

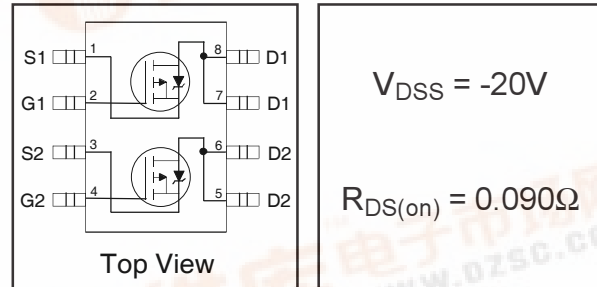
International IOR Rectifier

PD - 96104

IRF7304QPbF

HEXFET® Power MOSFET

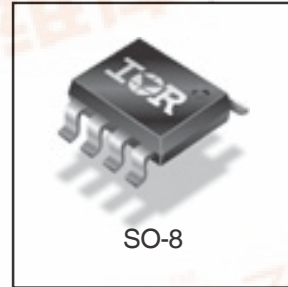
- Advanced Process Technology
- Ultra Low On-Resistance
- Dual P Channel MOSFET
- Surface Mount
- Available in Tape & Reel
- 150°C Operating Temperature
- Automotive [Q101] Qualified
- Lead-Free



Description

Specifically designed for Automotive applications, these HEXFET® Power MOSFET's in a Dual SO-8 package utilize the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of these Automotive qualified HEXFET Power MOSFET's are a 150°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These benefits combine to make this design an extremely efficient and reliable device for use in Automotive applications and a wide variety of other applications.

The efficient SO-8 package provides enhanced thermal characteristics and dual MOSFET die capability making it ideal in a variety of power applications. This dual, surface mount SO-8 can dramatically reduce board space and is also available in Tape & Reel.



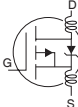
Absolute Maximum Ratings

	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

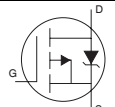
Thermal Resistance Ratings

	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient ③	---	62.5	°C/W

Electrical Characteristics @ T_J = 25°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 = -250μA
ΔV _{(BR)DSS/ΔT_J}	Breakdown Voltage Temp. Coefficient	—	-0.012	—	V/°C	Reference to 25°C, I _D = -1mA
R _{DS(ON)}	Static Drain-to-Source On-Resistance	—	—	0.090	Ω	V _{GS} = -4.5V, I _D = -2.2A ③
		—	—	0.140		V _{GS} = -2.7V, I _D = -1.8A ③
V _{GS(th)}	Gate Threshold Voltage	-0.70	—	—	V	V _{DS} = V _{GS} , I _D = -250μA
g _{fs}	Forward Transconductance	4.0	—	—	S	V _{DS} = -16V, I _D = -2.2A
I _{DSS}	Drain-to-Source Leakage Current	—	—	-1.0	μA	V _{DS} = -16V, V _{GS} = 0V
		—	—	-25		V _{DS} = -16V, V _{GS} = 0V, T _J = 125°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	—	—	22	nC	I _D = -2.2A
Q _{gs}	Gate-to-Source Charge	—	—	3.3		V _{DS} = -16V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	9.0		V _{GS} = -4.5V, See Fig. 6 and 12 ③
t _{d(on)}	Turn-On Delay Time	—	8.4	—	ns	V _{DD} = -10V I _D = -2.2A R _G = 6.0Ω R _D = 4.5Ω, See Fig. 10 ③
t _r	Rise Time	—	26	—		
t _{d(off)}	Turn-Off Delay Time	—	51	—		
t _f	Fall Time	—	33	—		
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} = 0V V _{DS} = -15V f = 1.0MHz, See Fig. 5
C _{oss}	Output Capacitance	—	310	—		
C _{rss}	Reverse Transfer Capacitance	—	170	—		

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°C, I _S = -1.8A, V _{GS} = 0V ③
t _{rr}	Reverse Recovery Time	—	56	84	ns	T _J = 25°C, I _F = -2.2A
Q _{rr}	Reverse Recovery Charge	—	71	110	nC	di/dt = 100A/μs 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} ≤ -2.2A, di/dt ≤ -50A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 150°C
- ③ Pulse width ≤ 300μs; duty cycle ≤ 2%.

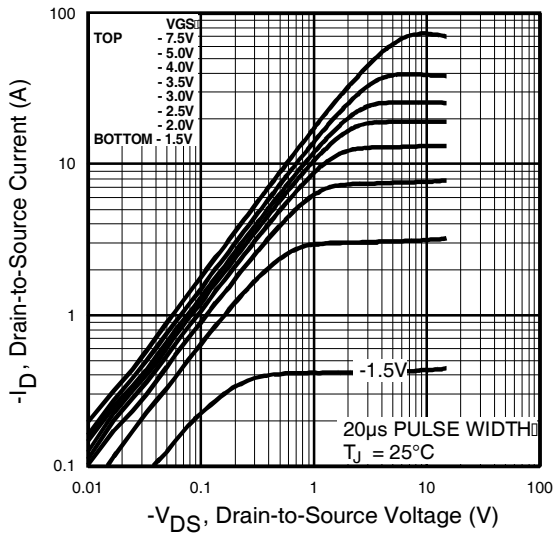


Fig 1. Typical Output Characteristics

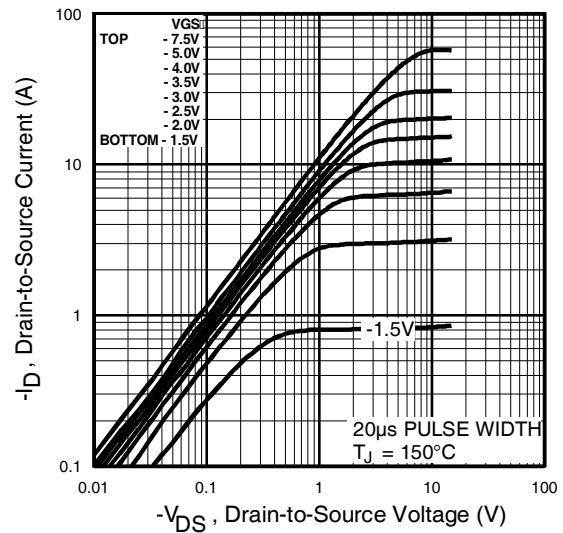


Fig 2. Typical Output Characteristics

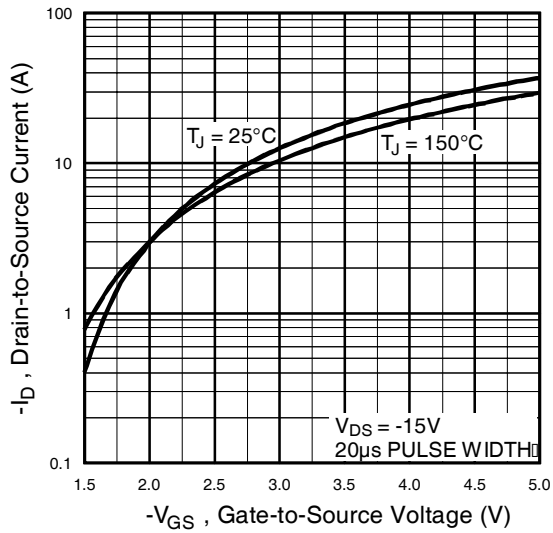


Fig 3. Typical Transfer Characteristics

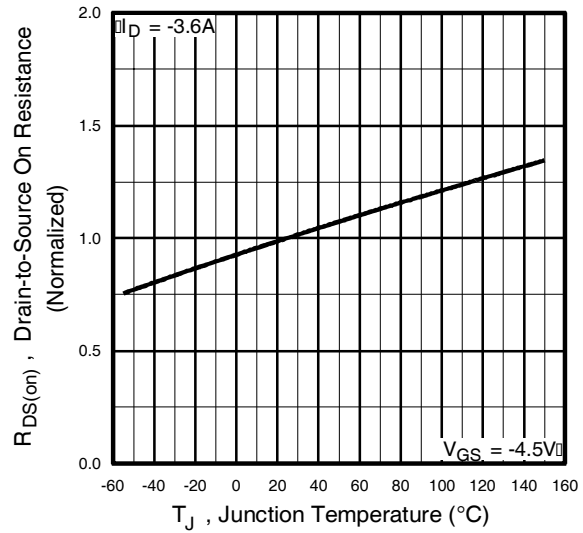


Fig 4. Normalized On-Resistance Vs. Temperature

IRF7304QPbF

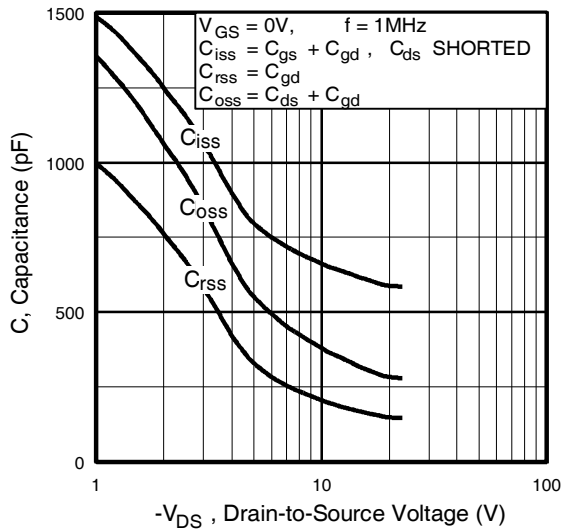


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

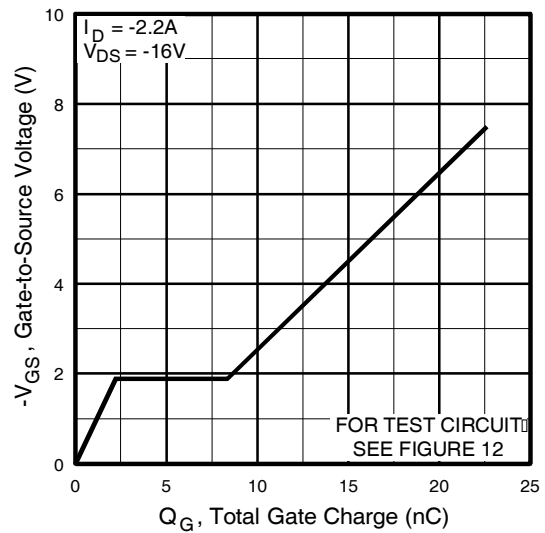


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

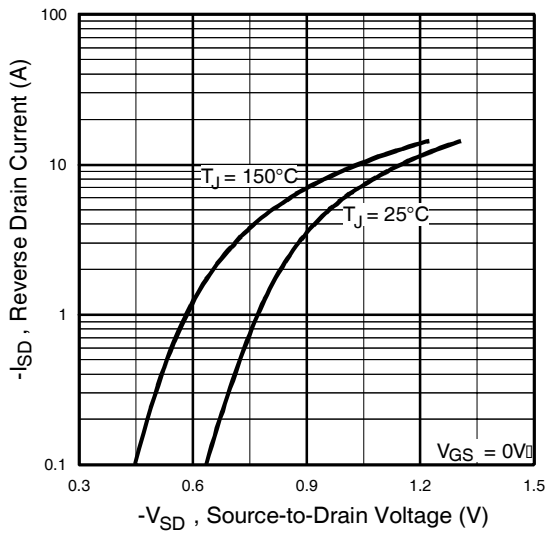


Fig 7. Typical Source-Drain Diode Forward Voltage

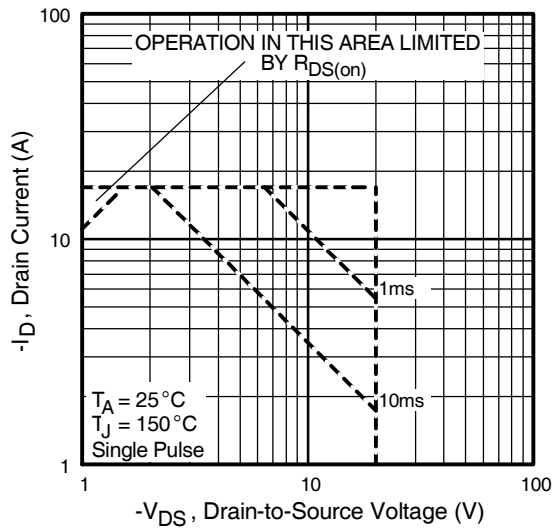


Fig 8. Maximum Safe Operating Area

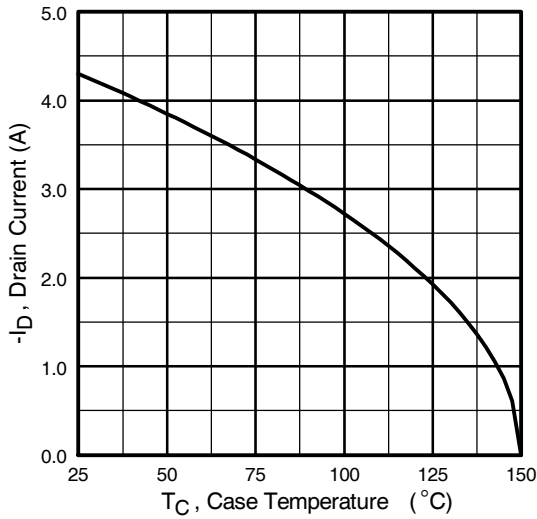


Fig 9. Maximum Drain Current Vs. Ambient Temperature

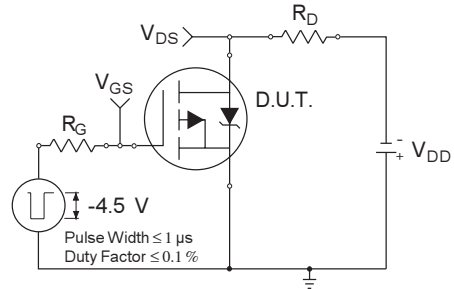


Fig 10a. Switching Time Test Circuit

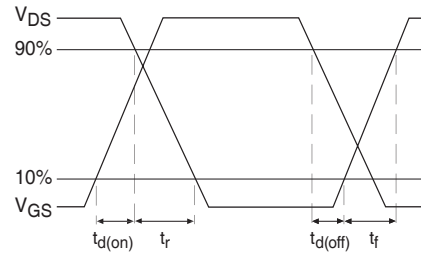


Fig 10b. Switching Time Waveforms

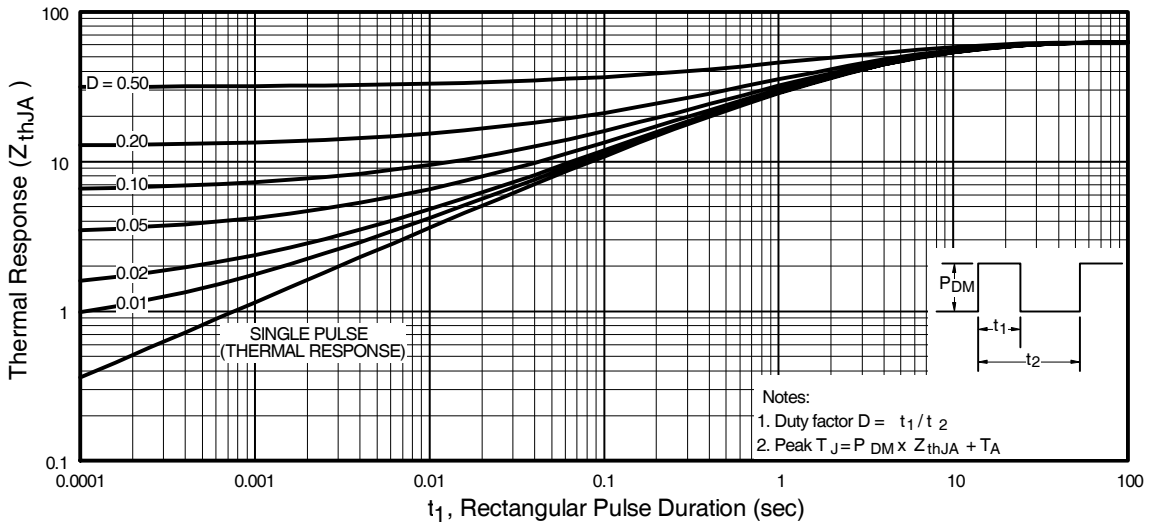


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

IRF7304QPbF

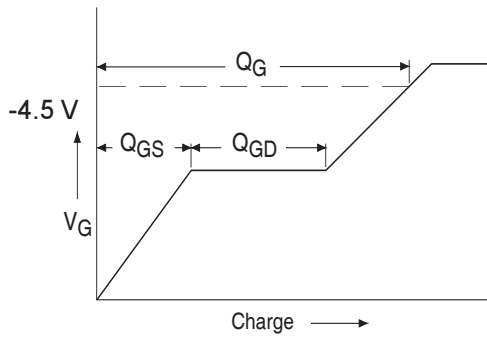


Fig 12a. Basic Gate Charge Waveform

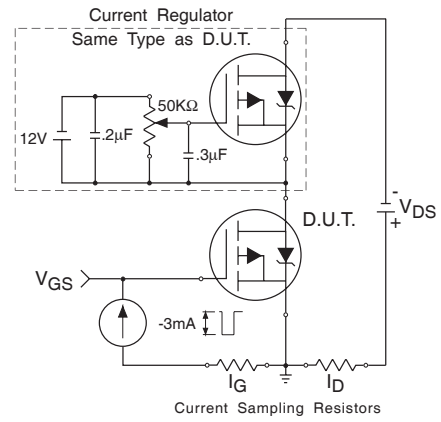
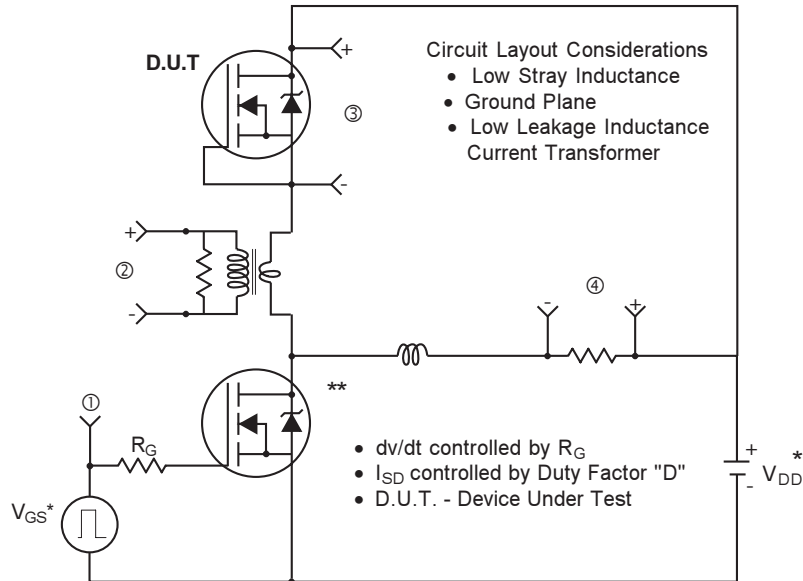


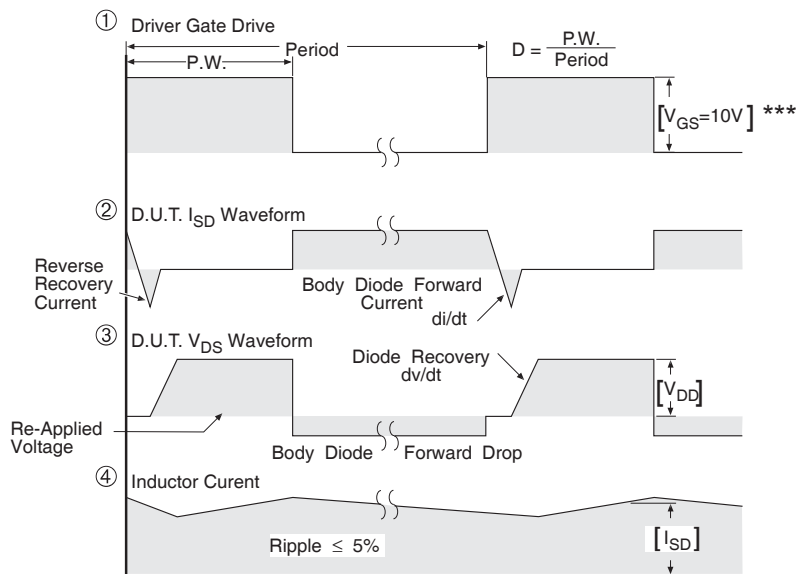
Fig 12b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity for P-Channel

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



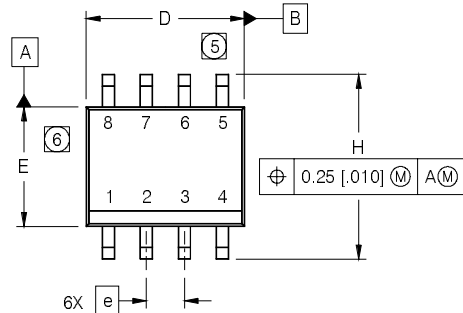
*** $V_{GS} = 5.0V$ for Logic Level and 3V Drive Devices

Fig 13. For P-Channel HEXFETS

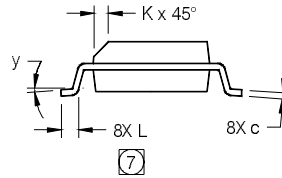
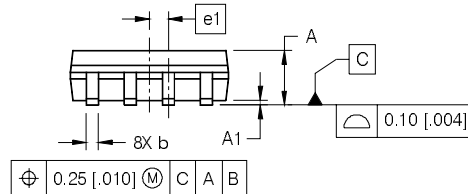
IRF7304QPbF

SO-8 Package Outline

Dimensions are shown in millimeters (inches)



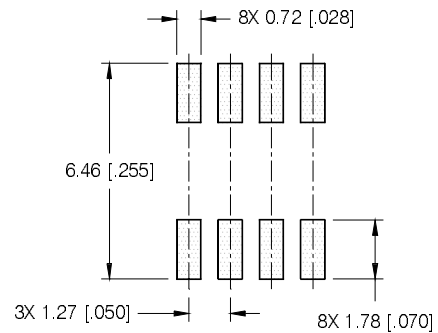
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40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



NOTES:

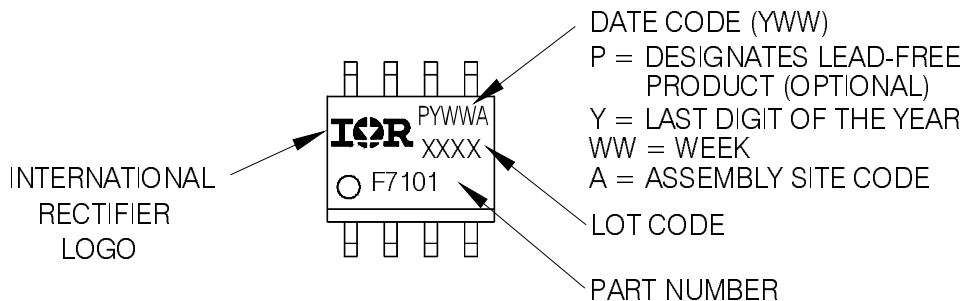
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- ⑤ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
- ⑥ DIMENSION DOES NOT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

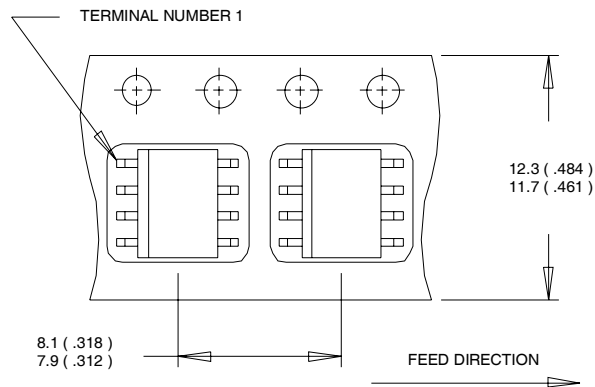
EXAMPLE: THIS IS AN IRF7101 (MOSFET)



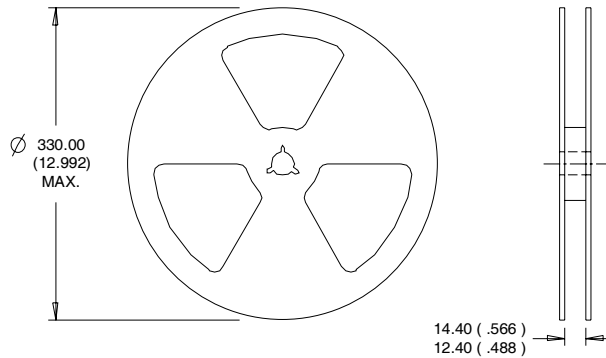
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

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/>

Data and specifications subject to change without notice.
 This product has been designed and qualified for the Automotive [Q101] market.
 Qualification Standards can be found on IR's Web site.