International
IOR Rectifier

PD- 93840B

SMPS MOSFET

IRF7456

HEXFET® Power MOSFET

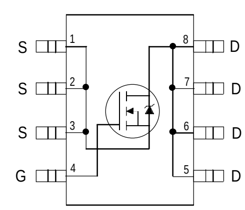
Applications

- High Frequency DC-DC Converters with Synchronous Rectification

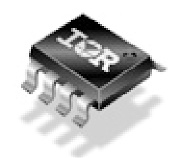
V_{DSS}	$R_{DS(on)}$ max	I_D
20V	0.0065Ω	16A

Benefits

- Ultra-Low $R_{DS(on)}$ at 4.5V V_{GS}
- Low Charge and Low Gate Impedance to Reduce Switching Losses
- Fully Characterized Avalanche Voltage and Current



Top View


SO-8

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-to-Source Voltage	± 12	V
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	16	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	13	
I_{DM}	Pulsed Drain Current①	130	
P_D @T_A = 25°C	Maximum Power Dissipation③	2.5	W
P_D @T_A = 70°C	Maximum Power Dissipation③	1.6	W
	Linear Derating Factor	0.02	W/°C
T_J , T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

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

Typical SMPS Topologies

- Telecom 48V Input Converters with Logic-Level Driven Synchronous Rectifiers

Notes ① through ④ are on page 8

4/20/00

Static @ 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, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.024	——	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	0.0047	0.0065	Ω	V_{GS} = 10V, I_D = 16A ③
		——	0.0057	0.0075		V_{GS} = 4.5V, I_D = 13A ③
		——	0.011	0.020		V_{GS} = 2.8V, I_D = 3.5A ③
$V_{GS(th)}$	Gate Threshold Voltage	0.6	——	2.0	V	V_{DS} = V_{GS}, I_D = 250μA
I_{DSS}	Drain-to-Source Leakage Current	——	——	20	μA	V_{DS} = 16V, V_{GS} = 0V
		——	——	100		V_{DS} = 16V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	200	nA	V_{GS} = 12V
	Gate-to-Source Reverse Leakage	——	——	-200		V_{GS} = -12V

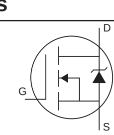
Dynamic @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	44	——	——	S	V_{DS} = 10V, I_D = 16A
Q_g	Total Gate Charge	——	41	62		I_D = 16A
Q_{gs}	Gate-to-Source Charge	——	9.7	15	nC	V_{DS} = 16V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	18	27		V_{GS} = 5.0V, ③
$t_{d(on)}$	Turn-On Delay Time	——	20	——		V_{DD} = 10V
t_r	Rise Time	——	25	——	ns	I_D = 1.0A
$t_{d(off)}$	Turn-Off Delay Time	——	50	——		R_G = 6.0Ω
t_f	Fall Time	——	52	——		V_{GS} = 4.5V ③
C_{iss}	Input Capacitance	——	3640	——		V_{GS} = 0V
C_{oss}	Output Capacitance	——	1570	——		V_{DS} = 15V
C_{rss}	Reverse Transfer Capacitance	——	330	——	pF	f = 1.0MHz

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	——	250	mJ
I_{AR}	Avalanche Current①	——	16	A
E_{AR}	Repetitive Avalanche Energy①	——	0.25	mJ

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	2.5	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	130		
V_{SD}	Diode Forward Voltage	——	——	1.2	V	T_J = 25°C, I_S = 2.5A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	——	48	72	ns	T_J = 25°C, I_F = 2.5A
Q_{rr}	Reverse RecoveryCharge	——	74	110	nC	di/dt = 100A/μs ③

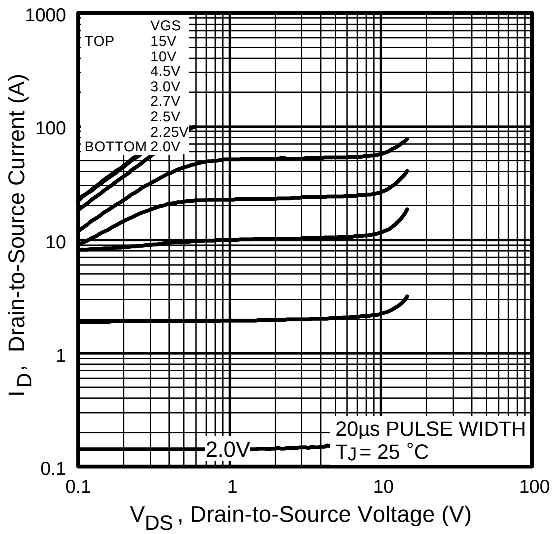


Fig 1. Typical Output Characteristics

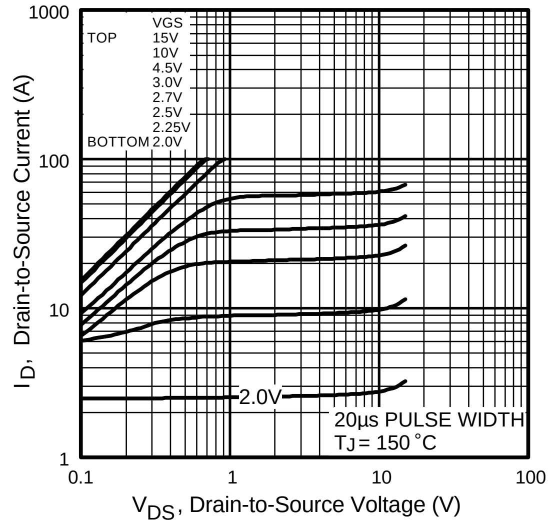


Fig 2. Typical Output Characteristics

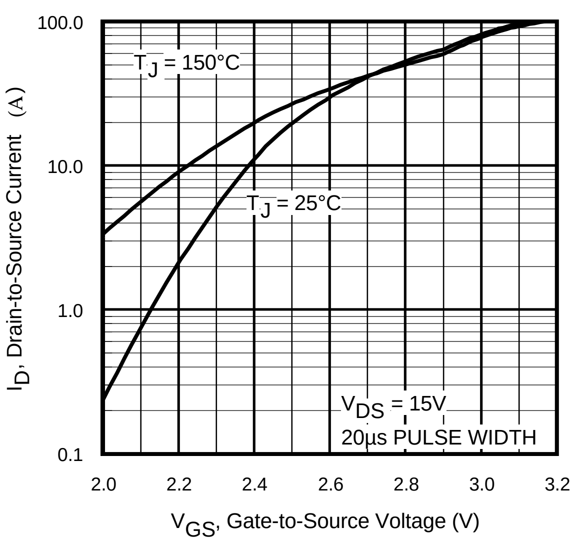


Fig 3. Typical Transfer Characteristics

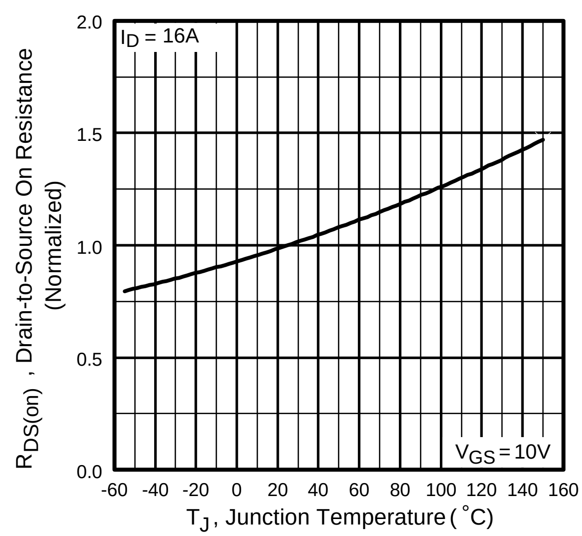


Fig 4. Normalized On-Resistance
Vs. Temperature

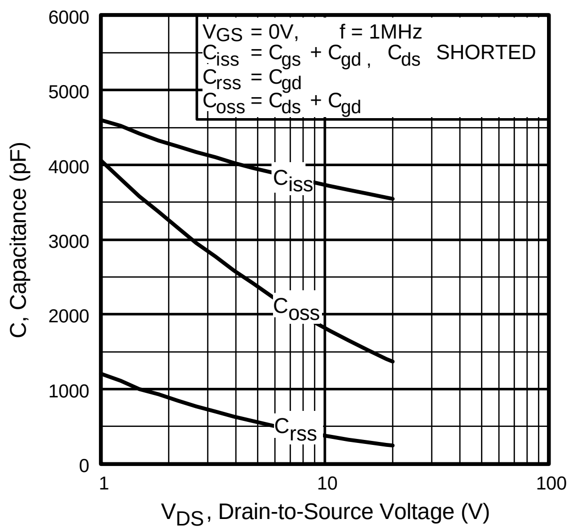


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

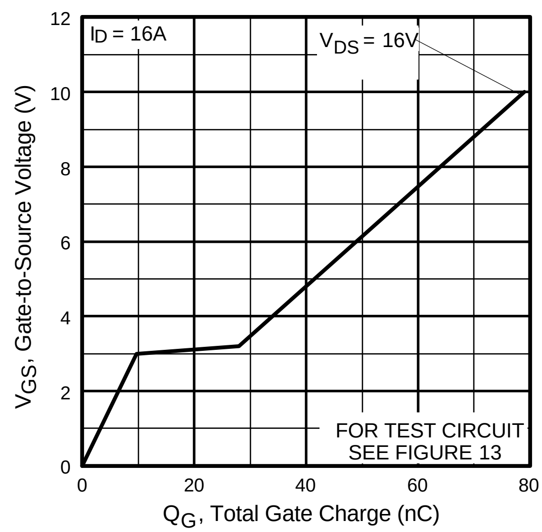


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

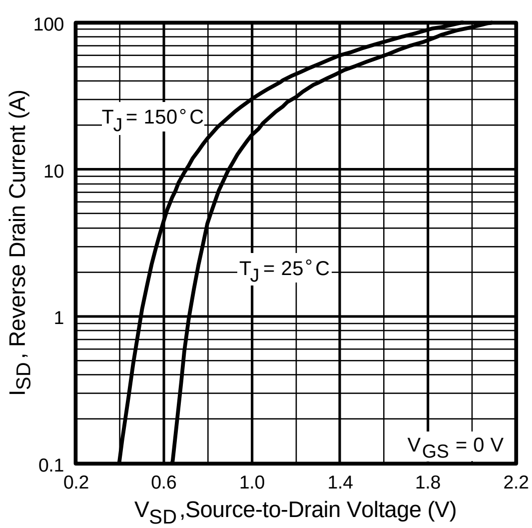


Fig 7. Typical Source-Drain Diode Forward Voltage

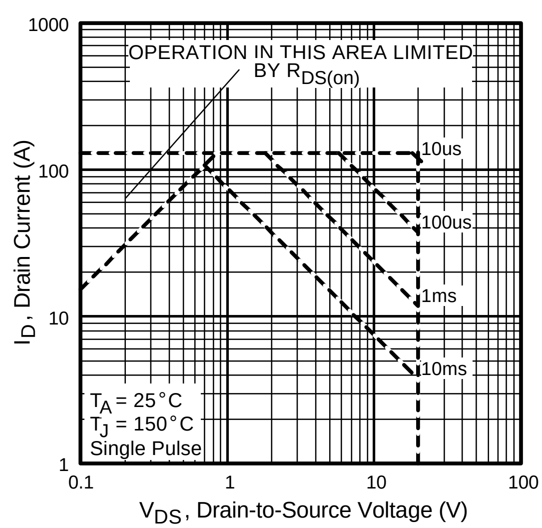


Fig 8. Maximum Safe Operating Area

Fig 6. On-Resistance Vs. Drain Current

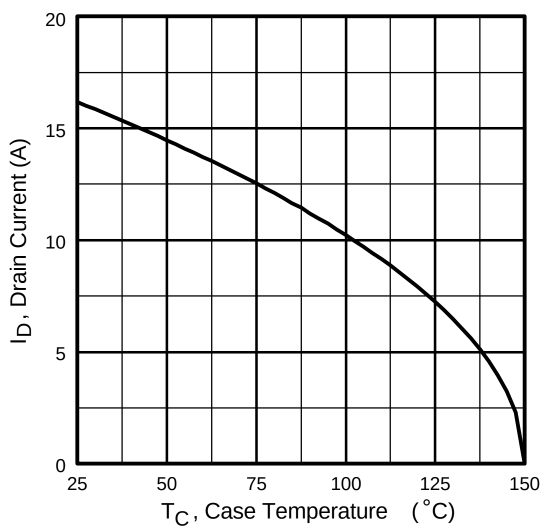


Fig 9. Maximum Drain Current Vs. Case Temperature

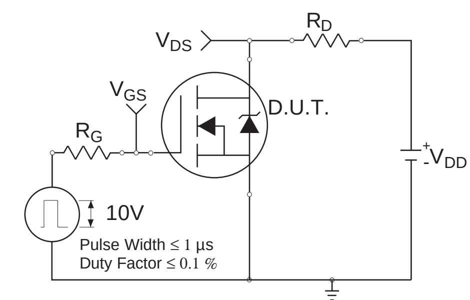


Fig 10a. Switching Time Test Circuit

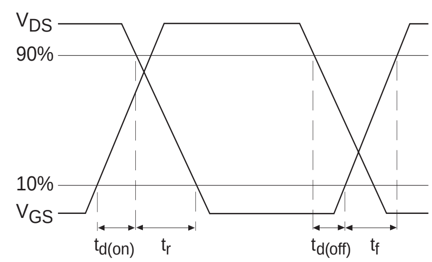


Fig 10b. Switching Time Waveforms

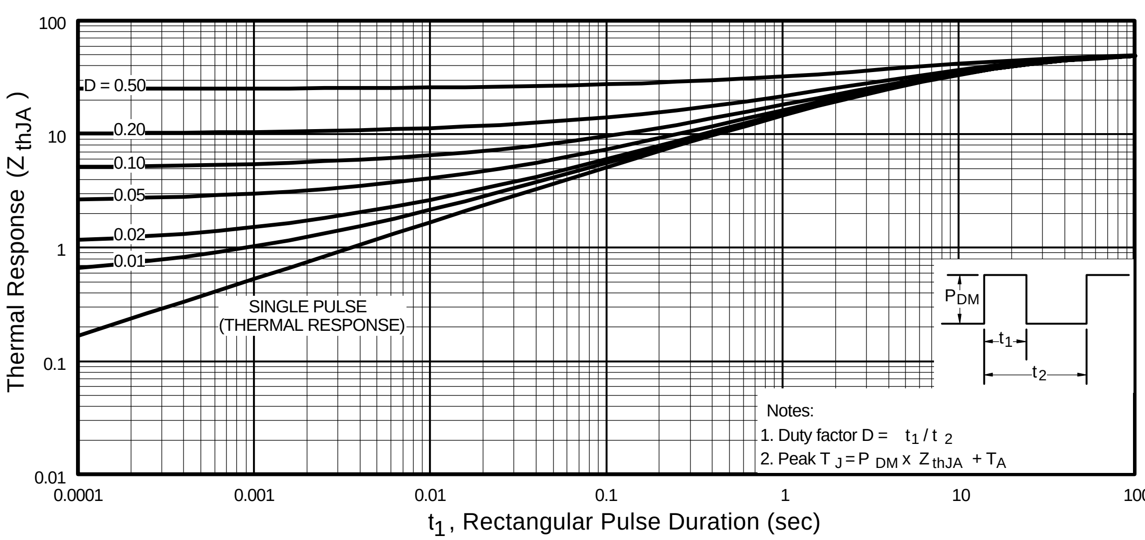


Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Case

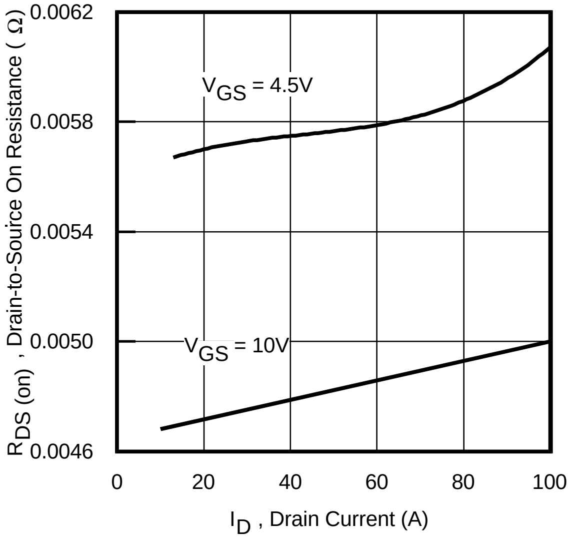


Fig 12. On-Resistance Vs. Drain Current

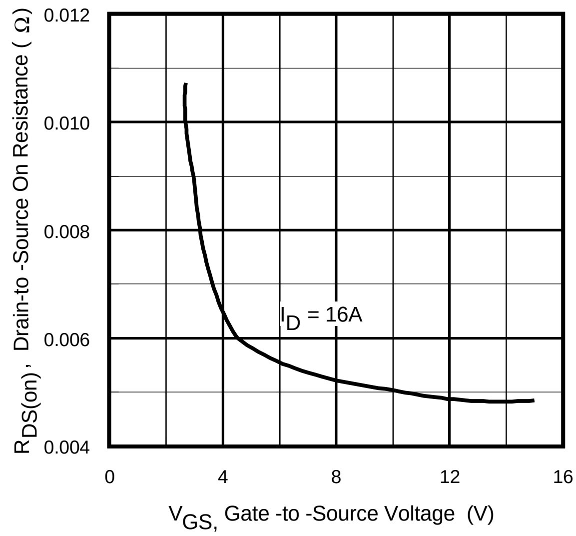


Fig 13. On-Resistance Vs. Gate Voltage

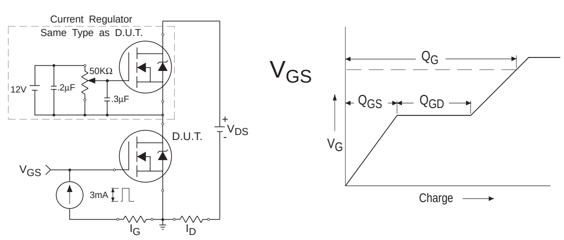


Fig 13a&b. Basic Gate Charge Test Circuit and Waveform

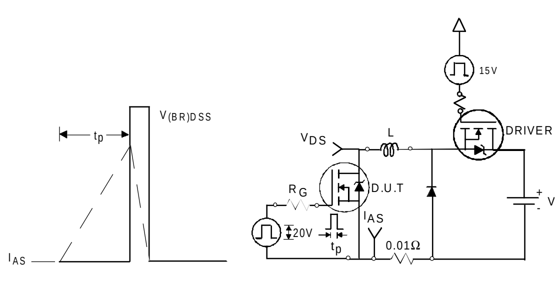


Fig 14a&b. Unclamped Inductive Test circuit and Waveforms

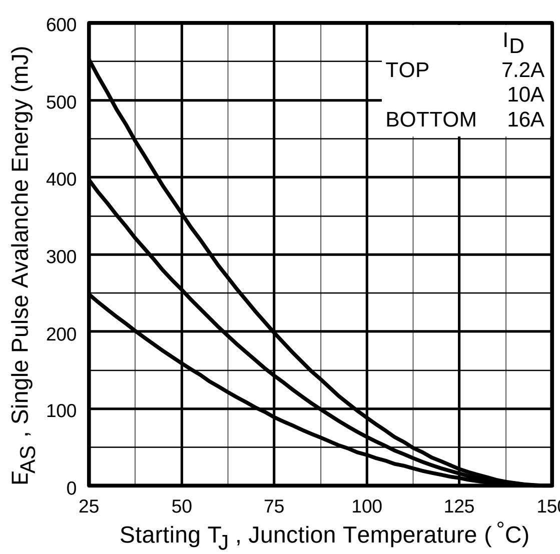
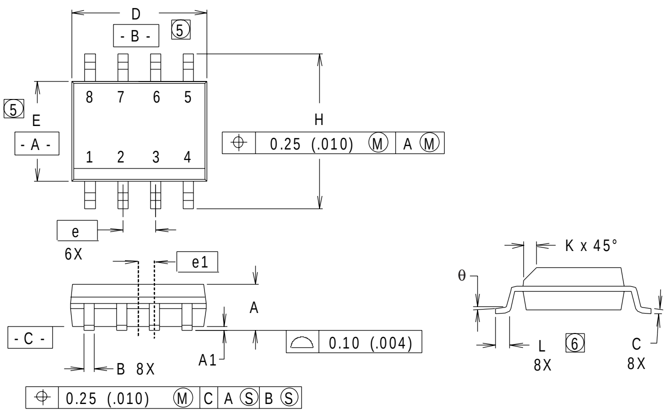


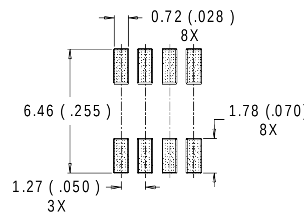
Fig 14c. Maximum Avalanche Energy Vs. Drain Current

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	.014	.018	0.36	0.46
C	.0075	.0098	0.19	0.25
D	.189	.196	4.80	4.98
E	.150	.157	3.81	3.99
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.011	.019	0.28	0.48
L	0.16	.050	0.41	1.27
θ	0°	8°	0°	8°

RECOMMENDED FOOTPRINT

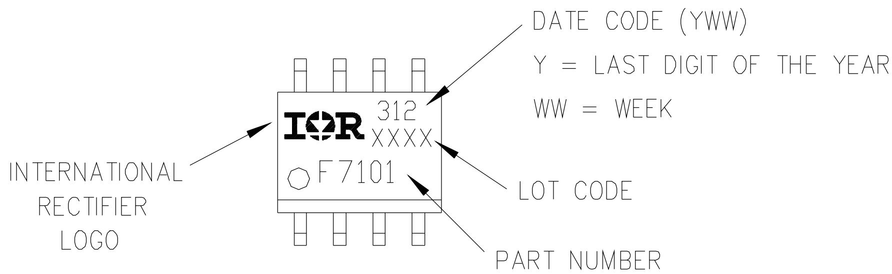


NOTES:

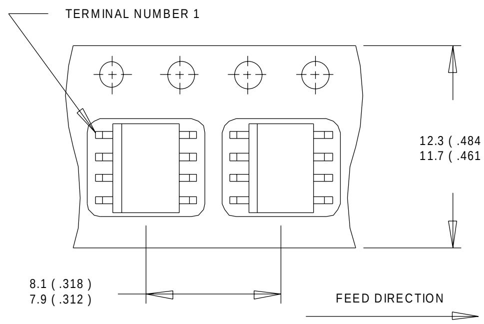
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1982.
2. CONTROLLING DIMENSION : INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS
   MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.006).
6. DIMENSIONS IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE..

SO-8 Part Marking

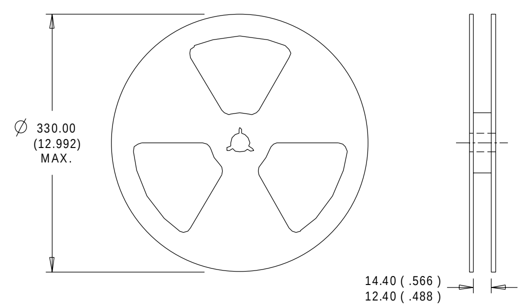
EXAMPLE: THIS IS AN IRF7101



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 $T_J = 25°C$, L = 2.0mH $R_G = 25\Omega$, $I_{AS} = 16A$.

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

④ When mounted on 1 inch square copper board, t<10 sec

International
IOR Rectifier

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IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 (0) 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 011 451 0111
IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo 171 Tel: 81 (0)3 3983 0086
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Data and specifications subject to change without notice. 4/00