

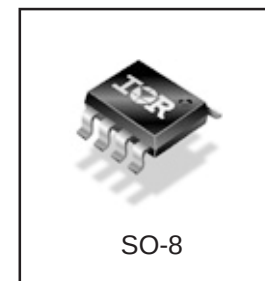
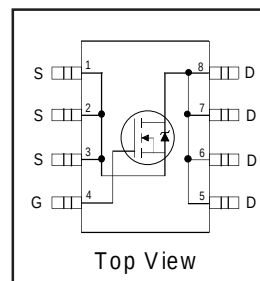
### Applications

- High frequency DC-DC converters

| $V_{DSS}$ | $R_{DS(on)}$ max | $I_D$ |
|-----------|------------------|-------|
| 150V      | 0.09 $\Omega$    | 3.6A  |

### Benefits

- Low Gate to Drain Charge to Reduce Switching Losses
- Fully Characterized Capacitance Including Effective  $C_{OSS}$  to Simplify Design, (See App. Note AN1001)
- Fully Characterized Avalanche Voltage and Current



### Absolute Maximum Ratings

|                                  | Parameter                                | Max.                   | Units |
|----------------------------------|------------------------------------------|------------------------|-------|
| $I_D$ @ $T_A = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS}$ @ 10V | 3.6                    | A     |
| $I_D$ @ $T_A = 70^\circ\text{C}$ | Continuous Drain Current, $V_{GS}$ @ 10V | 2.9                    |       |
| $I_{DM}$                         | Pulsed Drain Current ①                   | 29                     |       |
| $P_D$ @ $T_A = 25^\circ\text{C}$ | Power Dissipation⑥                       | 2.5                    | W     |
|                                  | Linear Derating Factor                   | 0.02                   | W/°C  |
| $V_{GS}$                         | Gate-to-Source Voltage                   | $\pm 30$               | V     |
| $dv/dt$                          | Peak Diode Recovery $dv/dt$ ③            | 7.9                    | V/ns  |
| $T_J$                            | Operating Junction and                   | -55 to + 150           | °C    |
| $T_{STG}$                        | Storage Temperature Range                |                        |       |
|                                  | Soldering Temperature, for 10 seconds    | 300 (1.6mm from case ) |       |

### Thermal Resistance

| Symbol          | Parameter              | Typ. | Max. | Units |
|-----------------|------------------------|------|------|-------|
| $R_{\theta JL}$ | Junction-to-Drain Lead | —    | 20   | °C/W  |
| $R_{\theta JA}$ | Junction-to-Ambient ⑥  | —    | 50   |       |

Notes ① through ⑥ are on page 8

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# IRF7451

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**Static @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

|                                 | Parameter                            | Min. | Typ. | Max. | Units               | Conditions                                             |
|---------------------------------|--------------------------------------|------|------|------|---------------------|--------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 150  | —    | —    | V                   | $V_{GS} = 0V, I_D = 250\mu A$                          |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.19 | —    | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}$ , $I_D = 1\text{mA}$ ④ |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | —    | 0.09 | $\Omega$            | $V_{GS} = 10V, I_D = 2.2A$ ④                           |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 3.0  | —    | 5.5  | V                   | $V_{DS} = V_{GS}, I_D = 250\mu A$                      |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —    | 25   | $\mu A$             | $V_{DS} = 150V, V_{GS} = 0V$                           |
|                                 |                                      | —    | —    | 250  |                     | $V_{DS} = 120V, V_{GS} = 0V, T_J = 150^\circ\text{C}$  |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —    | 100  | nA                  | $V_{GS} = 30V$                                         |
|                                 | Gate-to-Source Reverse Leakage       | —    | —    | -100 |                     | $V_{GS} = -30V$                                        |

**Dynamic @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

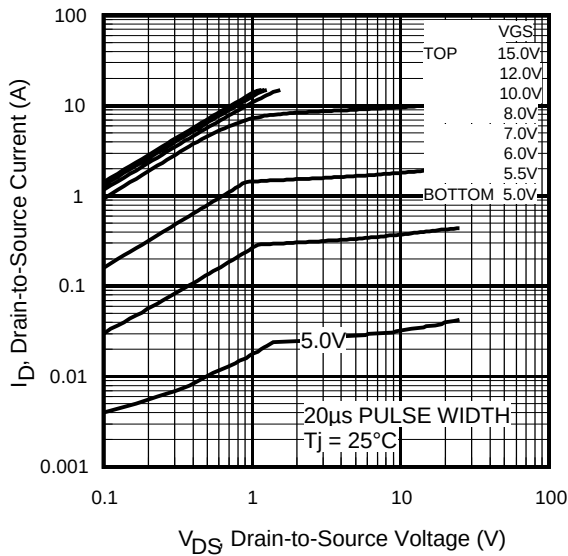
|                        | Parameter                       | Min. | Typ. | Max. | Units | Conditions                                      |
|------------------------|---------------------------------|------|------|------|-------|-------------------------------------------------|
| $g_{fs}$               | Forward Transconductance        | 3.5  | —    | —    | S     | $V_{DS} = 25V, I_D = 2.2A$                      |
| $Q_g$                  | Total Gate Charge               | —    | 28   | 41   | nC    | $I_D = 2.2A$                                    |
| $Q_{gs}$               | Gate-to-Source Charge           | —    | 6.8  | 10   |       | $V_{DS} = 120V$                                 |
| $Q_{gd}$               | Gate-to-Drain ("Miller") Charge | —    | 13   | 20   |       | $V_{GS} = 10V$ ④                                |
| $t_{d(on)}$            | Turn-On Delay Time              | —    | 10   | —    | ns    | $V_{DD} = 75V$                                  |
| $t_r$                  | Rise Time                       | —    | 4.2  | —    |       | $I_D = 2.2A$                                    |
| $t_{d(off)}$           | Turn-Off Delay Time             | —    | 17   | —    |       | $R_G = 6.5\Omega$                               |
| $t_f$                  | Fall Time                       | —    | 15   | —    |       | $V_{GS} = 10V$ ④                                |
| $C_{iss}$              | Input Capacitance               | —    | 990  | —    | pF    | $V_{GS} = 0V$                                   |
| $C_{oss}$              | Output Capacitance              | —    | 220  | —    |       | $V_{DS} = 25V$                                  |
| $C_{rss}$              | Reverse Transfer Capacitance    | —    | 42   | —    |       | $f = 1.0\text{MHz}$                             |
| $C_{oss}$              | Output Capacitance              | —    | 1260 | —    |       | $V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$ |
| $C_{oss}$              | Output Capacitance              | —    | 100  | —    |       | $V_{GS} = 0V, V_{DS} = 120V, f = 1.0\text{MHz}$ |
| $C_{oss \text{ eff.}}$ | Effective Output Capacitance    | —    | 180  | —    |       | $V_{GS} = 0V, V_{DS} = 0V \text{ to } 120V$ ⑤   |

## Avalanche Characteristics

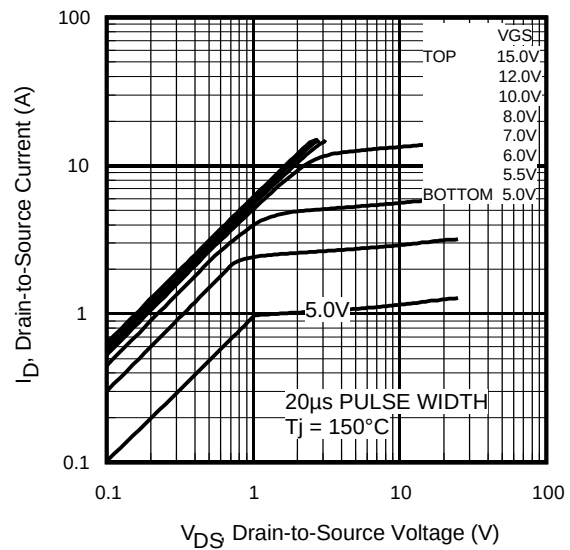
|          | Parameter                      | Typ. | Max. | Units |
|----------|--------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy② | —    | 210  | mJ    |
| $I_{AR}$ | Avalanche Current①             | —    | 3.6  | A     |

## Diode Characteristics

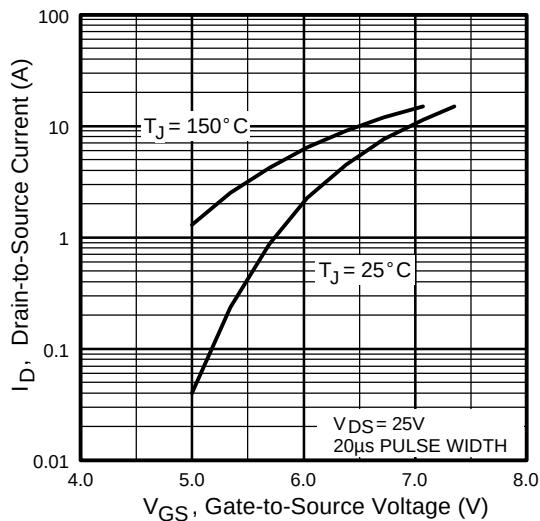
|          | Parameter                                 | Min. | Typ. | Max. | Units | Conditions                                                              |
|----------|-------------------------------------------|------|------|------|-------|-------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —    | —    | 2.3  | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —    | —    | 29   |       |                                                                         |
| $V_{SD}$ | Diode Forward Voltage                     | —    | —    | 1.3  | V     | $T_J = 25^\circ\text{C}, I_S = 2.2A, V_{GS} = 0V$ ④                     |
| $t_{rr}$ | Reverse Recovery Time                     | —    | 76   | 110  | ns    | $T_J = 25^\circ\text{C}, I_F = 2.2A$                                    |
| $Q_{rr}$ | Reverse Recovery Charge                   | —    | 270  | 400  | nC    | $di/dt = 100A/\mu s$ ④                                                  |



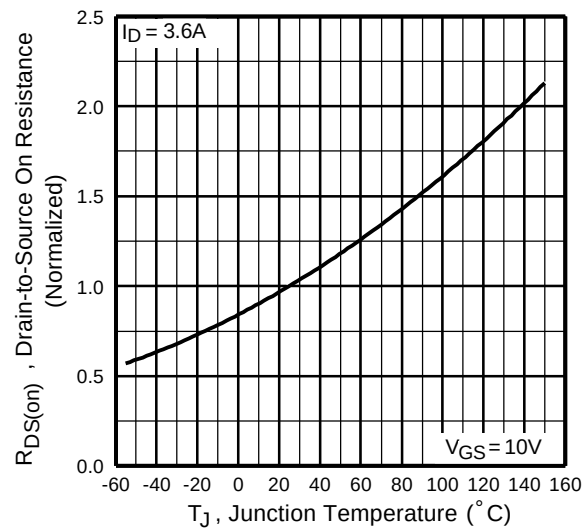
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



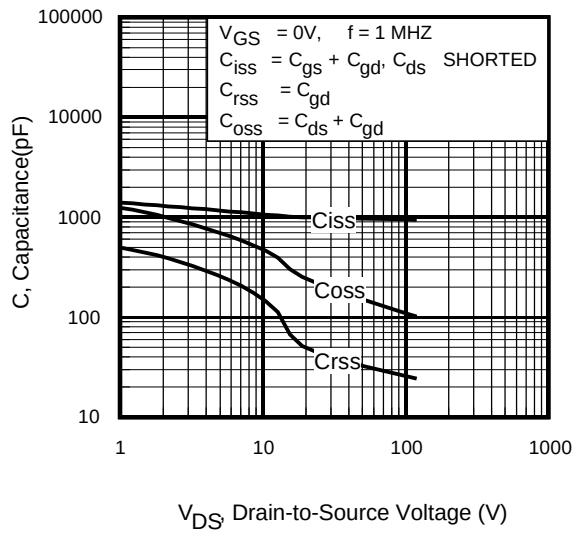
**Fig 3.** Typical Transfer Characteristics



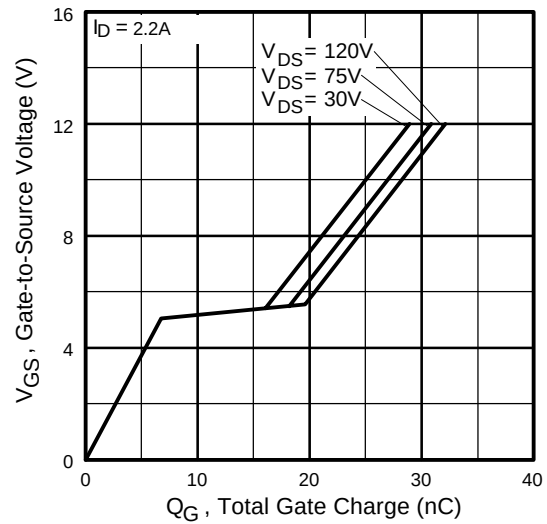
**Fig 4.** Normalized On-Resistance Vs. Temperature

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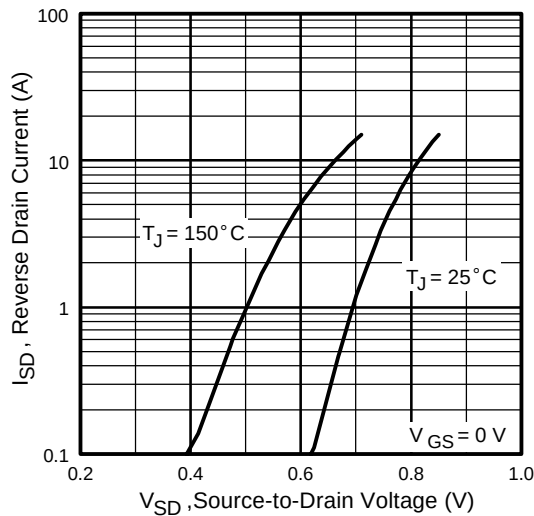
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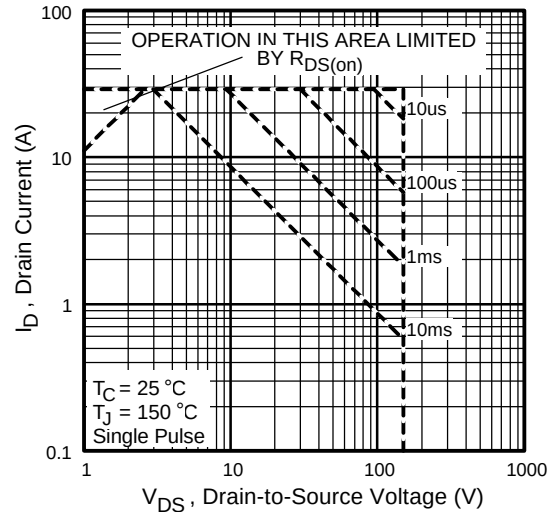
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



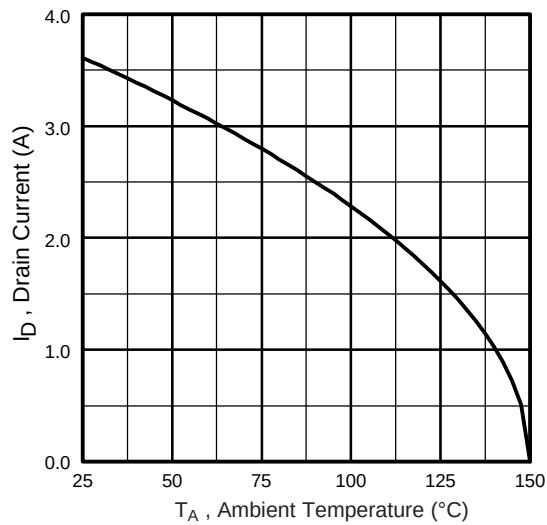
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



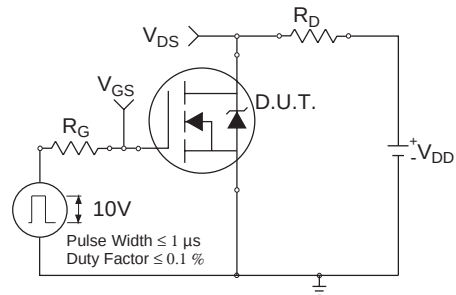
**Fig 7.** Typical Source-Drain Diode Forward Voltage



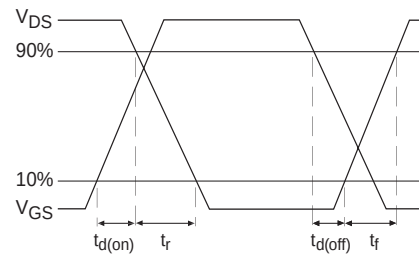
**Fig 8.** Maximum Safe Operating Area



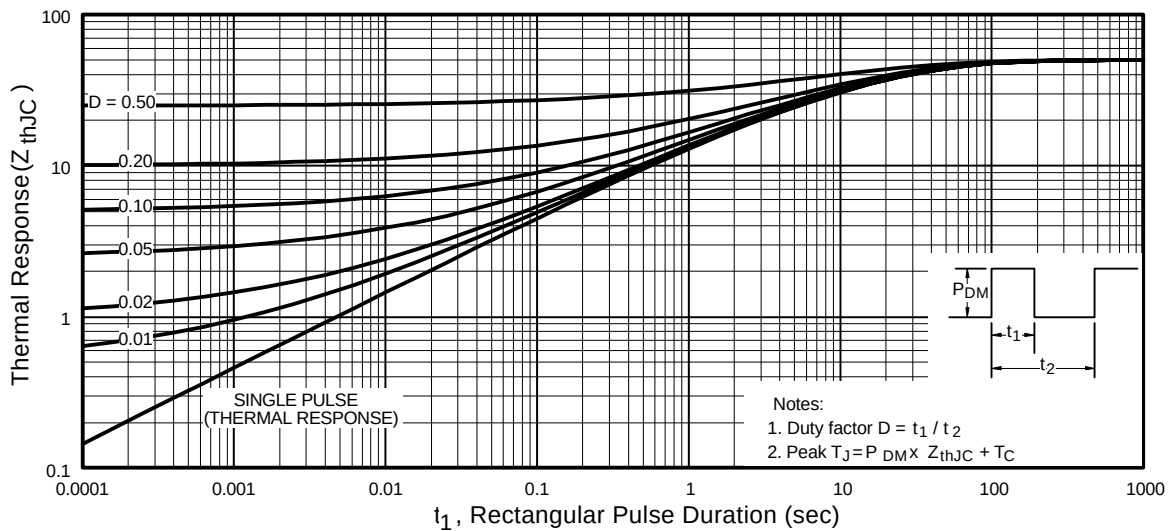
**Fig 9.** Maximum Drain Current Vs. Ambient Temperature



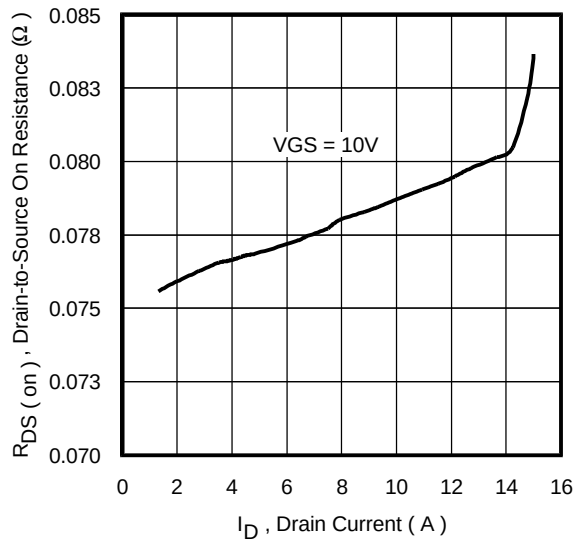
**Fig 10a.** Switching Time Test Circuit



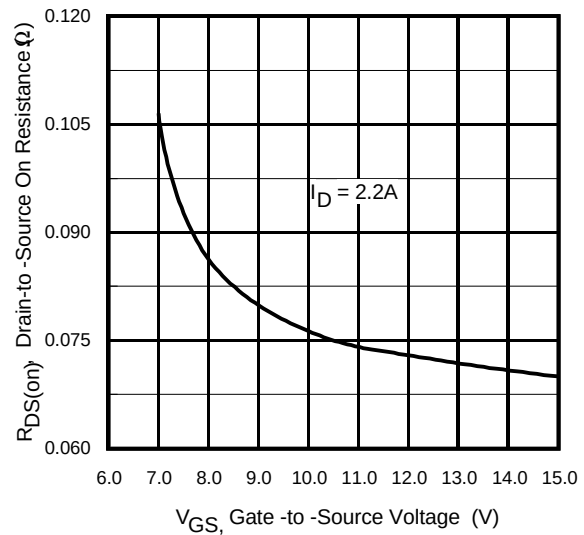
**Fig 10b.** Switching Time Waveforms



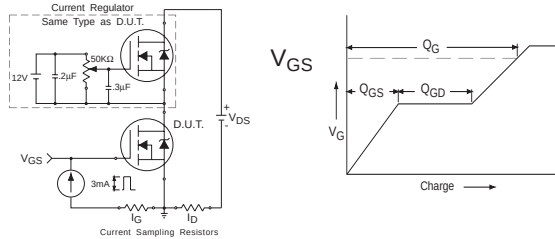
**Fig 10.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



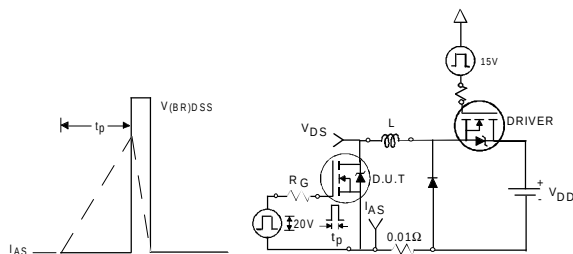
**Fig 12.** On-Resistance Vs. Drain Current



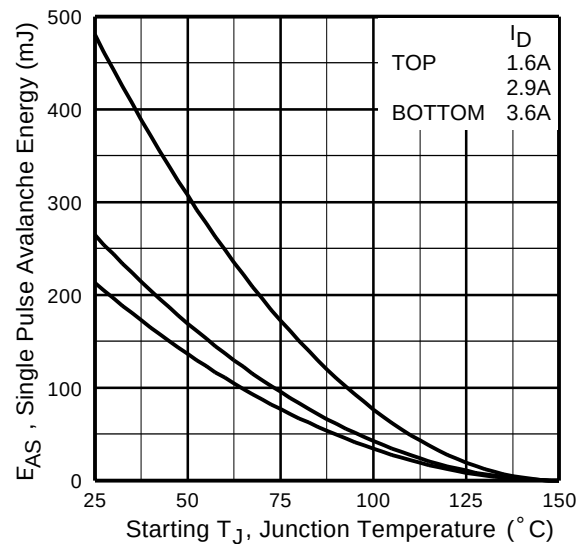
**Fig 13.** On-Resistance Vs. Gate Voltage



**Fig 13a&b.** Basic Gate Charge Test Circuit and Waveform

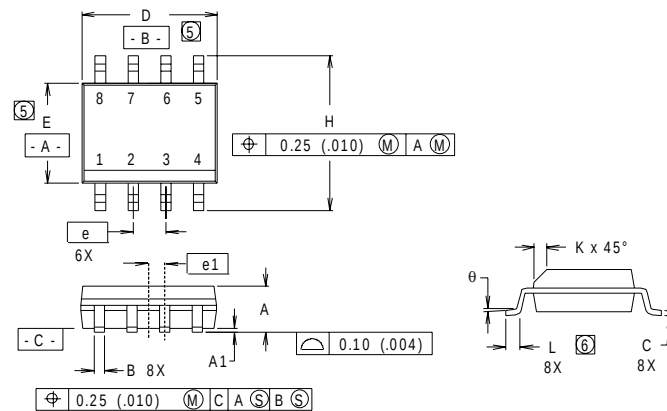


**Fig 14a&b.** Unclamped Inductive Test circuit and Waveforms



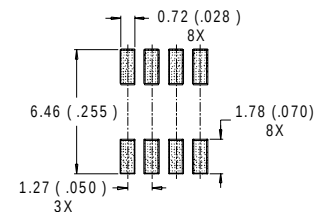
**Fig 14c.** Maximum Avalanche Energy Vs. Drain Current

## 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   | .014       | .018  | 0.36        | 0.46 |
| C   | .0075      | .0098 | 0.19        | 0.25 |
| D   | .189       | .196  | 4.80        | 4.98 |
| E   | .150       | .157  | 3.81        | 3.99 |
| e   | .050 BASIC |       | 1.27 BASIC  |      |
| e1  | .025 BASIC |       | 0.635 BASIC |      |
| H   | .2284      | .2440 | 5.80        | 6.20 |
| K   | .011       | .019  | 0.28        | 0.48 |
| L   | 0.16       | .050  | 0.41        | 1.27 |
| θ   | 0°         | 8°    | 0°          | 8°   |

RECOMMENDED FOOTPRINT

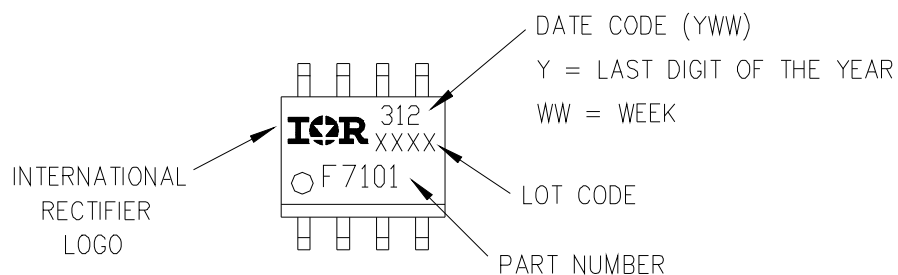


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1982.
2. CONTROLLING DIMENSION : INCH.
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 0.25 (.006).
6. DIMENSIONS IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE..

## SO-8 Part Marking

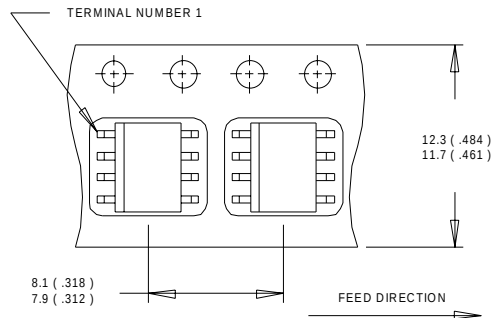
EXAMPLE: THIS IS AN IRF7101



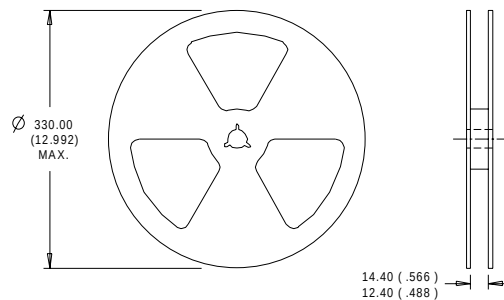
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## SO-8 Tape and Reel



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.

### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 33\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 3.6\text{A}$ .
- ③  $I_{SD} \leq 2.2\text{A}$ ,  $di/dt \leq 180\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$
- ④ Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ⑤  $C_{OSS}$  eff. is a fixed capacitance that gives the same charging time as  $C_{OSS}$  while  $V_{DS}$  is rising from 0 to 80%  $V_{DSS}$ .
- ⑥ When mounted on 1 inch square copper board.

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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**IR** Rectifier

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