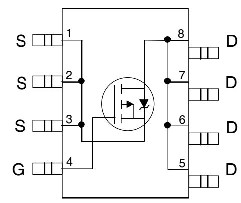
International
IOR Rectifier

PD - 96127A

IRF7404QPbF

HEXFET® Power MOSFET

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



Top View

V_{DSS} = -20V

$R_{DS(on)}$ = 0.040Ω


SO-8

Description

These HEXFET® Power MOSFET's in package utilize the lastest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of these 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 a wide variety of applications.
The efficient SO-8 package provides enhanced thermal characteristics making it ideal in a variety of power applications. This surface mount SO-8 can dramatically reduce board space and is also available in Tape & Reel.

Absolute Maximum Ratings

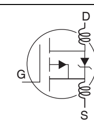
	Parameter	Max.	Units
I_D @ T_A = 25°C	10 Sec. Pulsed Drain Current, V_{GS} @ -4.5V	-7.7	A
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ -4.5V	-6.7	
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ -4.5V	-5.4	
I_{DM}	Pulsed Drain Current ①	-27	
P_D @T_A = 25°C	Power Dissipation	2.5	W
	Linear Derating Factor	0.02	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

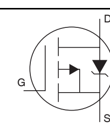
	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient④	–––	50	°C/W

08/09/10

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, ID = -250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	-0.012	–––	V/°C	Reference to 25°C, I_D = -1mA
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	–––	–––	0.040	Ω	V_{GS} = -4.5V, I_D = -3.2A ③
		–––	–––	0.060		V_{GS} = -2.7V, I_D = -2.7A ③
$V_{GS(th)}$	Gate Threshold Voltage	-0.70	–––	–––	V	V_{DS} = V_{GS}, I_D = -250µA
g_{fs}	Forward Transconductance	6.8	–––	–––	S	V_{DS} = -15V, I_D = -3.2A
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	–––	–––	50	nC	I_D = -3.2A
Q_{gs}	Gate-to-Source Charge	–––	–––	5.5		V_{DS} = -16V
Q_{gd}	Gate-to-Drain ("Miller") Charge	–––	–––	21		V_{GS} = -4.5V, See Fig. 6 and 12 ③
$t_{d(on)}$	Turn-On Delay Time	–––	14	–––	ns	V_{DD} = -10V
t_r	Rise Time	–––	32	–––		I_D = -3.2A
$t_{d(off)}$	Turn-Off Delay Time	–––	100	–––		R_G = 6.0Ω
t_f	Fall Time	–––	65	–––		R_D = 3.1Ω, See Fig. 10 ③
L_D	Internal Drain Inductance	–––	2.5	–––	nH	Between lead tip and center of die contact 
L_S	Internal Source Inductance	–––	4.0	–––		
C_{iss}	Input Capacitance	–––	1500	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	730	–––		V_{DS} = -15V
C_{rss}	Reverse Transfer Capacitance	–––	340	–––		ƒ = 1.0MHz, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	-3.1	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	–––	–––	-27		
V_{SD}	Diode Forward Voltage	–––	–––	-1.0	V	T_J = 25°C, I_S = -2.0A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	–––	69	100	ns	T_J = 25°C, I_F = -3.2A
Q_{rr}	Reverse RecoveryCharge	–––	71	110	µC	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 $I_{SD} \leq$ -3.2A, di/dt $\leq$ -65A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 150°C

③ Pulse width ≤ 300µs; duty cycle ≤ 2%.

④ Surface mounted on FR-4 board, t ≤ 10sec.

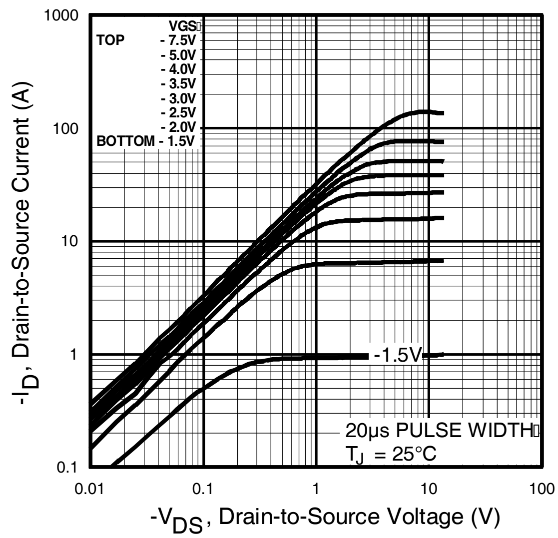


Fig 1. Typical Output Characteristics

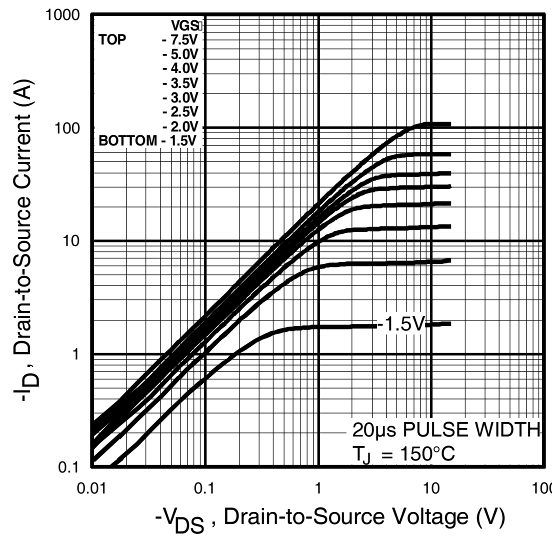


Fig 2. Typical Output Characteristics

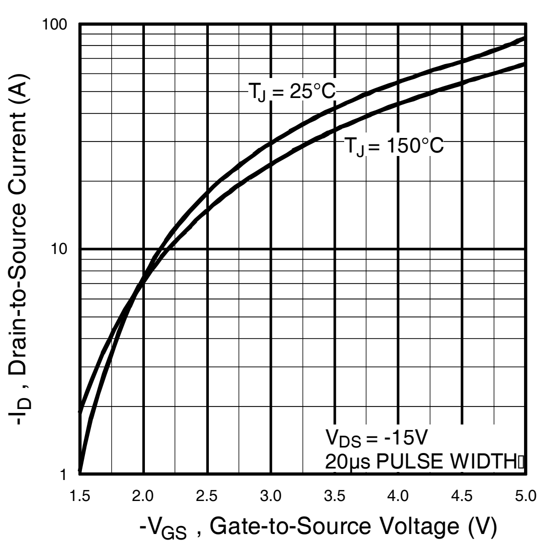


Fig 3. Typical Transfer Characteristics

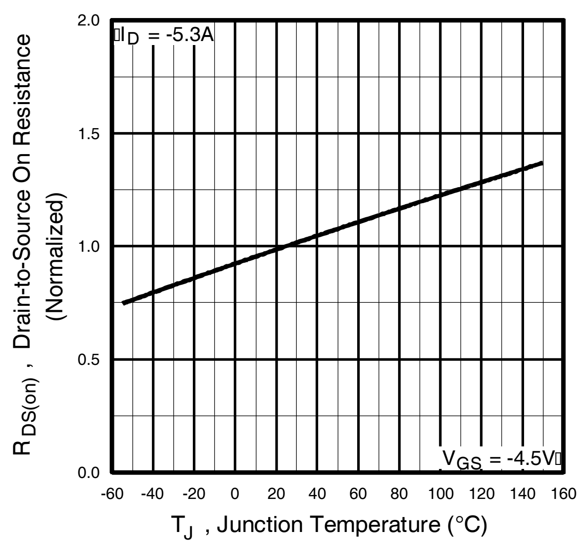


Fig 4. Normalized On-Resistance Vs. Temperature

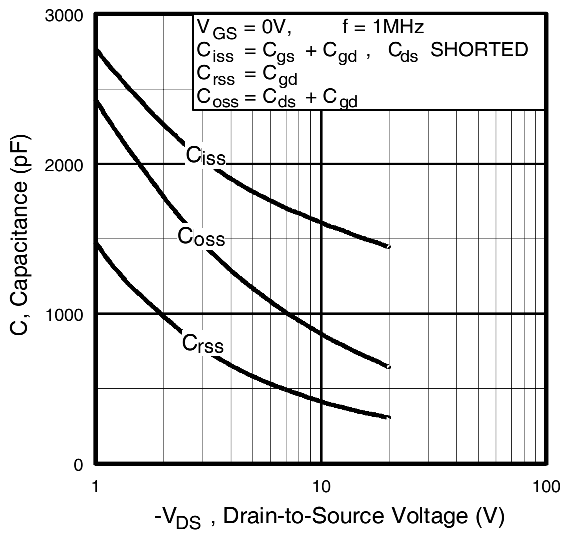


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

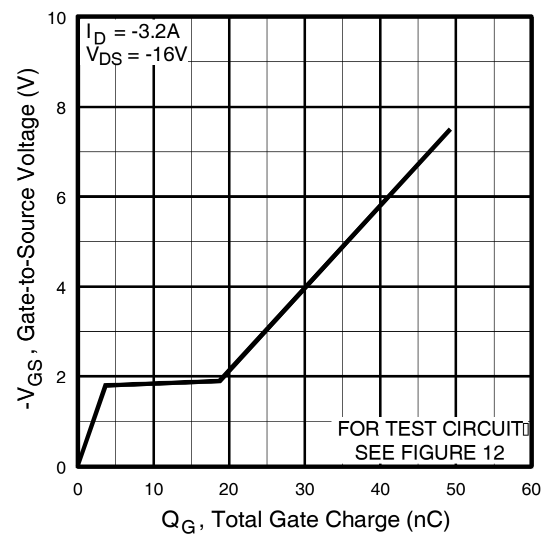


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

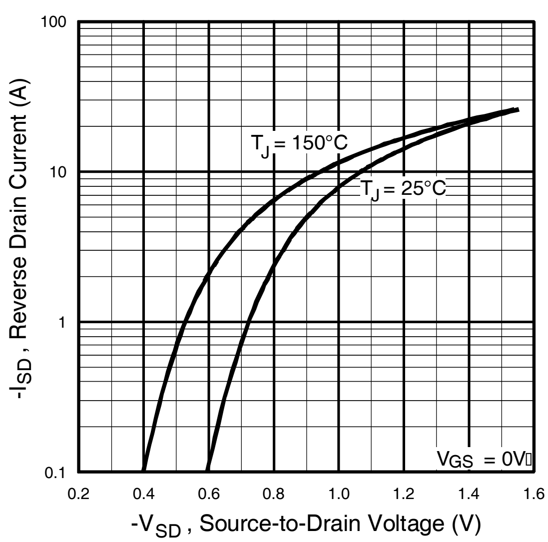


Fig 7. Typical Source-Drain Diode Forward Voltage

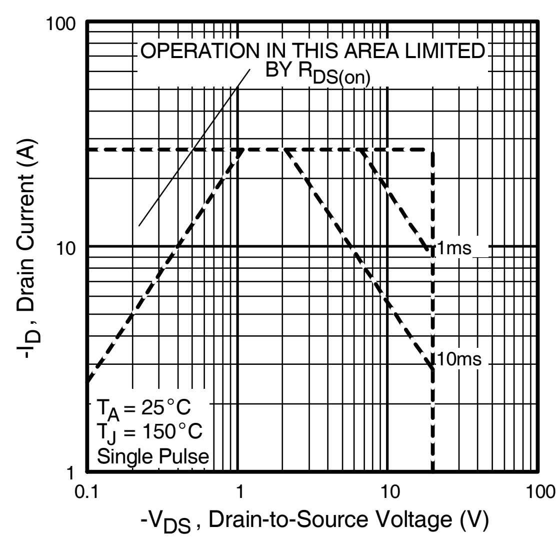


Fig 8. Maximum Safe Operating Area

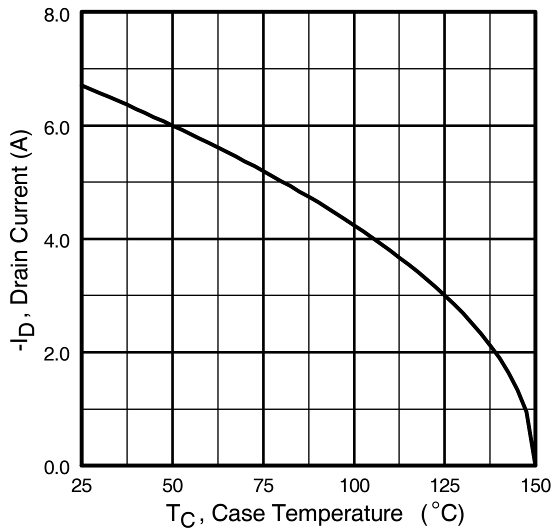


Fig 9. Maximum Drain Current Vs. Ambient Temperature

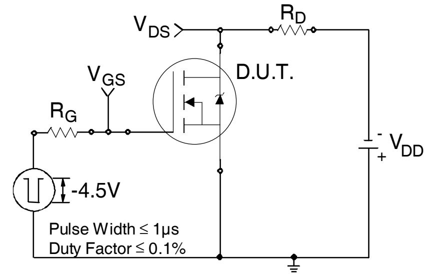


Fig 10a. Switching Time Test Circuit

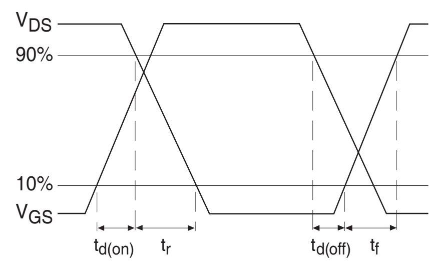


Fig 10b. Switching Time Waveforms

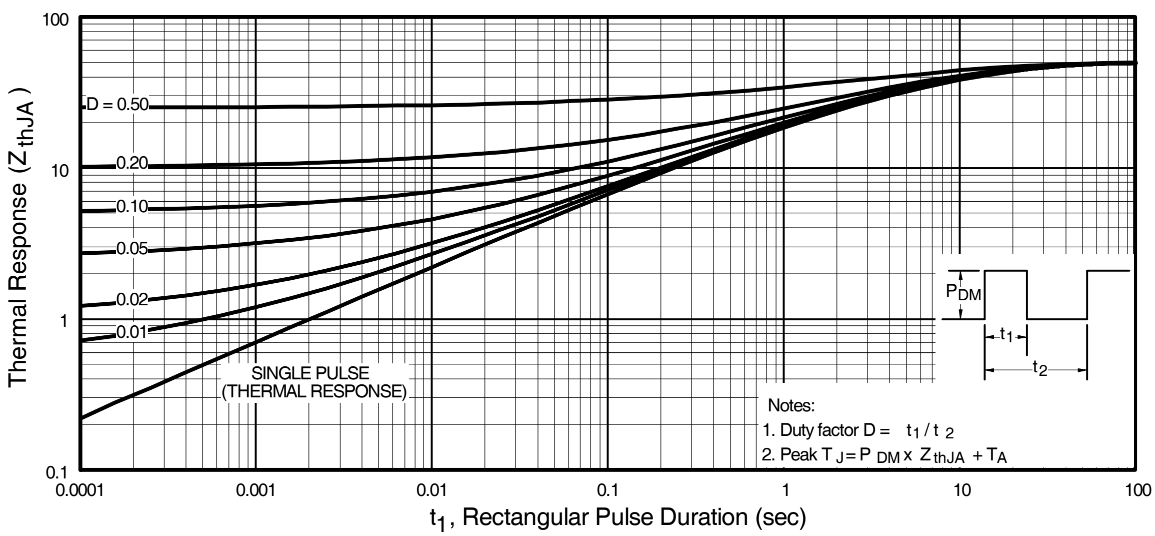


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

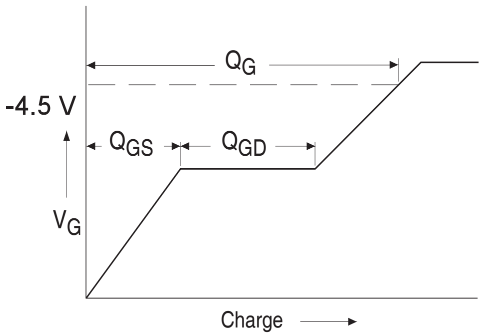


Fig 12a. Basic Gate Charge Waveform

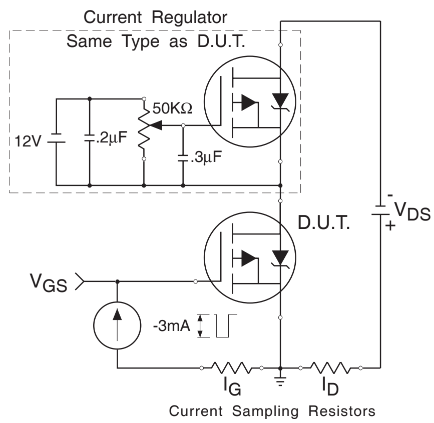
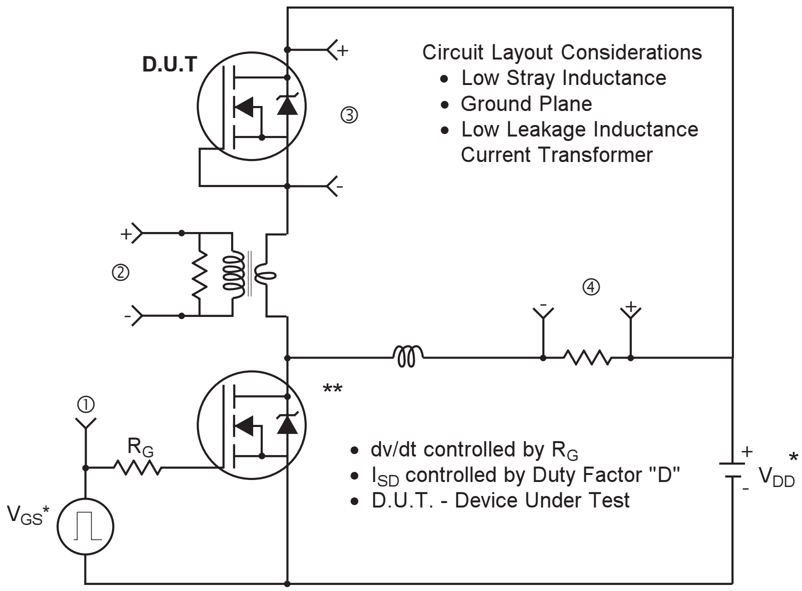
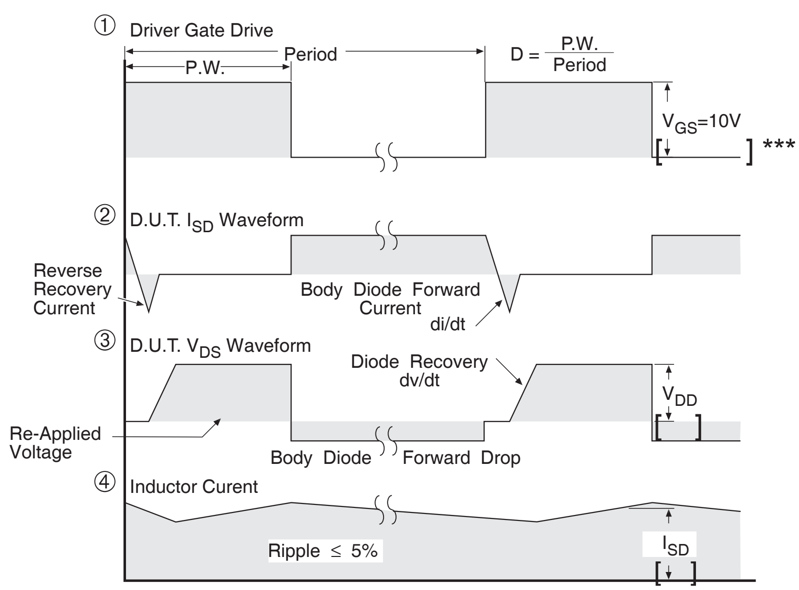


Fig 12b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

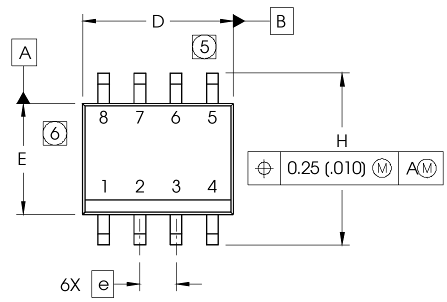


*** V_{GS} = 5.0V for Logic Level and 3V Drive Devices

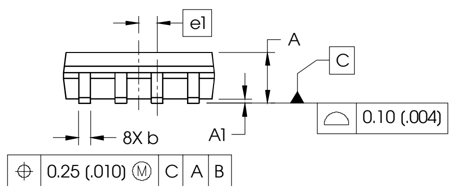
Fig 13. For P-Channel HEXFETS

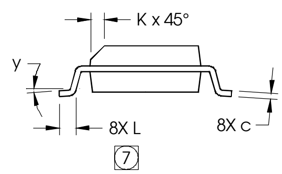
SO-8 Package Outline

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:

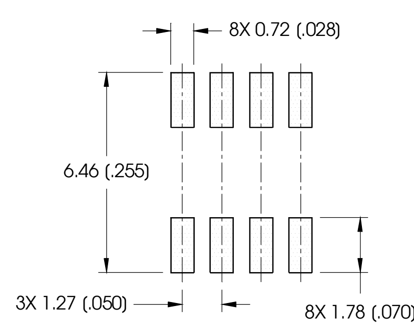
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.

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].

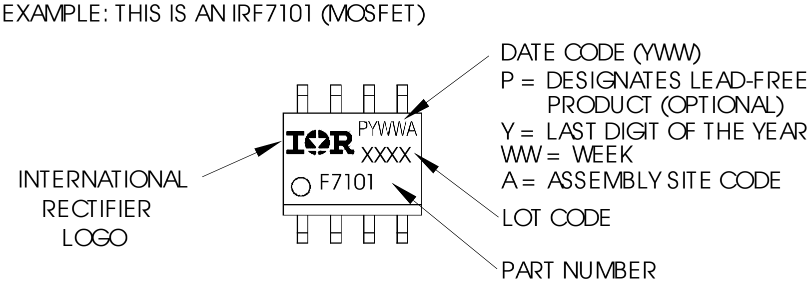
7. DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

FOOTPRINT



SO-8 Part Marking

EXAMPLE: THIS IS AN IRF7101 (MOSFET)



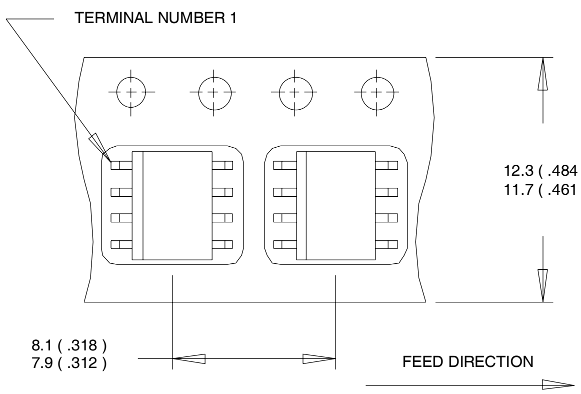
Notes:

1. For an Automotive Qualified version of this part please see http://www.irf.com/product-info/auto/

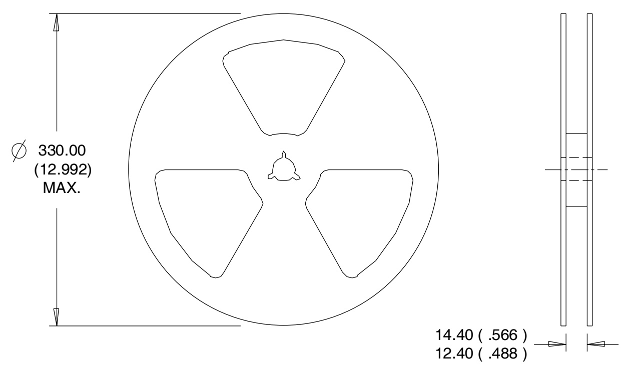
2. For the most current drawing please refer to IR website at http://www.irf.com/package/

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.

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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