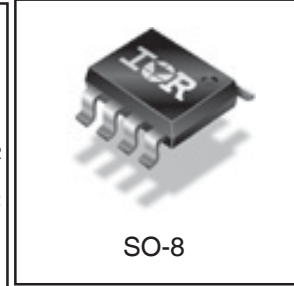
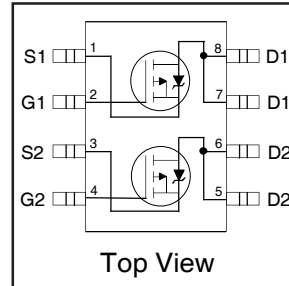


HEXFET® Power MOSFET

$V_{DS}$	<b>-20</b>	<b>V</b>
$R_{DS(on) max}$ (@ $V_{GS} = -4.5V$ )	<b>0.09</b>	<b><math>\Omega</math></b>
$Q_g$	<b>22</b>	<b>nC</b>
$I_D$ (@ $T_A = 25^\circ C$ )	<b>-4.3</b>	<b>A</b>



**Features**

Industry-standard pinout SO-8 Package
Compatible with Existing Surface Mount Techniques
RoHS Compliant, Halogen-Free
MSL1, Industrial qualification



**Benefits**

Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
Increased Reliability

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRF7304PbF-1	SO-8	Tube/Bulk	95	IRF7304PbF-1
		Tape and Reel	4000	IRF7304TRPbF-1

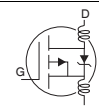
**Absolute Maximum Ratings**

	Parameter	Max.	Units
$I_D @ T_A = 25^\circ C$	10 Sec. Pulsed Drain Current, $V_{GS} @ -4.5V$	-4.7	A
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-4.3	
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-3.4	
$I_{DM}$	Pulsed Drain Current ①	-17	
$P_D @ T_A = 25^\circ C$	Power Dissipation	2.0	W
	Linear Derating Factor	0.016	W/°C
$V_{GS}$	Gate-to-Source Voltage	±12	V
dv/dt	Peak Diode Recovery dv/dt ②	-5.0	V/ns
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to + 150	°C

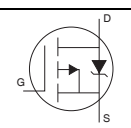
**Thermal Resistance Ratings**

	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient③	---	62.5	°C/W

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

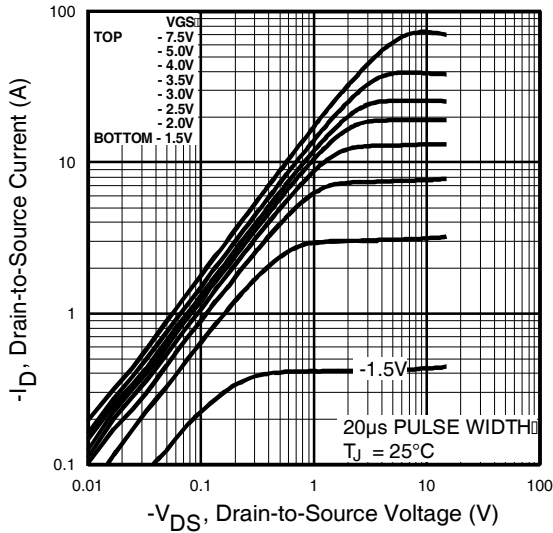
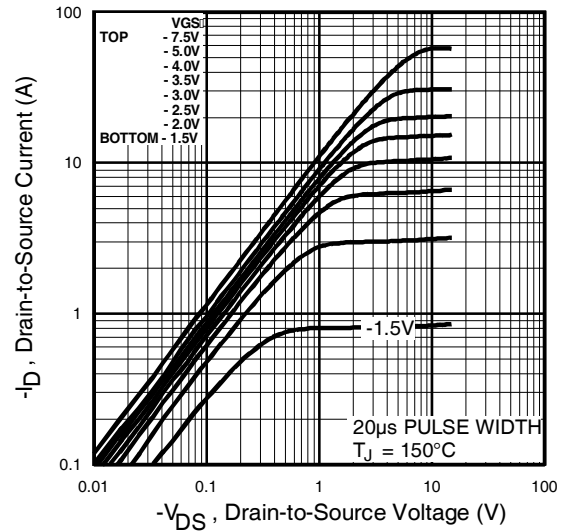
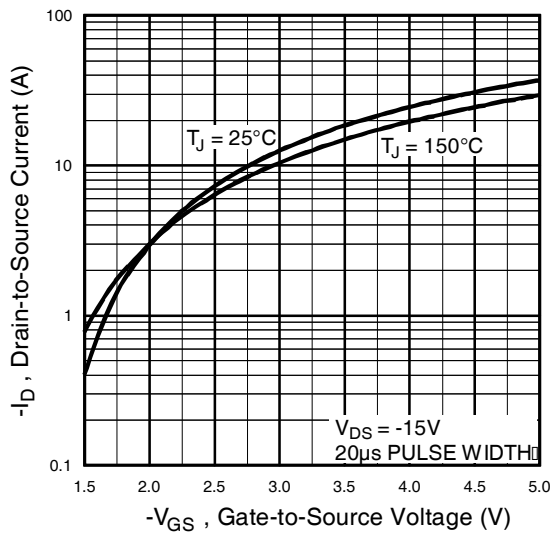
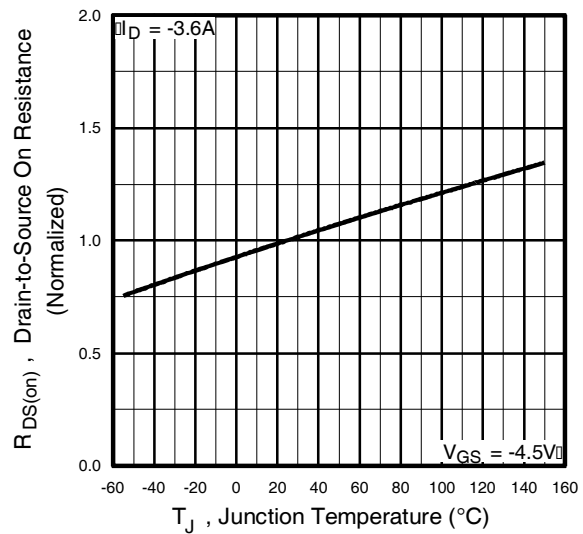
	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-20	—	—	V	$V_{GS} = 0\text{V}$ , $I_D = -250\mu\text{A}$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.012	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}$ , $I_D = -1\text{mA}$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	—	—	0.090	$\Omega$	$V_{GS} = -4.5\text{V}$ , $I_D = -2.2\text{A}$ ③
		—	—	0.140		$V_{GS} = -2.7\text{V}$ , $I_D = -1.8\text{A}$ ③
$V_{GS(th)}$	Gate Threshold Voltage	-0.70	—	—	V	$V_{DS} = V_{GS}$ , $I_D = -250\mu\text{A}$
$g_{fs}$	Forward Transconductance	4.0	—	—	S	$V_{DS} = -16\text{V}$ , $I_D = -2.2\text{A}$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	-1.0	$\mu\text{A}$	$V_{DS} = -16\text{V}$ , $V_{GS} = 0\text{V}$
		—	—	-25		$V_{DS} = -16\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	-100	nA	$V_{GS} = -12\text{V}$
	Gate-to-Source Reverse Leakage	—	—	100		$V_{GS} = 12\text{V}$
$Q_g$	Total Gate Charge	—	—	22	nC	$I_D = -2.2\text{A}$
$Q_{gs}$	Gate-to-Source Charge	—	—	3.3		$V_{DS} = -16\text{V}$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	9.0		$V_{GS} = -4.5\text{V}$ , See Fig. 6 and 12 ③
$t_{d(on)}$	Turn-On Delay Time	—	8.4	—	ns	$V_{DD} = -10\text{V}$
$t_r$	Rise Time	—	26	—		$I_D = -2.2\text{A}$
$t_{d(off)}$	Turn-Off Delay Time	—	51	—		$R_G = 6.0\Omega$
$t_f$	Fall Time	—	33	—		$R_D = 4.5\Omega$ , See Fig. 10 ③
$L_D$	Internal Drain Inductance	—	4.0	—	nH	Between lead tip and center of die contact 
$L_S$	Internal Source Inductance	—	6.0	—		
$C_{iss}$	Input Capacitance	—	610	—	pF	$V_{GS} = 0\text{V}$
$C_{oss}$	Output Capacitance	—	310	—		$V_{DS} = -15\text{V}$
$C_{rss}$	Reverse Transfer Capacitance	—	170	—		$f = 1.0\text{MHz}$ , See Fig. 5

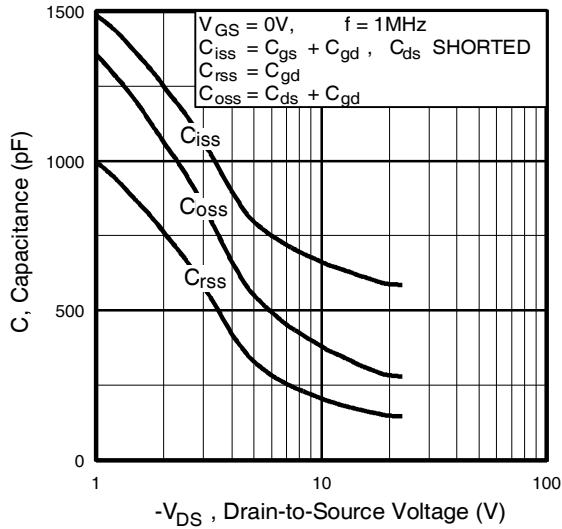
**Source-Drain Ratings and Characteristics**

	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	—	—	-17		
$V_{SD}$	Diode Forward Voltage	—	—	-1.0	V	$T_J = 25^\circ\text{C}$ , $I_S = -1.8\text{A}$ , $V_{GS} = 0\text{V}$ ③
$t_{rr}$	Reverse Recovery Time	—	56	84	ns	$T_J = 25^\circ\text{C}$ , $I_F = -2.2\text{A}$
$Q_{rr}$	Reverse Recovery Charge	—	71	110	nC	$di/dt = 100\text{A}/\mu\text{s}$ ③
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S+L_D$ )				

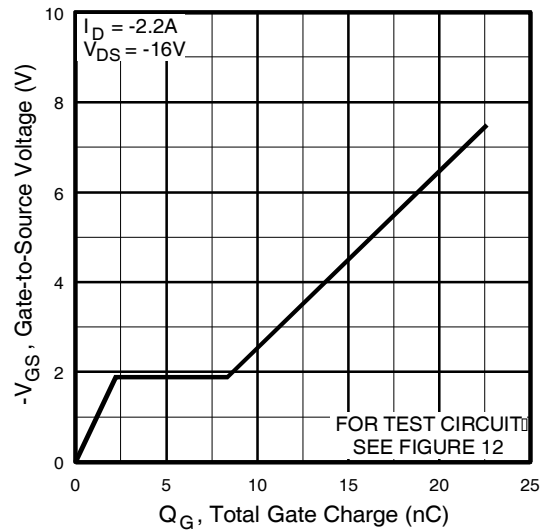
**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ②  $I_{SD} \leq -2.2\text{A}$ ,  $di/dt \leq -50\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$
- ③ Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

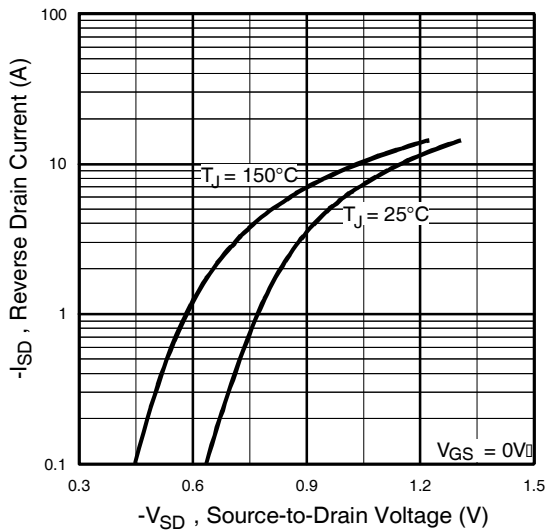

**Fig 1. Typical Output Characteristics**

**Fig 2. Typical Output Characteristics**

**Fig 3. Typical Transfer Characteristics**

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



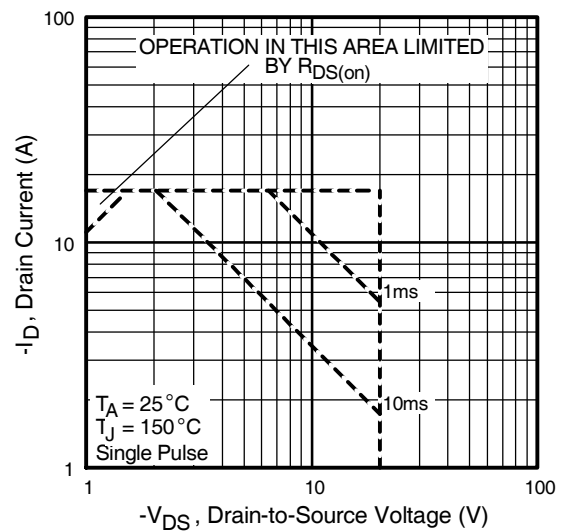
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



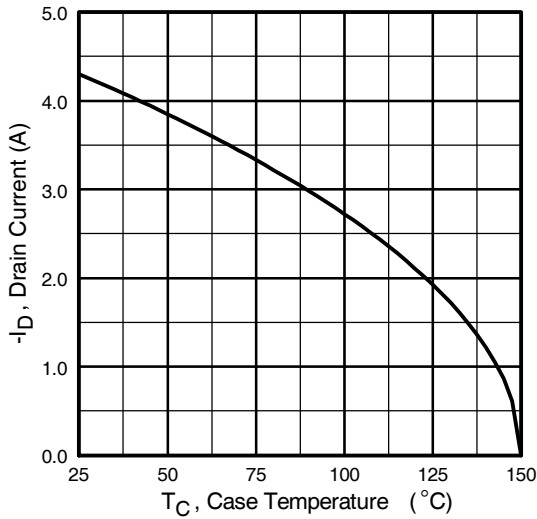
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



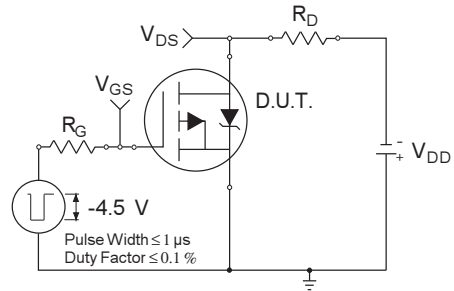
**Fig 7.** Typical Source-Drain Diode Forward Voltage



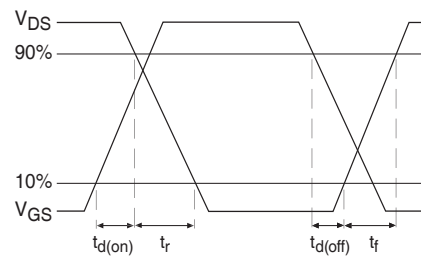
**Fig 8.** Maximum Safe Operating Area



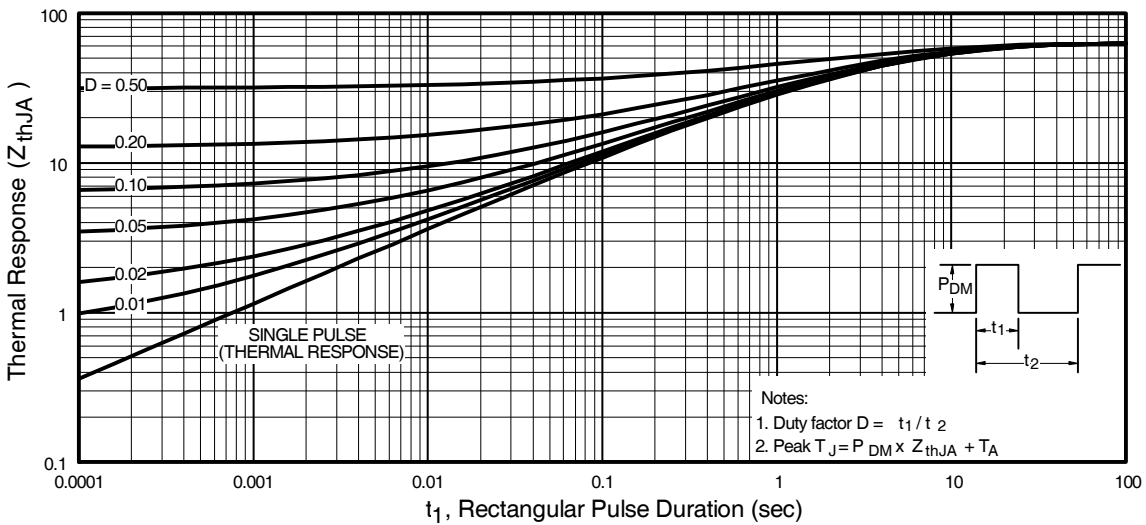
**Fig 9.** Maximum Drain Current Vs. Ambient Temperature



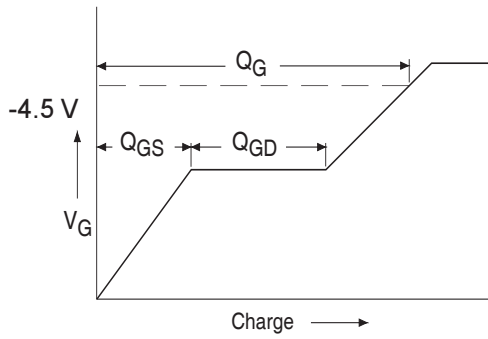
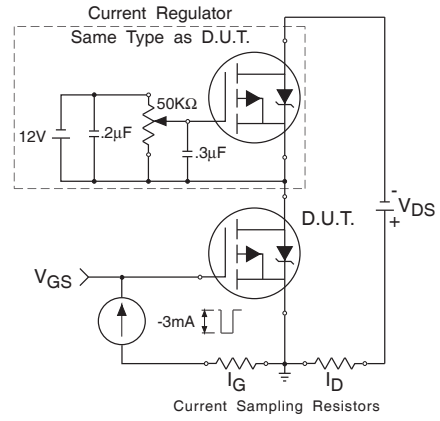
**Fig 10a.** Switching Time Test Circuit



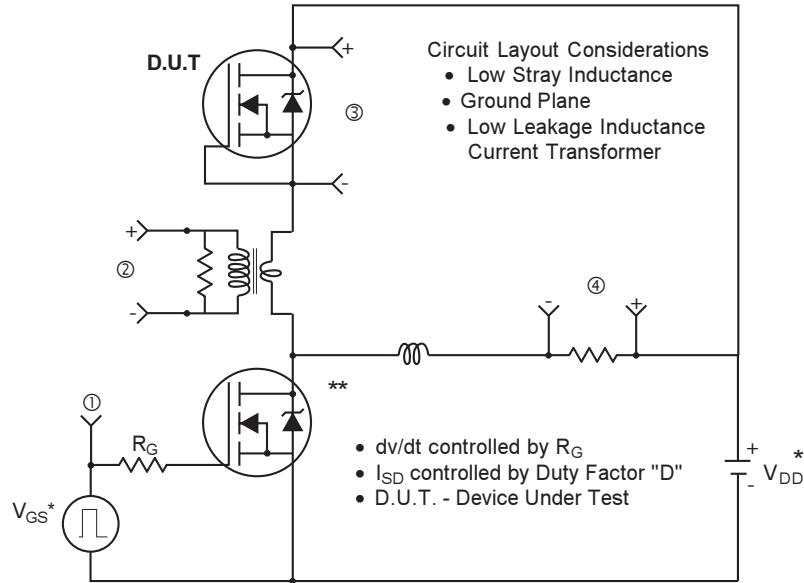
**Fig 10b.** Switching Time Waveforms



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

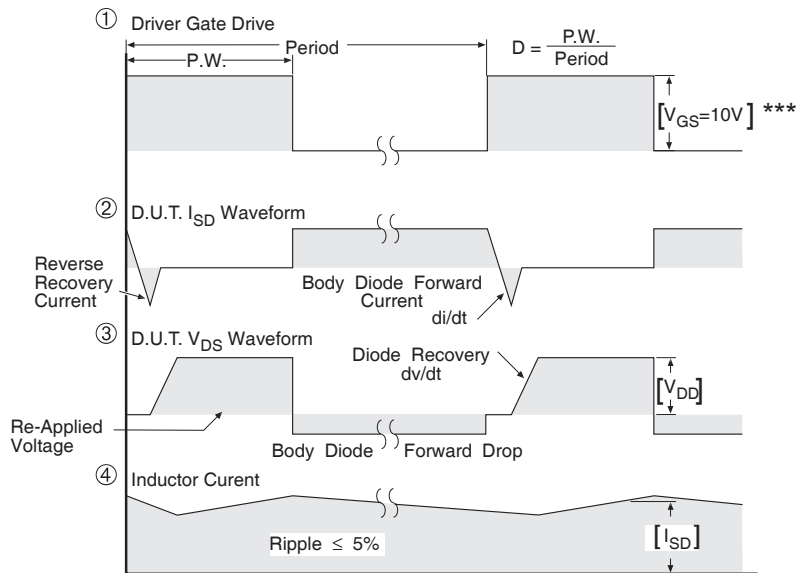

**Fig 12a. Basic Gate Charge Waveform**

**Fig 12b. Gate Charge Test Circuit**

### Peak Diode Recovery dv/dt Test Circuit



\* Reverse Polarity for P-Channel

\*\* Use P-Channel Driver for P-Channel Measurements

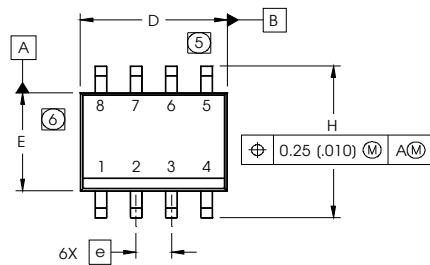


\*\*\*  $V_{GS} = 5.0V$  for Logic Level and 3V Drive Devices

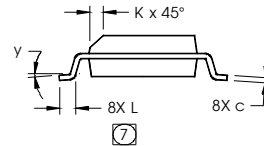
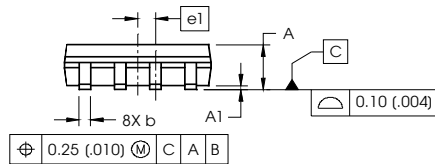
**Fig 13. For P-Channel HEXFETS**

## SO-8 Package Outline

Dimensions are shown in millimeters (inches)



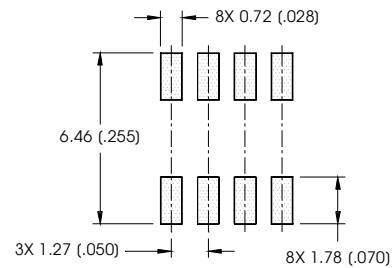
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
y	0°	8°	0°	8°



### NOTES:

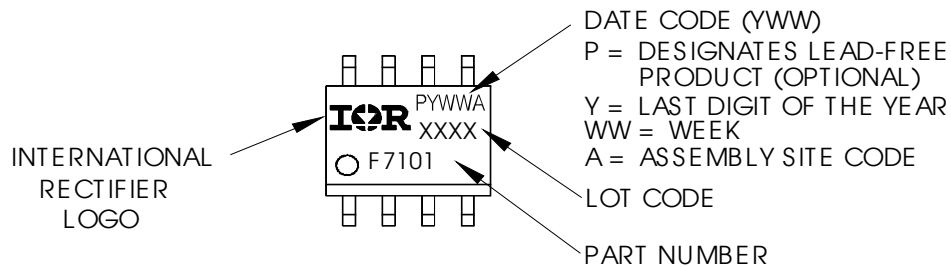
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- ⑤ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 (.006).
- ⑥ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.010).
- ⑦ DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

### FOOTPRINT



## SO-8 Part Marking Information (Lead-Free)

EXAMPLE: THIS IS AN IRF7101 (MOSFET)

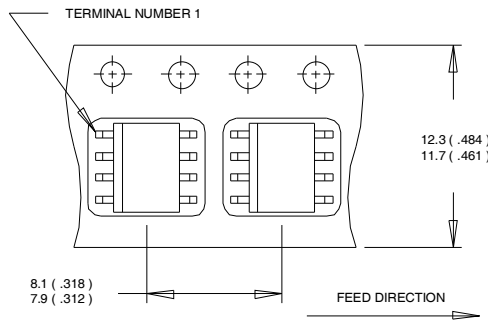


Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

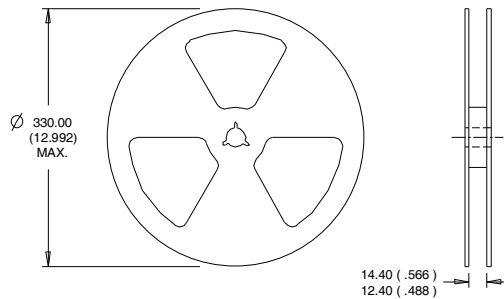


## SO-8 Tape and Reel

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.

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

### Qualification information<sup>†</sup>

Qualification level	Industrial (per JEDEC JESD47F <sup>††</sup> guidelines)	
Moisture Sensitivity Level	SO-8	MSL1 (per JEDEC J-STD-020D <sup>††</sup> )
RoHS compliant	Yes	

<sup>†</sup> Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/product-info/reliability>

<sup>††</sup> Applicable version of JEDEC standard at the time of product release

International  
 Rectifier

**IR WORLD HEADQUARTERS:** 101 N. Sepulveda Blvd., El Segundo, California 90245, USA  
 To contact International Rectifier, please visit <http://www.irf.com/whoto-call/>