International
IOR Rectifier

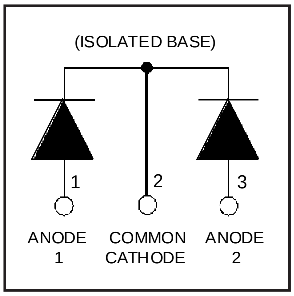
PD -2.463 rev. B 03/99

HFA60MC60C

HEXFRED™ Ultrafast, Soft Recovery Diode

Features

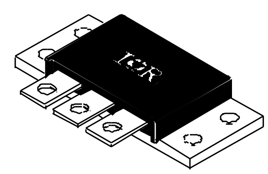
- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters



V_R = 600V
V_F(typ.)③ = 1.1V
$I_{F(AV)}$ = 60A
Q_{rr} (typ.) = 200nC
I_{RRM}(typ.) = 6A
t_{rr}(typ.) = 30ns
$di_{(rec)M}/dt$ (typ.)③ = 170A/µs

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.



TO-249AA

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	50	A
I_F @ T_C = 100°C	Continuous Forward Current	24	
I_{FSM}	Single Pulse Forward Current ①	200	
E_{AS}	Non-Repetitive Avalanche Energy ②	220	µJ
P_D @ T_C = 25°C	Maximum Power Dissipation	125	W
P_D @ T_C = 100°C	Maximum Power Dissipation	50	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	

Thermal - Mechanical Characteristics

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case, Single Leg Conducting	——	——	1.0	°C/W K/W
	Junction-to-Case, Both Legs Conducting	——	——	0.50	
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	——	0.10	——	
Wt	Weight	——	58 (2.0)	——	g (oz)
	Mounting Torque	35 (4.0)	——	50 (5.7)	lbf•in (N•m)

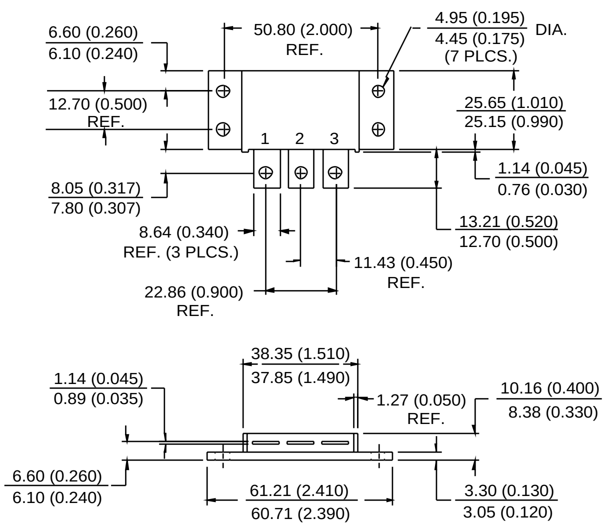
Note: ① Limited by junction temperature
② L = 100µH, duty cycle limited by max T_J
③ 125°C

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 = 30A	See Fig. 1
		—	1.4	1.7		I_F = 60A	
		—	1.1	1.3		I_F = 30A, T_J = 125°C	
I_{RM}	Max Reverse Leakage Current	—	2.0	10	µA	V_R = V_R Rated	See Fig. 2
		—	0.50	2.0	mA	T_J = 125°C, V_R = 480V	
C_T	Junction Capacitance	—	68	100	pF	V_R = 200V	See Fig. 3
L_S	Series Inductance	—	8.0	—	nH	From terminal hole to terminal hole	

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions		
t_{rr}	Reverse Recovery Time	—	30	—	ns	I_F = 1.0A, di_f/dt = 200A/µs, V_R = 30V		
t_{rr1}		—	67	100		T_J = 25°C	See Fig. 5	I_F = 50A
t_{rr2}		—	112	170		T_J = 125°C		
I_{RRM1}	Peak Recovery Current	—	6.0	11	A	T_J = 25°C	See Fig. 6	V_R = 200V
I_{RRM2}		—	9.0	16		T_J = 125°C		
Q_{rr1}	Reverse Recovery Charge	—	200	550	nC	T_J = 25°C	See Fig. 7	di_f/dt = 200A/µs
Q_{rr2}		—	500	1400		T_J = 125°C		
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current	—	250	—	A/µs	T_J = 25°C	See Fig. 8	
$di_{(rec)M}/dt2$	During t_b	—	170	—		T_J = 125°C		



LEAD ASSIGNMENTS
1 - ANODE
2 - CATHODE
3 - ANODE
BASE (ISOLATED)

Conforms to JEDEC Outline TO - 249AA
Dimensions in millimeters and inches

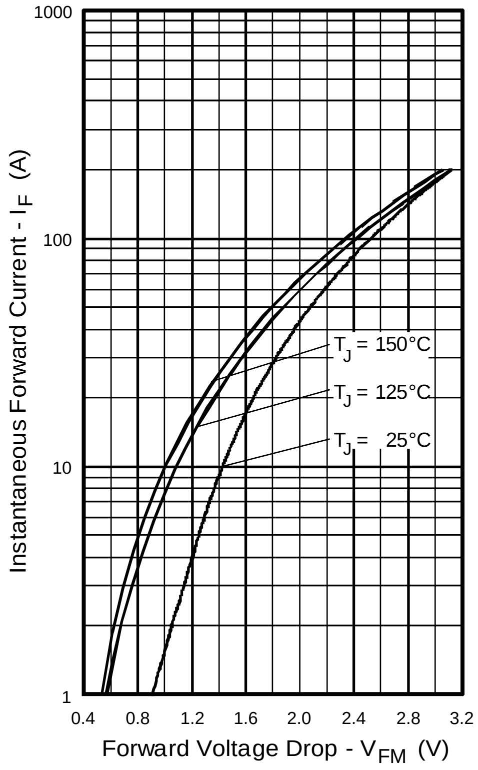


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current, (per Leg)

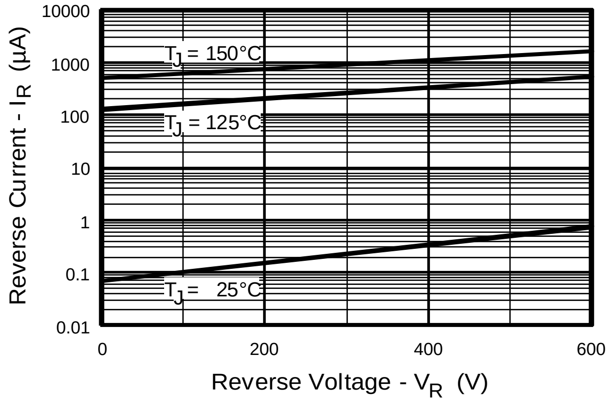


Fig. 2 - Typical Reverse Current vs. Reverse Voltage, (per Leg)

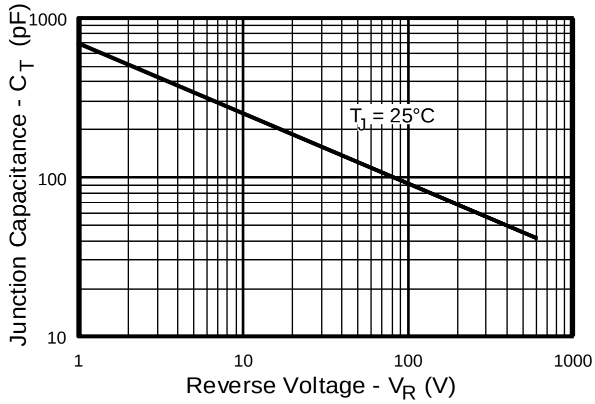


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)

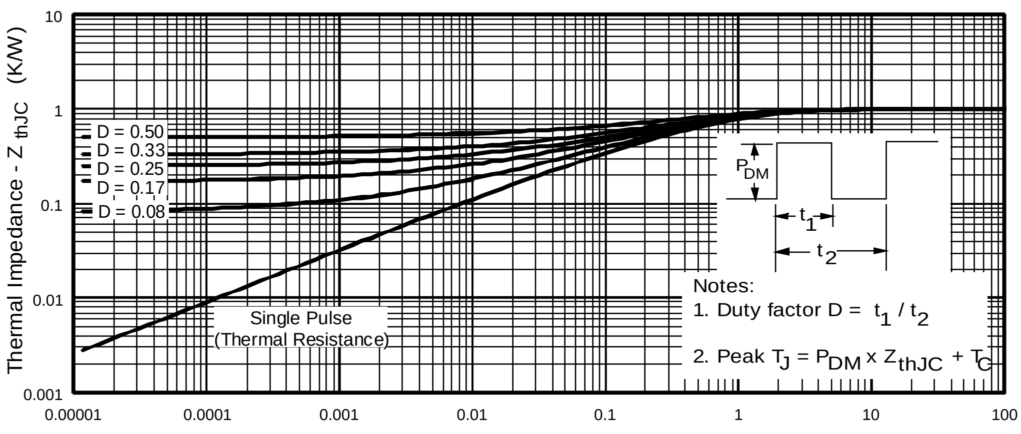


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics, (per Leg)

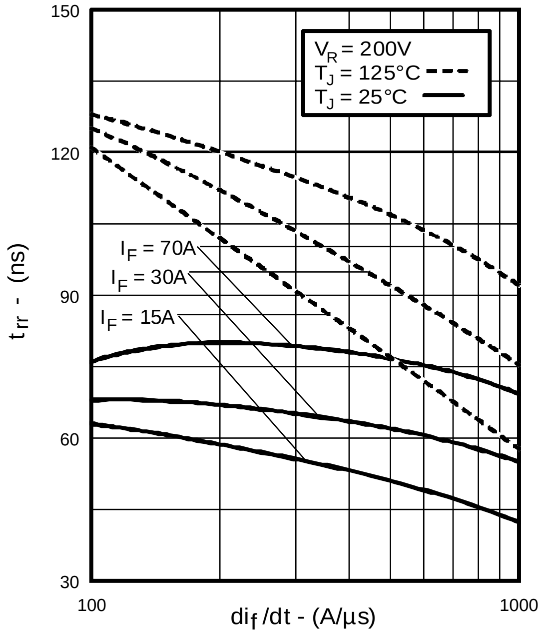


Fig. 5 - Typical Reverse Recovery vs. di_f/dt, (per Leg)

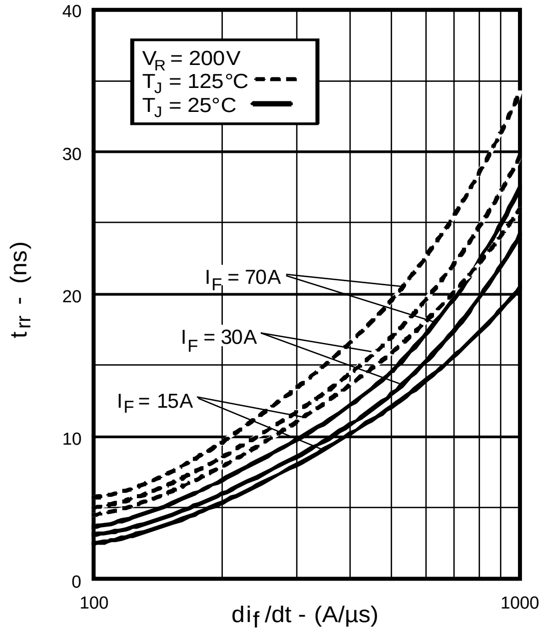


Fig. 6 - Typical Recovery Current vs. di_f/dt, (per Leg)

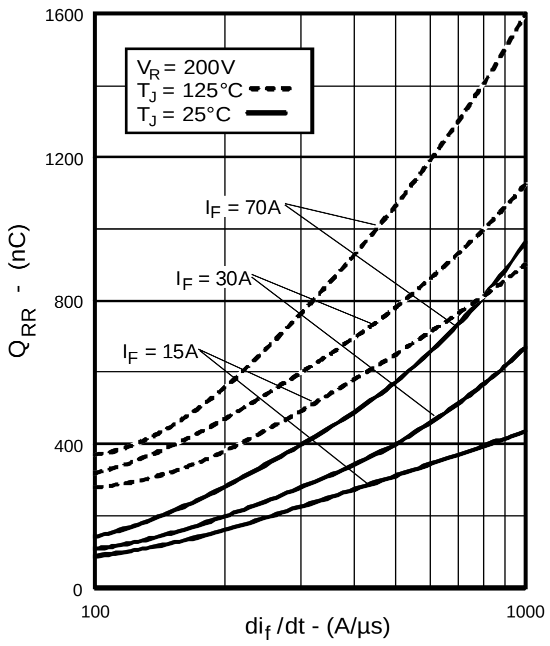


Fig. 7 - Typical Stored Charge vs. di_f/dt, (per Leg)

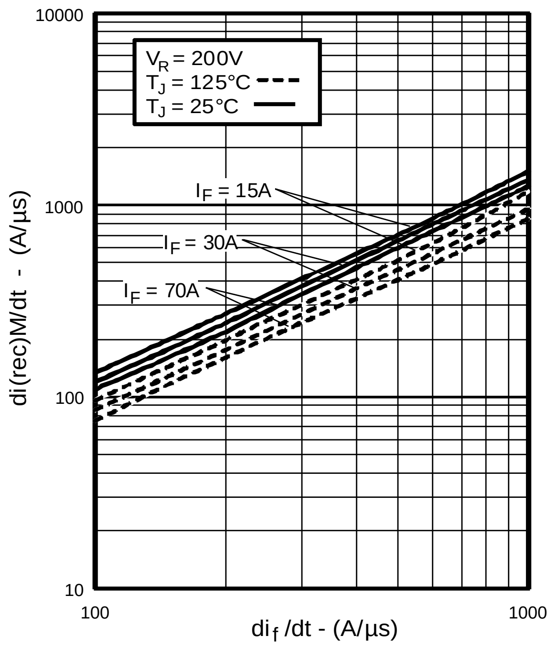


Fig. 8 - Typical $di_{(rec)M}/dt$ vs. di_f/dt, (per Leg)

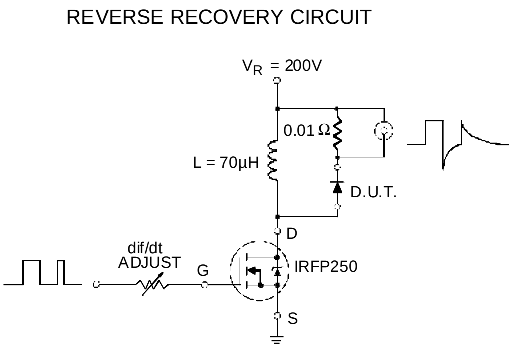
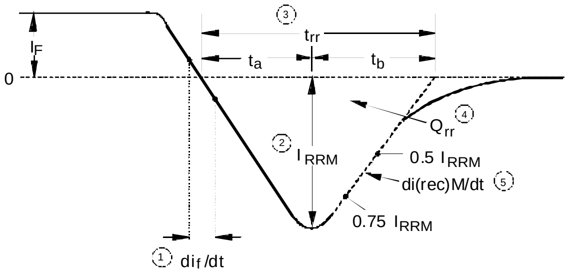


Fig. 9 - Reverse Recovery Parameter Test Circuit



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}

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

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

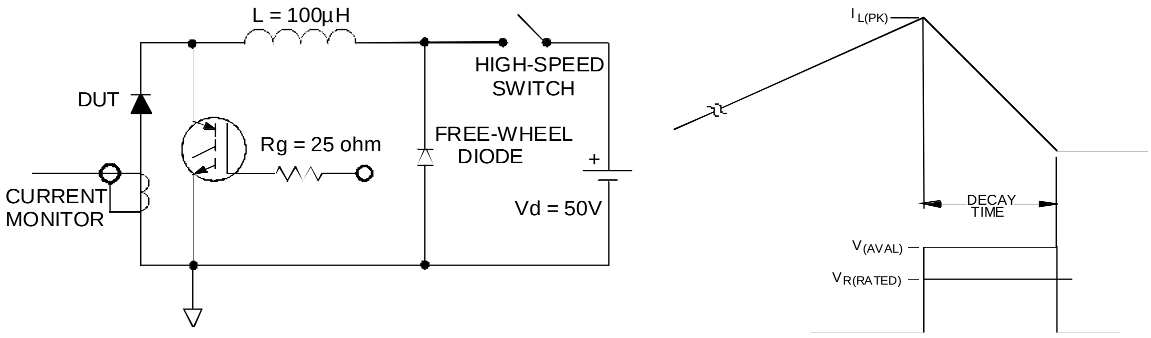


Fig. 11 - Avalanche Test Circuit and Waveforms

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