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IRL3302PBF

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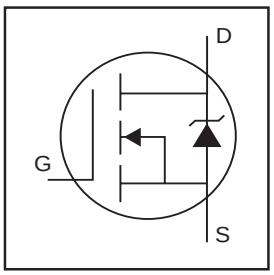
PD-95660

International
IOR Rectifier

# IRL3302PbF

HEXFET® Power MOSFET

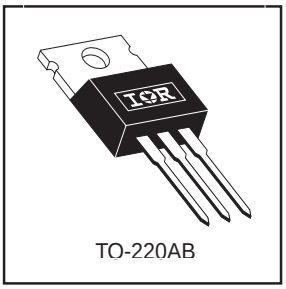
- Advanced Process Technology
- Optimized for 4.5V Gate Drive
- Ideal for CPU Core DC-DC Converters
- 150°C Operating Temperature
- Fast Switching
- Lead-Free




$V_{DSS}$ = 20V

$R_{DS(on)}$ = 0.020Ω

$I_D$ = 39A




TO-220AB

## 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

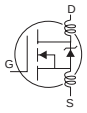
| | Parameter | Max. | Units |
|---|---|---|---|
| $I_D$ @ $T_C$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 4.5V | 39 | A |
| $I_D$ @ $T_C$ = 100°C | Continuous Drain Current, $V_{GS}$ @ 4.5V | 25 | |
| $I_{DM}$ | Pulsed Drain Current ① | 160 | |
| $P_D$ @$T_C$ = 25°C | Power Dissipation | 57 | W |
| | Linear Derating Factor | 0.45 | W/°C |
| $V_{GS}$ | Gate-to-Source Voltage | ± 10 | V |
| $V_{GSM}$ | Gate-to-Source Voltage (Start Up Transient, tp = 100µs) | 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 | 300 (1.6mm from case ) | |
| | Mounting torque, 6-32 or M3 srew | 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 | |

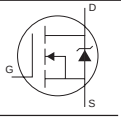
## Electrical Characteristics @ $T_J$ = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 20 | ––– | ––– | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | ––– | 0.022 | ––– | V/°C | Reference to 25°C, $I_D$ = 1mA |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | ––– | ––– | 0.023 | Ω | $V_{GS}$ = 4.5V, $I_D$ = 23A ④ |
| | | ––– | ––– | 0.020 | | $V_{GS}$ = 7.0V, $I_D$ = 23A ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 0.70 | ––– | ––– | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| $g_{fs}$ | Forward Transconductance | 21 | ––– | ––– | S | $V_{DS}$ = 10V, $I_D$ = 23A |
| $I_{DSS}$ | Drain-to-Source Leakage Current | ––– | ––– | 25 | µA | $V_{DS}$ = 20V, $V_{GS}$ = 0V |
| | | ––– | ––– | 250 | | $V_{DS}$ = 10V, $V_{GS}$ = 0V, $T_J$ = 150°C |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | ––– | ––– | 100 | nA | $V_{GS}$ = 10V |
| | Gate-to-Source Reverse Leakage | ––– | ––– | -100 | | $V_{GS}$ = -10V |
| $Q_g$ | Total Gate Charge | ––– | ––– | 31 | nC | $I_D$ = 23A |
| $Q_{gs}$ | Gate-to-Source Charge | ––– | ––– | 5.7 | | $V_{DS}$ = 16V |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | ––– | ––– | 13 | | $V_{GS}$ = 4.5V, See Fig. 6 ④ |
| $t_{d(on)}$ | Turn-On Delay Time | ––– | 7.2 | ––– | ns | $V_{DD}$ = 10V |
| $t_r$ | Rise Time | ––– | 110 | ––– | | $I_D$ = 23A |
| $t_{d(off)}$ | Turn-Off Delay Time | ––– | 41 | ––– | | $R_G$ = 9.5Ω, $V_{GS}$ = 4.5V |
| $t_f$ | Fall Time | ––– | 89 | ––– | | $R_D$ = 2.4Ω, ④ |
| $L_D$ | Internal Drain Inductance | ––– | 4.5 | ––– | nH | Between lead, 6mm (0.25in.) from package and center of die contact |
| $L_S$ | Internal Source Inductance | ––– | 7.5 | ––– | | |
| $C_{iss}$ | Input Capacitance | ––– | 1300 | ––– | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | ––– | 520 | ––– | | $V_{DS}$ = 15V |
| $C_{rss}$ | Reverse Transfer Capacitance | ––– | 190 | ––– | | ƒ = 1.0MHz, See Fig. 5 |




## Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | ––– | ––– | 39 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | ––– | ––– | 160 | | |
| $V_{SD}$ | Diode Forward Voltage | ––– | ––– | 1.3 | V | $T_J$ = 25°C, $I_S$ = 23A, $V_{GS}$ = 0V ④ |
| $t_{rr}$ | Reverse Recovery Time | ––– | 62 | 94 | ns | $T_J$ = 25°C, $I_F$ = 23A |
| $Q_{rr}$ | Reverse Recovery Charge | ––– | 110 | 160 | nC | di/dt = 100A/µs ④ |
| $t_{on}$ | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$+$L_D$) | | | | |




**Notes:**

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting $T_J$ = 25°C, L = 0.49mH $R_G$ = 25Ω, $I_{AS}$ = 23A.

③ $I_{SD}$ ≤ 23A, di/dt ≤ 97A/µs, $V_{DD}$ ≤ $V_{(BR)DSS}$, $T_J$ ≤ 150°C

④ Pulse width ≤ 300µs; duty cycle ≤ 2%.

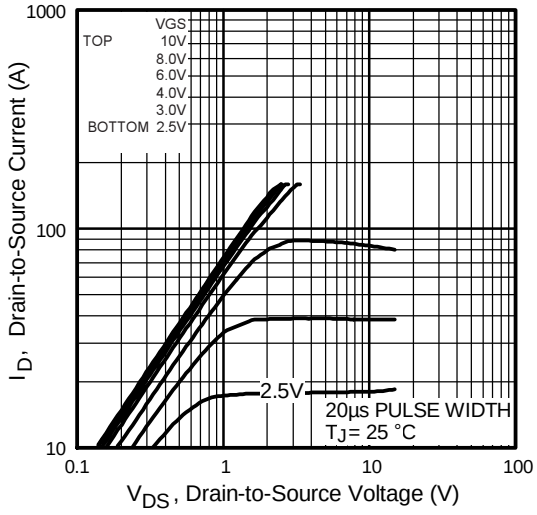



**Fig 1.** Typical Output Characteristics

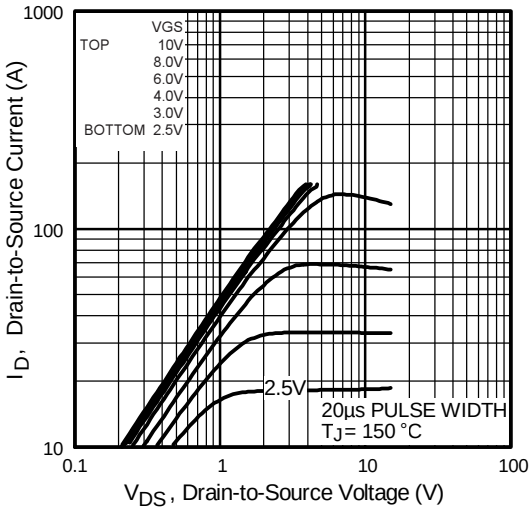



**Fig 2.** Typical Output Characteristics

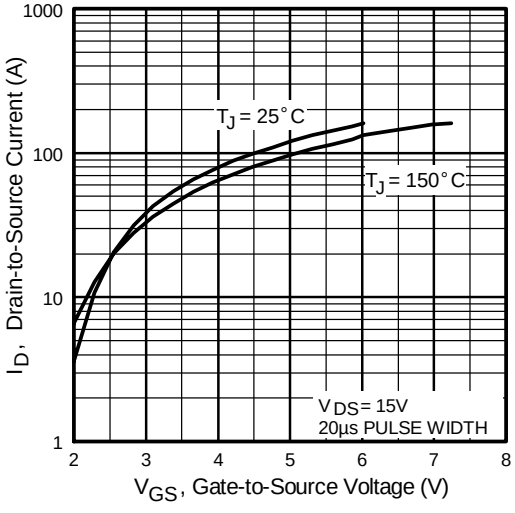



**Fig 3.** Typical Transfer Characteristics

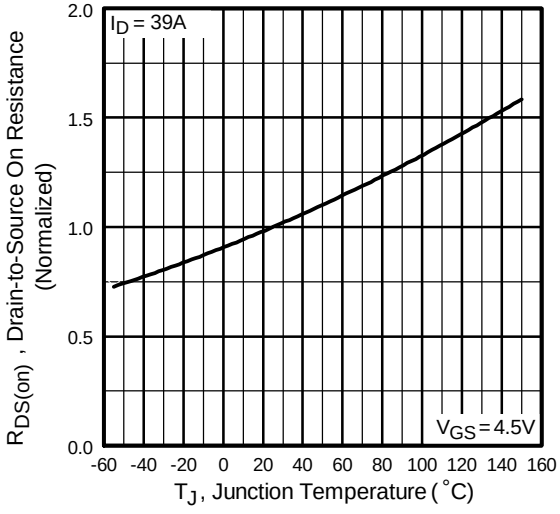



**Fig 4.** Normalized On-Resistance
Vs. Temperature

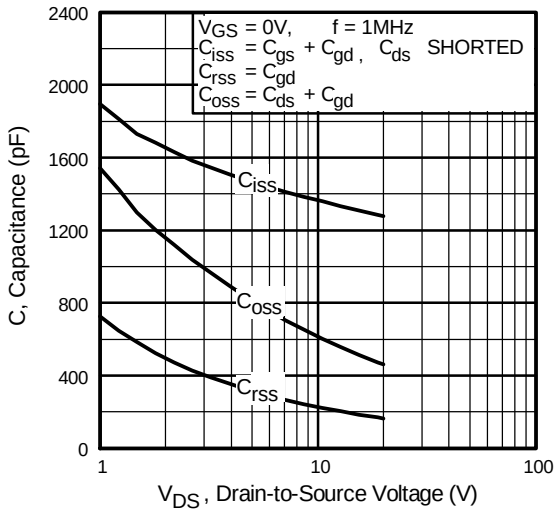



**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

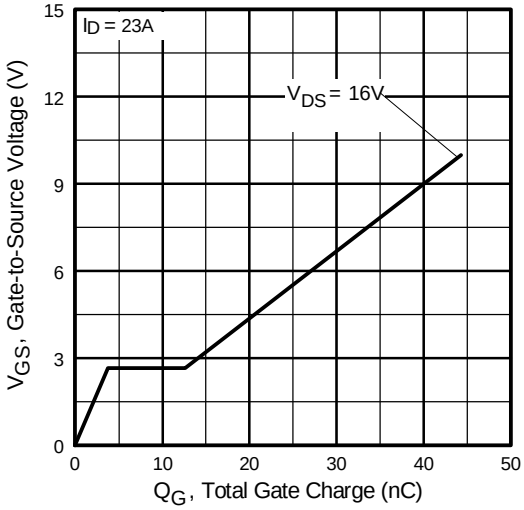



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

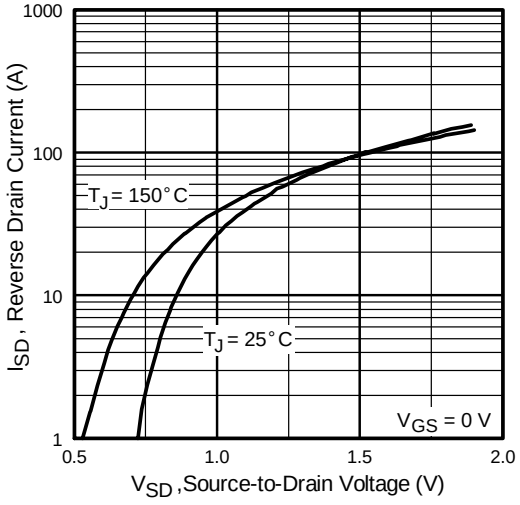



**Fig 7.** Typical Source-Drain Diode Forward Voltage

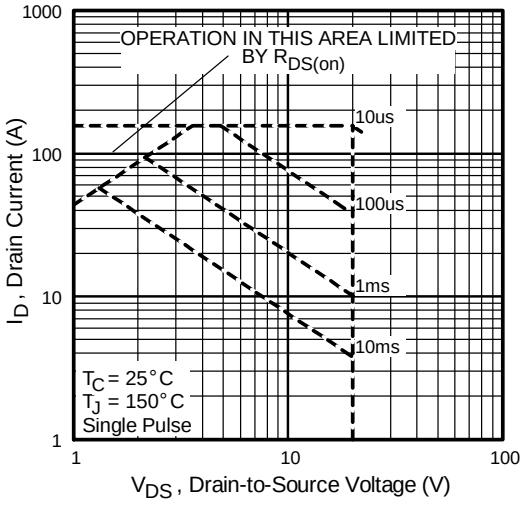



**Fig 8.** Maximum Safe Operating Area

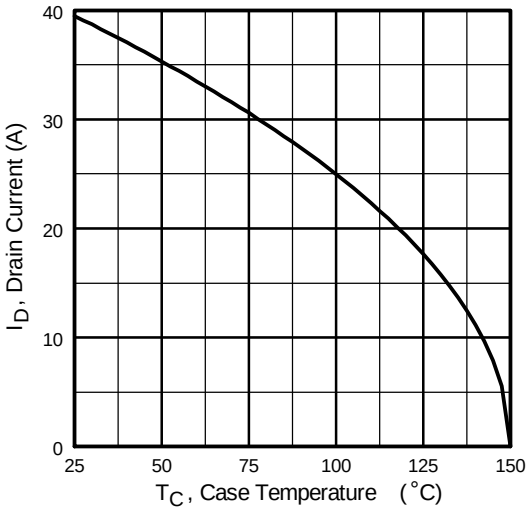



**Fig 9.** Maximum Drain Current Vs. Case Temperature

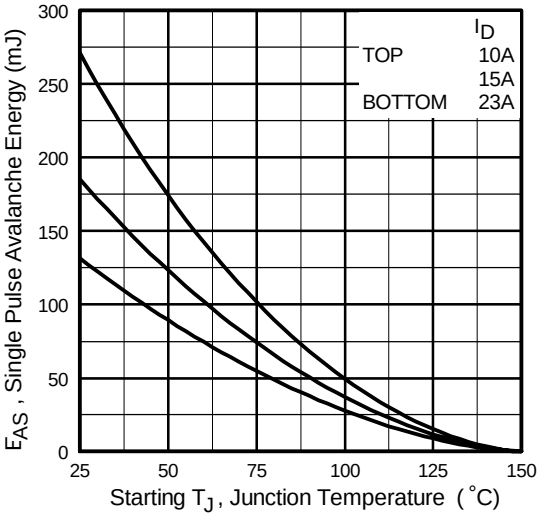



**Fig 10.** Maximum Avalanche Energy Vs. Drain Current

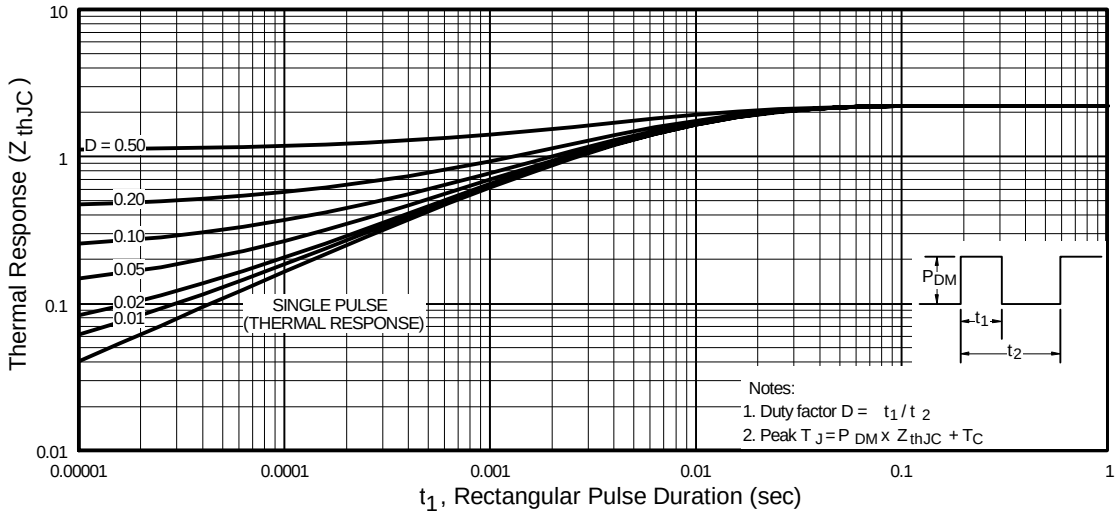



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

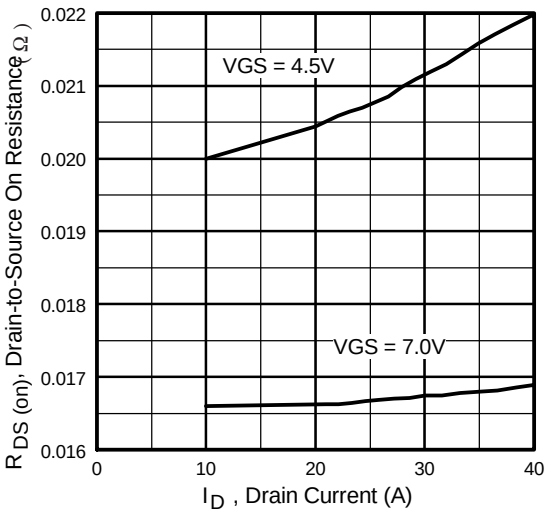



**Fig 12.** On-Resistance Vs. Drain Current

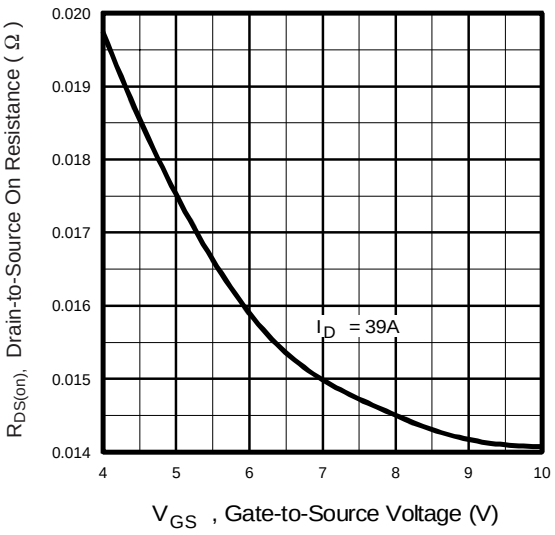
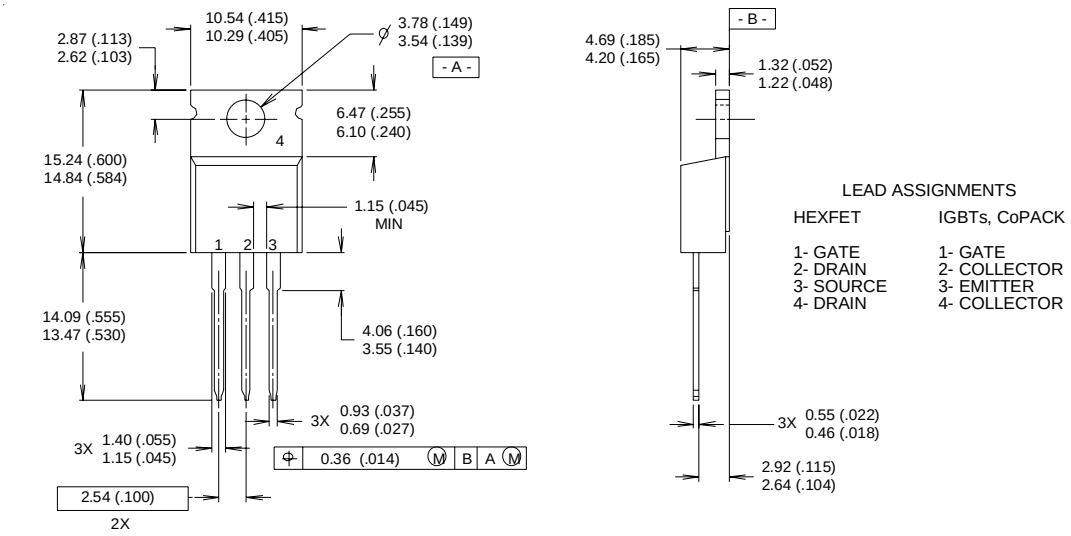



**Fig 13.** On-Resistance Vs. Gate Voltage

## TO-220AB Package Outline

Dimensions are shown in millimeters (inches)




LEAD ASSIGNMENTS

| HEXFET | IGBTs, CoPACK |
|---|---|
| 1- GATE | 1- GATE |
| 2- DRAIN | 2- COLLECTOR |
| 3- SOURCE | 3- EMITTER |
| 4- DRAIN | 4- COLLECTOR |

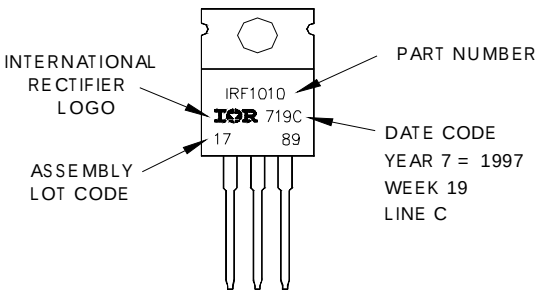
NOTES:

1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH
3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

## 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.

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