

International Rectifier

HEXFRED™

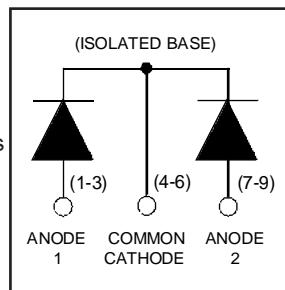
PD -2.475A

HFA75MB40C

Ultrafast, Soft Recovery Diode

Features

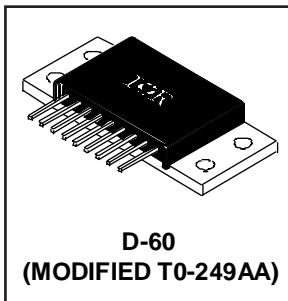
- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters



$V_R = 400V$
$V_F(\text{typ.})^{\circledcirc} = 1V$
$I_{F(\text{AV})} = 75A$
$Q_{rr} (\text{typ.}) = 200\text{nC}$
$I_{RRM} (\text{typ.}) = 6A$
$t_{rr} (\text{typ.}) = 30\text{ns}$
$di_{(\text{rec})M}/dt (\text{typ.})^{\circledcirc} = 190\text{A}/\mu\text{s}$

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.



D-60
(MODIFIED TO-249AA)

Absolute Maximum Ratings (per Leg)

	Parameter	Max.	Units
V_R	Cathode-to-Anode Voltage	400	V
$I_F @ T_C = 25^\circ\text{C}$	Continuous Forward Current	75	
$I_F @ T_C = 100^\circ\text{C}$	Continuous Forward Current	36	
I_{FSM}	Single Pulse Forward Current \circledcirc	300	A
I_{AS}	Maximum Single Pulse Avalanche Current \circledcirc	5.0	
E_{AS}	Non-Repetitive Avalanche Energy \circledcirc	1.4	mJ
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation	125	
$P_D @ T_C = 100^\circ\text{C}$	Maximum Power Dissipation	50	
T_J	Operating Junction and		
T_{STG}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
	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	$^\circ\text{C}/\text{W}$
	Junction-to-Case, Both Legs Conducting	—	—	0.50	K/W
$R_{\theta CS}$	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: \circledcirc Limited by junction temperature

\circledcirc $L = 100\mu\text{H}$, duty cycle limited by max T_J

\circledcirc 125°C

HFA75MB40C

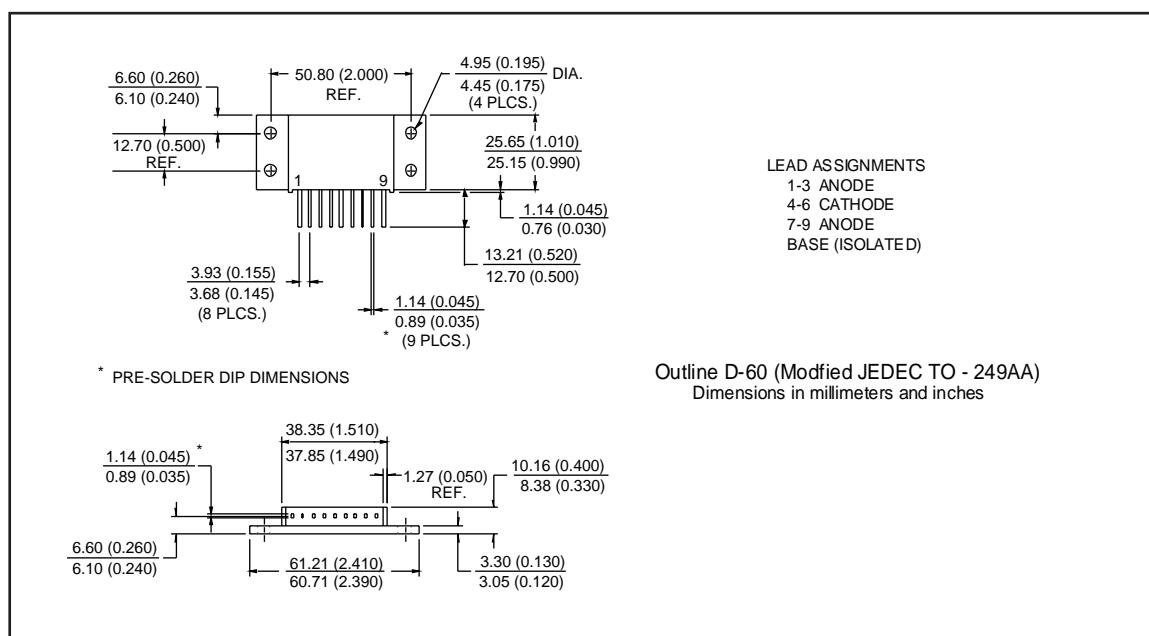
International
Rectifier

Electrical Characteristics (per Leg) @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
V_{BR}	Cathode Anode Breakdown Voltage	400	—	—	V	$I_R = 100\mu\text{A}$
V_{FM}	Max Forward Voltage	—	1.1	1.3	V	$I_F = 35\text{A}$
		—	1.3	1.5	V	$I_F = 75\text{A}$
		—	1.0	1.2	V	$I_F = 35\text{A}, T_J = 125^\circ\text{C}$
I_{RM}	Max Reverse Leakage Current	—	0.50	3.0	μA	$V_R = V_R$ Rated
		—	0.75	4.0	mA	$T_J = 125^\circ\text{C}, V_R = 320\text{V}$
C_T	Junction Capacitance	—	90	125	pF	$V_R = 200\text{V}$
L_S	Series Inductance	—	9.2	—	nH	Lead to lead 5mm from package body

Dynamic Recovery Characteristics (per Leg) @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
t_{rr}	Reverse Recovery Time	—	30	—	ns	$I_F = 1.0\text{A}, dI/dt = 200\text{A}/\mu\text{s}, V_R = 30\text{V}$
		—	67	100	ns	$T_J = 25^\circ\text{C}$ See Fig.
		—	110	170	ns	$T_J = 125^\circ\text{C}$ 5
I_{RRM1}	Peak Recovery Current	—	6.0	11	A	$T_J = 25^\circ\text{C}$ See Fig.
		—	9.0	16	A	$T_J = 125^\circ\text{C}$ 6
Q_{rr1}	Reverse Recovery Charge	—	200	540	nC	$T_J = 25^\circ\text{C}$ See Fig.
		—	500	1300	nC	$T_J = 125^\circ\text{C}$ 7
$di_{(rec)M}/dt_1$	Peak Rate of Fall of Recovery Current During t_b	—	240	—	A/ μs	$T_J = 25^\circ\text{C}$ See Fig.
		—	190	—	A/ μs	$T_J = 125^\circ\text{C}$ 8



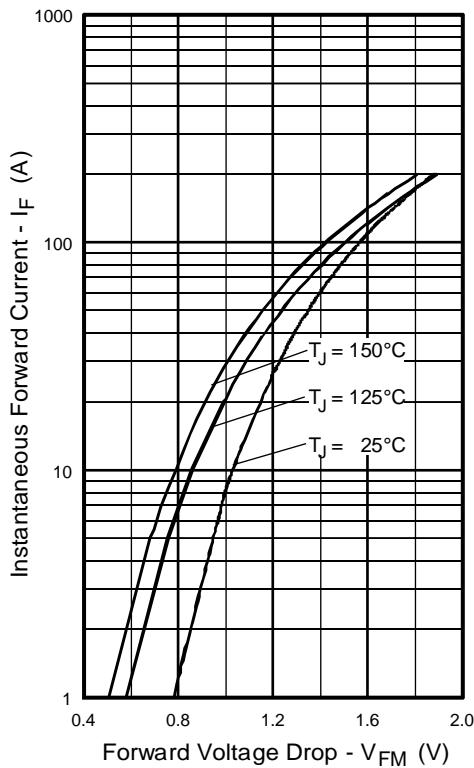


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current, (per Leg)

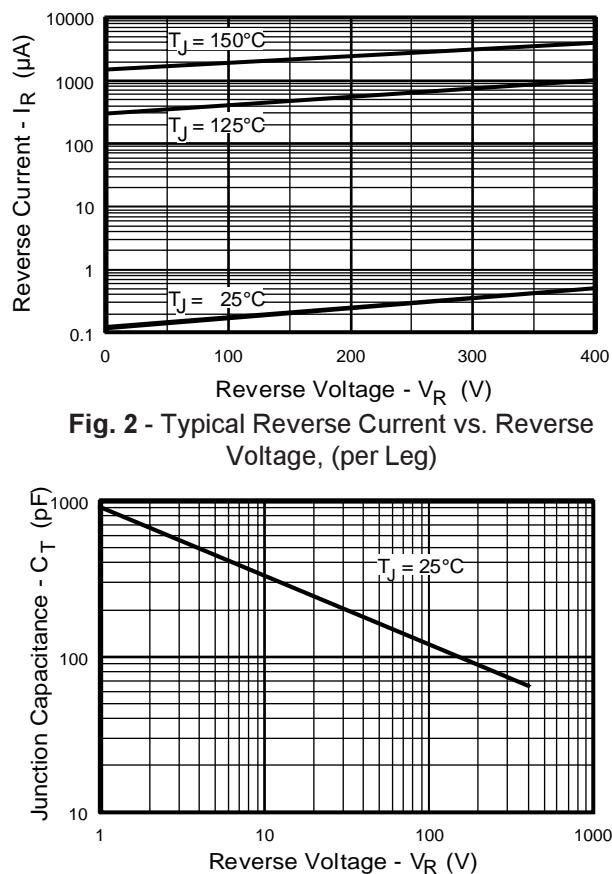


Fig. 2 - Typical Reverse Current vs. Reverse Voltage, (per Leg)

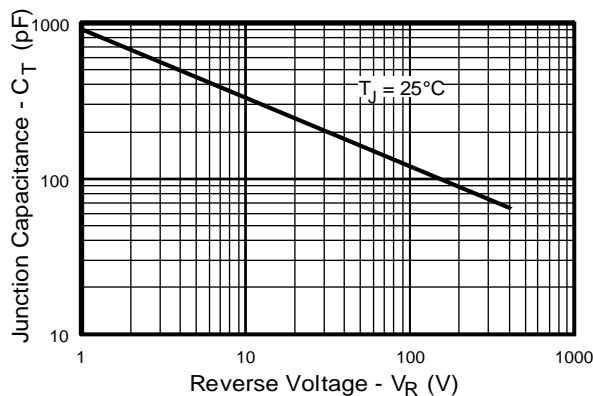


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)

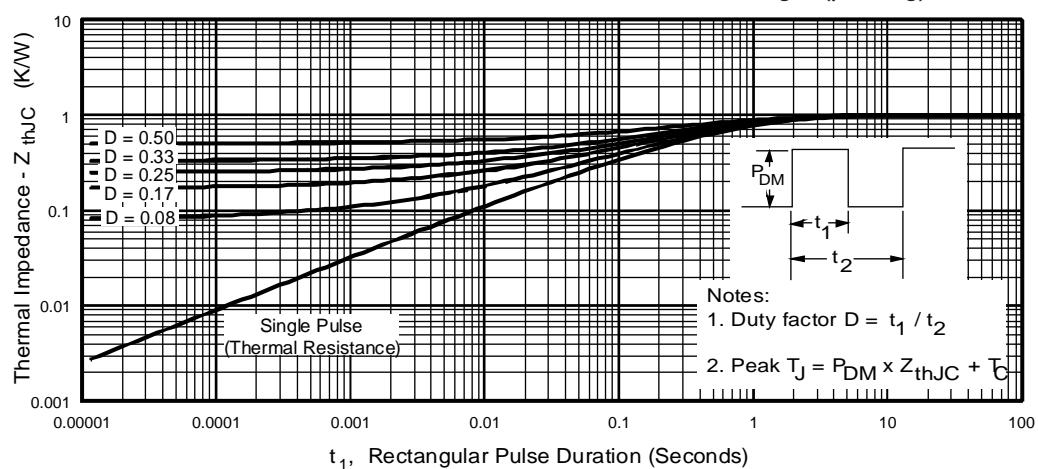


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics, (per Leg)

HFA75MB40C

International
ICR Rectifier

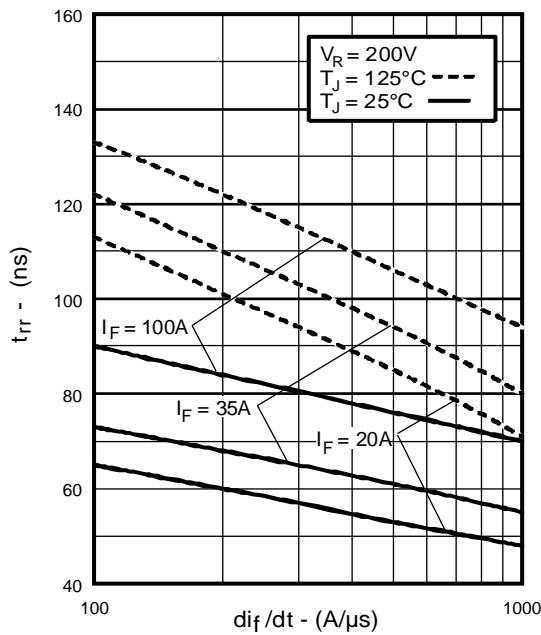


Fig. 5 - Typical Reverse Recovery vs. di_f/dt , (per Leg)

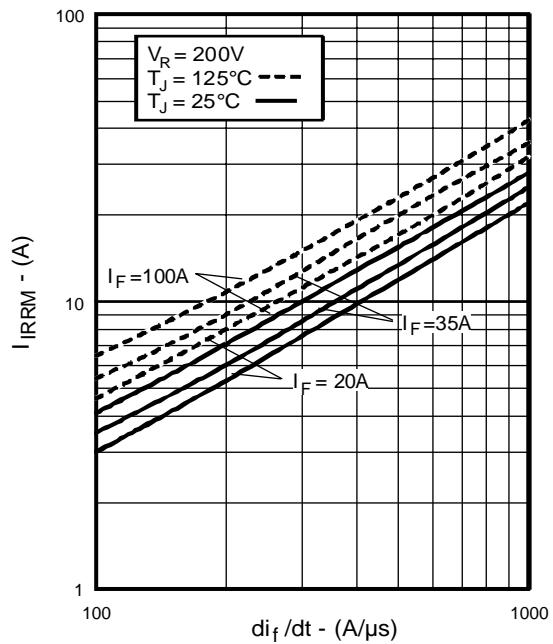


Fig. 6 - Typical Recovery Current vs. di_f/dt , (per Leg)

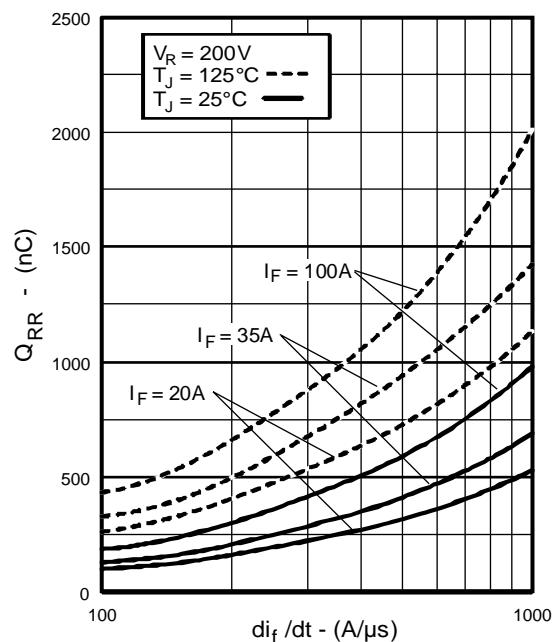


Fig. 7 - Typical Stored Charge vs. di_f/dt , (per Leg)

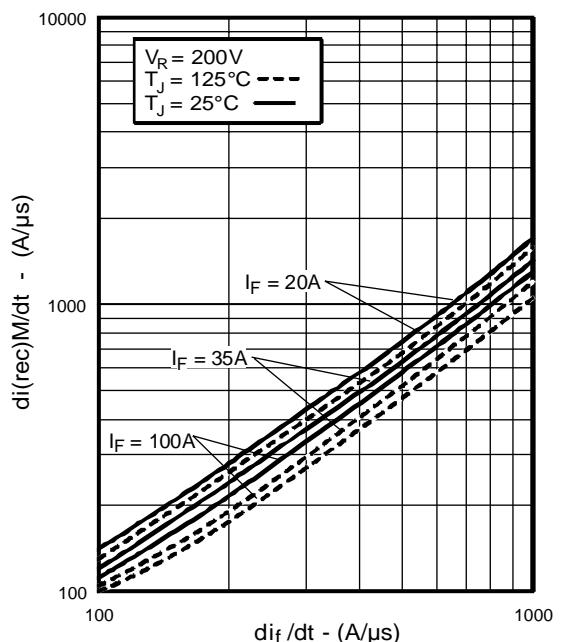
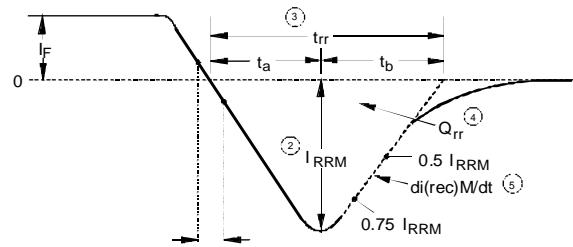
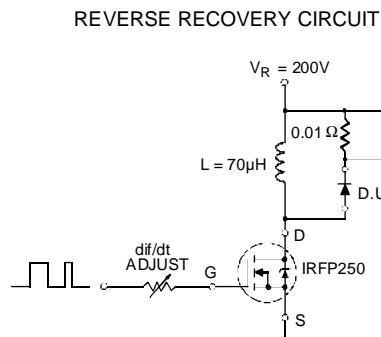


Fig. 8 - Typical $dI_{(rec)}M/dt$ vs. di_f/dt , (per Leg)



1. $\frac{di}{dt}$ - 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. $\frac{di_{(rec)}M}{dt}$ - Peak rate of change of current during t_b portion of t_{rr}
- $$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

Fig. 9 - Reverse Recovery Parameter Test Circuit

Fig. 10 - Reverse Recovery Waveform and Definitions

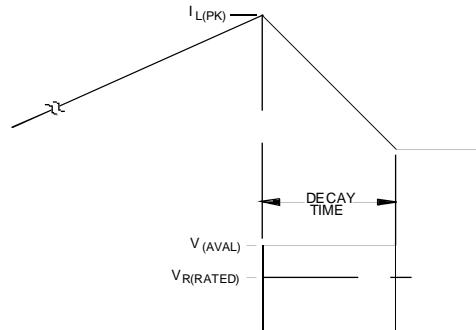
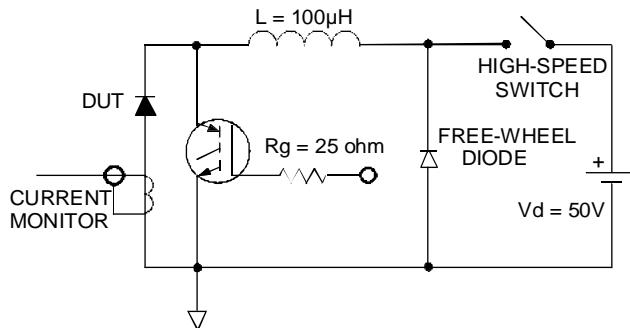


Fig. 11 - Avalanche Test Circuit and Waveforms

International
IR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331

EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020

IR CANADA: 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 2Z8, Tel: (905) 475 1897

IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590

IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111

IR FAR EAST: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086

IR SOUTHEAST ASIA: 315 Outram Road, #10-02 Tan Boon Liat Building, Singapore 0316 Tel: 65 221 8371

<http://www.irf.com/> Data and specifications subject to change without notice. 5/97