

SMPS MOSFET

IRF7478PbF

HEXFET® Power MOSFET

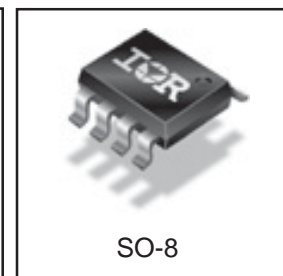
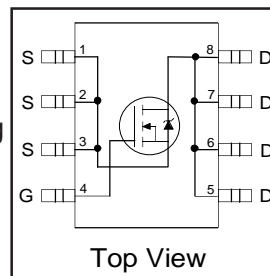
Applications

- High frequency DC-DC converters
- Lead-Free

V_{DSS}	$R_{DS(on)}$ max (m Ω)	I_D
60V	26 @ $V_{GS} = 10V$	4.2A
	30 @ $V_{GS} = 4.5V$	3.5A

Benefits

- Low Gate to Drain Charge to Reduce Switching Losses
- Fully Characterized Capacitance Including Effective C_{OSS} to Simplify Design, (See App. Note AN1001)
- Fully Characterized Avalanche Voltage and Current



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_A = 25^\circ C$	Continuous Drain Current, V_{GS} @ 10V	7.0	A
I_D @ $T_A = 70^\circ C$	Continuous Drain Current, V_{GS} @ 10V	5.6	
I_{DM}	Pulsed Drain Current ①	56	
P_D @ $T_A = 25^\circ C$	Power Dissipation ②	2.5	W
	Linear Derating Factor	0.02	W/ $^\circ C$
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	$^\circ C$
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	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient ④	—	50	

Notes ① through ⑥ are on page 8
www.irf.com

IRF7478PbF

International
IR Rectifier

Static @ T_J = 25°C (unless otherwise specified)

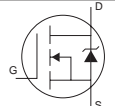
	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	60	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.065	—	V/°C	Reference to 25°C, I _D = 1mA
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	20	26	mΩ	V _{GS} = 10V, 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 Recovery Charge	—	100	150	nC	di/dt = 100A/μs ③

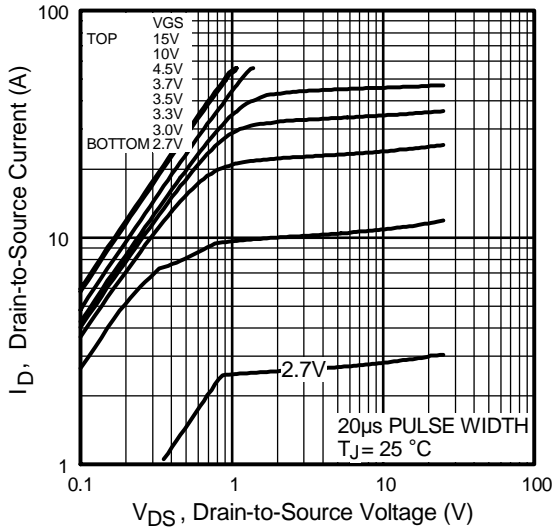


Fig 1. Typical Output Characteristics

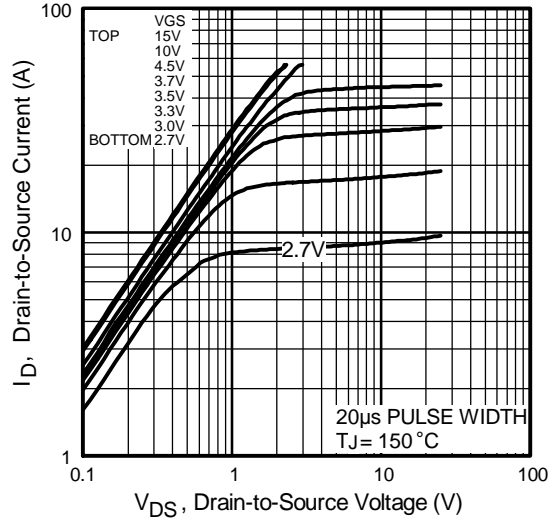


Fig 2. Typical Output Characteristics

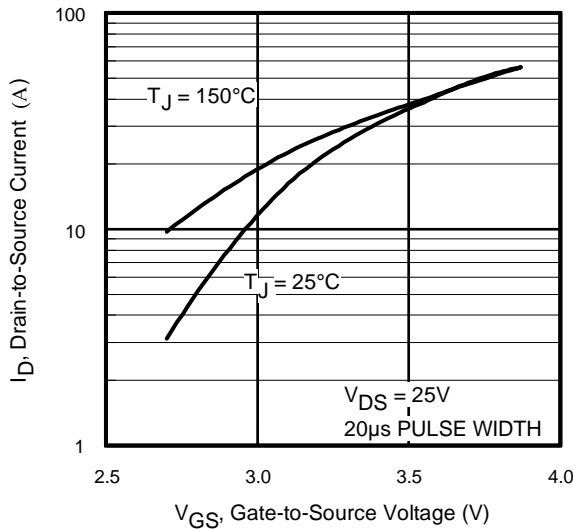


Fig 3. Typical Transfer Characteristics

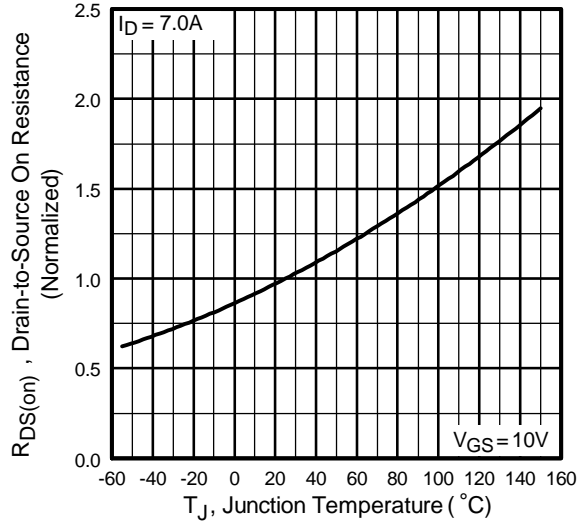


Fig 4. Normalized On-Resistance Vs. Temperature

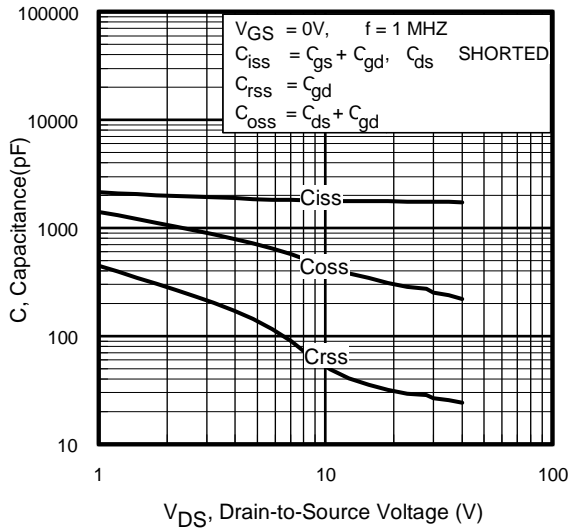


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

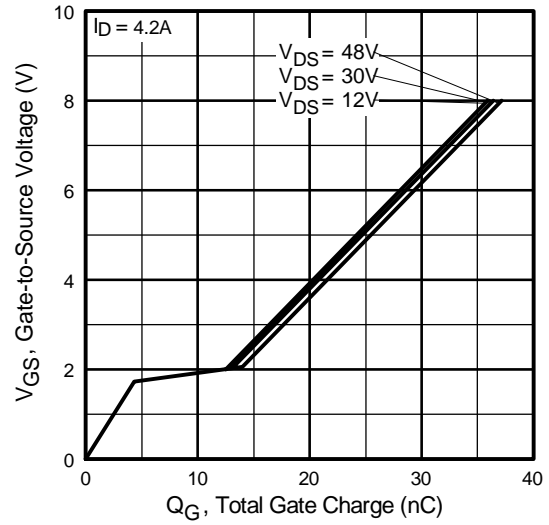


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

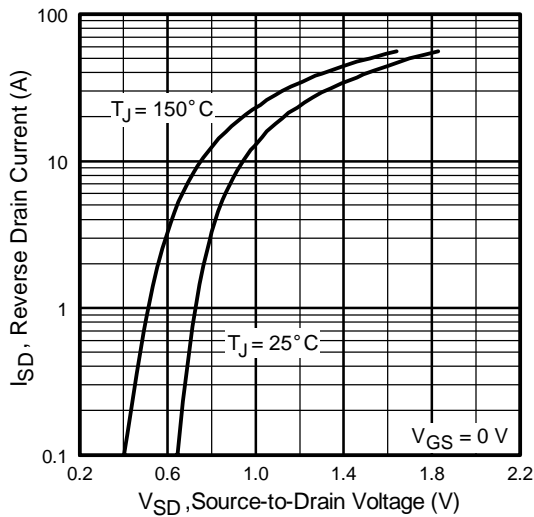


Fig 7. Typical Source-Drain Diode Forward Voltage

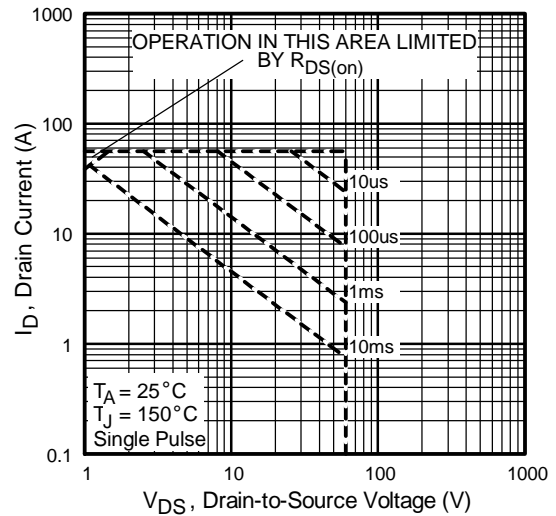


Fig 8. Maximum Safe Operating Area

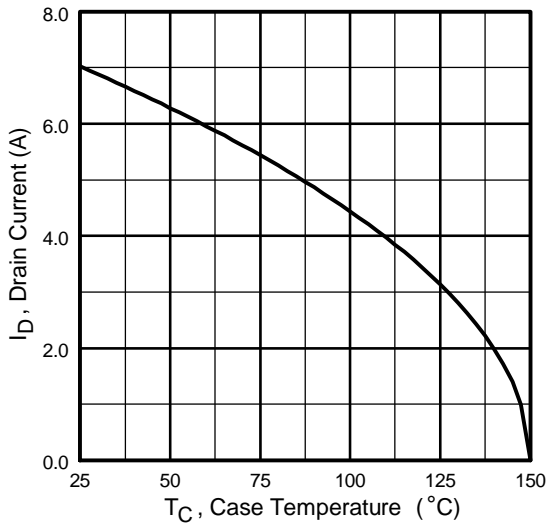


Fig 9. Maximum Drain Current Vs. Ambient Temperature



Fig 10a. Switching Time Test Circuit

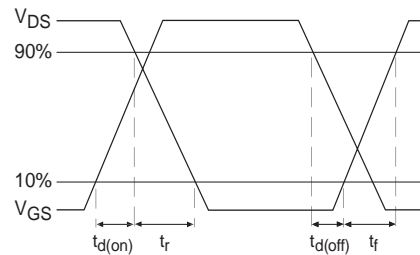


Fig 10b. Switching Time Waveforms

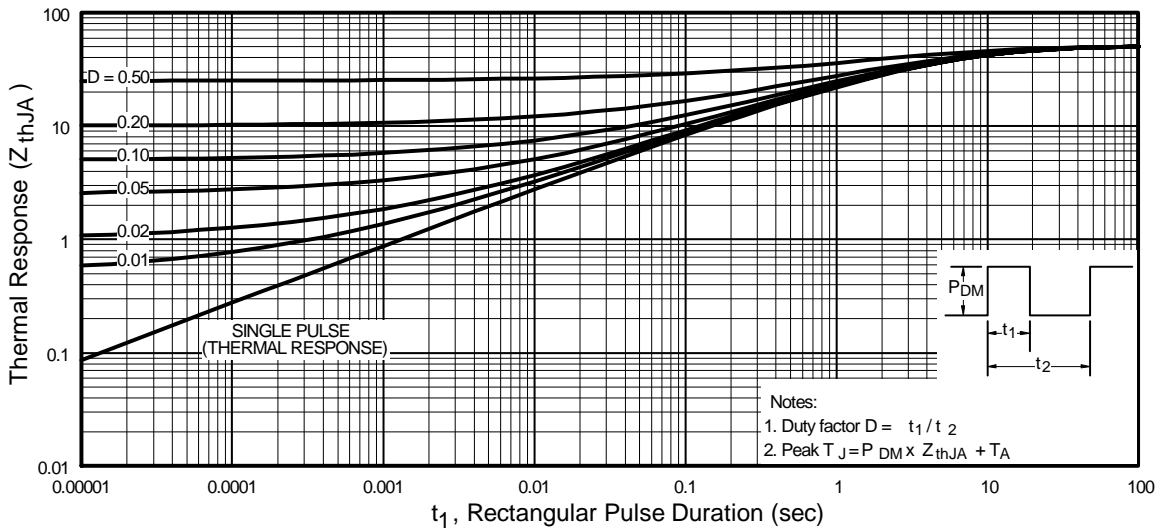


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

IRF7478PbF

International
IR Rectifier

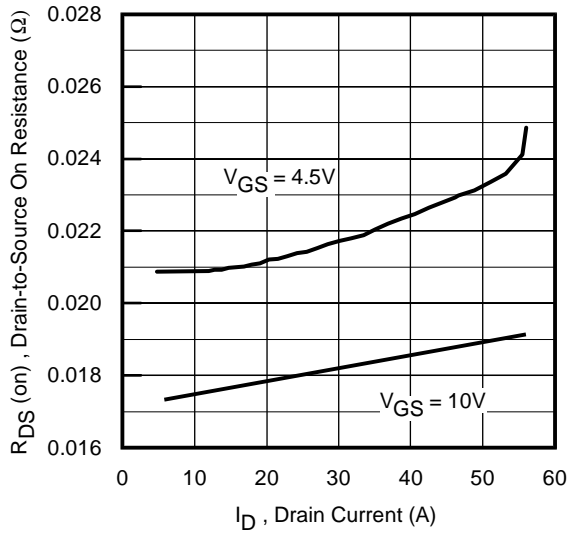


Fig 12. On-Resistance Vs. Drain Current

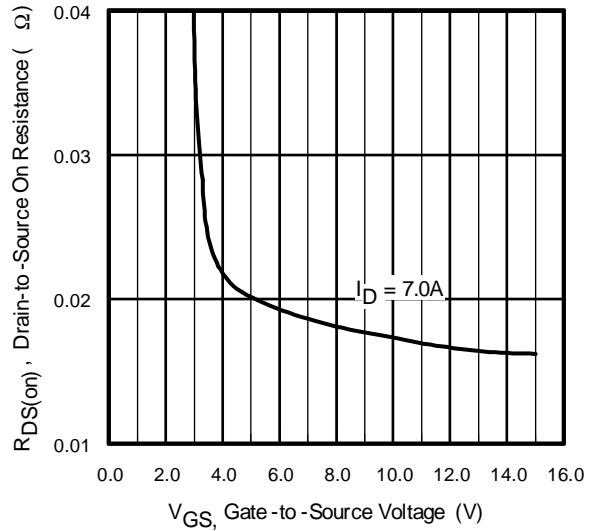


Fig 13. On-Resistance Vs. Gate Voltage



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

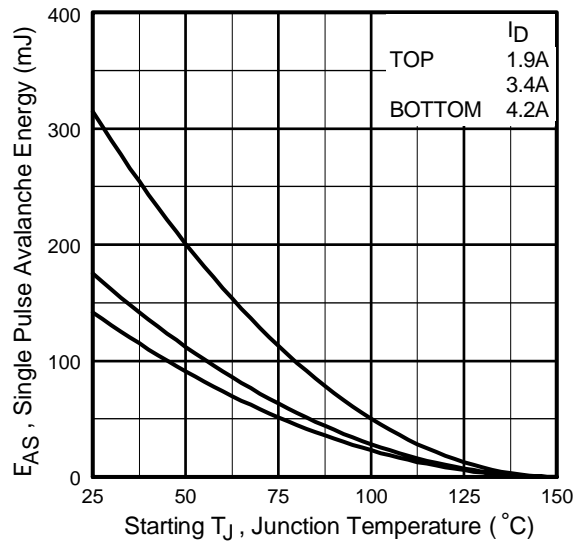


Fig 15c. Maximum Avalanche Energy Vs. Drain Current

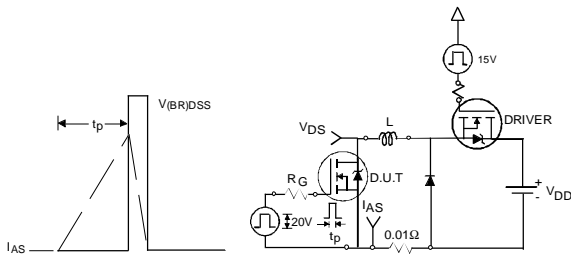
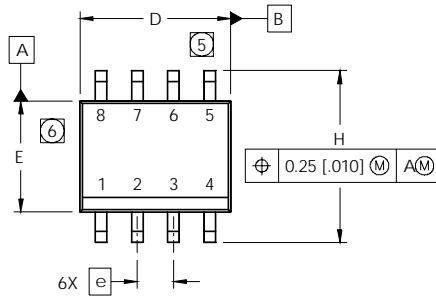


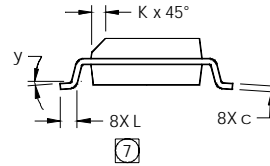
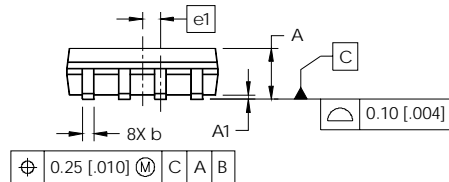
Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

SO-8 Package Outline

Dimensions are shown in millimeters (inches)



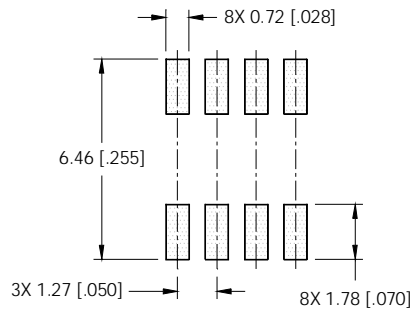
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40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



NOTES:

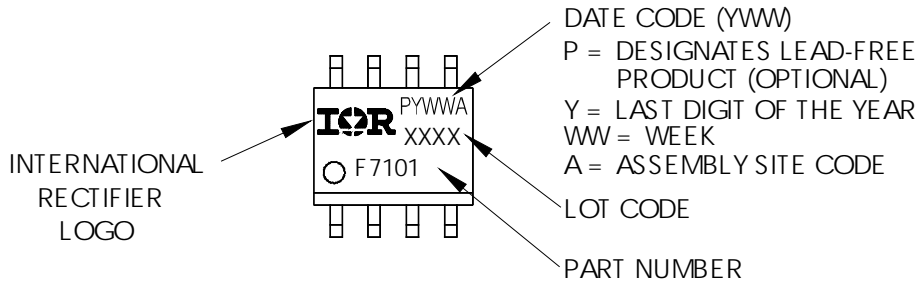
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
6. DIMENSION DOES NOT INCLUDE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

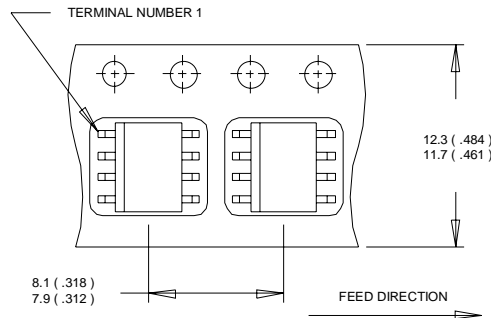


IRF7478PbF

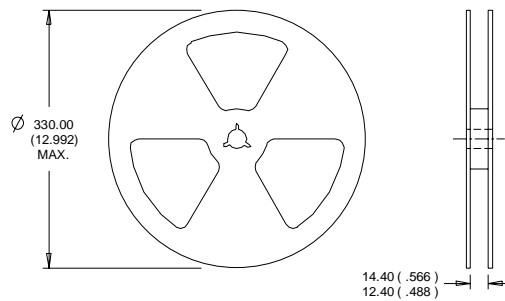
SO-8 Tape and Reel

Dimensions are shown in millimeters (inches)

International
IR Rectifier



- 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.

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 Consumer market.
Qualifications Standards can be found on IR's Web site.

International
IR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903

Visit us at www.irf.com for sales contact information.09/04

www.irf.com