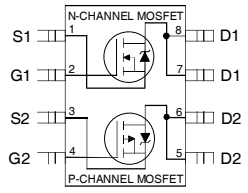
International
IOR Rectifier

PD - 96106A

# IRF7307QPbF

HEXFET® Power MOSFET

- Advanced Process Technology
- Ultra Low On-Resistance
- Dual N and P Channel MOSFET
- Surface Mount
- Available in Tape & Reel
- 150°C Operating Temperature
- Lead-Free



Top View

| | N-Ch | P-Ch |
|---|---|---|
| $V_{DSS}$ | 20V | -20V |
| $R_{DS(on)}$ | 0.050Ω | 0.090Ω |


SO-8

## Description

These HEXFET® Power MOSFET's in a Dual SO-8 package utilize the lastest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of these HEXFET Power MOSFET's are a 150°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These benefits combine to make this design an extremely efficient and reliable device for use in a wide variety of applications.

The efficient SO-8 package provides enhanced thermal characteristics and dual MOSFET die capability making it ideal in a variety of power applications. This dual, surface mount SO-8 can dramatically reduce board space and is also available in Tape & Reel.

## Absolute Maximum Ratings

| | Parameter | Max. | | Units |
|---|---|---|---|---|
| | | N-Channel | P-Channel | |
| $I_D$ @ $T_A$ = 25°C | 10 Sec. Pulse Drain Current, $V_{GS}$ @ 4.5V | 5.7 | -4.7 | A |
| $I_D$ @ $T_A$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 4.5V | 5.2 | -4.3 | |
| $I_D$ @ $T_A$ = 70°C | Continuous Drain Current, $V_{GS}$ @ 4.5V | 4.1 | -3.4 | |
| $I_{DM}$ | Pulsed Drain Current ① | 21 | -17 | |
| $P_D$ @$T_A$ = 25°C | Power Dissipation | 2.0 | | W |
| | Linear Derating Factor | 0.016 | | W/°C |
| $V_{GS}$ | Gate-to-Source Voltage | ± 12 | | V |
| dv/dt | Peak Diode Recovery dv/dt ② | 5.0 | -5.0 | V/ns |
| $T_J$, $T_{STG}$ | Junction and Storage Temperature Range | -55 to + 150 | | °C |

## Thermal Resistance Ratings

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient④ | ––– | 62.5 | °C/W |

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

| | Parameter | | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | N-Ch | 20 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| | | P-Ch | -20 | — | — | | $V_{GS}$ = 0V, $I_D$ = -250µA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | N-Ch | — | 0.044 | — | V/°C | Reference to 25°C, $I_D$ = 1mA |
| | | P-Ch | — | -0.012 | — | | Reference to 25°C, $I_D$ = -1mA |
| $R_{DS(ON)}$ | Static Drain-to-Source On-Resistance | N-Ch | — | — | 0.050 | Ω | $V_{GS}$ = 4.5V, $I_D$ = 2.6A ③ |
| | | | — | — | 0.070 | | $V_{GS}$ = 2.7V, $I_D$ = 2.2A ③ |
| | | P-Ch | — | — | 0.090 | | $V_{GS}$ = -4.5V, $I_D$ = -2.2A ③ |
| | | | — | — | 0.140 | | $V_{GS}$ = -2.7V, $I_D$ = -1.8A ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | N-Ch | 0.70 | — | — | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| | | P-Ch | -0.70 | — | — | | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| $g_{fs}$ | Forward Transconductance | N-Ch | 8.30 | — | — | S | $V_{DS}$ = 15V, $I_D$ = 2.6A ③ |
| | | P-Ch | 4.00 | — | — | | $V_{DS}$ = -15V, $I_D$ = -2.2A ③ |
| $I_{DSS}$ | Drain-to-Source Leakage Current | N-Ch | — | — | 1.0 | µA | $V_{DS}$ = 16V, $V_{GS}$ = 0V |
| | | P-Ch | — | — | -1.0 | | $V_{DS}$ = -16V, $V_{GS}$ = 0V, |
| | | N-Ch | — | — | 25 | | $V_{DS}$ = 16V, $V_{GS}$ = 0V, $T_J$ = 125°C |
| | | P-Ch | — | — | -25 | | $V_{DS}$ = -16V, $V_{GS}$ = 0V, $T_J$ = 125°C |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | N-P | — | — | ±100 | | $V_{GS}$ = ± 12V |
| $Q_g$ | Total Gate Charge | N-Ch | — | — | 20 | nC | N-Channel<br>$I_D$ = 2.6A, $V_{DS}$ = 16V, $V_{GS}$ = 4.5V ③<br>P-Channel<br>$I_D$ = -2.2A, $V_{DS}$ = -16V, $V_{GS}$ = -4.5V |
| | | P-Ch | — | — | 22 | | |
| $Q_{gs}$ | Gate-to-Source Charge | N-Ch | — | — | 2.2 | | |
| | | P-Ch | — | — | 3.3 | | |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | N-Ch | — | — | 8.0 | | |
| | | P-Ch | — | — | 9.0 | | |
| $t_{d(on)}$ | Turn-On Delay Time | N-Ch | — | 9.0 | — | ns | N-Channel<br>$V_{DD}$ = 10V, $I_D$ = 2.6A, $R_G$ = 6.0Ω,<br>$R_D$ = 3.8Ω ③<br>P-Channel<br>$V_{DD}$ = -10V, $I_D$ = -2.2A, $R_G$ = 6.0Ω,<br>$R_D$ = 4.5Ω |
| | | P-Ch | — | 8.4 | — | | |
| $t_r$ | Rise Time | N-Ch | — | 42 | — | | |
| | | P-Ch | — | 26 | — | | |
| $t_{d(off)}$ | Turn-Off Delay Time | N-Ch | — | 32 | — | | |
| | | P-Ch | — | 51 | — | | |
| $t_f$ | Fall Time | N-Ch | — | 51 | — | | |
| | | P-Ch | — | 33 | — | | |
| $L_D$ | Internal Drain Inductace | N-P | — | 4.0 | — | nH | Between lead tip<br>and center of die contact |
| $L_S$ | Internal Source Inductance | N-P | — | 6.0 | — | | |
| $C_{iss}$ | Input Capacitance | N-Ch | — | 660 | — | pF | N-Channel<br>$V_{GS}$ = 0V, $V_{DS}$ = 15V, $f$ = 1.0MHz ③<br>P-Channel<br>$V_{GS}$ = 0V, $V_{DS}$ = -15V, $f$ = 1.0MHz |
| | | P-Ch | — | 610 | — | | |
| $C_{oss}$ | Output Capacitance | N-Ch | — | 280 | — | | |
| | | P-Ch | — | 310 | — | | |
| $C_{rss}$ | Reverse Transfer Capacitance | N-Ch | — | 140 | — | | |
| | | P-Ch | — | 170 | — | | |

## Source-Drain Ratings and Characteristics

| | Parameter | | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | N-Ch | — | — | 2.5 | A | |
| | | P-Ch | — | — | -2.5 | | |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | N-Ch | — | — | 21 | | |
| | | P-Ch | — | — | -17 | | |
| $V_{SD}$ | Diode Forward Voltage | N-Ch | — | — | 1.0 | V | $T_J$ = 25°C, $I_S$ = 1.8A, $V_{GS}$ = 0V ③ |
| | | P-Ch | — | — | -1.0 | | $T_J$ = 25°C, $I_S$ = -1.8A, $V_{GS}$ = 0V ③ |
| $t_{rr}$ | Reverse Recovery Time | N-Ch | — | 29 | 44 | ns | N-Channel<br>$T_J$ = 25°C, $I_F$ = 2.6A, di/dt = 100A/µs<br>P-Channel ③<br>$T_J$ = 25°C, $I_F$ = -2.2A, di/dt = 100A/µs |
| | | P-Ch | — | 56 | 84 | | |
| $Q_{rr}$ | Reverse Recovery Charge | N-Ch | — | 22 | 33 | nC | |
| | | P-Ch | — | 71 | 110 | | |
| $t_{on}$ | Forward Turn-On Time | N-P | Intrinsic turn-on time is neglegible (turn-on is dominated by $L_S$+$L_D$) | | | | |

**Notes:**

① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 23 )

② N-Channel $I_{SD}$ ≤ 2.6A, di/dt ≤ 100A/µs, $V_{DD}$ ≤ $V_{(BR)DSS}$, $T_J$ ≤ 150°C
P-Channel $I_{SD}$ ≤ -2.2A, di/dt ≤ 50A/µs, $V_{DD}$ ≤ $V_{(BR)DSS}$, $T_J$ ≤ 150°C

③ Pulse width ≤ 300µs; duty cycle ≤ 2%.

④ Surface mounted on FR-4 board, t ≤ 10sec.

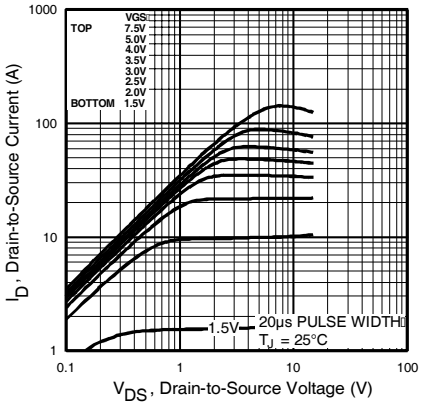



**Fig 1.** Typical Output Characteristics

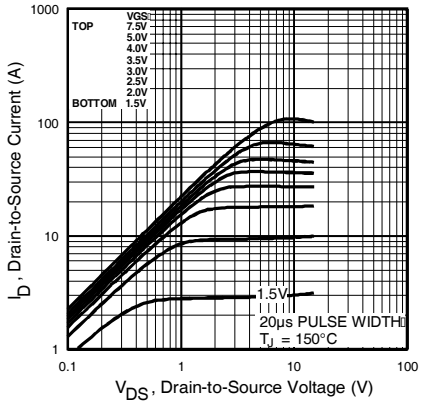



**Fig 2.** Typical Output Characteristics

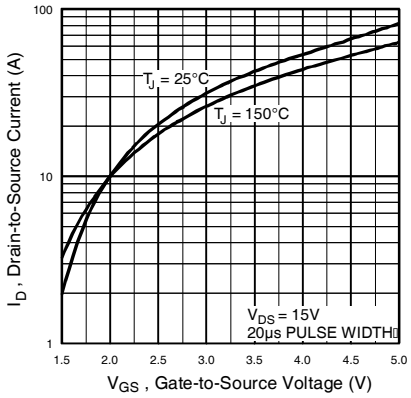



**Fig 3.** Typical Transfer Characteristics

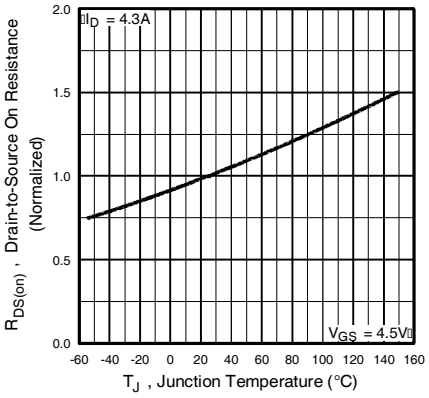



**Fig 4.** Normalized On-Resistance Vs. Temperature

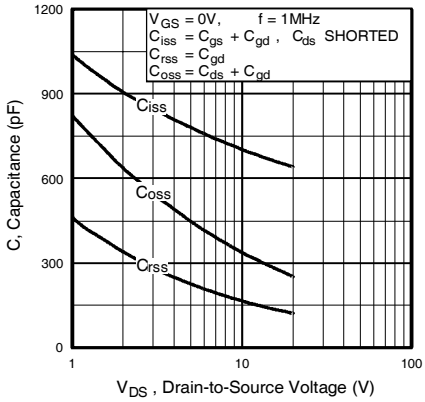



**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

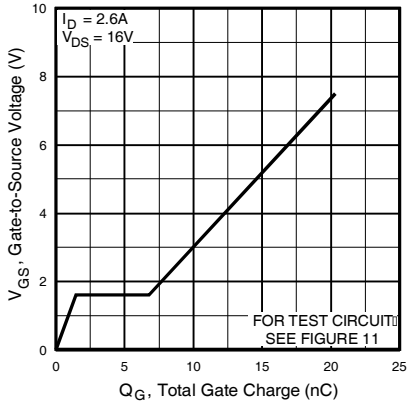



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

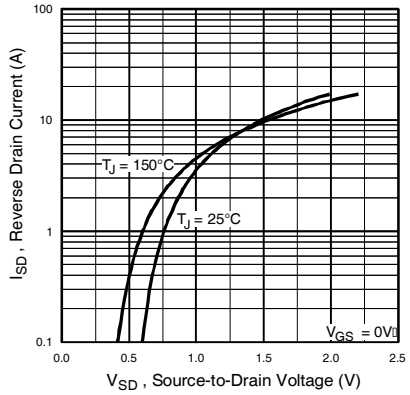



**Fig 7.** Typical Source-Drain Diode Forward Voltage

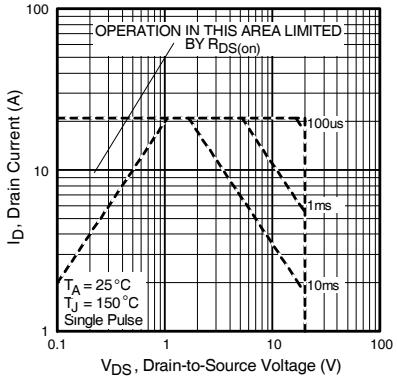



**Fig 8.** Maximum Safe Operating Area

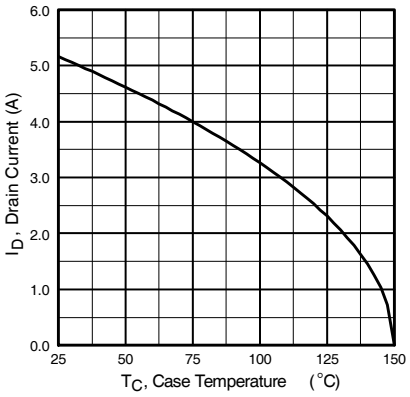



**Fig 9.** Maximum Drain Current Vs. Ambient Temperature

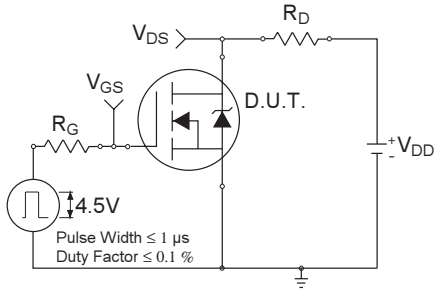



**Fig 10a.** Switching Time Test Circuit

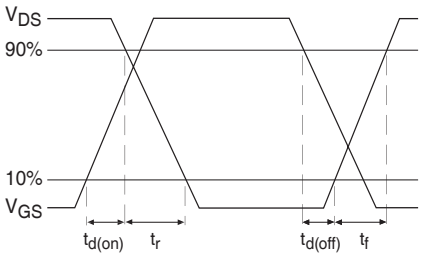



**Fig 10b.** Switching Time Waveforms

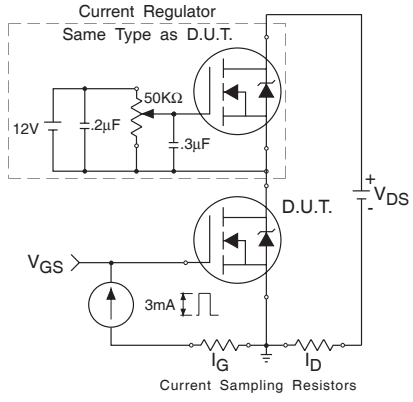



**Fig 11a.** Gate Charge Test Circuit

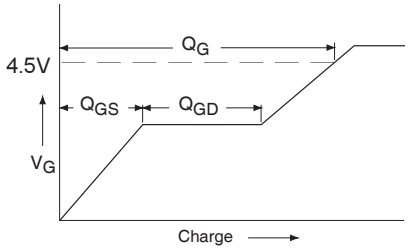



**Fig 11b.** Basic Gate Charge Waveform

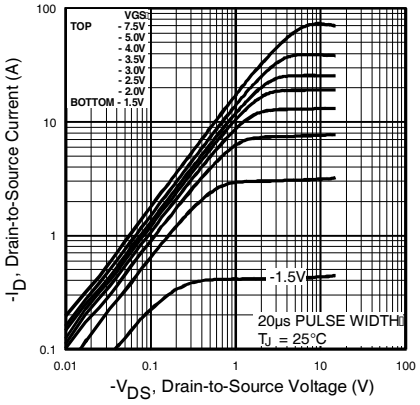



**Fig 12.** Typical Output Characteristics

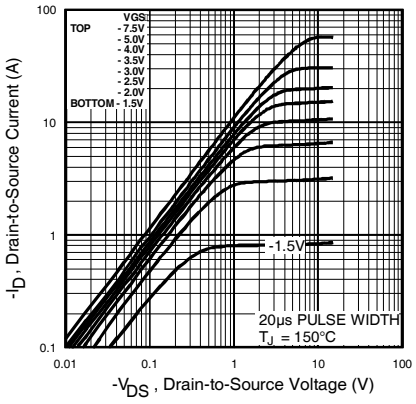



**Fig 13.** Typical Output Characteristics

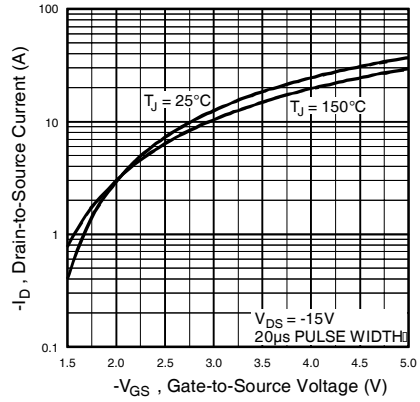



**Fig 14.** Typical Transfer Characteristics

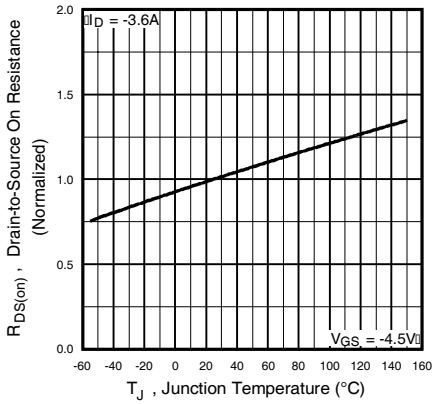



**Fig 15.** Normalized On-Resistance Vs. Temperature

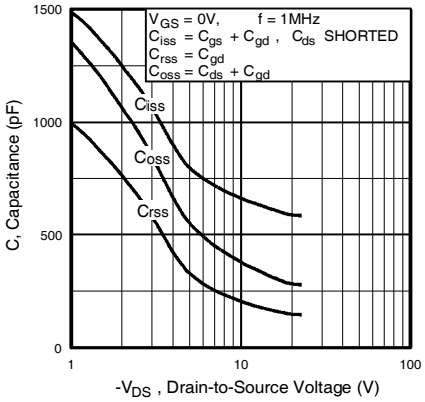



**Fig 16.** Typical Capacitance Vs. Drain-to-Source Voltage

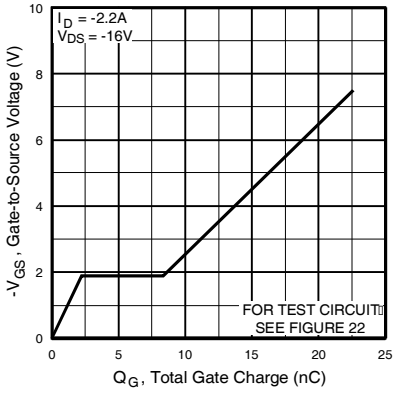



**Fig 17.** Typical Gate Charge Vs. Gate-to-Source Voltage

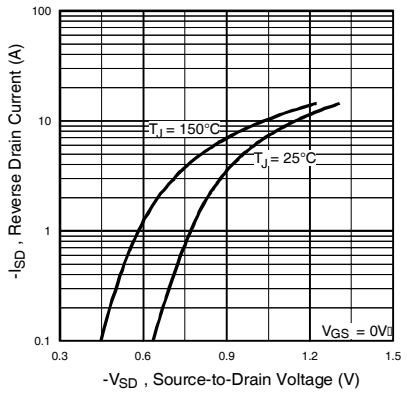



**Fig 18.** Typical Source-Drain Diode Forward Voltage

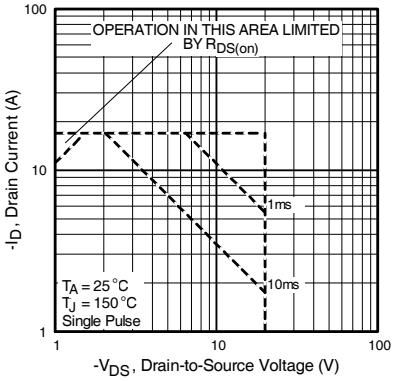



**Fig 19.** Maximum Safe Operating Area

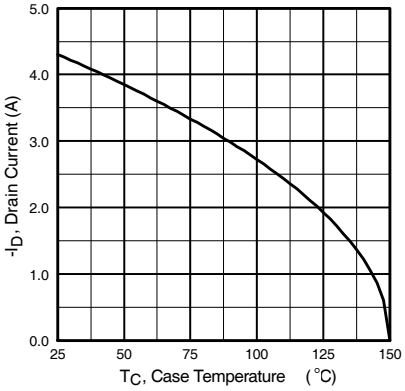



**Fig 20.** Maximum Drain Current Vs. Ambient Temperature

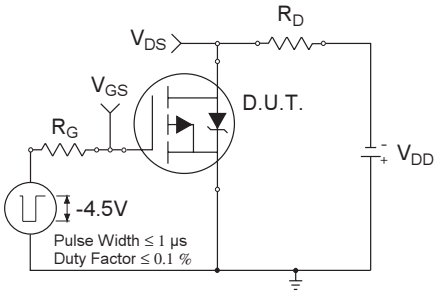



**Fig 21a.** Switching Time Test Circuit

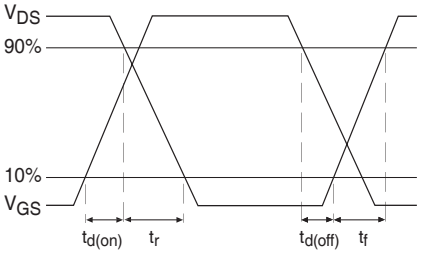



**Fig 21b.** Switching Time Waveforms

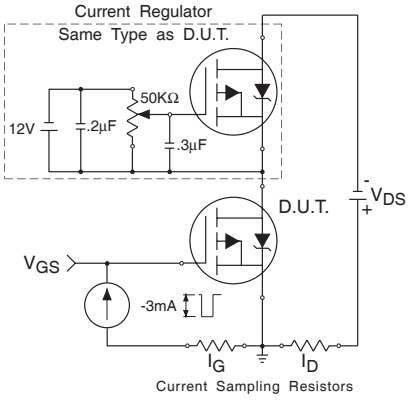



**Fig 22a.** Gate Charge Test Circuit

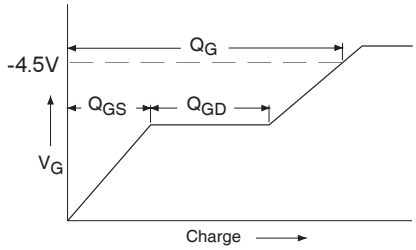



**Fig 22b.** Basic Gate Charge Waveform

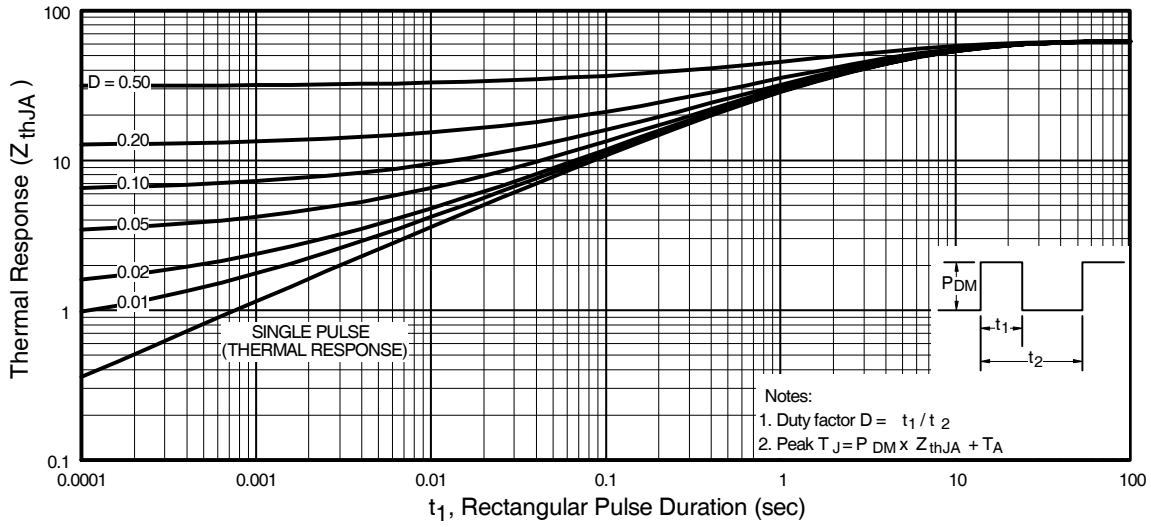
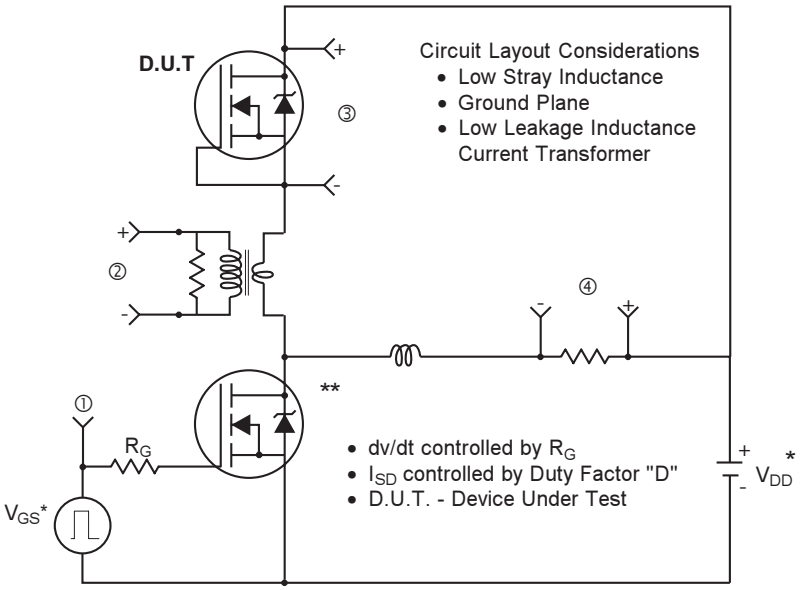
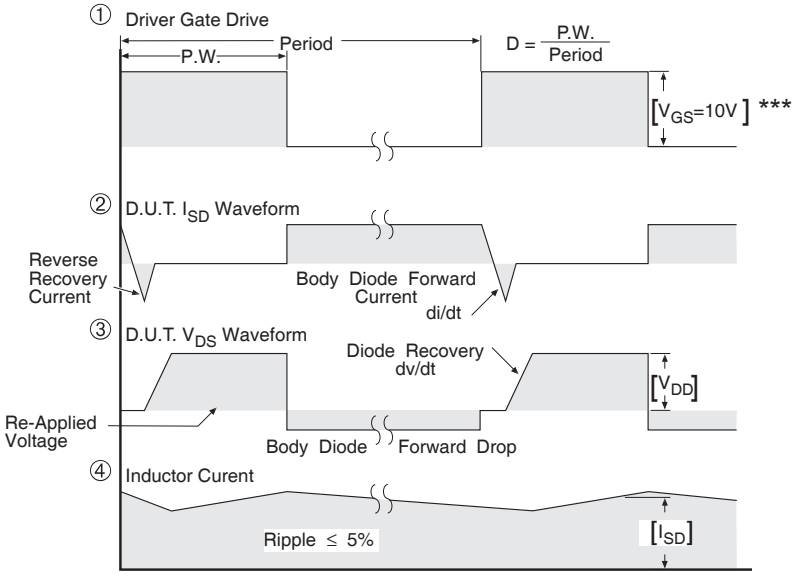



**Fig 23.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

## Peak Diode Recovery dv/dt Test Circuit




* Reverse Polarity for P-Channel
** Use P-Channel Driver for P-Channel Measurements

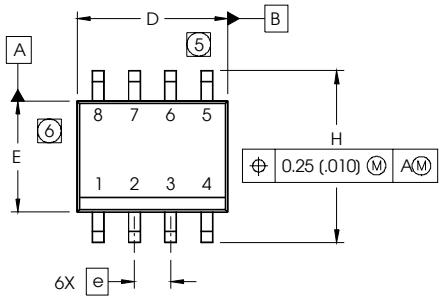


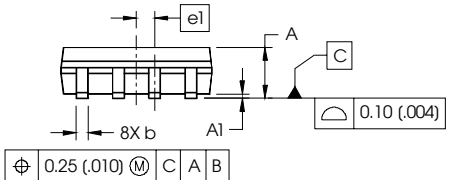

*** $V_{GS}$ = 5.0V for Logic Level and 3V Drive Devices

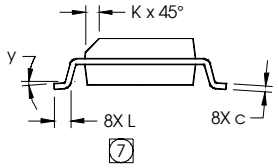
**Fig 24.** For N and P Channel HEXFETS

## SO-8 Package Outline

Dimensions are shown in millimeters (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 | |
| e1 | .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° |

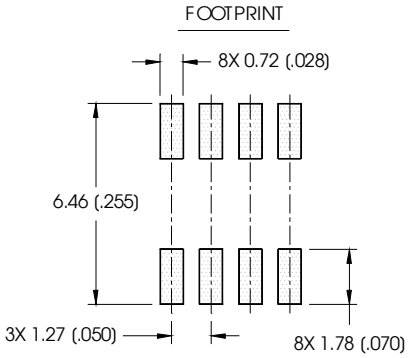
NOTES:

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).

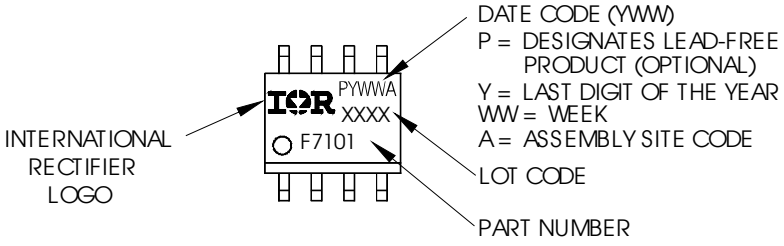
6 DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.010).

7 DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.




## SO-8 Part Marking

EXAMPLE: THIS IS AN IRF7101 (MOSFET)



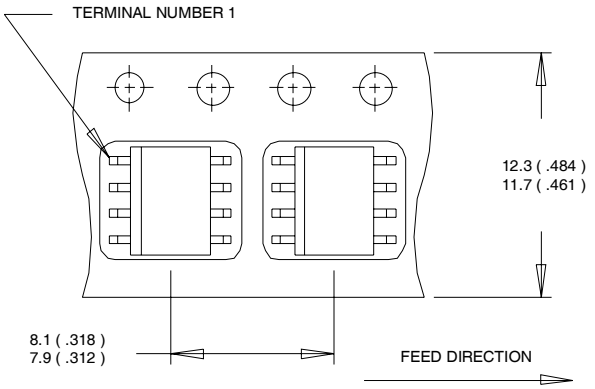

**Notes:**

**1. For an Automotive Qualified version of this part please see http://www.irf.com/product-info/auto/**

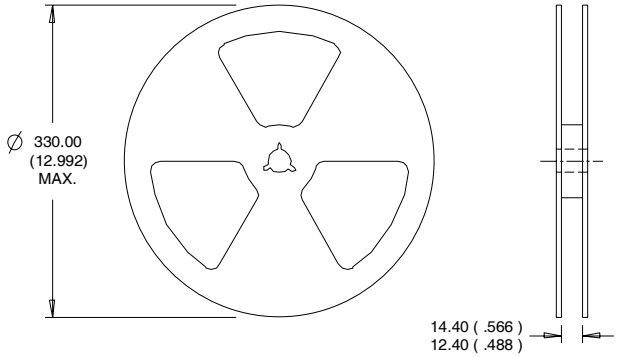
**2. For the most current drawing please refer to IR website at http://www.irf.com/package/**

## SO-8 Tape and Reel

Dimensions are shown in millimeters (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.

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

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