

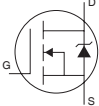
# IRF7331

International  
IR Rectifier

## Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

|                                 | Parameter                            | Min. | Typ.  | Max. | Units               | Conditions                                                |
|---------------------------------|--------------------------------------|------|-------|------|---------------------|-----------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 20   | —     | —    | V                   | $V_{GS} = 0V$ , $I_D = 250\mu A$                          |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.013 | —    | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}$ , $I_D = 1mA$             |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | —     | 30   | $m\Omega$           | $V_{GS} = 4.5V$ , $I_D = 7.0A$ ②                          |
|                                 |                                      | —    | —     | 45   |                     | $V_{GS} = 2.5V$ , $I_D = 5.6A$ ②                          |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 0.6  | —     | 1.2  | V                   | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                      |
| $g_{fs}$                        | Forward Transconductance             | 14   | —     | —    | S                   | $V_{DS} = 10V$ , $I_D = 7.0A$                             |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —     | 1.0  | $\mu A$             | $V_{DS} = 16V$ , $V_{GS} = 0V$                            |
|                                 |                                      | —    | —     | 25   |                     | $V_{DS} = 16V$ , $V_{GS} = 0V$ , $T_J = 70^\circ\text{C}$ |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —     | 100  | nA                  | $V_{GS} = 12V$                                            |
|                                 | Gate-to-Source Reverse Leakage       | —    | —     | -100 |                     | $V_{GS} = -12V$                                           |
| $Q_g$                           | Total Gate Charge                    | —    | 13    | 20   | nC                  | $I_D = 7.0A$                                              |
| $Q_{gs}$                        | Gate-to-Source Charge                | —    | 3.7   | —    |                     | $V_{DS} = 10V$                                            |
| $Q_{gd}$                        | Gate-to-Drain ("Miller") Charge      | —    | 2.1   | —    |                     | $V_{GS} = 4.5V$                                           |
| $t_{d(on)}$                     | Turn-On Delay Time                   | —    | 7.6   | —    | ns                  | $V_{DD} = 10V$ ②                                          |
| $t_r$                           | Rise Time                            | —    | 22    | —    |                     | $I_D = 1.0A$                                              |
| $t_{d(off)}$                    | Turn-Off Delay Time                  | —    | 110   | —    |                     | $R_G = 53\Omega$                                          |
| $t_f$                           | Fall Time                            | —    | 50    | —    |                     | $V_{GS} = 4.5V$                                           |
| $C_{iss}$                       | Input Capacitance                    | —    | 1340  | —    | pF                  | $V_{GS} = 0V$                                             |
| $C_{oss}$                       | Output Capacitance                   | —    | 170   | —    |                     | $V_{DS} = 16V$                                            |
| $C_{rss}$                       | Reverse Transfer Capacitance         | —    | 120   | —    |                     | $f = 1.0MHz$                                              |

## Source-Drain Ratings and Characteristics

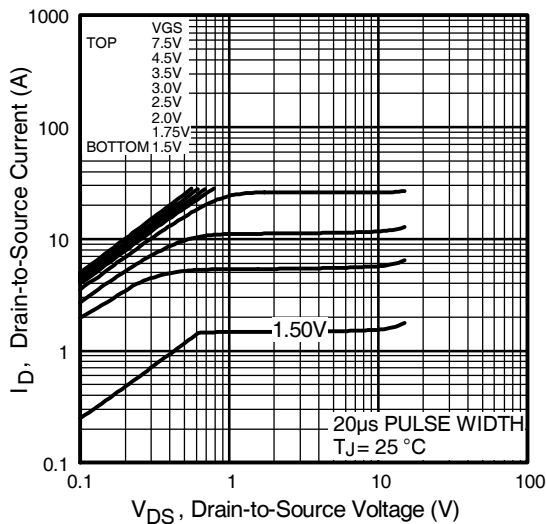
|          | Parameter                              | Min. | Typ. | Max. | Units | Conditions                                                                                                                                           |
|----------|----------------------------------------|------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current (Body Diode) | —    | —    | 2.0  | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①   | —    | —    | 28   |       |                                                                                                                                                      |
| $V_{SD}$ | Diode Forward Voltage                  | —    | —    | 1.2  | V     | $T_J = 25^\circ\text{C}$ , $I_S = 2.0A$ , $V_{GS} = 0V$ ②                                                                                            |
| $t_{rr}$ | Reverse Recovery Time                  | —    | 31   | 47   | ns    | $T_J = 25^\circ\text{C}$ , $I_F = 2.0A$                                                                                                              |
| $Q_{rr}$ | Reverse Recovery Charge                | —    | 15   | 23   | nC    | $di/dt = 100A/\mu s$ ②                                                                                                                               |

### Notes:

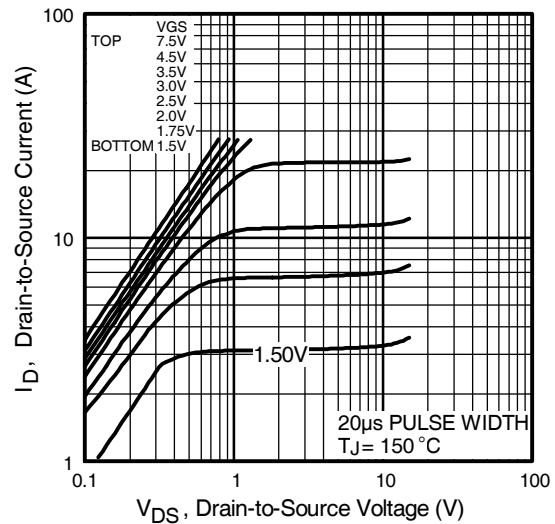
① Repetitive rating; pulse width limited by max. junction temperature.

② Surface mounted on 1 in square Cu board

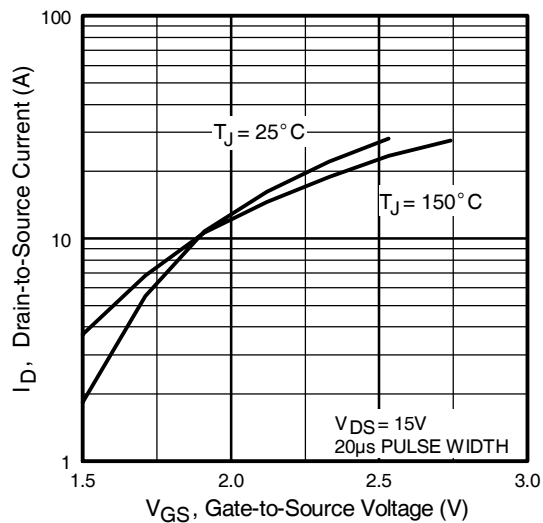
② Pulse width  $\leq 400\mu s$ ; duty cycle  $\leq 2\%$ .



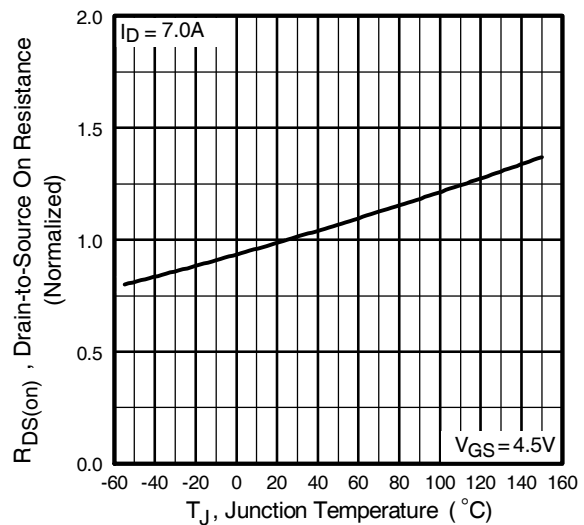
**Fig 1.** Typical Output Characteristics



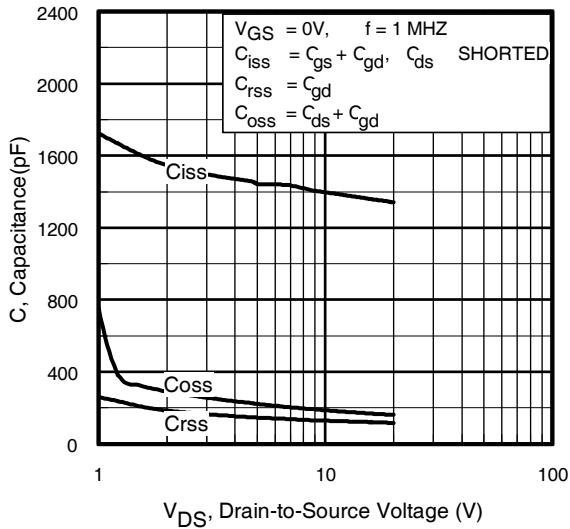
**Fig 2.** Typical Output Characteristics



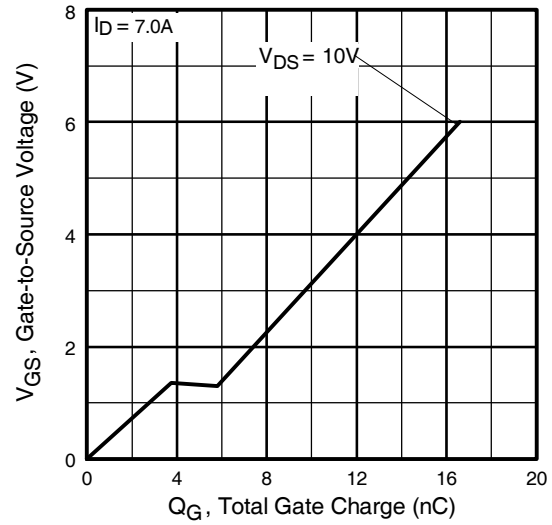
**Fig 3.** Typical Transfer Characteristics



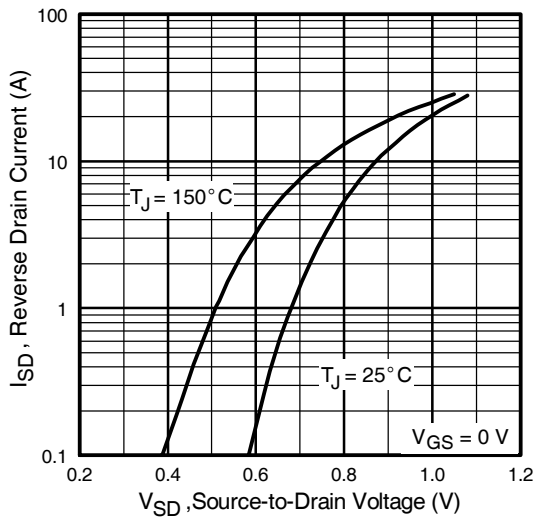
**Fig 4.** Normalized On-Resistance  
Vs. Temperature



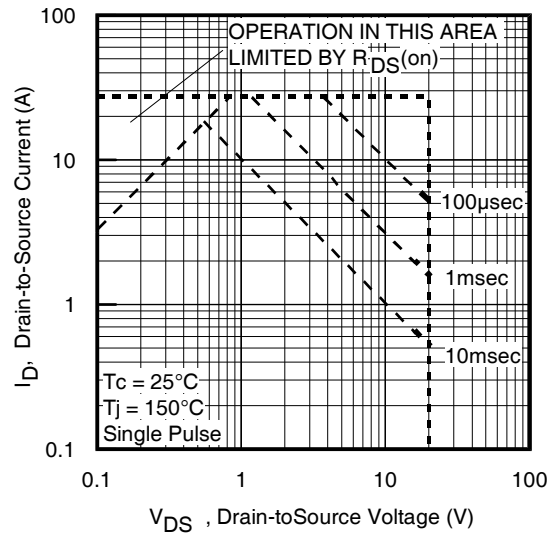
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



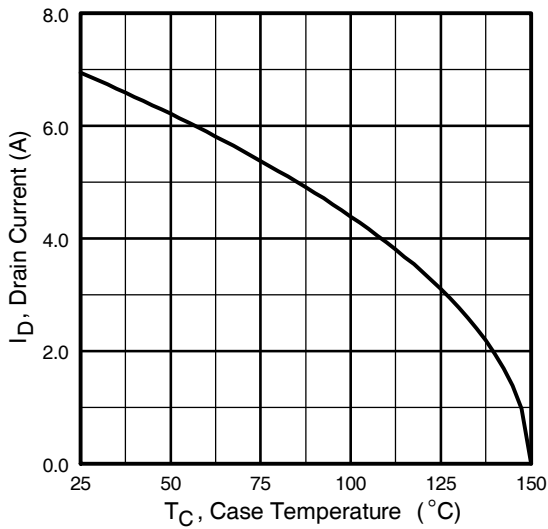
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



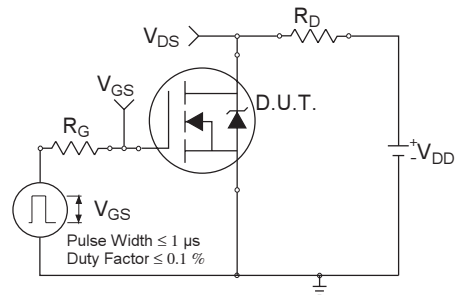
**Fig 7.** Typical Source-Drain Diode Forward Voltage



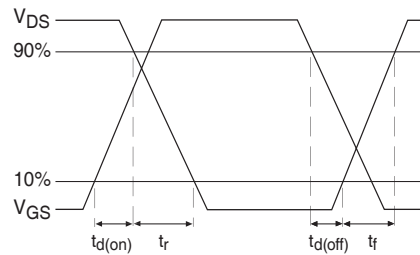
**Fig 8.** Maximum Safe Operating Area



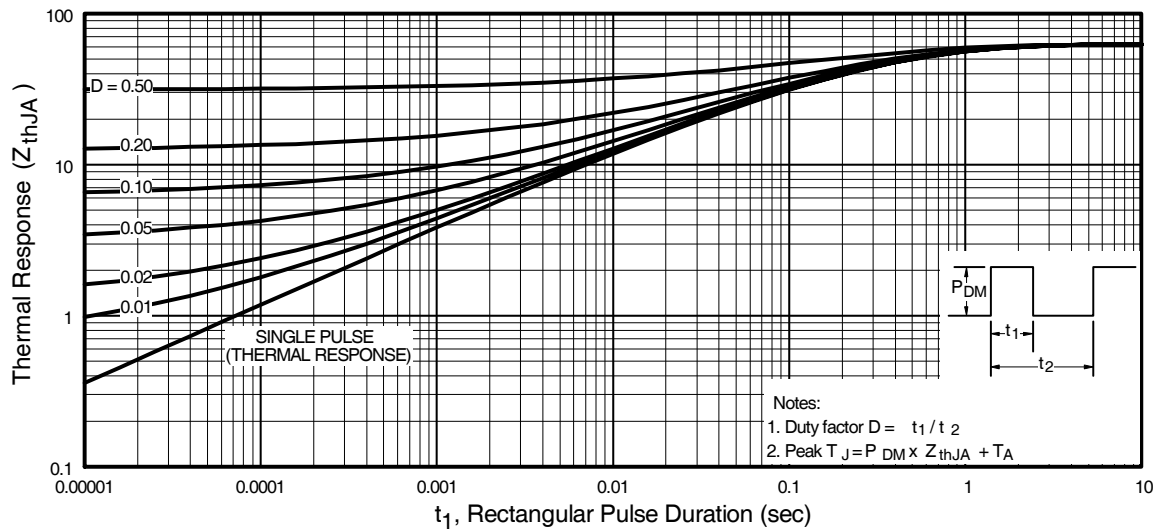
**Fig 9.** Maximum Drain Current Vs. Case Temperature



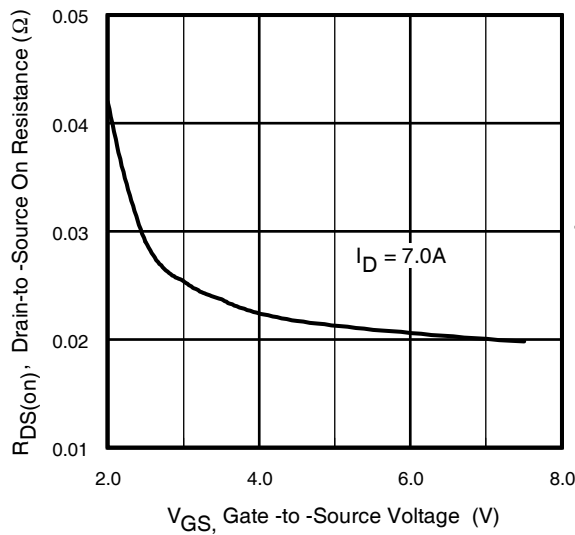
**Fig 10a.** Switching Time Test Circuit



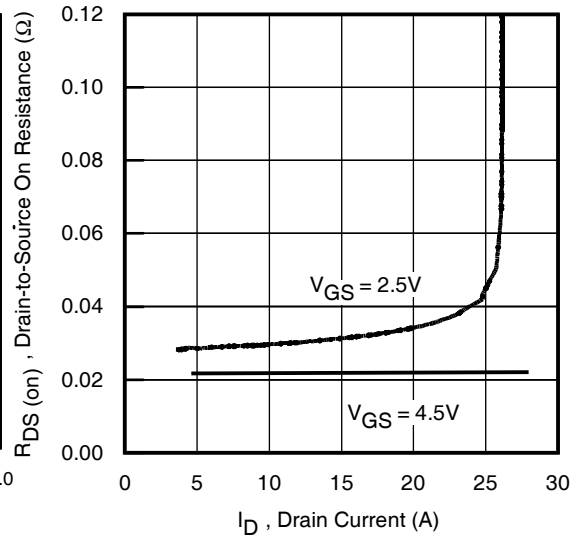
**Fig 10b.** Switching Time Waveforms



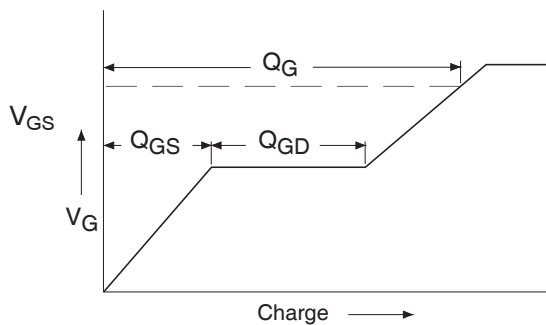
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



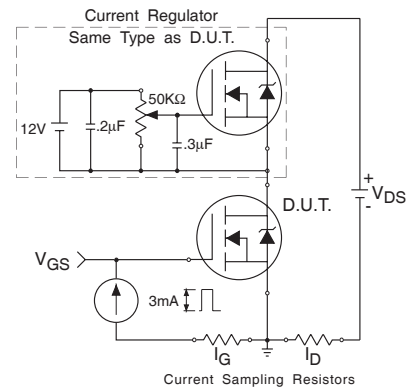
**Fig 12.** Typical On-Resistance Vs. Gate Voltage



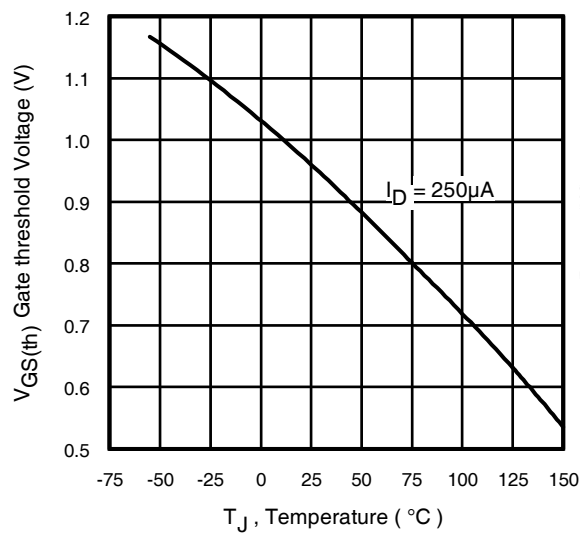
**Fig 13.** Typical On-Resistance Vs. Drain Current



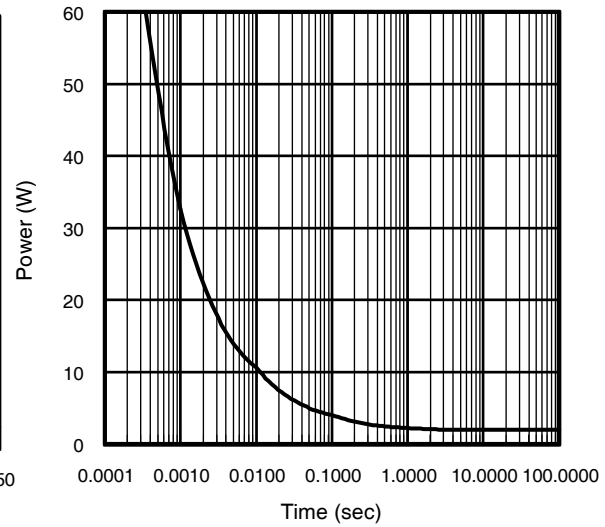
**Fig 14a.** Basic Gate Charge Waveform



**Fig 14b.** Gate Charge Test Circuit



**Fig 15.** Typical  $V_{GS(th)}$  Vs. Junction Temperature



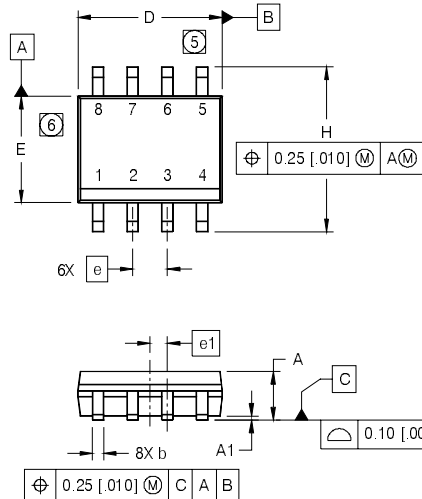
**Fig 16.** Typical Power Vs. Time

# IRF7331

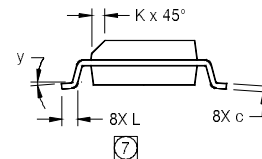
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## SO-8 Package Outline (Mosfet & Fetky)

Dimensions are shown in millimeters (inches)



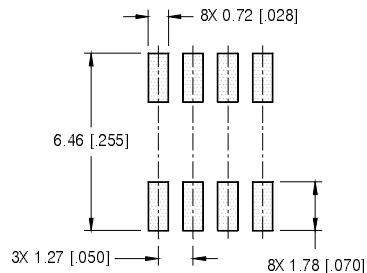
| DIM | INCHES     |       | MILLIMETERS |      |
|-----|------------|-------|-------------|------|
|     | MIN        | MAX   | MIN         | MAX  |
| A   | .0532      | .0688 | 1.35        | 1.75 |
| A1  | .0040      | .0098 | 0.10        | 0.25 |
| b   | .013       | .020  | 0.33        | 0.51 |
| 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:

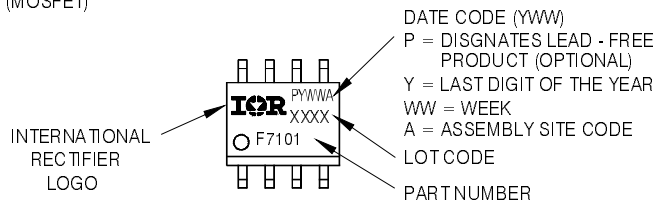
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
6. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [0.010].
7. DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

### FOOTPRINT



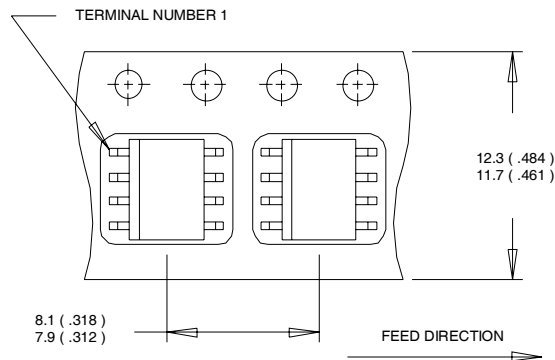
## SO-8 Part Marking Information

EXAMPLE: THIS IS AN IRF7101 (MOSFET)

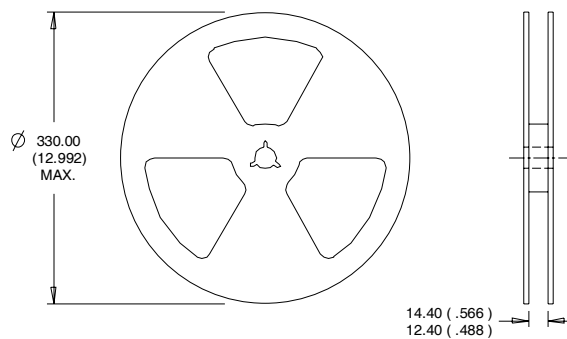


Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

## SO-8 Tape and Reel



- 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/>

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  
**IR** Rectifier

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