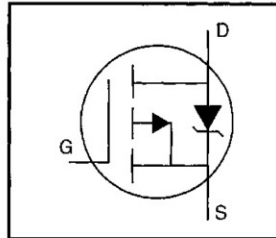


IRF9Z34PbF

HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- P-Channel
- 175°C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Lead-Free



$$V_{DSS} = -60V$$

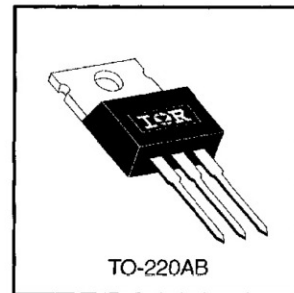
$$R_{DS(on)} = 0.14\Omega$$

$$I_D = -18A$$

Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

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 |
|---------------------------|--|-----------------------|-------|
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -10 V$ | -18 | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ -10 V$ | -13 | |
| I_{DM} | Pulsed Drain Current ① | -72 | |
| $P_D @ T_C = 25^\circ C$ | Power Dissipation | 88 | W |
| | Linear Derating Factor | 0.59 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| E_{AS} | Single Pulse Avalanche Energy ② | 370 | mJ |
| I_{AR} | Avalanche Current ① | -18 | A |
| E_{AR} | Repetitive Avalanche Energy ① | 8.8 | mJ |
| dv/dt | Peak Diode Recovery dv/dt ③ | -4.5 | V/ns |
| T_J T_{STG} | Operating Junction and Storage Temperature Range | -55 to +175 | °C |
| | Soldering Temperature, for 10 seconds | 300 (1.6mm from case) | |
| | Mounting Torque, 6-32 or M3 screw | 10 lbf·in (1.1 N·m) | |

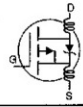
Thermal Resistance

| | Parameter | Min. | Typ. | Max. | Units |
|-----------------|-------------------------------------|------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case | — | — | 1.7 | °C/W |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface | — | 0.50 | — | |
| $R_{\theta JA}$ | Junction-to-Ambient | — | — | 62 | |

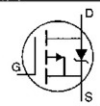
IRF9Z34PbF

International
 Rectifier

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

| | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---------------------------------|--------------------------------------|------|--------|------|----------|--|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | -60 | — | — | V | $V_{GS}=0V, I_D=-250\mu A$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | -0.060 | — | V/°C | Reference to 25°C , $I_D=-1\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 0.14 | Ω | $V_{GS}=-10V, I_D=-11A$ ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | -2.0 | — | -4.0 | V | $V_{DS}=V_{GS}, I_D=-250\mu A$ |
| g_{fs} | Forward Transconductance | 5.9 | — | — | S | $V_{DS}=-25V, I_D=-11A$ ④ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | -100 | μA | $V_{DS}=-60V, V_{GS}=0V$ |
| | | — | — | -500 | | $V_{DS}=-48V, V_{GS}=0V, T_J=150^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | -100 | nA | $V_{GS}=-20V$ |
| | Gate-to-Source Reverse Leakage | — | — | 100 | | $V_{GS}=20V$ |
| Q_g | Total Gate Charge | — | — | 34 | nC | $I_D=-18A$ |
| Q_{gs} | Gate-to-Source Charge | — | — | 9.9 | | $V_{DS}=-48V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | — | 16 | | $V_{GS}=-10V$ See Fig. 6 and 13 ④ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 18 | — | ns | $V_{DD}=-30V$ |
| t_r | Rise Time | — | 120 | — | | $I_D=-18A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 20 | — | | $R_G=12\Omega$ |
| t_f | Fall Time | — | 58 | — | | $R_D=1.5\Omega$ See Figure 10 ④ |
| L_D | Internal Drain Inductance | — | 4.5 | — | nH | Between lead, 6 mm (0.25in.) from package and center of die contact  |
| L_S | Internal Source Inductance | — | 7.5 | — | | |
| C_{iss} | Input Capacitance | — | 1100 | — | pF | $V_{GS}=0V$ |
| C_{oss} | Output Capacitance | — | 620 | — | | $V_{DS}=-25V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 100 | — | | $f=1.0\text{MHz}$ See Figure 5 |

Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|----------|--|---|------|------|---------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | -18 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | -72 | | |
| V_{SD} | Diode Forward Voltage | — | — | -6.3 | V | $T_J=25^\circ\text{C}, I_S=-18A, V_{GS}=0V$ ④ |
| t_{rr} | Reverse Recovery Time | — | 100 | 200 | ns | $T_J=25^\circ\text{C}, I_F=-18A$ |
| Q_{rr} | Reverse Recovery Charge | — | 0.28 | 0.52 | μC | $di/dt=100A/\mu s$ 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 (See Figure 11)
- ② $V_{DD}=-25V$, starting $T_J=25^\circ\text{C}$, $L=1.3\text{mH}$, $R_G=25\Omega$, $I_{AS}=-18A$ (See Figure 12)
- ③ $I_{SD}\leq-18A$, $di/dt\leq 170A/\mu s$, $V_{DD}\leq V_{(BR)DSS}$, $T_J\leq 175^\circ\text{C}$
- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

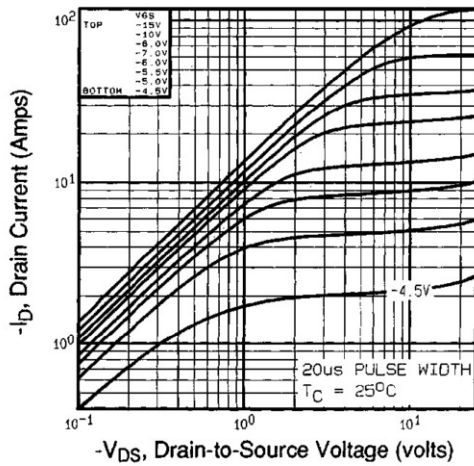


Fig 1. Typical Output Characteristics,
 $T_C=25^\circ\text{C}$

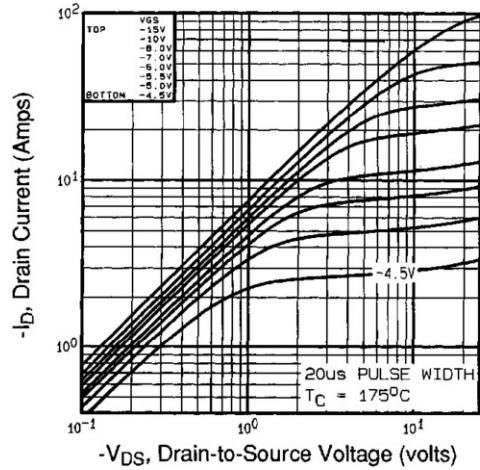


Fig 2. Typical Output Characteristics,
 $T_C=175^\circ\text{C}$

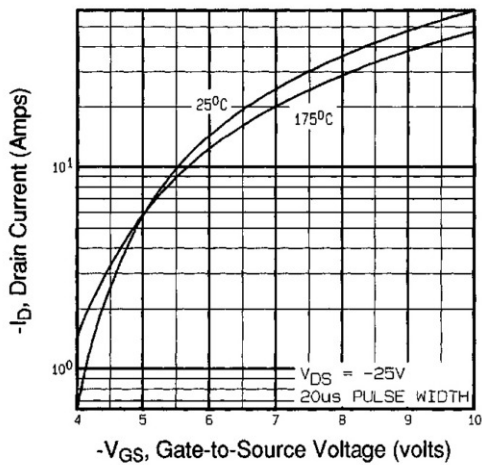


Fig 3. Typical Transfer Characteristics

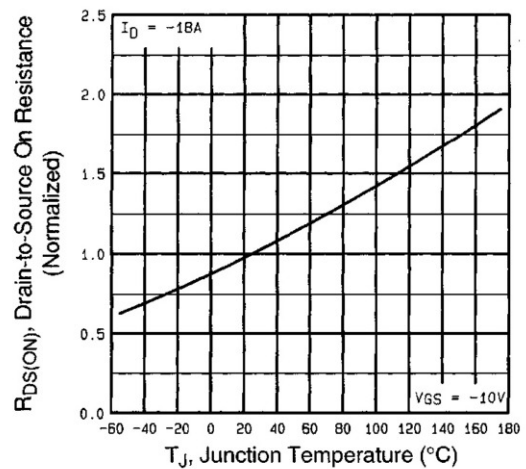


Fig 4. Normalized On-Resistance
 Vs. Temperature

IRF9Z34PbF

International
IR Rectifier

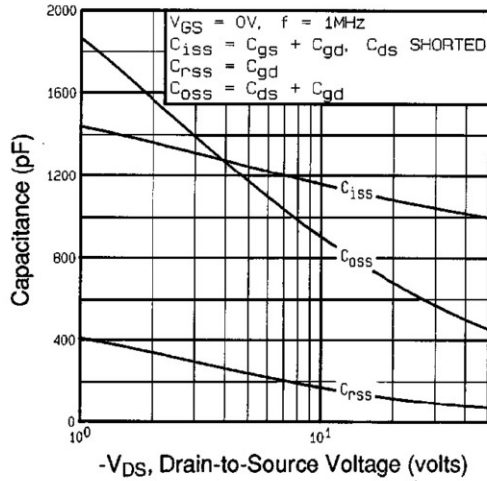


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

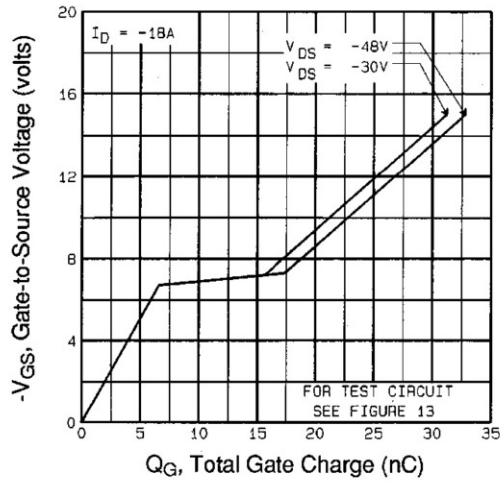


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

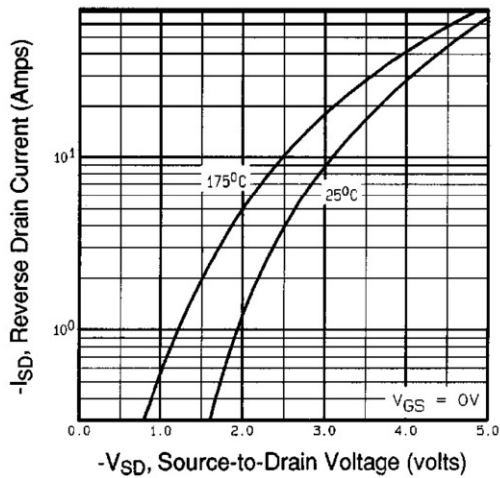


Fig 7. Typical Source-Drain Diode Forward Voltage

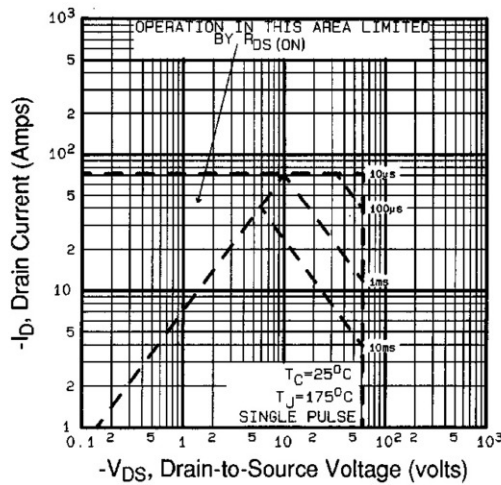


Fig 8. Maximum Safe Operating Area

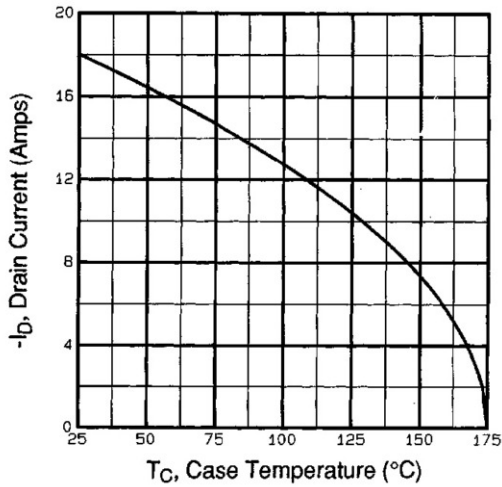


Fig 9. Maximum Drain Current Vs. Case Temperature

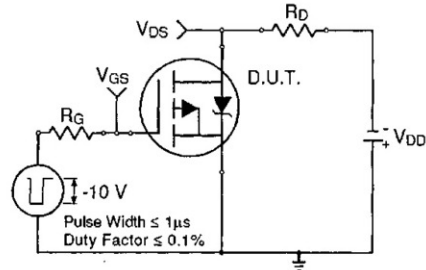


Fig 10a. Switching Time Test Circuit

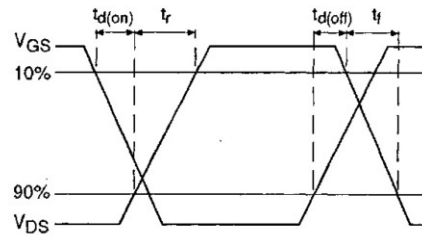


Fig 10b. Switching Time Waveforms

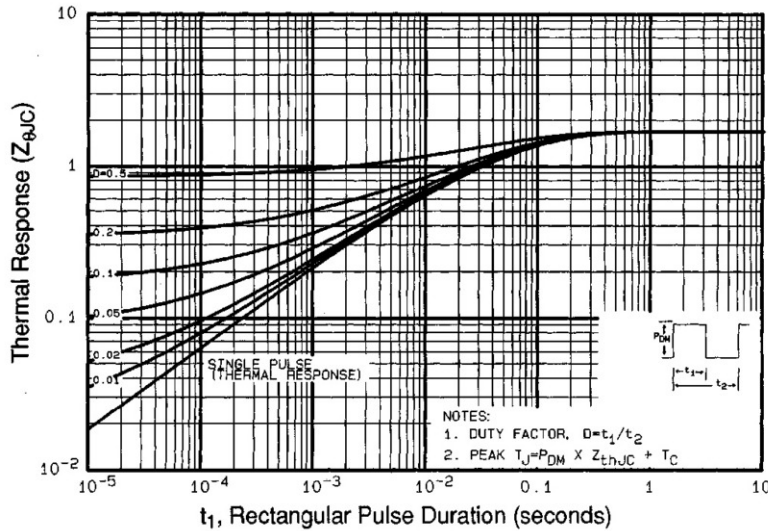


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRF9Z34PbF

International
IOR Rectifier

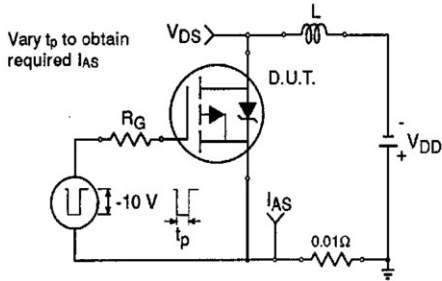


Fig 12a. Unclamped Inductive Test Circuit

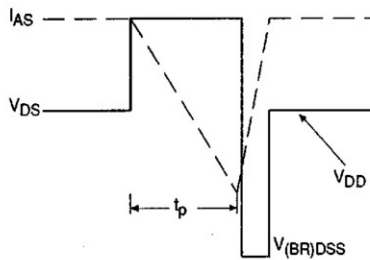


Fig 12b. Unclamped Inductive Waveforms

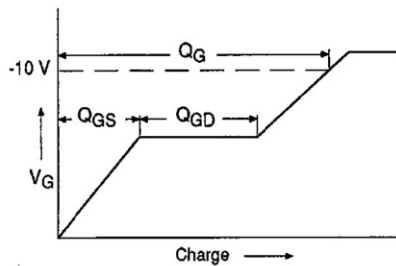


Fig 13a. Basic Gate Charge Waveform

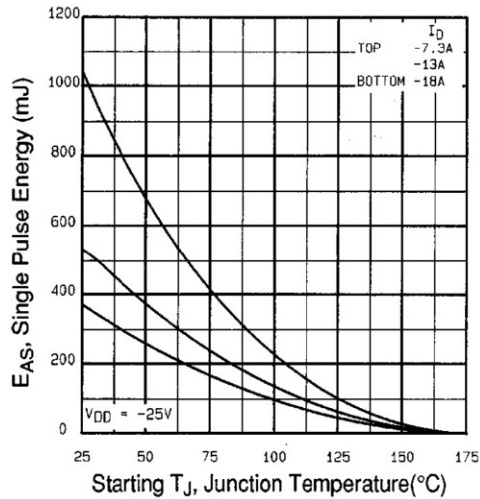


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

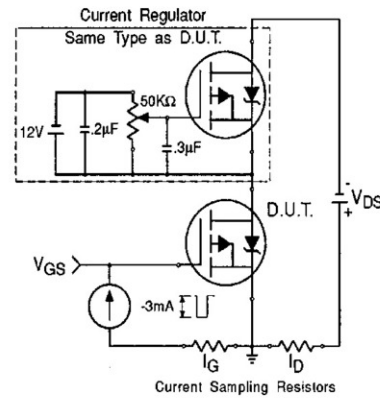


Fig 13b. Gate Charge Test Circuit

Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit – See page 1506

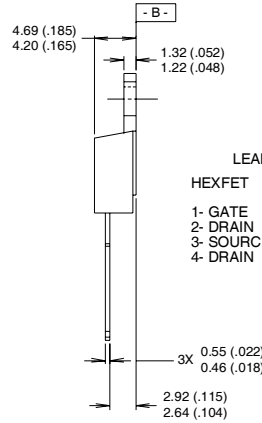
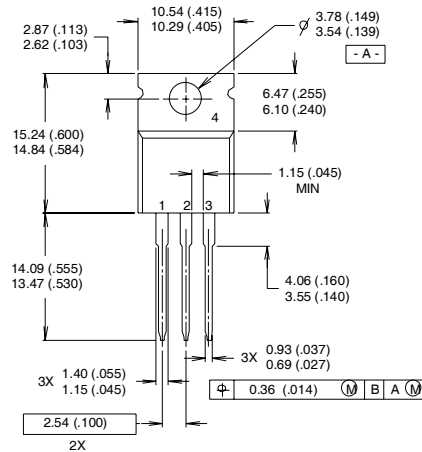
Appendix B: Package Outline Mechanical Drawing – See page 1509

Appendix E: Optional Leadforms– See page 1525

International
IOR Rectifier

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 |

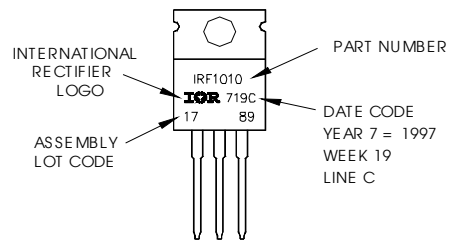
NOTES:

- 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.

International
IR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
 TAC Fax: (310) 252-7903
 01/04



Notice

The products described herein were acquired by Vishay Intertechnology, Inc., as part of its acquisition of International Rectifier's Power Control Systems (PCS) business, which closed in April 2007. Specifications of the products displayed herein are pending review by Vishay and are subject to the terms and conditions shown below.

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.

International Rectifier®, IR®, the IR logo, HEXFET®, HEXSense®, HEXDIP®, DOL®, INTERO®, and POWIRTRAIN® are registered trademarks of International Rectifier Corporation in the U.S. and other countries. All other product names noted herein may be trademarks of their respective owners.