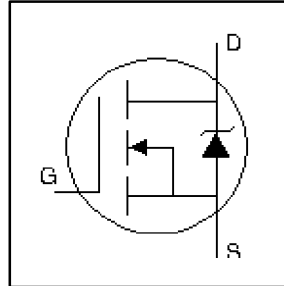


HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Logic-Level Gate Drive
- $R_{DS(ON)}$ Specified at $V_{GS} = 4V$ & $5V$
- $150^{\circ}C$ Operating Temperature
- Fast Switching
- Ease of paralleling



$$V_{DSS} = 200V$$

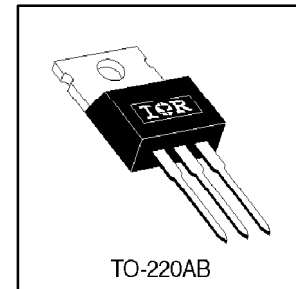
$$R_{DS(on)} = 0.40\Omega$$

$$I_D = 9.0A$$

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} @ 5.0V | 9.0 | A |
| I_D @ $T_C = 100^{\circ}C$ | Continuous Drain Current, V_{GS} @ 5.0V | 5.7 | |
| I_{DM} | Pulsed Drain Current ① | 36 | |
| P_D @ $T_C = 25^{\circ}C$ | Power Dissipation | 74 | W |
| | Linear Derating Factor | 0.59 | W/ $^{\circ}C$ |
| V_{GS} | Gate-to-Source Voltage | ± 10 | V |
| E_{AS} | Single Pulse Avalanche Energy ② | 250 | mJ |
| I_{AR} | Avalanche Current ① | 9.0 | A |
| E_{AR} | Repetitive Avalanche Energy ① | 7.4 | mJ |
| dv/dt | Peak Diode Recovery dv/dt ③ | 5.0 | V/ns |
| T_J | Operating Junction and | -55 to + 150 | $^{\circ}C$ |
| T_{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 seconds | | |
| | Mounting torque, 6-32 or M3 screw. | 10 lbf•in (1.1N•m) | |

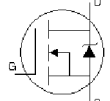
Thermal Resistance

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

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------------------|--------------------------------------|------|------|------|---------------------|--|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 200 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.27 | — | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ |
| $R_{DS(ON)}$ | Static Drain-to-Source On-Resistance | — | — | 0.40 | Ω | $V_{GS} = 5.0V, I_D = 5.4A$ ④ |
| | | — | — | 0.50 | | $V_{GS} = 4.0V, I_D = 4.5A$ ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 1.0 | — | 2.0 | V | $V_{DS} = V_{GS}, I_D = 250\mu A$ |
| g_{fs} | Forward Transconductance | 4.8 | — | — | S | $V_{DS} = 50V, I_D = 5.4A$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 25 | μA | $V_{DS} = 200V, V_{GS} = 0V$ |
| | | — | — | 250 | | $V_{DS} = 160V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| 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 | — | — | 40 | nC | $I_D = 9.0A$ |
| Q_{gs} | Gate-to-Source Charge | — | — | 5.5 | | $V_{DS} = 160V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | — | 24 | | $V_{GS} = 10V$, See Fig. 6 and 13 ④ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 8.0 | — | ns | $V_{DD} = 100V$ |
| t_r | Rise Time | — | 57 | — | | $I_D = 9.0A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 38 | — | | $R_G = 6.0\Omega$ |
| t_f | Fall Time | — | 33 | — | | $R_D = 11\Omega$, See Fig. 10 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 | — | 1100 | — | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 220 | — | | $V_{DS} = 25V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 70 | — | | $f = 1.0\text{MHz}$, See Fig. 5 |

Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|---|------|------|---------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 9.0 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 36 | | |
| V_{SD} | Diode Forward Voltage | — | — | 2.0 | V | $T_J = 25^\circ\text{C}, I_S = 9.0A, V_{GS} = 0V$ ② |
| t_{rr} | Reverse Recovery Time | — | 230 | 350 | ns | $T_J = 25^\circ\text{C}, I_F = 9.0A$ |
| Q_{rr} | Reverse Recovery Charge | — | 1.7 | 2.6 | μC | $di/dt = 100A/\mu s$ ③ |
| 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 fig. 11)
- ② $V_{DD} = 25V$, starting $T_J = 25^\circ\text{C}$, $L = 4.6\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 9.0A$. (See Figure 12)
- ③ $I_{SD} \leq 9.0A$, $di/dt \leq 120A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 150^\circ\text{C}$
- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

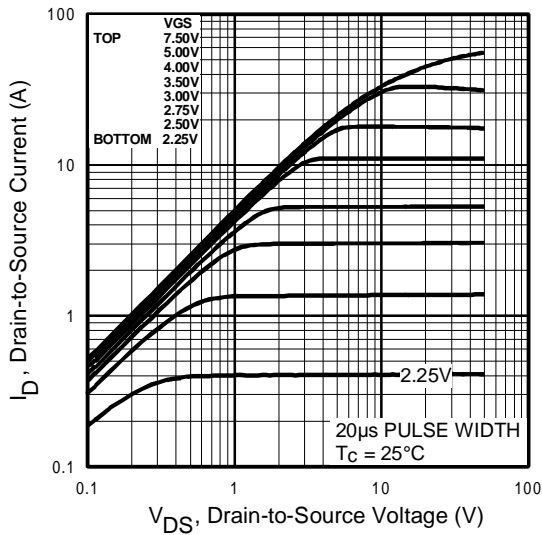


Fig 1. Typical Output Characteristics,
 $T_C = 25^\circ\text{C}$

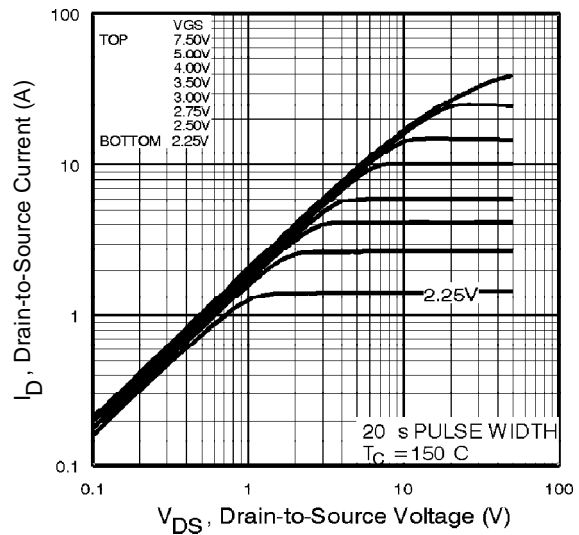


Fig 2. Typical Output Characteristics,
 $T_C = 150^\circ\text{C}$

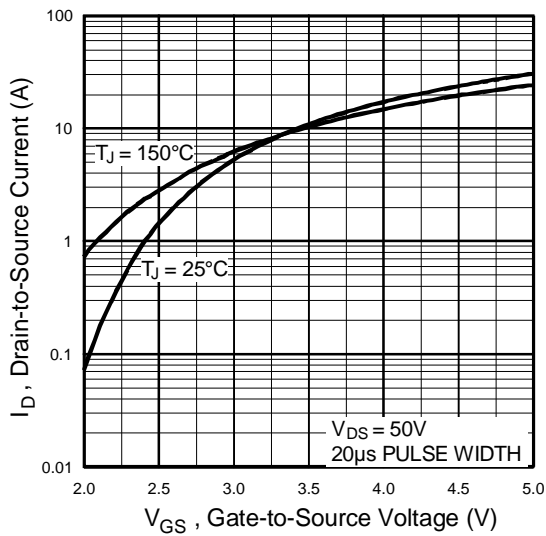


Fig 3. Typical Transfer Characteristics

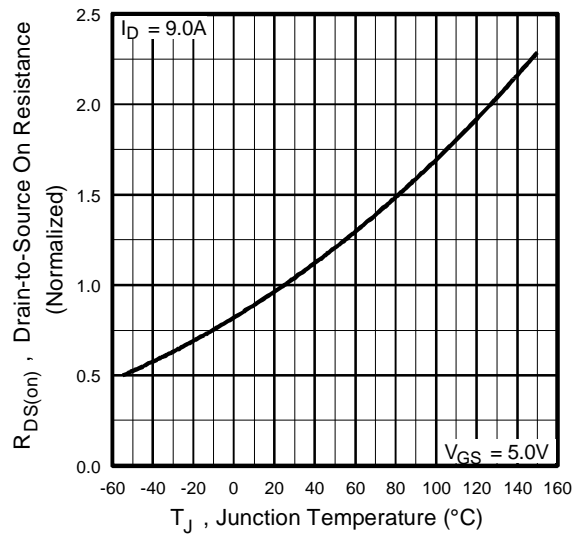


Fig 4. Normalized On-Resistance
Vs. Temperature

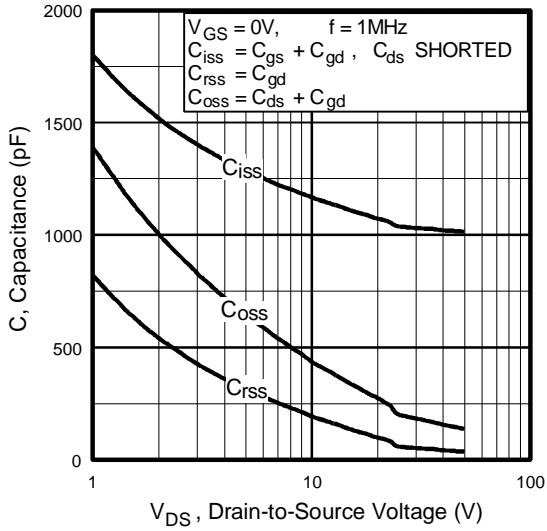


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

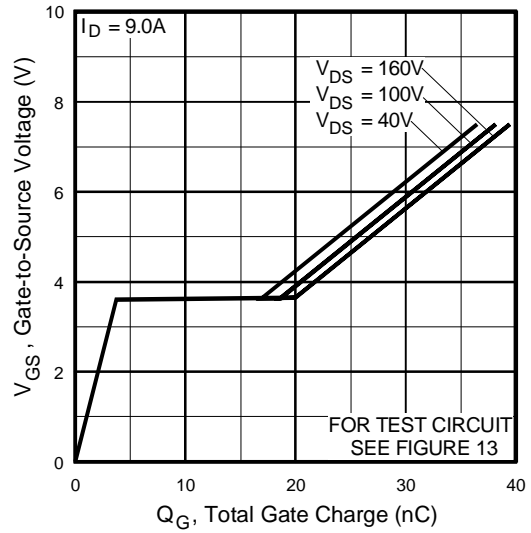


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

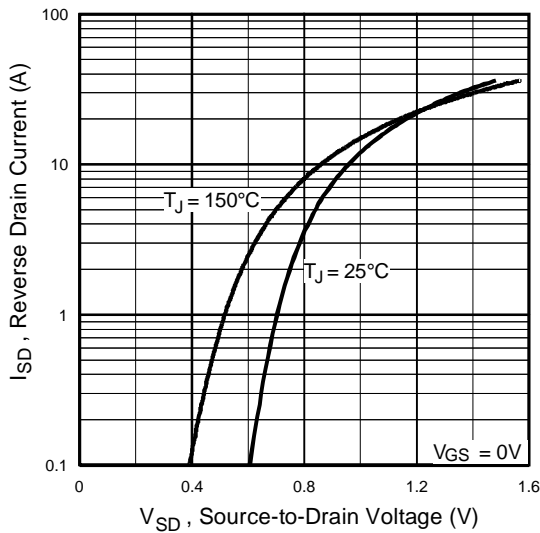


Fig 7. Typical Source-Drain Diode Forward Voltage

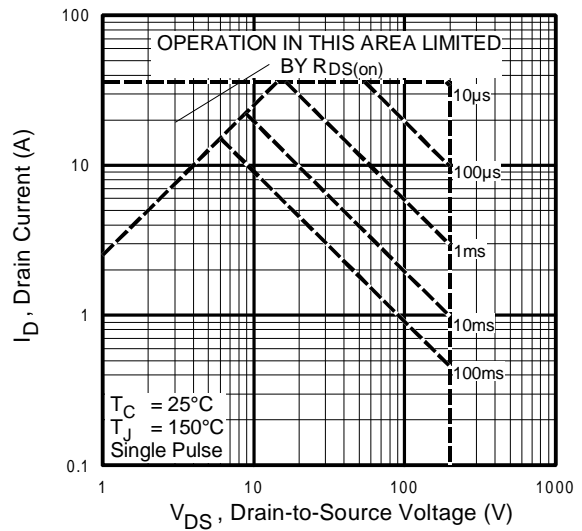


Fig 8. Maximum Safe Operating Area

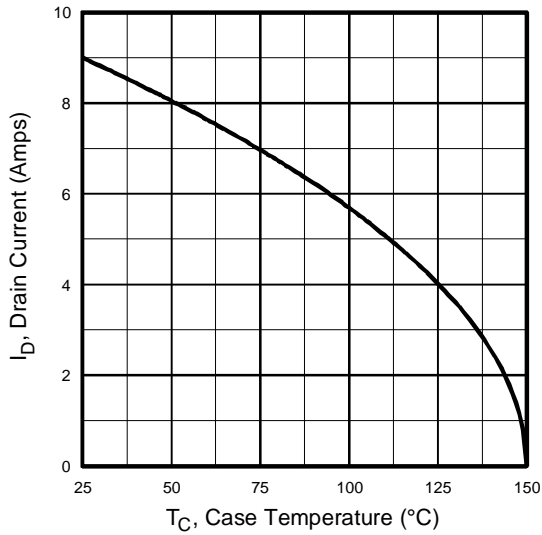


Fig 9. Maximum Drain Current Vs. Case Temperature

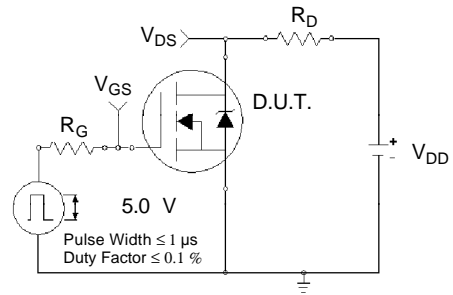


Fig 10a. Switching Time Test Circuit

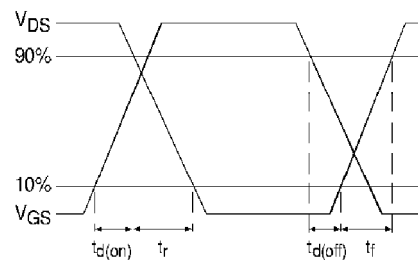


Fig 10b. Switching Time Waveforms

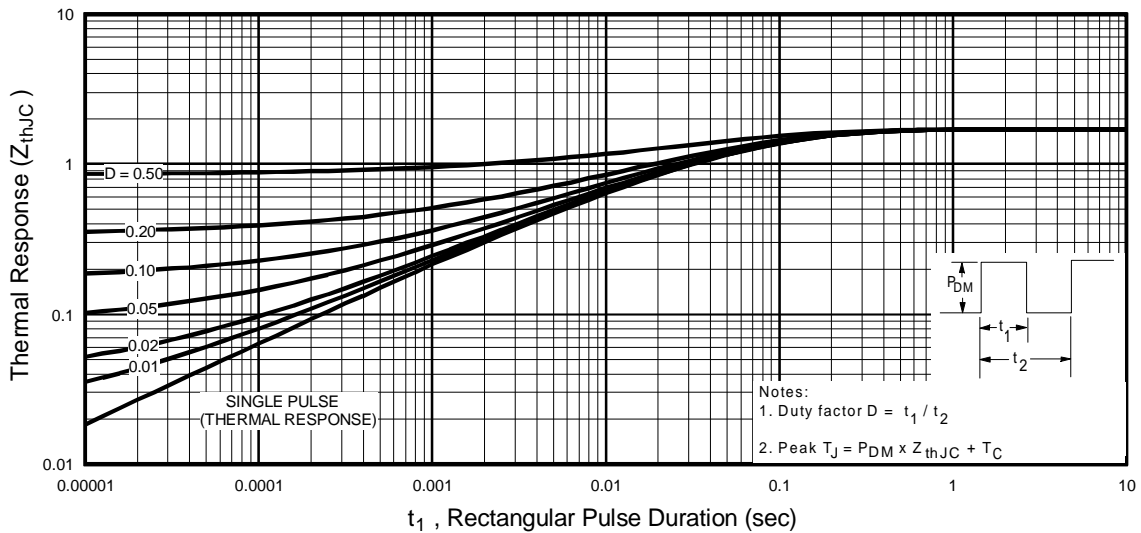


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

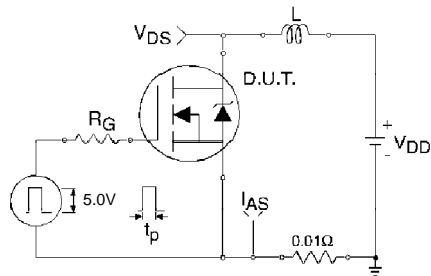


Fig 12a. Unclamped Inductive Test Circuit

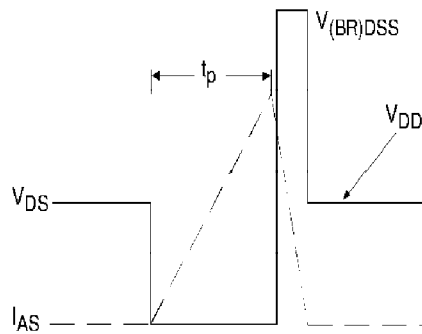


Fig 12b. Unclamped Inductive Waveforms

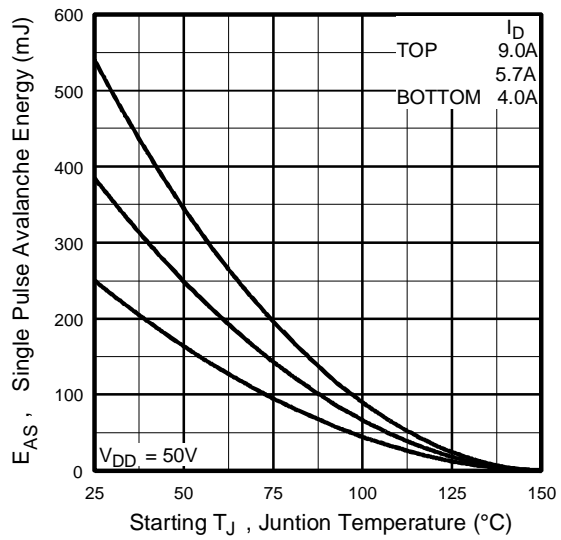


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

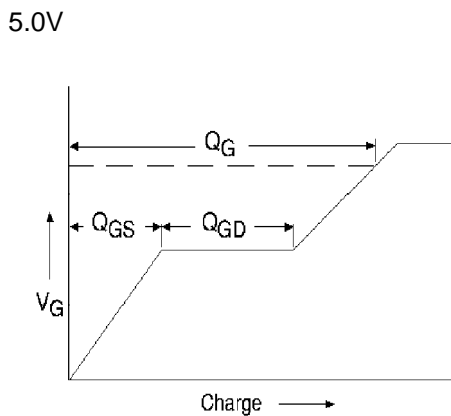


Fig 13a. Basic Gate Charge Waveform

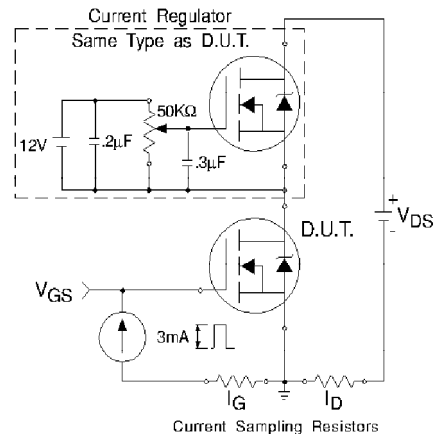
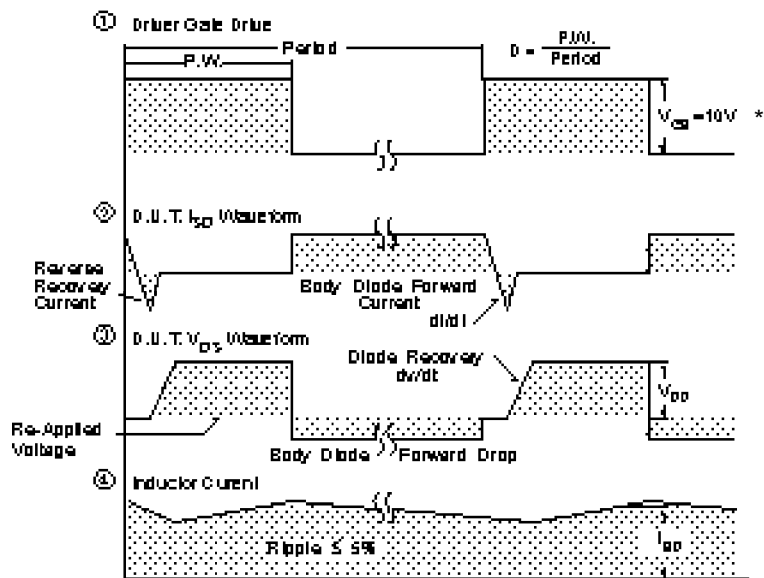
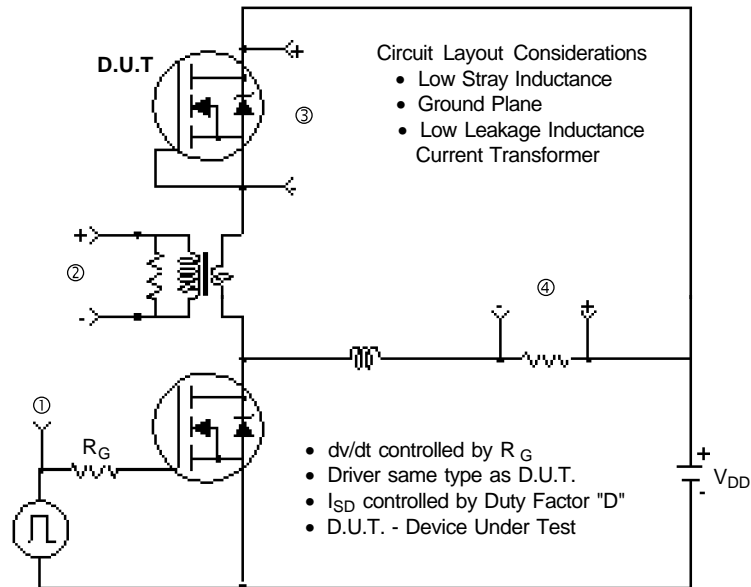


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



* $V_{GS} = 5V$ for Logic Level Devices

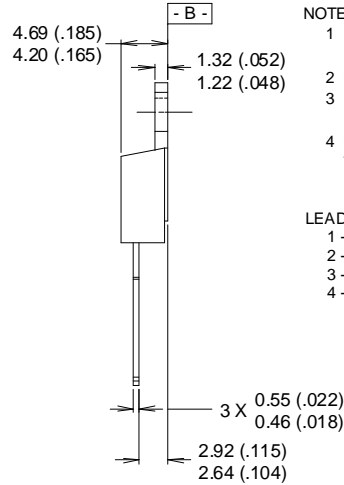
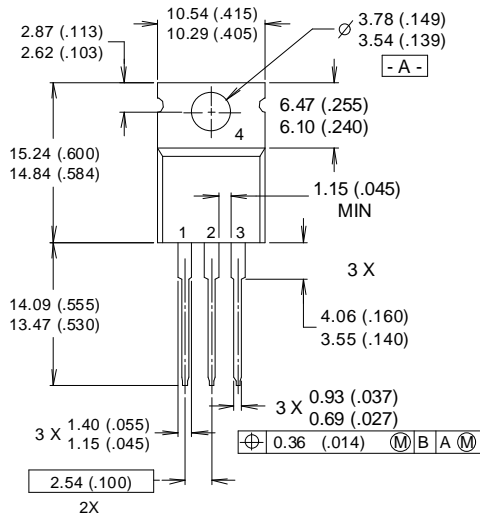
Fig 14. For N-Channel HEXFETS

IRL630



Package Outline

TO-220AB Outline



- NOTES:
- 1 DIMENSIONS & TOLERANCING PER ANSI Y14.5M, 1982.
 - 2 CONTROLLING DIMENSION : INCH.
 - 3 DIMENSIONS ARE SHOWN MILLIMETERS (INCHES).
 - 4 CONFORMS TO JEDEC OUTLINE TO-220AB.

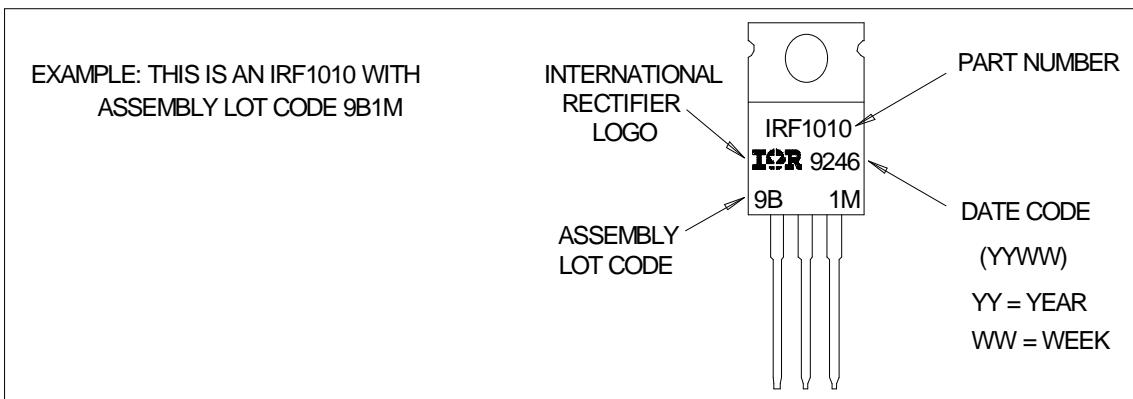
- LEAD ASSIGNMENTS
- 1 - GATE
 - 2 - DRAIN
 - 3 - SOURCE
 - 4 - DRAIN

CONFORMS TO JEDEC OUTLINE TO-220AB

Dimensions in Millimeters and (Inches)

Part Marking Information

TO-220AB



WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331

EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: (44) 0883 713215

IR CANADA: 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 3L1, Tel: (905) 475 1897 **IR GERMANY:**

Saalburgstrasse 157, 61350 Bad Homburg Tel: 6172 37066 **IR ITALY:** Via Liguria 49, 10071 Borgaro, Torino Tel: (39) 1145

10111 **IR FAR EAST:** K&H Bldg., 2F, 3-30-4 Nishi-Ikeburo 3-Chome, Toshima-Ki, Tokyo 171 Tel: (03)3983 0641 **IR**

SOUTHEAST ASIA: 315 Outram Road, #10-02 Tan Boon Liat Building, 0316 Tel: 65 221 8371

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