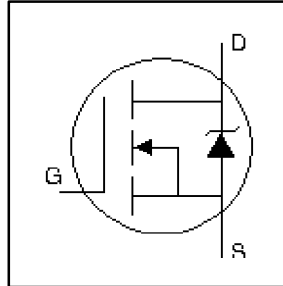


HEXFET® Power MOSFET

- Advanced Process Technology
- Ultra Low On-Resistance
- Isolated Package
- High Voltage Isolation = 2.5KVRMS^⑤
- Sink to Lead Creepage Dist. = 4.8mm
- Repetitive Avalanche Rated
- 175°C Operating Temperature



$$V_{DSS} = 100V$$

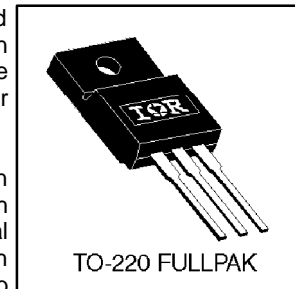
$$R_{DS(on)} = 0.04\Omega$$

$$I_D = 22A$$

Description

Fourth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient device for use in a wide variety of applications.

The TO-220 Fullpak eliminates the need for additional insulating hardware in commercial-industrial applications. The moulding compound used provides a high isolation capability and a low thermal resistance between the tab and external heatsink. This isolation is equivalent to using a 100 micron mica barrier with standard TO-220 product. The Fullpak is mounted to a heatsink using a single clip or by a single screw fixing.



Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---------------------------|--|-----------------------|-------|
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 22 | |
| $I_D @ T_C = 100^\circ C$ | Continuous Collector Current, $V_{GS} @ 10V$ | 15 | A |
| I_{DM} | Pulsed Drain Current ^① | 88 | |
| $P_D @ T_C = 25^\circ C$ | Power Dissipation | 48 | W |
| | Linear Derating Factor | 0.32 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ±20 | V |
| E_{AS} | Single Pulse Avalanche Energy ^② | 120 | mJ |
| I_{AR} | Avalanche Current ^① | 22 | A |
| E_{AR} | Repetitive Avalanche Energy ^① | 4.8 | mJ |
| dv/dt | Peak Diode Recovery dv/dt ^③ | 5.5 | V/ns |
| T_J | Operating Junction and | -55 to + 175 | |
| T_{STG} | Storage Temperature Range | | °C |
| | Soldering Temperature, for 10 seconds | 300 (1.6mm from case) | |
| | 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 | — | — | 3.1 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient | — | — | — | 65 |

IRFI1310G



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 | 100 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.10 | — | V/°C | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ |
| $R_{DS(ON)}$ | Static Drain-to-Source On-Resistance | — | — | 0.04 | Ω | $V_{GS} = 10V, I_D = 13A$ 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 | 12 | — | — | S | $V_{DS} = 50V, I_D = 25A$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 25 | μA | $V_{DS} = 100V, V_{GS} = 0V$ |
| | | — | — | 250 | | $V_{DS} = 80V, V_{GS} = 0V, T_J = 150^\circ\text{C}$ |
| 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 | — | — | 110 | nC | $I_D = 25A$ |
| Q_{gs} | Gate-to-Source Charge | — | — | 18 | | $V_{DS} = 80V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | — | 42 | | $V_{GS} = 10V$, See Fig. 6 and 13 ④ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 13 | — | | ns |
| t_r | Rise Time | — | 77 | — | $I_D = 25A$ | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 82 | — | $R_G = 9.1\Omega$ | |
| t_f | Fall Time | — | 64 | — | $R_D = 2.0\Omega$, 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 | — | 2500 | — | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 630 | — | | $V_{DS} = 25V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 130 | — | | $f = 1.0\text{MHz}$, See Fig. 5 |



Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|---|------|------|---------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 22 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 88 | | |
| V_{SD} | Diode Forward Voltage | — | — | 2.5 | V | $T_J = 25^\circ\text{C}, I_S = 13A, V_{GS} = 0V$ ④ |
| t_{rr} | Reverse Recovery Time | — | 140 | 210 | ns | $T_J = 25^\circ\text{C}, I_F = 25A$ |
| Q_{rr} | Reverse Recovery Charge | — | 0.79 | 1.2 | 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 fig. 11)

③ $I_{SD} \leq 25A, di/dt \leq 170A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^\circ\text{C}$

⑤ $t=60s, f=60\text{Hz}$

② $V_{DD} = 25V, \text{ starting } T_J = 25^\circ\text{C}, L = 1.0\text{mH}$
 $R_G = 25\Omega, I_{AS} = 13A.$ (See Figure 12)

④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

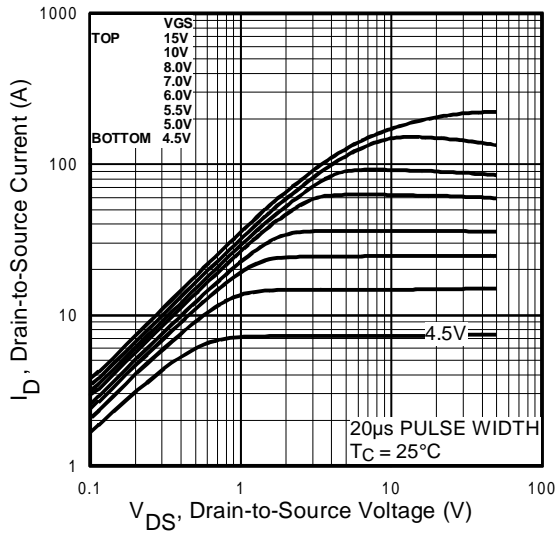


Fig 1. Typical Output Characteristics,
 $T_C = 25^\circ\text{C}$

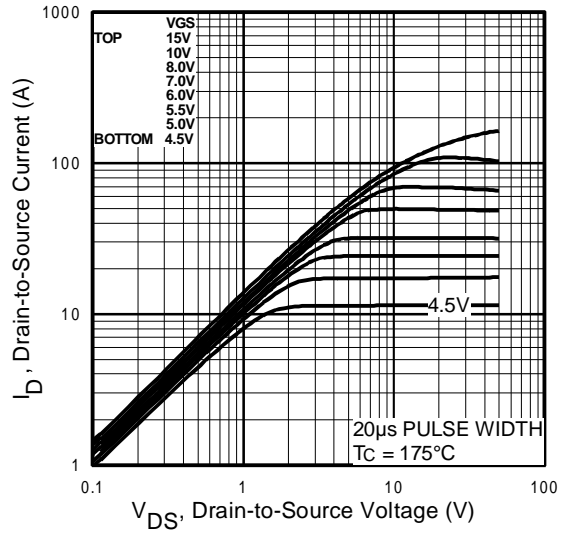


Fig 2. Typical Output Characteristics,
 $T_C = 175^\circ\text{C}$

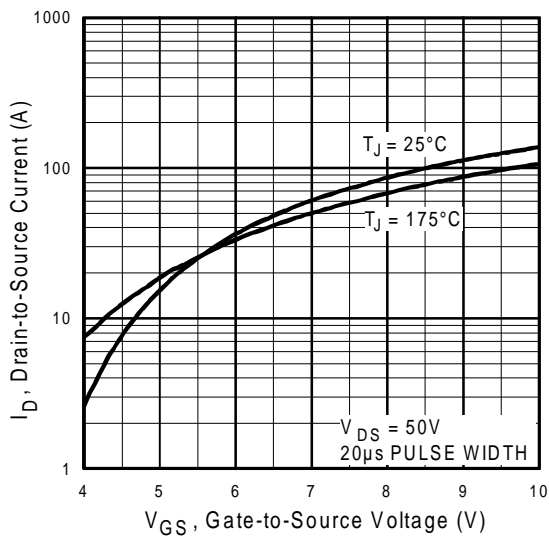


Fig 3. Typical Transfer Characteristics

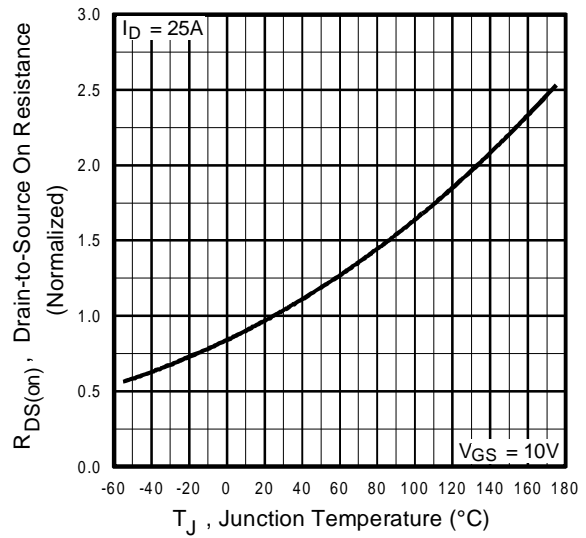


Fig 4. Normalized On-Resistance
Vs. Temperature

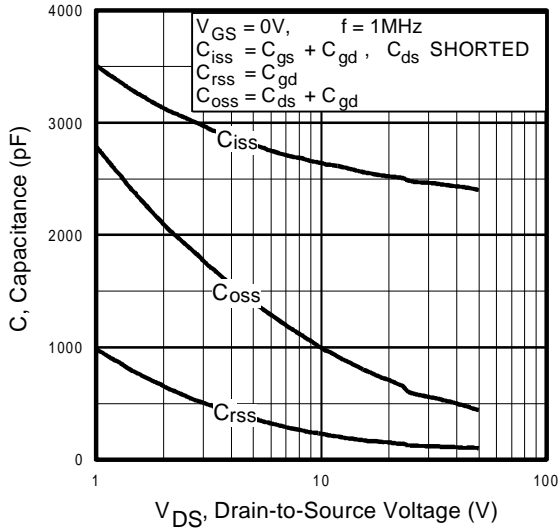


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

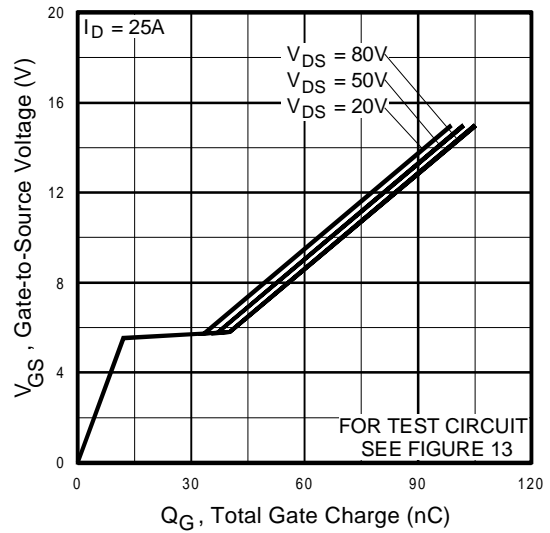


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

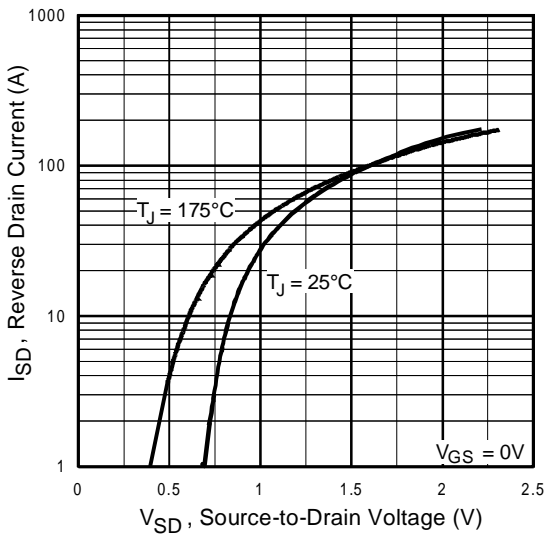


Fig 7. Typical Source-Drain Diode Forward Voltage

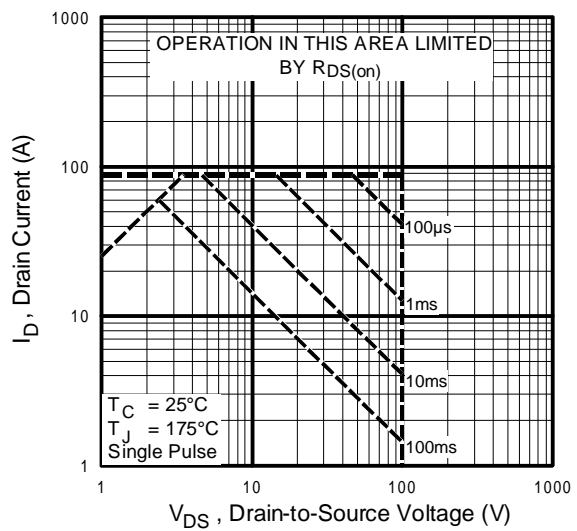


Fig 8. Maximum Safe Operating Area

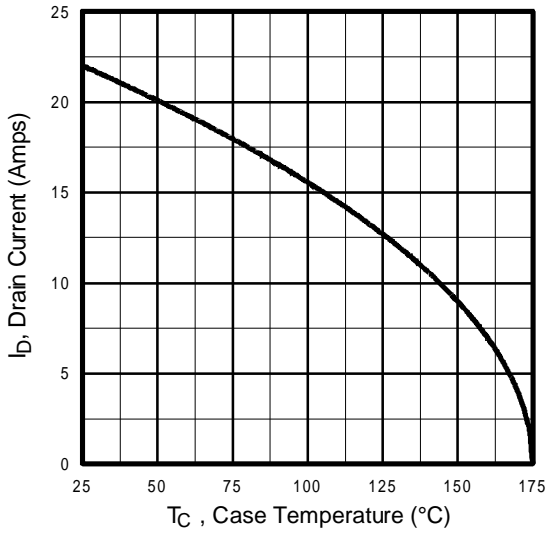


Fig 9. Maximum Drain Current Vs. Case Temperature

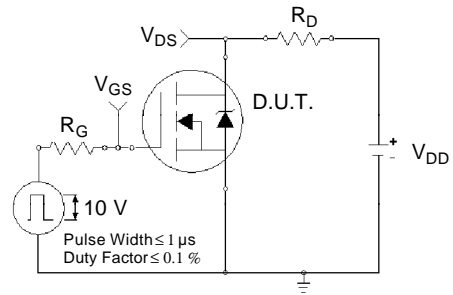


Fig 10a. Switching Time Test Circuit



Fig 10b. Switching Time Waveforms

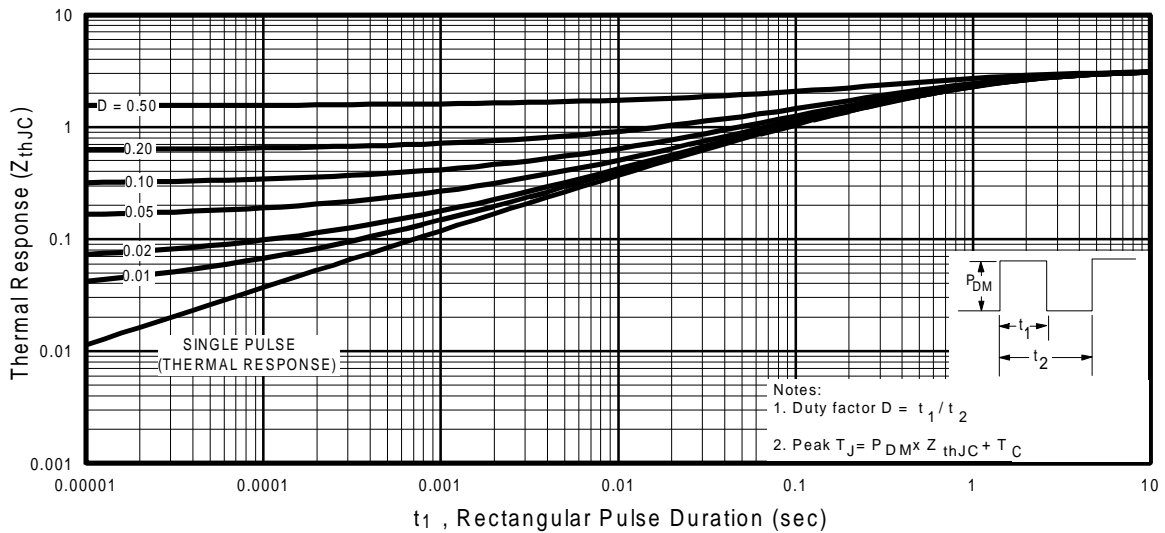


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

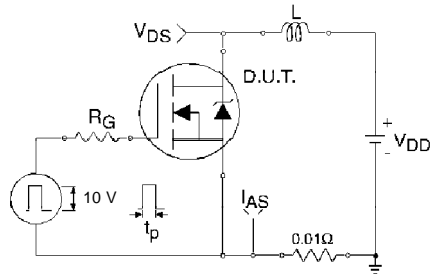


Fig 12a. Unclamped Inductive Test Circuit

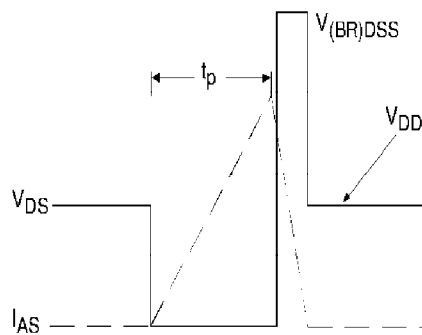


Fig 12b. Unclamped Inductive Waveforms

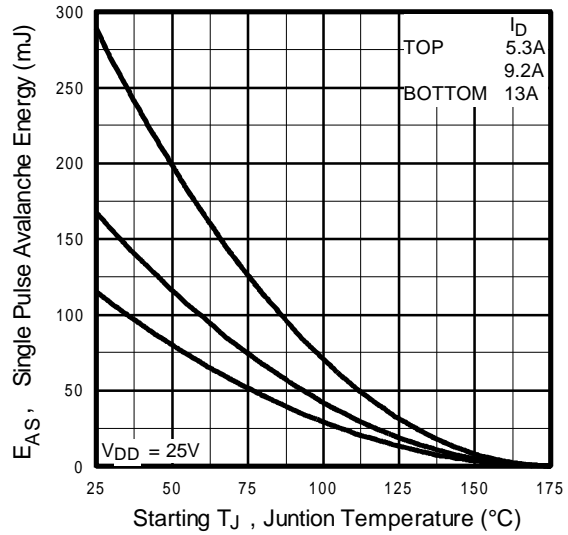


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

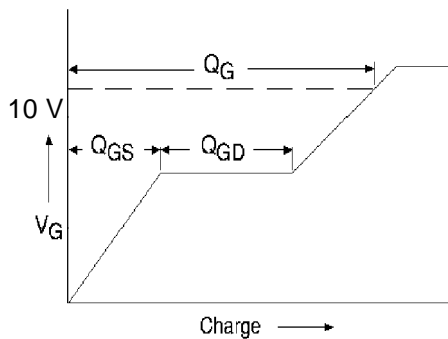


Fig 13a. Basic Gate Charge Waveform

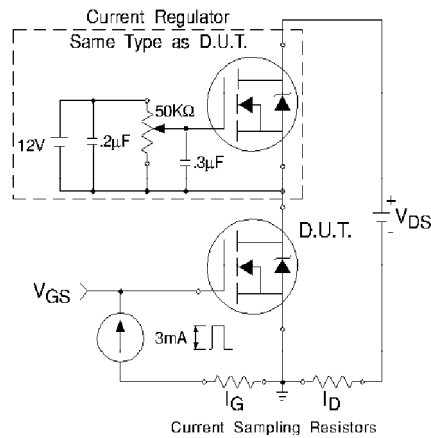


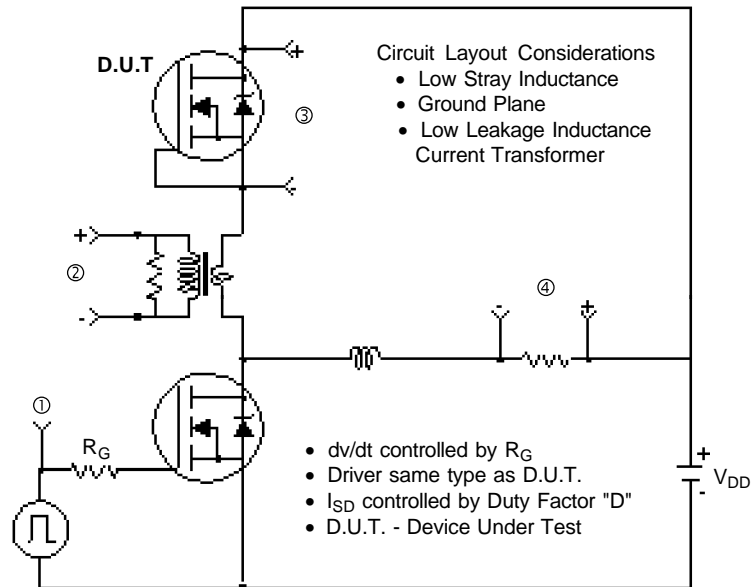
Fig 13b. Gate Charge Test Circuit

Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit

Appendix B: Package Outline Mechanical Drawing

Appendix C: Part Marking Information

Peak Diode Recovery dv/dt Test Circuit



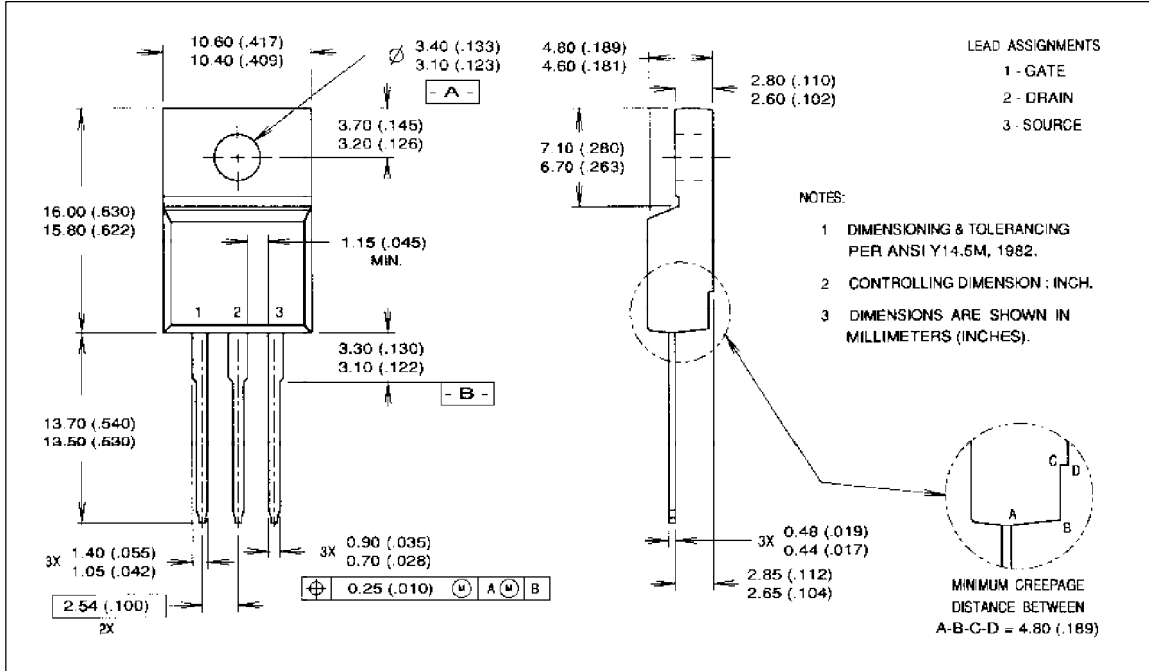
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFETS

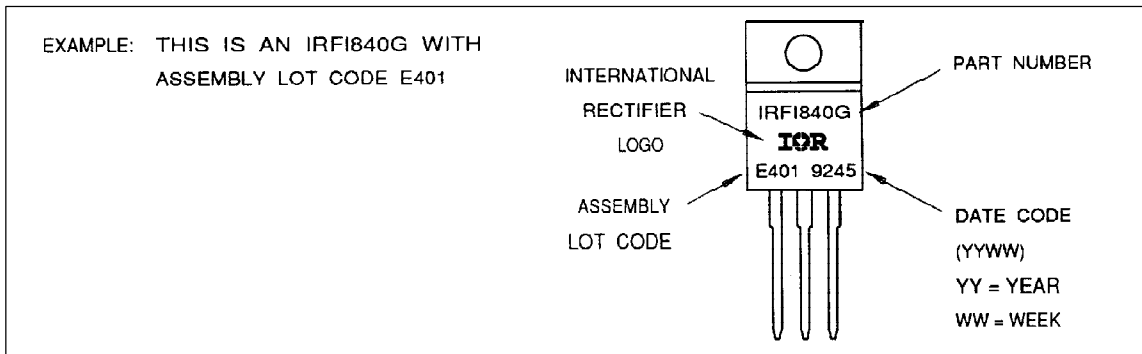
IRFI1310G



Package Outline TO-220 Full-Pak



Part Marking Information TO-220 Full-Pak



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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

Data and specifications subject to change without notice.