

# International IOR Rectifier

Bulletin PD -2.492 rev. A 11/00

## HFA16TB120

HEXFRED™

Ultrafast, Soft Recovery Diode

### Features

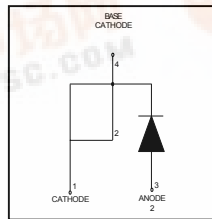
- Ultrafast Recovery
- Ultrasoft Recovery
- Very Low  $I_{RRM}$
- Very Low  $Q_{rr}$
- Specified at Operating Conditions

### Benefits

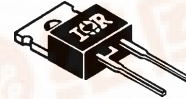
- Reduced RFI and EMI
- Reduced Power Loss in Diode and Switching Transistor
- Higher Frequency Operation
- Reduced Snubbing
- Reduced Parts Count

### Description

International Rectifier's HFA16TB120 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 1200 volts and 16 amps continuous current, the HFA16TB120 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 HFA16TB120 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.



$V_R = 1200V$
$V_F(\text{typ.})^* = 2.3V$
$I_F(\text{AV}) = 16A$
$Q_{rr}(\text{typ.}) = 260nC$
$I_{RRM}(\text{typ.}) = 5.8A$
$t_{rr}(\text{typ.}) = 30ns$
$di_{(rec)}/dt(\text{typ.})^* = 76A/\mu s$



TO-220AC

### Absolute Maximum Ratings

	Parameter	Max	Units
$V_R$	Cathode-to-Anode Voltage	1200	V
$I_F @ T_C = 100^\circ C$	Continuous Forward Current	16	A
$I_{FSM}$	Single Pulse Forward Current	190	
$I_{FRM}$	Maximum Repetitive Forward Current	64	°C
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	151	
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	60	
$T_J$	Operating Junction and	-55 to +150	W
$T_{STG}$	Storage Temperature Range		

\* 125°C



**Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

	Parameter	Min	Typ	Max	Units	Test Conditions
V <sub>BR</sub>	Cathode Anode Breakdown Voltage	1200			V	I <sub>R</sub> = 100μA
V <sub>FM</sub>	Max Forward Voltage		2.5	3.0	V	I <sub>F</sub> = 16A
			3.2	3.93		I <sub>F</sub> = 32A
			2.3	2.7		I <sub>F</sub> = 16A, T <sub>J</sub> = 125°C
I <sub>RM</sub>	Max Reverse Leakage Current		0.75	20	μA	V <sub>R</sub> = V <sub>R</sub> Rated
			375	2000		T <sub>J</sub> = 125°C, V <sub>R</sub> = 0.8 x V <sub>R</sub> Rated
C <sub>T</sub>	Junction Capacitance		27	40	pF	V <sub>R</sub> = 200V
L <sub>S</sub>	Series Inductance		8.0		nH	Measured lead to lead 5mm from package body

**Dynamic Recovery Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

	Parameter	Min	Typ	Max	Units	Test Conditions
t <sub>rr</sub>	Reverse Recovery Time		30		ns	I <sub>F</sub> = 1.0A, di/dt = 200A/μs, V <sub>R</sub> = 30V
t <sub>rr1</sub>	See Fig. 5, 10		90	135		T <sub>J</sub> = 25°C
			164	245		T <sub>J</sub> = 125°C
I <sub>RRM1</sub>	Peak Recovery Current		5.8	10	A	T <sub>J</sub> = 25°C
			8.3	15		T <sub>J</sub> = 125°C
I <sub>RRM2</sub>	See Fig. 6					V <sub>R</sub> = 200V
Q <sub>rr1</sub>	Reverse Recovery Charge		260	675	nC	T <sub>J</sub> = 25°C
Q <sub>rr2</sub>	See Fig. 7		680	1838		T <sub>J</sub> = 125°C
di <sub>(rec)M</sub> /dt1	Peak Rate of Fall of Recovery Current		120		A/μs	T <sub>J</sub> = 25°C
di <sub>(rec)M</sub> /dt2	During t <sub>b</sub> See Fig. 8		76			T <sub>J</sub> = 125°C

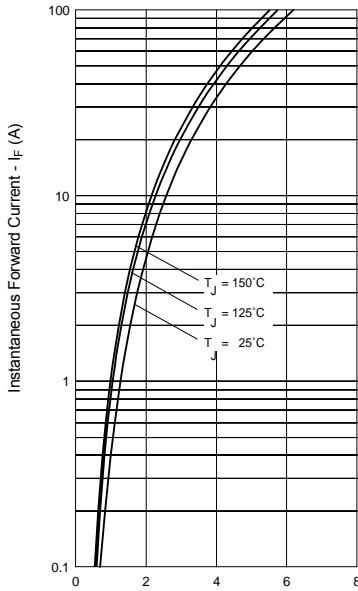
**Thermal - Mechanical Characteristics**

	Parameter	Min	Typ	Max	Units
T <sub>lead</sub> ①	Lead Temperature			300	°C
R <sub>thJC</sub>	Thermal Resistance, Junction to Case			0.83	K/W
R <sub>thJA</sub> ②	Thermal Resistance, Junction to Ambient			80	
R <sub>thCS</sub> ③	Thermal Resistance, Case to Heat Sink		0.50		
Wt	Weight		2.0		g
				0.07	(oz)
	Mounting Torque		6.0	12	Kg-cm
			5.0	10	lbf-in

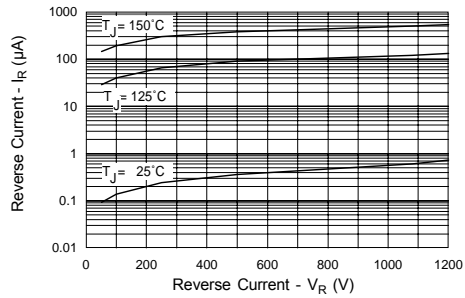
① 0.063 in. from Case (1.6mm) for 10 sec

② Typical Socket Mount

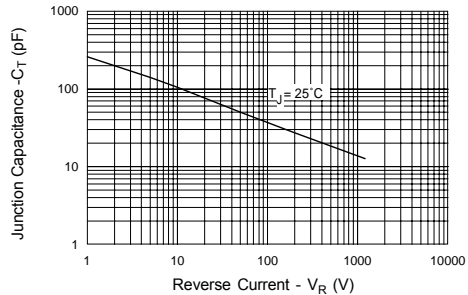
③ Mounting Surface, Flat, Smooth and Greased



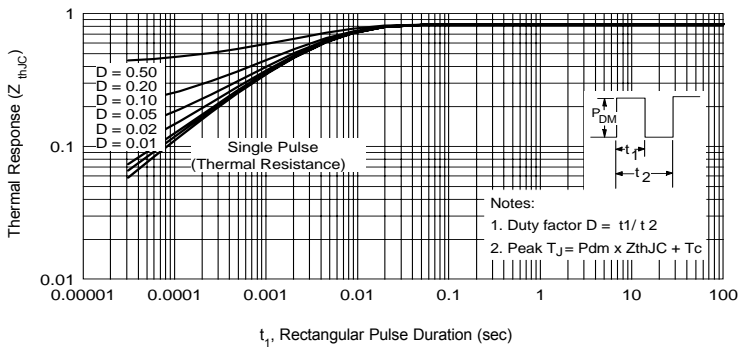
**Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current**



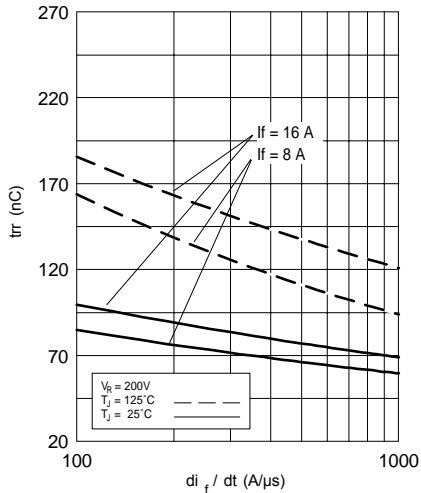
**Fig. 2 - Typical Reverse Current vs. Reverse Voltage**



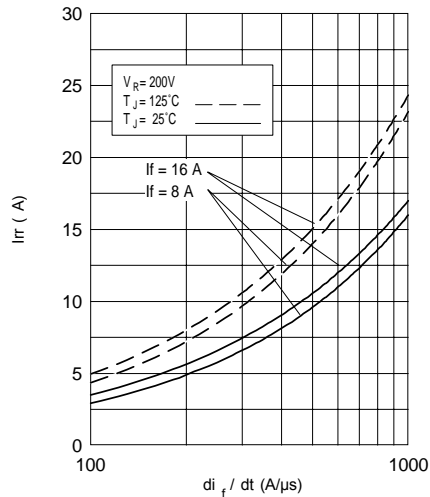
**Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage**



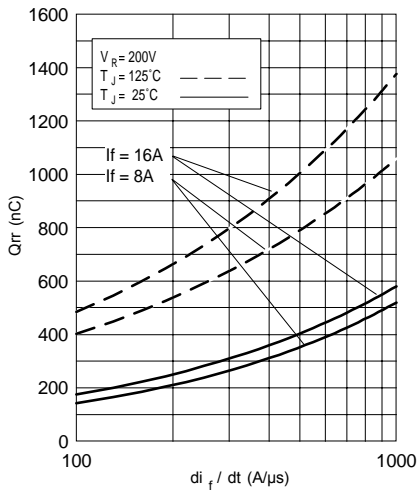
**Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics**



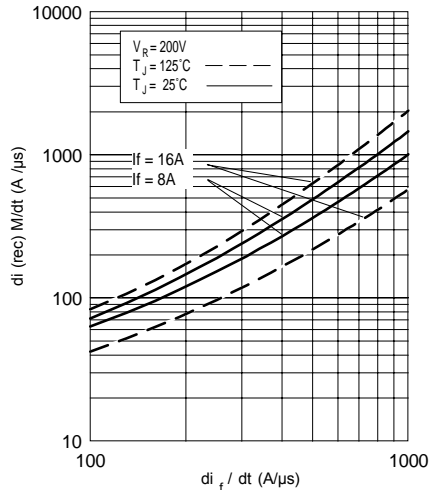
**Fig. 5 - Typical Reverse Recovery vs.  $di_f/dt$ , (per Leg)**



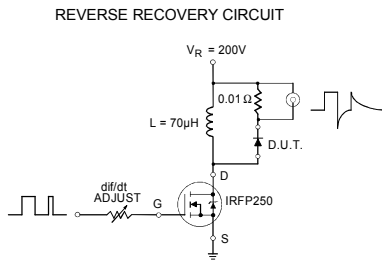
**Fig. 6 - Typical Recovery Current vs.  $di_f/dt$ , (per Leg)**



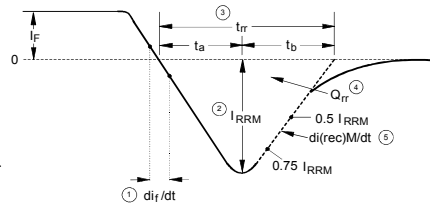
**Fig. 7 - Typical Stored Charge vs.  $di_f/dt$ , (per Leg)**



**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.  $t_{rr}$  - 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  $t_{rr}$

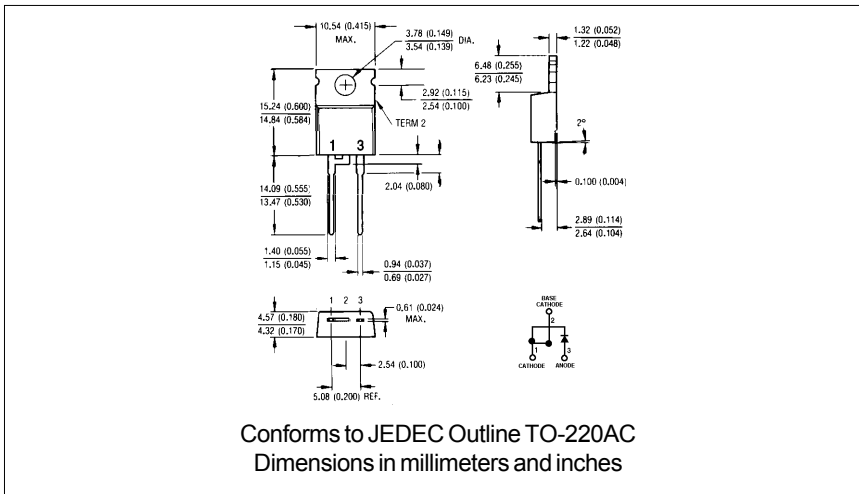
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

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

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Data and specifications subject to change without notice.