Bulletin PD -2.340 rev. A 11/00

International
IOR Rectifier

HFA15PB60

HEXFRED™

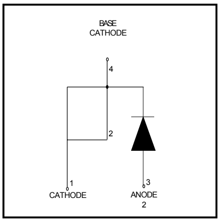
Ultrafast, Soft Recovery Diode

Features

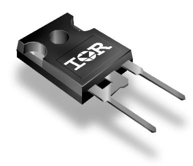
- Ultrafast Recovery
- Ultrasoft Recovery
- Very Low I_{RRM}
- Very Low Q_{rr}
- Specified at Operating Conditions

Benefits

- Reduced RFI and EMI
- Reduced Power Loss in Diode and Switching Transistor
- Higher Frequency Operation
- Reduced Snubbing
- Reduced Parts Count



V_R = 600V
V_F(typ.)* = 1.3V
$I_{F(AV)}$ = 15A
Q_{rr} (typ.)= 80nC
I_{RRM} (typ.) = 4.0A
t_{rr}(typ.) = 19ns
$di_{(rec)M}/dt$ (typ.)* = 160A/μs



TO-247AC (Modified)

Description

International Rectifier's HFA15PB60 is a state of the art ultra fast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which result in performance which is unsurpassed by any rectifier previously available. With basic ratings of 600 volts and 15 amps continuous current, the HFA15PB60 is especially well suited for use as the companion diode for IGBTs and MOSFETs. In addition to ultra fast recovery time, the HEXFRED product line features extremely low values of peak recovery current (I_{RRM}) and does not exhibit any tendency to "snap-off" during the t_b portion of recovery. The HEXFRED features combine to offer designers a rectifier with lower noise and significantly lower switching losses in both the diode and the switching transistor. These HEXFRED advantages can help to significantly reduce snubbing, component count and heatsink sizes. The HEXFRED HFA15PB60 is ideally suited for applications in power supplies and power conversion systems (such as inverters), motor drives, and many other similar applications where high speed, high efficiency is needed.

Absolute Maximum Ratings

	Parameter	Max	Units
V_R	Cathode-to-Anode Voltage	600	V
I_F @ T_C = 100°C	Continuous Forward Current	15	A
I_{FSM}	Single Pulse Forward Current	150	
I_{FRM}	Maximum Repetitive Forward Current	60	
P_D @ T_C = 25°C	Maximum Power Dissipation	74	W
P_D @ T_C = 100°C	Maximum Power Dissipation	29	
T_J	Operating Junction and	-55 to +150	C
T_{STG}	Storage Temperature Range		

* 125°C

Electrical Characteristics @ 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	1.7	V	I_F = 15A See Fig. 1
			1.5	2.0		I_F = 30A
			1.2	1.6		I_F = 15A, T_J = 125°C
I_{RM}	Max Reverse Leakage Current		1.0	10	µA	V_R = V_R Rated See Fig. 2
			400	1000		T_J = 125°C, V_R = 0.8 x V_R Rated
C_T	Junction Capacitance		25	50	pF	V_R = 200V See Fig. 3
L_S	Series Inductance		12		nH	Measured lead to lead 5mm from package body

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

	Parameter	Min	Typ	Max	Units	Test Conditions	
t_{rr}	Reverse Recovery Time		19		ns	I_F = 1.0A, di_f/dt = 200A/µs, V_R = 30V	
t_{rr1}	See Fig. 5, 10		42	60		T_J = 25°C	I_F = 15A
t_{rr2}			74	120		T_J = 125°C	
I_{RRM1}	Peak Recovery Current		4.0	6.0	A	T_J = 25°C	V_R = 200V
I_{RRM2}	See Fig. 6		6.5	10		T_J = 125°C	
Q_{rr1}	Reverse Recovery Charge		80	180	nC	T_J = 25°C	di_f/dt = 200A/µs
Q_{rr2}	See Fig. 7		220	600		T_J = 125°C	
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current		188		A/µs	T_J = 25°C	
$di_{(rec)M}/dt2$	During t_b See Fig. 8		160			T_J = 125°C	

Thermal - Mechanical Characteristics

	Parameter	Min	Typ	Max	Units
T_{lead}①	Lead Temperature			300	°C
R_{thJC}	Thermal Resistance, Junction to Case			1.7	K/W
R_{thJA}②	Thermal Resistance, Junction to Ambient			40	
R_{thCS}③	Thermal Resistance, Case to Heat Sink		0.25		
Wt	Weight		6.0		g
			0.21		(oz)
	Mounting Torque	6.0		12	Kg-cm
		5.0		10	lbf•in

① 0.063 in. from Case (1.6mm) for 10 sec
② Typical Socket Mount
③ Mounting Surface, Flat, Smooth and Greased

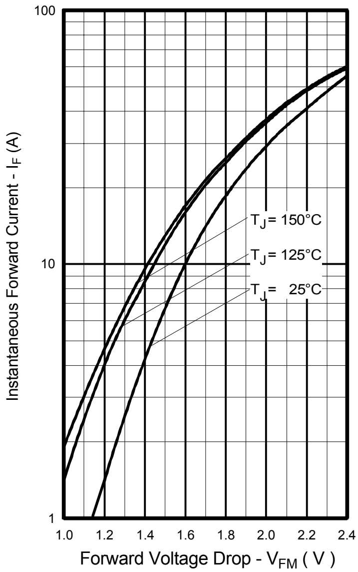


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

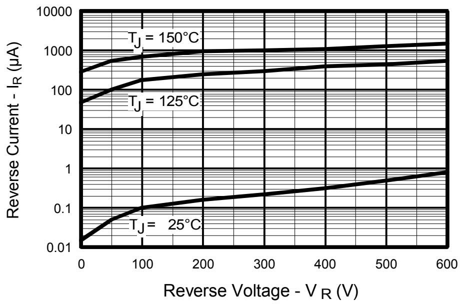


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

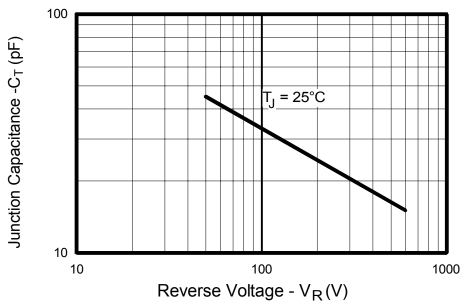


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

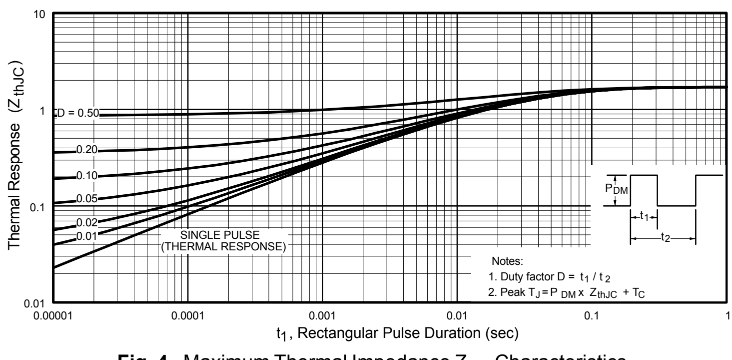


Fig. 4 - Maximum Thermal Impedance Z_{thjc} Characteristics

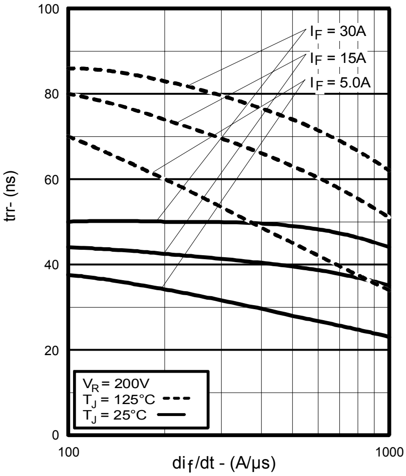


Fig. 5 - Typical Reverse Recovery Time vs. di_f/dt

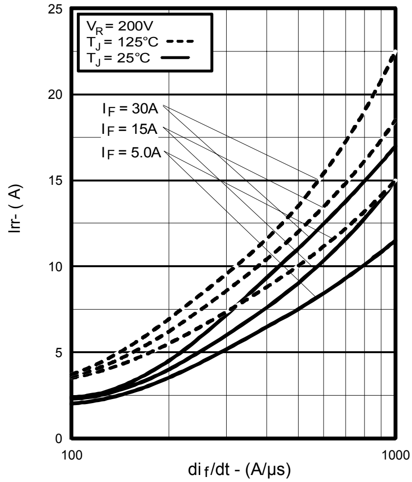


Fig. 6 - Typical Recovery Current vs. di_f/dt

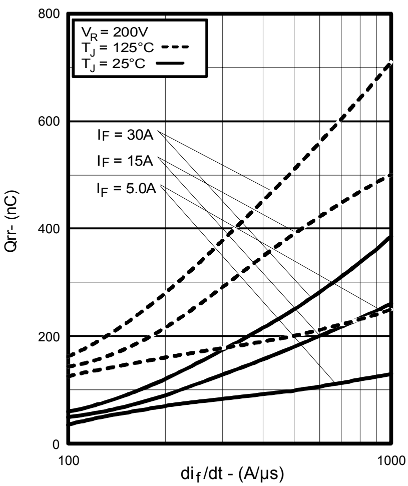


Fig. 7 - Typical Stored Charge vs. di_f/dt

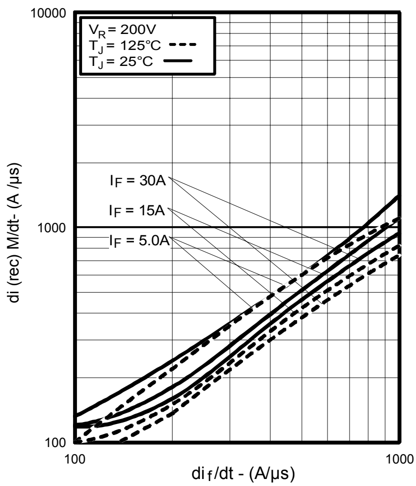


Fig. 8 - Typical $di_{(rec)M}/dt$ vs. di_f/dt

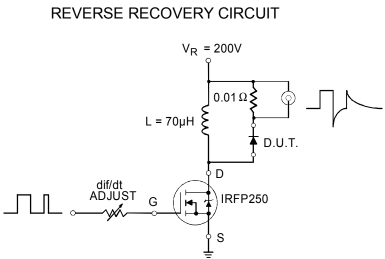
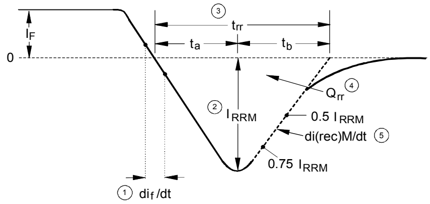


Fig. 9 - Reverse Recovery Parameter Test Circuit

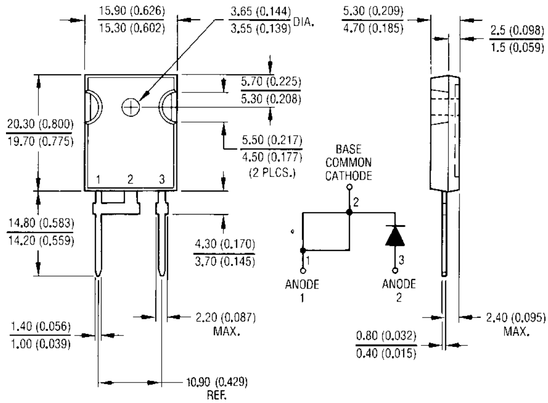


1. di_f/dt - Rate of change of current through zero crossing
2. I_{RRM} - Peak reverse recovery current
3. trr - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current
4. Q_{rr} - Area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



Conforms to JEDEC Outline TO-247AC MODIFIED
Dimensions in millimeters and inches

International IOR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245 U.S.A. Tel: (310) 322 3331. Fax: (310) 322 3332.
EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB, U.K. Tel: ++ 44 1883 732020. Fax: ++ 44 1883 733408.
IR CANADA: 15 Lincoln Court, Brampton, Markham, Ontario L6T3Z2. Tel: (905) 453 2200. Fax: (905) 475 8801.
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg. Tel: ++ 49 6172 96590. Fax: ++ 49 6172 965933.
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino. Tel: ++ 39 11 4510111. Fax: ++ 39 11 4510220.
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: 1 Kim Seng Promenade, Great World City West Tower,13-11, Singapore 237994. Tel: ++ 65 838 4630.
IR TAIWAN: 16 Fl. Suite D.207, Sec. 2, Tun Haw South Road, Taipei, 10673, Taiwan. Tel: 886 2 2377 9936.