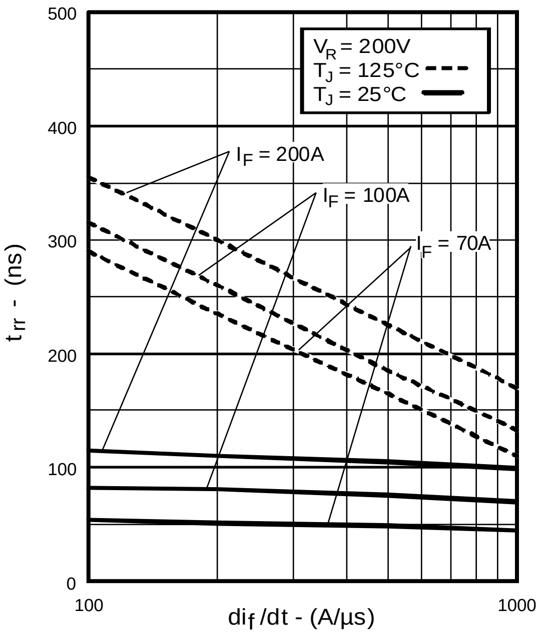


Fig. 5 - Typical Reverse Recovery vs. di_f/dt, (per Leg)

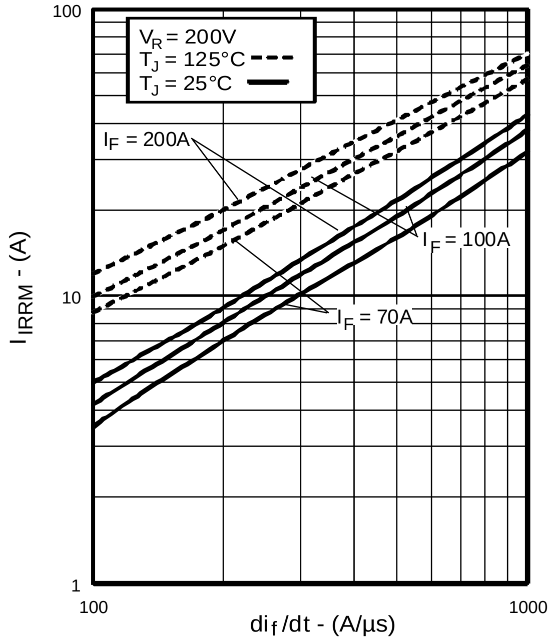


Fig. 6 - Typical Recovery Current vs. di_f/dt, (per Leg)

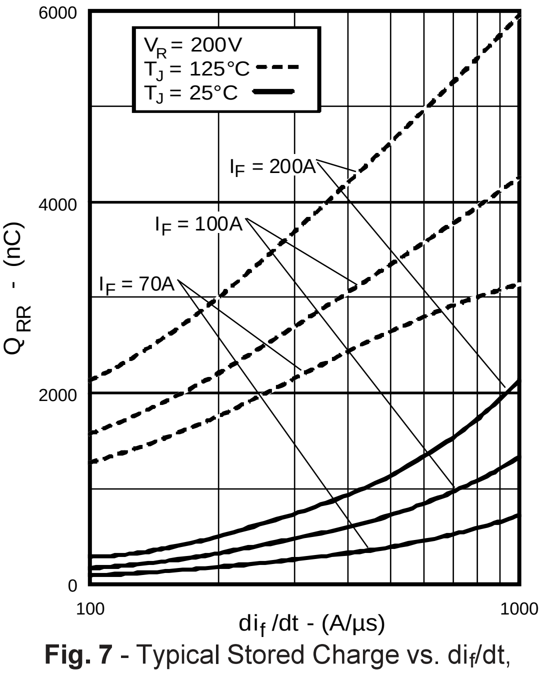


Fig. 7 - Typical Stored Charge vs. di_f/dt, (per Leg)

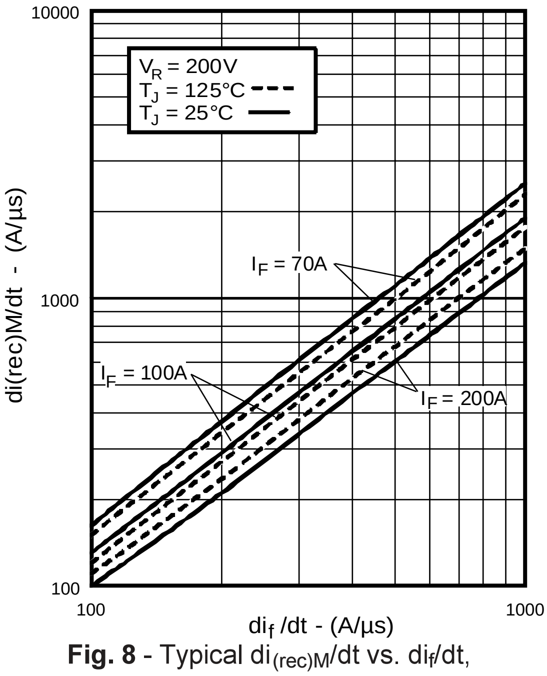


Fig. 8 - Typical $di_{(rec)M}$/dt vs. di_f/dt, (per Leg)

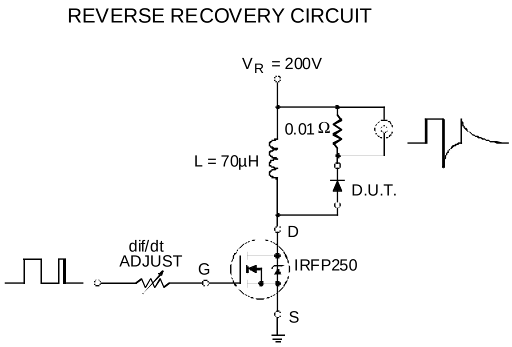
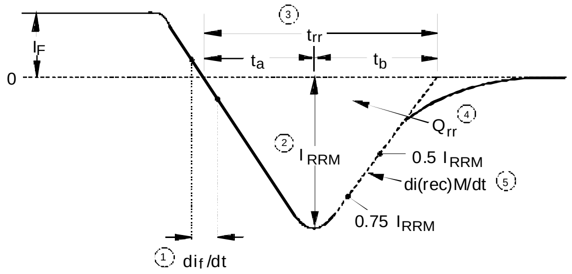


Fig. 9 - Reverse Recovery Parameter Test Circuit



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}

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

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

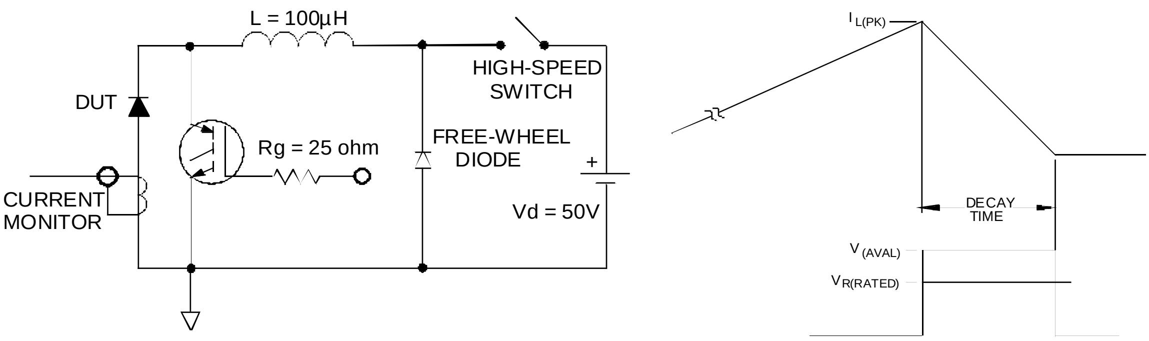


Fig. 11 - Avalanche Test Circuit and Waveforms

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