Bulletin PD-21078 rev. A 10/06

International
IOR Rectifier

8ETU04PbF

Ultrafast Rectifier

Features

- Ultrafast Recovery Time
- Low Forward Voltage Drop
- Low Leakage Current
- 175°C Operating Junction Temperature
- Lead-Free ("PbF" data sheet)

t_{rr} = 60ns
$I_{F(AV)}$ = 8Amp
V_R = 400V

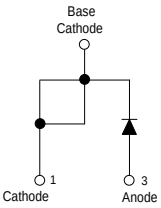
Description/ Applications

International Rectifier's FRED.. series are the state of the art Ultra fast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultra fast recovery time.
The planar structure and the platinum doped life time control, guarantee the best overall performance, ruggedness and reliability characteristics.
These devices are intended for use in the output rectification stage of SMPS, UPS, DC-DC converters as well as free-wheeling diode in low voltage inverters and chopper motor drives.
Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

Absolute Maximum Ratings

	Parameters	Max	Units
V_{RRM}	Peak Repetitive Peak Reverse Voltage	400	V
$I_{F(AV)}$	Average Rectified Forward Current, T_C = 155°C	8	A
I_{FSM}	Non Repetitive Peak Surge Current, T_C = 25°C	100	
I_{FRM}	Peak Repetitive Forward Current	16	
T_J, T_{STG}	Operating Junction and Storage Temperatures	- 65 to 175	°C

Case Styles



TO-220AC

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

Parameters		Min	Typ	Max	Units	Test Conditions
V_{BR}, V_r	Breakdown Voltage, Blocking Voltage	400	-	-	V	I_R = 100µA
V_F	Forward Voltage	-	1.19	1.3	V	I_F = 8A
		-	0.94	1.0	V	I_F = 8A, T_J = 150°C
I_R	Reverse Leakage Current	-	0.2	10	µA	V_R = V_R Rated
		-	20	500	µA	T_J = 150°C, V_R = V_R Rated
C_T	Junction Capacitance	-	14	-	pF	V_R = 400V
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)

Parameters		Min	Typ	Max	Units	Test Conditions	
t_{rr}	Reverse Recovery Time	-	35	60	ns	I_F = 1.0A, di_F/dt = 50A/µA, V_R = 30V	
		-	43	-		T_J = 25°C	I_F = 8A V_R = 200V di_F/dt = 200A/µs
			67			T_J = 125°C	
I_{RRM}	Peak Recovery Current	-	2.8	-	A	T_J = 25°C	
		-	6.3	-		T_J = 125°C	
Q_{rr}	Reverse Recovery Charge	-	60	-	nC	T_J = 25°C	
		-	210	-		T_J = 125°C	

Thermal - Mechanical Characteristics

Parameters		Min	Typ	Max	Units
R_{thJC}	Thermal Resistance, Junction to Case	-	1.8	2	°C/W
R_{thJA} ①	Thermal Resistance, Junction to Ambient	-	-	50	
R_{thCS} ②	Thermal Resistance, Case to Heatsink	-	0.5	-	
Wt	Weight	-	2.0	-	g
		-	0.07	-	(oz)
	Mounting Torque	6.0	-	12	Kg-cm
		5.0	-	10	lbf.in
	Marking Device	8ETU04			

① Typical Socket Mount
② Mounting Surface, Flat, Smooth and Greased

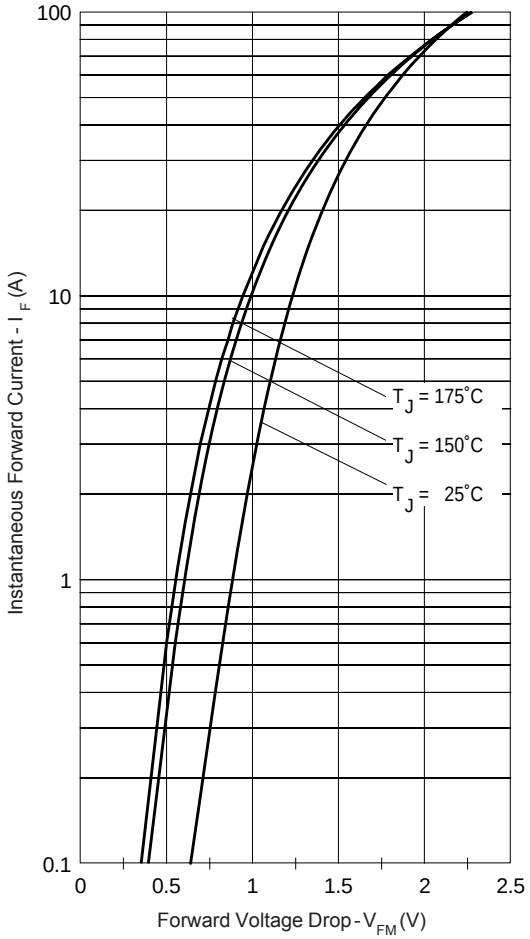


Fig. 1 - Typical Forward Voltage Drop Characteristics

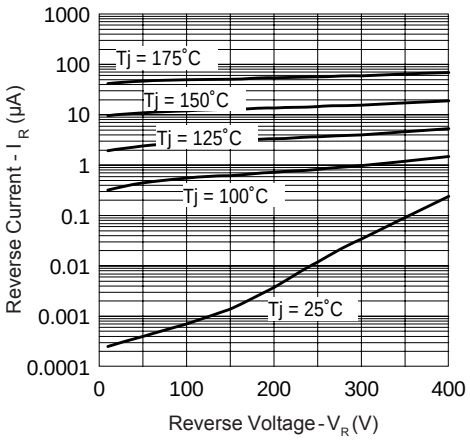


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage

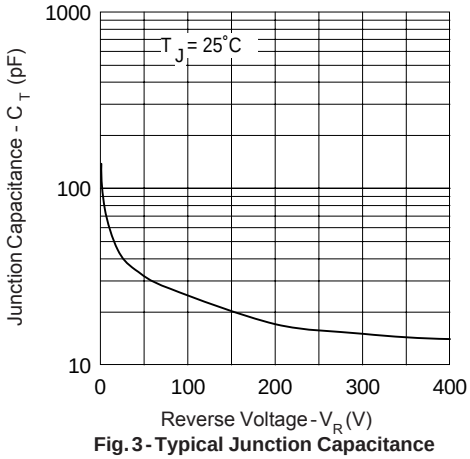


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

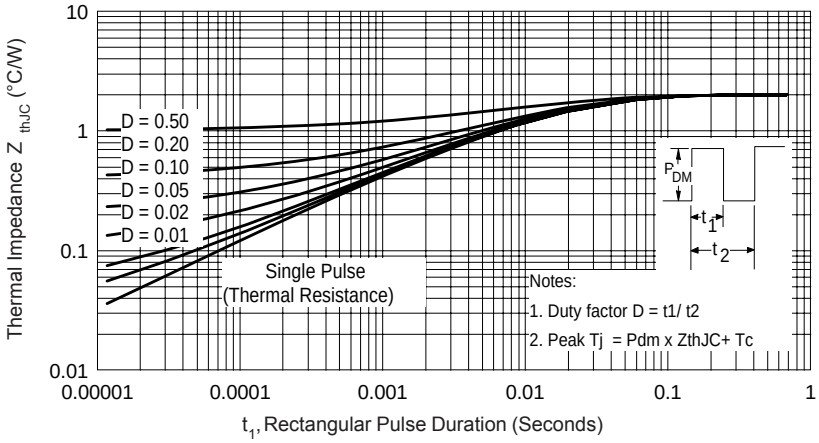


Fig. 4 - Max. Thermal Impedance Z_{thJC} Characteristics

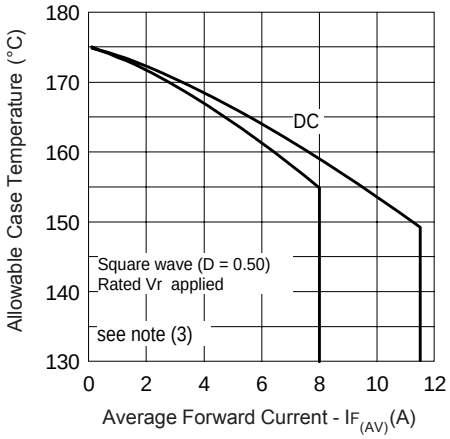


Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current

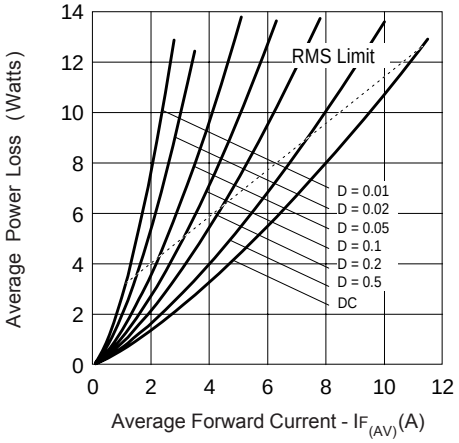


Fig. 6 - Forward Power Loss Characteristics

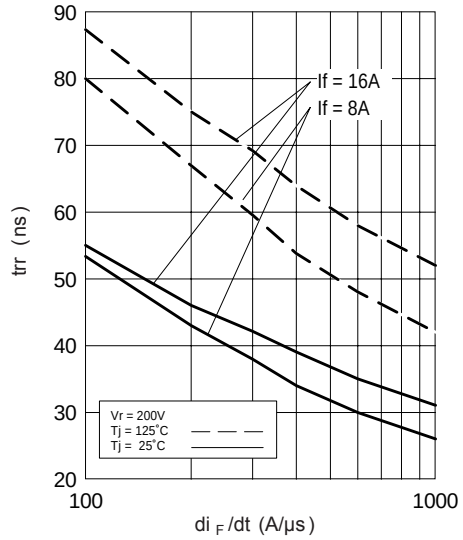


Fig. 7 - Typical Reverse Recovery vs. di_F/dt

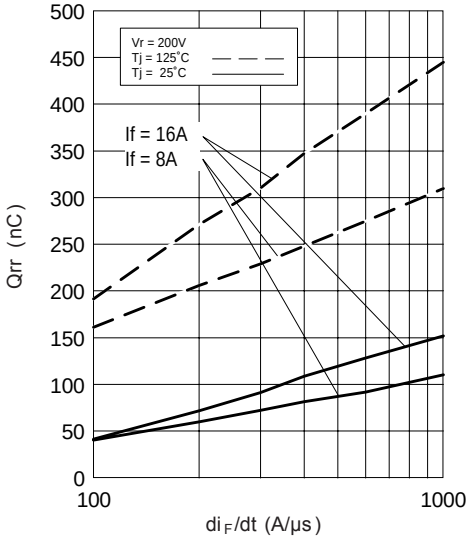


Fig. 8 - Typical Stored Charge vs. di_F/dt

(3) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = Forward Power Loss = $I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$ (see Fig. 6);
Pd_{REV} = Inverse Power Loss = $V_{R1} \times I_R (1 - D)$; $I_R @ V_{R1}$ = rated V_R

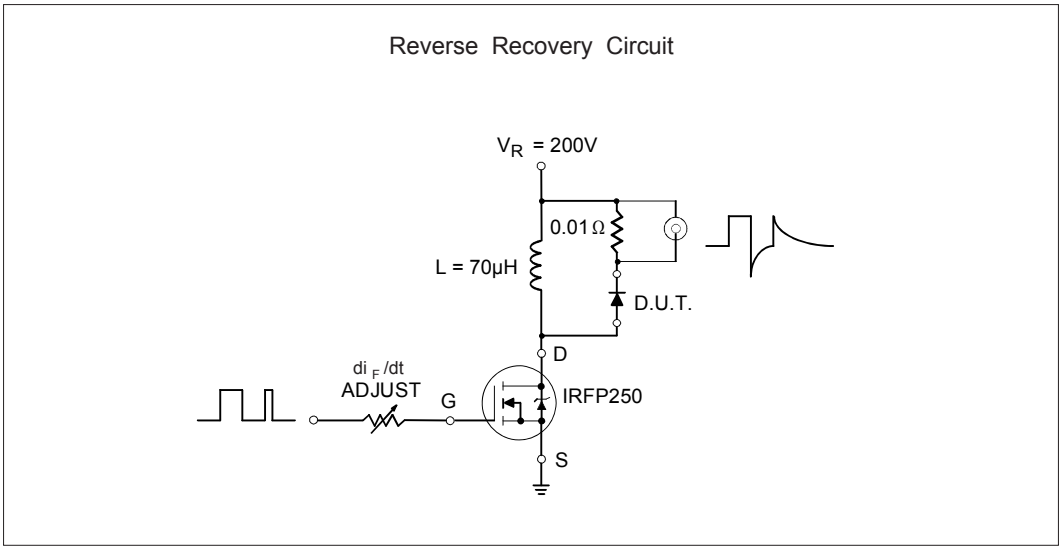
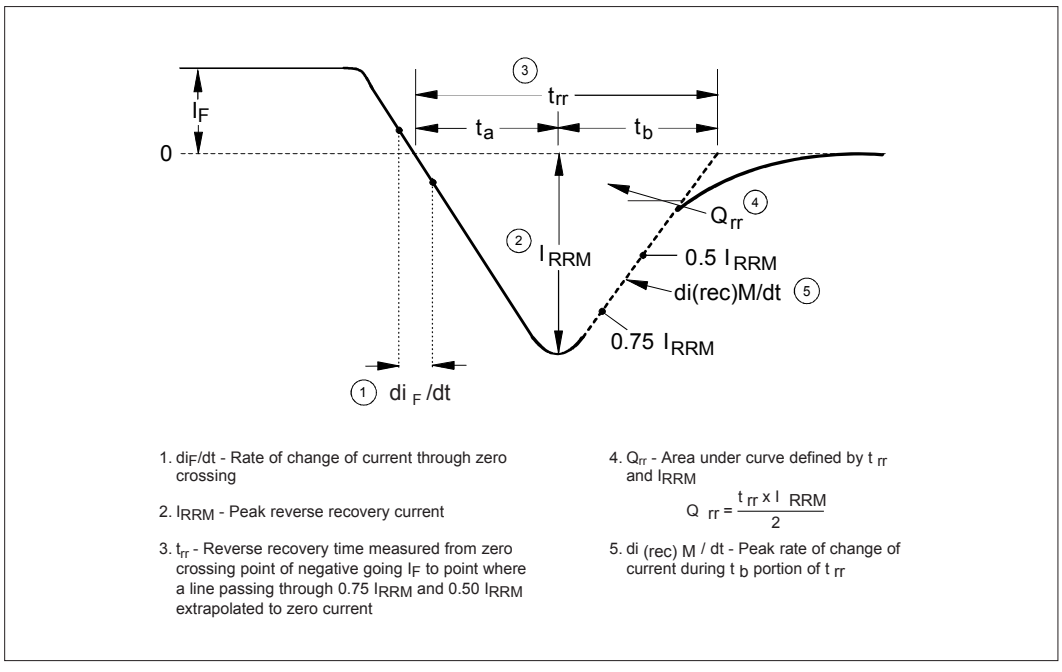


Fig. 9- Reverse Recovery Parameter Test Circuit



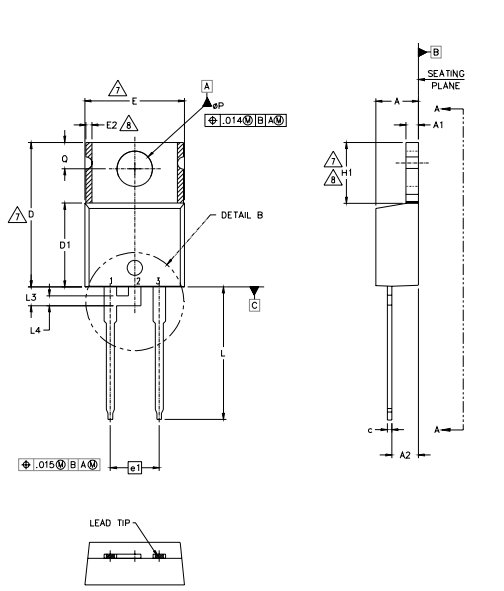
1. di_F/dt - Rate of change of current through zero crossing
2. I_{RRM} - Peak reverse recovery current
3. t_{rr} - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current
4. Q_{rr}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

Outline Table



NOTES:
1.- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3.- LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
4.- DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5.- DIMENSION b1, b3 & c1 APPLY TO BASE METAL ONLY.
6.- CONTROLLING DIMENSION : INCHES.
7.- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
8.- DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.
9.- OUTLINE CONFORMS TO JEDEC TO-220, D2 (min) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.83	.140	.190	
A1	0.51	1.40	.020	.055	
A2	2.03	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.97	.015	.038	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	
D2	11.68	12.88	.460	.507	7
E	9.65	10.67	.380	.420	4,7
E1	6.86	8.89	.270	.350	7
E2	–	0.76	–	.030	8
e	2.54 BSC		.100 BSC		
e1	5.08 BSC		.200 BSC		
H1	5.84	6.86	.230	.270	7,8
L	12.70	14.73	.500	.580	
L1	–	6.35	–	.250	3
L3	1.78	2.13	.070	.084	
L4	0.76	1.27	.030	.050	3
øP	3.53	3.73	.139	.147	
Q	2.54	3.05	.100	.120	

LEAD ASSIGNMENTS
DIODES
1+2.- CATHODE
3.- ANODE

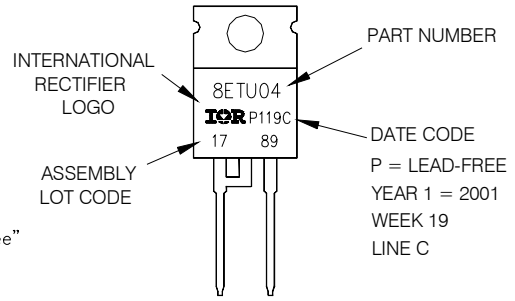
Conforms to JEDEC Outline TO-220AC
Dimensions in millimeters and (inches)

Part Marking Information

IRXC Assembly Line

EXAMPLE: THIS IS A 8ETU04
LOT CODE 1789
ASSEMBLED ON WW 19, 2001
IN THE ASSEMBLY LINE "C"

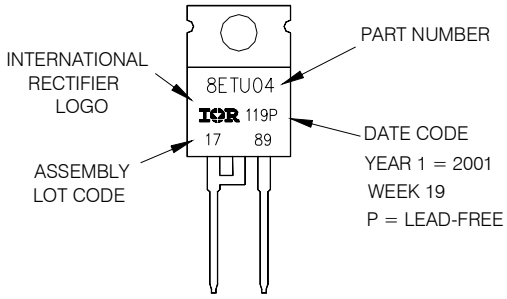
Note: "P" in the beginning of date code indicates "Lead–Free"



IRMX Assembly Line

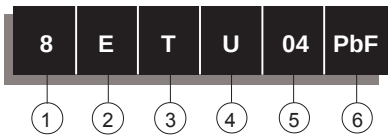
EXAMPLE: THIS IS A 8ETU04
LOT CODE 1789
ASSEMBLED ON WW 19, 2001
IN THE ASSEMBLY LINE "C"

Note: "P" in assembly line position indicates "Lead–Free"



Ordering Information Table

Device Code



1 - Current Rating (8 = 8A)
2 - E = Single Diode
3 - Package
T = TO-220
4 - U = UltraFast Recovery
5 - Voltage Rating (04 = 400V)
6 - • none = Standard Production
• PbF = Lead-Free

Tube Standard Pack Quantity : 50 pieces

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level and Lead-Free.
Qualification Standards can be found on IR's Web site.

International
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Visit us at www.irf.com for sales contact information. 10/06

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