

# International IOR Rectifier

Bulletin PD -2.340 rev. A 11/00

## HFA15PB60

HEXFRED™

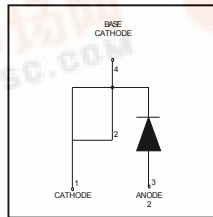
Ultrafast, Soft Recovery Diode

### 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



$V_R = 600V$
$V_F(\text{typ.})^* = 1.3V$
$I_F(\text{AV}) = 15A$
$Q_{rr}(\text{typ.}) = 80nC$
$I_{RRM}(\text{typ.}) = 4.0A$
$t_{rr}(\text{typ.}) = 19ns$
$di(\text{rec})/dt(\text{typ.})^* = 160A/\mu s$



### 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
$I_F @ T_C = 100^\circ C$	Continuous Forward Current	15	
$I_{FSM}$	Single Pulse Forward Current	150	A
$I_{FRM}$	Maximum Repetitive Forward Current	60	
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	74	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	29	
$T_J$	Operating Junction and	-55 to +150	C
$T_{STG}$	Storage Temperature Range		

\* 125°C

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

	Parameter	Min	Typ	Max	Units	Test Conditions
$V_{BR}$	Cathode Anode Breakdown Voltage	600			V	$I_R = 100\mu\text{A}$
$V_{FM}$	Max Forward Voltage		1.3	1.7	V	$I_F = 15\text{A}$ $I_F = 30\text{A}$ $I_F = 15\text{A}, T_J = 125^\circ\text{C}$
			1.5	2.0		
			1.2	1.6		
$I_{RM}$	Max Reverse Leakage Current		1.0	10	$\mu\text{A}$	$V_R = V_R \text{ Rated}$ $T_J = 125^\circ\text{C}, V_R = 0.8 \times V_R \text{ Rated}$
			400	1000		
$C_T$	Junction Capacitance		25	50	pF	$V_R = 200\text{V}$ See Fig. 3
$L_S$	Series Inductance		12		nH	Measured lead to lead 5mm from package body

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

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

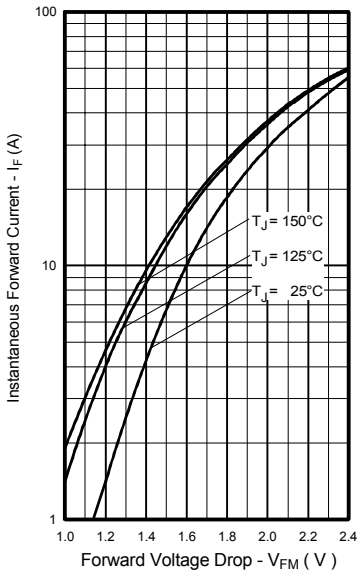
**Thermal - Mechanical Characteristics**

	Parameter	Min	Typ	Max	Units
$T_{\text{lead}}^{\text{①}}$	Lead Temperature			300	$^\circ\text{C}$
$R_{\text{thJC}}$	Thermal Resistance, Junction to Case			1.7	K/W
$R_{\text{thJA}}^{\text{②}}$	Thermal Resistance, Junction to Ambient			40	
$R_{\text{thCS}}^{\text{③}}$	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

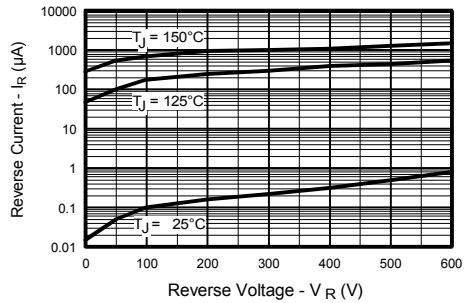
① 0.063 in. from Case (1.6mm) for 10 sec

② Typical Socket Mount

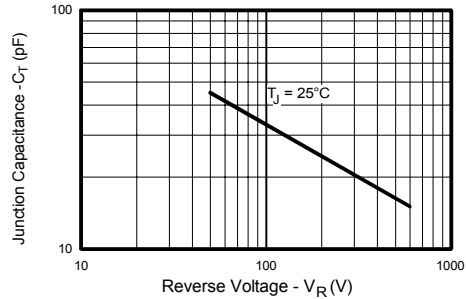
③ Mounting Surface, Flat, Smooth and Greased



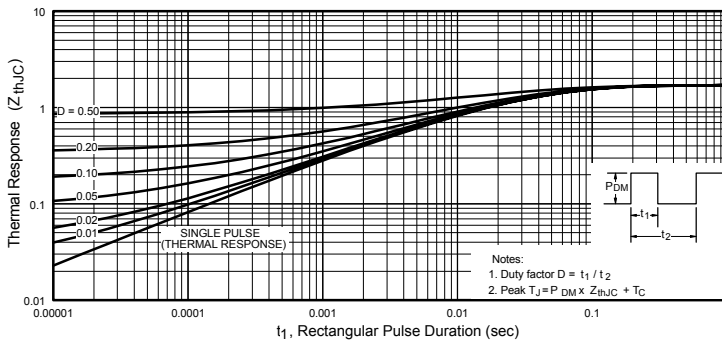
**Fig. 1** - Maximum Forward Voltage Drop vs. Instantaneous Forward Current



**Fig. 2** - Typical Reverse Current vs. Reverse Voltage



**Fig. 3** - Typical Junction Capacitance vs. Reverse Voltage



**Fig. 4** - Maximum Thermal Impedance  $Z_{th(jc)}$  Characteristics

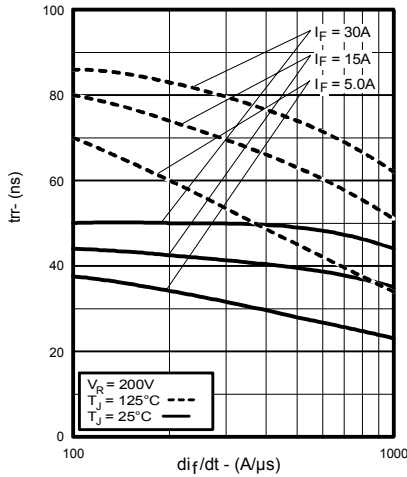


Fig. 5 - Typical Reverse Recovery Time vs.  $di_f/dt$

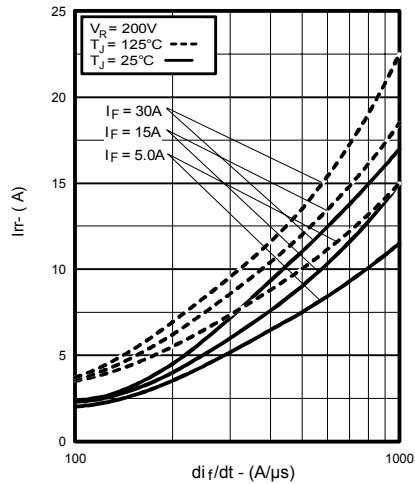


Fig. 6 - Typical Recovery Current vs.  $di_f/dt$

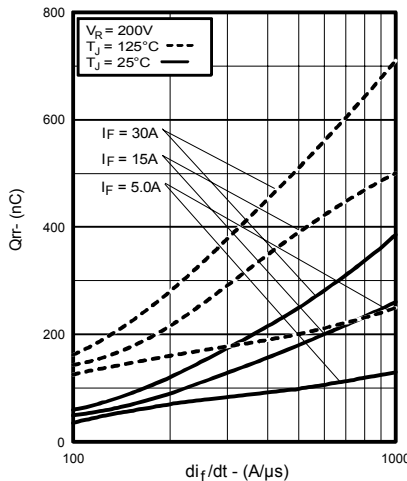


Fig. 7 - Typical Stored Charge vs.  $di_f/dt$

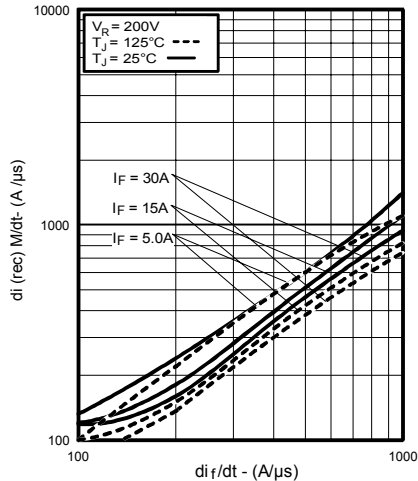
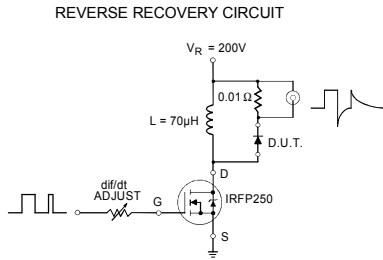
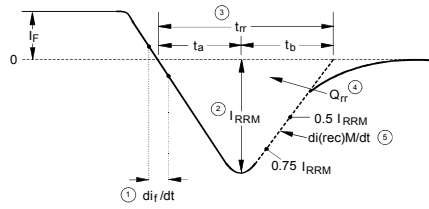


Fig. 8 - Typical  $di_{(rec)}M/dt$  vs.  $di_f/dt$



**Fig. 9 - Reverse Recovery Parameter Test Circuit**



1.  $di/dt$  - 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  $I_C$  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.  $di_{(rec)}/dt$  - Peak rate of change of current during  $t_b$  portion of  $t_{rr}$

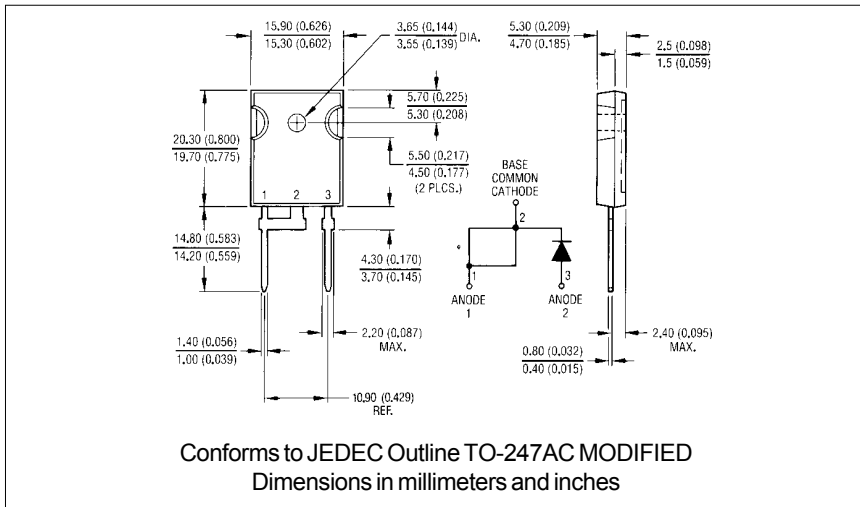
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

**Fig. 10 - Reverse Recovery Waveform and Definitions**

# HFA15PB60

Bulletin PD-2.340 rev. A 11/00

International  
**IR** Rectifier



International  
**IR** 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.

<http://www.irf.com>

Fax-On-Demand: +44 1883 733420

Data and specifications subject to change without notice.