

**Ultrafast, Soft Recovery Diode**

- Ultra fast Recovery
- Ultra soft Recovery
- Very Low IRRM
- Very Low Qrr
- Specified at Operating Conditions
- Lead-Free

|                  |            |             |
|------------------|------------|-------------|
| $V_R$            | <b>600</b> | <b>V</b>    |
| $V_{F(Max)}$     | <b>1.7</b> | <b>V</b>    |
| <b>Qrr</b>       | <b>65</b>  | <b>nC</b>   |
| $D_{I(rec)M}/dt$ | <b>240</b> | <b>A/μs</b> |



**Benefits**

- Reduced RFI and EMI
- Reduced Power Loss in Diode and Switching Transistor
- Higher Frequency Operation
- Reduced Snubbing
- Reduced Parts Count

**Description**

International Rectifier's HFA08TB60PbF is a state of the art ultra fast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which result in performance which is unsurpassed by any rectifier previously available. With basic ratings of 600 volts and 8 amps per Leg continuous current, the HFA08TB60PbF is especially well suited for use as the companion diode for IGBTs and MOSFETs. In addition to ultra fast recovery time, the ultra fast recovery diode product line features extremely low values of peak recovery current (IRRM) and does not exhibit any tendency to "snap-off" during the tb portion of recovery. The ultra fast recovery diode features combine to offer designers a rectifier with lower noise and significantly lower switching losses in both the diode and the switching transistor. These ultra fast recovery diode advantages can help to significantly reduce snubbing, component count and heat sink sizes. The HFA08TB60PbF is ideally suited for applications in power supplies and power conversion systems (such as inverters), motor drives, and many other similar applications where high speed, high efficiency is needed.

| Base part number | Package Type | Standard Pack |          | Orderable Part Number |
|------------------|--------------|---------------|----------|-----------------------|
|                  |              | Form          | Quantity |                       |
| HFA08TB60PbF     | TO-220AC     | Tube          | 50       | HFA08TB60PbF          |

**Absolute Maximum Ratings**

|                           | Parameter                                           | Max.         | Units      |
|---------------------------|-----------------------------------------------------|--------------|------------|
| $V_R$                     | Cathode -to – Anode Voltage                         | 600          | V          |
| $I_F @ T_C = 100^\circ C$ | Continuous Forward Current                          | 8.0          | A          |
| $I_{FSM}$                 | Single Pulse Forward Current                        | 60           |            |
| $I_{FRM}$                 | Maximum Repetitive Forward Current                  | 24           |            |
| $P_D @ T_C = 25^\circ C$  | Maximum Power Dissipation                           | 36           | W          |
| $P_D @ T_C = 100^\circ C$ | Maximum Power Dissipation                           | 14           |            |
| $T_J$<br>$T_{STG}$        | Operating Junction and<br>Storage Temperature Range | -55 to + 150 | $^\circ C$ |

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

|                 | Parameter                       | Min. | Typ. | Max. | Units | Conditions                                                                                                                          |
|-----------------|---------------------------------|------|------|------|-------|-------------------------------------------------------------------------------------------------------------------------------------|
| V <sub>BR</sub> | Cathode Anode Breakdown Voltage | 600  | —    | —    | V     | I <sub>R</sub> = 100μA<br>I <sub>F</sub> = 8.0A See Fig. 1<br>I <sub>F</sub> = 16A<br>I <sub>F</sub> = 8.0A, T <sub>J</sub> = 125°C |
| V <sub>FM</sub> | Max Forward Voltage             | —    | 1.4  | 1.7  |       |                                                                                                                                     |
|                 |                                 | —    | 1.7  | 2.1  |       |                                                                                                                                     |
| I <sub>RM</sub> | Max Reverse Leakage Current     | —    | 0.3  | 5.0  | μA    | V <sub>R</sub> = V <sub>R</sub> Rated See Fig. 2<br>T <sub>J</sub> = 125°C, V <sub>R</sub> = 0.8 x V <sub>R</sub> Rated             |
|                 |                                 | —    | 100  | 500  |       |                                                                                                                                     |
| C <sub>T</sub>  | Junction Capacitance            | —    | 10   | 25   | pF    | V <sub>R</sub> = 200V See Fig. 3                                                                                                    |
| L <sub>S</sub>  | Series Inductance               | —    | 8.0  | —    | nH    | Measured lead to lead 5mm from package body                                                                                         |

**Dynamic Recovery Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

|                              | Parameter                             | Min. | Typ. | Max. | Units | Conditions                                                                                                      |
|------------------------------|---------------------------------------|------|------|------|-------|-----------------------------------------------------------------------------------------------------------------|
| t <sub>rr</sub>              | Reverse Recovery Time See Fig. 5      | —    | 18   | —    | ns    | I <sub>F</sub> = 1.0A, di/dt = 200A/μs, V <sub>R</sub> = 30V<br>T <sub>J</sub> = 25°C<br>T <sub>J</sub> = 125°C |
| t <sub>rr1</sub>             |                                       | —    | 37   | 55   |       |                                                                                                                 |
| t <sub>rr2</sub>             |                                       | —    | 55   | 90   |       |                                                                                                                 |
| I <sub>R<sub>RM1</sub></sub> | Peak Recovery Current See Fig. 6      | —    | 3.5  | 5.0  | A     | I <sub>F</sub> = 8.0A<br>V <sub>R</sub> = 200V<br>di/dt = 200A/μs                                               |
| I <sub>R<sub>RM2</sub></sub> |                                       | —    | 4.5  | 8.0  |       |                                                                                                                 |
| Q <sub>rr1</sub>             | Reverse Recovery Charge See Fig.7     | —    | 65   | 138  | nC    | T <sub>J</sub> = 25°C<br>T <sub>J</sub> = 125°C                                                                 |
| Q <sub>rr2</sub>             |                                       | —    | 124  | 360  |       |                                                                                                                 |
| di <sub>(rec)M</sub> /dt1    | Peak Rate of Fall of Recovery Current | —    | 240  | —    | A/μs  | T <sub>J</sub> = 25°C<br>T <sub>J</sub> = 125°C                                                                 |
| di <sub>(rec)M</sub> /dt2    | During t <sub>b</sub> See Fig.8       | —    | 210  | —    |       |                                                                                                                 |

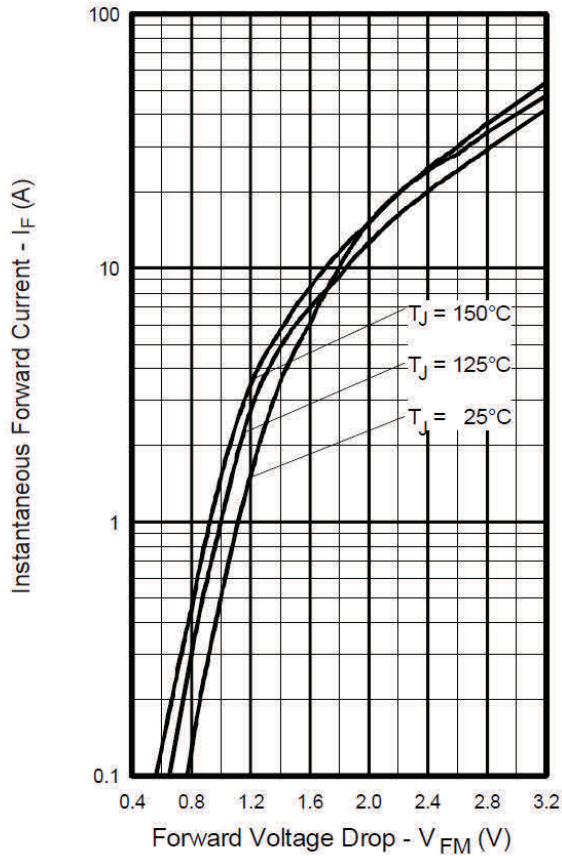
**Thermal Resistance**

|                     | Parameter                               | Min. | Typ. | Max. | Units  |
|---------------------|-----------------------------------------|------|------|------|--------|
| T <sub>lead</sub> ① | Lead Temperature                        | —    | —    | 300  | °C/W   |
| R <sub>θJC</sub>    | Thermal Resistance, Junction to Case    | —    | —    | 3.5  |        |
| R <sub>θJA</sub> ②  | Thermal Resistance, Junction to Ambient | —    | —    | 62   |        |
| R <sub>θCS</sub> ③  | Thermal Resistance, Case to Heat Sink   | —    | 0.50 | —    |        |
| Wt                  | Weight                                  | —    | 2.0  | —    | g      |
|                     |                                         | —    | 0.07 | —    | (oz)   |
| T                   | Mounting Torque                         | 6.0  | —    | 12   | Kg-cm  |
|                     |                                         | 5.0  | —    | 10   | lbf•in |

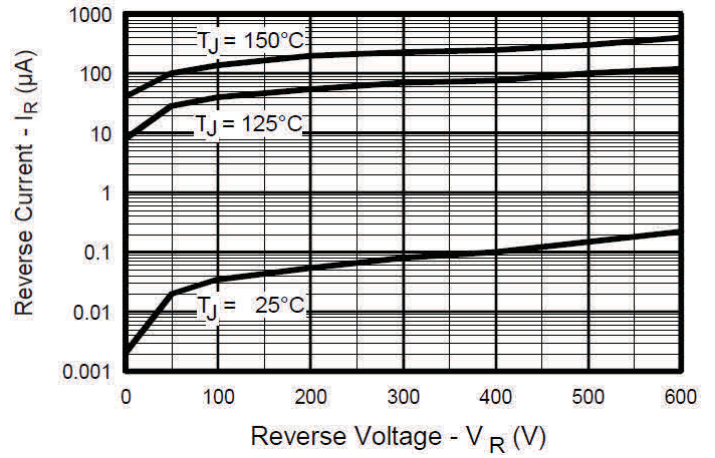
① 0.063 in. from Case (1.6mm) for 10 sec

② Typical Socket Mount

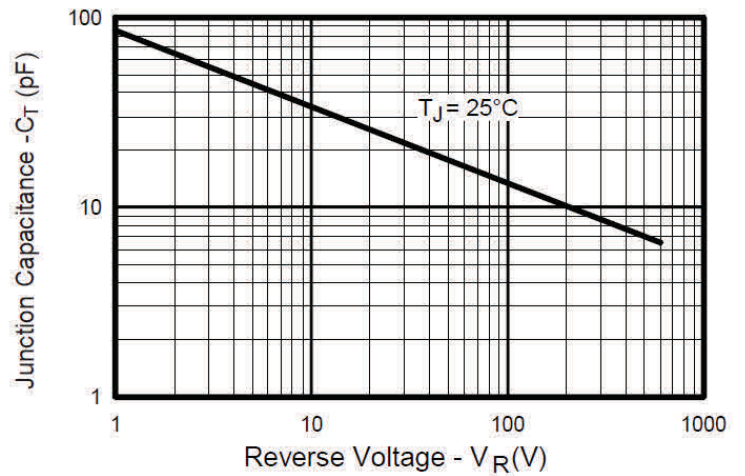
③ Mounting Surface, Flat, Smooth and Greased



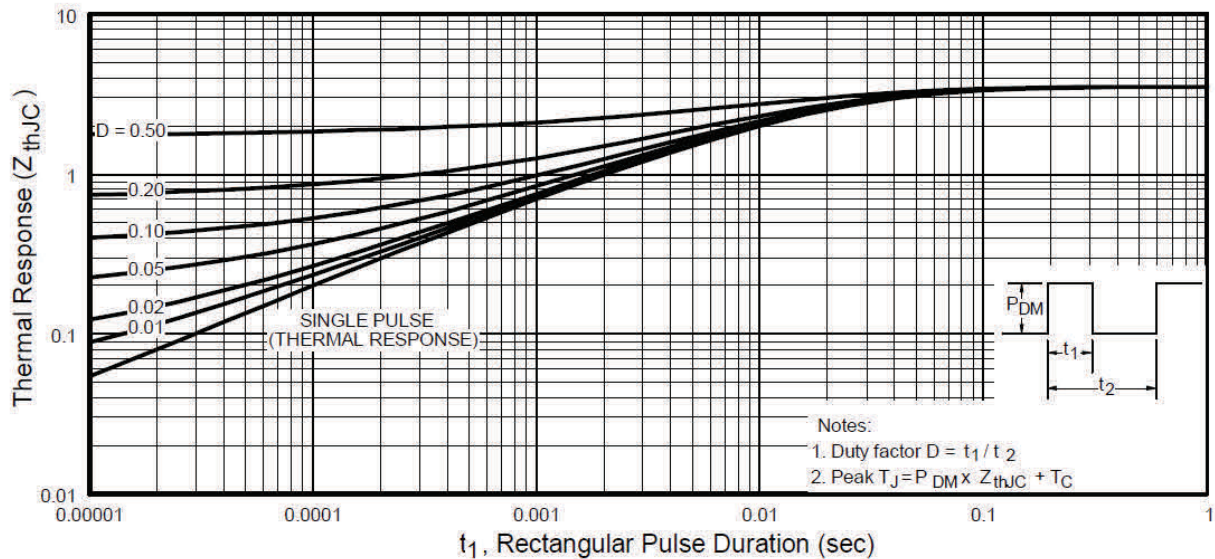
**Fig. 1** - Maximum Forward Voltage Drop vs. Instantaneous Forward Current



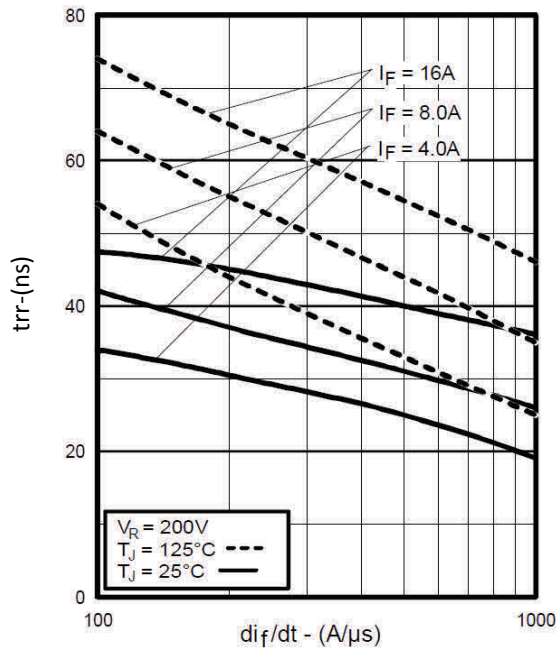
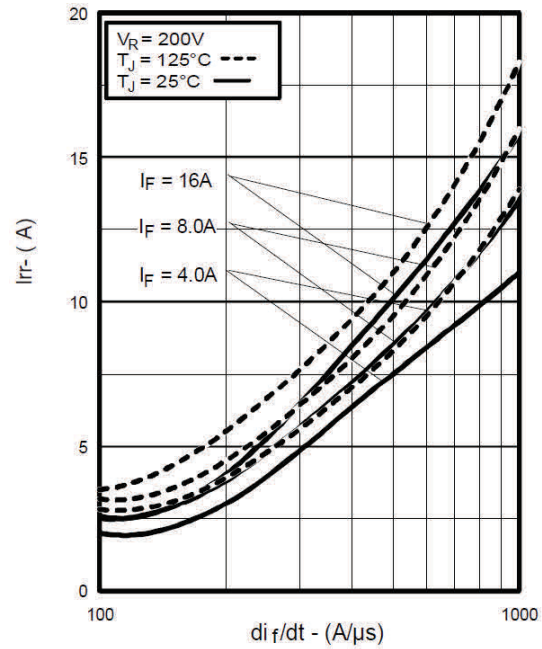
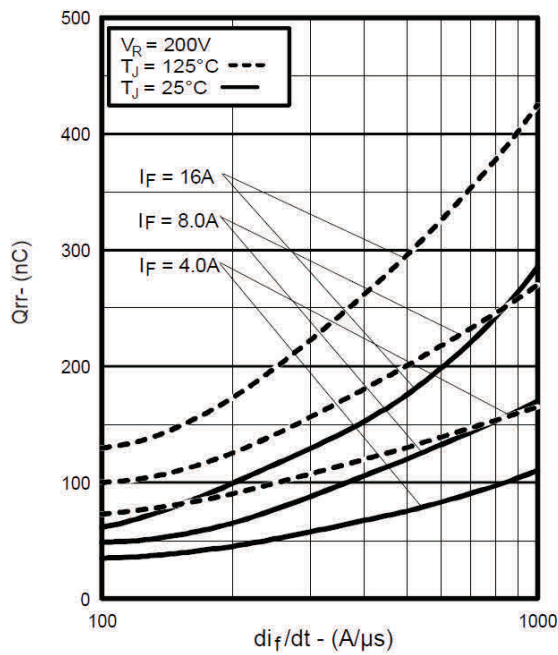
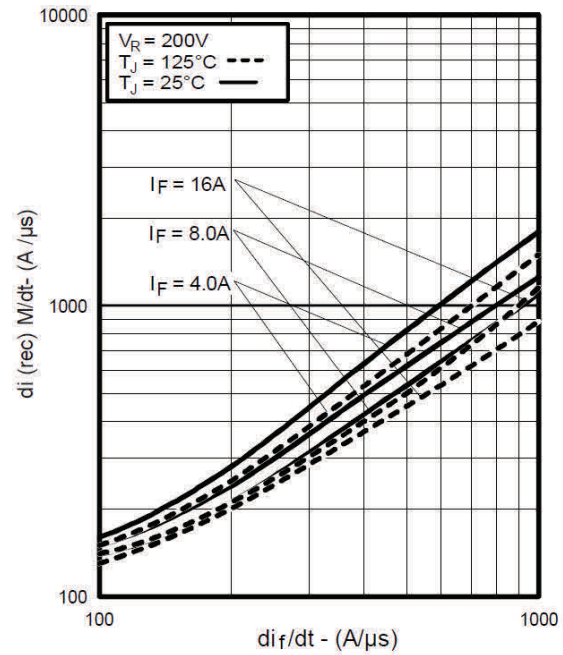
**Fig. 2** - Typical Reverse Current vs. Reverse Voltage

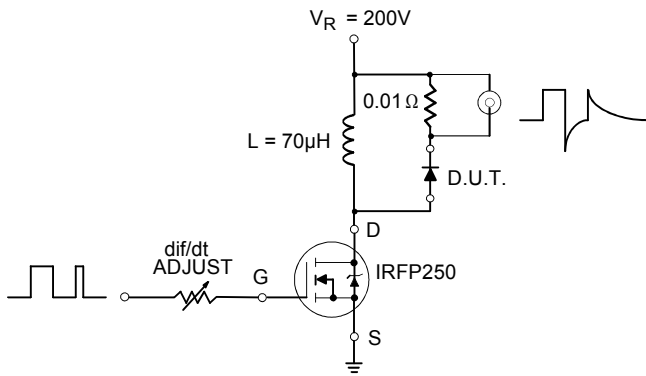
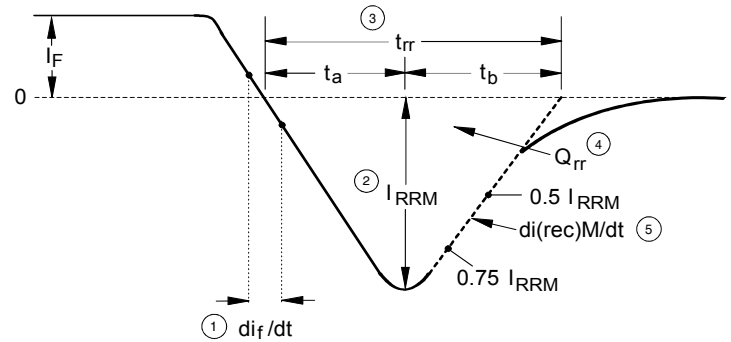


**Fig. 3** - Typical Junction Capacitance vs. Reverse Voltage



**Fig. 4** - Maximum Thermal Impedance  $Z_{thjC}$  Characteristics

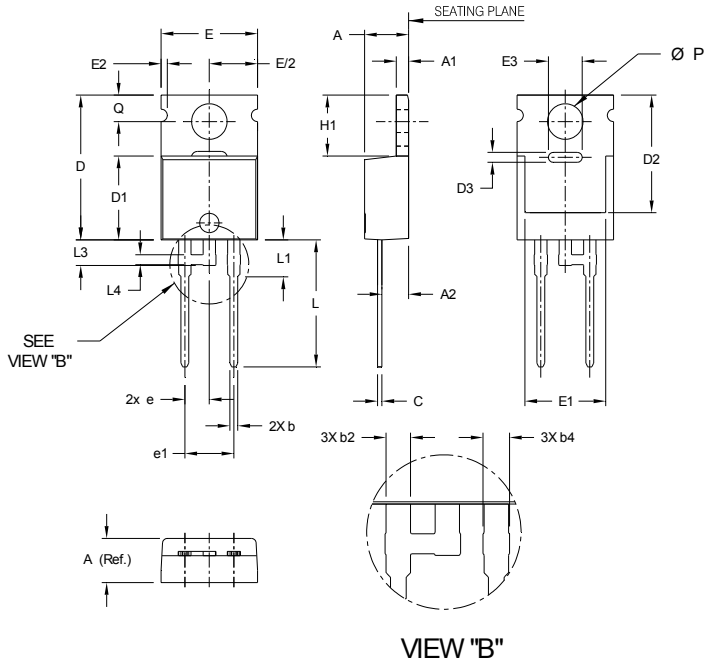

**Fig. 5 - Typical Reverse Recovery vs. di/dt**

**Fig. 6 - Typical Recovery Current vs. di/dt**

**Fig. 7 - Typical Stored Charge vs. di/dt**

**Fig. 8 - Typical di(rec)M/dt vs. di/dt**

**REVERSE RECOVERY CIRCUIT**

**Fig. 9 - 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  $t_{rr}$

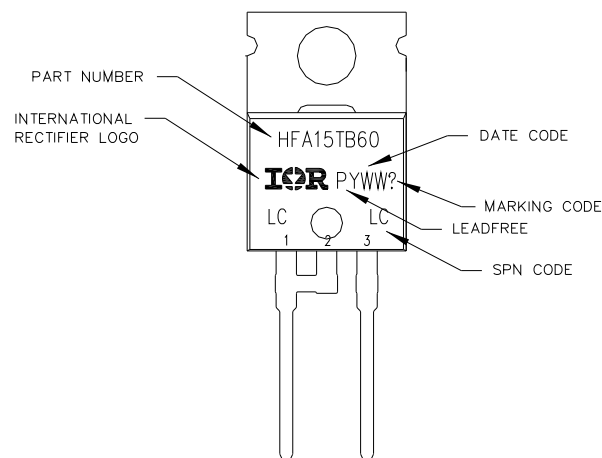
**Fig. 10 - Reverse Recovery Waveform and Definitions**

**TO-220AC Package Outline (Dimensions are shown in millimeters (inches))**


| SYMBOL | MIN.       | NOM.  | MAX.  |
|--------|------------|-------|-------|
| A      | 3.56       | 4.57  | 4.83  |
| A1     | 1.14       | 1.27  | 1.40  |
| A2     | 2.03       | 2.77  | 2.92  |
| b      | 0.38       | 0.81  | 1.01  |
| b2     | 1.17       | 1.27  | 1.37  |
| b4     | 1.25       | 1.35  | 1.45  |
| c      | 0.36       | 0.46  | 0.61  |
| D      | 14.32      | 15.00 | 16.51 |
| D1     | 8.38       | 8.69  | 9.02  |
| D2     | 11.68      | 12.19 | 12.88 |
| D3     | 0.82       | 1.02  | 1.22  |
| E      | 9.65       | 10.00 | 10.67 |
| E1     | 6.86       | 8.39  | 8.89  |
| E2     | --         | --    | 0.76  |
| E3     | 3.30       | 3.50  | 3.70  |
| e      | 2.54 BASIC |       |       |
| e1     | 5.08 BASIC |       |       |
| H1     | 5.84       | 6.31  | 6.86  |
| L      | 12.70      | 13.16 | 14.73 |
| L1     | 3.56       | 3.83  | 4.06  |
| L3     | 2.31       | 2.56  | 2.81  |
| L4     | 0.76       | 1.01  | 1.27  |
| øP     | 3.54       | 3.68  | 4.08  |
| Q      | 2.54       | 2.74  | 3.42  |

**NOTES:**

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M 1994.
2. DIMENSIONS ARE SHOWN IN MILLIMETERS.

**TO-220AC Part Marking Information**


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

**Qualification Information<sup>†</sup>**

|                                   |                                                 |     |
|-----------------------------------|-------------------------------------------------|-----|
| <b>Qualification Level</b>        | Industrial<br>(per JEDEC JESD47F) <sup>††</sup> |     |
| <b>Moisture Sensitivity Level</b> | TO-220AC                                        | N/A |
| <b>RoHS Compliant</b>             | Yes                                             |     |

† Qualification standards can be found at International Rectifier’s web site: <http://www.irf.com/product-info/reliability/>

†† Applicable version of JEDEC standard at the time of product release.