

Ultra-low V_F Hyperfast Rectifier for Discontinuous Mode PFC

Features

- Benchmark Ultra-low Forward Voltage Drop
- Hyperfast Recovery Time
- Low Leakage Current
- 175°C Operating Junction Temperature
- Fully Isolated package ($V_{INS} = 2500 V_{RMS}$)
- UL E78996 approved 
- Lead-Free ("PbF" suffix)

$$V_F = 0.99V \text{ typ.}$$

$$I_{F(AV)} = 15Amp$$

$$V_R = 600V$$

Description

State of the art, ultra-low V_F , soft-switching Hyperfast Rectifiers optimized for Discontinuous (Critical) Mode (DCM) Power Factor Correction (PFC).

The minimised conduction loss, optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

The device is also intended for use as a free wheeling diode in power supplies and other power switching applications.

Applications

AC-DC SMPS 70W-400W

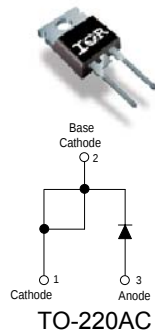
e.g. Laptop & Printer AC Adaptors, Desktop PC, TV & Monitor, Games units and DVD AC-DC power supplies.

Absolute Maximum Ratings

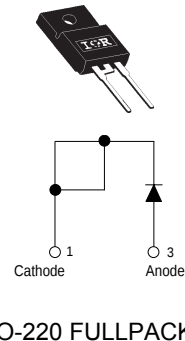
Parameters	Max	Units
V_{RRM} Peak Repetitive Reverse Voltage	600	V
$I_{F(AV)}$ Average Rectified Forward Current @ $T_C = 154^\circ C$ @ $T_C = 120^\circ C$ (FULLPACK)	15	A
I_{FSM} Non Repetitive Peak Surge Current @ $T_J = 25^\circ C$	250	
I_{FM} Peak Repetitive Forward Current	30	
T_J, T_{STG} Operating Junction and Storage Temperatures	- 65 to 175	$^\circ C$

Case Styles

15ETL06PbF



15ETL06FPPbF



Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Parameters	Min	Typ	Max	Units	Test Conditions
V_{BR}, V_r Breakdown Voltage, Blocking Voltage	600	-	-	V	$I_R = 100\mu\text{A}$
V_F Forward Voltage	-	0.99	1.05	V	$I_F = 15\text{A}, T_J = 25^\circ\text{C}$
	-	0.85	0.92	V	$I_F = 15\text{A}, T_J = 150^\circ\text{C}$
I_R Reverse Leakage Current	-	0.1	10	μA	$V_R = V_R \text{ Rated}$
	-	15	120	μA	$T_J = 150^\circ\text{C}, V_R = V_R \text{ Rated}$
C_T Junction Capacitance	-	20	-	pF	$V_R = 600\text{V}$
L_S Series Inductance	-	8.0	-	nH	Measured lead to lead 5mm from package body

Dynamic Recovery Characteristics @ $T_C = 25^\circ\text{C}$ (unless otherwise specified)

Parameters	Min	Typ	Max	Units	Test Conditions
t_{rr} Reverse Recovery Time	-	60	120	ns	$I_F = 1\text{A}, di_F/dt = 100\text{A}/\mu\text{s}, V_R = 30\text{V}$
	-	190	270		$I_F = 15\text{A}, di_F/dt = 100\text{A}/\mu\text{s}, V_R = 30\text{V}$
	-	-	220	-	$T_J = 25^\circ\text{C}$
	-	320	-		$T_J = 125^\circ\text{C}$
I_{RRM} Peak Recovery Current	-	19	-	A	$T_J = 25^\circ\text{C}$
	-	26	-		$T_J = 125^\circ\text{C}$
Q_{rr} Reverse Recovery Charge	-	2.2	-	μC	$T_J = 25^\circ\text{C}$
	-	4.3	-		$T_J = 125^\circ\text{C}$

$I_F = 15\text{A}$
 $di_F/dt = 200\text{A}/\mu\text{s}$
 $V_R = 390\text{V}$

Thermal - Mechanical Characteristics

Parameters	Min	Typ	Max	Units
T_J Max. Junction Temperature Range	-	-	175	$^\circ\text{C}$
T_{Stg} Max. Storage Temperature Range	- 65	-	175	
R_{thJC} Thermal Resistance, Junction to Case	Per Leg	1.0	1.3	$^\circ\text{C}/\text{W}$
	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

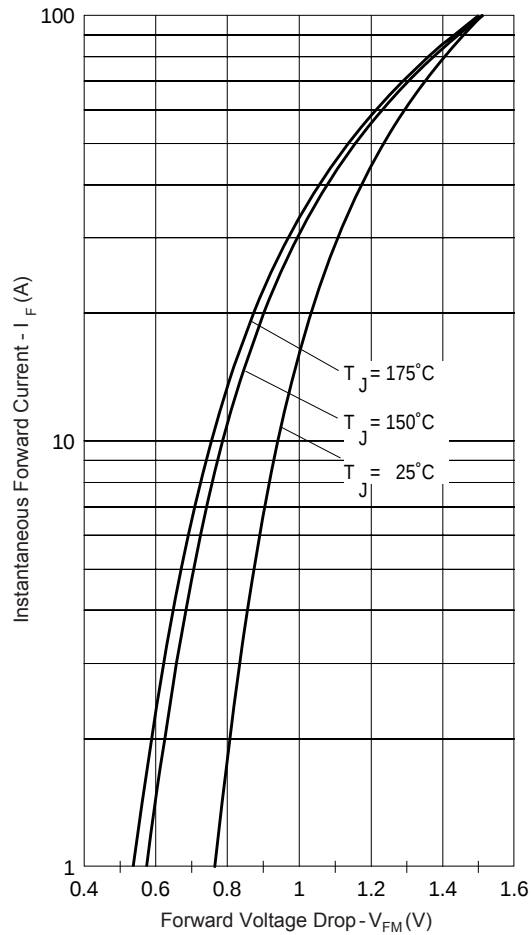


Fig. 1 - Typical Forward Voltage Drop Characteristics

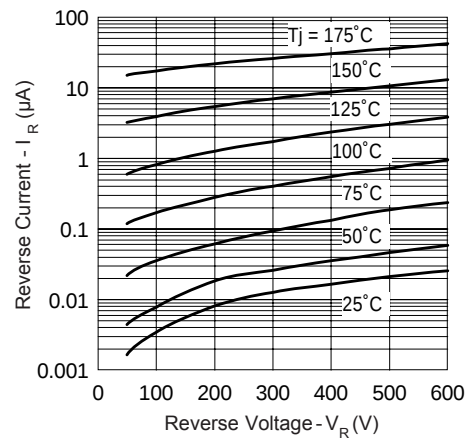


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage

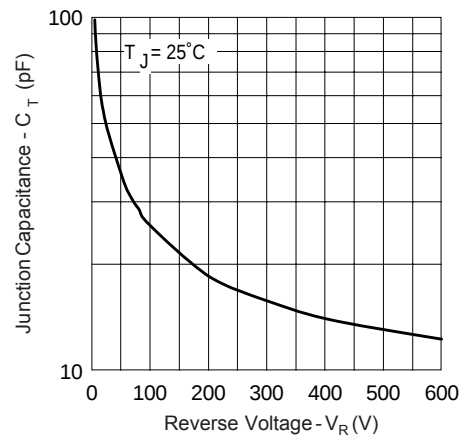


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

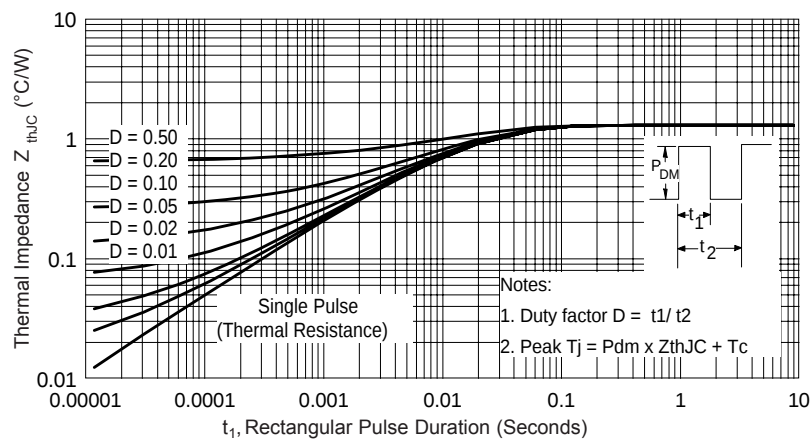


Fig. 4 - Max. Thermal Impedance Z_{thJC} Characteristics

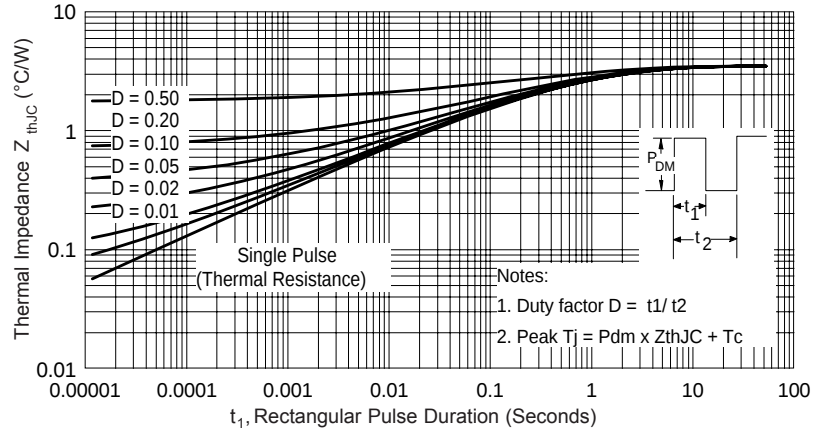
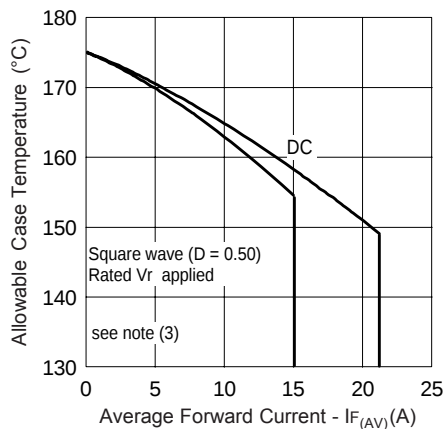
Fig. 5 - Max. Thermal Impedance Z_{thJC} Characteristics (FULLPACK)

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

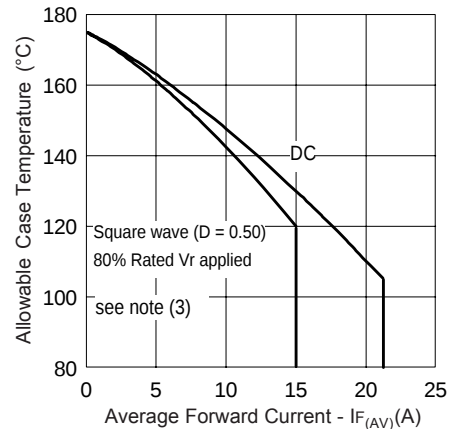


Fig. 7 - Max. Allowable Case Temperature Vs. Average Forward Current (FULLPACK)

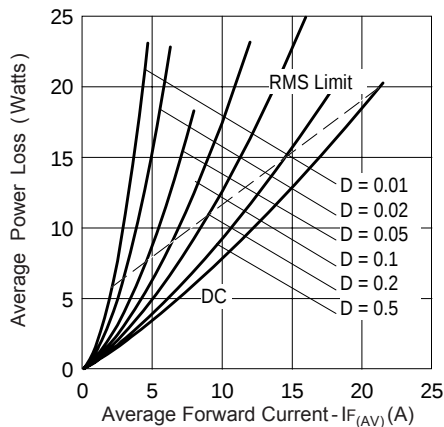


Fig. 8 - Forward Power Loss Characteristics

(3) Formula used: $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$;

P_d = Forward Power Loss =

$$I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$$

(see Fig. 8);

$$P_{d_{REV}} = \text{Inverse Power Loss} = V_{R1} \times I_R (1 - D);$$

$$I_R @ V_{R1} = \text{rated } V_R$$

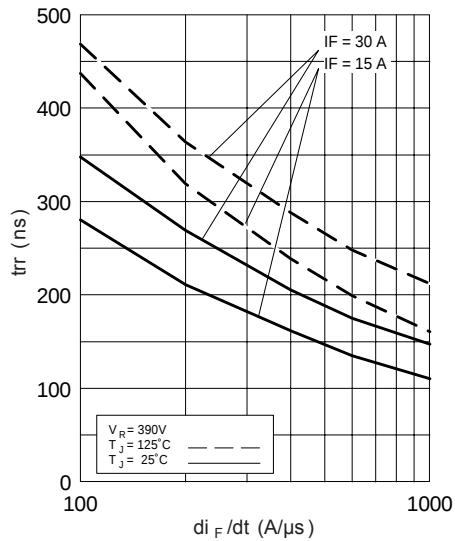


Fig. 9 - Typical Reverse Recovery vs. di_F/dt

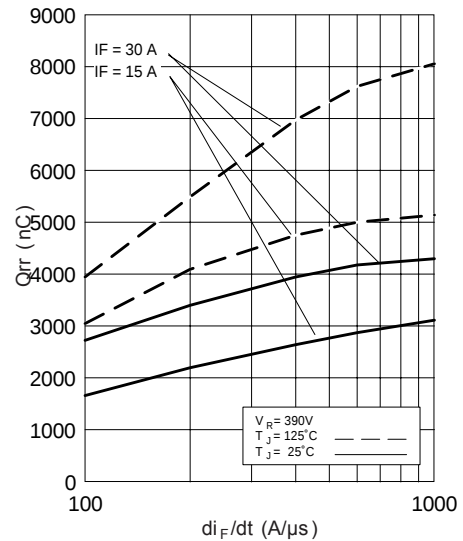


Fig. 10 - Typical Stored Charge vs. di_F/dt

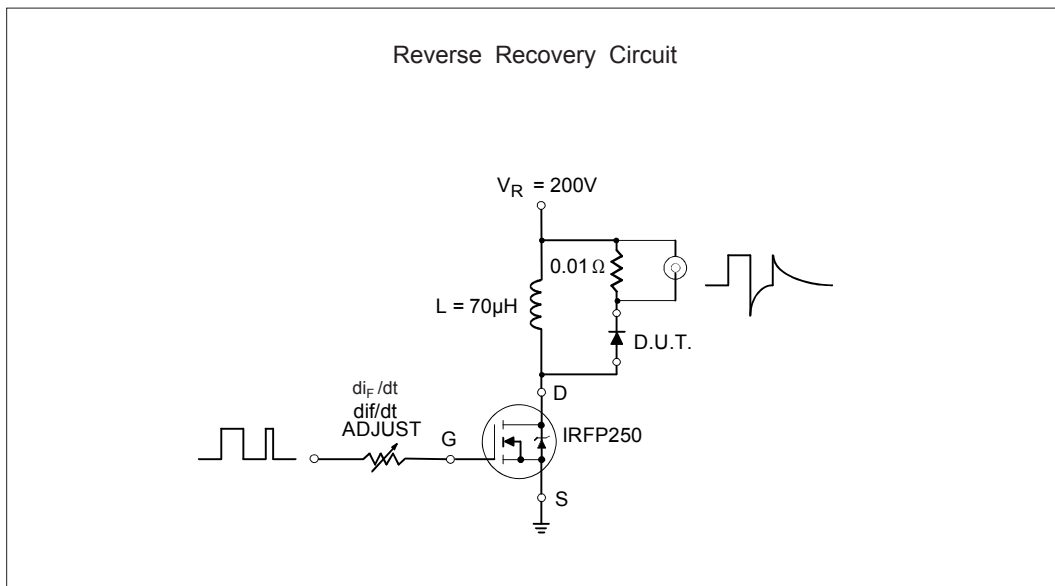


Fig. 11- Reverse Recovery Parameter Test Circuit

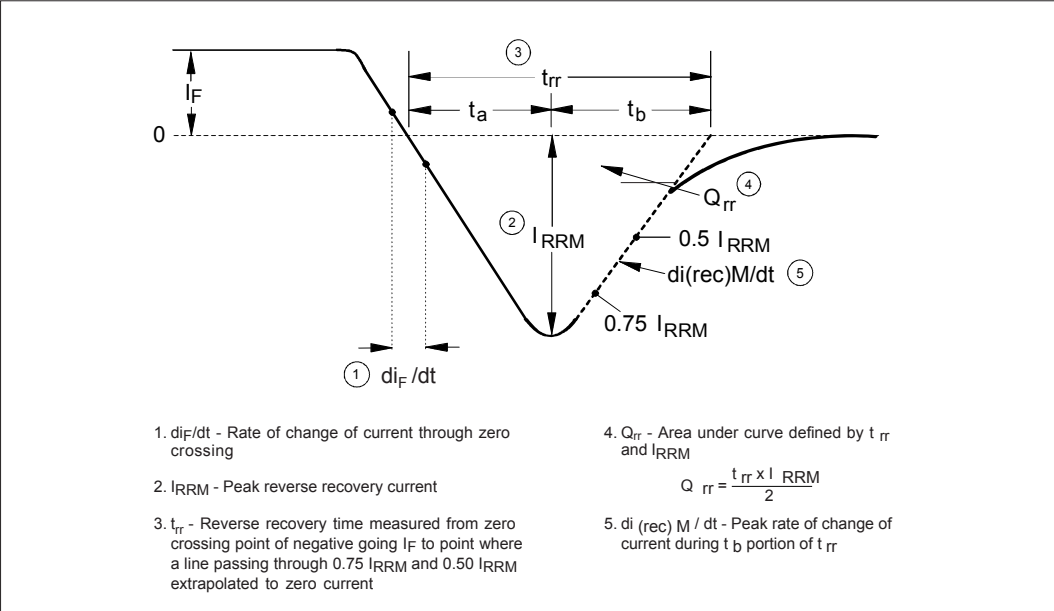
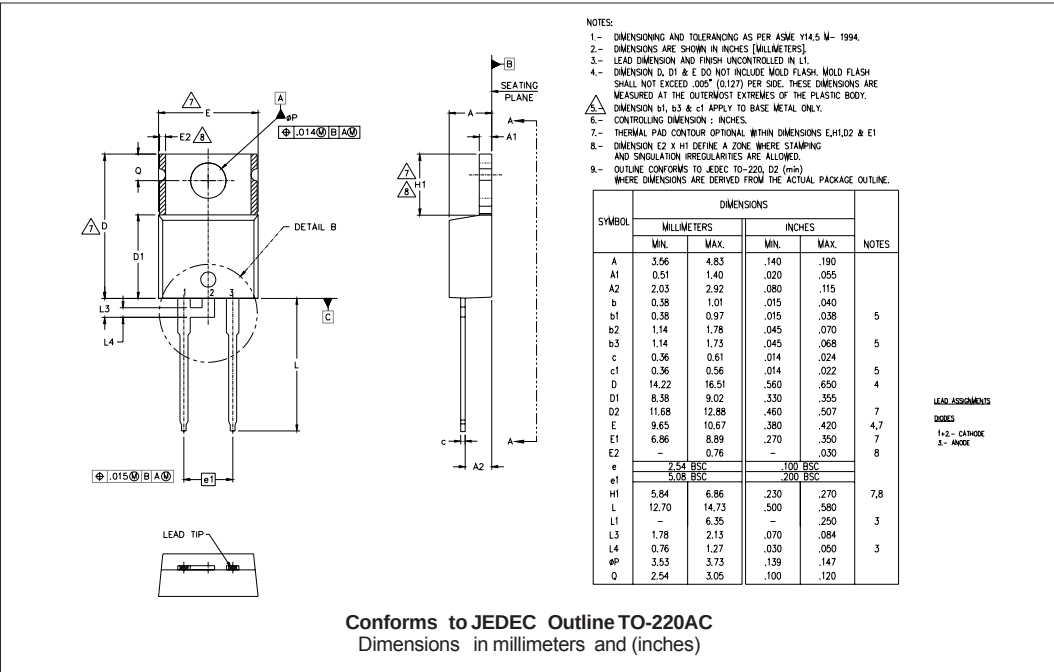
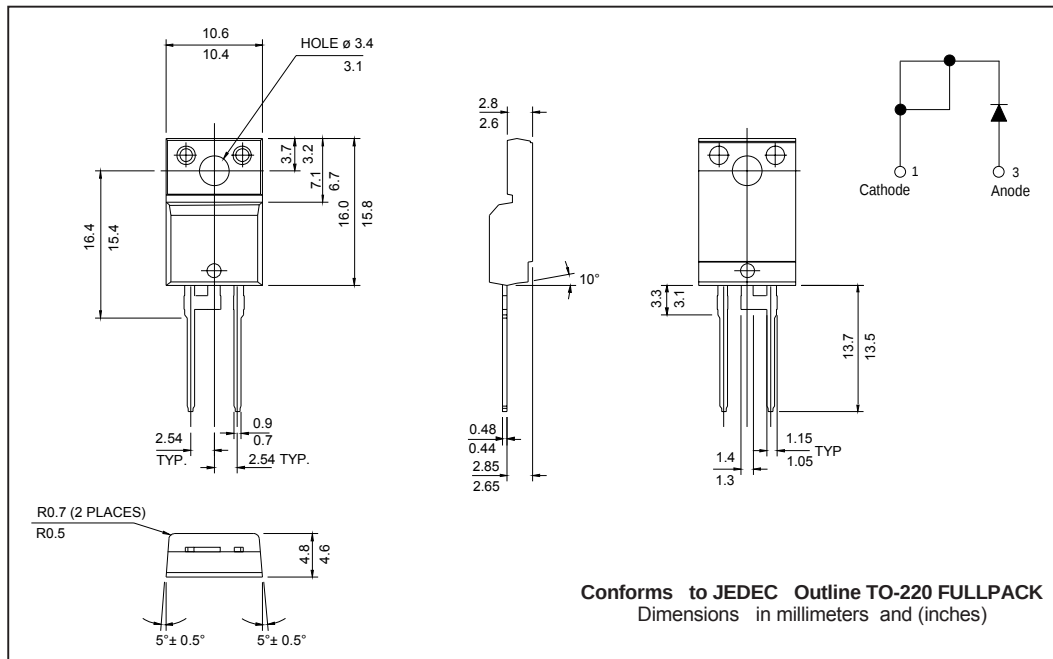


Fig. 12 - Reverse Recovery Waveform and Definitions

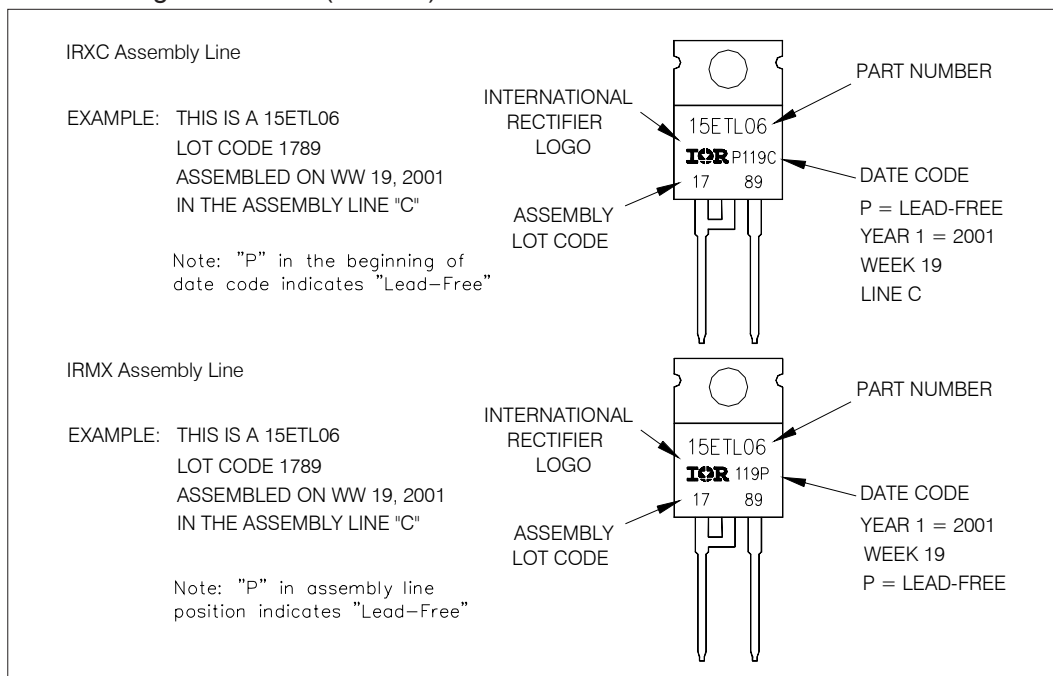
Outline Table



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Part Marking Information (TO-220)



Part Marking Information (TO-220 FULL-PAK)

EXAMPLE: THIS IS A 15ETL06FP
LOT CODE 1789
ASSEMBLED ON WW 19, 2002
IN THE ASSEMBLY LINE "C"

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

PART NUMBER
FP = Fullpack

DATE CODE
YEAR = 2002
WEEK 19
P = Lead-Free

Ordering Information Table

Device Code

15	E	T	L	06	FP	PbF
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1

2

3

4

5

6

7

1

- Current Rating (15 = 15A)

2

- E = Single Diode

3

- T = TO-220, D²Pak

4

- L = Ultra-low V_F 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
IR Rectifier

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