International Rectifier

Provisional Data Sheet PD-2.361

HFA16PA120C

HEXFRED™ ULTRA FAST, SOFT RECOVERY DIODE 1200V, 16A

Major Ratings and Characteristics (per Leg)

Characteristics		Units
V_R V_{RRM}	1200	V
I_F (AV)	8.0	A
t_{rr} (typ)	28	ns
Q_{RR} (typ)	140	nC
I_{RRM} (typ)	4.5	A
di(rec)M/dt (typ)	133	A/us
V_F (max)	3.3	V

Features:

- Ultra Fast Recovery
- Ultra Soft Recovery
- Very Low I_{RRM}
- Very Low Q_{rr}
- Guaranteed Avalanche
- 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

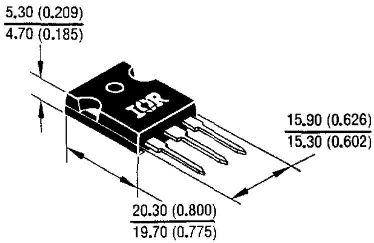
International Rectifier's HFA16PA120C is a state of the art center tap ultra fast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which results in performance which is unsurpassed by any rectifier previously available.

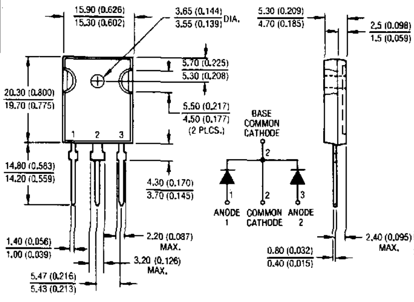
The HFA16PA120C has basic ratings of 1200 volts *and 8.0 amps per Leg continuous current. In addition* to ultra fast recovery time, the HEXFRED product line features extremely low values of peak recovery current (I_{RRM}) and does not exhibit any tendency to "snap-off" during the t_b portion of recovery.

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 HFA16PA120C is ideally suited for applications in power supplies and power conversion systems (such as inverters, converters, UPS systems, and power factor correction circuits), motor drives, and many other similar applications where high speed, high efficiency rectification is needed.

CASE STYLE AND DIMENSIONS





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

Voltage Ratings (per Leg): T_J = 25 - 150°C

Parameter		
V_R	Max D.C. Reverse Voltage (V)	1200 Volts
V_{RRM}	Max PK Repetitive Reverse Voltage (V)	
V_{RWM}	Max Working PK Reverse Voltage (V)	

Absolute Maximum Ratings (per Leg)

Parameter		Min	Typ	Max	Units	Conditions
$I_{F(AV)}$	Max Average Foward Current	—	—	8.0	A	T_C = 91°C, d.c. = 50%, rect. wave V_R = 0.8 V_{RRM}
I_{FRM}	Max Repetitive Foward Current	—	—	32		T_C = 108°C, P.W. = 10 µs, d.c. = 10% V_R = 0.8 V_{RRM}
I_{FSM}	Max Single Pulse Foward Current	—	—	130		T_C = 25°C, 1/2 Sine Wave, 60 Hz P.W. = 8.33ms
I_{AS}	Max Single Pulse Avalanche Current	—	—	8.0	A	L = 100 µH, duty cycle limited by max T_J

Electrical Specifications (per Leg): T_J = 25°C unless otherwise specified

V_{FM}	Max Foward Voltage see fig. 1	—	2.6	3.3	V	I_F = 8.0A
			3.4	4.3		I_F = 16A
			2.4	3.1		I_F = 8.0A, TJ = 125°C
I_{RM}	Max Reverse Leakage Current see fig. 2	—	0.31	10	µA	V_R = V_R Rated
			135	1000		T_J = 125°C, V_R = 0.8 X V_R Rated
C_T	Junction Capacitance see fig. 3	—	11	20	pF	V_R = 200V
L_S	Series Inductance	—	12	—	nH	Measured lead to lead 5mm from package body

Dynamic Recovery Specifications (per Leg): T_J = 25°C unless otherwise specified

t_{rr}	Reverse Recovery Time see fig. 5, 6 & 16	—	28	—	ns	I_F = 1.0A, di_f/dt = 200A/µs, V_R = 30V
t_{rr1}			63	95		I_F = 8.0A, di_f/dt = 200A/µs, V_R = 200V
t_{rr2}			106	160		T_J = 125°C
I_{RRM1}	Max Recovery Current see fig. 7 & 8	—	4.5	8.0	A	I_F = 8.0A, di_f/dt = 200A/µs, V_R = 200V
I_{RRM2}			6.2	11		T_J = 125°C
Q_{RR1}	Reverse Recovery Charge see fig. 9 & 10	—	140	380	nC	I_F = 8.0A, di_f/dt = 200A/µs, V_R = 200V
Q_{RR2}			335	880		T_J = 125°C
di(rec)M/dt	Max Rate of Fall of Recovery Current During t_b see fig. 11 & 12	—	133	—	A/µs	I_F = 8.0A, di_f/dt = 200A/µs, V_R = 200V
			85			T_J = 125°C

Thermal-Mechanical Specifications

T_J, T_{STG}	Junction and storage temp range	-55	—	150	°C	
T_{lead}	Lead Temperature	—	—	300		0.063 in. from Case (1.6mm) for 10 sec
R_{thJC}	Thermal Resistance, Junction to Case	—	—	1.7	K/W	Single Leg Conducting
				0.85		Both Legs Conducting
R_{thJA}	Thermal Resistance, Junction to Ambient	—	—	40		Typical Socket Mount
R_{thCS}	Thermal Resistance, Case to Heat Sink	—	0.25	—		Mounting surface, Flat, Smooth and Greased
W_T	Weight	—	6.0	—	g	
			0.21	—	oz	
T	Mounting Torque	6.0	—	12	Kg-cm	
		5.0		10	lbf-in	
Case	T0-247AC	—	—	—	—	JEDEC

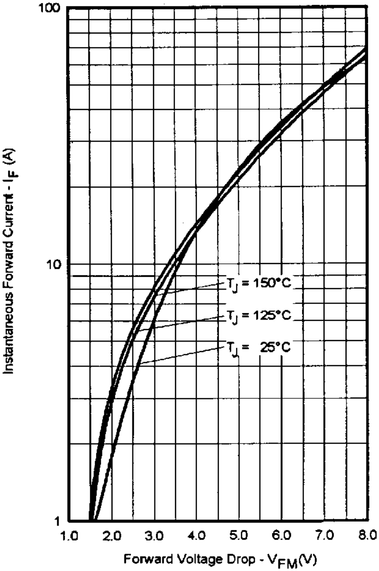


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current, (per Leg)

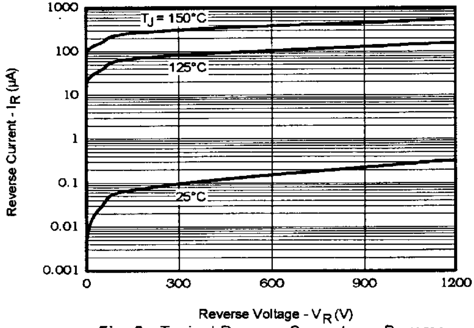


Fig. 2 - Typical Reverse Current vs. Reverse Voltage, (per Leg)

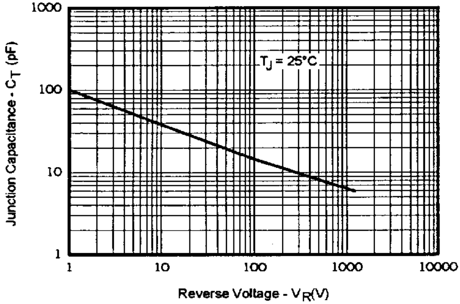


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)

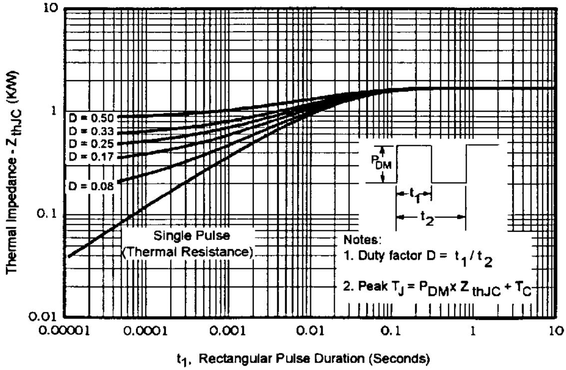


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics, (per Leg)

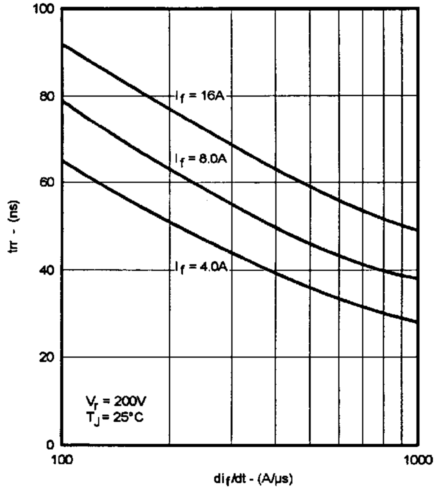


Fig. 5 - Typical Reverse Recovery vs. di_f/dt, (per Leg)

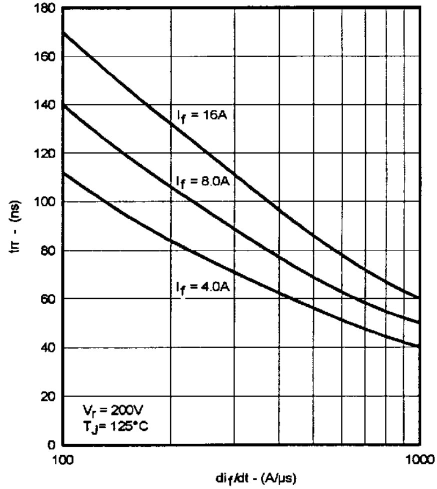


Fig. 6 - Typical Reverse Recovery vs. di_f/dt, (per Leg)

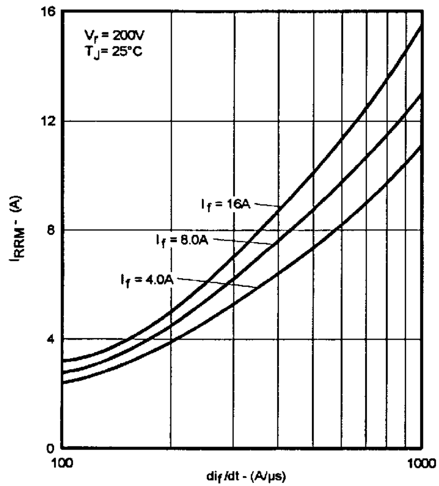


Fig. 7 - Typical Recovery Current vs. di_f/dt, (per Leg)

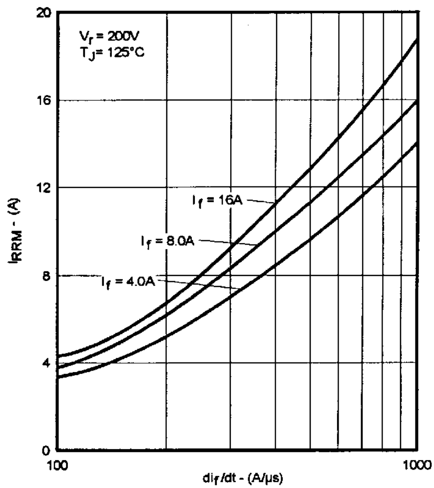


Fig. 8 - Typical Recovery Current vs. di_f/dt, (per Leg)

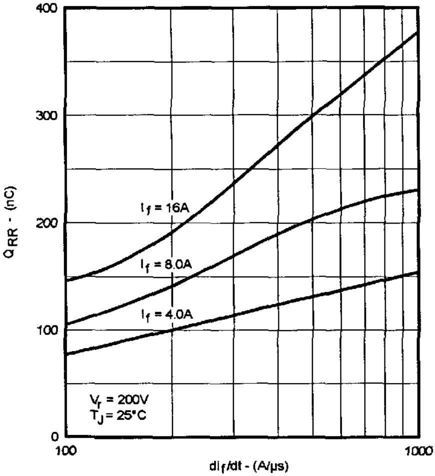


Fig. 9 - Typical Stored Charge vs. di$_f$/dt, (per Leg)

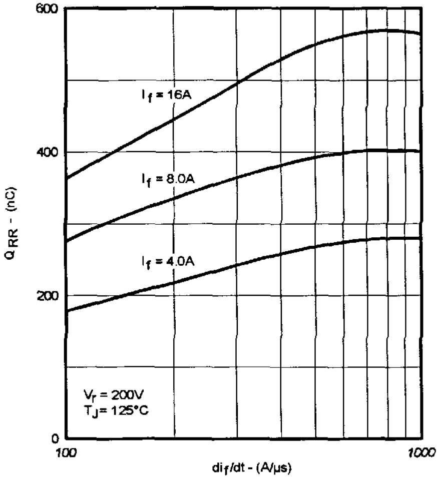


Fig. 10 - Typical Stored Charge vs. di$_f$/dt, (per Leg)

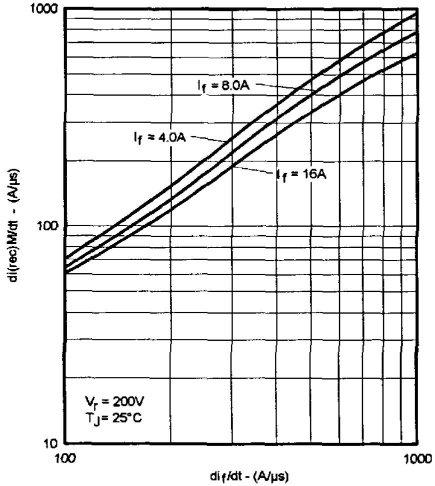


Fig. 11 - Typical di(rec)M/dt vs. di$_f$/dt, (per Leg)

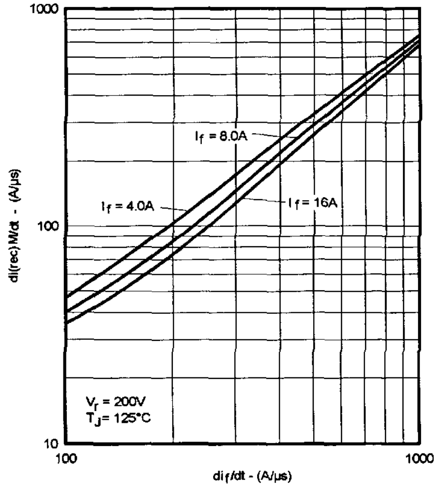


Fig. 12 - Typical di(rec)M/dt vs. di$_f$/dt, (per Leg)

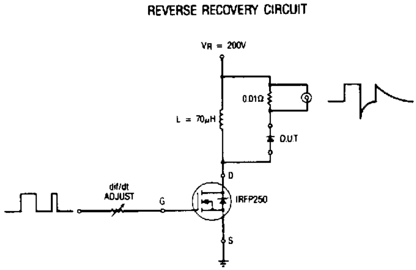
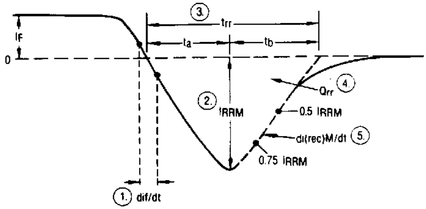


Fig. 13 - Reverse Recovery Parameter Test Circuit



1. dif/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}

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

5. di(rec)M/dt — Peak rate of change of current during t_b portion of t_{rr}

Fig. 14 - Reverse Recovery Waveform and Definitions

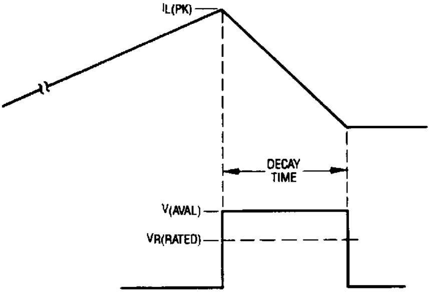
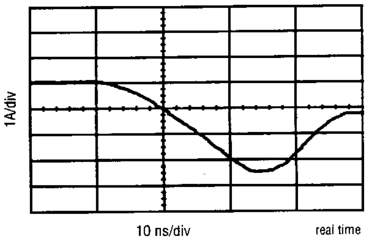


Fig. 15 - Avalanche Current and Voltage Waveforms



COND.	READINGS
I_F = 1A	t_{rr} = 28 ns
dif/dt = 200A/μs	I_{RRM} = 2.4A
T_J = 25°C	Q_{rr} = 34 nC
V_R = 30V	di(rec)M/dt = 213A/μs

Fig. 16 - Oscilloscope Display of Recovery Characteristic

International
IOR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322-3331, Twx: 4720403
EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB England, Tel: (0883) 713215, Twx: 95219

IR CANADA: 101 Bentley St., Markham, Ontario L3R 3L1, Tel: (416) 475-1897. **IR GERMANY:** Saalburgstrasse 157, D-6380 Bad Homburg, Tel: 6172-37066. **IR ITALY:** Via Liguria 49 10071 Borgaro, Torino, Tel: (011) 470 1484. **IR FAR EAST:** K&H Building, 30-4 Nishiikebukuro 3-Chome, Toshima-ku, Tokyo 171 Japan, Tel: (03) 983 0641. **IR SOUTHEAST ASIA:** 190 Middle Road, HEX 10-01 Fortune Centre, Singapore 0718, Tel: (65) 336 3922.

Sales Offices, Agents and Distributors in Major Cities Throughout the World.

Printed in U.S.A. 4/92