International
IOR Rectifier

**AUTOMOTIVE MOSFET**

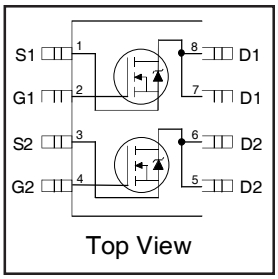
PD - 96362A

# AUIRF7341Q

HEXFET® Power MOSFET

## Features

- Advanced Planar Technology
- Ultra Low On-Resistance
- Dual N Channel MOSFET
- Surface Mount
- Available in Tape & Reel
- 175°C Operating Temperature
- Automotive [Q101] Qualified
- Lead-Free, RoHS Compliant



Top View

| | | |
|---|---|---|
| $V_{(BR)DSS}$ | | 55V |
| $R_{DS(on)}$ | typ. | 0.043Ω |
| | max. | 0.050Ω |
| $I_D$ | | 5.1A |


SO-8

| G | D | S |
|---|---|---|
| Gate | Drain | Source |

## Description

Specifically designed for Automotive applications, 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 Automotive qualified HEXFET Power MOSFET's are a 175°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 Automotive applications and a wide variety of other 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

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 |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 55 | V |
| $I_D$ @ $T_A$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V | 5.1 | A |
| $I_D$ @ $T_A$ = 70°C | Continuous Drain Current, $V_{GS}$ @ 10V | 4.2 | |
| $I_{DM}$ | Pulsed Drain Current ① | 42 | |
| $P_D$ @$T_A$ = 25°C | Power Dissipation③ | 2.4 | W |
| $P_D$ @$T_A$ = 70°C | Power Dissipation③ | 1.7 | |
| | Linear Derating Factor | 16 | mW/°C |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy② | 140 | mJ |
| $I_{AR}$ | Avalanche Current | 5.1 | A |
| $E_{AR}$ | Repetitive Avalanche Energy | See Fig. 16,17,14a, 14b | mJ |
| $T_J$<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 ④ | 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)**

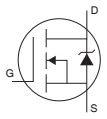
| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 55 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.052 | — | V/°C | Reference to 25°C, $I_D$ = 1mA |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 0.043 | 0.050 | Ω | $V_{GS}$ = 10V, $I_D$ = 5.1A ③ |
| | | — | 0.056 | 0.065 | | $V_{GS}$ = 4.5V, $I_D$ = 4.42A③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 1.0 | — | 3.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| gfs | Forward Transconductance | 10.4 | — | — | S | $V_{DS}$ = 10V, $I_D$ = 5.2A |
| $I_{DSS}$ | Drain-to-Source Leakage Current | — | — | 2.0 | µA | $V_{DS}$ = 44V, $V_{GS}$ = 0V |
| | | — | — | 25 | | $V_{DS}$ = 44V, $V_{GS}$ = 0V, $T_J$ = 150°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 | — | 29 | 44 | nC | $I_D$ = 5.2A |
| $Q_{gs}$ | Gate-to-Source Charge | — | 2.9 | 4.4 | | $V_{DS}$ = 44V |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | — | 7.3 | 11 | | $V_{GS}$ = 10V |
| $t_{d(on)}$ | Turn-On Delay Time | — | 9.2 | — | ns | $V_{DD}$ = 28V |
| $t_r$ | Rise Time | — | 7.7 | — | | $I_D$ = 1.0A |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 31 | — | | $R_G$ = 6.0Ω |
| $t_f$ | Fall Time | — | 12.5 | — | | $V_{GS}$ = 10V ③ |
| $C_{iss}$ | Input Capacitance | — | 780 | — | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | — | 190 | — | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse Transfer Capacitance | — | 66 | — | | $f$ = 1.0MHz |

## Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 2.4 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | — | — | 42 | | |
| $V_{SD}$ | Diode Forward Voltage | — | — | 1.2 | V | $T_J$ = 25°C, $I_S$ = 2.6A, $V_{GS}$ = 0V ③ |
| $t_{rr}$ | Reverse Recovery Time | — | 51 | 77 | ns | $T_J$ = 25°C,$I_F$ = 2.6A |
| $Q_{rr}$ | Reverse Recovery Charge | — | 76 | 114 | nC | di/dt = 100A/µs ③ |




**Notes:**

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

② $V_{DD}$ = 25V, starting $T_J$ = 25°C, L = 10.7mH, $R_G$ = 25Ω, $I_{AS}$ = 5.2A.

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

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

## 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(+/-200V )††† (per AEC-Q101-002) | |
| | Human Body Model | Class H1A(+/-500V )††† (per AEC-Q101-001) | |
| | Charged Device Model | Class C5(+/-1125V )††† (per 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

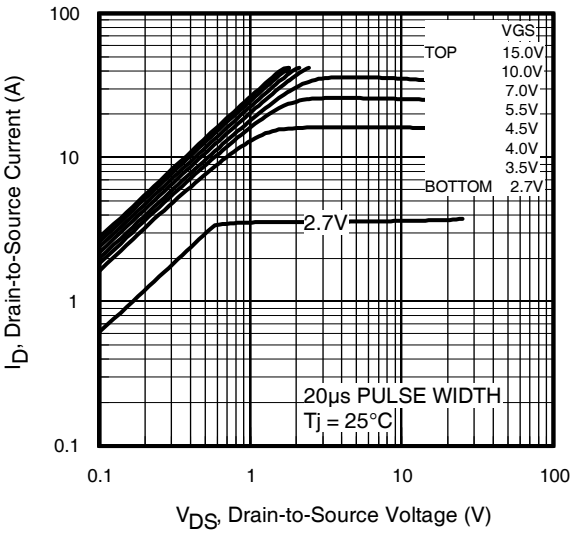



**Fig 1.** Typical Output Characteristics

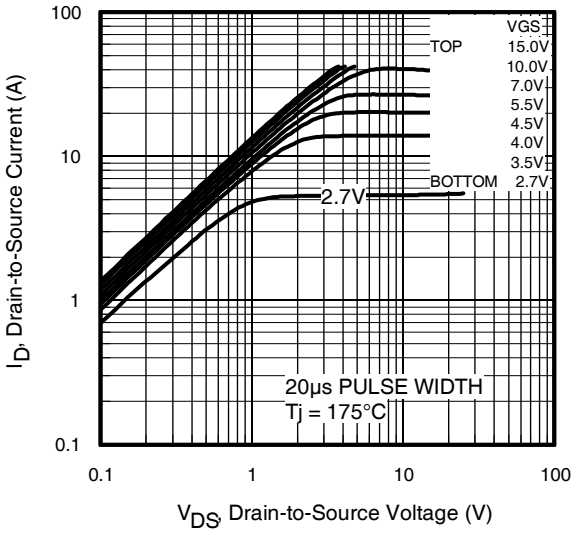



**Fig 2.** Typical Output Characteristics

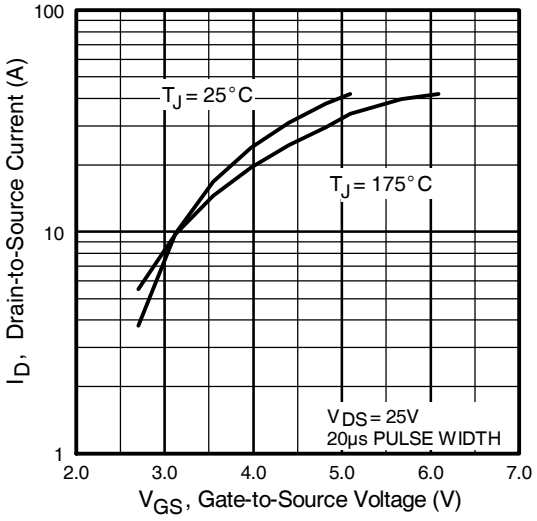



**Fig 3.** Typical Transfer Characteristics

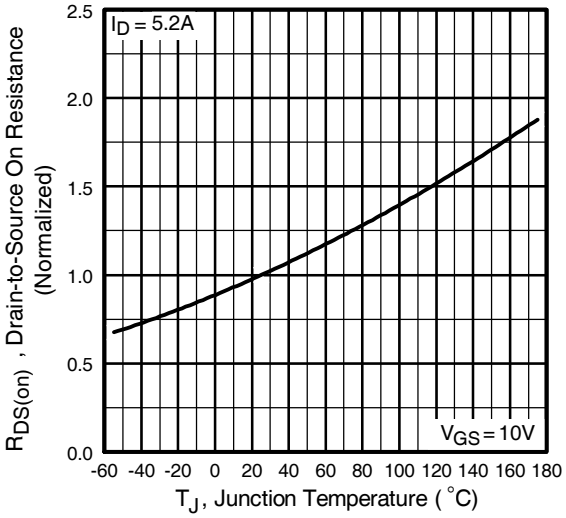



**Fig 4.** Normalized On-Resistance Vs. Temperature

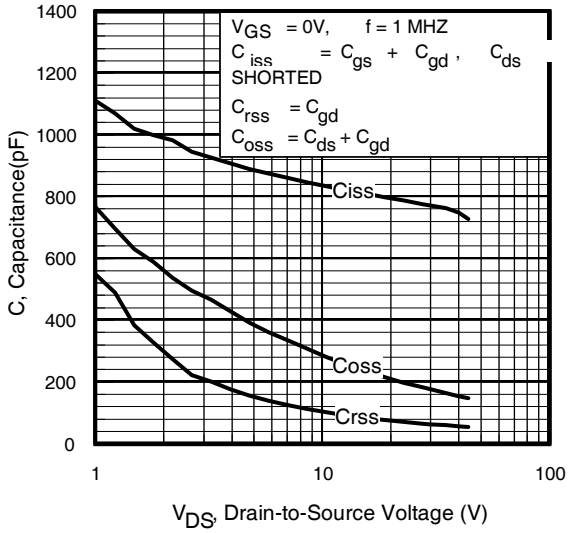



**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

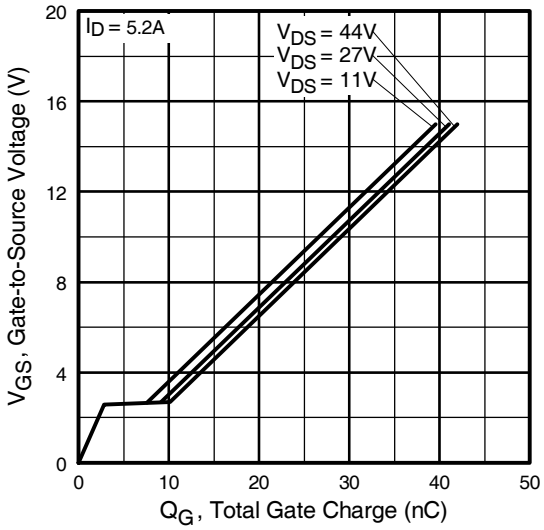



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

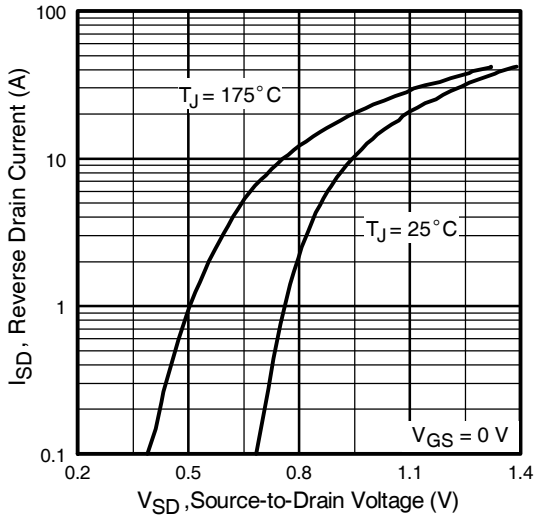



**Fig 7.** Typical Source-Drain Diode Forward Voltage

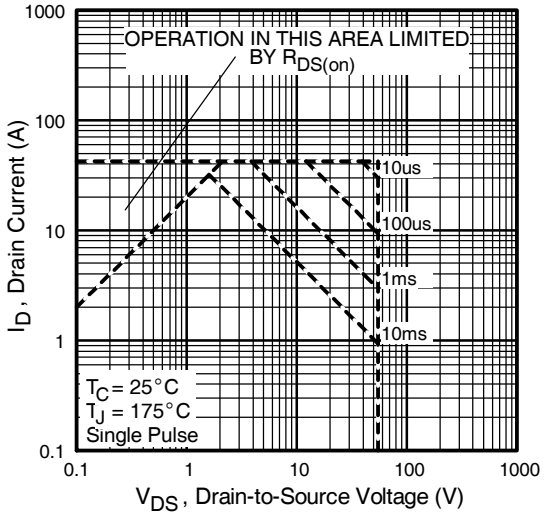



**Fig 8.** Maximum Safe Operating Area

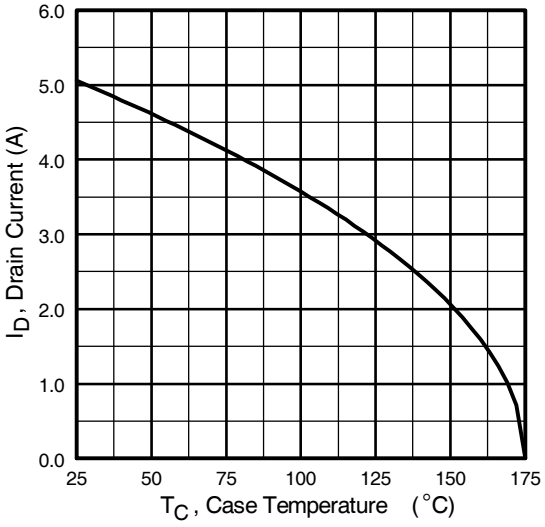



**Fig 9.** Maximum Drain Current Vs. Case Temperature

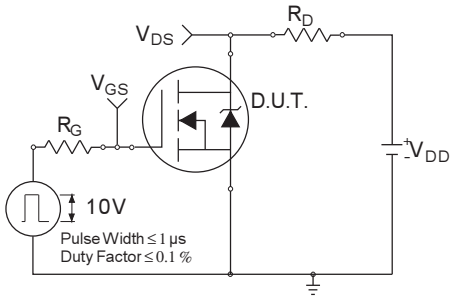



**Fig 10a.** Switching Time Test Circuit

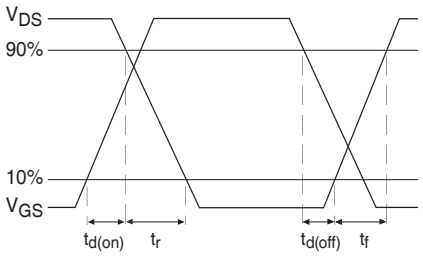



**Fig 10b.** Switching Time Waveforms

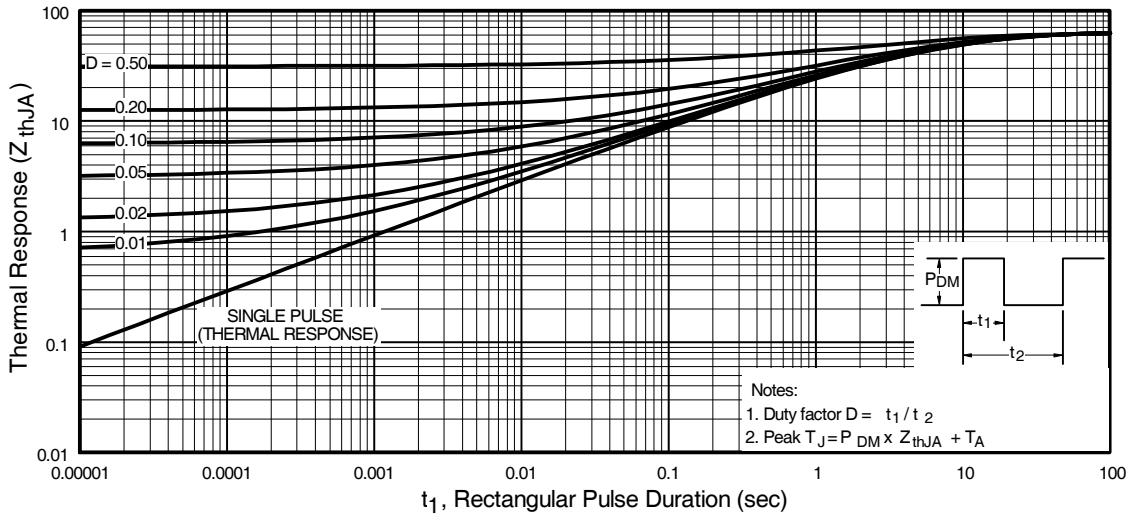



**Fig 10.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

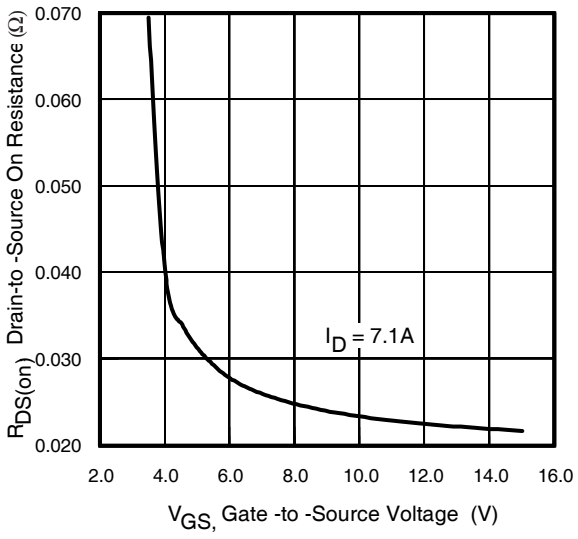



**Fig 11.** Typical On-Resistance Vs. Gate Voltage

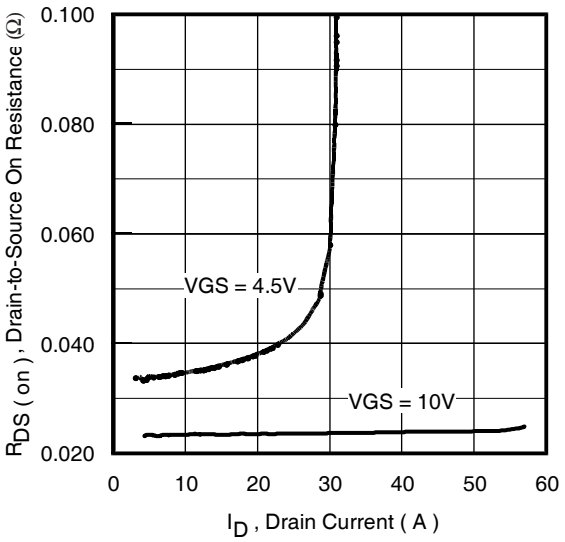



**Fig 12.** Typical On-Resistance Vs. Drain Current

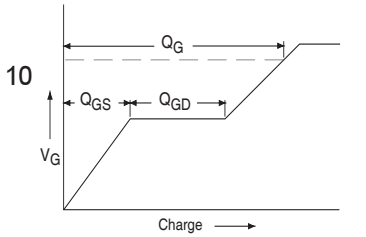



**Fig 13a.** Basic Gate Charge Waveform

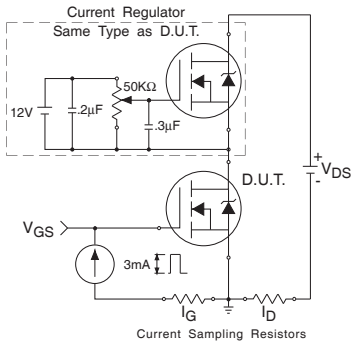



**Fig 13b.** Gate Charge Test Circuit

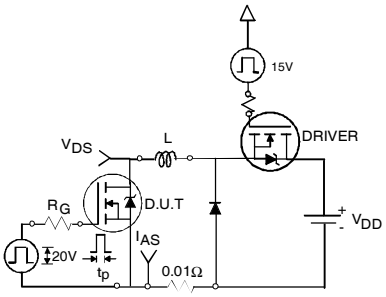



**Fig 14a.** Unclamped Inductive Test Circuit

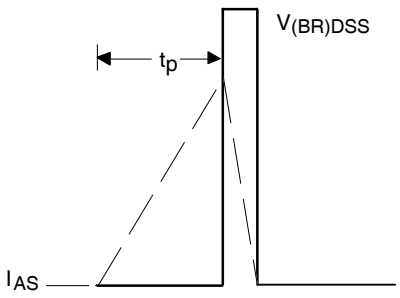



**Fig 14b.** Unclamped Inductive Waveforms

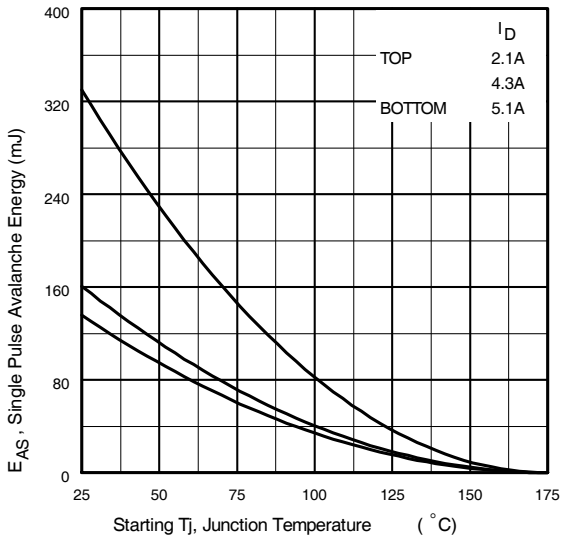



**Fig 15.** Maximum Avalanche Energy Vs. Drain Current

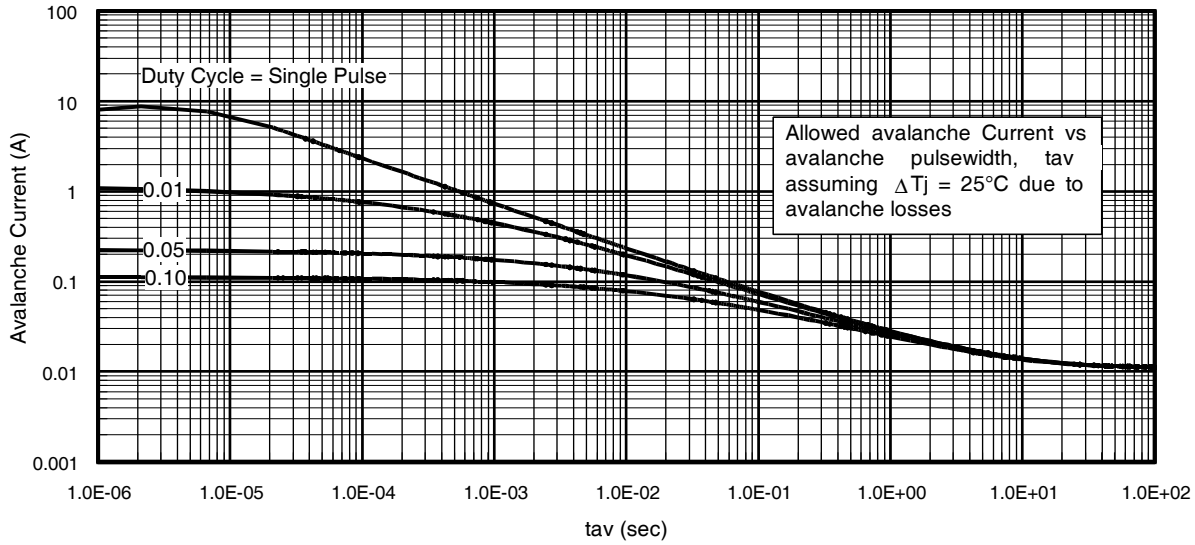



**Fig 16.** Typical Avalanche Current Vs.Pulsewidth

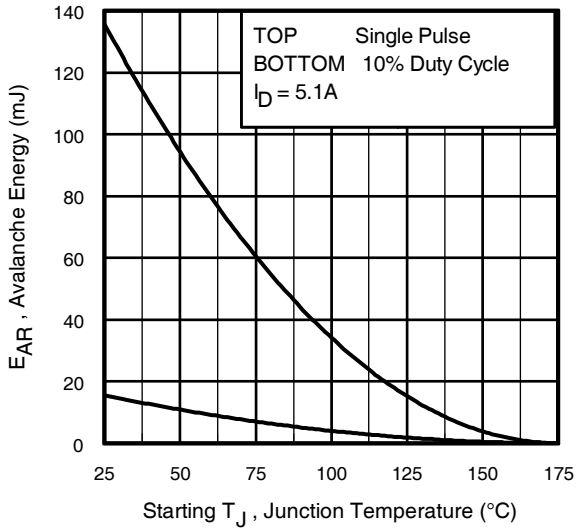



**Fig 17.** Maximum Avalanche Energy Vs. Temperature

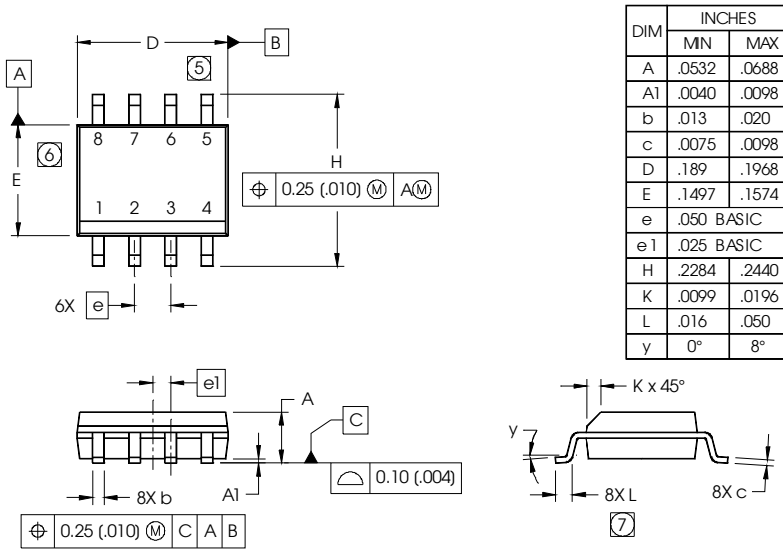
**Notes on Repetitive Avalanche Curves , Figures 16, 17:**
**(For further info, see AN-1005 at www.irf.com)**

1. Avalanche failures assumption:
   Purely a thermal phenomenon and failure occurs at a temperature far in excess of $T_{jmax}$. This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as$T_{jmax}$ is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 14a, 14b.
4. $P_{D\ (ave)}$ = Average power dissipation per single avalanche pulse.
5. BV = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).
6. $I_{av}$ = Allowable avalanche current.
7. $\Delta T$ = Allowable rise in junction temperature, not to exceed $T_{jmax}$ (assumed as 25°C in Figure 15, 16).
   $t_{av}$ = Average time in avalanche.
   D = Duty cycle in avalanche = $t_{av} \cdot f$
   $Z_{thJC}(D, t_{av})$ = Transient thermal resistance, see figure 11)

$$P_{D\ (ave)} = 1/2\ (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$$
$$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$$
$$E_{AS\ (AR)} = P_{D\ (ave)} \cdot t_{av}$$

## SO-8 Package Outline

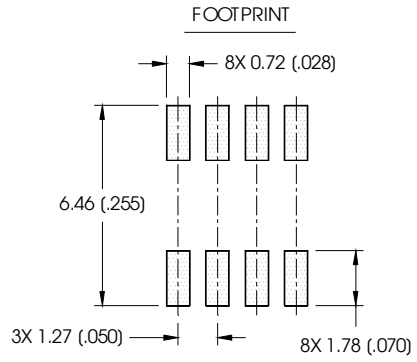
Dimensions are shown in millimeters (inches)



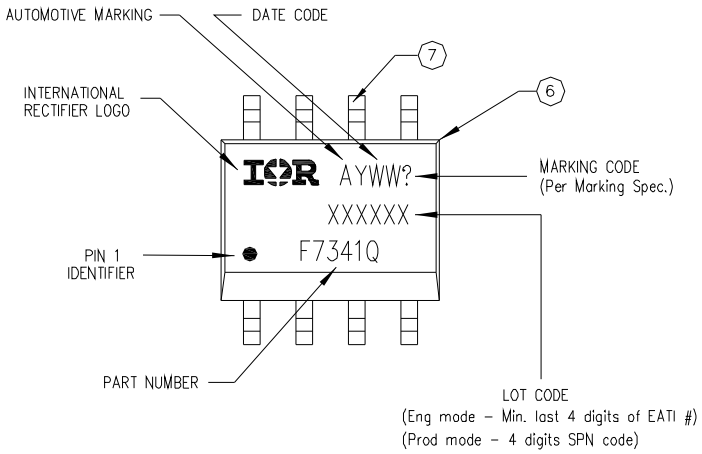

| DIM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .0532 | .0688 | 1.35 | 1.75 |
| A1 | .0040 | .0098 | 0.10 | 0.25 |
| b | .013 | .020 | 0.33 | 0.51 |
| c | .0075 | .0098 | 0.19 | 0.25 |
| D | .189 | .1968 | 4.80 | 5.00 |
| E | .1497 | .1574 | 3.80 | 4.00 |
|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

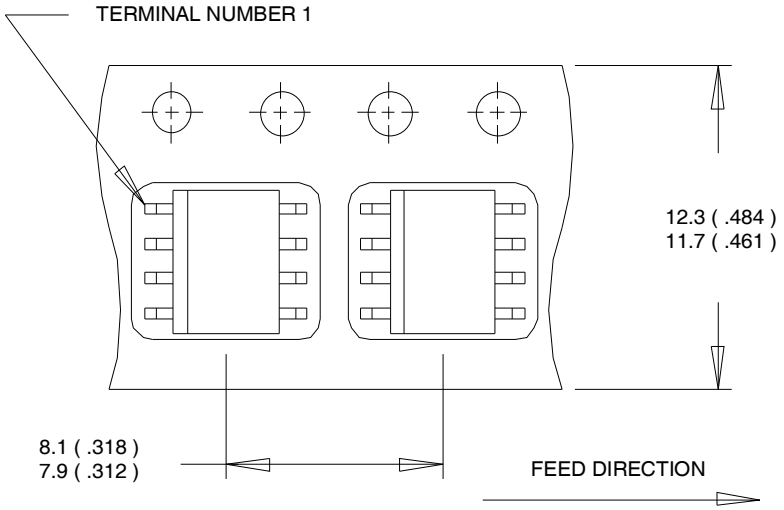



TOP MARKING (LASER)

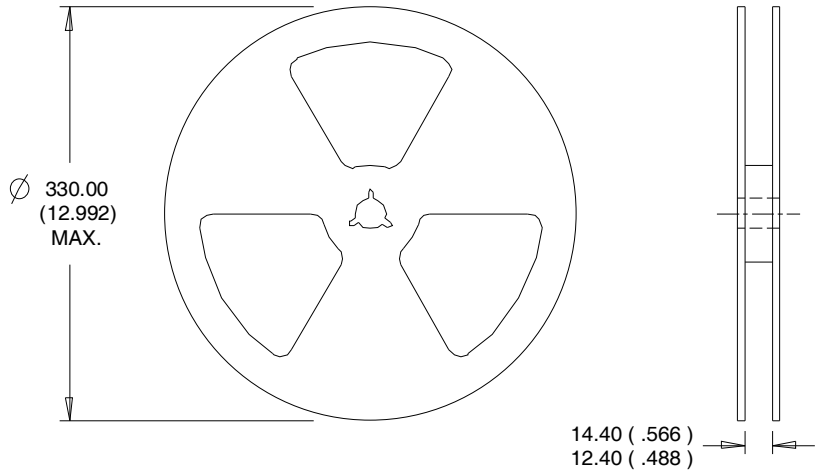
**Note: For the most current drawing please refer to IR website at http://www.irf.com/package/**

## 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.

## Ordering Information

| Base part | Package Type | Standard Pack | | Complete Part Number |
|---|---|---|---|---|
| | | Form | Quantity | |
| AUIRF7341Q | SO-8 | Tube | 95 | AUIRF7341Q |
| | | Tape and Reel | 4000 | AUIRF7341QTR |

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For technical support, please contact IR's Technical Assistance Center
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