Bulletin PD -2.399 rev. A 11/00

International
IOR Rectifier

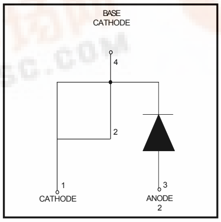
HFA04TB60

HEXFRED™

Ultrafast, Soft Recovery Diode

Features

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



V_R = 600V

V_F = 1.8V

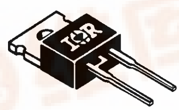
Q_{rr} * = 40nC

$di_{(rec)M}/dt$ * = 280A/μs

* 125°C

Benefits

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



TO-220AC

Description

International Rectifier's HFA04TB60 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 8 amps per Leg continuous current, the HFA04TB60 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 HFA04TB60 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	4.0	
I_{FSM}	Single Pulse Forward Current	25	A
I_{FRM}	Maximum Repetitive Forward Current	16	
P_D @ T_C = 25°C	Maximum Power Dissipation	25	W
P_D @ T_C = 100°C	Maximum Power Dissipation	10	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	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		1.5	1.8	V	I_F = 4.0A	See Fig. 1
			1.8	2.2		I_F = 8.0A	
			1.4	1.7		I_F = 4.0A, T_J = 125°C	
I_{RM}	Max Reverse Leakage Current		0.17	3.0	µA	V_R = V_R Rated	See Fig. 2
			44	300		T_J = 125°C, V_R = 0.8 x V_R Rated	
C_T	Junction Capacitance		4.0	8.0	pF	V_R = 200V	See Fig. 3
L_S	Series Inductance		8.0		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		17		ns	I_F = 1.0A, di_f/dt = 200A/µs, V_R = 30V	
t_{rr1}	See Fig. 5, 6 & 16		28	42		T_J = 25°C	I_F = 4.0A
t_{rr2}			38	57		T_J = 125°C	
I_{RRM1}	Peak Recovery Current		2.9	5.2	A	T_J = 25°C	V_R = 200V
I_{RRM2}	See Fig. 7& 8		3.7	6.7		T_J = 125°C	
Q_{rr1}	Reverse Recovery Charge		40	60	nC	T_J = 25°C	di_f/dt = 200A/µs
Q_{rr2}	See Fig. 9 & 10		70	105		T_J = 125°C	
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current		280		A/µs	T_J = 25°C	
$di_{(rec)M}/dt2$	During t_b See Fig. 11 & 12		235			T_J = 125°C	

Thermal - Mechanical Characteristics

	Parameter	Min	Typ	Max	Units
T_{lead}①	Lead Temperature			300	℃
R_{thJC}	Thermal Resistance, Junction to Case			5.0	K/W
R_{thA}②	Thermal Resistance, Junction to Ambient			80	
R_{thS}③	Thermal Resistance, Case to Heat Sink		0.5		
Wt	Weight		2.0		g
			0.07		(oz)
T	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

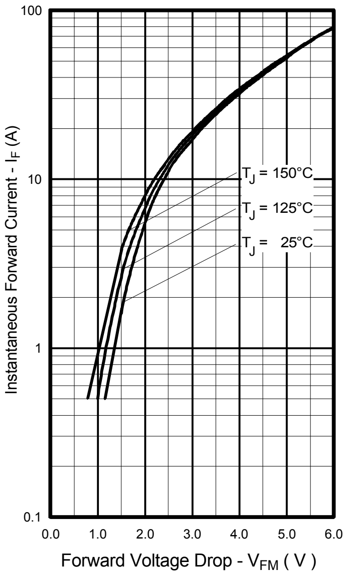


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current,

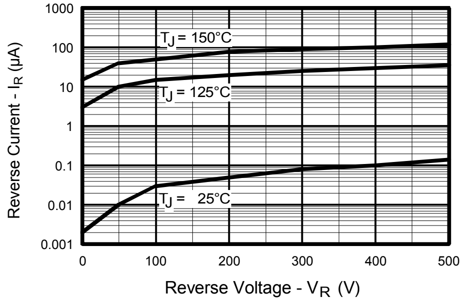


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

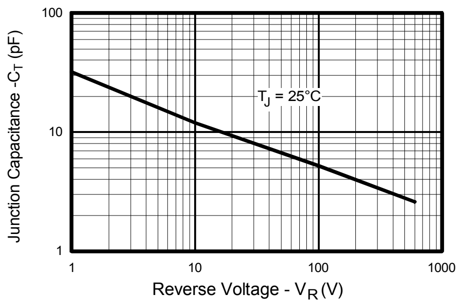


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

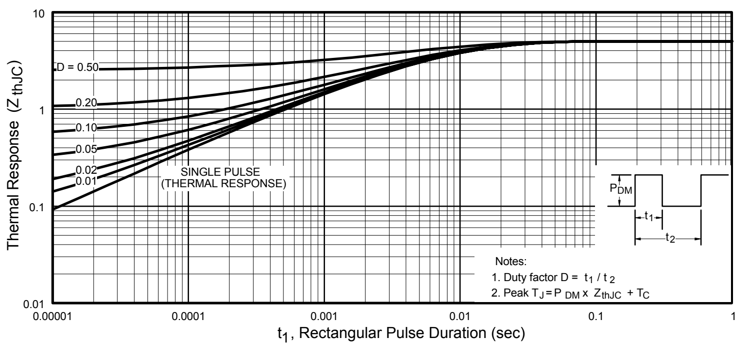


Fig. 4 - Maximum Thermal Impedance Z_{thjc} Characteristics

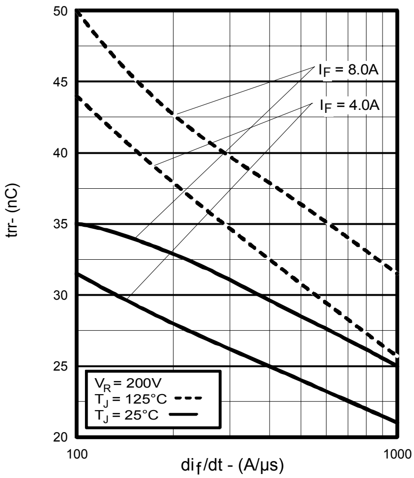


Fig. 5 - Typical Reverse Recovery vs. di_f/dt

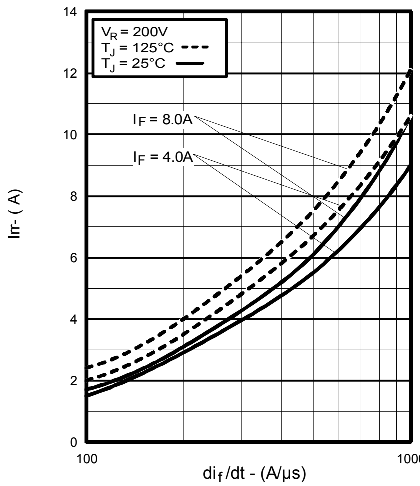


Fig. 6 - Typical Recovery Current vs. di_f/dt

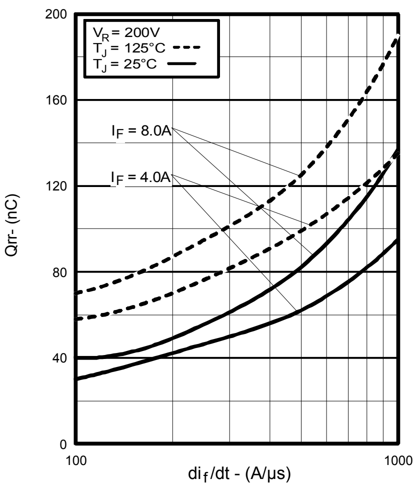


Fig. 7 - Typical Stored Charge vs. di_f/dt

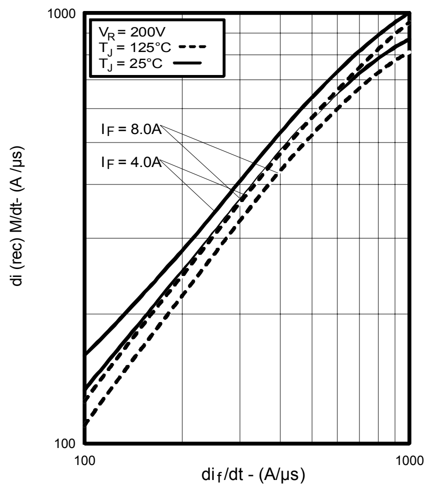


Fig. 8 - Typical $di_{(rec)M}/dt$ vs. di_f/dt,

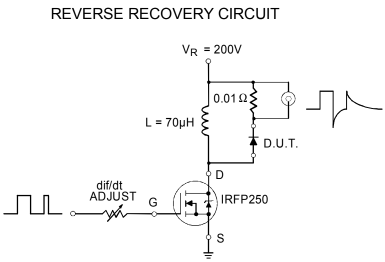
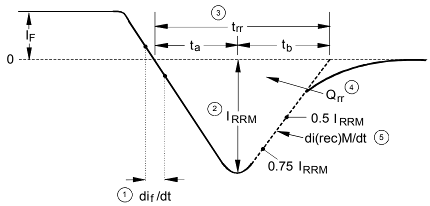


Fig. 9 - Reverse Recovery Parameter Test Circuit

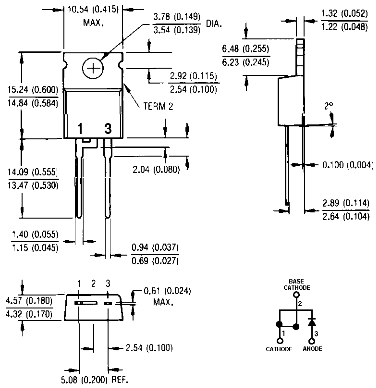


1. di_f/dt - Rate of change of current through zero crossing
2. I_{RRM} - Peak reverse recovery current
3. trr - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current
4. Q_{rr} - Area 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-220AC
Dimensions in millimeters and inches

International IOR Rectifier

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