

International
IR Rectifier

SMPS MOSFET

IRF7456

HEXFET® Power MOSFET

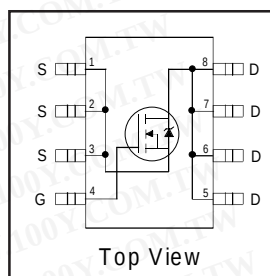
Applications

- High Frequency DC-DC Converters with Synchronous Rectification

V_{DS}	$R_{DS(on)}$ 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



Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-to-Source Voltage	± 12	V
I_D @ $T_A = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	16	A
I_D @ $T_A = 70^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	13	
I_{DM}	Pulsed Drain Current①	130	
P_D @ $T_A = 25^\circ\text{C}$	Maximum Power Dissipation③	2.5	W
P_D @ $T_A = 70^\circ\text{C}$	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
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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	20	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.024	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	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	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 16V, V_{GS} = 0V$
		—	—	100		$V_{DS} = 16V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 12V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -12V$

Dynamic @ $T_J = 25^\circ\text{C}$ (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	nC	$I_D = 16A$
Q_{gs}	Gate-to-Source Charge	—	9.7	15		$V_{DS} = 16V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	18	27		$V_{GS} = 5.0V$, ③
$t_{d(on)}$	Turn-On Delay Time	—	20	—	ns	$V_{DD} = 10V$
t_r	Rise Time	—	25	—		$I_D = 1.0A$
$t_{d(off)}$	Turn-Off Delay Time	—	50	—		$R_G = 6.0\Omega$
t_f	Fall Time	—	52	—		$V_{GS} = 4.5V$ ③
C_{iss}	Input Capacitance	—	3640	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1570	—		$V_{DS} = 15V$
C_{rss}	Reverse Transfer Capacitance	—	330	—		$f = 1.0MHz$

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	$T_J = 25^\circ\text{C}, I_S = 2.5A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	48	72	ns	$T_J = 25^\circ\text{C}, I_F = 2.5A$
Q_{rr}	Reverse Recovery Charge	—	74	110	nC	$di/dt = 100A/\mu s$ ③

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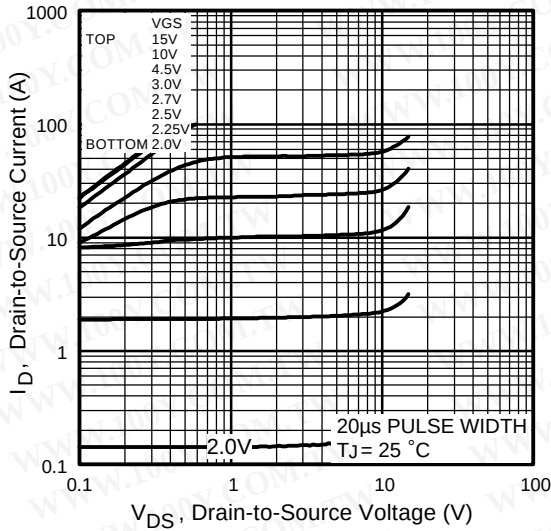


Fig 1. Typical Output Characteristics

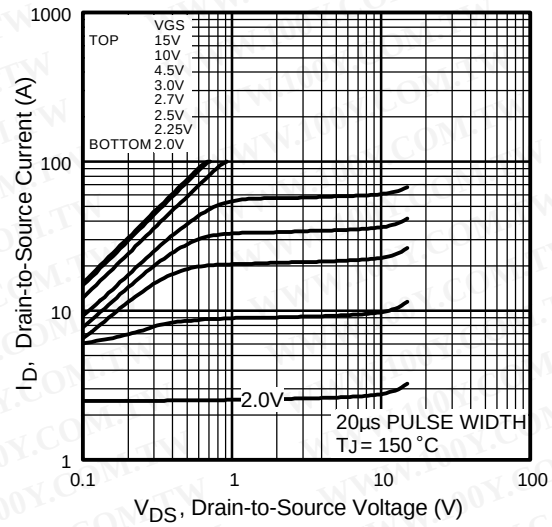


Fig 2. Typical Output Characteristics

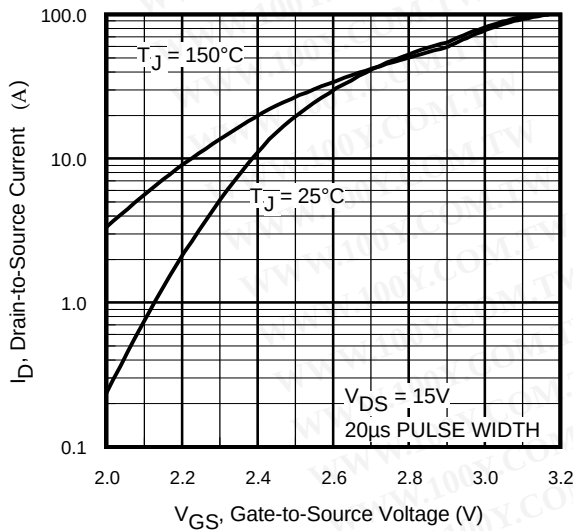


Fig 3. Typical Transfer Characteristics

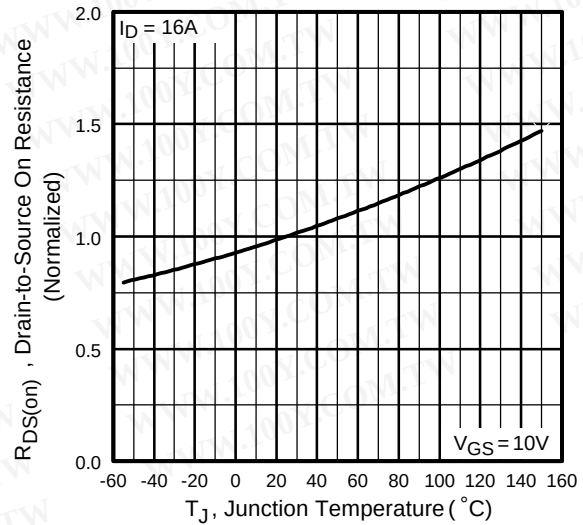


Fig 4. Normalized On-Resistance
 Vs. Temperature

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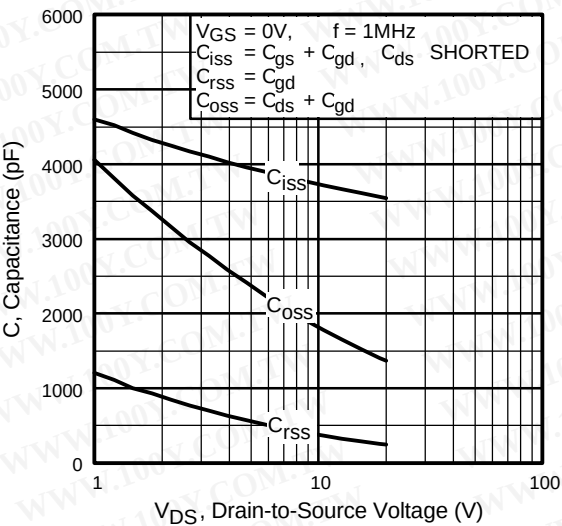


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

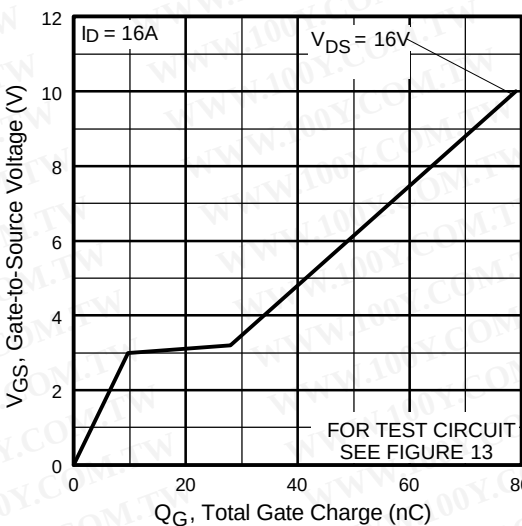


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

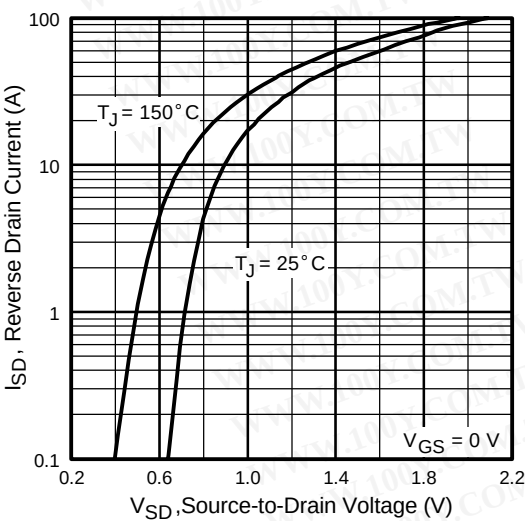


Fig 7. Typical Source-Drain Diode Forward Voltage

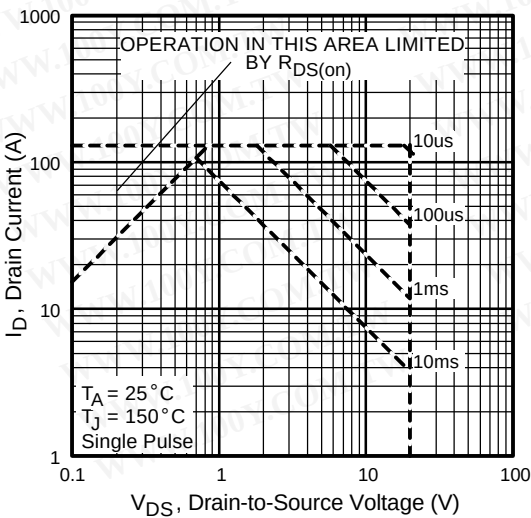


Fig 8. Maximum Safe Operating Area

Fig 6. On-Resistance Vs. Drain Current

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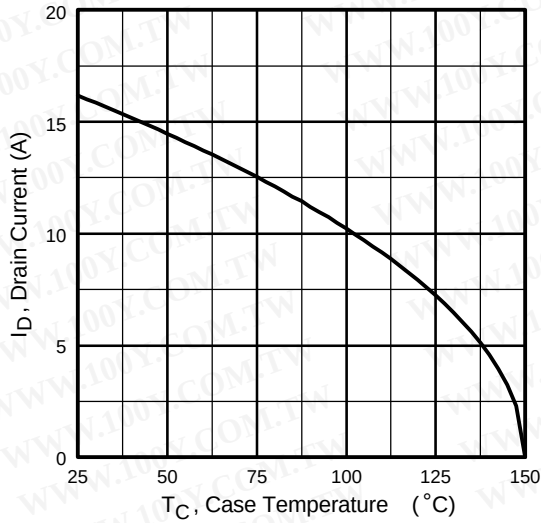


Fig 9. Maximum Drain Current Vs. Case Temperature

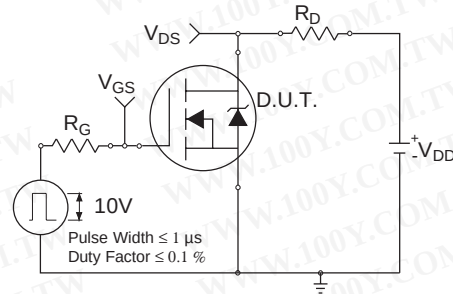


Fig 10a. Switching Time Test Circuit

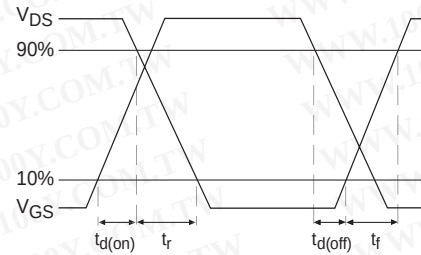


Fig 10b. Switching Time Waveforms

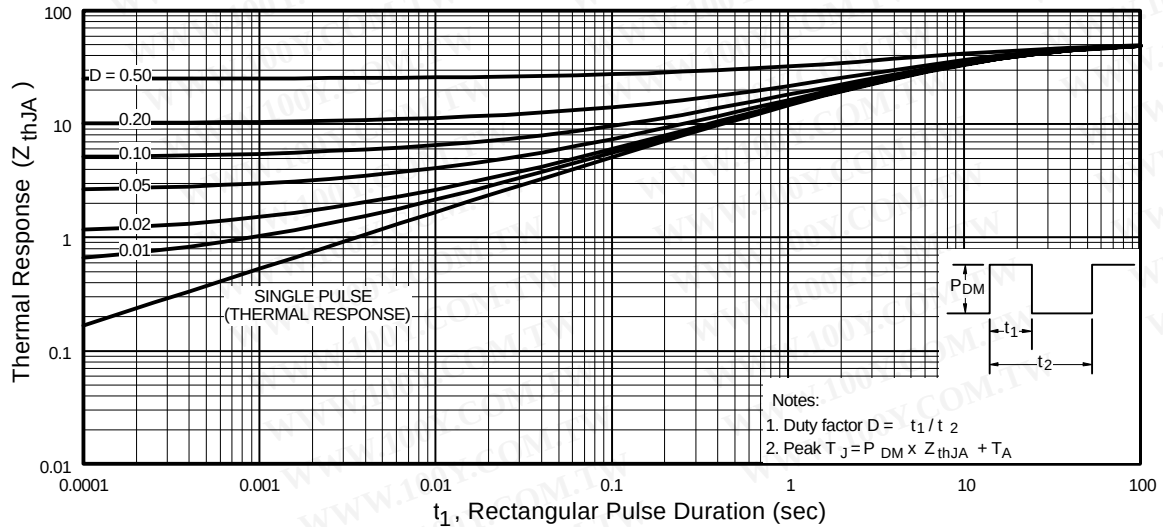


Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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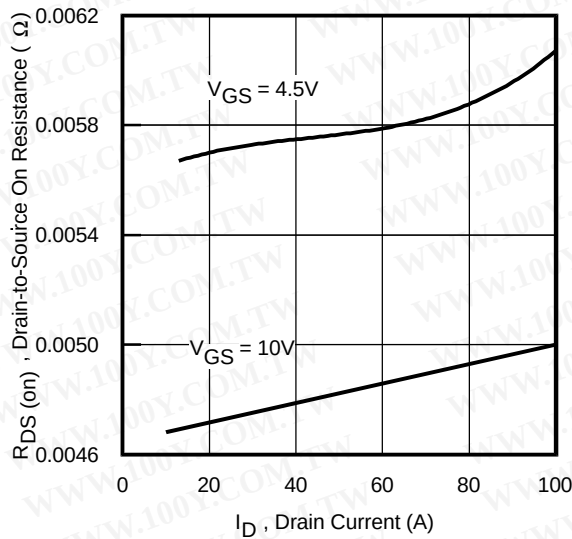


Fig 12. On-Resistance Vs. Drain Current

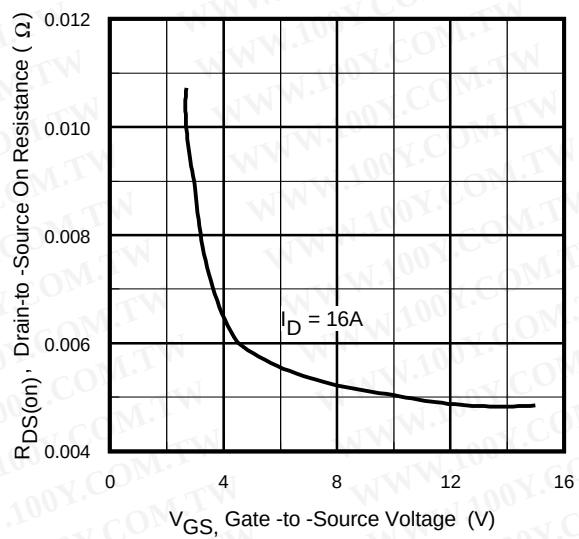


Fig 13. On-Resistance Vs. Gate Voltage

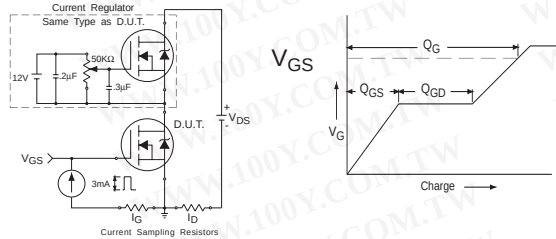


Fig 13a&b. Basic Gate Charge Test Circuit and Waveform

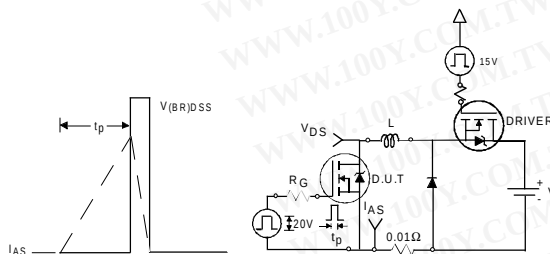


Fig 14a&b. Unclamped Inductive Test circuit and Waveforms

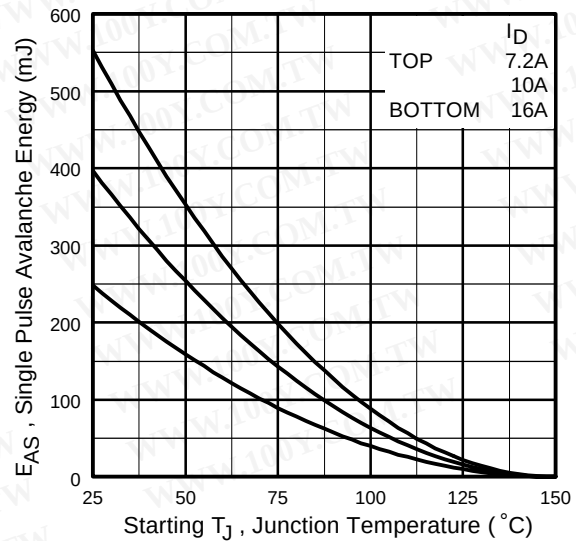
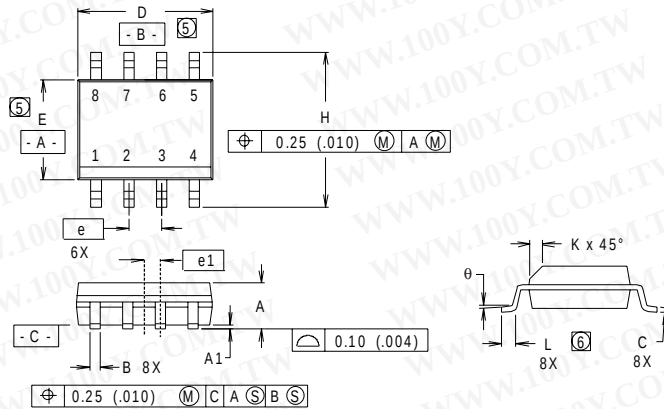


Fig 14c. Maximum Avalanche Energy Vs. Drain Current

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SO-8 Package Details

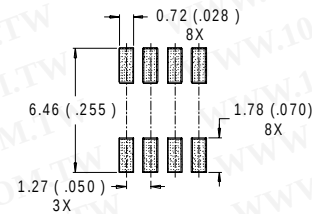


NOTES:

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..

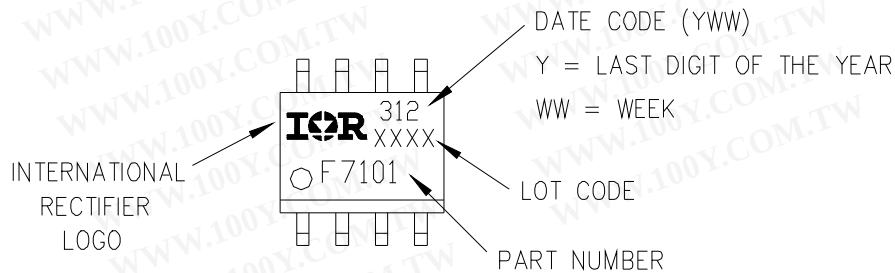
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
B	.014	.018	0.36	0.46
C	.0075	.0098	0.19	0.25
D	.189	.196	4.80	4.98
E	.150	.157	3.81	3.99
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.011	.019	0.28	0.48
L	0.16	.050	0.41	1.27
θ	0°	8°	0°	8°

RECOMMENDED FOOTPRINT



SO-8 Part Marking

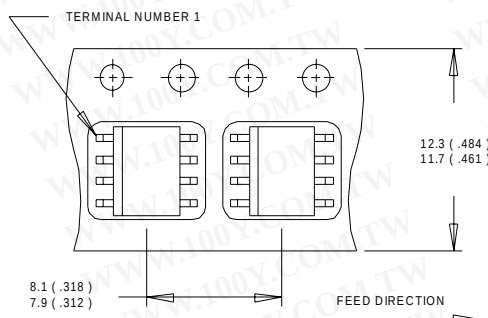
EXAMPLE: THIS IS AN IRF7101



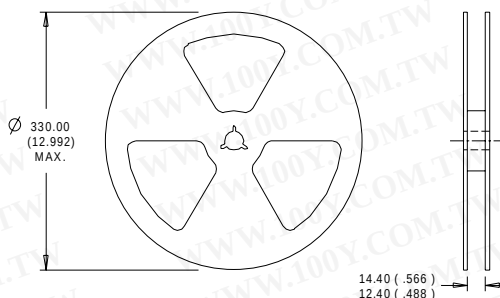
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SO-8 Tape and Reel



- 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 $T_J = 25^\circ\text{C}$, $L = 2.0\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 16\text{A}$.
- ③ Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ When mounted on 1 inch square copper board, $t < 10$ sec

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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
IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994 Tel: ++ 65 (0)838 4630
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Data and specifications subject to change without notice. 4/00

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