

International **IR** Rectifier

SMPS MOSFET

PD - 93937B

IRF3707
 IRF3707S
 IRF3707L

HEXFET® Power MOSFET

Applications

- High Frequency DC-DC Isolated Converters with Synchronous Rectification for Telecom and Industrial use
- High Frequency Buck Converters for Computer Processor Power

V_{DSS}	R_{DS(on)} max	I_D
30V	12.5mΩ	62A

Benefits

- Ultra-Low Gate Impedance
- Very Low R_{DS(on)}
- Fully Characterized Avalanche Voltage and Current



Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V _{DS}	Drain-Source Voltage	30	V
V _{GS}	Gate-to-Source Voltage	± 20	V
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V	62	A
I _D @ T _C = 70°C	Continuous Drain Current, V _{GS} @ 10V	52	
I _{DM}	Pulsed Drain Current ^①	248	
P _D @ T _C = 25°C	Maximum Power Dissipation ^③	87	W
P _D @ T _C = 70°C	Maximum Power Dissipation ^③	61	W
	Linear Derating Factor	0.59	mW/°C
T _J , T _{STG}	Junction and Storage Temperature Range	-55 to + 175	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
R _{θJC}	Junction-to-Case	—	1.73	°C/W
R _{θCS}	Case-to-Sink, Flat, Greased Surface ^④	0.50	—	
R _{θJA}	Junction-to-Ambient ^④	—	62	
R _{θJA}	Junction-to-Ambient (PCB mount)*	—	40	

* When mounted on 1" square PCB (FR-4 or G-10 Material) .
 For recommended footprint and soldering techniques refer to application note #AN-994

Notes ① through ④ are on page 10

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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	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.027	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	9.0	12.5	mΩ	$V_{GS} = 10V, I_D = 15A$ ③
		—	12.6	17		$V_{GS} = 4.5V, I_D = 12A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	3.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 24V, V_{GS} = 0V$
		—	—	100		$V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 16V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -16V$

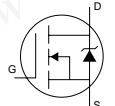
Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	37	—	—	S	$V_{DS} = 15V, I_D = 49.6A$
Q_g	Total Gate Charge	—	19	—	nC	$I_D = 24.8A$
Q_{gs}	Gate-to-Source Charge	—	8.2	—		$V_{DS} = 15V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	6.3	—		$V_{GS} = 4.5V$ ③
Q_{oss}	Output Gate Charge	—	18	27		$V_{GS} = 0V, V_{DS} = 15V$
$t_{d(on)}$	Turn-On Delay Time	—	8.5	—	ns	$V_{DD} = 15V$
t_r	Rise Time	—	78	—		$I_D = 24.8A$
$t_{d(off)}$	Turn-Off Delay Time	—	11.8	—		$R_G = 1.8\Omega$
t_f	Fall Time	—	3.3	—		$V_{GS} = 4.5V$ ③
C_{iss}	Input Capacitance	—	1990	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	707	—		$V_{DS} = 15V$
C_{rss}	Reverse Transfer Capacitance	—	50	—		$f = 1.0MHz$

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	—	213	mJ
I_{AR}	Avalanche Current①	—	62	A

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	62	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	248		
V_{SD}	Diode Forward Voltage	—	0.88	1.3	V	$T_J = 25^\circ\text{C}, I_S = 31A, V_{GS} = 0V$ ③
		—	0.8	—		$T_J = 125^\circ\text{C}, I_S = 31A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	39	59	ns	$T_J = 25^\circ\text{C}, I_F = 31A, V_R = 20V$
Q_{rr}	Reverse Recovery Charge	—	49	74	nC	$di/dt = 100A/\mu s$ ③
t_{rr}	Reverse Recovery Time	—	42	63	ns	$T_J = 125^\circ\text{C}, I_F = 31A, V_R = 20V$
Q_{rr}	Reverse Recovery Charge	—	62	93	nC	$di/dt = 100A/\mu s$ ③

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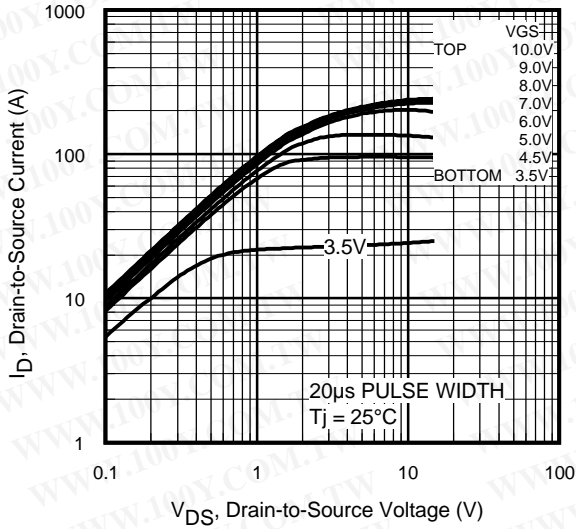


Fig 1. Typical Output Characteristics

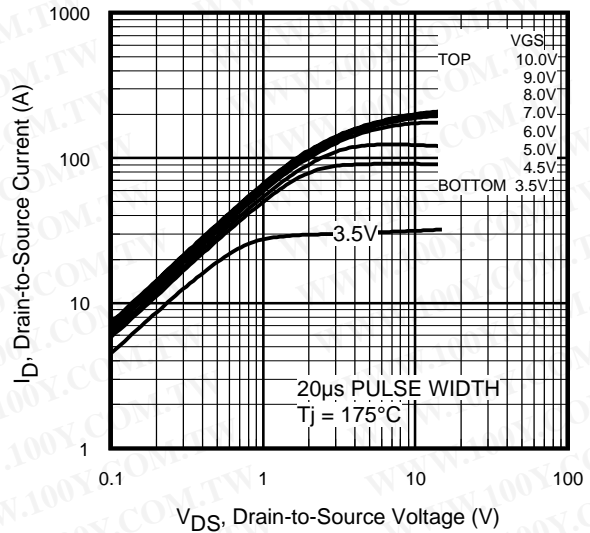


Fig 2. Typical Output Characteristics

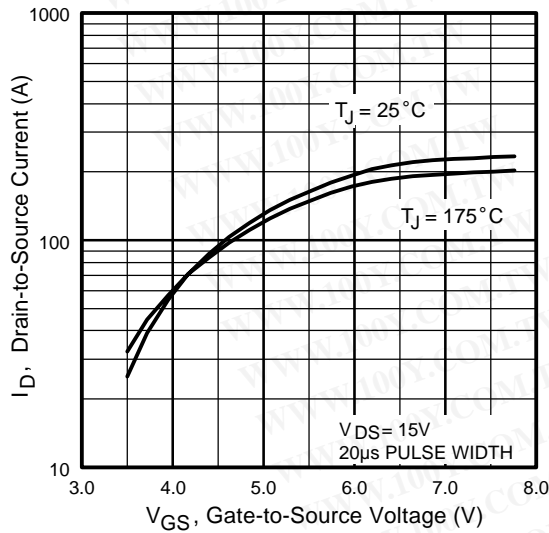


Fig 3. Typical Transfer Characteristics

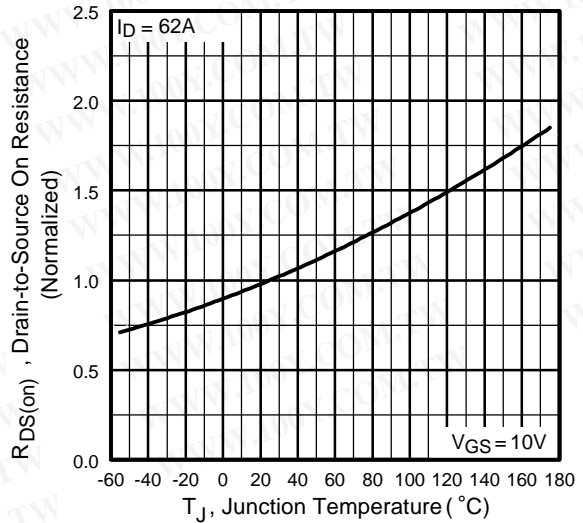


Fig 4. Normalized On-Resistance Vs. Temperature

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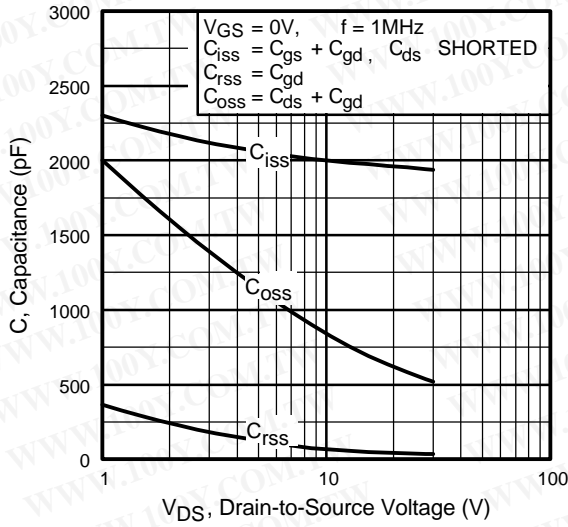


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

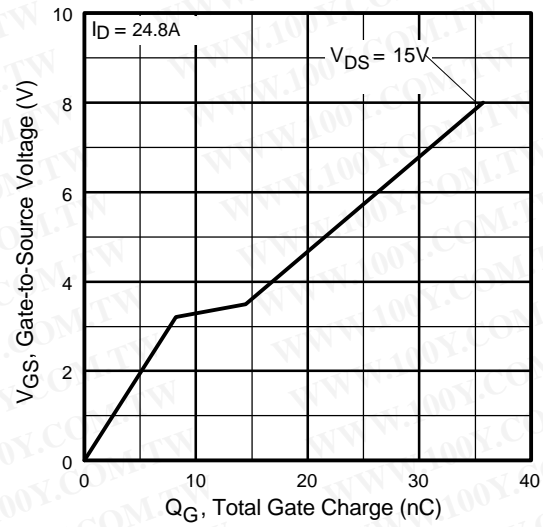


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

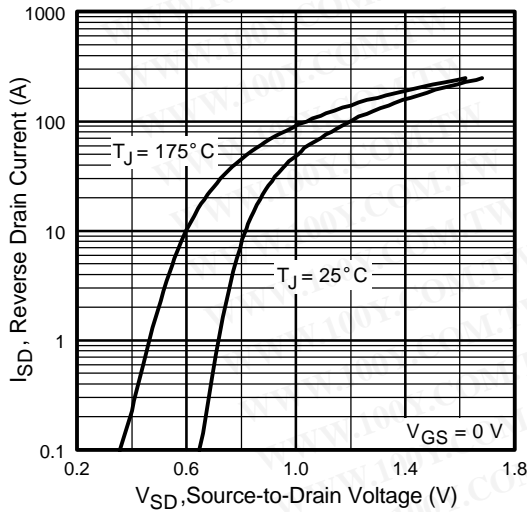


Fig 7. Typical Source-Drain Diode Forward Voltage

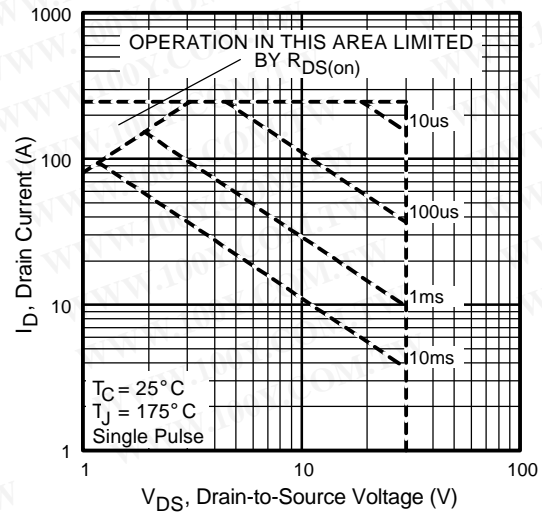


Fig 8. Maximum Safe Operating Area

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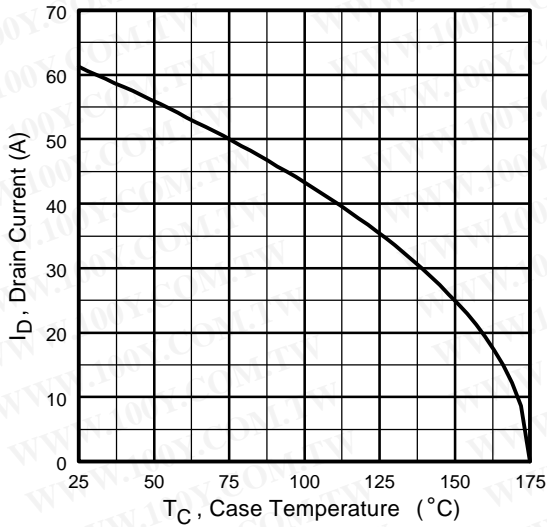


Fig 9. Maximum Drain Current Vs. Case Temperature

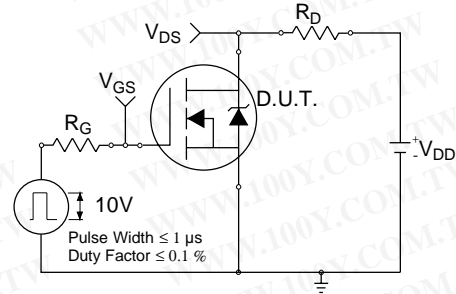


Fig 10a. Switching Time Test Circuit

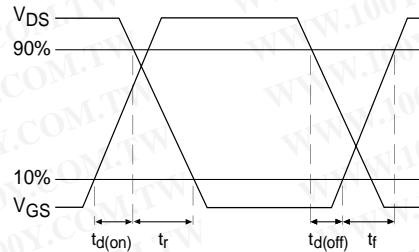


Fig 10b. Switching Time Waveforms

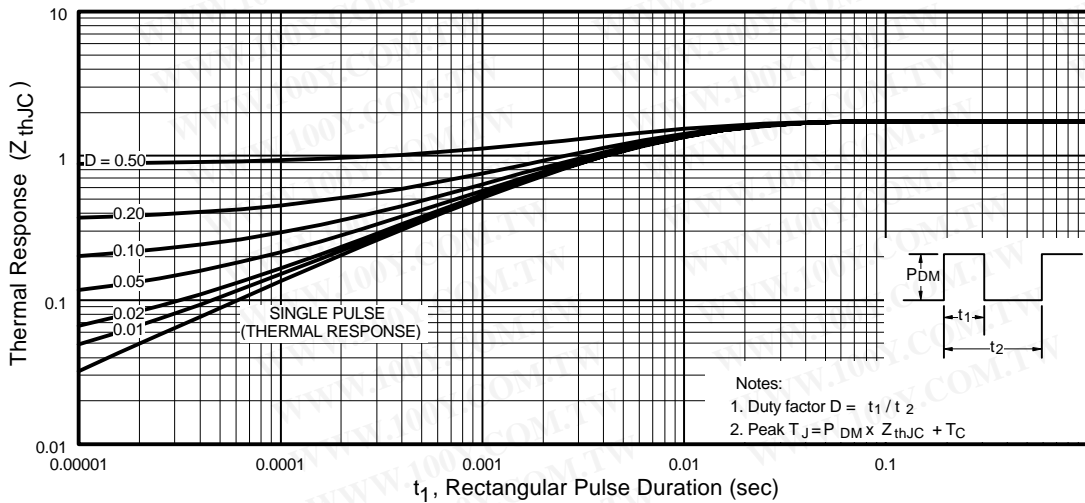


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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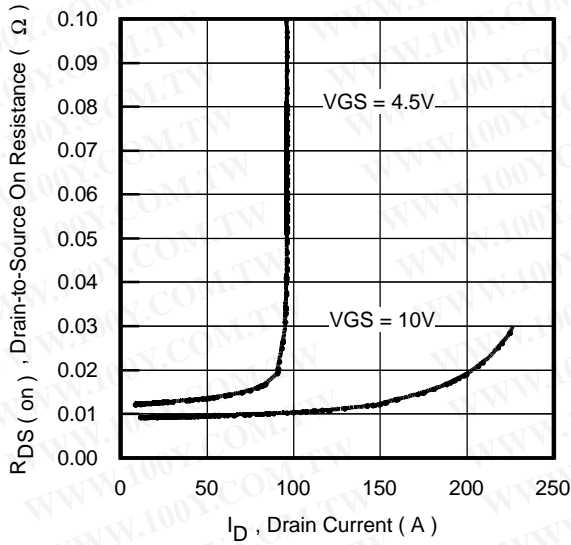


Fig 12. On-Resistance Vs. Drain Current

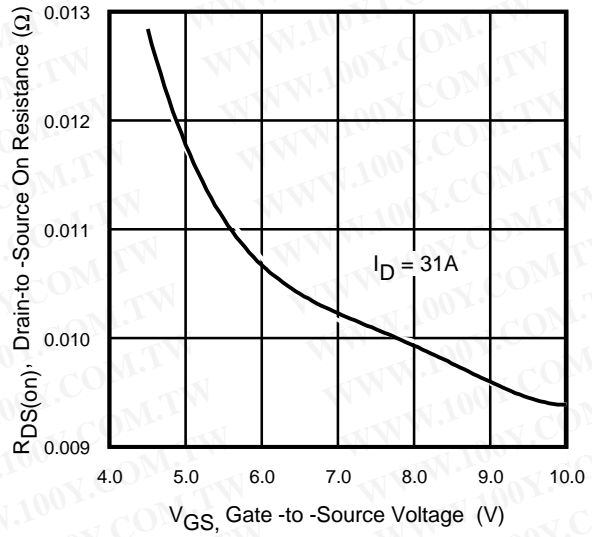


Fig 13. On-Resistance Vs. Gate Voltage

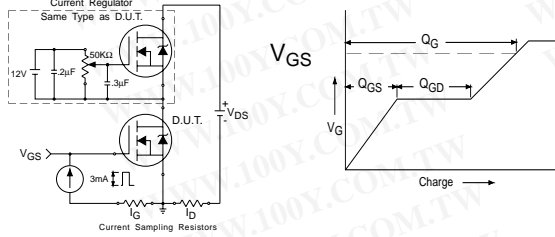


Fig 14a&b. Basic Gate Charge Test circuit and Waveforms

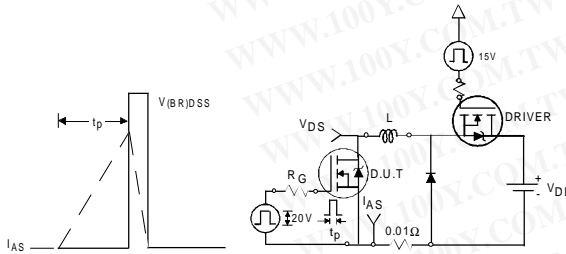


Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

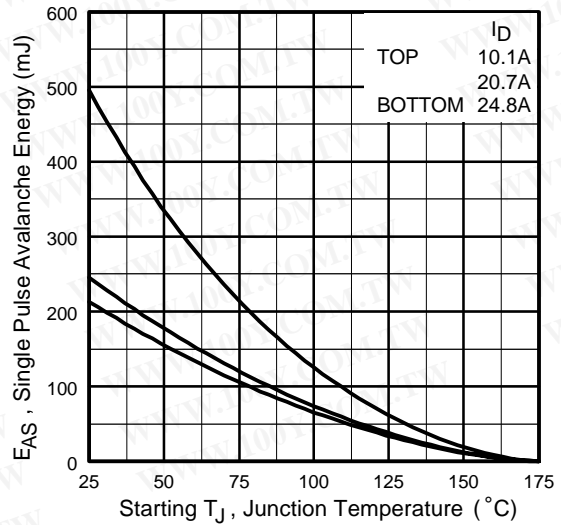


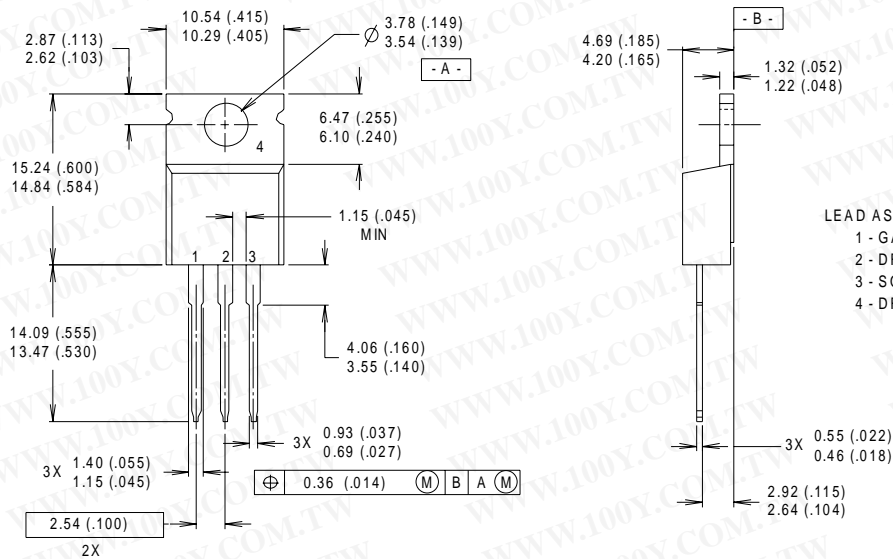
Fig 15c. Maximum Avalanche Energy Vs. Drain Current

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TO-220AB Package Outline

Dimensions are shown in millimeters (inches)

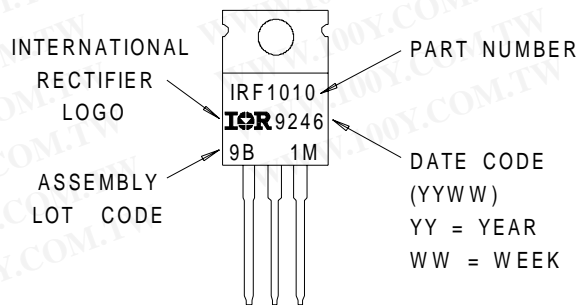


NOTES:

- 1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
- 2 CONTROLLING DIMENSION : INCH
- 3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
- 4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

TO-220AB Part Marking Information

EXAMPLE : THIS IS AN IRF1010
 WITH ASSEMBLY
 LOT CODE 9B1M

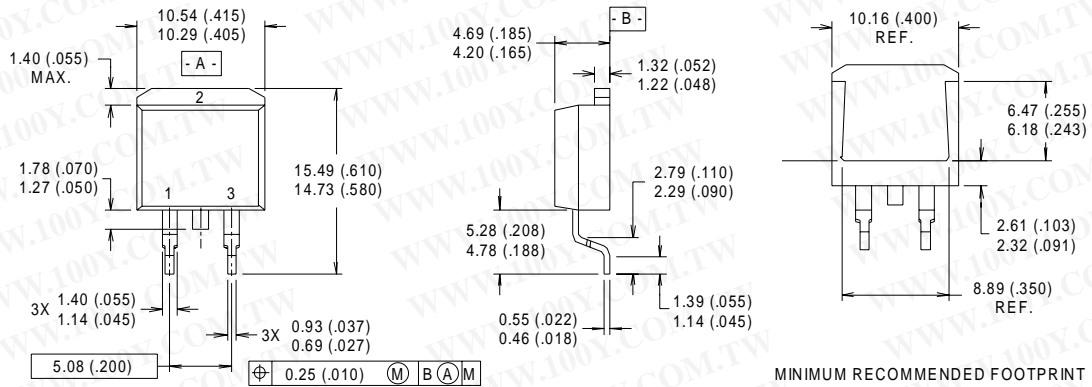


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D²Pak Package Outline

Dimensions are shown in millimeters (inches)



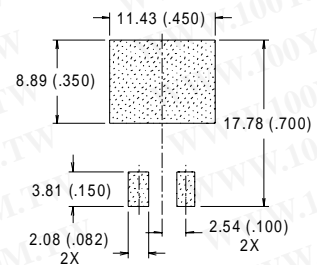
NOTES:

- 1 DIMENSIONS AFTER SOLDER DIP.
- 2 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
- 3 CONTROLLING DIMENSION : INCH.
- 4 HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

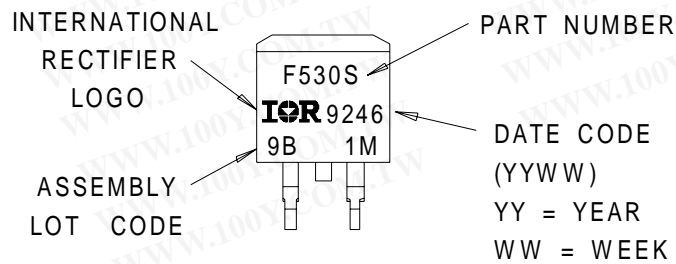
LEAD ASSIGNMENTS

- 1 - GATE
- 2 - DRAIN
- 3 - SOURCE

MINIMUM RECOMMENDED FOOTPRINT



D²Pak Part Marking Information

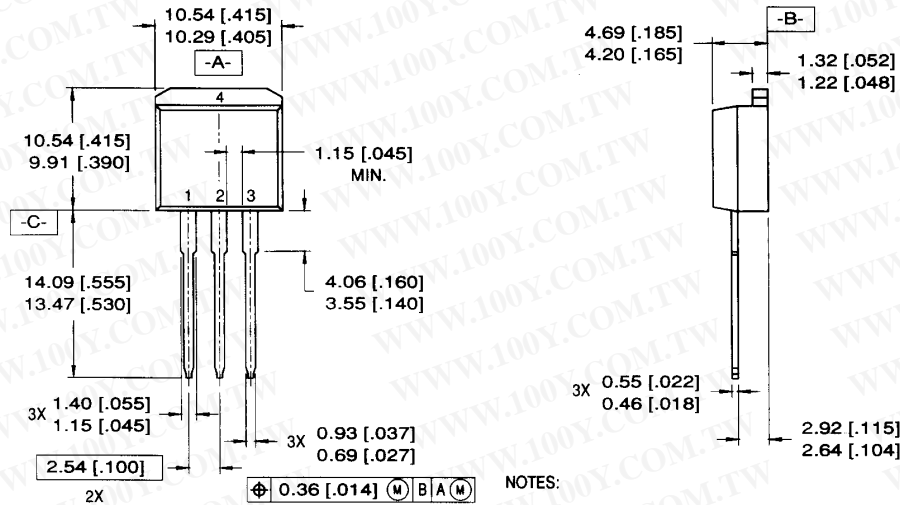


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TO-262 Package Outline

Dimensions are shown in millimeters (inches)



LEAD ASSIGNMENTS

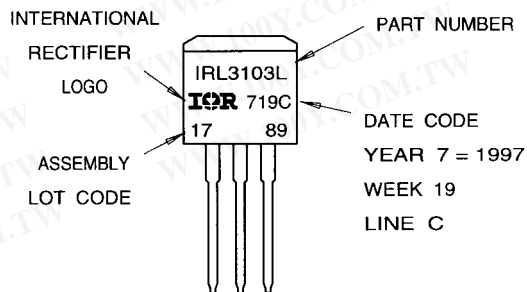
1 = GATE	3 = SOURCE
2 = DRAIN	4 = DRAIN

NOTES:

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

TO-262 Part Marking Information

EXAMPLE: THIS IS AN IRL3103L
 LOT CODE 1789
 ASSEMBLED ON WW 19, 1997
 IN THE ASSEMBLY LINE "C"

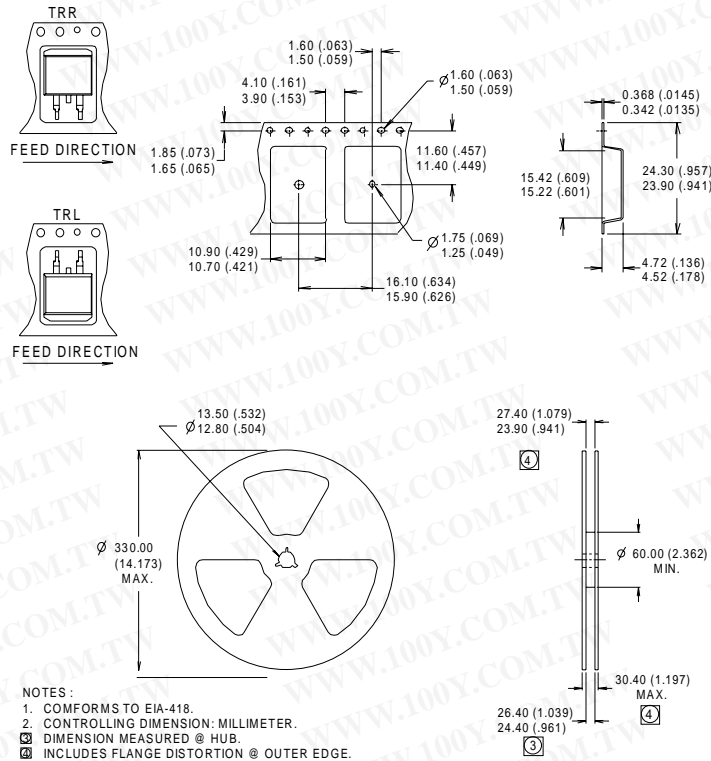


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D²Pak Tape & Reel Information

Dimensions are shown in millimeters (inches)



Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.7\text{ mH}$
 $R_G = 25\Omega$, $I_{AS} = 24.8\text{ A}$.
- ③ Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ This is only applied to TO-220AB package

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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
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Data and specifications subject to change without notice. 8/00