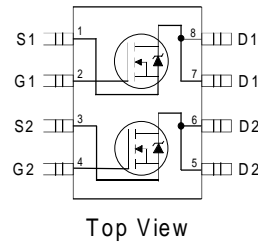


**MOSFET**

- Ultra Low On-Resistance
- Dual N-Channel MOSFET
- Surface Mount
- Fully Avalanche Rated



$$V_{DSS} = 20V$$

$$R_{DS(on)} = 0.029\Omega$$

**Description**

The SO-8 has been modified through a customized leadframe for enhanced thermal characteristics and multiple-die capability making it ideal in a variety of power applications. With these improvements, multiple devices can be used in an application with dramatically reduced board space. The package is designed for vapor phase, infra red, or wave soldering techniques.

**SOP-8**

**Absolute Maximum Ratings (  $T_A = 25^\circ C$  Unless Otherwise Noted)**

|  |                    | Symbol         | Maximum      | Units      |
|--|--------------------|----------------|--------------|------------|
| Drain-Source Voltage                         |                    | $V_{DS}$       | 20           | V          |
| Gate-Source Voltage                          |                    | $V_{GS}$       | $\pm 12$     |            |
| Continuous Drain Current <sup>⑤</sup>        | $T_A = 25^\circ C$ | $I_D$          | 6.6          | A          |
|  | $T_A = 70^\circ C$ |                | 5.3          |            |
| Pulsed Drain Current                         |                    | $I_{DM}$       | 26           |            |
| Continuous Source Current (Diode Conduction) |                    | $I_S$          | 2.5          |            |
| Maximum Power Dissipation <sup>⑤</sup>       | $T_A = 25^\circ C$ | $P_D$          | 2.0          | W          |
|  | $T_A = 70^\circ C$ |                | 1.3          |            |
| Single Pulse Avalanche Energy <sup>②</sup>   |                    | $E_{AS}$       | 100          | mJ         |
| Avalanche Current                            |                    | $I_{AR}$       | 4.1          | A          |
| Repetitive Avalanche Energy                  |                    | $E_{AR}$       | 0.20         | mJ         |
| Peak Diode Recovery $dv/dt$ <sup>③</sup>     |                    | $dv/dt$        | 5.0          | V/ ns      |
| Junction and Storage Temperature Range       |                    | $T_J, T_{STG}$ | -55 to + 150 | $^\circ C$ |

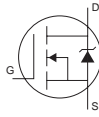
**Thermal Resistance Ratings**

| Parameter                                | Symbol          | Limit | Units        |
|--|-----------------|-------|--------------|
| Maximum Junction-to-Ambient <sup>⑤</sup> | $R_{\theta JA}$ | 62.5  | $^\circ C/W$ |

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

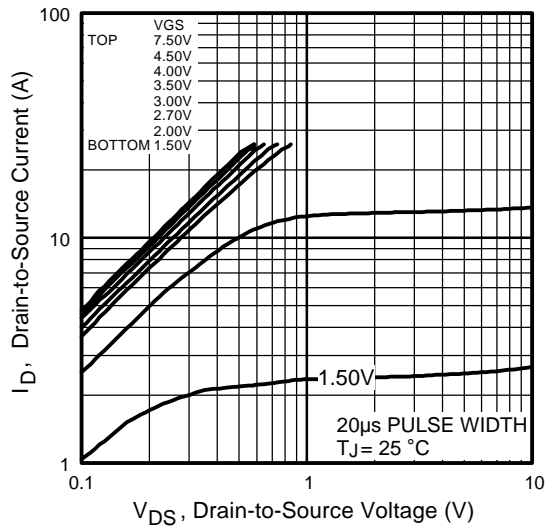
|                                 | Parameter                            | Min. | Typ.  | Max.  | Units               | Conditions  |
|---------------------------------|--------------------------------------|------|-------|-------|---------------------|---|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 20   | —     | —     | V                   | $V_{GS} = 0V, I_D = 250\mu A$                       |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.027 | —     | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$   |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | 0.023 | 0.029 | $\Omega$            | $V_{GS} = 4.5V, I_D = 6.0A$ ④                       |
|                                 |                                      | —    | 0.030 | 0.046 |                     | $V_{GS} = 2.7V, I_D = 5.2A$ ④                       |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 0.7  | —     | —     | V                   | $V_{DS} = V_{GS}, I_D = 250\mu A$                   |
| $g_{fs}$                        | Forward Transconductance             | —    | 20    | —     | S                   | $V_{DS} = 10V, I_D = 6.0A$                          |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —     | 1.0   | $\mu A$             | $V_{DS} = 16V, V_{GS} = 0V$                         |
|                                 |                                      | —    | —     | 5.0   |                     | $V_{DS} = 16V, V_{GS} = 0V, T_J = 55^\circ\text{C}$ |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —     | 100   | nA                  | $V_{GS} = 12V$                                      |
|                                 | Gate-to-Source Reverse Leakage       | —    | —     | -100  |                     | $V_{GS} = -12V$                                     |
| $Q_g$                           | Total Gate Charge                    | —    | 18    | 27    | nC                  | $I_D = 6.0A$  |
| $Q_{gs}$                        | Gate-to-Source Charge                | —    | 2.2   | 3.3   |                     | $V_{DS} = 10V$                                      |
| $Q_{gd}$                        | Gate-to-Drain ("Miller") Charge      | —    | 6.2   | 9.3   |                     | $V_{GS} = 4.5V$ , See Fig. 10 ④                     |
| $t_{d(on)}$                     | Turn-On Delay Time                   | —    | 8.1   | 12    | ns                  | $V_{DD} = 10V$                                      |
| $t_r$                           | Rise Time                            | —    | 17    | 25    |                     | $I_D = 1.0A$  |
| $t_{d(off)}$                    | Turn-Off Delay Time                  | —    | 38    | 57    |                     | $R_G = 6.0\Omega$                                   |
| $t_f$                           | Fall Time                            | —    | 31    | 47    |                     | $R_D = 10\Omega$ ④                                  |
| $C_{iss}$                       | Input Capacitance                    | —    | 900   | —     | pF                  | $V_{GS} = 0V$                                       |
| $C_{oss}$                       | Output Capacitance                   | —    | 430   | —     |                     | $V_{DS} = 15V$                                      |
| $C_{riss}$                      | Reverse Transfer Capacitance         | —    | 200   | —     |                     | $f = 1.0\text{MHz}$ , See Fig. 9                    |

## Source-Drain Ratings and Characteristics

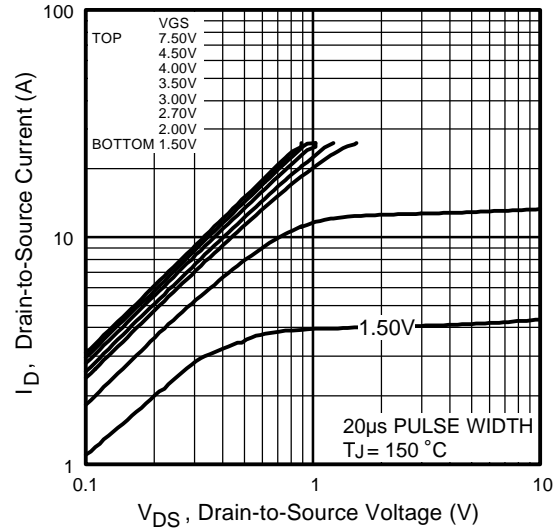
|          | Parameter                              | Min. | Typ. | Max. | Units | Conditions   |
|----------|--|------|------|------|-------|--|
| $I_S$    | Continuous Source Current (Body Diode) | —    | —    | 2.5  | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①   | —    | —    | 26   |       |  |
| $V_{SD}$ | Diode Forward Voltage                  | —    | 0.72 | 1.0  | V     | $T_J = 25^\circ\text{C}, I_S = 1.7A, V_{GS} = 0V$ ③  |
| $t_{rr}$ | Reverse Recovery Time                  | —    | 52   | 77   | ns    | $T_J = 25^\circ\text{C}, I_F = 1.7A$   |
| $Q_{rr}$ | Reverse Recovery Charge                | —    | 58   | 86   | nC    | $di/dt = 100A/\mu s$ ③   |

### Notes:

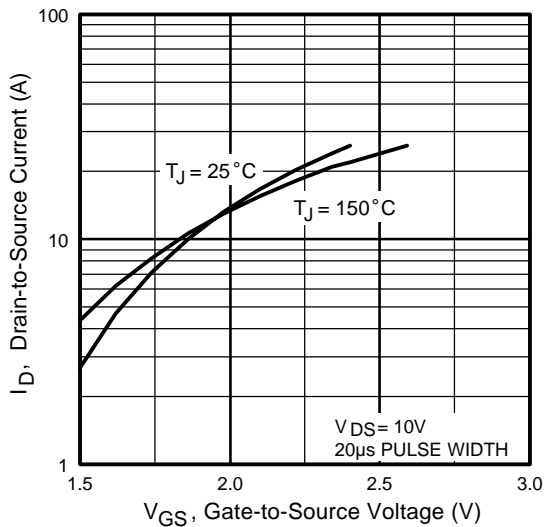
- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 12\text{mH}$   
 $R_G = 25\Omega, I_{AS} = 4.1A$ .
- ③  $I_{SD} \leq 4.1A, di/dt \leq 92A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤ Surface mounted on 1 in square Cu board



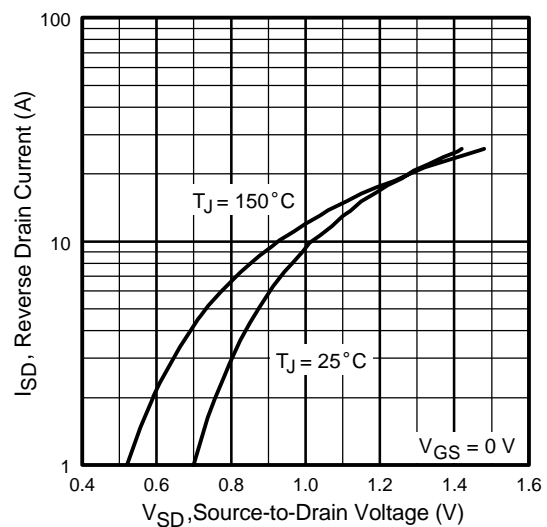
**Fig 1.** Typical Output Characteristics



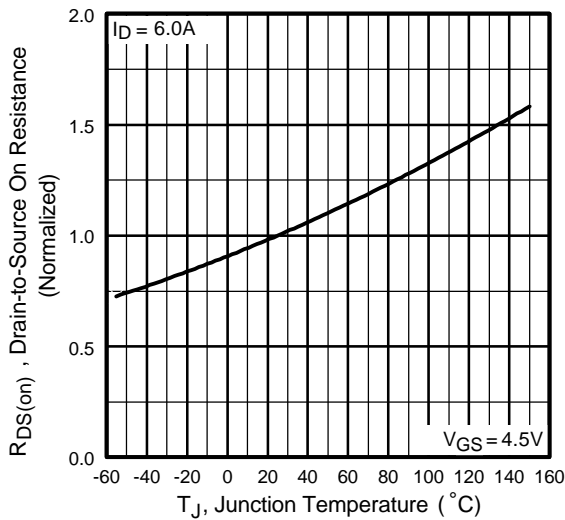
**Fig 2.** Typical Output Characteristics



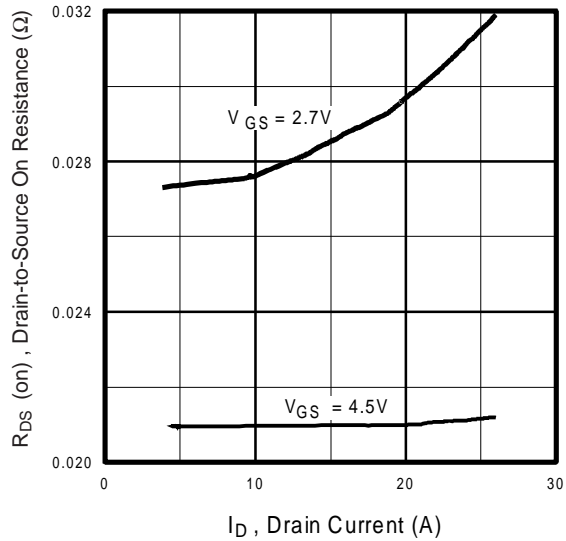
**Fig 3.** Typical Transfer Characteristics



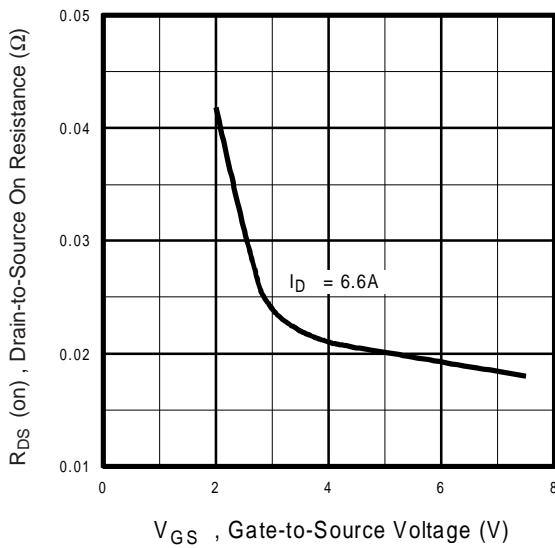
**Fig 4.** Typical Source-Drain Diode Forward Voltage



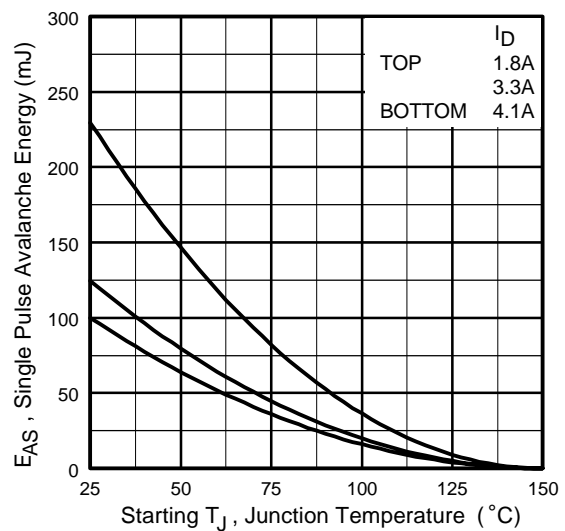
**Fig 5.** Normalized On-Resistance Vs. Temperature



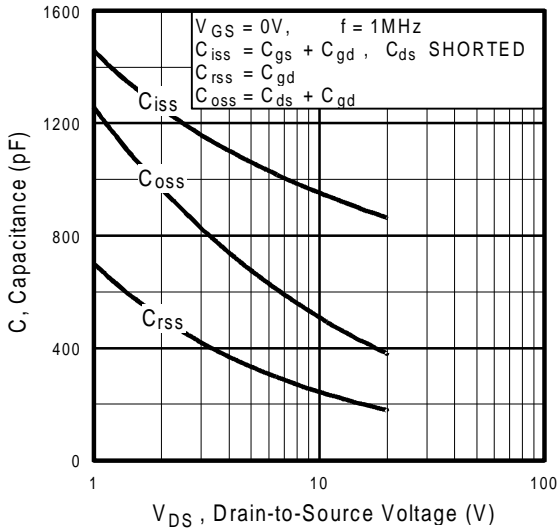
**Fig 6.** Typical On-Resistance Vs. Drain Current



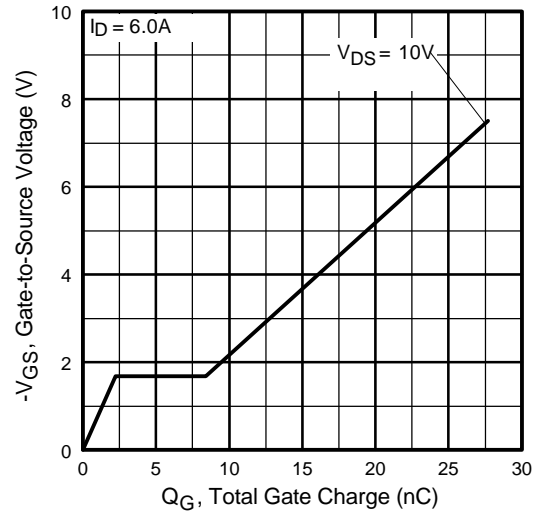
**Fig 7.** Typical On-Resistance Vs. Gate Voltage



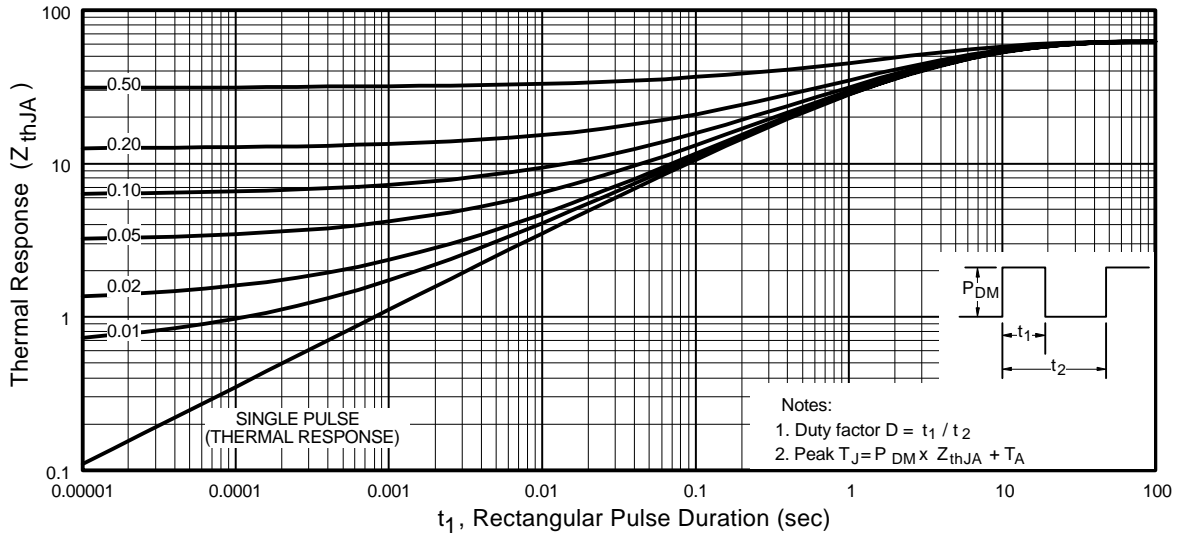
**Fig 8.** Maximum Avalanche Energy Vs. Drain Current



**Fig 9.** Typical Capacitance Vs. Drain-to-Source Voltage

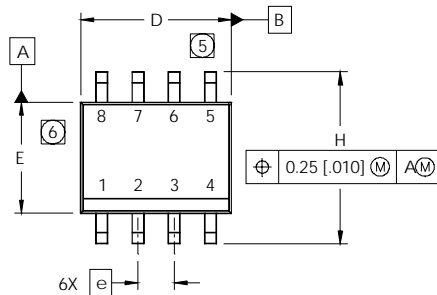


**Fig 10.** Typical Gate Charge Vs. Gate-to-Source Voltage

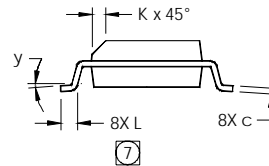
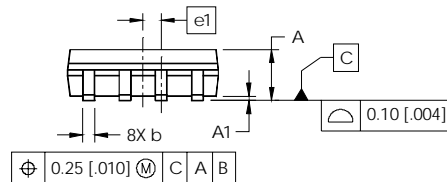


**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

## SO-8 Package Details



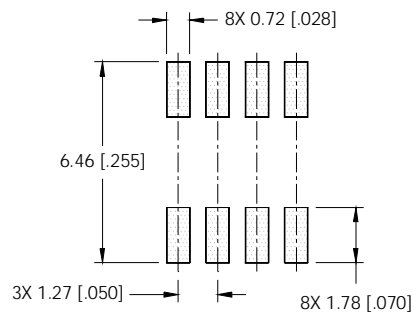
| DIM | INCHES     |       | MILLIMETERS |      |
|-----|------------|-------|-------------|------|
|     | MIN        | MAX   | MIN         | MAX  |
| A   | .0532      | .0688 | 1.35        | 1.75 |
| A1  | .0040      | .0098 | 0.10        | 0.25 |
| b   | .013       | .020  | 0.33        | 0.51 |
|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

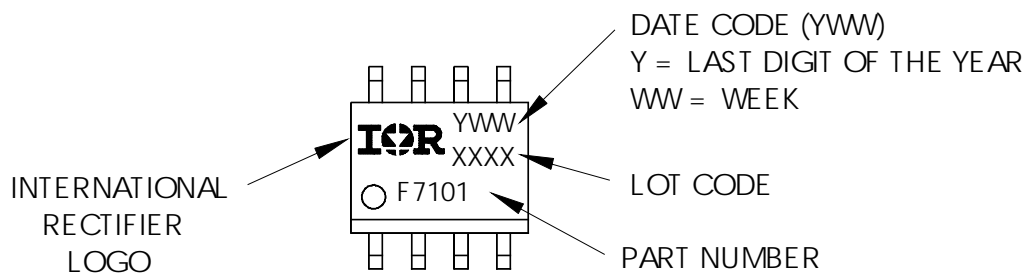
- DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
- CONTROLLING DIMENSION: MILLIMETER
- DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- (5)** DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
- (6)** DIMENSION DOES 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

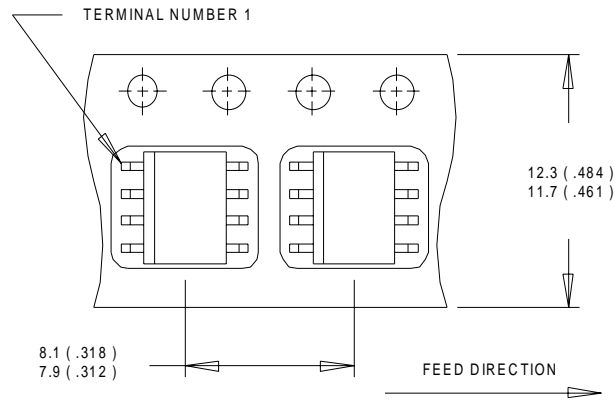
EXAMPLE: THIS IS AN IRF7101 (MOSFET)



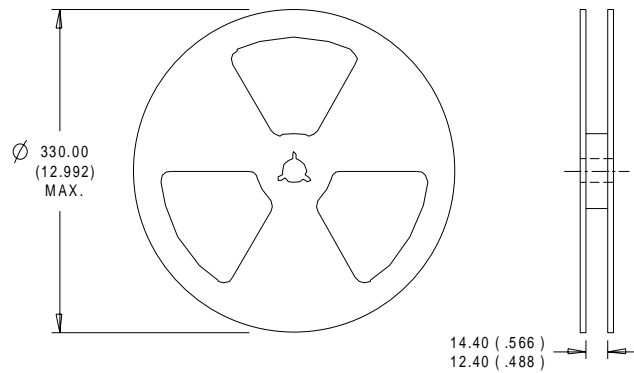


# IRF7311

## 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.