Bulletin PD-20886 rev. A 10/06

International
IOR Rectifier

15ETH06PbF
15ETH06FPPbF

Hyperfast Rectifier

Features

- Hyperfastfast Recovery Time
- Low Forward Voltage Drop
- Low Leakage Current
- 175°C Operating Junction Temperature
- Single Die Center Tap Module
- UL E78996 approved
- Lead-Free ("PbF")

t_{rr} = 22ns typ.
$I_{F(AV)}$ = 15Amp
V_R = 600V

Description/ Applications

State of the art Hyperfast recovery rectifiers designed with optimized performance of forward voltage drop, Hyperfast recover time, and soft recovery.
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 PFC Boost stage in the AC-DC section of SMPS, inverters or as freewheeling diodes.
The IR extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

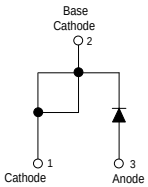
Absolute Maximum Ratings

	Parameters	Max	Units
V_{RRM}	Peak Repetitive Reverse Voltage	600	V
$I_{F(AV)}$	Average Rectified Forward Current @ T_C = 140°C	15	A
	@ T_C = 80°C (FULLPACK)		
I_{FSM}	Non Repetitive Peak Surge Current @ T_J = 25°C	120	
	(FULLPACK)	180	
I_{FM}	Peak Repetitive Forward Current	30	
T_J, T_{STG}	Operating Junction and Storage Temperatures	- 65 to 175	°C

Case Styles

15ETH06PbF

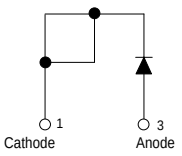




TO-220AC

15ETH06FPPbF





TO-220 FULLPACK

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

	Parameters	Min	Typ	Max	Units	Test Conditions
V_{BR}, V_r	Breakdown Voltage, Blocking Voltage	600	-	-	V	I_R = 100µA
V_F	Forward Voltage	-	1.8	2.2	V	I_F = 15A, T_J = 25°C
		-	1.3	1.6	V	I_F = 15A, T_J = 150°C
I_R	Reverse Leakage Current	-	0.2	50	µA	V_R = V_R Rated
		-	30	500	µA	T_J = 150°C, V_R = V_R Rated
C_T	Junction Capacitance	-	20	-	pF	V_R = 600V
L_S	Series Inductance	-	8.0	-	nH	Measured lead to lead 5mm from package body

Dynamic Recovery Characteristics @ T_C = 25°C (unless otherwise specified)

	Parameters	Min	Typ	Max	Units	Test Conditions	
t_{rr}	Reverse Recovery Time	-	22	30	ns	I_F = 1A, di_F/dt = 100A/µs, V_R = 30V	
		-	28	35		I_F = 15A, di_F/dt = 100A/µs, V_R = 30V	
			29	-	-	T_J = 25°C	I_F = 15A di_F/dt = 200A/µs V_R = 390V
		-	75	-		T_J = 125°C	
I_{RRM}	Peak Recovery Current	-	3.5	-	A	T_J = 25°C	
		-	7	-		T_J = 125°C	
Q_{rr}	Reverse Recovery Charge	-	57	-	nC	T_J = 25°C	
		-	300	-		T_J = 125°C	
t_{rr}	Reverse Recovery Time	-	51	-	ns	T_J = 125°C	I_F = 15A di_F/dt = 800A/µs V_R = 390V
I_{RRM}	Peak Recovery Current	-	20	-	A		
Q_{rr}	Reverse Recovery Charge	-	580	-	nC		

Thermal - Mechanical Characteristics

	Parameters		Min	Typ	Max	Units
T_J	Max. Junction Temperature Range		-	-	175	°C
T_{Stg}	Max. Storage Temperature Range		- 65	-	175	
R_{thJC}	Thermal Resistance, Junction to Case	Per Leg	-	1.0	1.3	°C/W
		(Fullpack) Per Leg	-	3.0	3.5	
R_{thJA} ①	Thermal Resistance, Junction to Ambient	Per Leg	-	-	70	
R_{thCS} ②	Thermal Resistance, Case to Heatsink		-	0.5	-	
	Weight		-	2.0	-	g
			-	0.07	-	(oz)
	Mounting Torque		6.0	-	12	Kg-cm
			5.0	-	10	lbf.in

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

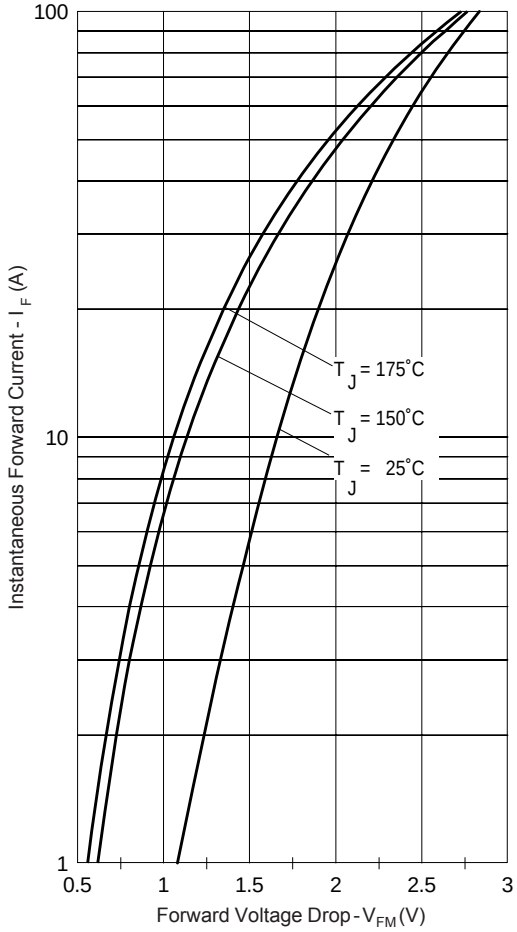


Fig. 1 - Typical Forward Voltage Drop Characteristics

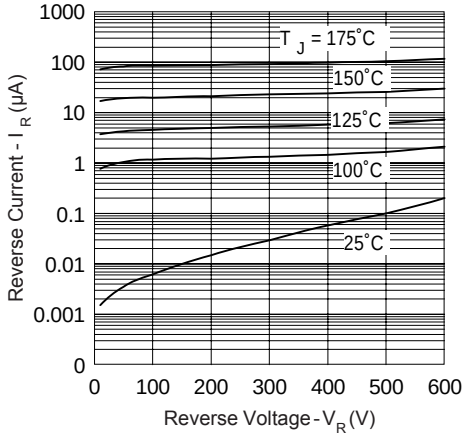


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage

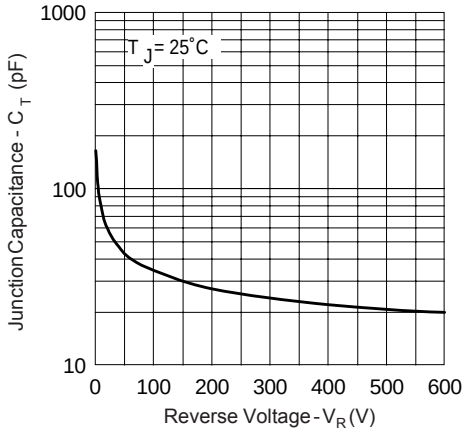


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

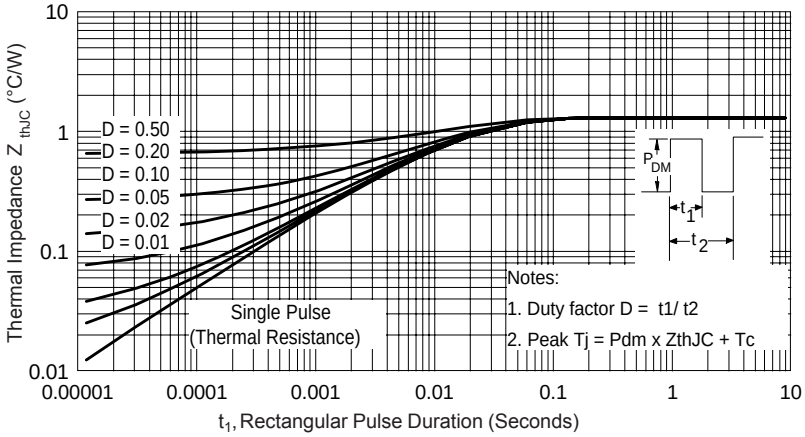


Fig. 4 - Max. Thermal Impedance Z_{thJC} Characteristics

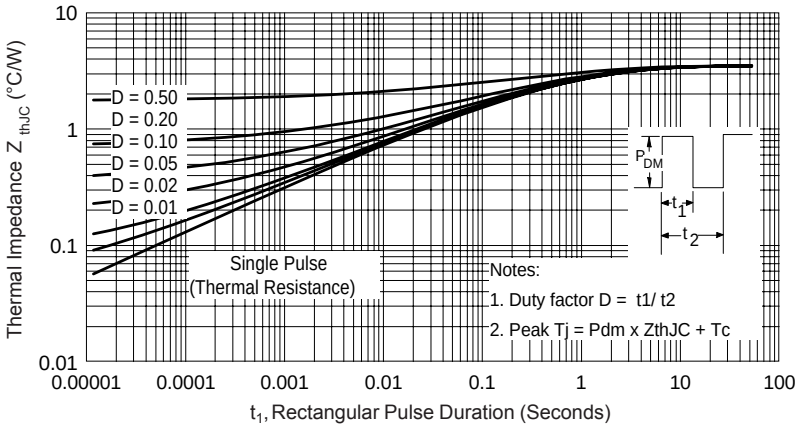


Fig. 5 - Max. Thermal Impedance Z_{thJC} Characteristics (FULLPACK)

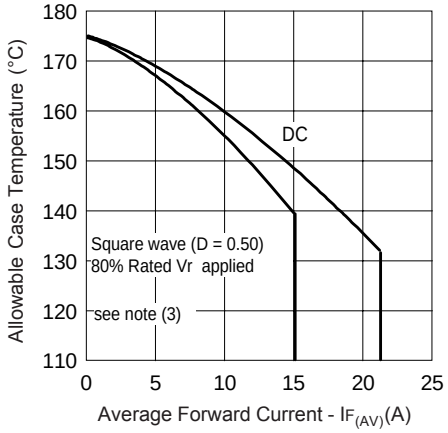


Fig. 6 - Max. Allowable Case Temperature Vs. Average Forward Current

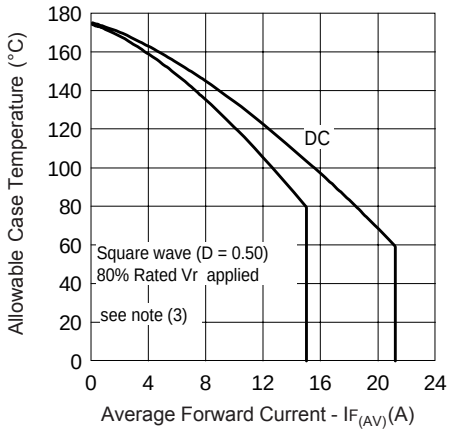


Fig. 7 - Max. Allowable Case Temperature Vs. Average Forward Current (FULLPACK)

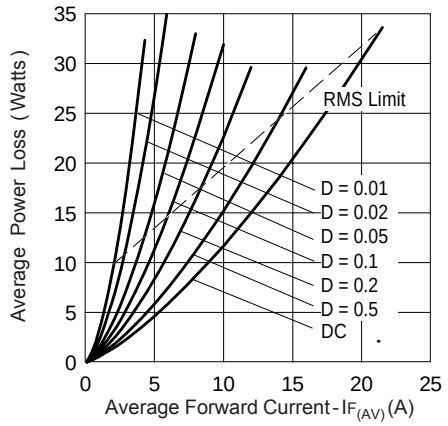


Fig. 8 - Forward Power Loss Characteristics

(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. 8);
Pd_{REV} = Inverse Power Loss = $V_{R1} \times I_R (1 - D)$;
$I_R @ V_{R1}$ = rated V_R

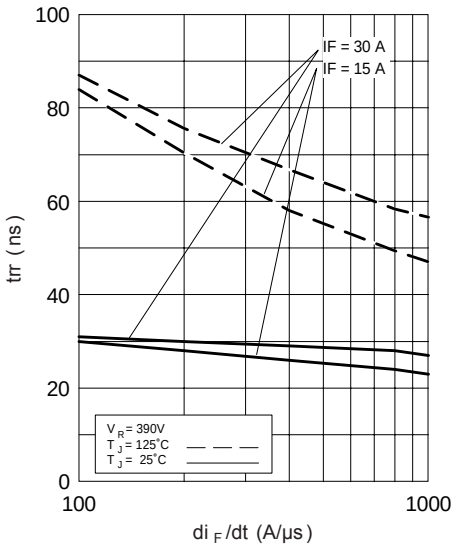


Fig. 7 - Typical Reverse Recovery vs. di_F/dt

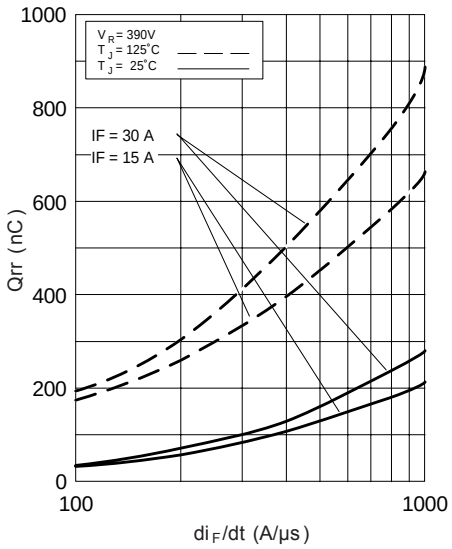


Fig. 8 - Typical Stored Charge vs. di_F/dt

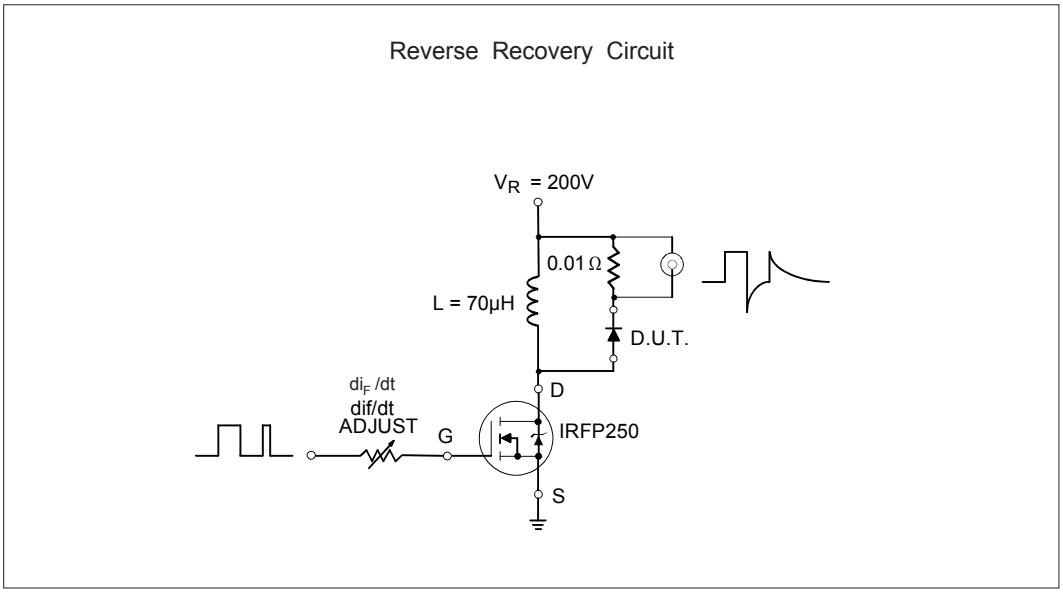
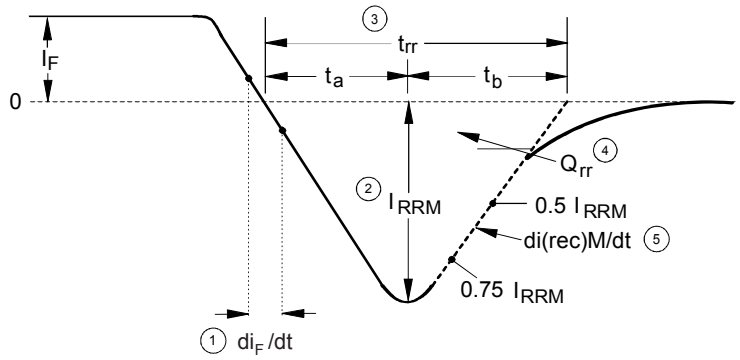


Fig. 11- Reverse Recovery Parameter Test Circuit



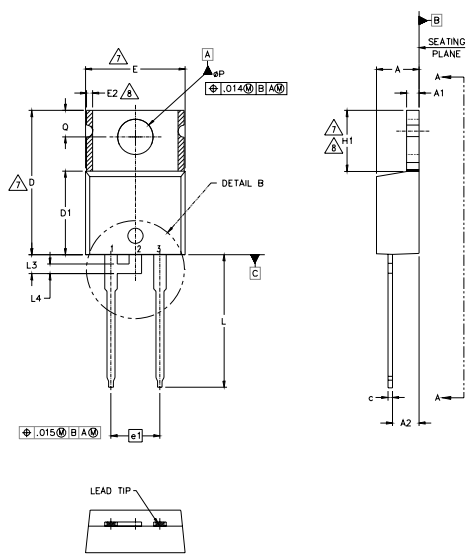
1. di_F/dt - Rate of change of current through zero crossing
2. I_{RRM} - Peak reverse recovery current
3. t_{rr} - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current
4. Q_{rr} - 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. 12 - Reverse Recovery Waveform and Definitions

Outline Table



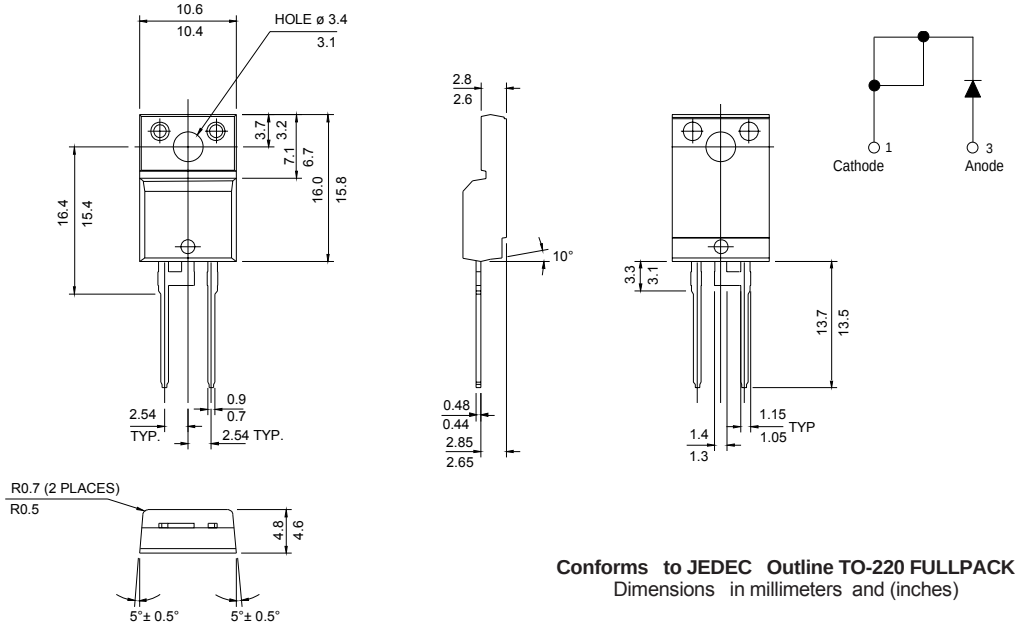
NOTES:
1.- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3.- LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
4.- DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT 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)

Outline Table



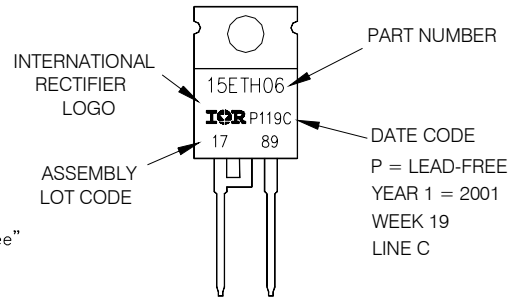
Conforms to JEDEC Outline TO-220 FULLPACK
Dimensions in millimeters and (inches)

Part Marking Information (TO-220)

IRXC Assembly Line

EXAMPLE: THIS IS A 15ETH06
LOT CODE 1789
ASSEMBLED ON WW 19, 2001
IN THE ASSEMBLY LINE "C"

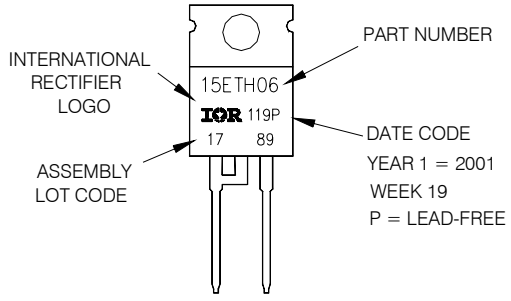
Note: "P" in the beginning of date code indicates "Lead-Free"



IRMX Assembly Line

EXAMPLE: THIS IS A 15ETH06
LOT CODE 1789
ASSEMBLED ON WW 19, 2001
IN THE ASSEMBLY LINE "C"

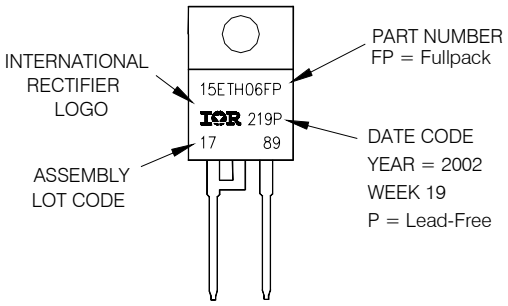
Note: "P" in assembly line position indicates "Lead-Free"



Part Marking Information (TO-220 FULL-PAK)

EXAMPLE: THIS IS A 15ETH06FP
LOT CODE 1789
ASSEMBLED ON WW 19, 2002
IN THE ASSEMBLY LINE "C"

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



Ordering Information Table

Device Code

15	E	T	H	06	FP	PbF
1	2	3	4	5	6	7

1 - Current Rating (15 = 15A)
2 - E = Single Diode
3 - T = TO-220, D^2Pak
4 - H = HyperFast Recovery
5 - Voltage Rating (06 = 600V)
6 - • none = TO-220AC
• FP = TO-220 FULLPACK
7 - • 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
IOR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7309
Visit us at www.irf.com for sales contact information. 12/06