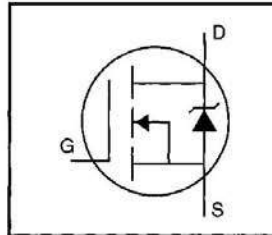


# IRFI630GPbF

## HEXFET® Power MOSFET

- Isolated Package
- High Voltage Isolation= 2.5KVRMS ⑤
- Sink to Lead Creepage Dist.= 4.8mm
- Dynamic dv/dt Rating
- Low Thermal Resistance
- Lead-Free

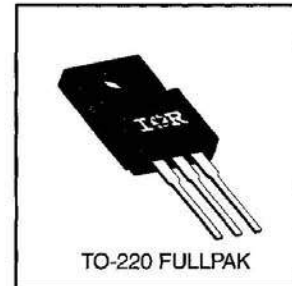


|                           |
|---------------------------|
| $V_{DSS} = 200V$          |
| $R_{DS(on)} = 0.40\Omega$ |
| $I_D = 5.9A$              |

### 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 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

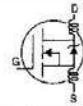
|                           | Parameter  | Max.                | Units |
|---------------------------|--|---------------------|-------|
| $I_D @ T_C = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10 V$        | 5.9                 | A     |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10 V$        | 3.7                 |       |
| $I_{DM}$                  | Pulsed Drain Current ①                           | 24                  |       |
| $P_D @ T_C = 25^\circ C$  | Power Dissipation                                | 35                  | W     |
|                           | Linear Derating Factor                           | 0.28                | W/°C  |
| $V_{GS}$                  | Gate-to-Source Voltage                           | $\pm 20$            | V     |
| $E_{AS}$                  | Single Pulse Avalanche Energy ②                  | 230                 | mJ    |
| $I_{AR}$                  | Avalanche Current ①                              | 5.9                 | A     |
| $E_{AR}$                  | Repetitive Avalanche Energy ①                    | 3.5                 | mJ    |
| dv/dt                     | Peak Diode Recovery dv/dt ③                      | 5.0                 | V/ns  |
| $T_J$                     | Operating Junction and Storage Temperature Range | -55 to +150         | °C    |
| $T_{STG}$                 |  |                     |       |
|                           |  |                     |       |
|                           | Mounting Torque, 6-32 or M3 screw                | 10 lbf•in (1.1 N•m) |       |

### Thermal Resistance

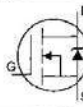
|                 | Parameter           | Min. | Typ. | Max. | Units |
|-----------------|---------------------|------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case    | —    | —    | 3.6  | °C/W  |
| $R_{\theta JA}$ | Junction-to-Ambient | —    | —    | 65   |       |

11/14/03

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

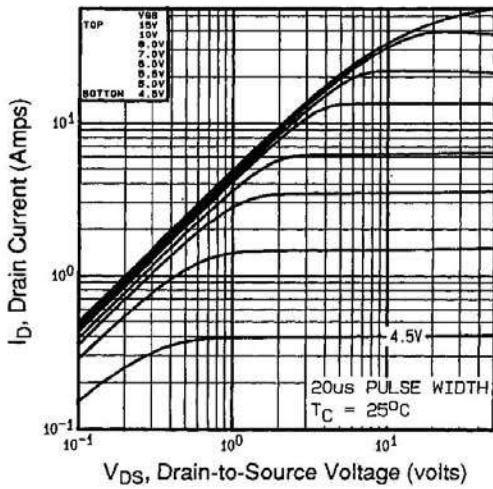
|                                      | Parameter                            | Min. | Typ. | Max. | Units | Test Conditions  |
|--------------------------------------|--------------------------------------|------|------|------|-------|--|
| V <sub>(BR)DSS</sub>                 | Drain-to-Source Breakdown Voltage    | 200  | —    | —    | V     | V <sub>GS</sub> =0V, I <sub>D</sub> = 250μA  |
| ΔV <sub>(BR)DSS/ΔT<sub>J</sub></sub> | Breakdown Voltage Temp. Coefficient  | —    | 0.24 | —    | V/°C  | Reference to 25°C, I <sub>D</sub> = 1mA  |
| R <sub>DS(on)</sub>                  | Static Drain-to-Source On-Resistance | —    | —    | 0.40 | Ω     | V <sub>GS</sub> =10V, I <sub>D</sub> =3.5A ④   |
| V <sub>GS(th)</sub>                  | Gate Threshold Voltage               | 2.0  | —    | 4.0  | V     | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = 250μA  |
| g <sub>fs</sub>                      | Forward Transconductance             | 3.2  | —    | —    | S     | V <sub>DS</sub> =50V, I <sub>D</sub> =3.5A ④   |
| I <sub>DSS</sub>                     | Drain-to-Source Leakage Current      | —    | —    | 25   | μA    | V <sub>DS</sub> =200V, V <sub>GS</sub> =0V   |
|                                      |                                      | —    | —    | 250  |       | V <sub>DS</sub> =160V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C  |
| I <sub>GSS</sub>                     | Gate-to-Source Forward Leakage       | —    | —    | 100  | nA    | V <sub>GS</sub> =20V   |
|                                      | Gate-to-Source Reverse Leakage       | —    | —    | -100 |       | V <sub>GS</sub> =-20V  |
| Q <sub>g</sub>                       | Total Gate Charge                    | —    | —    | 43   | nC    | I <sub>D</sub> =5.9A   |
| Q <sub>gs</sub>                      | Gate-to-Source Charge                | —    | —    | 7.0  |       | V <sub>DS</sub> =160V  |
| Q <sub>gd</sub>                      | Gate-to-Drain ("Miller") Charge      | —    | —    | 23   |       | V <sub>GS</sub> =10V See Fig. 6 and 13 ④   |
| t <sub>d(on)</sub>                   | Turn-On Delay Time                   | —    | 9.4  | —    | ns    | V <sub>DD</sub> =100V  |
| t <sub>r</sub>                       | Rise Time                            | —    | 28   | —    |       | I <sub>D</sub> =5.9A   |
| t <sub>d(off)</sub>                  | Turn-Off Delay Time                  | —    | 39   | —    |       | R <sub>G</sub> =12Ω  |
| t <sub>f</sub>                       | Fall Time                            | —    | 20   | —    |       | R <sub>D</sub> =16Ω See Figure 10 ④  |
| L <sub>D</sub>                       | Internal Drain Inductance            | —    | 4.5  | —    | nH    | Between lead, 6 mm (0.25in.) from package and center of die contact  |
| L <sub>S</sub>                       | Internal Source Inductance           | —    | 7.5  | —    |       |  |
| C <sub>iss</sub>                     | Input Capacitance                    | —    | 800  | —    | pF    | V <sub>GS</sub> =0V  |
| C <sub>oss</sub>                     | Output Capacitance                   | —    | 240  | —    |       | V <sub>DS</sub> = 25V  |
| C <sub>rss</sub>                     | Reverse Transfer Capacitance         | —    | 76   | —    |       | f=1.0MHz See Figure 5  |
| C                                    | Drain to Sink Capacitance            | —    | 12   | —    |       | f=1.0MHz   |

## Source-Drain Ratings and Characteristics

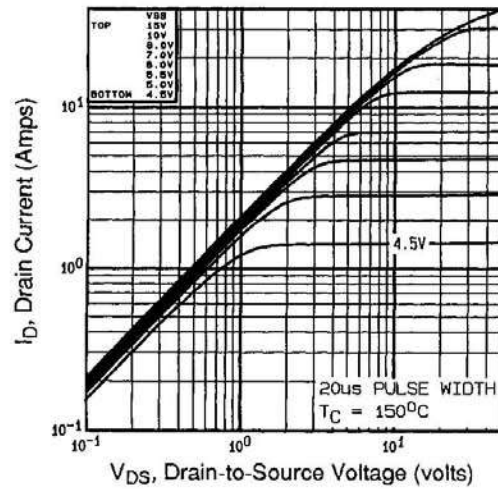
|                 | Parameter                              | Min.   | Typ. | Max. | Units | Test Conditions  |
|-----------------|--|--|------|------|-------|--|
| I <sub>S</sub>  | Continuous Source Current (Body Diode) | —  | —    | 5.9  | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I <sub>SM</sub> | Pulsed Source Current (Body Diode) ①   | —  | —    | 24   |       |  |
| V <sub>SD</sub> | Diode Forward Voltage                  | —  | —    | 2.0  | V     | T <sub>J</sub> =25°C, I <sub>S</sub> =5.9A, V <sub>GS</sub> =0V ④  |
| t <sub>rr</sub> | Reverse Recovery Time                  | —  | 170  | 340  | ns    | T <sub>J</sub> =25°C, I <sub>F</sub> =5.9A   |
| Q <sub>rr</sub> | Reverse Recovery Charge                | —  | 1.1  | 2.2  | μC    | di/dt=100A/μs ④  |
| t <sub>on</sub> | Forward Turn-On Time                   | Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> ) |      |      |       |  |

### Notes:

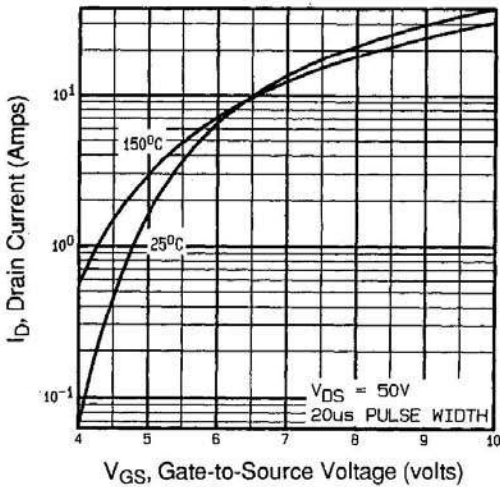
- ① Repetitive rating; pulse width limited by max. junction temperature (See Figure 11)
- ② V<sub>DD</sub>=50V, starting T<sub>J</sub>=25°C, L=9.9mH R<sub>G</sub>=25Ω, I<sub>AS</sub>=5.9A (See Figure 12)
- ③ I<sub>SD</sub>≤5.9A, di/dt≤120A/μs, V<sub>DD</sub>≤V<sub>(BR)DSS</sub>, T<sub>J</sub>≤150°C
- ④ Pulse width ≤ 300 μs; duty cycle ≤2%.
- ⑤ t=60s, f=60Hz



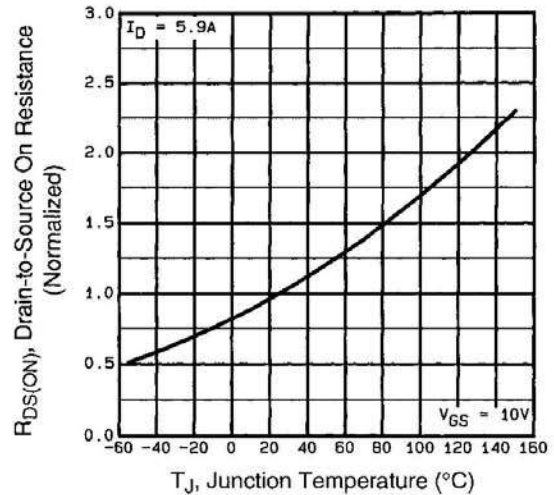
**Fig 1.** Typical Output Characteristics,  
 $T_C = 25^\circ\text{C}$



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



**Fig 3.** Typical Transfer Characteristics

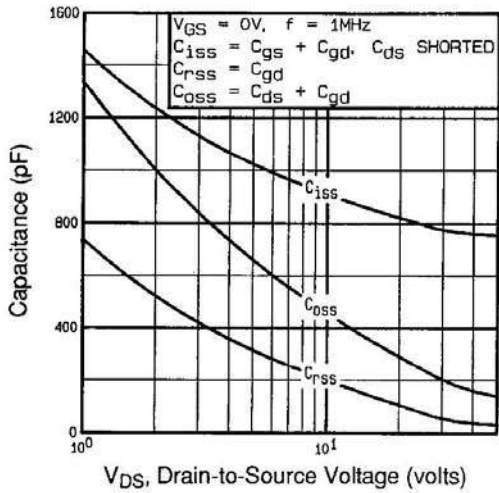


**Fig 4.** Normalized On-Resistance  
 Vs. Temperature

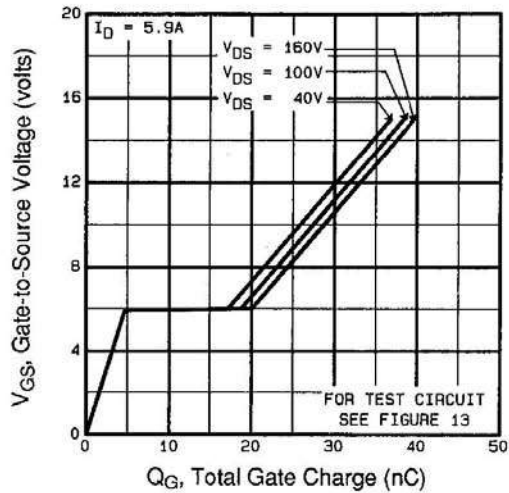


# IRFI630GPbF

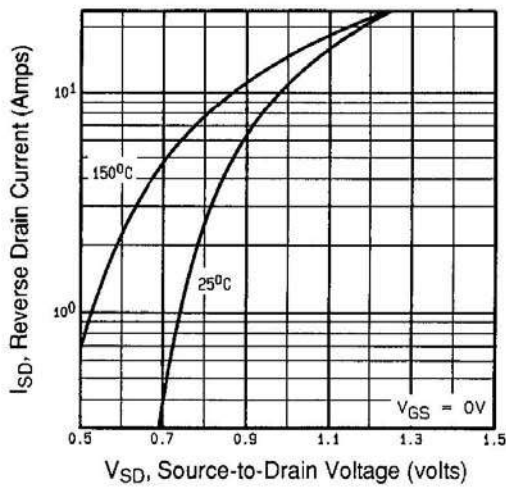
International  
**IR** Rectifier



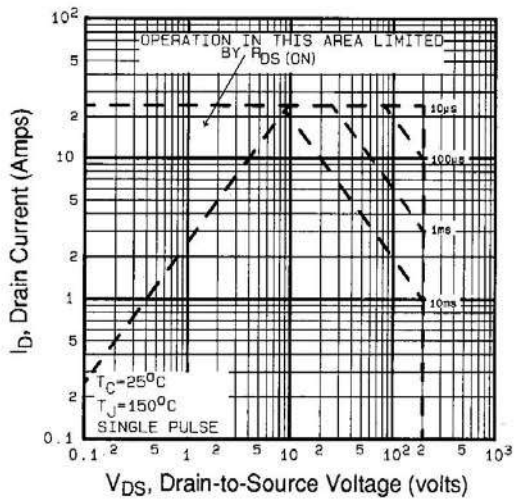
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



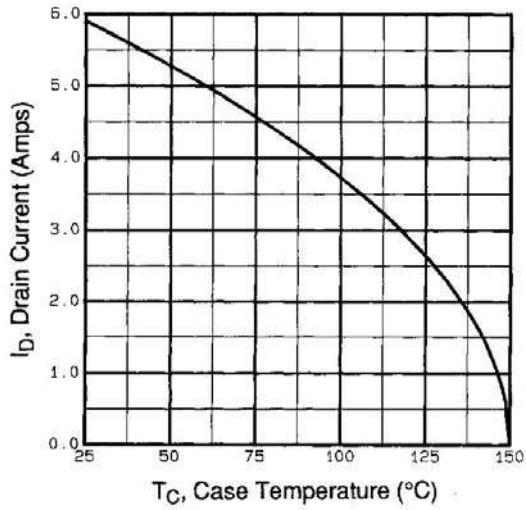
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



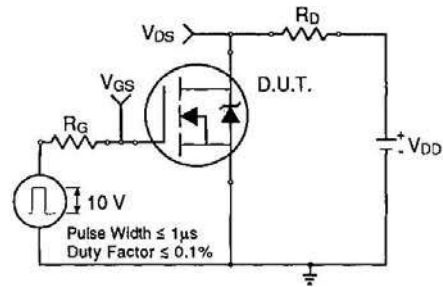
**Fig 7.** Typical Source-Drain Diode Forward Voltage



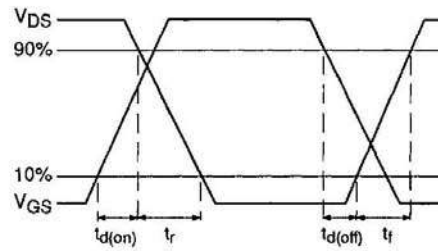
**Fig 8.** Maximum Safe Operating Area



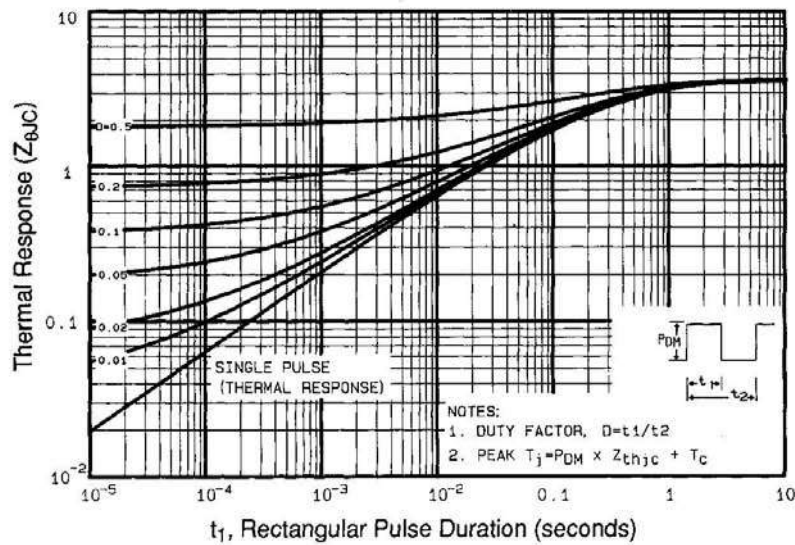
**Fig 9.** Maximum Drain Current Vs. Case Temperature



**Fig 10a.** Switching Time Test Circuit



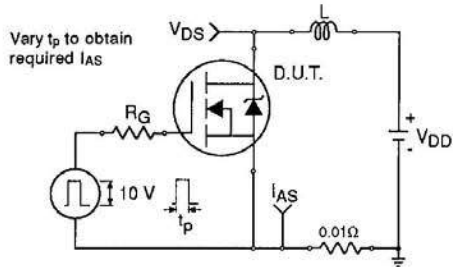
**Fig 10b.** Switching Time Waveforms



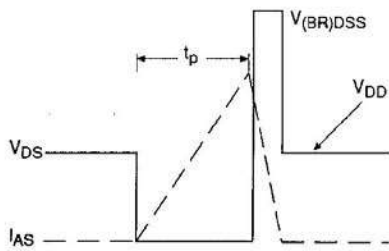
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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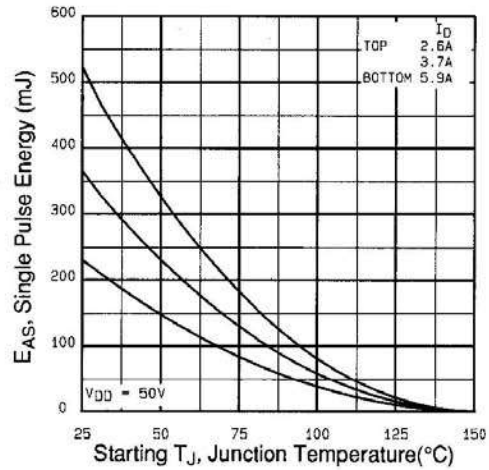
International  
**IR** Rectifier



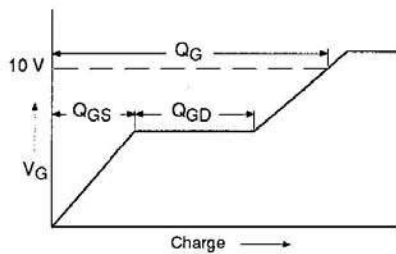
**Fig 12a.** Unclamped Inductive Test Circuit



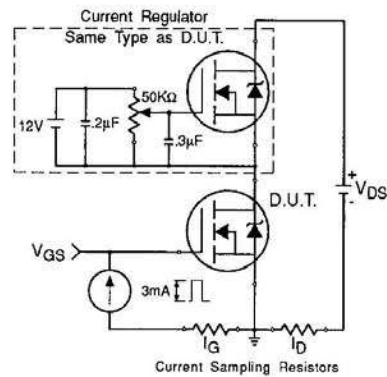
**Fig 12b.** Unclamped Inductive Waveforms



**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



**Fig 13a.** Basic Gate Charge Waveform



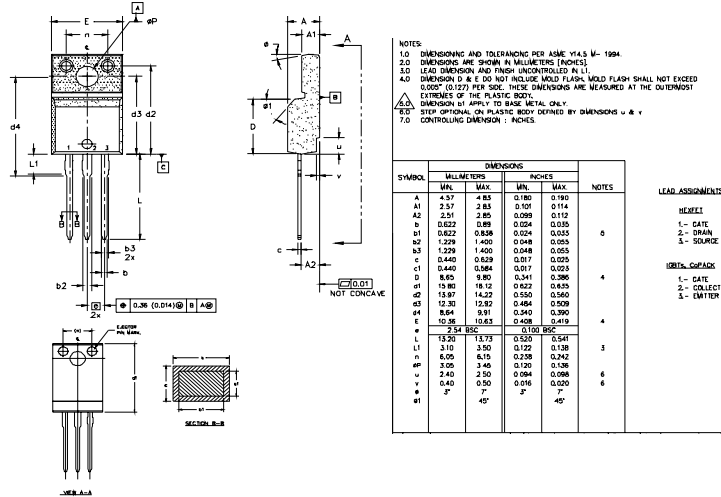
**Fig 13b.** Gate Charge Test Circuit

**Appendix A:** Figure 14, Peak Diode Recovery  $dv/dt$  Test Circuit – See page 1505

**Appendix B:** Package Outline Mechanical Drawing – See page 1510

## TO-220 Full-Pak Package Outline

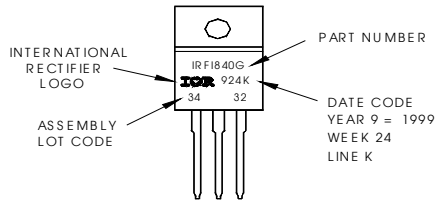
Dimensions are shown in millimeters (inches)



## TO-220 Full-Pak Part Marking Information

EXAMPLE: THIS IS AN IRFI840G  
WITH ASSEMBLY  
LOT CODE 3432  
ASSEMBLED ON WW 24 1999  
IN THE ASSEMBLY LINE "K"

**Note:** "P" in assembly line position indicates "Lead-Free"



Data and specifications subject to change without notice.



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