

# IRL3302PbF

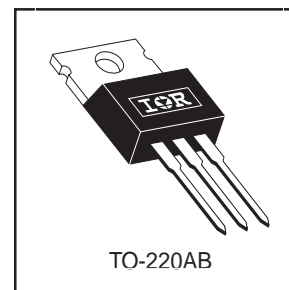
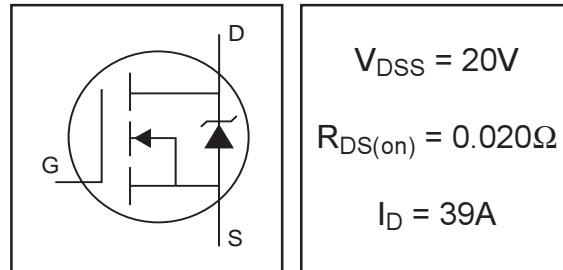
HEXFET® Power MOSFET

- Advanced Process Technology
- Optimized for 4.5V Gate Drive
- Ideal for CPU Core DC-DC Converters
- 150°C Operating Temperature
- Fast Switching
- Lead-Free

## Description

These HEXFET Power MOSFETs were designed specifically to meet the demands of CPU core DC-DC converters in the PC environment. Advanced processing techniques combined with an optimized gate oxide design results in a die sized specifically to offer maximum cost.

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



## Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 4.5\text{V}$	39	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 4.5\text{V}$	25	
$I_{DM}$	Pulsed Drain Current ①	160	
$P_D @ T_C = 25^\circ\text{C}$	Power Dissipation	57	W
	Linear Derating Factor	0.45	W/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 10$	V
$V_{GSM}$	Gate-to-Source Voltage (Start Up Transient, $t_p = 100\mu\text{s}$ )	14	V
$E_{AS}$	Single Pulse Avalanche Energy②	130	mJ
$I_{AR}$	Avalanche Current①	23	A
$E_{AR}$	Repetitive Avalanche Energy①	5.7	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ ③	5.0	V/ns
$T_J$	Operating Junction and	-55 to + 150	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds		
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

## Thermal Resistance

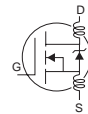
	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	---	2.2	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	---	
$R_{\theta JA}$	Junction-to-Ambient	---	62	

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## Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.022	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	0.023	Ω	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 23A ④
		—	—	0.020		V <sub>GS</sub> = 7.0V, I <sub>D</sub> = 23A ④
V <sub>GS(th)</sub>	Gate Threshold Voltage	0.70	—	—	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	21	—	—	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 23A
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	25	μA	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	100	nA	V <sub>GS</sub> = 10V
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -10V
Q <sub>g</sub>	Total Gate Charge	—	—	31	nC	I <sub>D</sub> = 23A
Q <sub>gs</sub>	Gate-to-Source Charge	—	—	5.7		V <sub>DS</sub> = 16V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	—	13		V <sub>GS</sub> = 4.5V, See Fig. 6 ④
t <sub>d(on)</sub>	Turn-On Delay Time	—	7.2	—	ns	V <sub>DD</sub> = 10V
t <sub>r</sub>	Rise Time	—	110	—		I <sub>D</sub> = 23A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	41	—		R <sub>G</sub> = 9.5Ω, V <sub>GS</sub> = 4.5V
t <sub>f</sub>	Fall Time	—	89	—		R <sub>D</sub> = 2.4Ω, ④
L <sub>D</sub>	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L <sub>S</sub>	Internal Source Inductance	—	7.5	—		
C <sub>iss</sub>	Input Capacitance	—	1300	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	520	—		V <sub>DS</sub> = 15V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	190	—		f = 1.0MHz, See Fig. 5

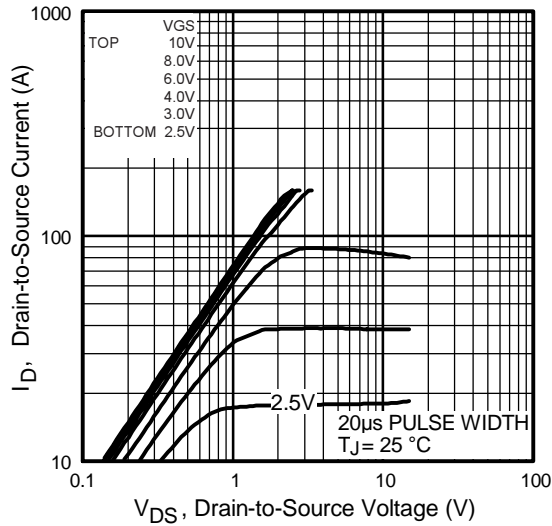


## Source-Drain Ratings and Characteristics

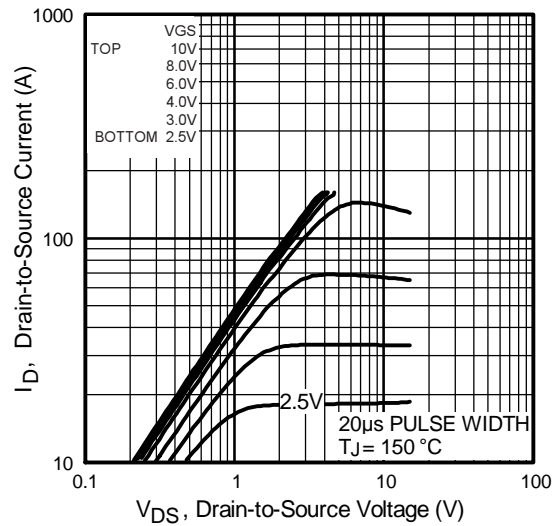
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	39	A	MOSFET symbol showing the integral reverse p-n junction diode.
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	160		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 23A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	62	94	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 23A
Q <sub>rr</sub>	Reverse Recovery Charge	—	110	160	nC	di/dt = 100A/μs ④
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				

### Notes:

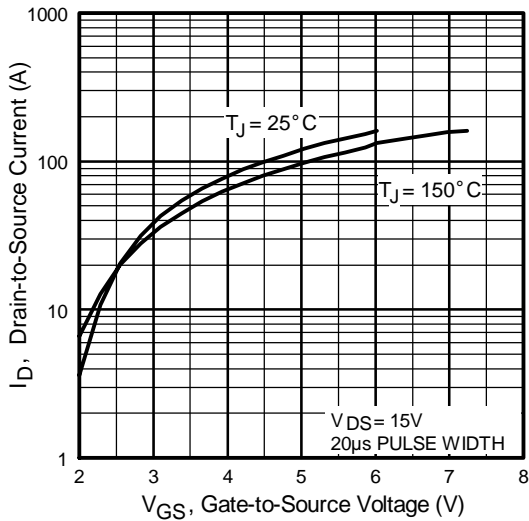
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting T<sub>J</sub> = 25°C, L = 0.49mH  
R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 23A.
- ③ I<sub>SD</sub> ≤ 23A, di/dt ≤ 97A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>,  
T<sub>J</sub> ≤ 150°C
- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.



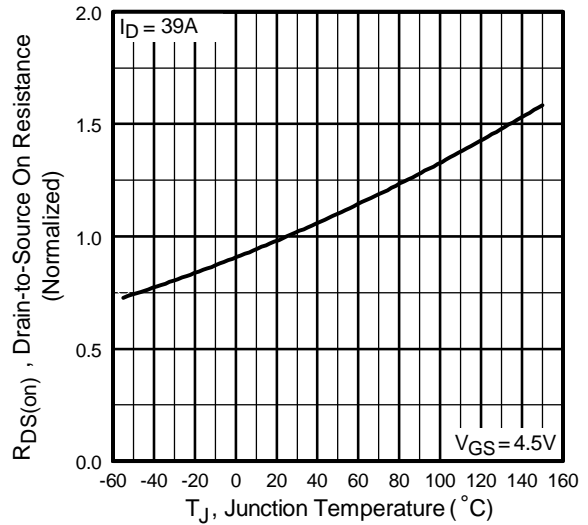
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



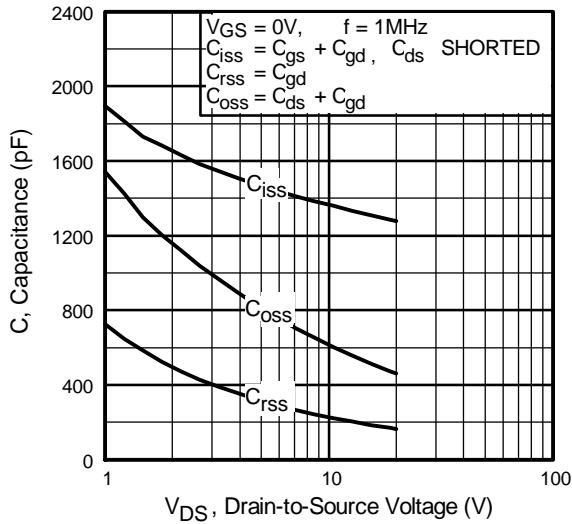
**Fig 3.** Typical Transfer Characteristics



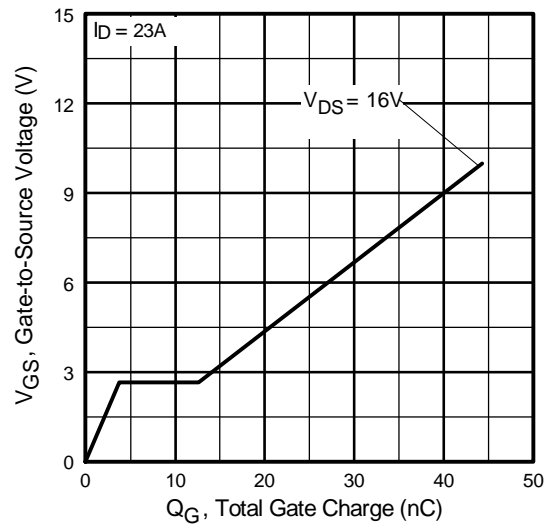
**Fig 4.** Normalized On-Resistance Vs. Temperature

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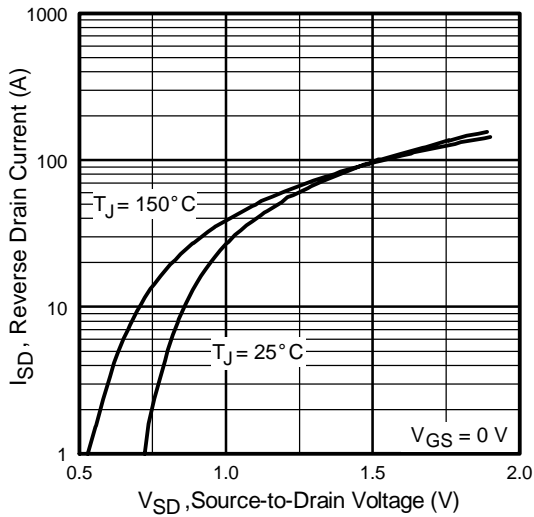
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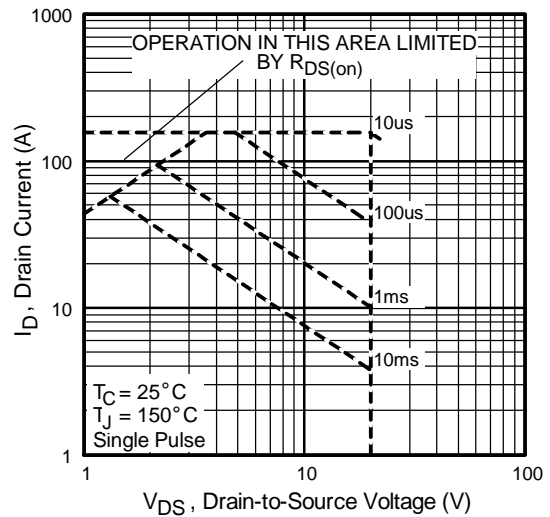
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



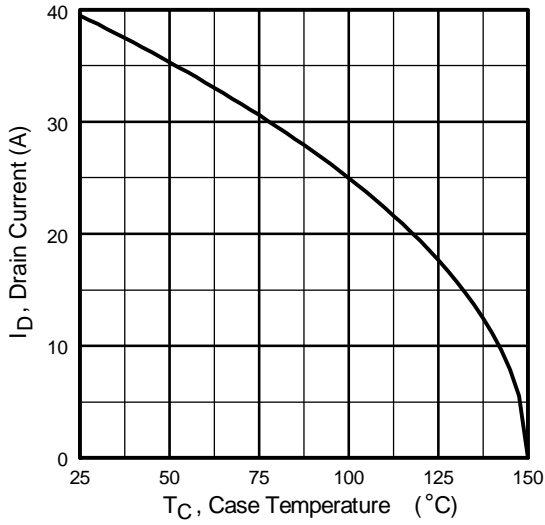
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



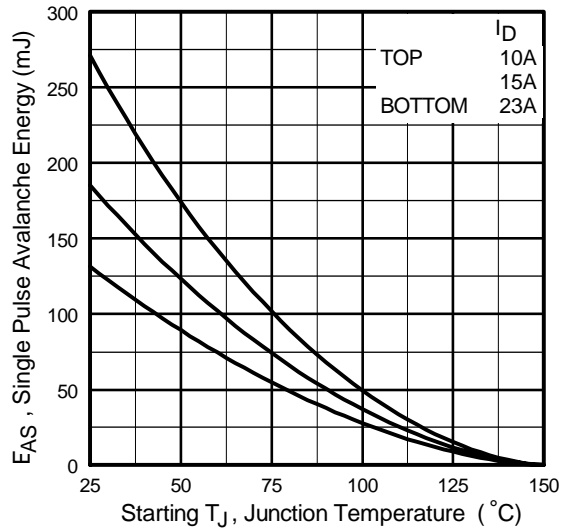
**Fig 7.** Typical Source-Drain Diode Forward Voltage



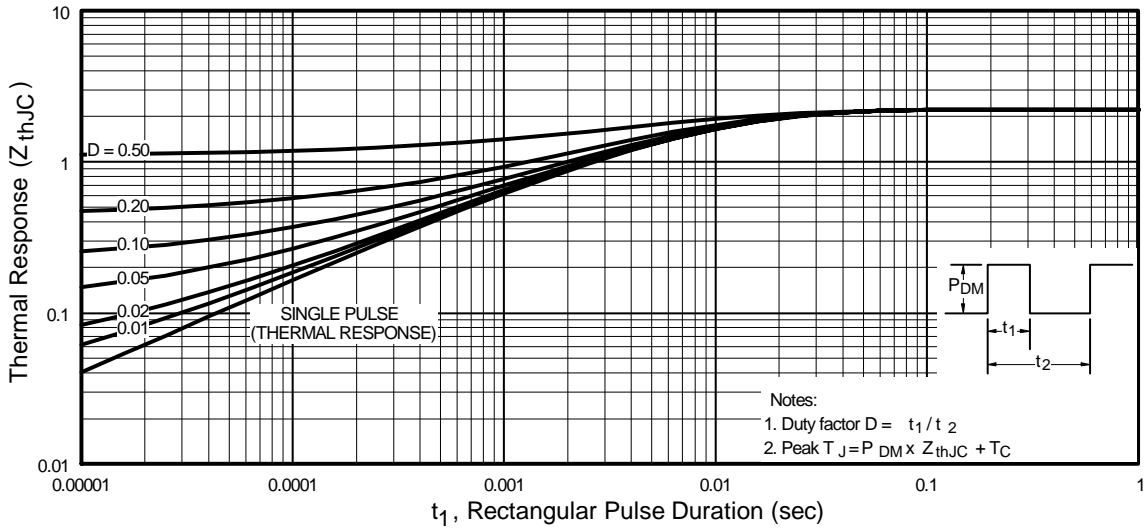
**Fig 8.** Maximum Safe Operating Area



**Fig 9.** Maximum Drain Current Vs. Case Temperature



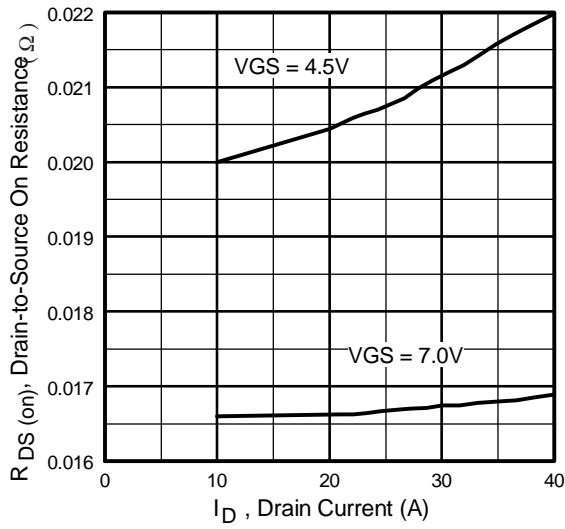
**Fig 10.** Maximum Avalanche Energy Vs. Drain Current



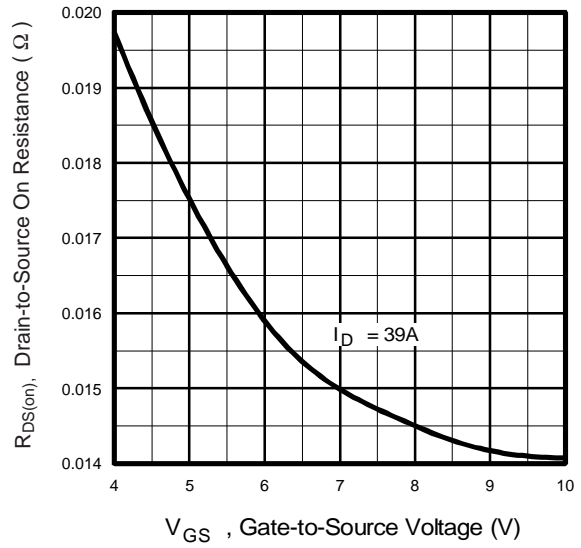
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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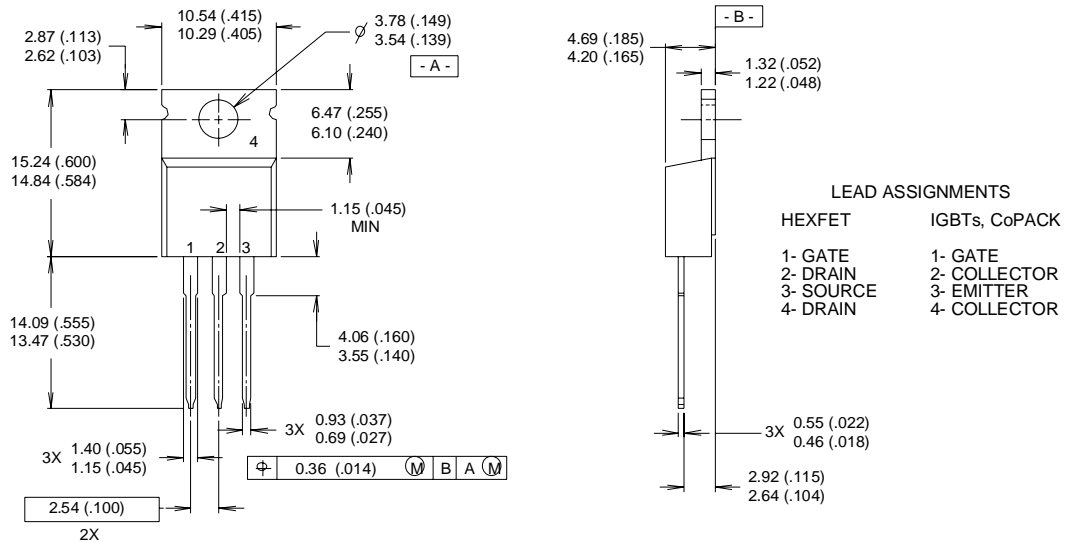
**Fig 12.** On-Resistance Vs. Drain Current



**Fig 13.** On-Resistance Vs. Gate Voltage

## TO-220AB Package Outline

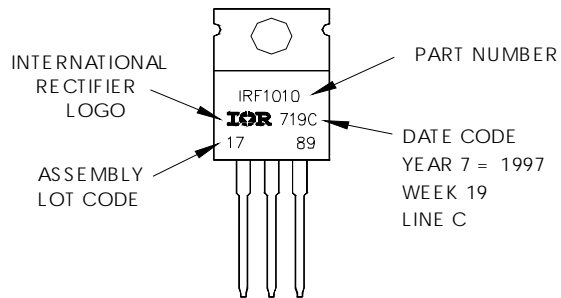
Dimensions are shown in millimeters (inches)



## TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010  
 LOT CODE 1789  
 ASSEMBLED ON WW 19, 1997  
 IN THE ASSEMBLY LINE "C"

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



Data and specifications subject to change without notice.

Note: For the most current drawings please refer to the IR website at:  
<http://www.irf.com/package/>