

International
IR Rectifier

PD-96128

SMPS MOSFET

IRF7478QPbF

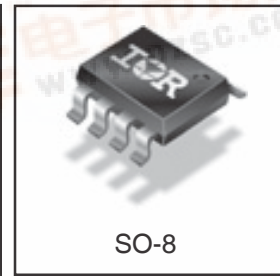
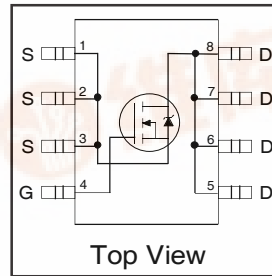
HEXFET® Power MOSFET

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

V _{DSS}	R _{DS(on)} max (mΩ)	I _D
60V	26 @ V _{GS} = 10V	4.2A
	30 @ V _{GS} = 4.5V	3.5A

Description

Specifically designed for Automotive applications. 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 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	Continuous Drain Current, V _{GS} @ 10V	7.0	A
I _D @ T _A = 70°C	Continuous Drain Current, V _{GS} @ 10V	5.6	
I _{DM}	Pulsed Drain Current ①	56	
P _D @ T _A = 25°C	Power Dissipation ②	2.5	W
	Linear Derating Factor	0.02	W/°C
V _{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery dv/dt ③	3.7	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 _{θJL}	Junction-to-Drain Lead	—	20	°C/W
R _{θJA}	Junction-to-Ambient ④	—	50	

Notes ① through ⑥ are on page 8
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Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

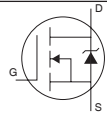
	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	60	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.065	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	20	26	m Ω	$V_{GS} = 10V, I_D = 4.2A$ ③
		—	23	30		$V_{GS} = 4.5V, I_D = 3.5A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	3.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 48V, V_{GS} = 0V$
		—	—	100		$V_{DS} = 48V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	17	—	—	S	$V_{DS} = 50V, I_D = 4.2A$
Q_g	Total Gate Charge	—	21	31	nC	$I_D = 4.2A$
Q_{gs}	Gate-to-Source Charge	—	4.3	—		$V_{DS} = 48V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	9.6	—		$V_{GS} = 4.5V$
$t_{d(on)}$	Turn-On Delay Time	—	7.7	—	ns	$V_{DD} = 30V$
t_r	Rise Time	—	2.6	—		$I_D = 4.2A$
$t_{d(off)}$	Turn-Off Delay Time	—	44	—		$R_G = 6.2\Omega$
t_f	Fall Time	—	13	—		$V_{GS} = 10V$ ③
C_{iss}	Input Capacitance	—	1740	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	300	—		$V_{DS} = 25V$
C_{riss}	Reverse Transfer Capacitance	—	37	—		$f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	1590	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	220	—		$V_{GS} = 0V, V_{DS} = 48V, f = 1.0\text{MHz}$
$C_{oss\ eff.}$	Effective Output Capacitance	—	410	—		$V_{GS} = 0V, V_{DS} = 0V\ \text{to}\ 48V$ ⑤

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	—	140	mJ
I_{AR}	Avalanche Current①	—	4.2	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	2.3	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	56		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 4.2A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	52	78	ns	$T_J = 25^\circ\text{C}, I_F = 4.2A$
Q_{rr}	Reverse Recovery Charge	—	100	150	nC	$di/dt = 100A/\mu s$ ③

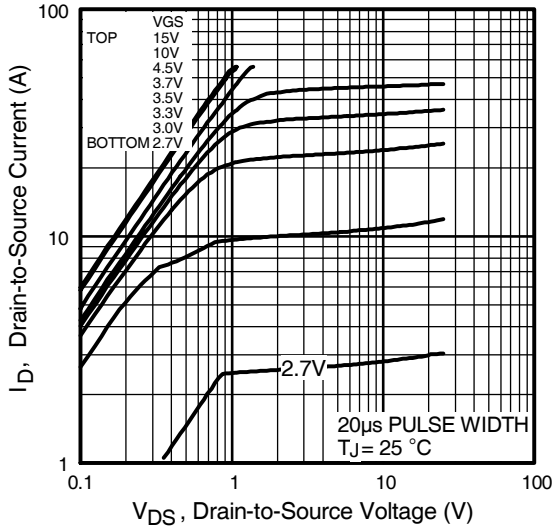


Fig 1. Typical Output Characteristics

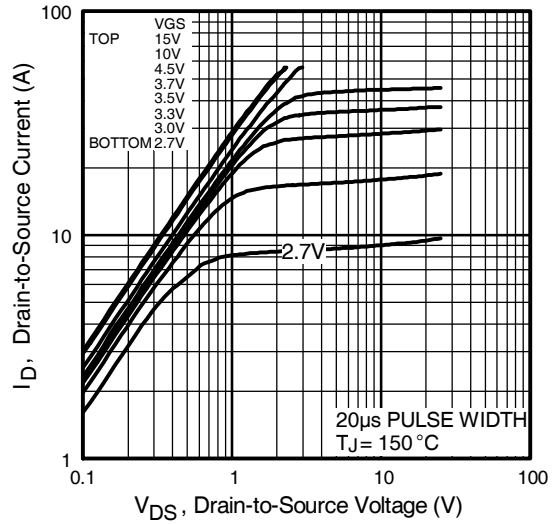


Fig 2. Typical Output Characteristics

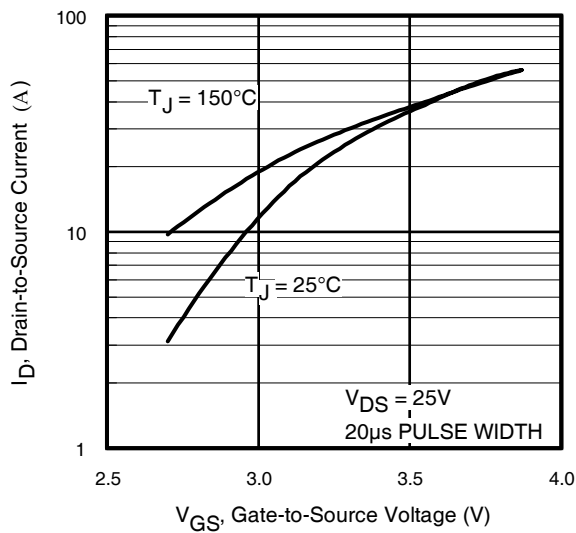


Fig 3. Typical Transfer Characteristics

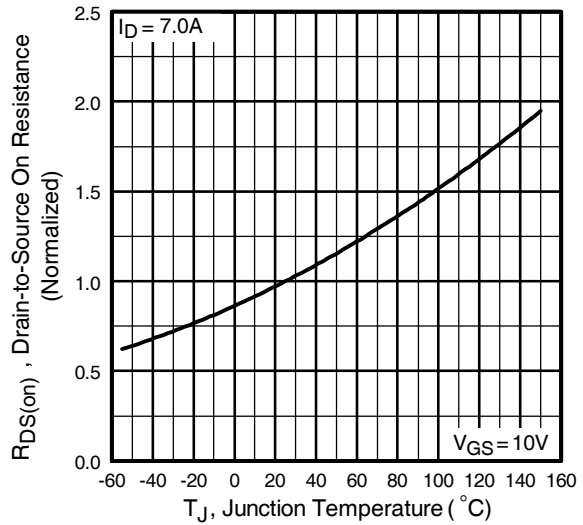


Fig 4. Normalized On-Resistance Vs. Temperature

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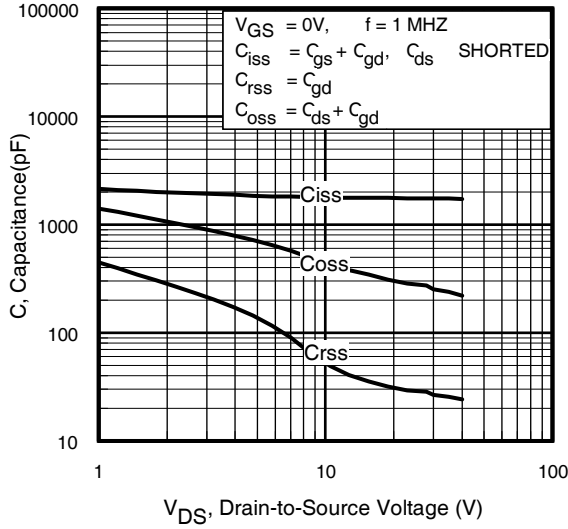


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

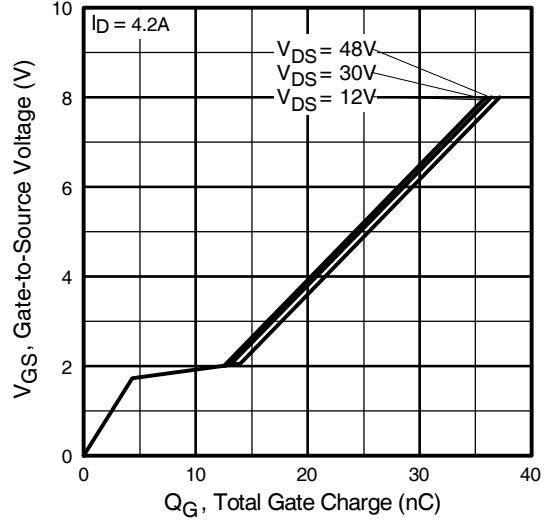


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

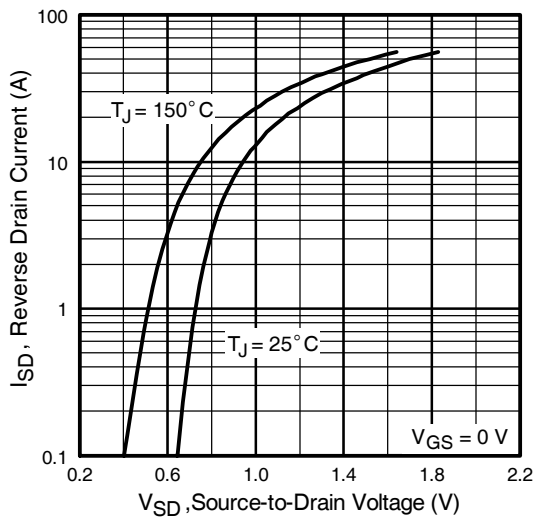


Fig 7. Typical Source-Drain Diode Forward Voltage

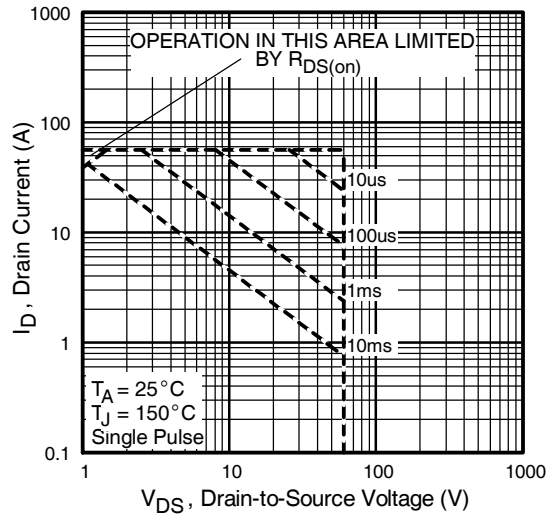


Fig 8. Maximum Safe Operating Area

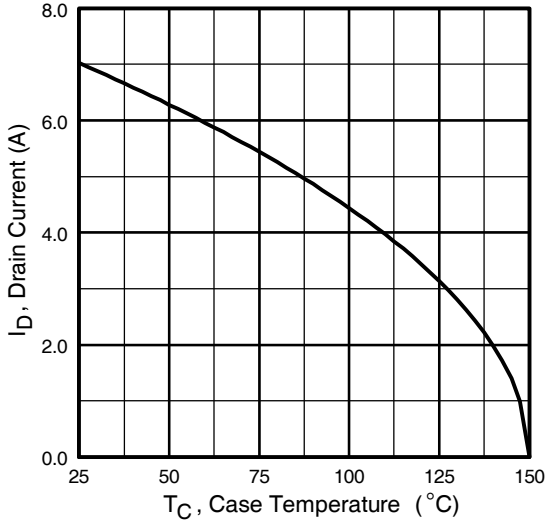


Fig 9. Maximum Drain Current Vs. Ambient Temperature

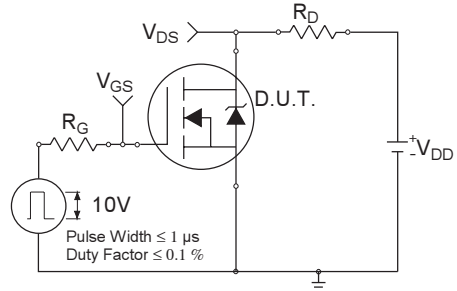


Fig 10a. Switching Time Test Circuit

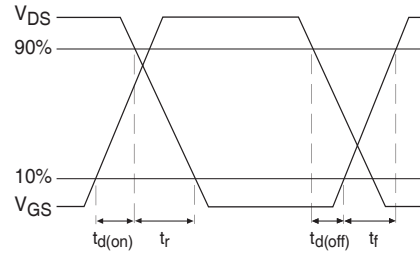


Fig 10b. Switching Time Waveforms

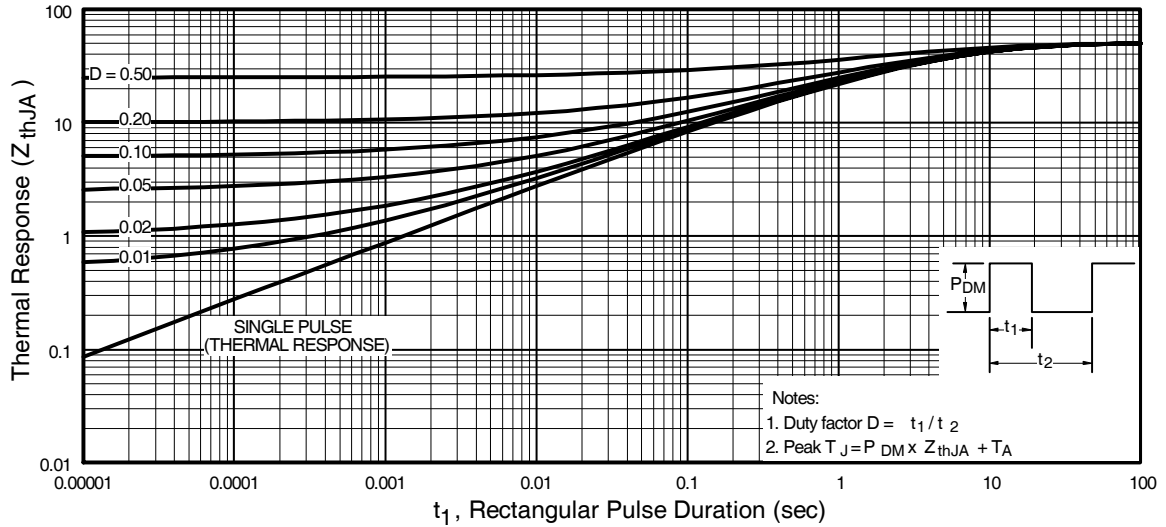


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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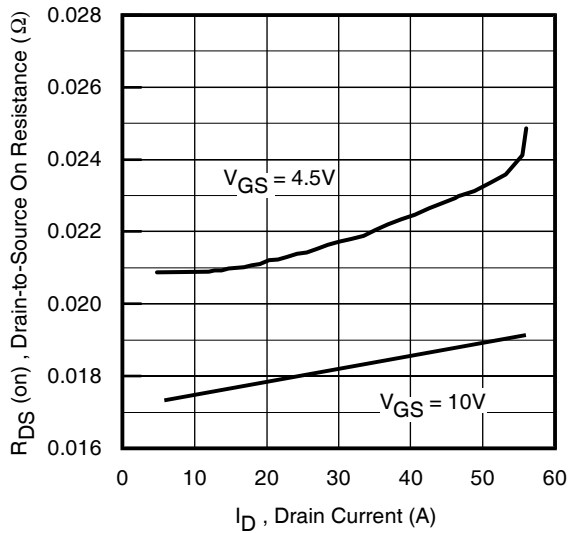


Fig 12. On-Resistance Vs. Drain Current

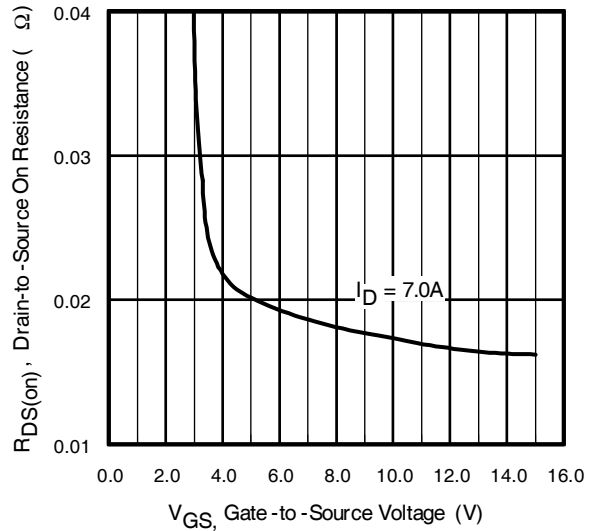


Fig 13. On-Resistance Vs. Gate Voltage

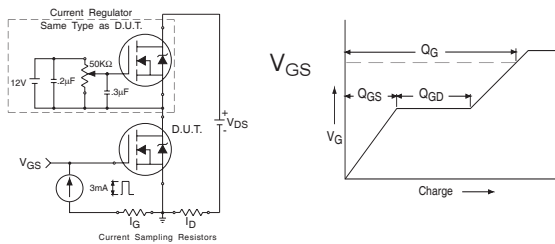


Fig 14a&b. Basic Gate Charge Test Circuit and Waveform

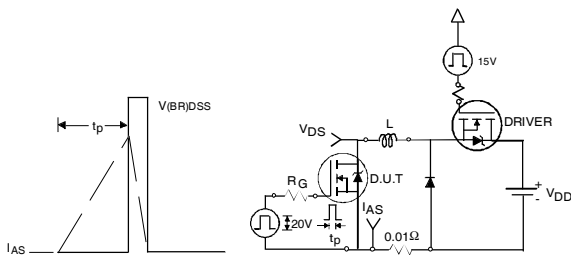


Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

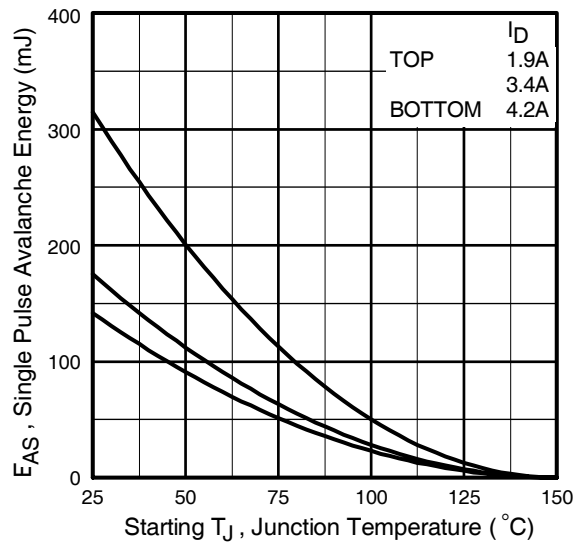
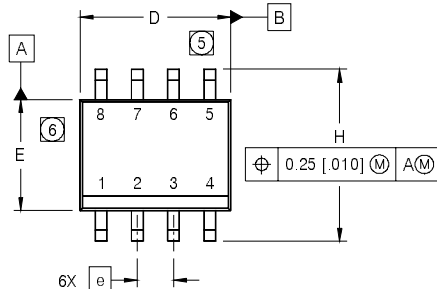


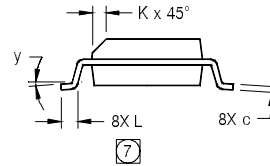
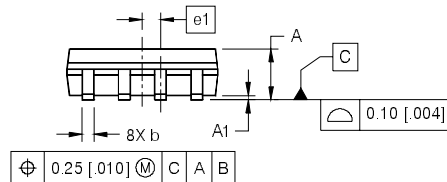
Fig 15c. Maximum Avalanche Energy Vs. Drain Current

SO-8 Package Outline

Dimensions are shown in millimeters (inches)



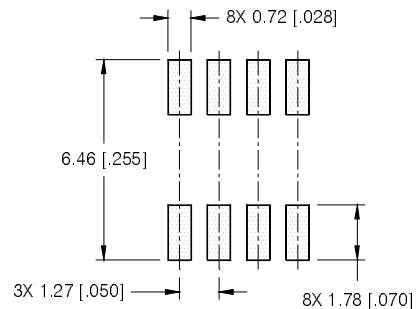
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40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



NOTES:

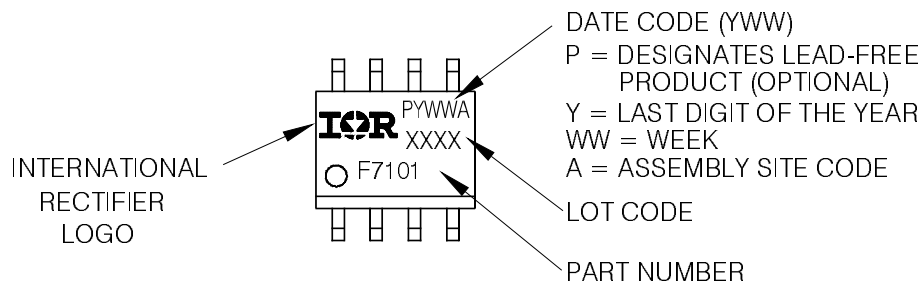
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- ⑤ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
- ⑥ DIMENSION DOES NOT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



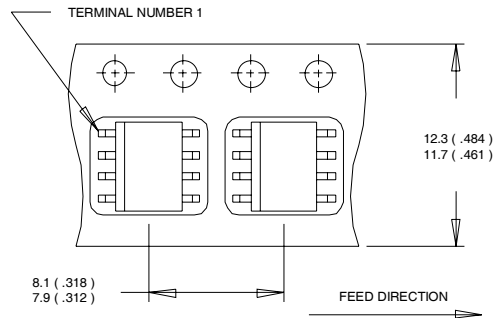
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>
www.irf.com

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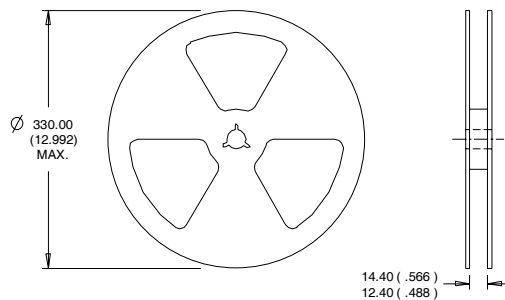
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SO-8 Tape and Reel

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/>

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 16\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 4.2\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ When mounted on 1 inch square copper board
- 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 $I_{SD} \leq 4.2\text{A}$, $di/dt \leq 160\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 150^\circ\text{C}$

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.

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