

International
IRF Rectifier

SMPS MOSFET

PD- 91330F

IRF7413

HEXFET® Power MOSFET

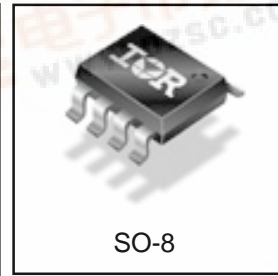
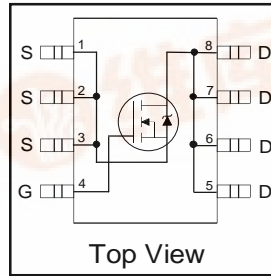
Applications

- High frequency DC-DC converters

V_{DSS}	R_{DS(on)} max(mΩ)	I_D
30V	11 @ V_{GS} = 10V	12A

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°C	Continuous Drain Current, V _{GS} @ 10V	12	A
I _D @ T _A = 70°C	Continuous Drain Current, V _{GS} @ 10V	9.6	
I _{DM}	Pulsed Drain Current ①	96	
P _D @ T _A = 25°C	Power Dissipation②	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	1.0	V/ns
T _J	Operating Junction and Storage Temperature Range	-55 to + 150	°C
T _{STG}	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 ④ are on page 8

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.03	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	11	m Ω	$V_{GS} = 10V, I_D = 7.2A$ ③
		—	—	18		$V_{GS} = 4.5V, I_D = 6.0A$
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	1.0	μA	$V_{DS} = 24V, V_{GS} = 0V$
		—	—	25		$V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$

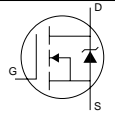
Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	16	—	—	S	$V_{DS} = 10V, I_D = 7.2A$
Q_g	Total Gate Charge	—	44	66	nC	$I_D = 7.2A$
Q_{gs}	Gate-to-Source Charge	—	7.9	—		$V_{DS} = 24V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	9.2	—		$V_{GS} = 10V,$
$t_{d(on)}$	Turn-On Delay Time	—	8.8	—		$V_{DD} = 100V$
t_r	Rise Time	—	8.0	—	ns	$I_D = 7.2A$
$t_{d(off)}$	Turn-Off Delay Time	—	35	—		$R_G = 6.2\Omega$
t_f	Fall Time	—	14	—		$V_{GS} = 10V$ ③
C_{iss}	Input Capacitance	—	1670	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	670	—		$V_{DS} = 25V$
C_{rSS}	Reverse Transfer Capacitance	—	100	—		$f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	2290	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	680	—		$V_{GS} = 0V, V_{DS} = 24V, f = 1.0\text{MHz}$
$C_{oss\ eff.}$	Effective Output Capacitance	—	1020	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 24V$ ⑤

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	—	120	mJ
I_{AR}	Avalanche Current①	—	7.2	A

Diode 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	—	—	96		
V_{SD}	Diode Forward Voltage	—	—	1.0	V	$T_J = 25^\circ\text{C}, I_S = 7.2A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	50	75	ns	$T_J = 25^\circ\text{C}, I_F = 7.2A$
Q_{rr}	Reverse Recovery Charge	—	74	110	nC	$di/dt = 100A/\mu s$ ③

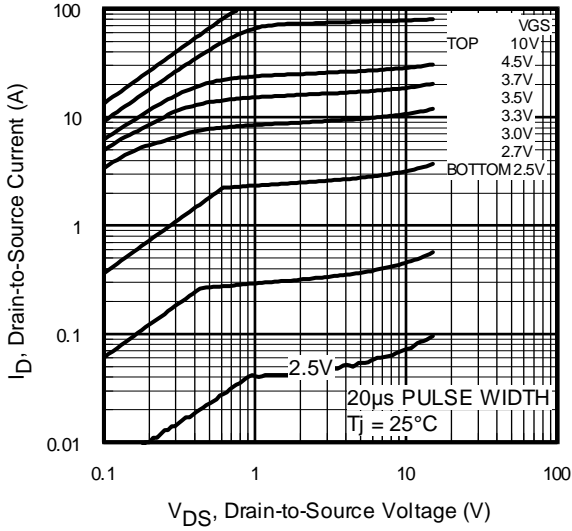


Fig 1. Typical Output Characteristics

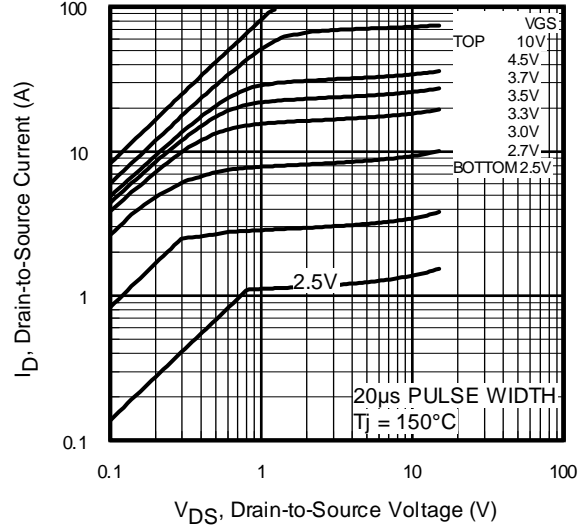


Fig 2. Typical Output Characteristics

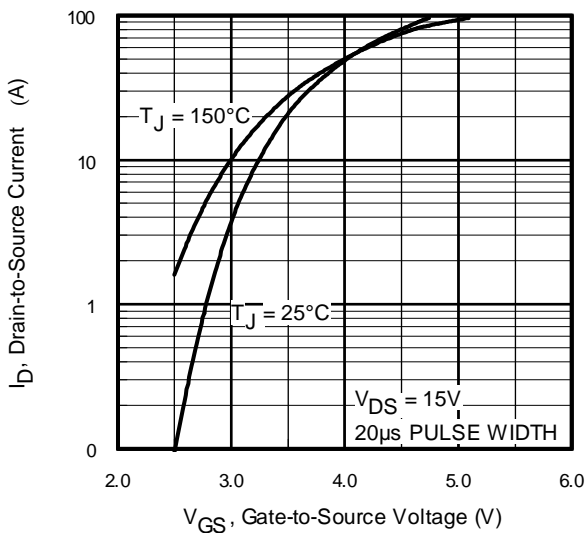


Fig 3. Typical Transfer Characteristics

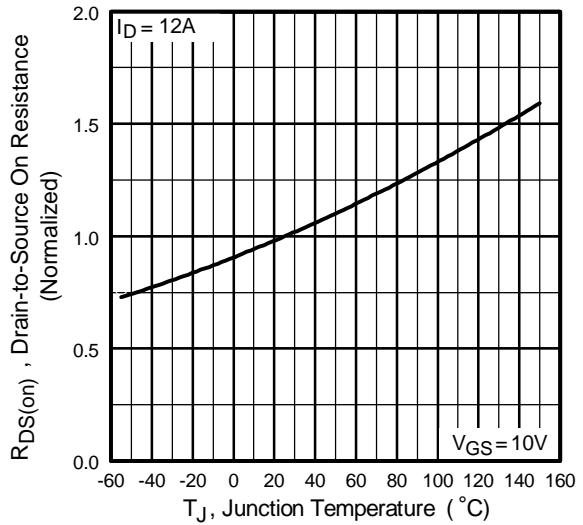


Fig 4. Normalized On-Resistance Vs. Temperature

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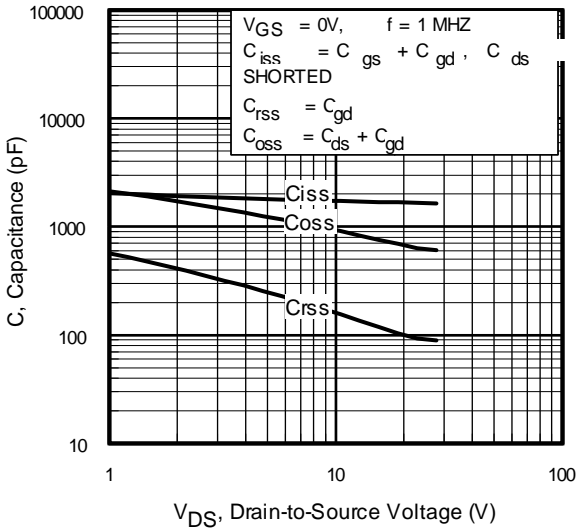


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

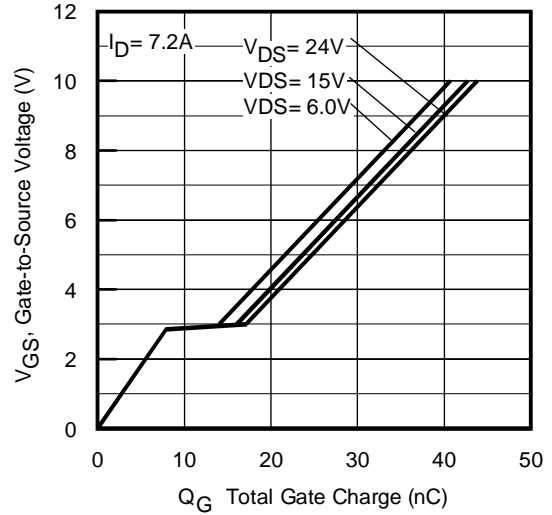


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

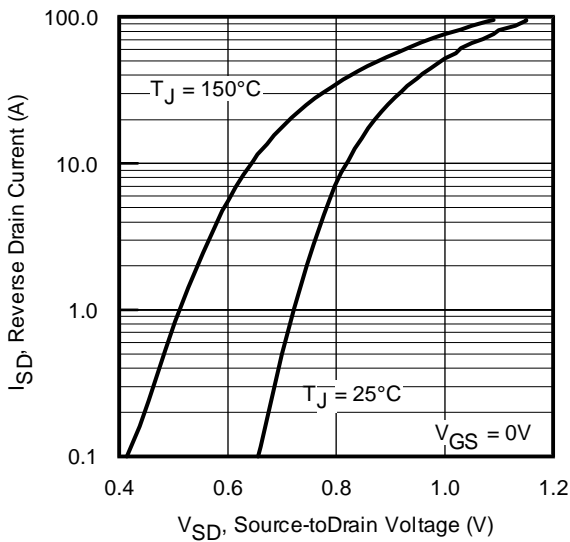


Fig 7. Typical Source-Drain Diode Forward Voltage

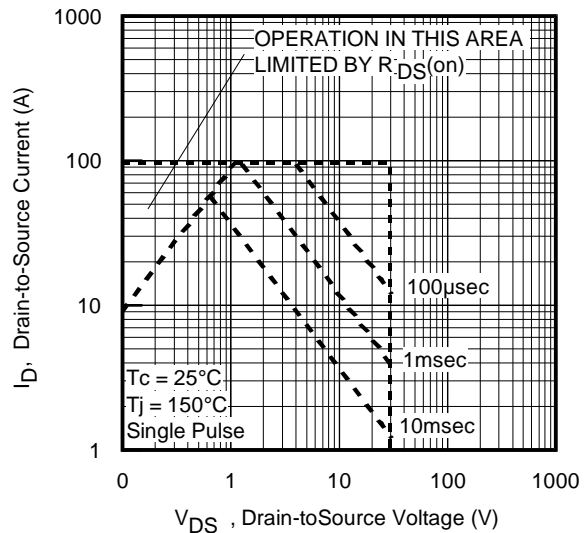


Fig 8. Maximum Safe Operating Area

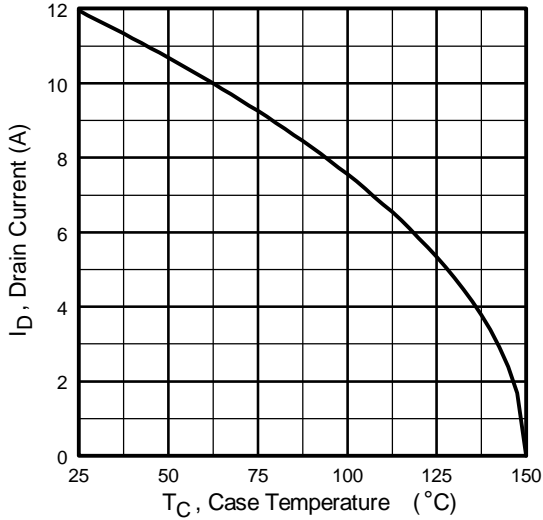


Fig 9. Maximum Drain Current Vs. Ambient Temperature

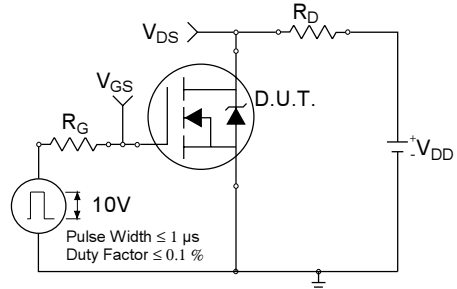


Fig 10a. Switching Time Test Circuit

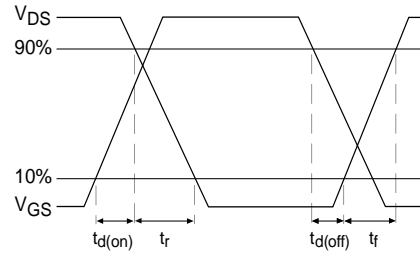


Fig 10b. Switching Time Waveforms

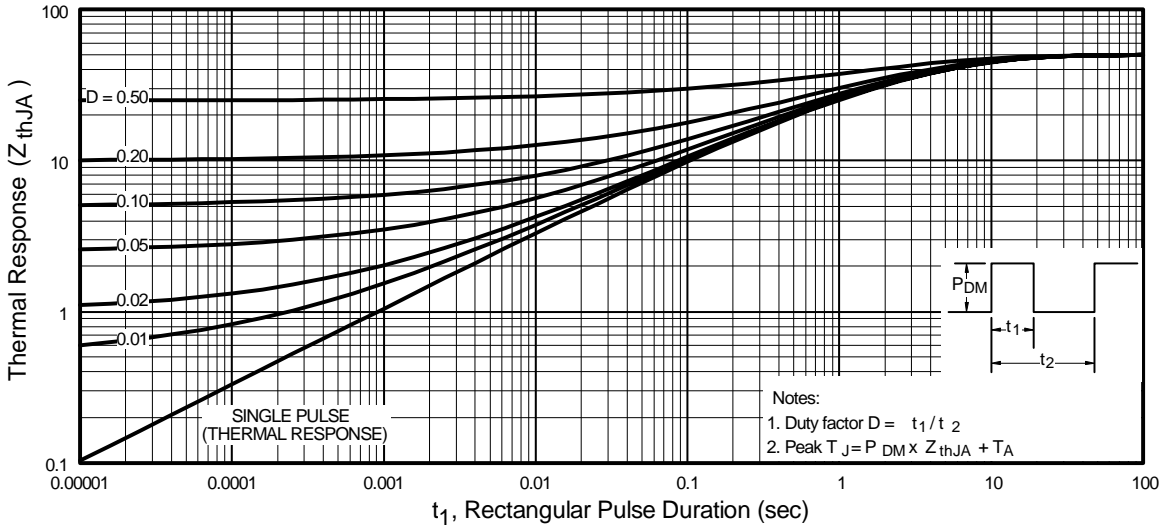


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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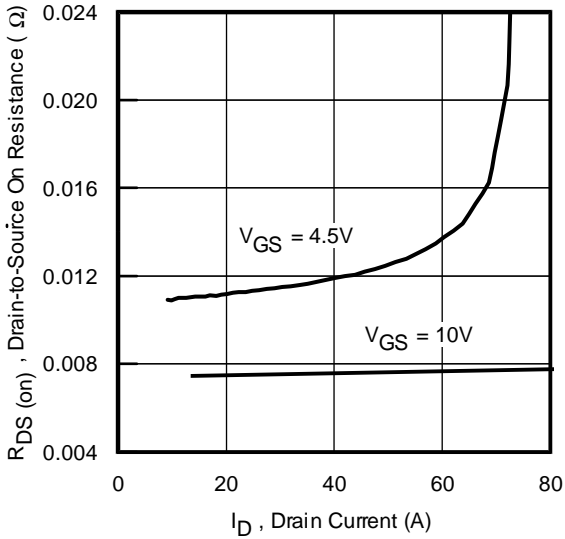


Fig 12. On-Resistance Vs. Drain Current

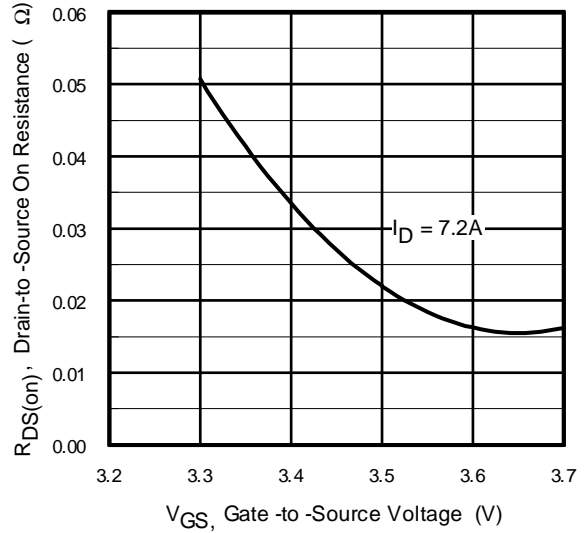


Fig 13. On-Resistance Vs. Gate Voltage

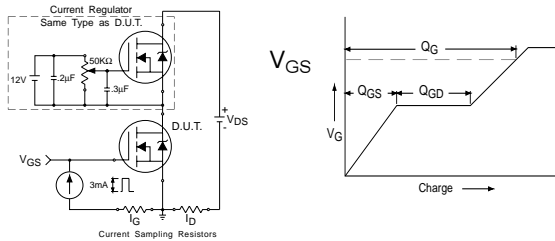


Fig 14a&b. Basic Gate Charge Test Circuit and Waveform

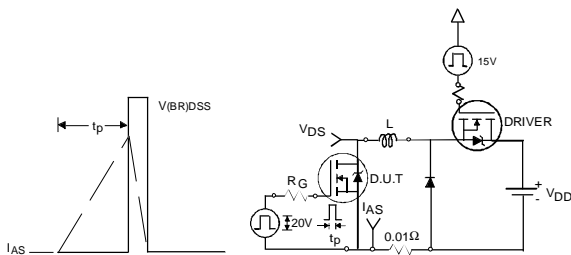


Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

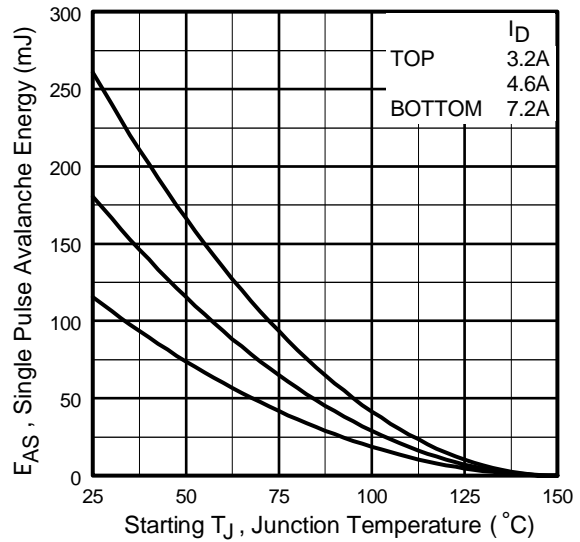
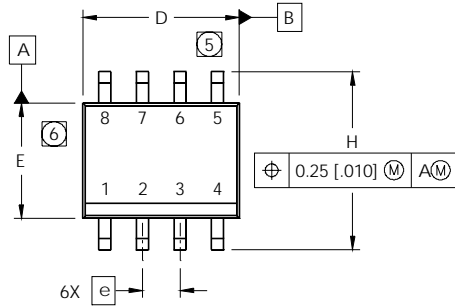
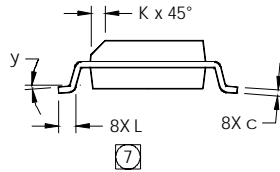
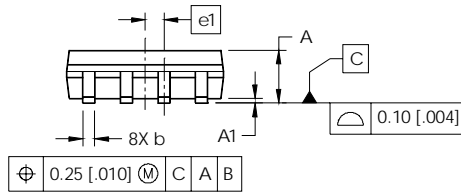


Fig 15c. Maximum Avalanche Energy Vs. Drain Current

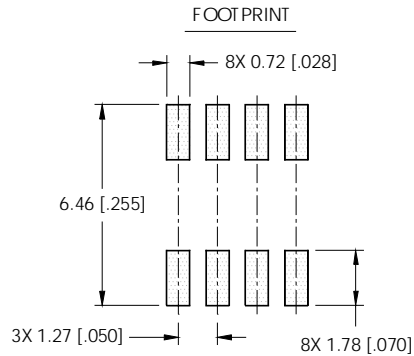
SO-8 Package Details



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°

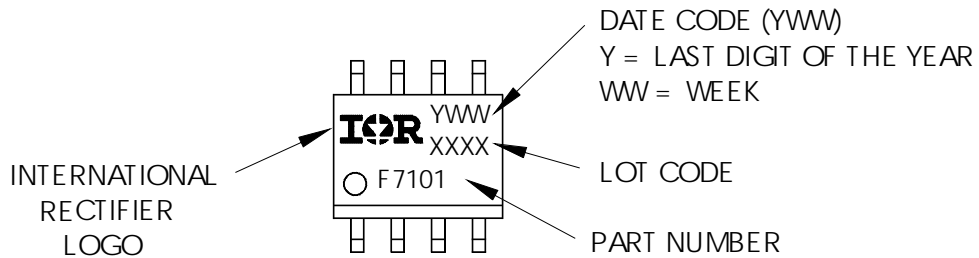


- NOTES:
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
 2. CONTROLLING DIMENSION: MILLIMETER
 3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
 4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA
 5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
 6. DIMENSION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



SO-8 Part Marking

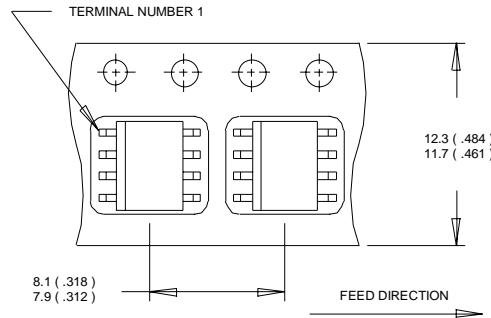
EXAMPLE: THIS IS AN IRF7101 (MOSFET)



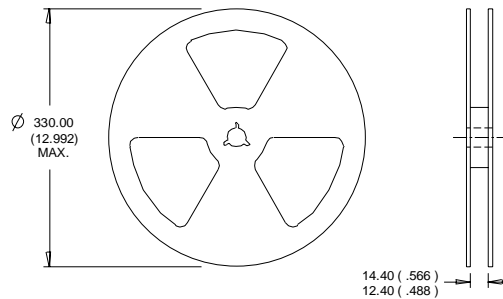
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SO-8 Tape and Reel



- 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 $T_J = 25^\circ\text{C}$, $L = 4.4\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 7.2\text{A}$.
- ③ Pulse width $\leq 300\mu\text{s}$; 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 $I_{SD} \leq 7.2\text{A}$, $di/dt \leq 120\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 150^\circ\text{C}$

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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