Bulletin PD-20893 rev. A 10/06

International
IOR Rectifier

20CTH03PbF
20CTH03FPPbF

Hyperfast Rectifier

t_{rr} = 35ns max.
$I_{F(AV)}$ = 20Amp
V_R = 300V

Features

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

Description/ Applications

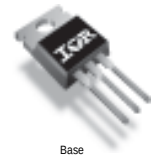
International Rectifier's 300V series are the state of the art Hyperfast recovery rectifiers designed with optimized performance of forward voltage drop and Hyperfast recovery time.
The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.
These devices are intended for use in the output rectification stage of SMPS, UPS, DC-DC converters as well as freewheeling diodes 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.

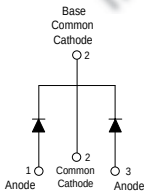
Absolute Maximum Ratings

	Parameters		Max	Units
V_{RRM}	Peak Repetitive Reverse Voltage		300	V
$I_{F(AV)}$	Average Rectified Forward Current	@ T_C = 160°C Per Diode	10	A
	@ T_C = 135°C (FULLPACK)	Per Diode		
		Per Device	20	
I_{FSM}	Non Repetitive Peak Surge Current @ T_J = 25°C		120	
T_J, T_{STG}	Operating Junction and Storage Temperatures		- 65 to 175	°C

Case Styles

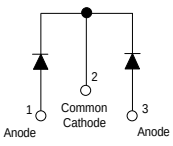
20CTH03PbF





TO-220AB

20CTH03FPPbF



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	300	-	-	V	I_R = 100µA
V_F	Forward Voltage	-	1.05	1.25	V	I_F = 10A, T_J = 25°C
		-	0.85	0.95	V	I_F = 10A, T_J = 125°C
I_R	Reverse Leakage Current	-	-	20	µA	V_R = V_R Rated
		-	6	200	µA	T_J = 125°C, V_R = V_R Rated
C_T	Junction Capacitance	-	30	-	pF	V_R = 300V
L_S	Series Inductance	-	8	-	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	-	-	35	ns	I_F = 1A, di_F/dt = 50A/µs, V_R = 30V	
		-	-	30		I_F = 1A, di_F/dt = 100A/µs, V_R = 30V	
		-	31	-		T_J = 25°C	I_F = 10A di_F/dt = 200A/µs V_R = 200V
		-	42	-		T_J = 125°C	
I_{RRM}	Peak Recovery Current	-	2.4	-	A	T_J = 25°C	
		-	5.6	-		T_J = 125°C	
Q_{rr}	Reverse Recovery Charge	-	36	-	nC	T_J = 25°C	
		-	120	-		T_J = 125°C	

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} ①	Thermal Resistance,	Per Diode	-	-	1.5	°C/W
	Junction to Case	Fullpack (Per Diode)	-	-	3.9	
	Device Marking		20CTH03			Case Style TO-220
			20CTH03FP			Case Style Fullpack

① Mounting Surface, Flat, Smooth and Greased

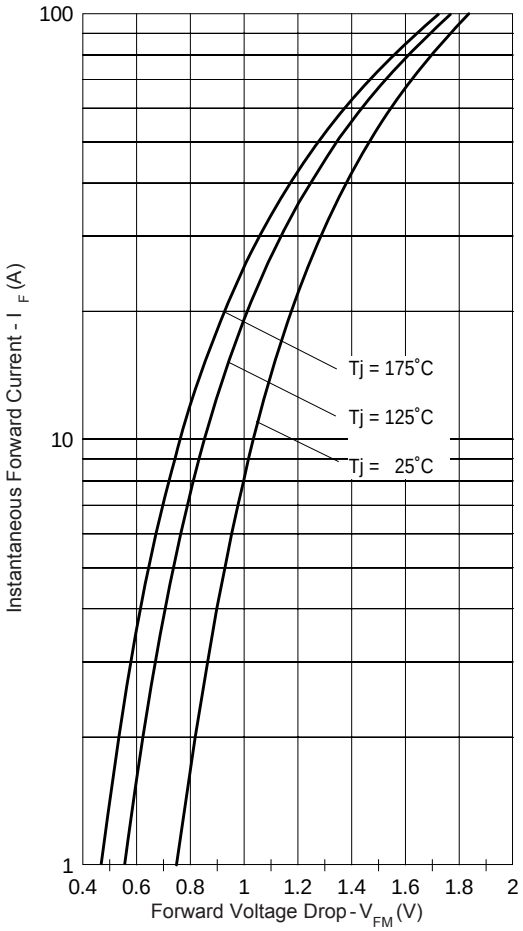


Fig. 1 - Typical Forward Voltage Drop Characteristics

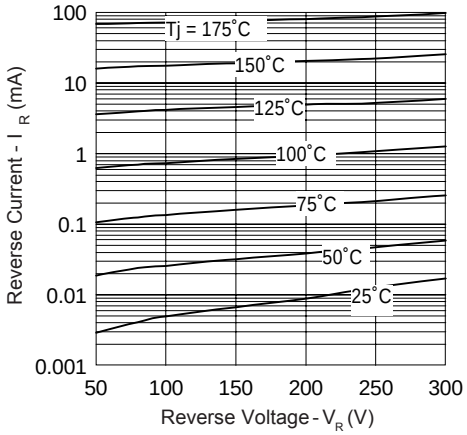


Fig. 2 - Typical Values of Reverse Current Vs. Reverse Voltage

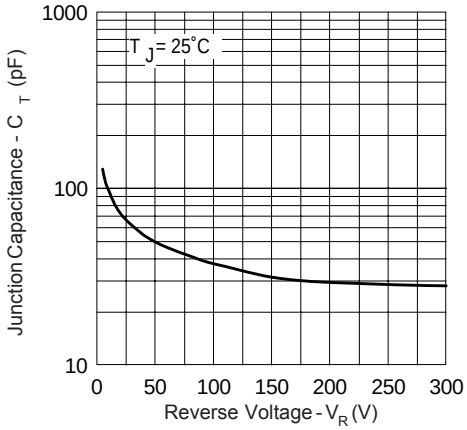


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

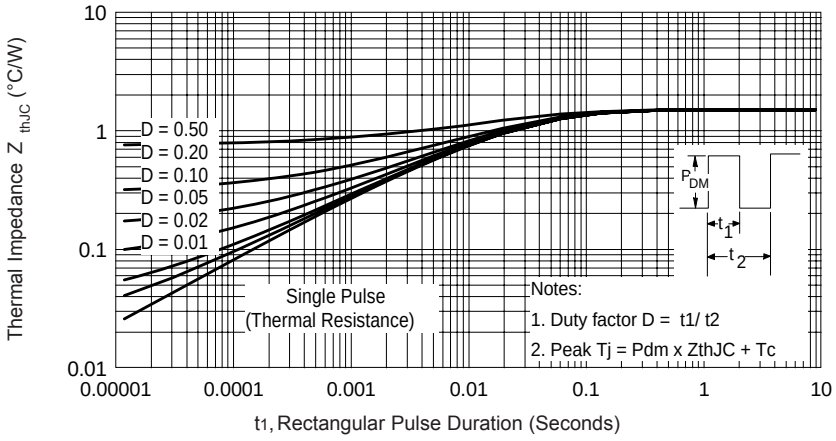


Fig. 4 - Max. Thermal Impedance Z_{thJC} Characteristics

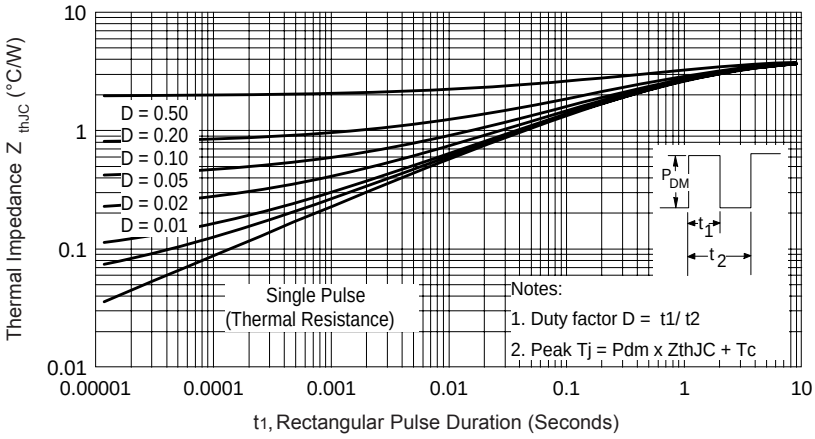


Fig. 5 - Max. Thermal Impedance Z_{thJC} Characteristics (FULLPACK)

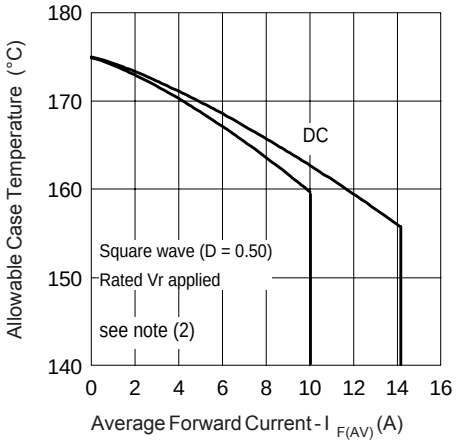


Fig. 6 - Max. Allowable Case Temperature Vs. Average Forward Current

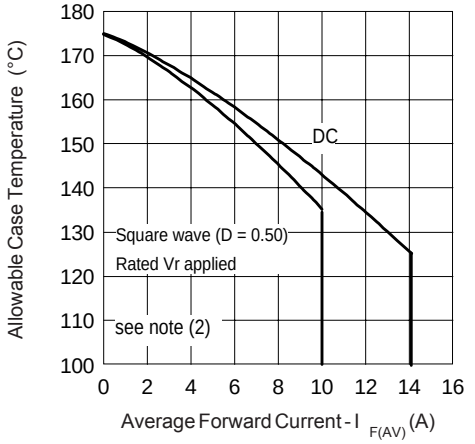


Fig. 7 - Max. Allowable Case Temperature Vs. Average Forward Current (FULLPACK)

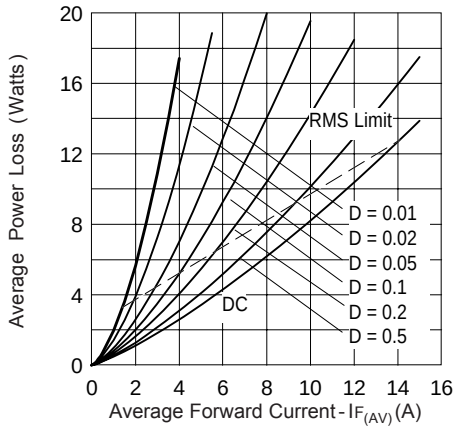


Fig. 8 - Forward Power Loss Characteristics

(2) 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

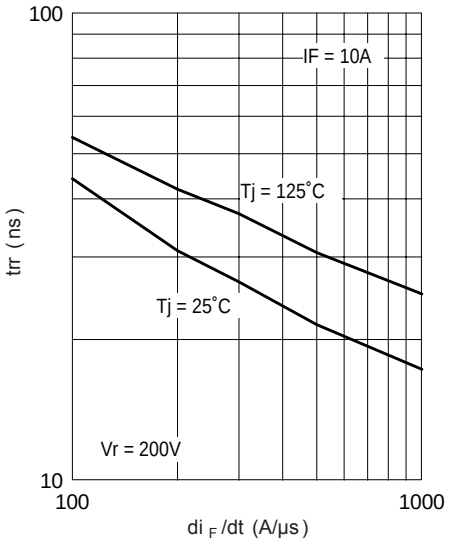


Fig. 9 - Typical Reverse Recovery vs. di_F/dt

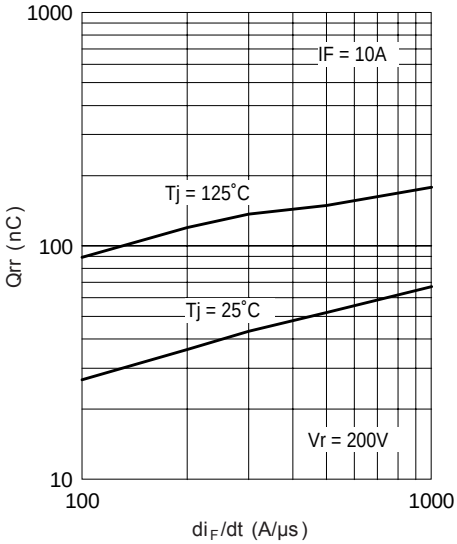


Fig. 10 - Typical Stored Charge vs. di_F/dt

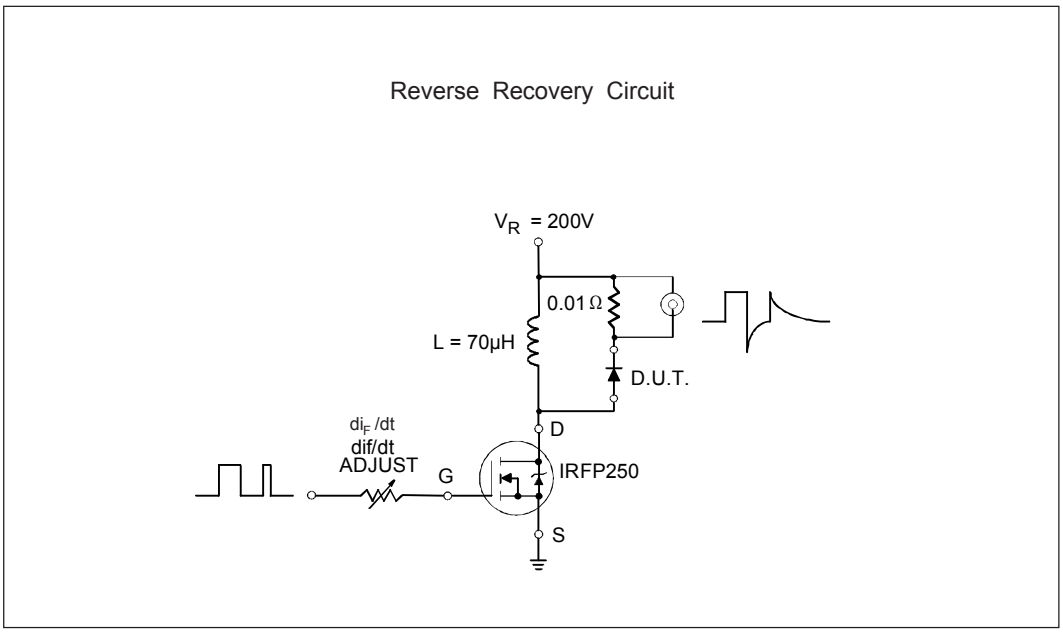
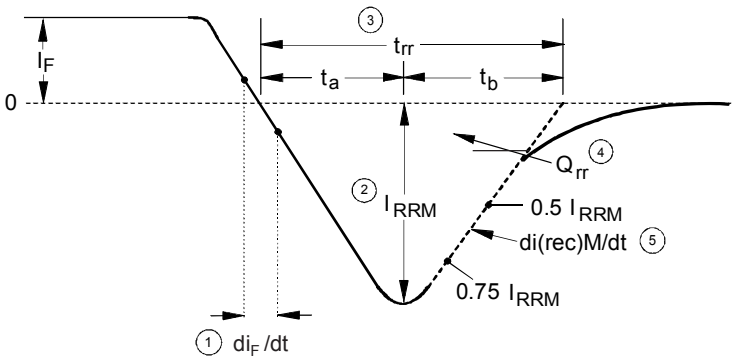


Fig. 11- Reverse Recovery Parameter Test Circuit



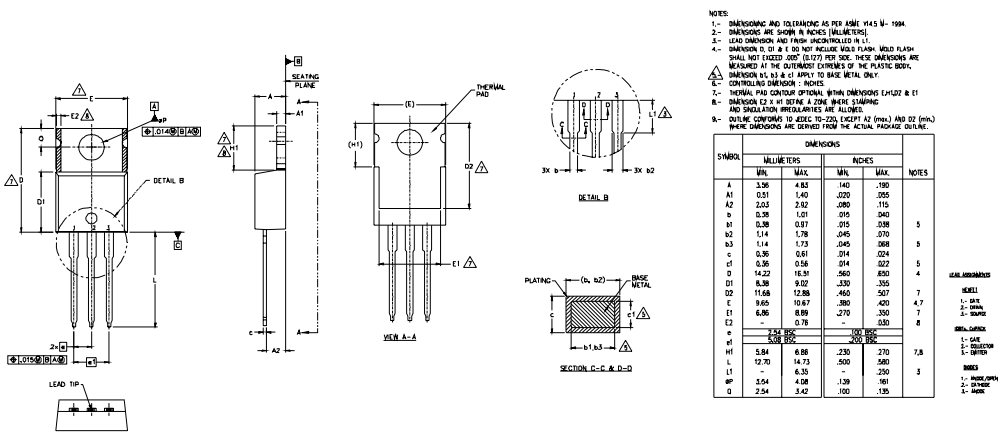
1. di_F/dt - Rate of change of current through zero crossing
2. I_{RRM} - Peak reverse recovery current
3. t_{rr} - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current
4. Q_{rr} - 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. 13 - Reverse Recovery Waveform and Definitions

Outline Table



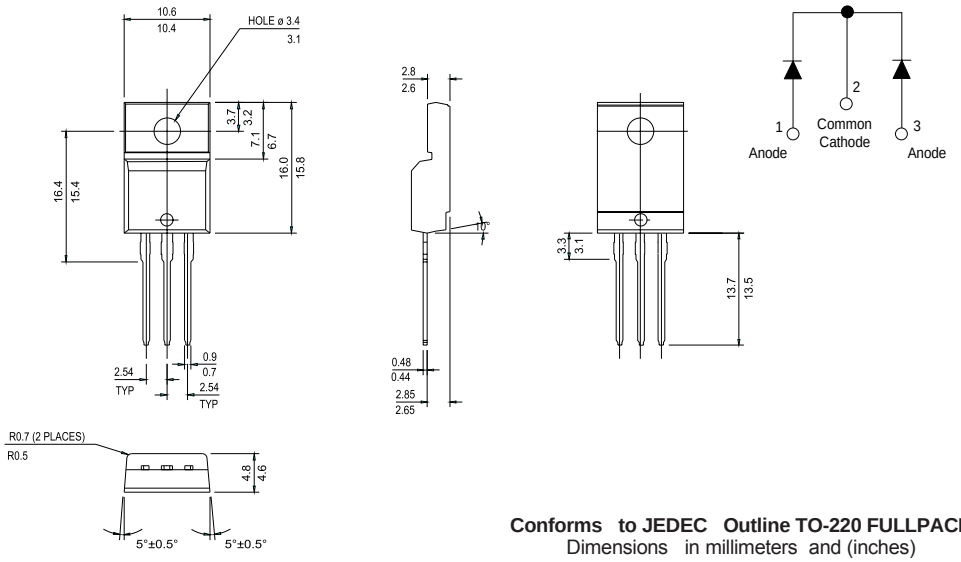
SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.83	.140	.190	
A1	0.51	1.40	.020	.055	
A2	2.03	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.97	.015	.038	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.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
øP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	

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 E1,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, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

LEAD ASSIGNMENTS
HEXFET
1.- GATE
2.- DRAIN
3.- SOURCE
IGBTs, CoPACK
1.- GATE
2.- COLLECTOR
3.- EMITTER
DIODES
1.- ANODE/OPEN
2.- CATHODE
3.- ANODE

Conform to JEDEC outline TO-220AB

Outline Table



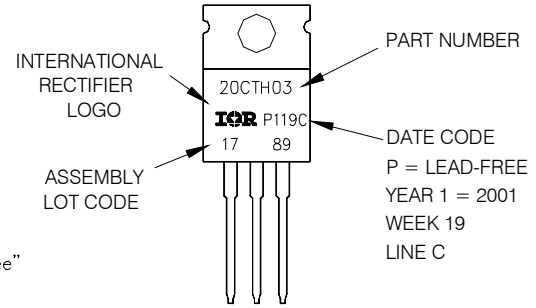
Conforms to JEDEC Outline TO-220 FULLPACK
Dimensions in millimeters and (inches)

Part Marking Information

IRXC Assembly Line

EXAMPLE: THIS IS A 20CTH03
LOT CODE 1789
ASSEMBLED ON WW 19, 2001
IN THE ASSEMBLY LINE "C"

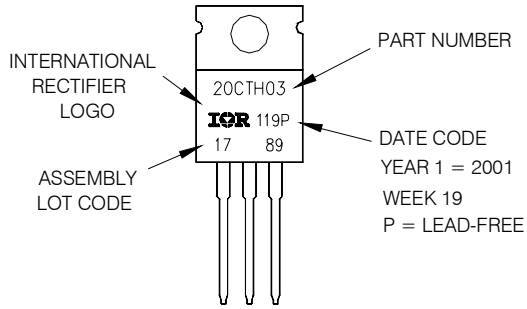
Note: "P" in the beginning of date code indicates "Lead–Free"



IRMX Assembly Line

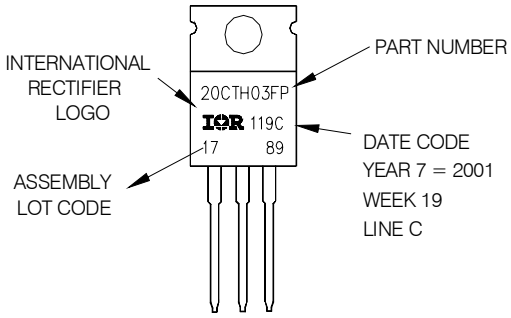
EXAMPLE: THIS IS A 20CTH03
LOT CODE 1789
ASSEMBLED ON WW 19, 2001

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



Marking Information

EXAMPLE: THIS IS A 20CTH03FP
LOT CODE 1789
ASSEMBLED ON WW 19, 2001
IN THE ASSEMBLY LINE "C"



Ordering Information Table

Device Code

20	C	T	H	03	FP	PbF
1	2	3	4	5	6	7

1 - Current Rating (20 = 20A)
2 - C = Common Cathode
3 - T = TO-220, D^2Pak
4 - H = HyperFast Recovery
5 - Voltage Rating (03 = 300V)
6 - • none = TO-220AB
• 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 AEC Q1O1 Level and Lead-Free.
Qualification Standards can be found on IR's Web site.

International
IOR Rectifier

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10/06

Notice

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