PD- 96128B

International
IOR Rectifier

IRF7478QPbF

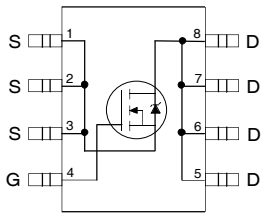
HEXFET® Power MOSFET

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

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.



Top View


SO-8

Base part number	Orderable part number	Package Type	Standard Pack		EOL Notice	Replacement Part Number
			Form	Quantity		
IRF7478QPbF	IRF7478QTRPbF	SO-8	Tape and Reel	4000	EOL 529	Please search the EOL part number on IR's website for guidance
	IRF7478QPbF	SO-8	Tube	95	EOL 529	

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 Dissipation④	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 ⑥	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
$R_{\theta JL}$	Junction-to-Drain Lead	----	20	°C/W
$R_{\theta JA}$	Junction-to-Ambient ④	----	50	

Notes ① through ⑥ are on page 8

Static @ T_J = 25°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 = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.065	—	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	20	26	mΩ	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 = 250µA
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°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°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 = 6.2Ω
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_{rss}	Reverse Transfer Capacitance	—	37	—		f = 1.0MHz
C_{oss}	Output Capacitance	—	1590	—		V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz
C_{oss}	Output Capacitance	—	220	—		V_{GS} = 0V, V_{DS} = 48V, f = 1.0MHz
C_{oss} eff.	Effective Output Capacitance	—	410	—		V_{GS} = 0V, V_{DS} = 0V 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°C, I_S = 4.2A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	—	52	78	ns	T_J = 25°C, I_F = 4.2A
Q_{rr}	Reverse RecoveryCharge	—	100	150	nC	di/dt = 100A/µs ③

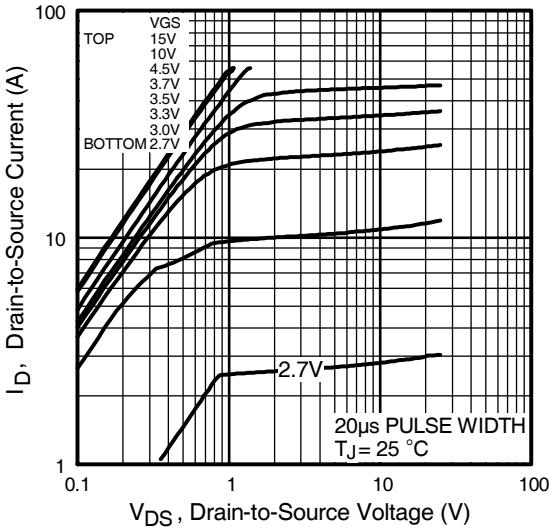


Fig 1. Typical Output Characteristics

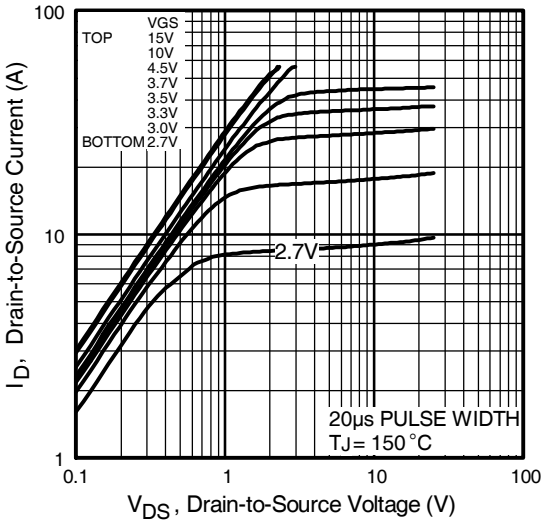


Fig 2. Typical Output Characteristics

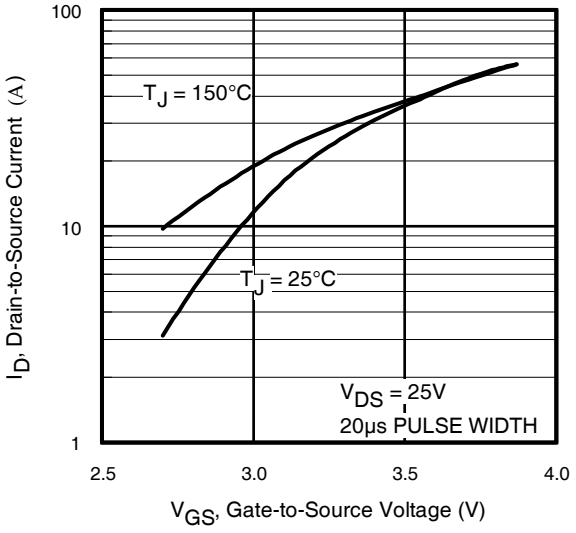


Fig 3. Typical Transfer Characteristics

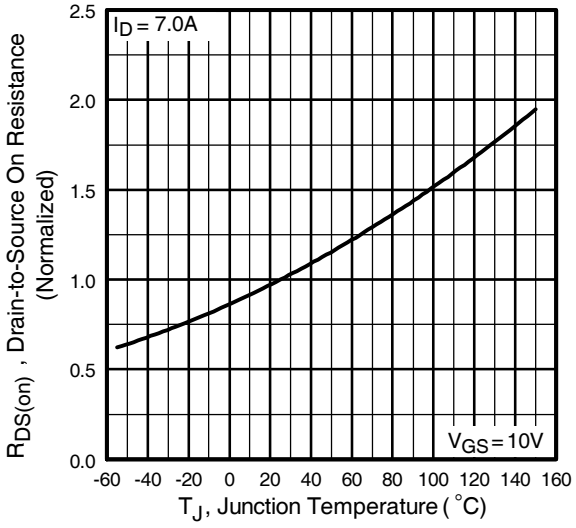


Fig 4. Normalized On-Resistance Vs. Temperature

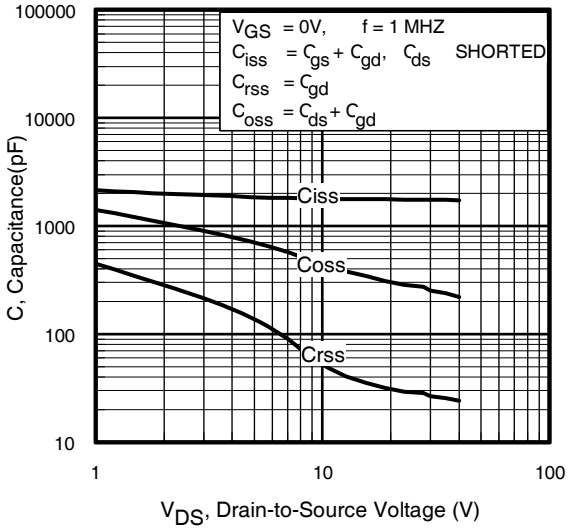


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

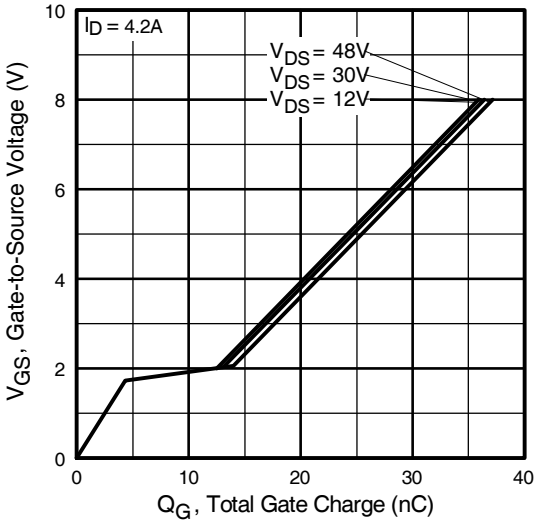


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

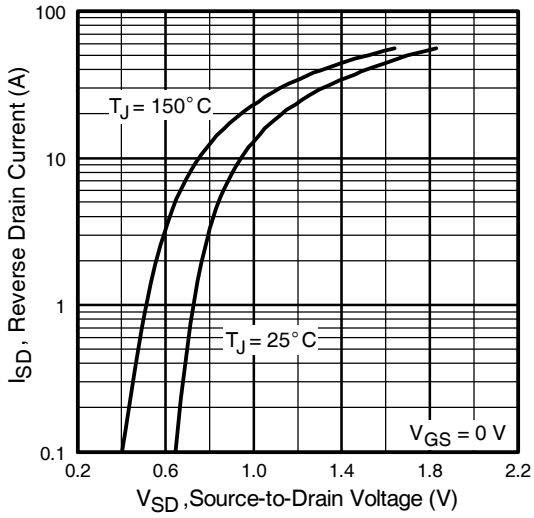


Fig 7. Typical Source-Drain Diode Forward Voltage

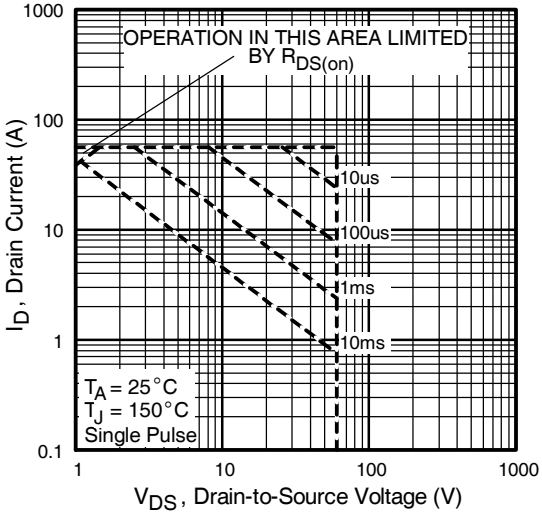


Fig 8. Maximum Safe Operating Area

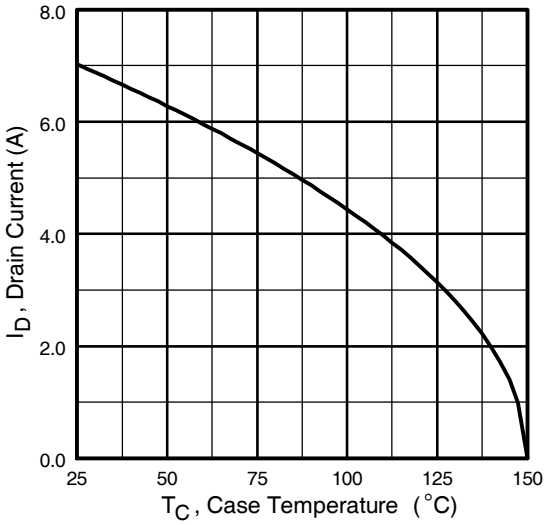


Fig 9. Maximum Drain Current Vs. Ambient Temperature

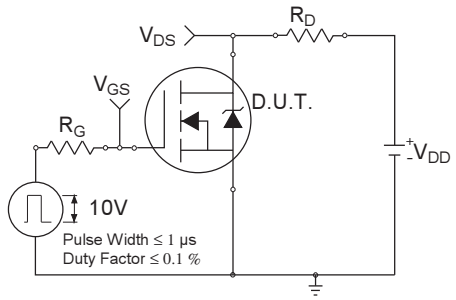


Fig 10a. Switching Time Test Circuit

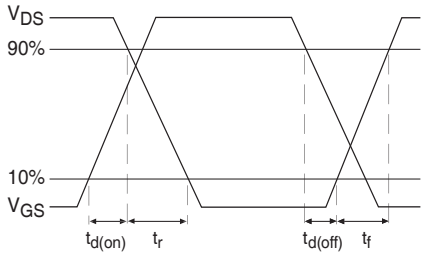


Fig 10b. Switching Time Waveforms

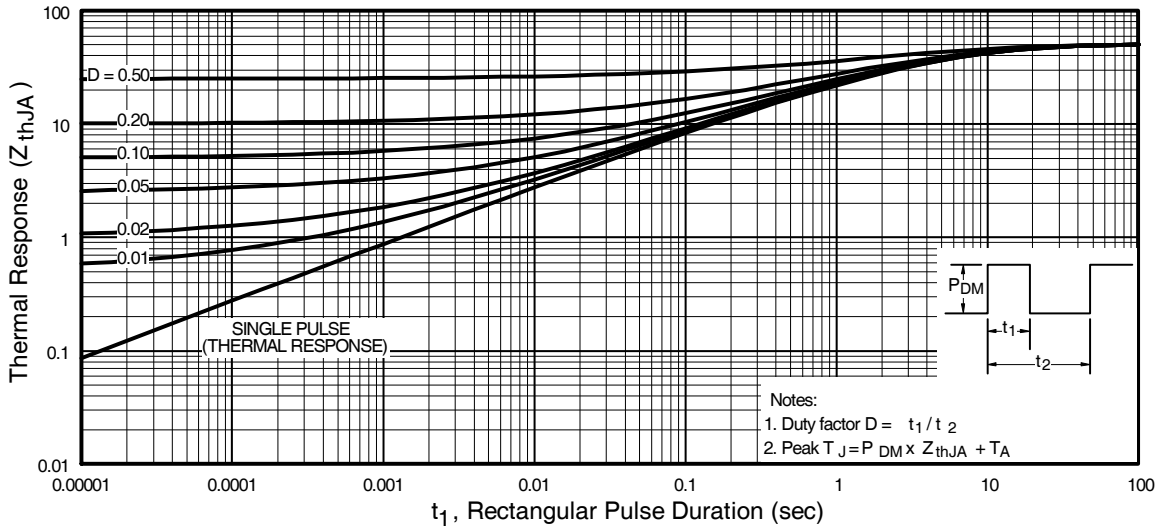


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

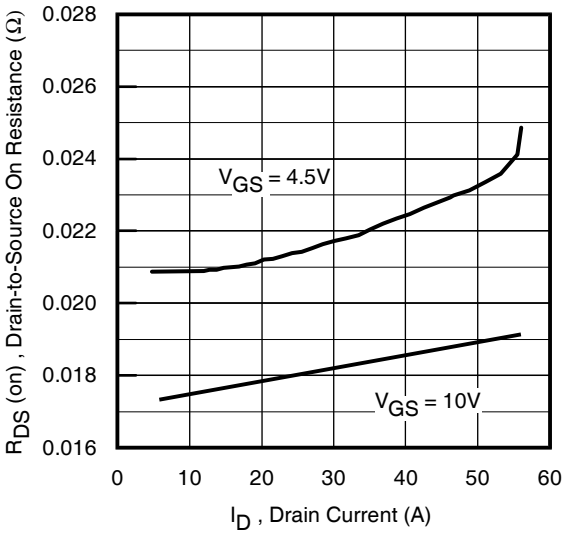


Fig 12. On-Resistance Vs. Drain Current

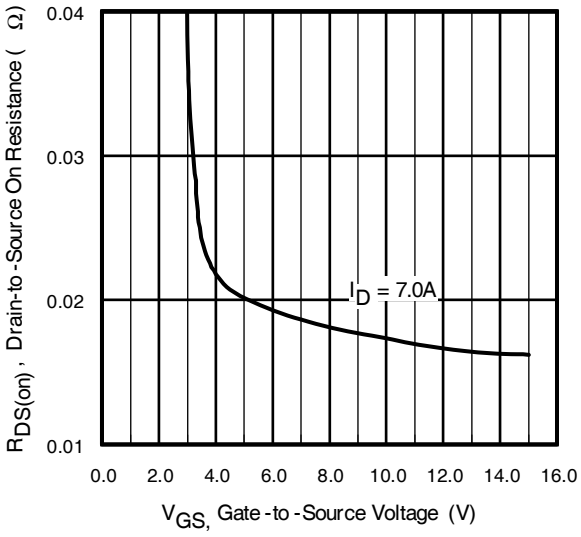


Fig 13. On-Resistance Vs. Gate Voltage

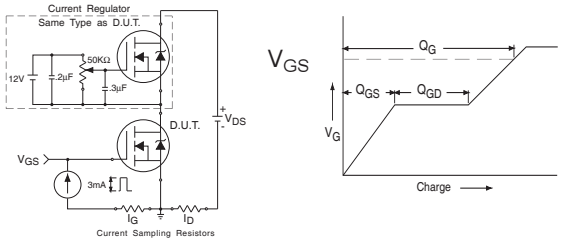


Fig 14a&b. Basic Gate Charge Test Circuit and Waveform

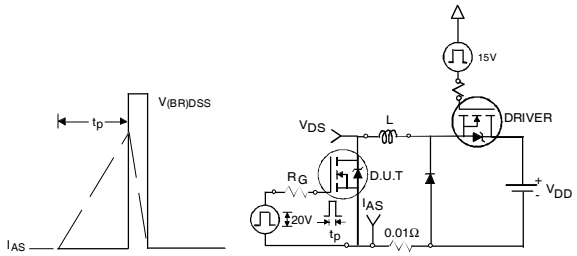


Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

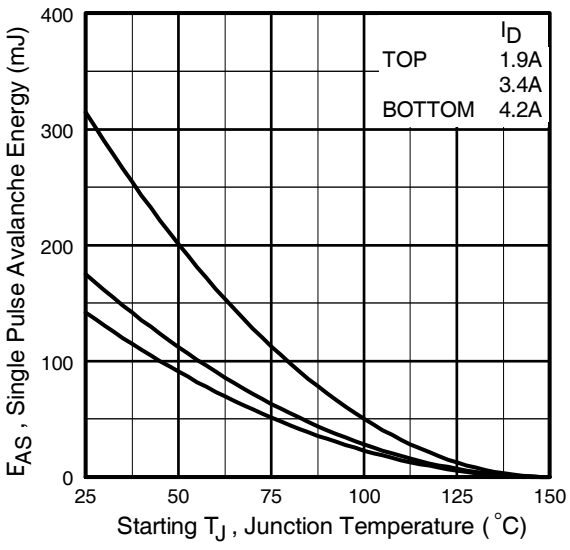
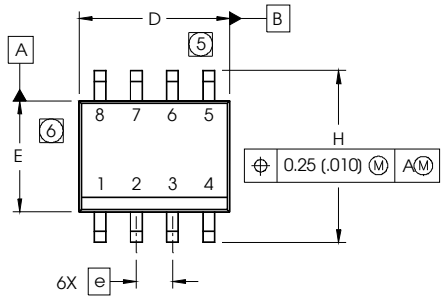


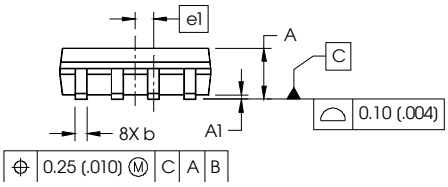
Fig 15c. Maximum Avalanche Energy Vs. Drain Current

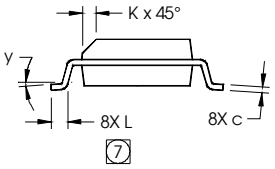
SO-8 Package Outline

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°

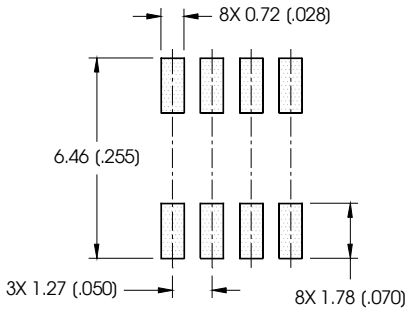




NOTES:

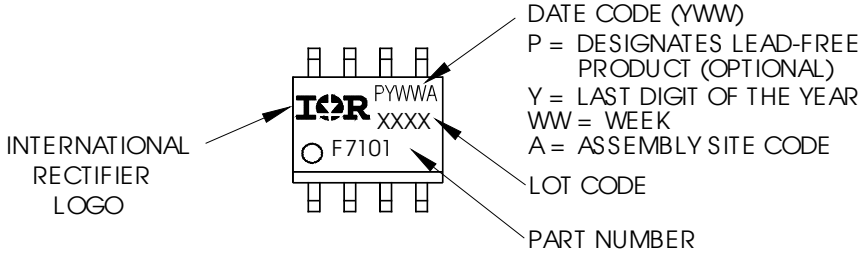
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 (.006).
6. DIMENSION DOES NOT INCLUDE 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)



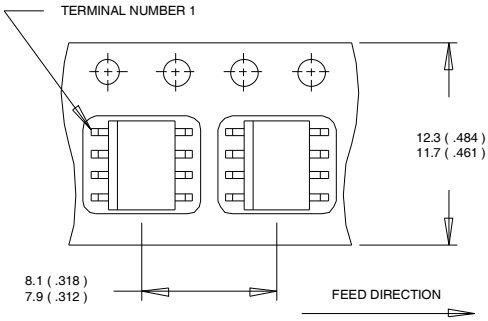
Notes:

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

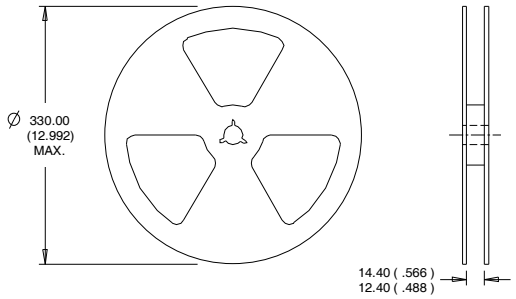
2. For the most current drawing please refer to IR website at http://www.irf.com/package/

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.

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

Qualification Information†

Qualification level	Industrial †	
	(per JEDEC JESD47F†† guidelines)	
Moisture Sensitivity Level	SO-8	MSL1 (per JEDEC J-STD-020D††)
RoHS Compliant	Yes	

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

†† Applicable version of JEDEC standard at the time of product release.

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting T_J = 25°C, L = 16mH R_G = 25Ω, I_{AS} = 4.2A.

③ Pulse width ≤ 400μs; duty cycle ≤ 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} ≤ 4.2A, di/dt ≤ 160A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C