International
IOR Rectifier

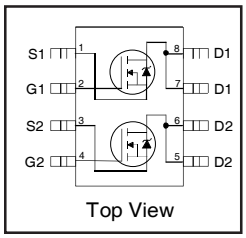
**AUTOMOTIVE GRADE**

# AUIRF7303Q

HEXFET® Power MOSFET

## Features

- Advanced Planar Technology
- Dual N Channel MOSFET
- Low On-Resistance
- Logic Level Gate Drive
- Dynamic dV/dT Rating
- 175°C Operating Temperature
- Fast Switching
- Lead-Free, RoHS Compliant
- Automotive Qualified*



Top View

| | |
|---|---|
| $V_{(BR)DSS}$ | 30V |
| $R_{DS(on)}$ max. | 0.05Ω |
| $I_D$ | 5.3A |


SO-8
AUIRF7303Q

## Description

Specifically designed for Automotive applications, this cellular design of HEXFET® Power MOSFETs utilizes the latest processing techniques to achieve low 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 and reliable device for use in Automotive and a wide variety of other applications.

| Base Part Number | Package Type | Standard Pack | | Orderable Part Number |
|---|---|---|---|---|
| | | Form | Quantity | |
| AUIRF7303Q | SO-8 | Tube | 95 | AUIRF7303Q |
| | | Tape and Reel | 4000 | AUIRF7303QTR |

## Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only; and functional operation of the device at these or any other condition beyond those indicated in the specifications is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions. Ambient temperature ($T_A$) is 25°C, unless otherwise specified.

| | Parameter | Max. | Units |
|---|---|---|---|
| $I_D$ @ $T_A$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V | 5.3 | A |
| $I_D$ @ $T_A$ = 70°C | Continuous Drain Current, $V_{GS}$ @ 10V | 4.4 | |
| $I_{DM}$ | Pulsed Drain Current ① | 44 | |
| $P_D$ @$T_A$ = 25°C | Power Dissipation | 2.4 | W |
| | Linear Derating Factor | 0.02 | W/°C |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy② | 414 | mJ |
| $E_{AS(Tested)}$ | Single Pulse Avalanche Energy⑤ | 1160 | |
| dv/dt | Peak Diode Recovery dv/dt ③ | 1.6 | V/ns |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to + 175 | °C |

### Thermal Resistance

| | Parameter | Max. | Units |
|---|---|---|---|
| $R_{\theta JA}$ | Junction-to-Ambient ⑥ | 62.5 | °C/W |

HEXFET® is a registered trademark of International Rectifier.
*Qualification standards can be found at http://www.irf.com/

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 30 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.03 | — | V/°C | Reference to 25°C, $I_D$ = 1mA |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 0.05 | Ω | $V_{GS}$ = 10V, $I_D$ = 2.7A ④ |
| | | — | — | 0.08 | | $V_{GS}$ = 4.5V, $I_D$ = 2.1A ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 1.0 | — | 3.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 100µA |
| gfs | Forward Transconductance | 5.6 | — | — | S | $V_{DS}$ = 15V, $I_D$ = 2.7A |
| $I_{DSS}$ | Drain-to-Source Leakage Current | — | — | 1.0 | µA | $V_{DS}$ = 24V, $V_{GS}$ = 0V |
| | | — | — | 25 | | $V_{DS}$ = 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 |

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge | — | 14 | 21 | nC | $I_D$ = 2.7A |
| $Q_{gs}$ | Gate-to-Source Charge | — | 1.5 | 2.3 | | $V_{DS}$ = 15V |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | — | 4.4 | 6.6 | | $V_{GS}$ = 10V ④ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 2.9 | — | ns | $V_{DD}$ = 15V |
| $t_r$ | Rise Time | — | 6.2 | — | | $I_D$ = 2.7A |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 15 | — | | $R_G$ = 6.8Ω |
| $t_f$ | Fall Time | — | 7.8 | — | | $V_{GS}$ =10V ④ |
| $C_{iss}$ | Input Capacitance | — | 515 | — | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | — | 217 | — | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse Transfer Capacitance | — | 90 | — | | $f$ = 1.0MHz |

### Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 3.0 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | — | — | 44 | | |
| $V_{SD}$ | Diode Forward Voltage | — | — | 1.0 | V | $T_J$ = 25°C, $I_S$ = 2.7A, $V_{GS}$ = 0V ④ |
| $t_{rr}$ | Reverse Recovery Time | — | 26 | 39 | ns | $T_J$ = 25°C,$I_F$ = 2.7A |
| $Q_{rr}$ | Reverse Recovery Charge | — | 50 | 75 | nC | di/dt = 100A/µs ④ |

**Notes:**

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

② Limited by $T_{Jmax}$, starting $T_J$ = 25°C, L = 118mH, $R_G$ = 50Ω, $I_{AS}$ = 2.7A, $V_{GS}$ =10V. Part not recommended for use above this value.

③ $I_{SD}$ ≤ 2.7A, di/dt ≤ 389A/µs, $V_{DD}$ ≤ $V_{(BR)DSS}$, $T_J$ ≤ 175°C.

④ Pulse width ≤ 400µs; duty cycle ≤ 2%.

⑤ This value determined from sample failure population, starting $T_J$ = 25°C, L = 118mH, $R_G$ = 50Ω, $I_{AS}$ = 2.7A, $V_{GS}$ =10V.

⑥ Surface mounted on FR-4 board, t ≤ 10sec..

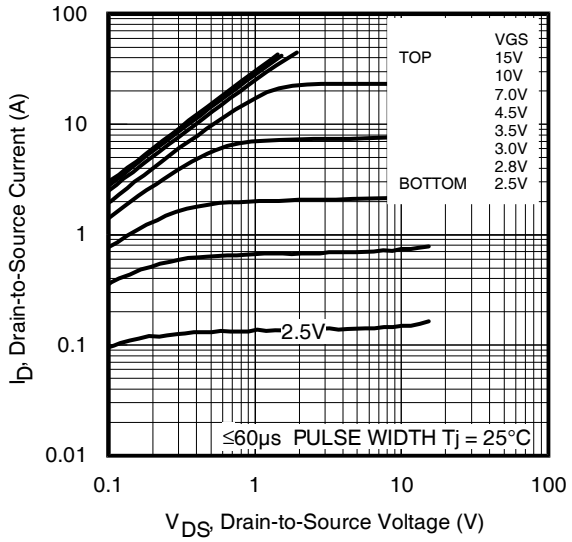



**Fig 1.** Typical Output Characteristics

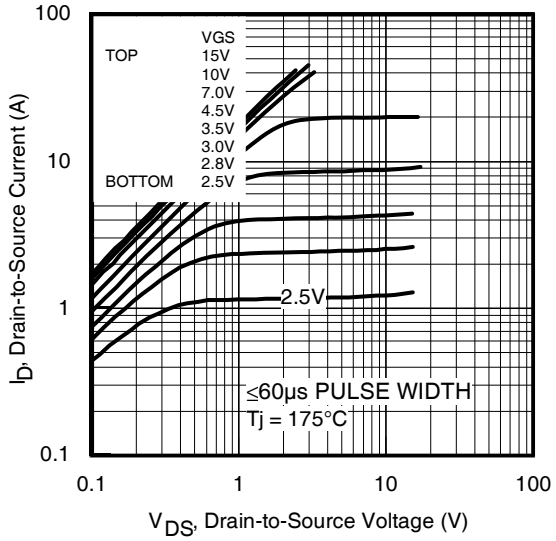



**Fig 2.** Typical Output Characteristics

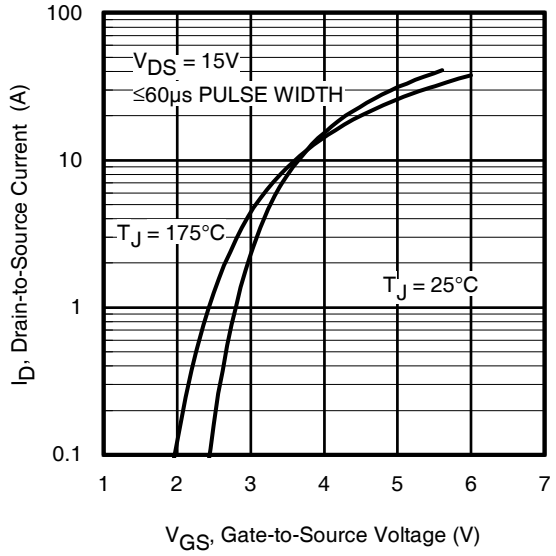



**Fig 3.** Typical Transfer Characteristics

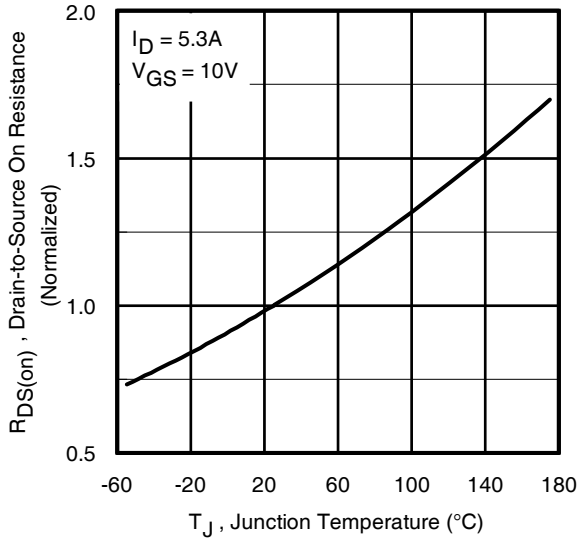



**Fig 4.** Normalized On-Resistance Vs. Temperature

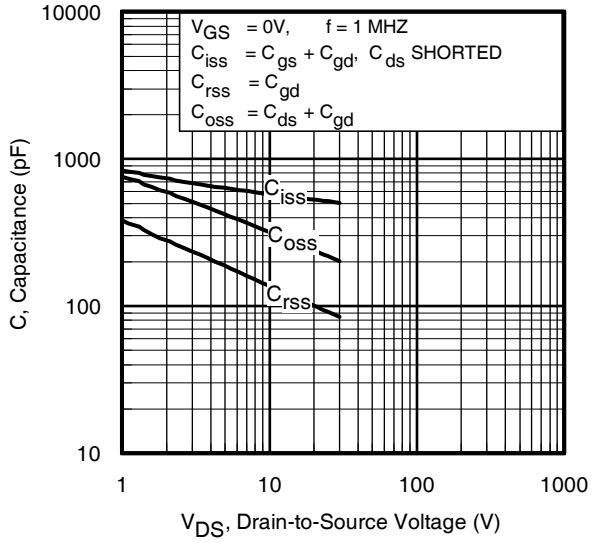



**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

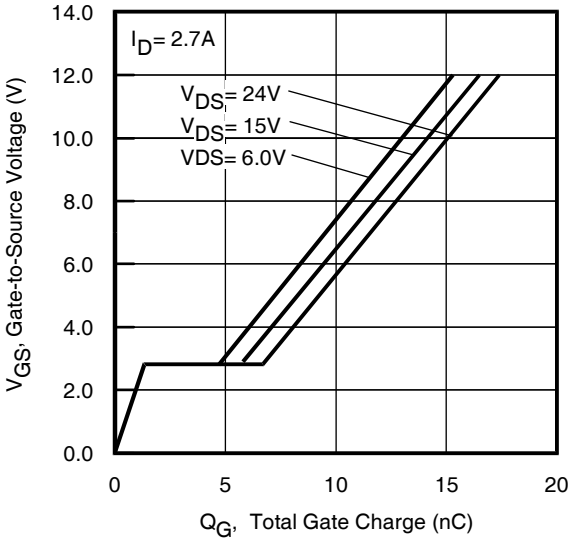



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

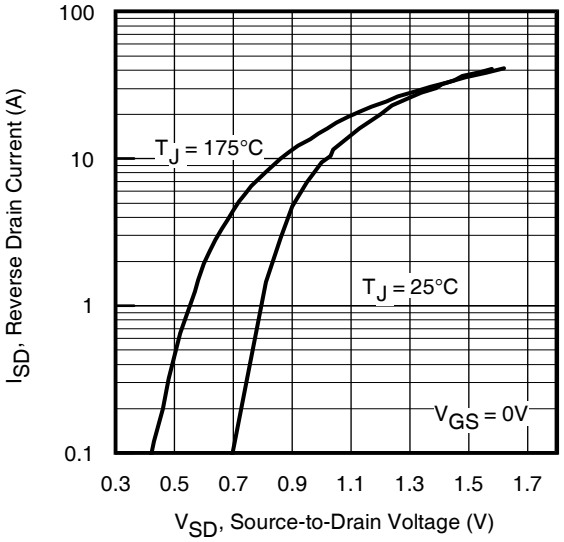



**Fig 7.** Typical Source-Drain Diode Forward Voltage

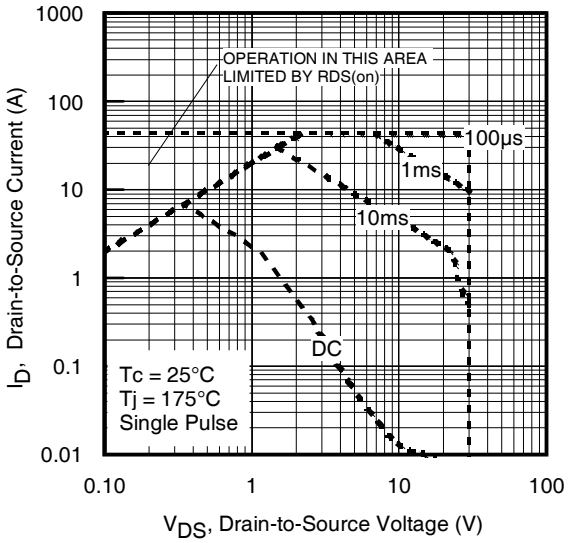



**Fig 8.** Maximum Safe Operating Area

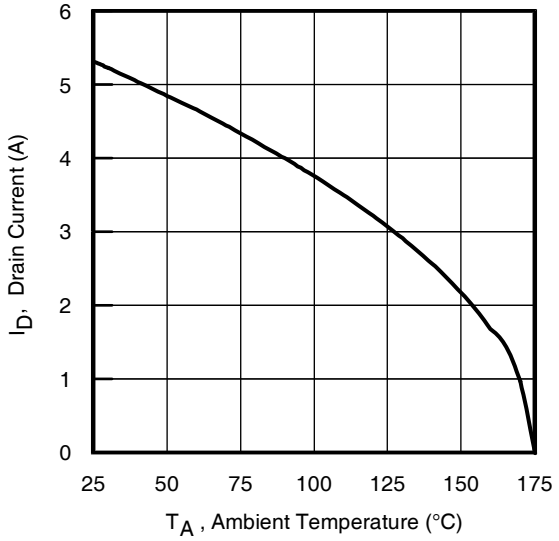



**Fig 9.** Maximum Drain Current Vs. Ambient Temperature

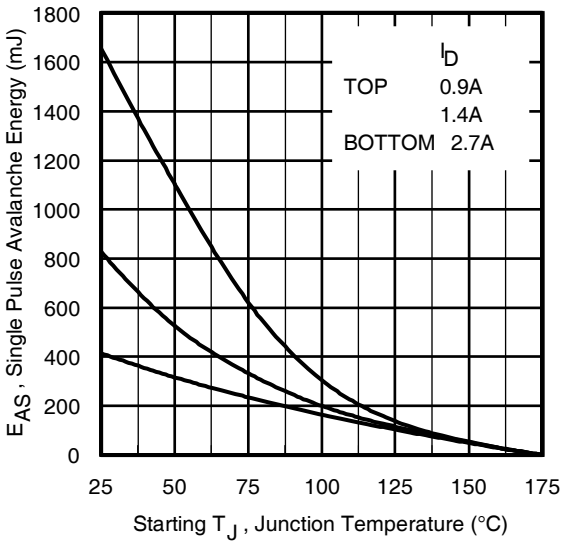



**Fig 10.** Maximum Avalanche Energy vs. DrainCurrent

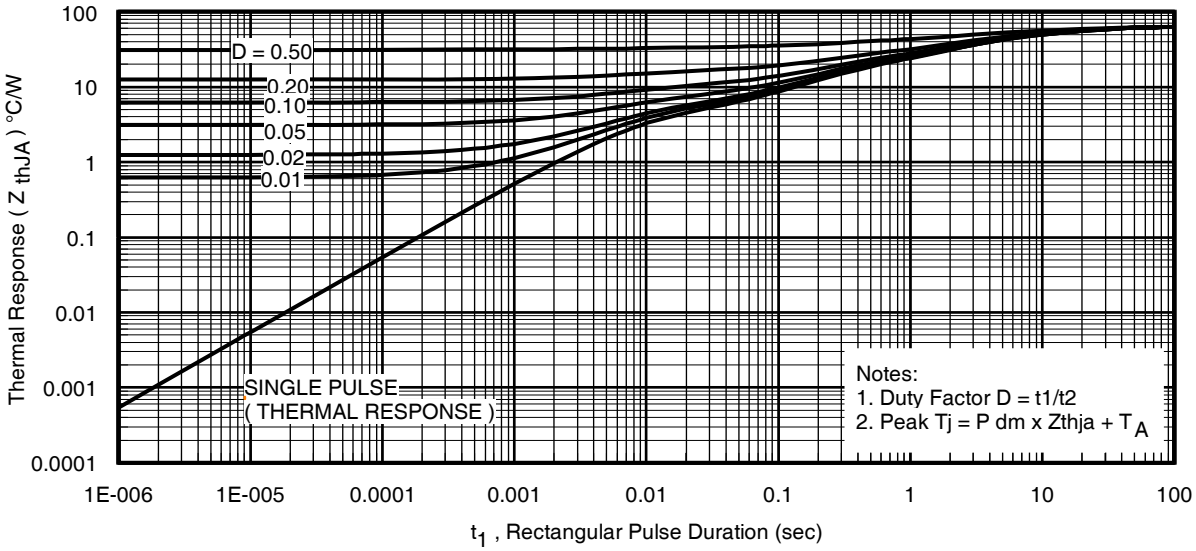



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

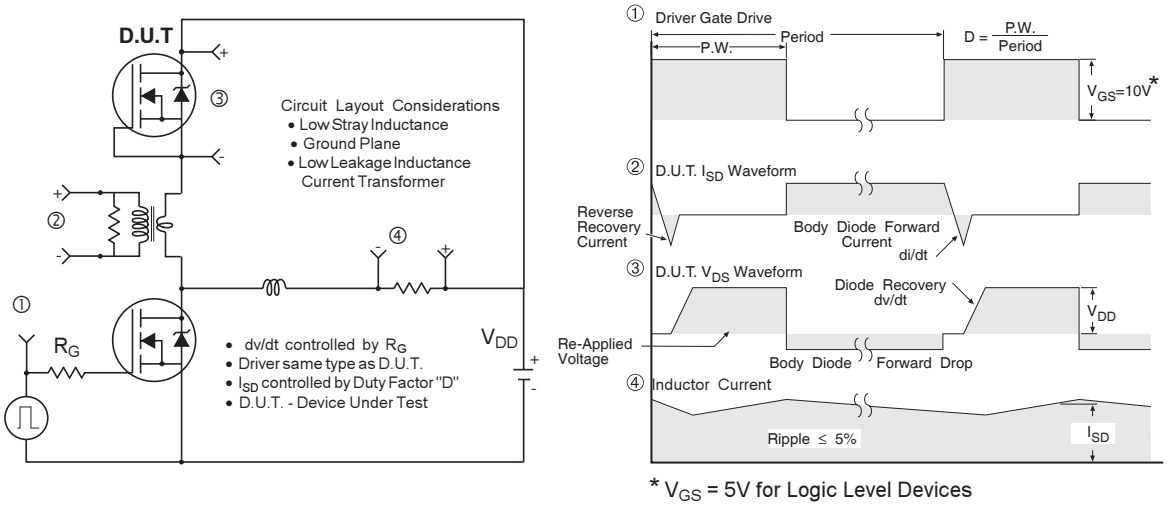



**Fig 12.** Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

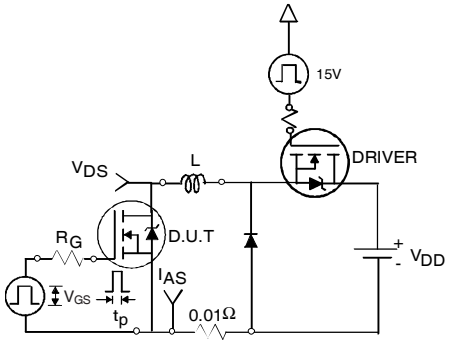



**Fig 13a.** Unclamped Inductive Test Circuit

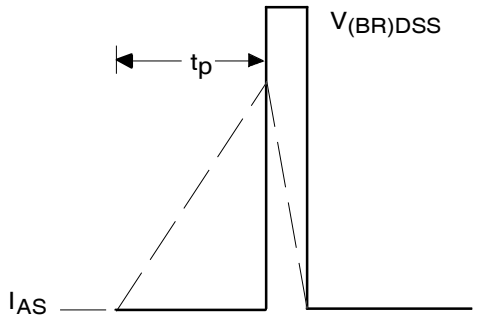



**Fig 13b.** Unclamped Inductive Waveforms

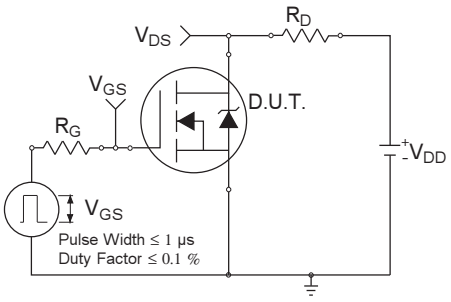



**Fig 14a.** Switching Time Test Circuit

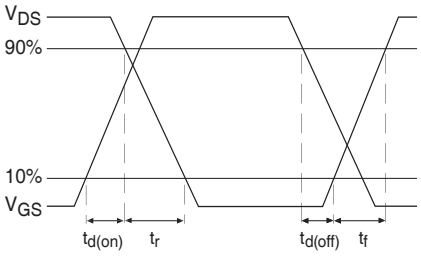



**Fig 14b.** Switching Time Waveforms

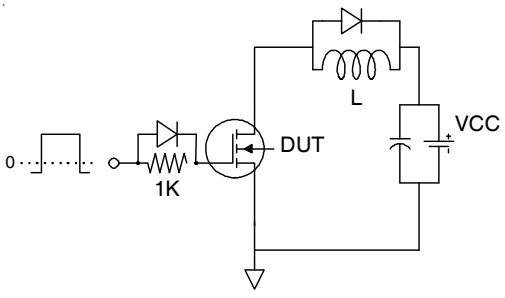



**Fig 15a.** Gate Charge Test Circuit

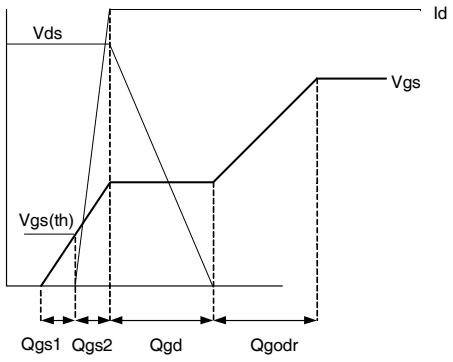
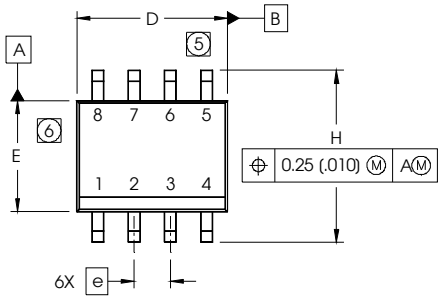


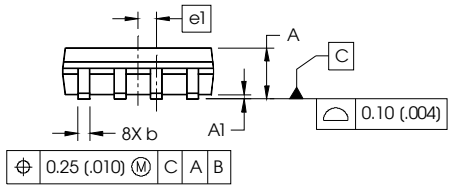

**Fig 15b.** Gate Charge Waveform

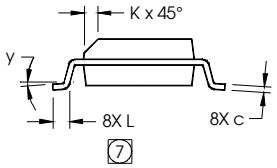
## SO-8 Package Outline

Dimensions are shown in millimeters (inches)



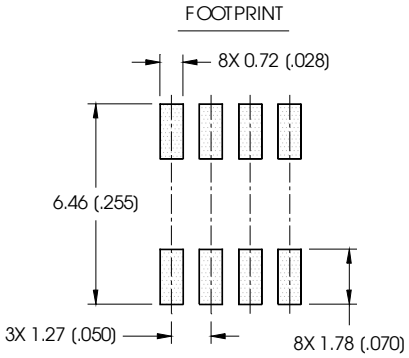

| DIM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .0532 | .0688 | 1.35 | 1.75 |
| A1 | .0040 | .0098 | 0.10 | 0.25 |
| b | .013 | .020 | 0.33 | 0.51 |
| c | .0075 | .0098 | 0.19 | 0.25 |
| D | .189 | .1968 | 4.80 | 5.00 |
| E | .1497 | .1574 | 3.80 | 4.00 |
| 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° |



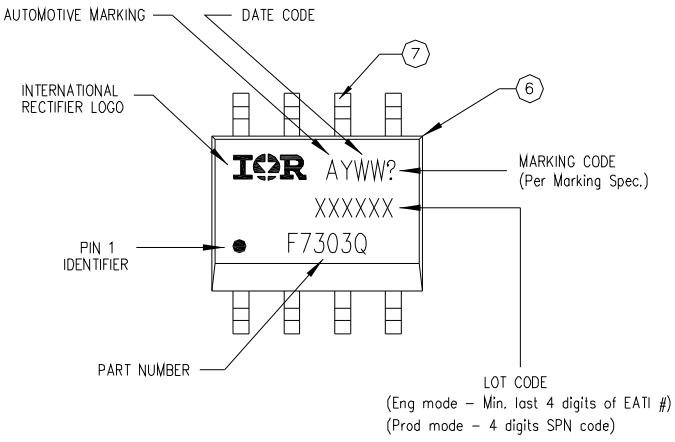




NOTES:

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

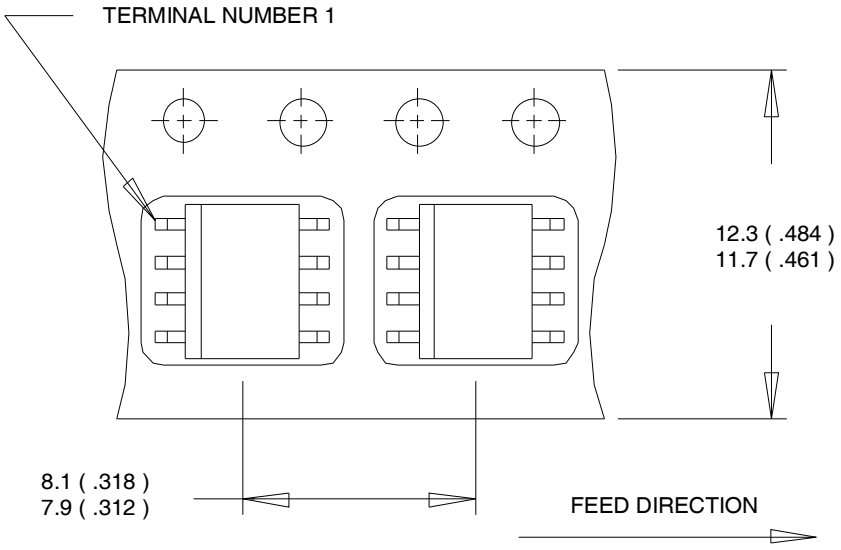



TOP MARKING (LASER)

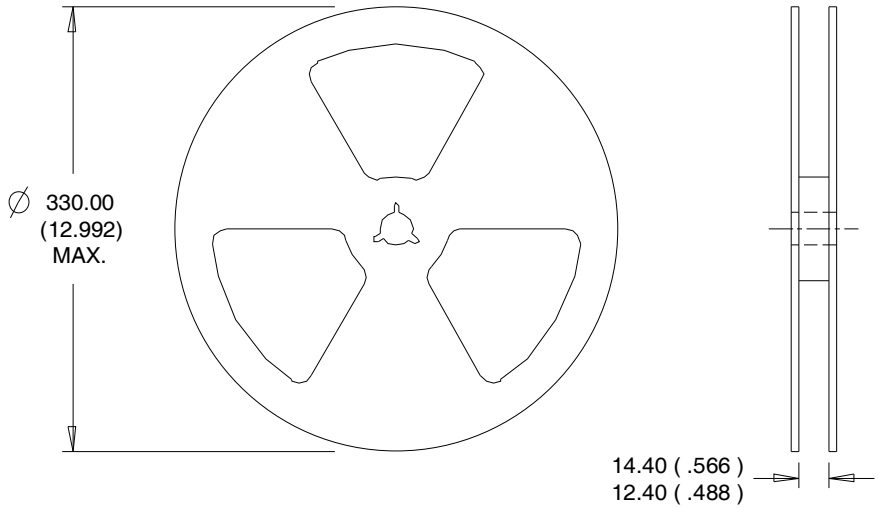
**Note: For the most current drawing please refer to IR website at http://www.irf.com/package/**

## SO-8 Tape and Reel

Dimensions are shown in 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.

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

## Qualification Information†

| | | | |
|---|---|---|---|
| **Qualification Level** | | Automotive (per AEC-Q101) †† | |
| | | Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level. | |
| **Moisture Sensitivity Level** | | SO-8 | MSL1 |
| **ESD** | Machine Model | Class M2 (+/- 150V)††† AEC-Q101-002 | |
| | Human Body Model | Class H1A (+/- 500V)††† AEC-Q101-001 | |
| | Charged Device Model | Class C5 (+/- 1500V)††† AEC-Q101-005 | |
| **RoHS Compliant** | | Yes | |

† Qualification standards can be found at International Rectifier's web site: http//www.irf.com/

†† Exceptions (if any) to AEC-Q101 requirements are noted in the qualification report.

††† Highest passing voltage

## IMPORTANT NOTICE

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For technical support, please contact IR's Technical Assistance Center
http://www.irf.com/technical-info/

**WORLD HEADQUARTERS:**
101 N. Sepulveda Blvd., El Segundo, California 90245
Tel: (310) 252-7105

**Revision History**

| Date | Comments |
|---|---|
| 3/4/2014 | • Added "Logic Level Gate Drive" bullet in the features section on page 1<br>• Updated data sheet with new IR corporate template |

  