PD - 96262

International Rectifier

# IRF8721GPbF

HEXFET® Power MOSFET

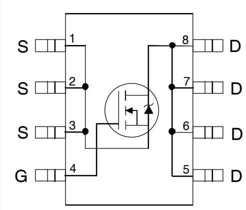
| $V_{DSS}$ | $R_{DS(on)}$ max | Qg |
|---|---|---|
| 30V | 8.5mΩ@$V_{GS}$ = 10V | 8.3nC |

## Applications

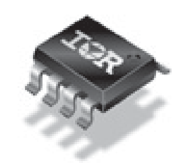
- Control MOSFET of Sync-Buck Converters used for Notebook Processor Power
- Control MOSFET for Isolated DC-DC Converters in Networking Systems

## Benefits

- Very Low Gate Charge
- Low $R_{DS(on)}$ at 4.5V $V_{GS}$
- Low Gate Impedance
- Fully Characterized Avalanche Voltage and Current
- 20V $V_{GS}$ Max. Gate Rating
- Lead-Free
- Halogen-Free



Top View


SO-8

## Description

The IRF8721GPbF incorporates the latest HEXFET Power MOSFET Silicon Technology into the industry standard SO-8 package The IRF8721GPbF has been optimized for parameters that are critical in synchronous buck operation including Rds(on) and gate charge to reduce both conduction and switching losses. The reduced total losses make this product ideal for high efficiency DC-DC converters that power the latest generation of processors for Notebook and Netcom applications.

## Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-to-Source Voltage | 30 | V |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | |
| $I_D$ @ $T_A$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V | 14 | A |
| $I_D$ @ $T_A$ = 70°C | Continuous Drain Current, $V_{GS}$ @ 10V | 11 | |
| $I_{DM}$ | Pulsed Drain Current ① | 110 | |
| $P_D$ @$T_A$ = 25°C | Power Dissipation | 2.5 | W |
| $P_D$ @$T_A$ = 70°C | Power Dissipation | 1.6 | |
| | Linear Derating Factor | 0.02 | W/°C |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to + 150 | °C |

## Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JL}$ | Junction-to-Drain Lead ⑤ | — | 20 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient ④ | — | 50 | |

Notes ① through ⑤ are on page 9



07/10/09

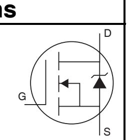
## Static @ $T_J$ = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-to-Source Breakdown Voltage | 30 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250μA |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.021 | — | V/°C | Reference to 25°C, $I_D$ = 1mA |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 6.9 | 8.5 | mΩ | $V_{GS}$ = 10V, $I_D$ = 14A ③ |
| | | — | 10.6 | 12.5 | | $V_{GS}$ = 4.5V, $I_D$ = 11A ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 1.35 | — | 2.35 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 25μA |
| $\Delta V_{GS(th)}$ | Gate Threshold Voltage Coefficient | — | -6.2 | — | mV/°C | |
| $I_{DSS}$ | Drain-to-Source Leakage Current | — | — | 1.0 | μA | $V_{DS}$ = 24V, $V_{GS}$ = 0V |
| | | — | — | 150 | | $V_{DS}$ = 24V, $V_{GS}$ = 0V, $T_J$ = 125°C |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS}$ = 20V |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | $V_{GS}$ = -20V |
| gfs | Forward Transconductance | 27 | — | — | S | $V_{DS}$ = 15V, $I_D$ = 11A |
| $Q_g$ | Total Gate Charge | — | 8.3 | 12 | | |
| $Q_{gs1}$ | Pre-Vth Gate-to-Source Charge | — | 2.0 | — | | $V_{DS}$ = 15V |
| $Q_{gs2}$ | Post-Vth Gate-to-Source Charge | — | 1.0 | — | nC | $V_{GS}$ = 4.5V |
| $Q_{gd}$ | Gate-to-Drain Charge | — | 3.2 | — | | $I_D$ = 11A |
| $Q_{godr}$ | Gate Charge Overdrive | — | 2.0 | — | | See Fig. 16a and 16b |
| $Q_{sw}$ | Switch Charge ($Q_{gs2}$ + $Q_{gd}$) | — | 4.2 | — | | |
| $Q_{oss}$ | Output Charge | — | 5.0 | — | nC | $V_{DS}$ = 16V, $V_{GS}$ = 0V |
| $R_G$ | Gate Resistance | — | 1.8 | 3.0 | Ω | |
| $t_{d(on)}$ | Turn-On Delay Time | — | 8.2 | — | | $V_{DD}$ = 15V, $V_{GS}$ = 4.5V |
| $t_r$ | Rise Time | — | 11 | — | | $I_D$ = 11A |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 8.1 | — | ns | $R_G$ = 1.8Ω |
| $t_f$ | Fall Time | — | 7.0 | — | | See Fig. 15a |
| $C_{iss}$ | Input Capacitance | — | 1040 | — | | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | — | 229 | — | pF | $V_{DS}$ = 15V |
| $C_{rss}$ | Reverse Transfer Capacitance | — | 114 | — | | $f$ = 1.0MHz |

## Avalanche Characteristics

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $E_{AS}$ | Single Pulse Avalanche Energy ② | — | 68 | mJ |
| $I_{AR}$ | Avalanche Current ① | — | 11 | A |

## Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 3.1 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | — | — | 112 | | |
| $V_{SD}$ | Diode Forward Voltage | — | — | 1.0 | V | $T_J$ = 25°C, $I_S$ = 11A, $V_{GS}$ = 0V ③ |
| $t_{rr}$ | Reverse Recovery Time | — | 14 | 21 | ns | $T_J$ = 25°C, $I_F$ = 11A, $V_{DD}$ = 15V |
| $Q_{rr}$ | Reverse Recovery Charge | — | 15 | 23 | nC | di/dt = 300A/μs ③ |
| $t_{on}$ | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

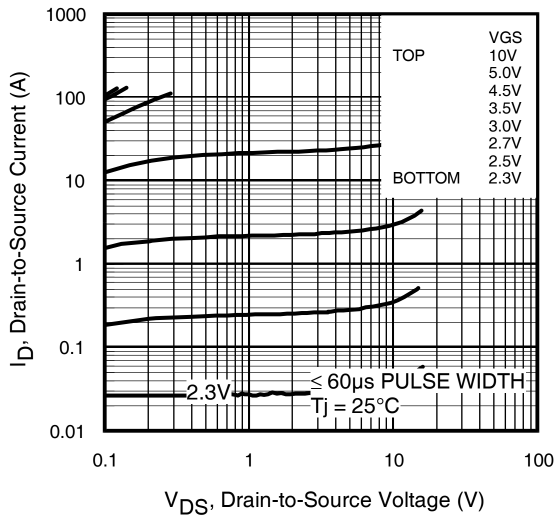



**Fig 1.** Typical Output Characteristics

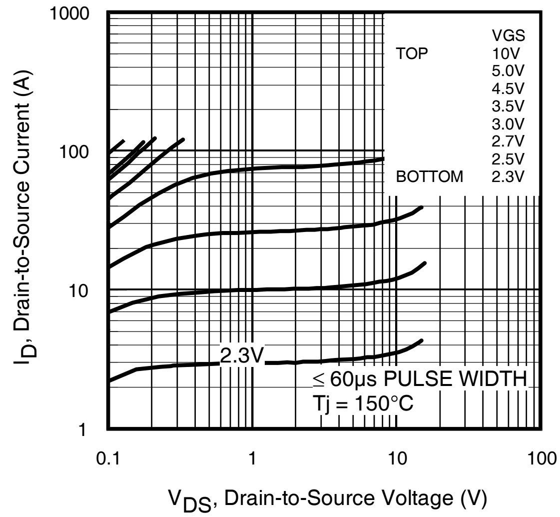



**Fig 2.** Typical Output Characteristics

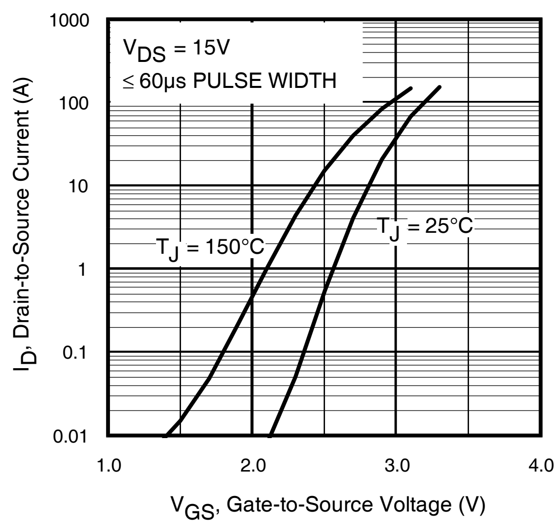



**Fig 3.** Typical Transfer Characteristics

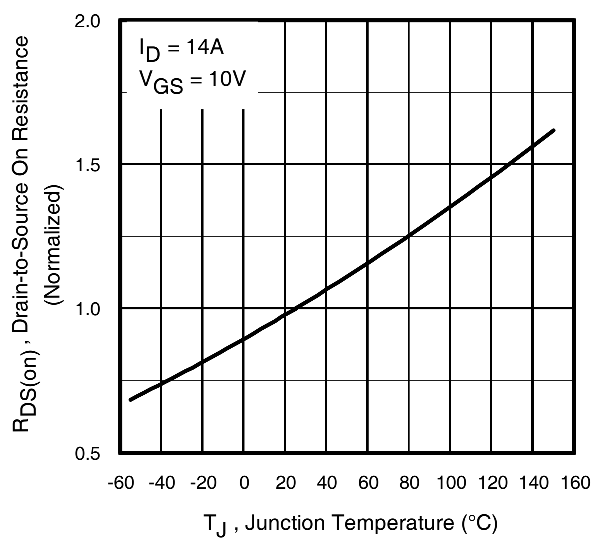



**Fig 4.** Normalized On-Resistance Vs. Temperature

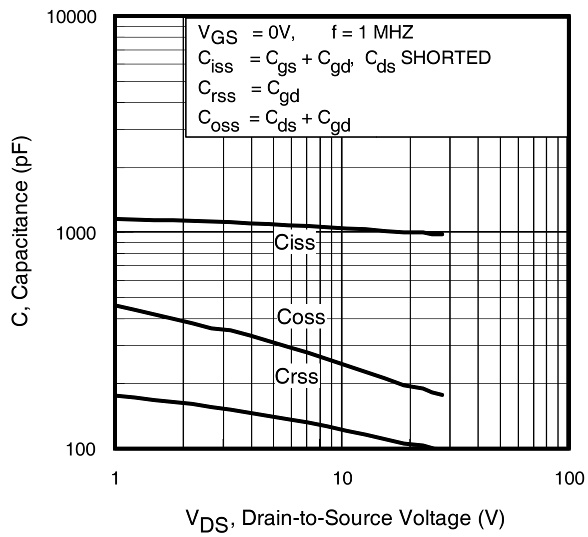



**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

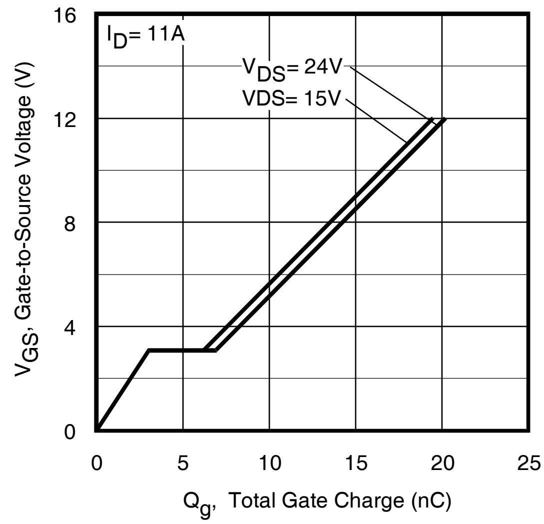



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

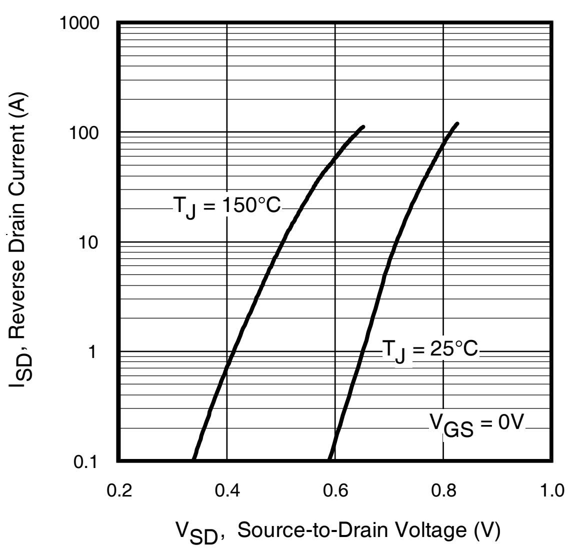



**Fig 7.** Typical Source-Drain Diode Forward Voltage

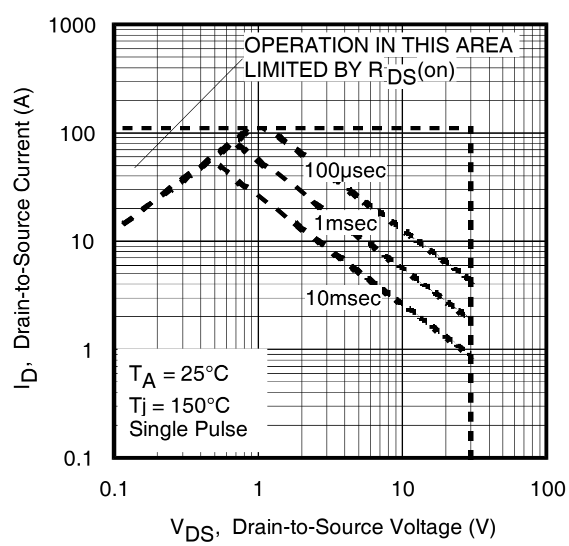



**Fig 8.** Maximum Safe Operating Area

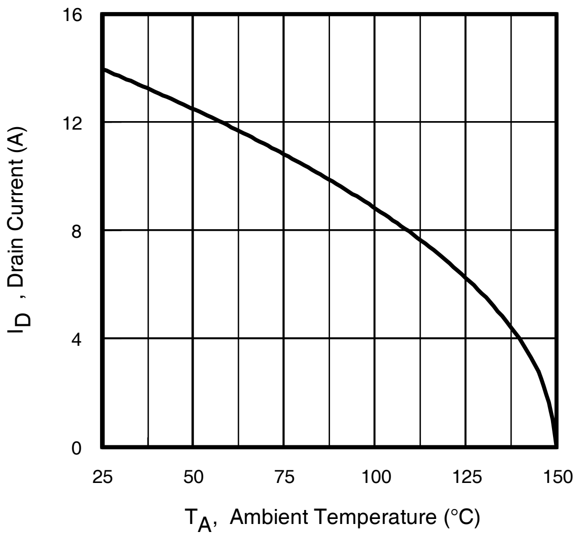



**Fig 9.** Maximum Drain Current Vs. Case Temperature

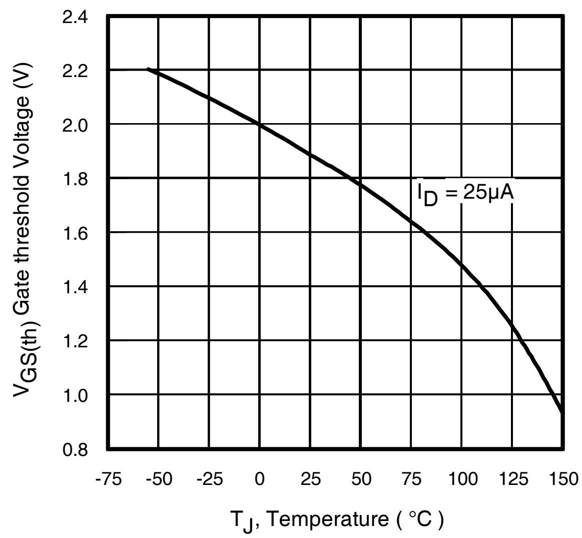
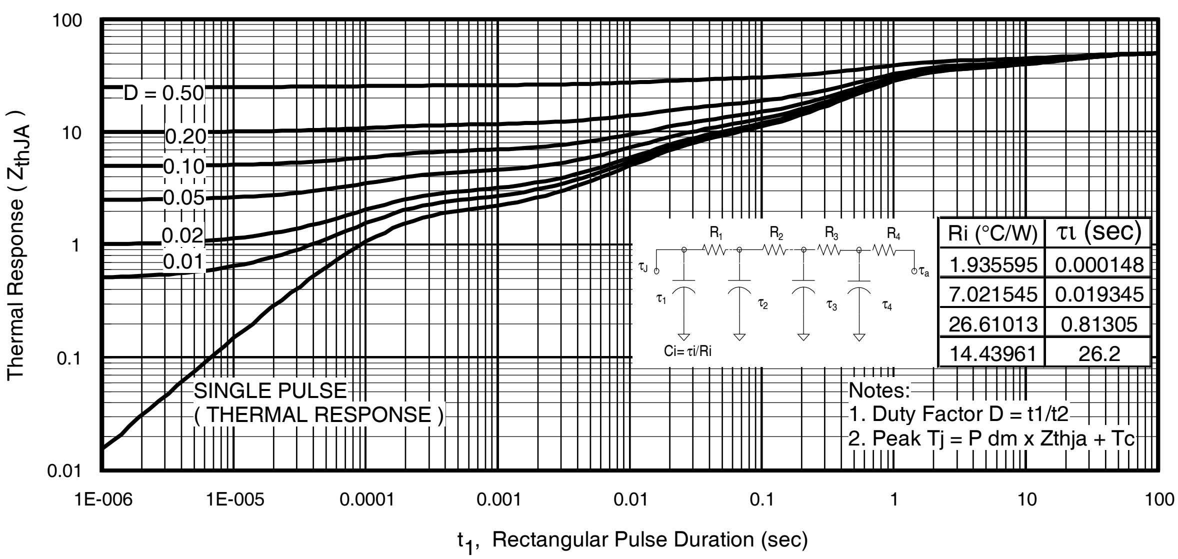



**Fig 10.** Threshold Voltage Vs. Temperature




| Ri (°C/W) | τi (sec) |
|---|---|
| 1.935595 | 0.000148 |
| 7.021545 | 0.019345 |
| 26.61013 | 0.81305 |
| 14.43961 | 26.2 |

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

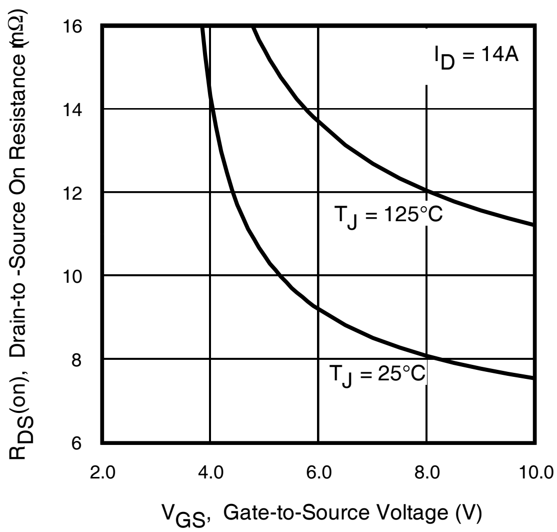



**Fig 12.** On-Resistance vs. Gate Voltage

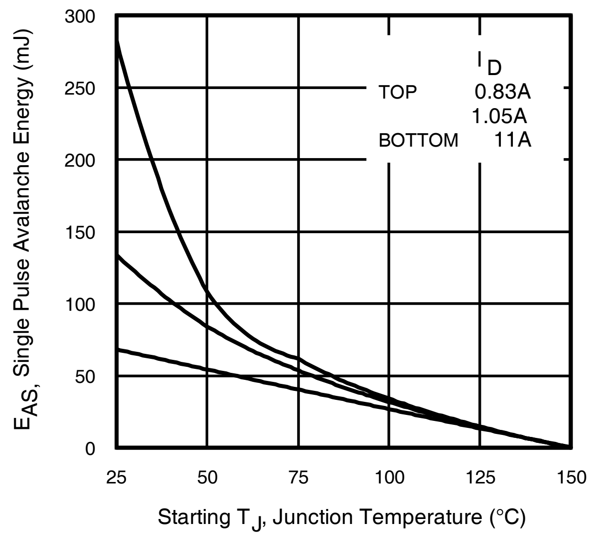



**Fig 13.** Maximum Avalanche Energy vs. Drain Current

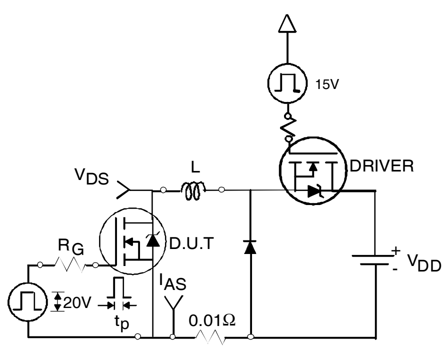



**Fig 14a.** Unclamped Inductive Test Circuit

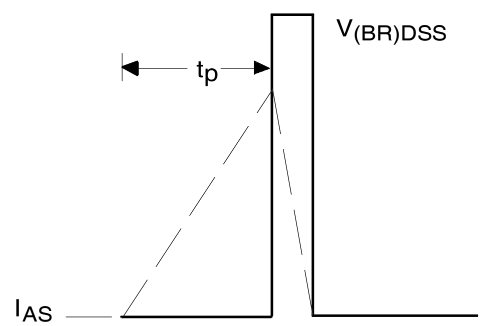



**Fig 14b.** Unclamped Inductive Waveforms

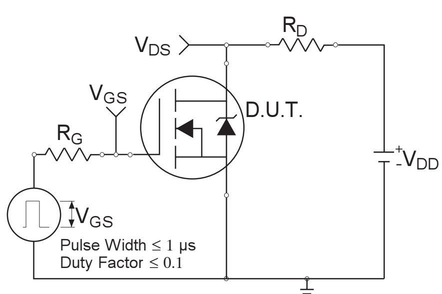



**Fig 15a.** Switching Time Test Circuit

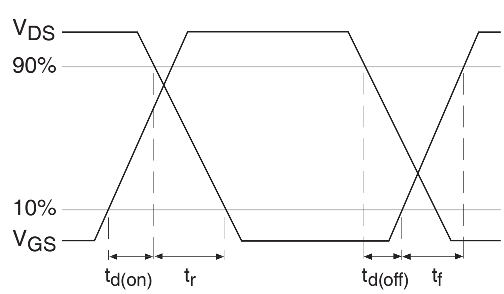



**Fig 15b.** Switching Time Waveforms

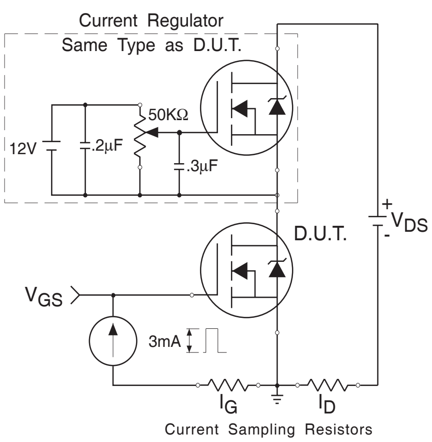



**Fig 16a.** Gate Charge Test Circuit

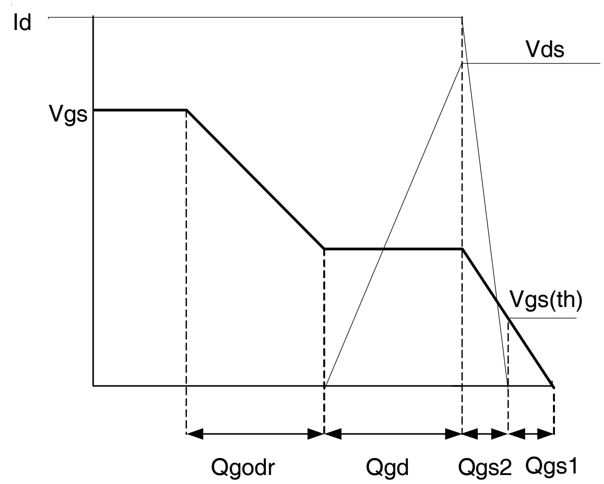
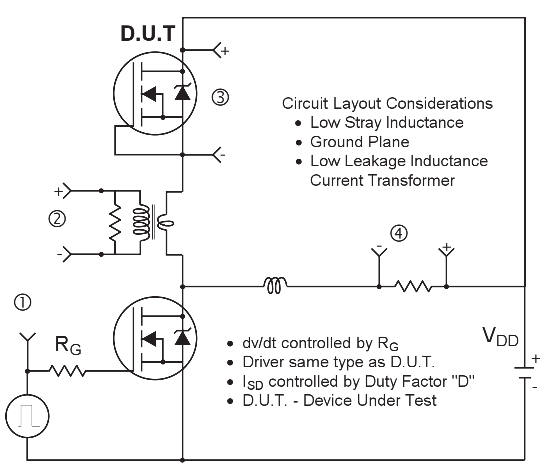



**Fig 16b.** Gate Charge Waveform



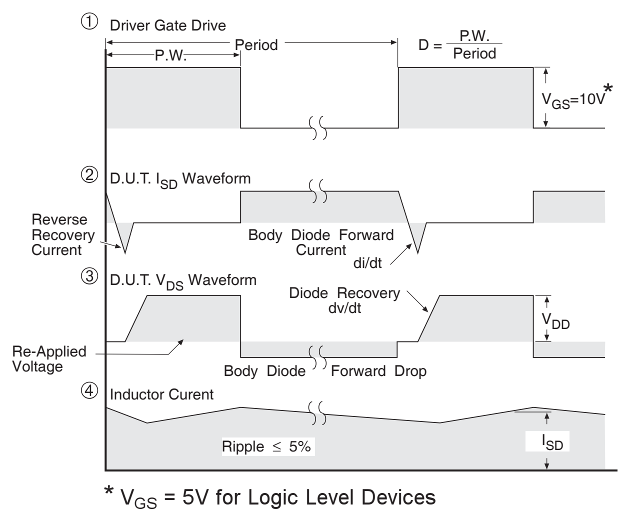
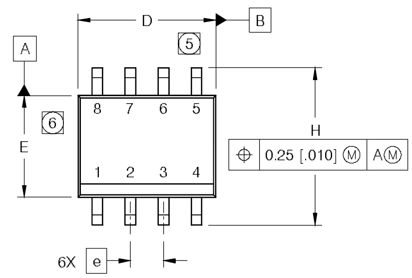



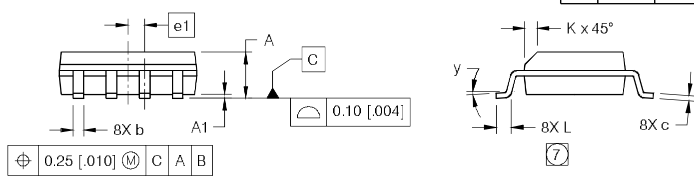

**Fig 17.** Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

## **SO-8 Package Outline**(Mosfet & Fetky)

Dimensions are shown in milimeters (inches)

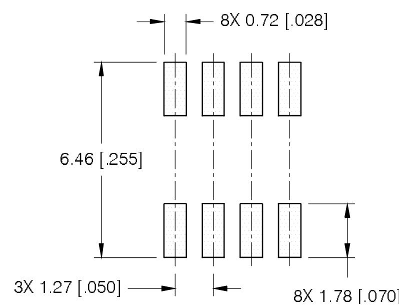



| DIM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .0532 | .0688 | 1.35 | 1.75 |
| A1 | .0040 | .0098 | 0.10 | 0.25 |
| b | .013 | .020 | 0.33 | 0.51 |
| c | .0075 | .0098 | 0.19 | 0.25 |
| D | .189 | .1968 | 4.80 | 5.00 |
| E | .1497 | .1574 | 3.80 | 4.00 |
| e | .050 BASIC | | 1.27 BASIC | |
| e 1 | .025 BASIC | | 0.635 BASIC | |
| H | .2284 | .2440 | 5.80 | 6.20 |
| K | .0099 | .0196 | 0.25 | 0.50 |
| L | .016 | .050 | 0.40 | 1.27 |
| y | 0° | 8° | 0° | 8° |



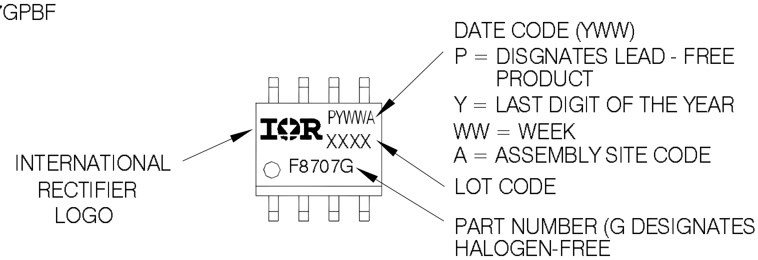

NOTES:
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [.006].
6. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [.010].
7. DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

FOOTPRINT




## SO-8 Part Marking Information

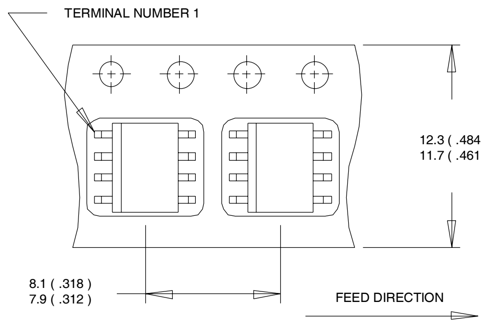
EXAMPLE: THIS IS AN IRF8707GPBF



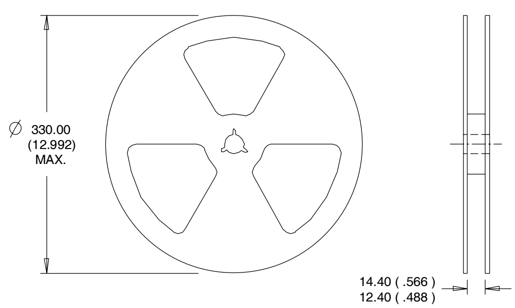

**Note: For the most current drawing please refer to IR website at http://www.irf.com/package/**

## SO-8 Tape and Reel

Dimensions are shown in milimeters (inches)




NOTES:
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS(INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.




NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

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

**Notes:**

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting $T_J$ = 25°C, L = 1.09mH, $R_G$ = 25Ω, $I_{AS}$ = 11A.

③ Pulse width ≤ 400µs; duty cycle ≤ 2%.

④ When mounted on 1 inch square copper board.

⑤ $R_\theta$ is measured at $T_J$ of approximately 90°C.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Consumer market.
Qualification Standards can be found on IR's Web site.

International
IOR Rectifier

**IR WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information.07/2009

## IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie") .

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (**www.infineon.com**).

## WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.