

International  
**IR Rectifier**

**SMPS MOSFET**

PD- 93898A

**IRF7451**

HEXFET® Power MOSFET

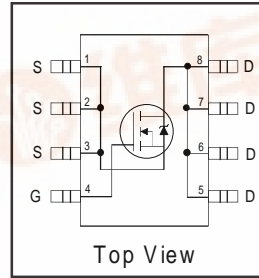
**Applications**

- High frequency DC-DC converters

<b>V<sub>DSS</sub></b>	<b>R<sub>DS(on) max</sub></b>	<b>I<sub>D</sub></b>
<b>150V</b>	<b>0.09Ω</b>	<b>3.6A</b>

**Benefits**

- Low Gate to Drain Charge to Reduce Switching Losses
- Fully Characterized Capacitance Including Effective C<sub>OSS</sub> to Simplify Design, (See App. Note AN1001)
- Fully Characterized Avalanche Voltage and Current



**Absolute Maximum Ratings**

	Parameter	Max.	Units
I <sub>D</sub> @ T <sub>A</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	3.6	A
I <sub>D</sub> @ T <sub>A</sub> = 70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	2.9	
I <sub>DM</sub>	Pulsed Drain Current ①	29	
P <sub>D</sub> @ T <sub>A</sub> = 25°C	Power Dissipation ②	2.5	W
	Linear Derating Factor	0.02	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③	7.9	V/ns
T <sub>J</sub>	Operating Junction and	-55 to + 150	°C
T <sub>STG</sub>	Storage Temperature Range		
	Soldering Temperature, for 10 seconds		

**Thermal Resistance**

Symbol	Parameter	Typ.	Max.	Units
R <sub>θJL</sub>	Junction-to-Drain Lead	—	20	°C/W
R <sub>θJA</sub>	Junction-to-Ambient ④	—	50	

Notes ① through ④ are on page 8  
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## Static @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	150	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS/ΔT<sub>J</sub></sub>	Breakdown Voltage Temp. Coefficient	—	0.19	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA ④
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	0.09	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 2.2A ④
V <sub>GS(th)</sub>	Gate Threshold Voltage	3.0	—	5.5	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	25	μA	V <sub>DS</sub> = 150V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 120V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	100	nA	V <sub>GS</sub> = 30V
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -30V

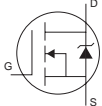
## Dynamic @ T<sub>J</sub> = 25°C (unless otherwise specified)

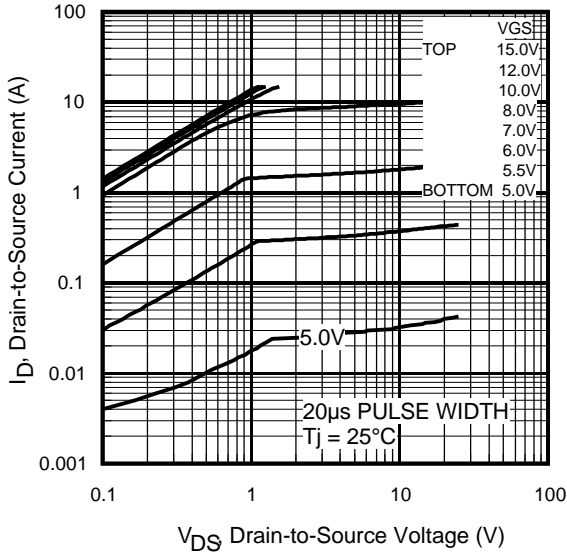
	Parameter	Min.	Typ.	Max.	Units	Conditions
g <sub>fs</sub>	Forward Transconductance	3.5	—	—	S	V <sub>DS</sub> = 25V, I <sub>D</sub> = 2.2A
Q <sub>g</sub>	Total Gate Charge	—	28	41	nC	I <sub>D</sub> = 2.2A
Q <sub>gs</sub>	Gate-to-Source Charge	—	6.8	10		V <sub>DS</sub> = 120V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	13	20		V <sub>GS</sub> = 10V ④
t <sub>d(on)</sub>	Turn-On Delay Time	—	10	—	ns	V <sub>DD</sub> = 75V
t <sub>r</sub>	Rise Time	—	4.2	—		I <sub>D</sub> = 2.2A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	17	—		R <sub>G</sub> = 6.5Ω
t <sub>f</sub>	Fall Time	—	15	—		V <sub>GS</sub> = 10V ④
C <sub>iss</sub>	Input Capacitance	—	990	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	220	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	42	—		f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	1260	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1.0V, f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	100	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 120V, f = 1.0MHz
C <sub>oss eff.</sub>	Effective Output Capacitance	—	180	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 120V ⑤

## Avalanche Characteristics

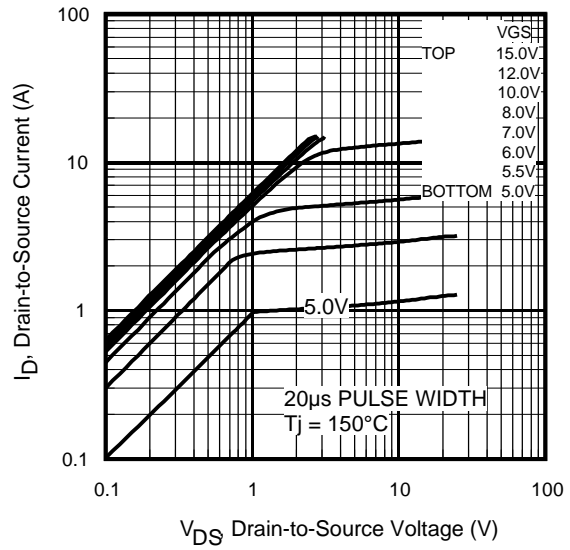
	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy②	—	210	mJ
I <sub>AR</sub>	Avalanche Current①	—	3.6	A

## Diode Characteristics

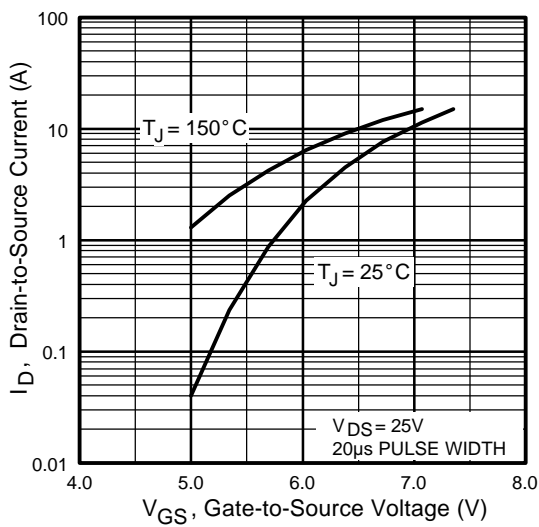
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	2.3	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	29		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 2.2A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	76	110	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 2.2A
Q <sub>rr</sub>	Reverse Recovery Charge	—	270	400	nC	di/dt = 100A/μs ④



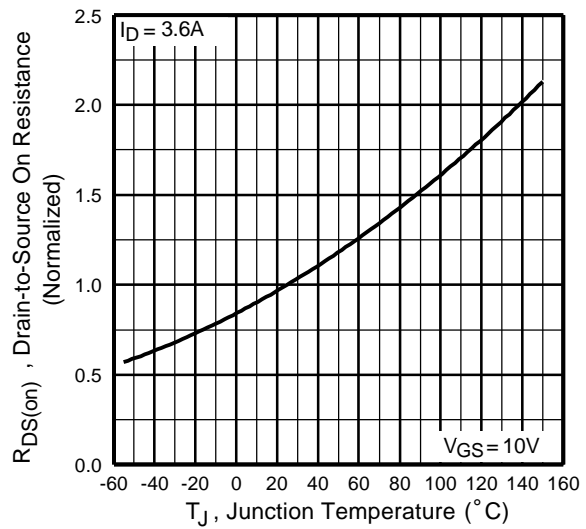
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



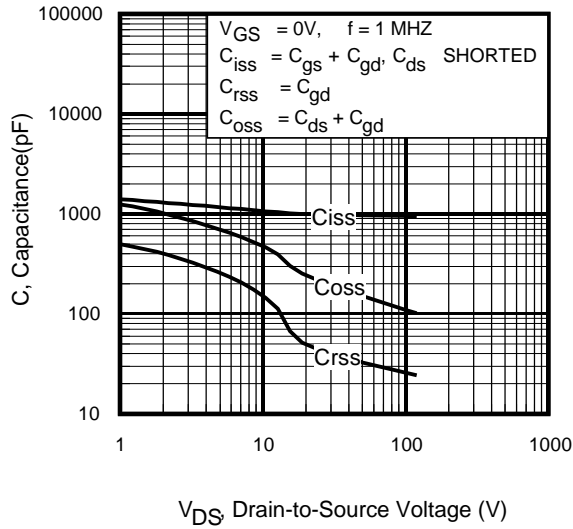
**Fig 3.** Typical Transfer Characteristics



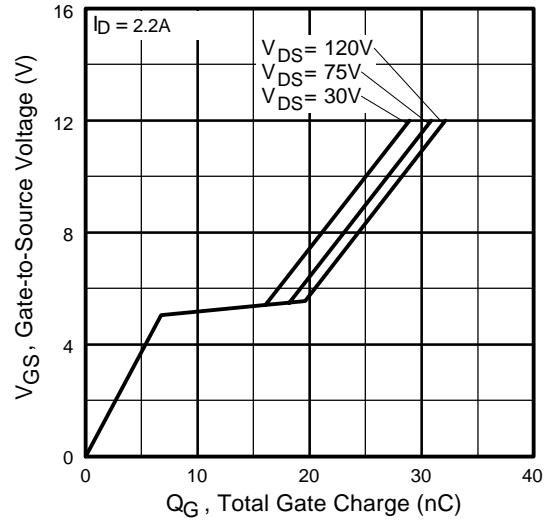
**Fig 4.** Normalized On-Resistance Vs. Temperature

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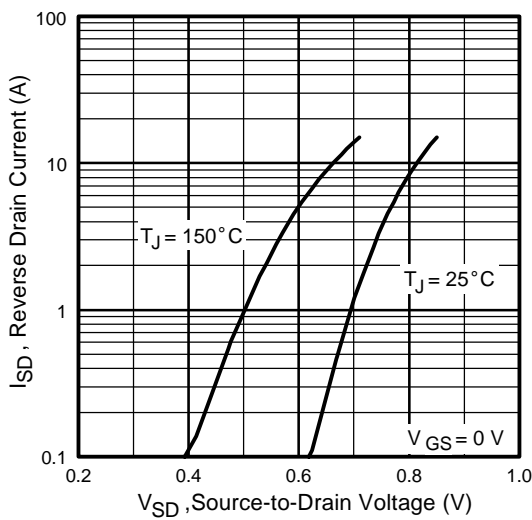
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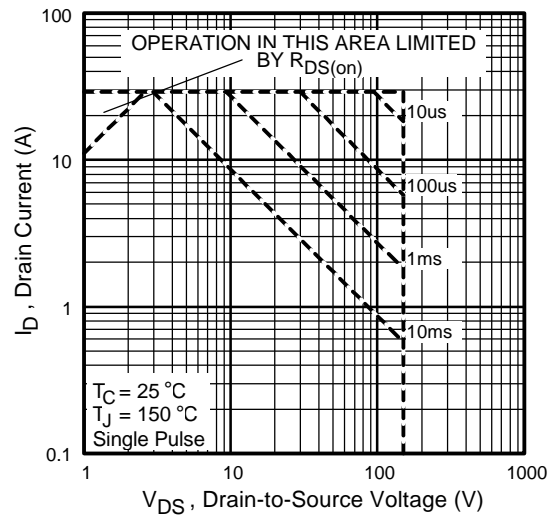
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



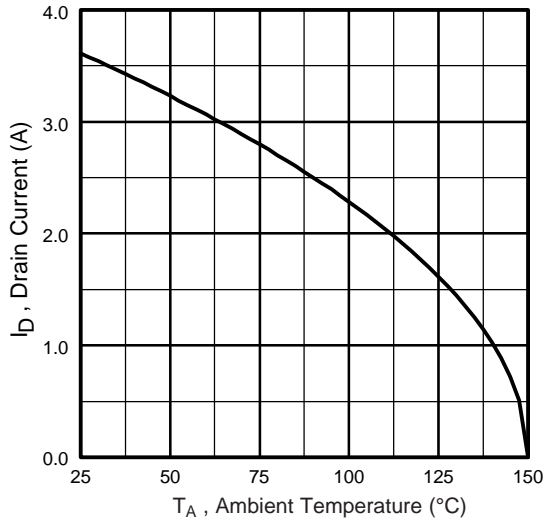
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



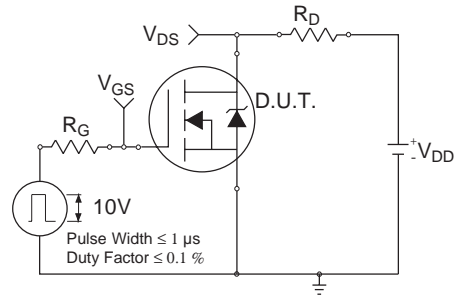
**Fig 7.** Typical Source-Drain Diode Forward Voltage



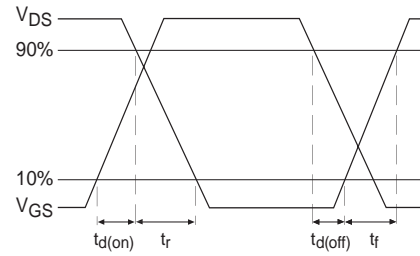
**Fig 8.** Maximum Safe Operating Area



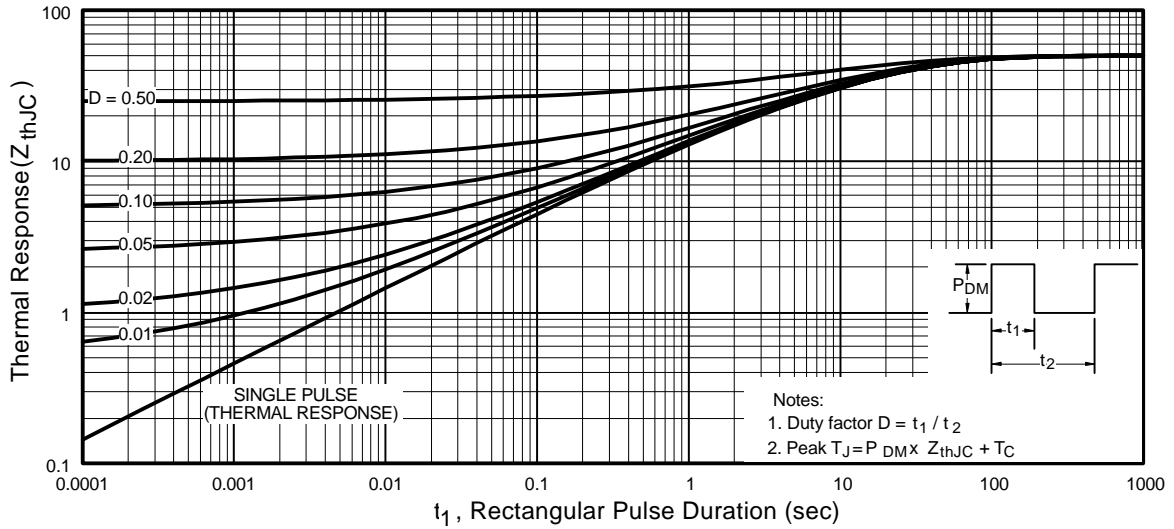
**Fig 9.** Maximum Drain Current Vs. Ambient Temperature



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



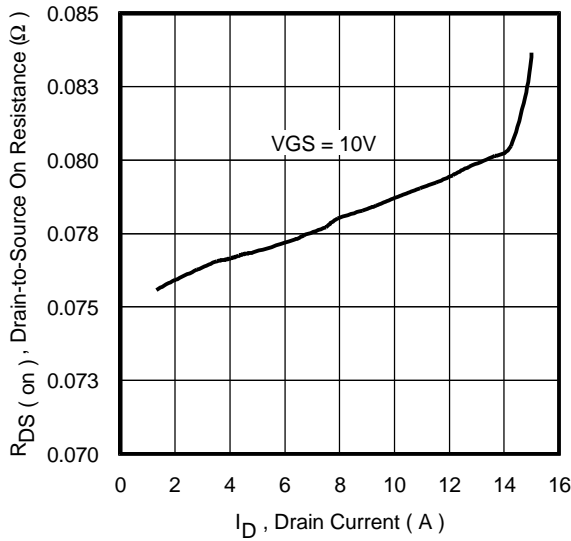
**Fig 10b.** Switching Time Waveforms



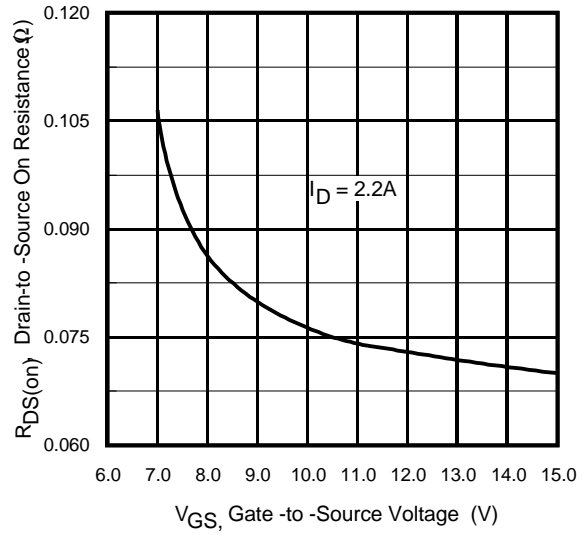
**Fig 10.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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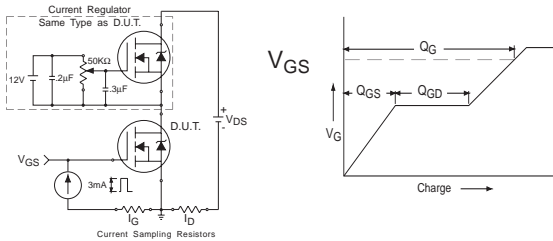
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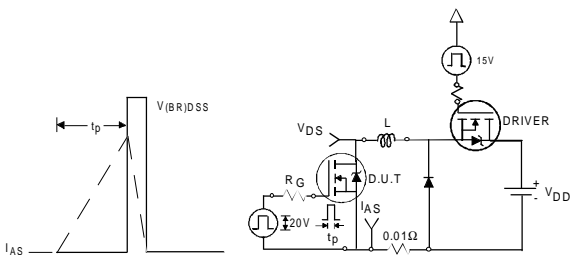
**Fig 12.** On-Resistance Vs. Drain Current



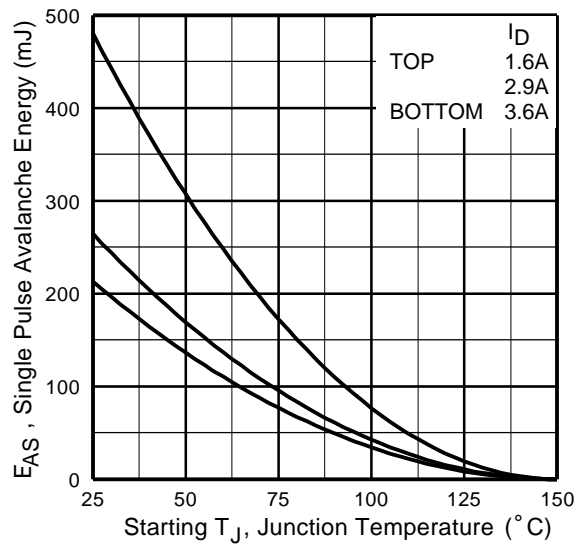
**Fig 13.** On-Resistance Vs. Gate Voltage



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

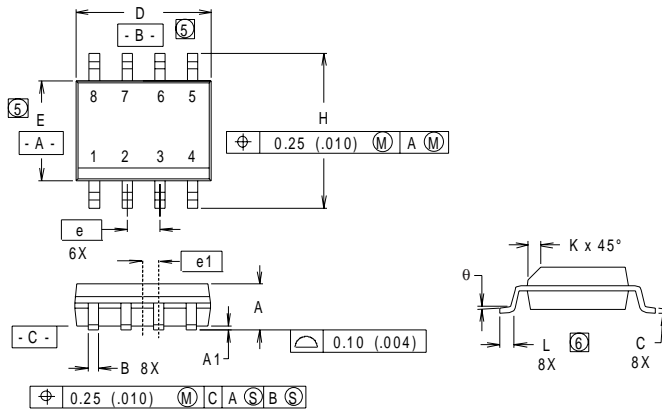


**Fig 14a&b.** Unclamped Inductive Test circuit and Waveforms



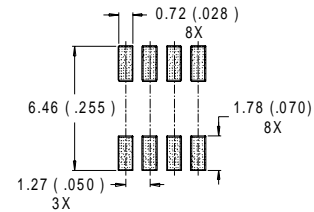
**Fig 14c.** Maximum Avalanche Energy Vs. Drain Current

## 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
$\theta$	0°	8°	0°	8°

### RECOMMENDED FOOTPRINT

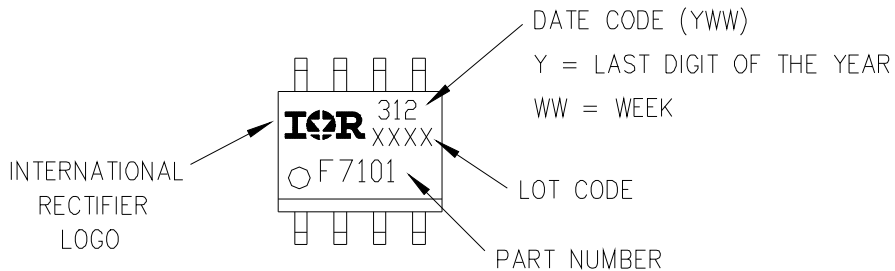


### NOTES:

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

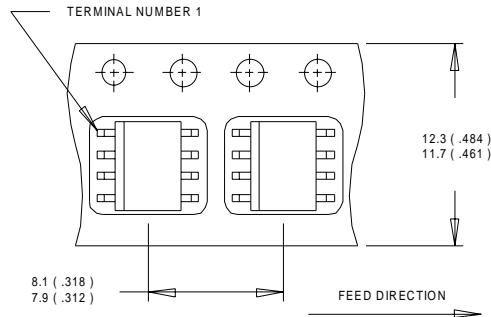
EXAMPLE: THIS IS AN IRF7101



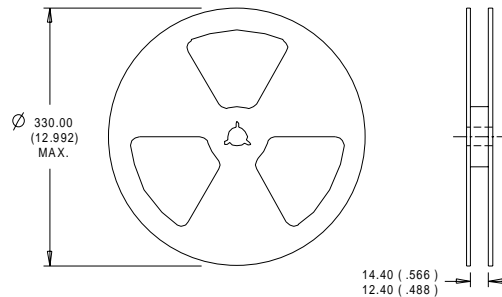
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## SO-8 Tape and Reel



- 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 WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105  
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