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PD - 94071

International
IOR Rectifier

SMPS MOSFET

IRF3709
IRF3709S
IRF3709L

HEXFET® Power MOSFET

V_{DSS}	$R_{DS(on)}$ max	I_D
30V	**9.0mΩ**	**90A⑥**

Applications
- High Frequency Isolated DC-DC Converters with Synchronous Rectification for Telecom and Industrial Use
- High Frequency Buck Converters for Server Processor Power Synchronous FET
- Optimized for Synchronous Buck Converters Including Capacitive Induced Turn-on Immunity

TO-220AB IRF3709 | D^2Pak IRF3709S | TO-262 IRF3709L

Benefits
- Ultra-Low Gate Impedance
- Very Low RDS(on) at 4.5V V_{GS}
- 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	90⑥	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	57	
I_{DM}	Pulsed Drain Current①	360	
P_D @T_C = 25°C	Maximum Power Dissipation③	120	W
P_D @T_A = 25°C	Maximum Power Dissipation⑤	3.1	W
	Linear Derating Factor	0.96	mW/°C
T_J , T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	——	1.04	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface ④	0.50	——	
$R_{\theta JA}$	Junction-to-Ambient④	——	62	
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)⑤	——	40	

Notes ① through ⑥ are on page 11

Static @ T_J = 25°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 = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.029	——	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	6.4	9.0	mΩ	V_{GS} = 10V, I_D = 15A ③
		——	7.4	10.5		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 = 250μA
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°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	200	nA	V_{GS} = 16V
	Gate-to-Source Reverse Leakage	——	——	-200		V_{GS} = -16V

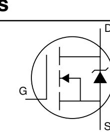
Dynamic @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	53	——	——	S	V_{DS} = 15V, I_D = 30A
Q_g	Total Gate Charge	——	27	41	nC	I_D = 15A
Q_{gs}	Gate-to-Source Charge	——	6.7	——		V_{DS} = 16V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	9.7	——		V_{GS} = 5.0V ③
Q_{oss}	Output Gate Charge	——	22	——		V_{GS} = 0V, V_{DS} = 10V
$t_{d(on)}$	Turn-On Delay Time	——	11	——	ns	V_{DD} = 15V
t_r	Rise Time	——	171	——		I_D = 30A
$t_{d(off)}$	Turn-Off Delay Time	——	21	——		R_G = 1.8Ω
t_f	Fall Time	——	9.2	——		V_{GS} = 4.5V ③
C_{iss}	Input Capacitance	——	2672	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	1064	——		V_{DS} = 16V
C_{rss}	Reverse Transfer Capacitance	——	109	——		ƒ = 1.0MHz

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	——	382	mJ
I_{AR}	Avalanche Current①	——	30	A

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	90⑥	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	360		
V_{SD}	Diode Forward Voltage	——	0.88	1.3	V	T_J = 25°C, I_S = 30A, V_{GS} = 0V ③
		——	0.82	——		T_J = 125°C, I_S = 30A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	——	48	72	ns	T_J = 25°C, I_F = 30A, V_R=15V
Q_{rr}	Reverse Recovery Charge	——	46	69	nC	di/dt = 100A/μs ③
t_{rr}	Reverse Recovery Time	——	48	72	ns	T_J = 125°C, I_F = 30A, V_R=15V
Q_{rr}	Reverse Recovery Charge	——	52	78	nC	di/dt = 100A/μs ③

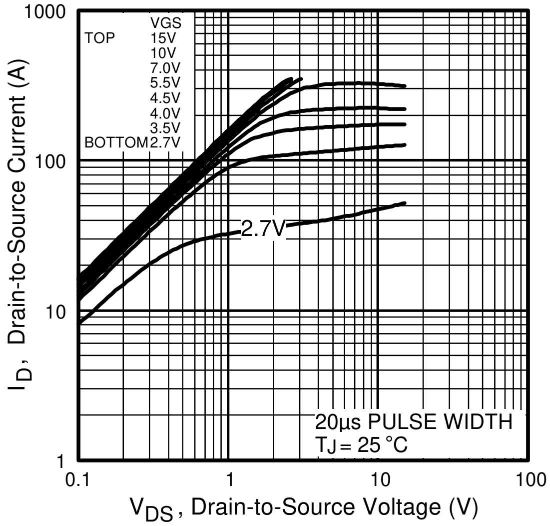


Fig 1. Typical Output Characteristics

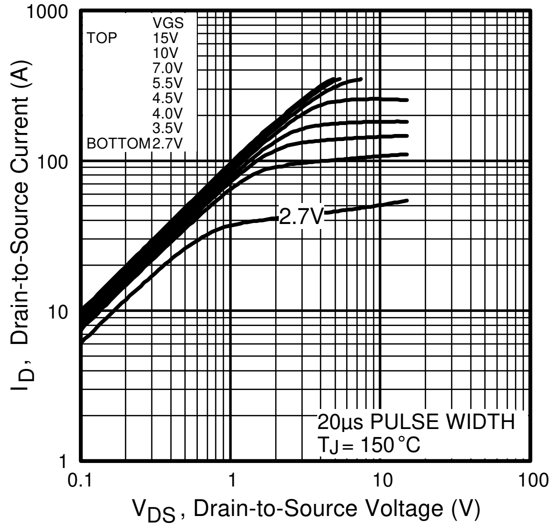


Fig 2. Typical Output Characteristics

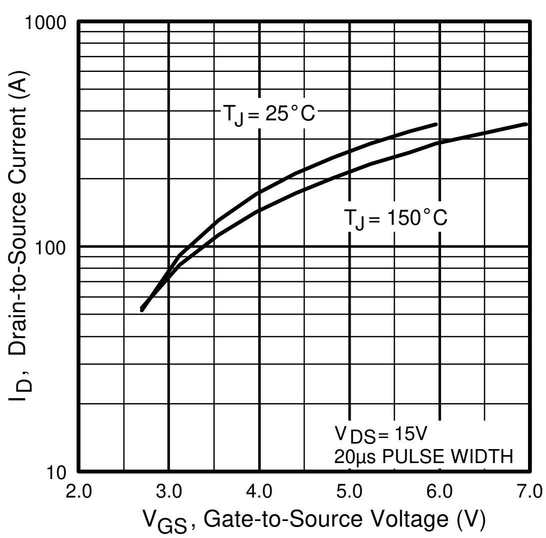


Fig 3. Typical Transfer Characteristics

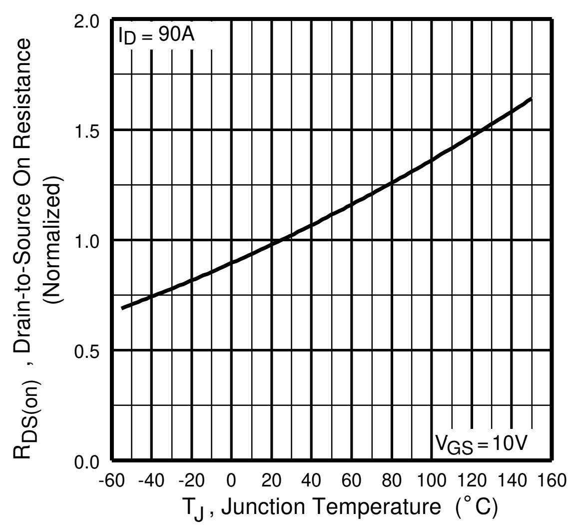


Fig 4. Normalized On-Resistance Vs. Temperature

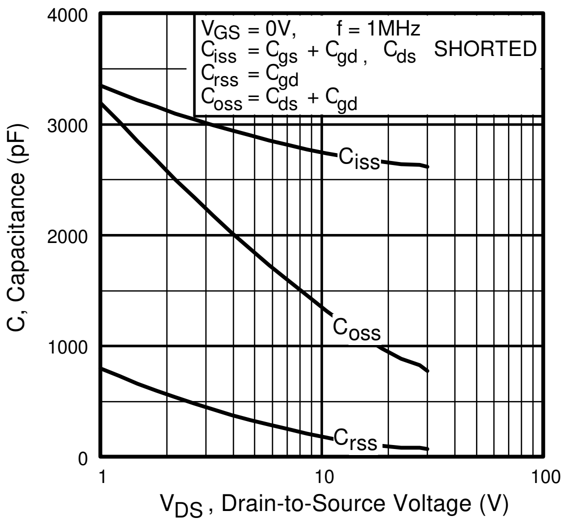


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

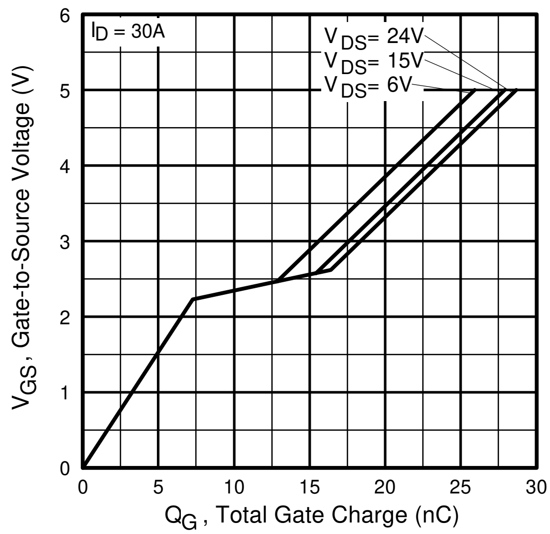


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

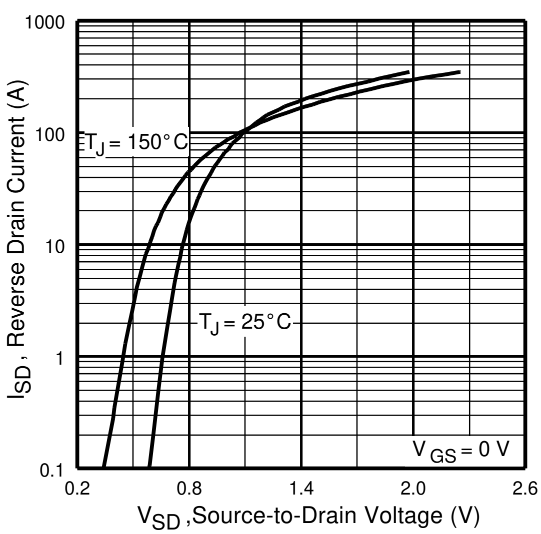


Fig 7. Typical Source-Drain Diode Forward Voltage

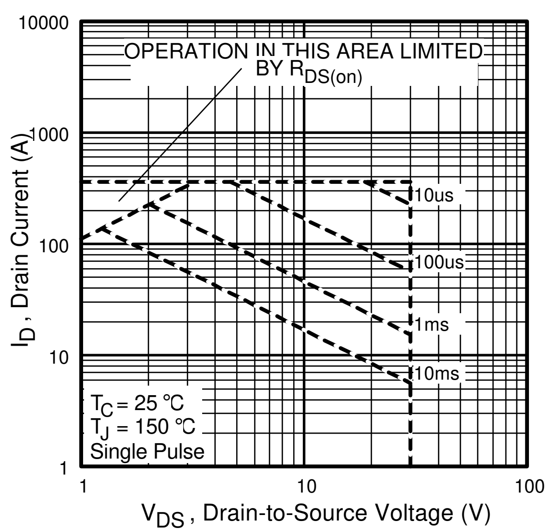


Fig 8. Maximum Safe Operating Area

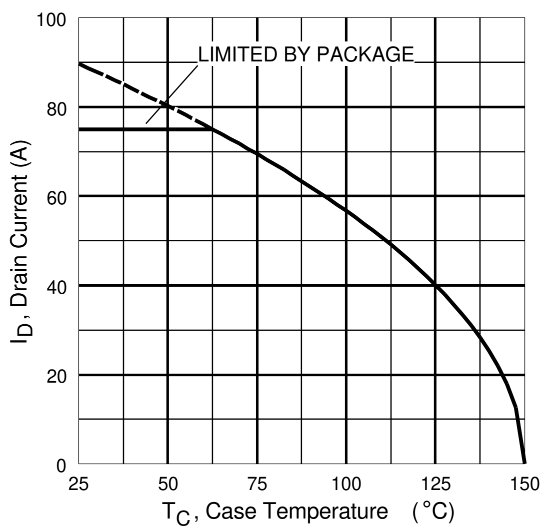


Fig 9. Maximum Drain Current Vs. Case Temperature

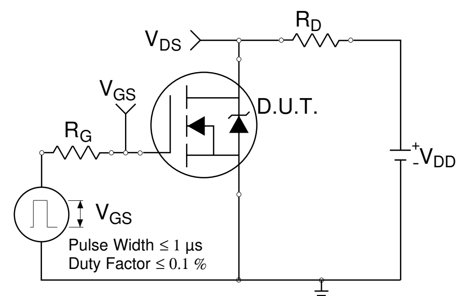


Fig 10a. Switching Time Test Circuit

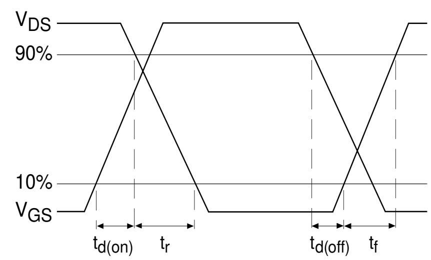


Fig 10b. Switching Time Waveforms

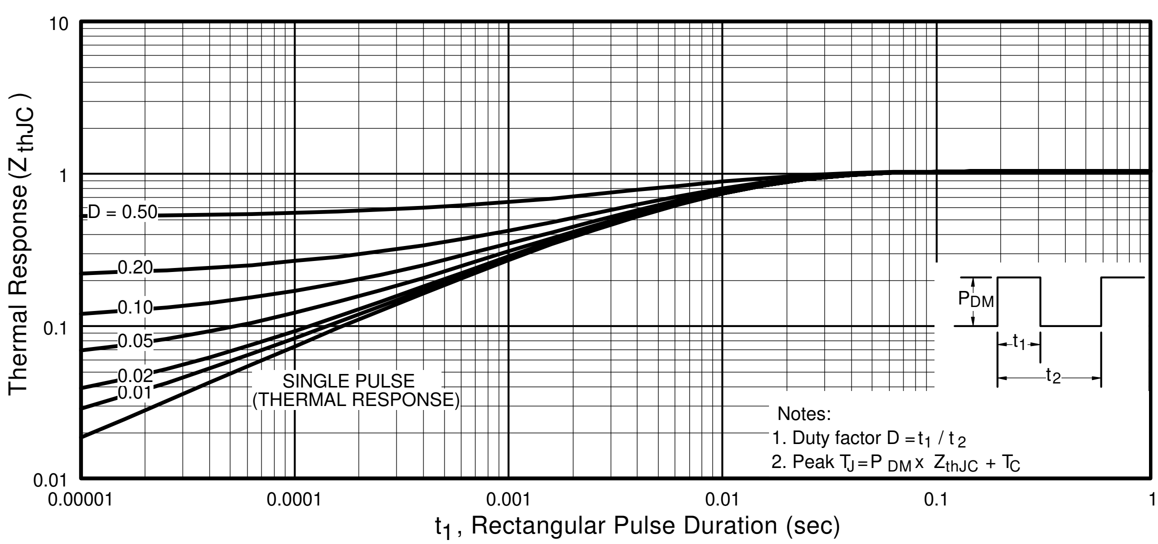


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

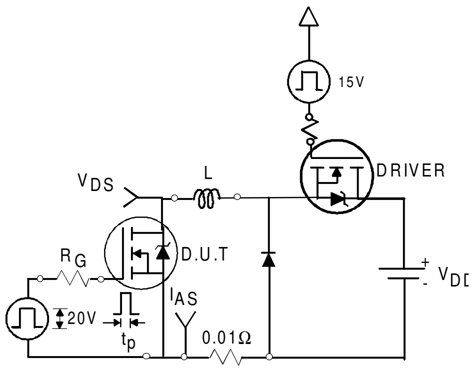


Fig 12a. Unclamped Inductive Test Circuit

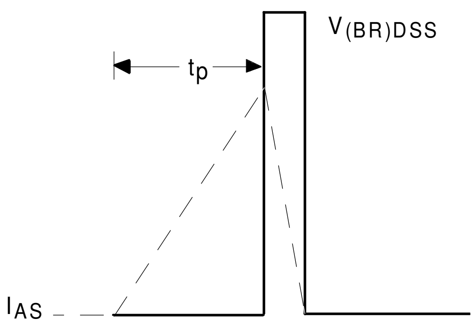


Fig 12b. Unclamped Inductive Waveforms

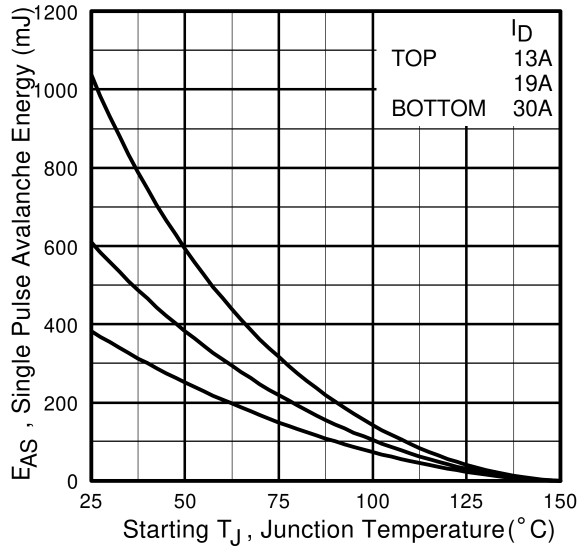


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

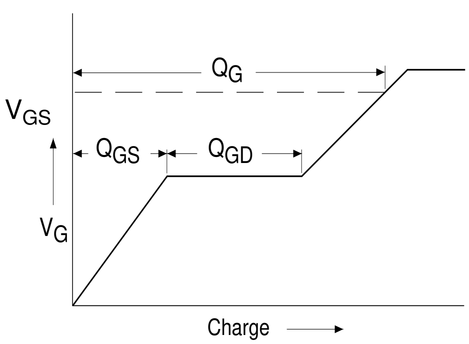


Fig 13a. Basic Gate Charge Waveform

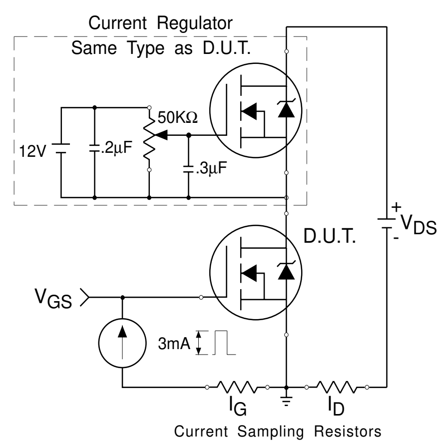
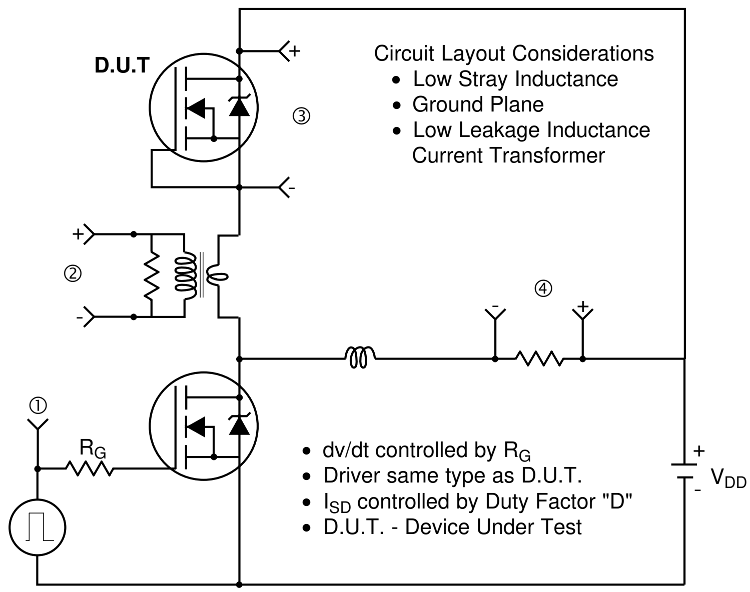
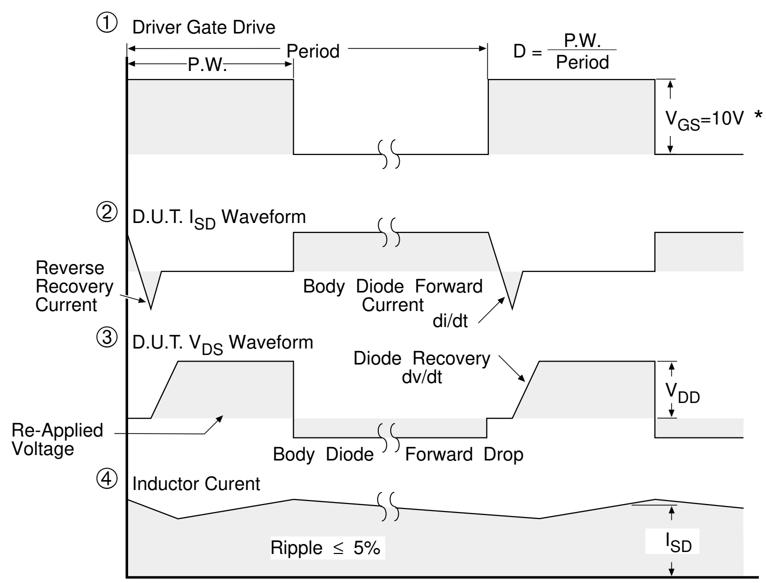


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



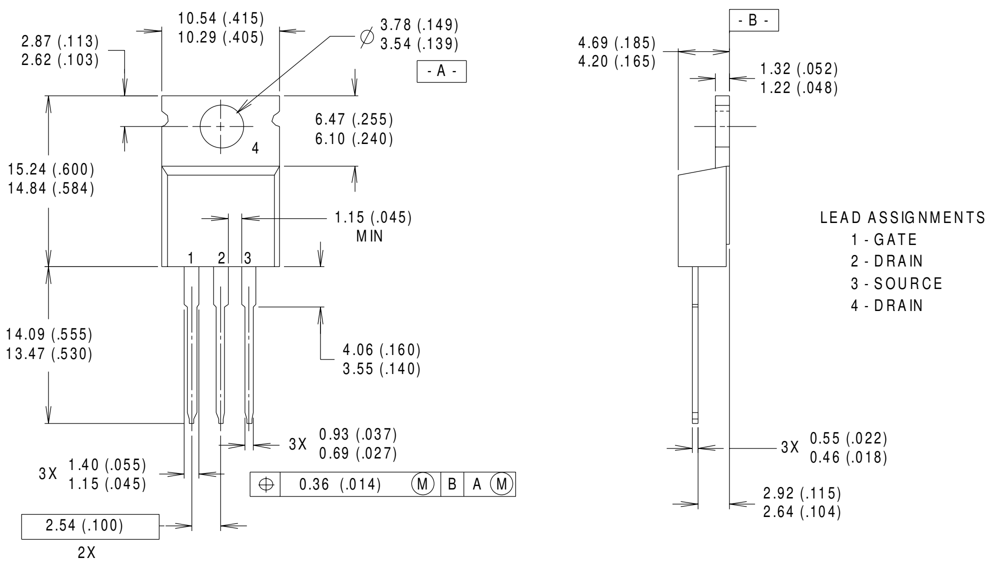


* V_{GS} = 5V for Logic Level Devices

Fig 14. For N-Channel HEXFET® Power MOSFETs

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)

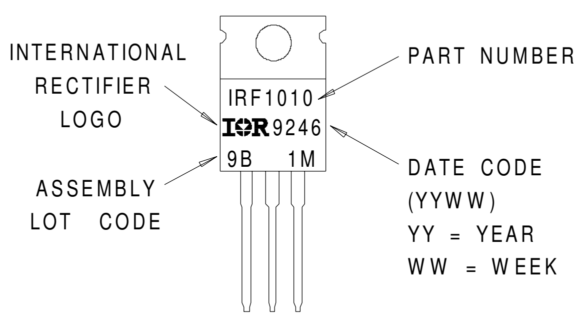


NOTES:

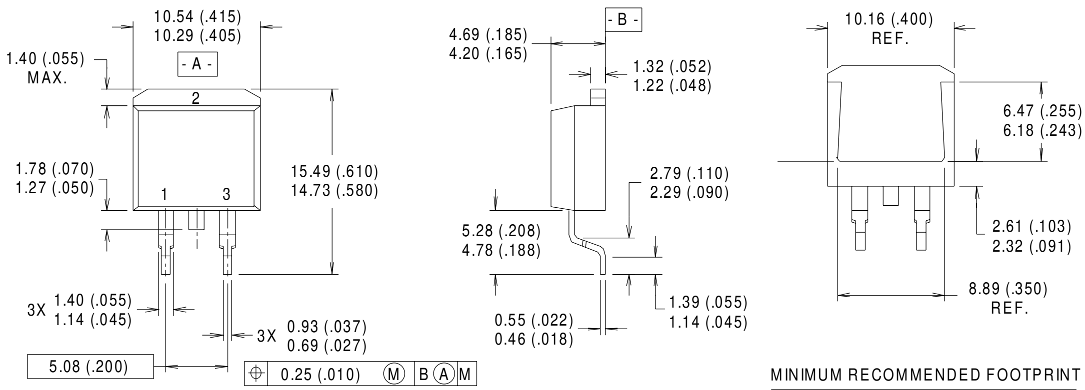
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH
3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

TO-220AB Part Marking Information

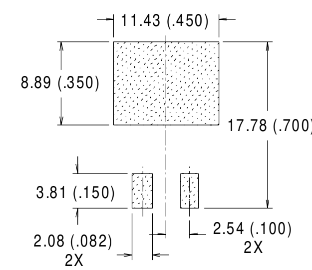
EXAMPLE : THIS IS AN IRF1010
WITH ASSEMBLY
LOT CODE 9B1M



D²Pak Package Outline



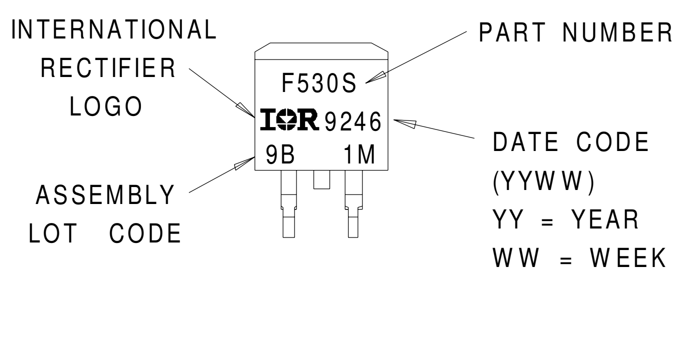
MINIMUM RECOMMENDED FOOTPRINT



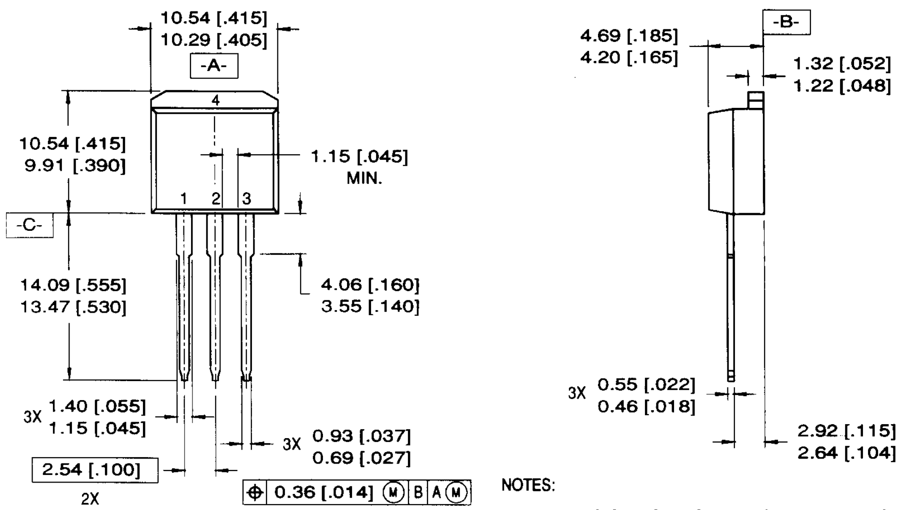
NOTES:
1. DIMENSIONS AFTER SOLDER DIP.
2. DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
3. CONTROLLING DIMENSION : INCH.
4. HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE

D²Pak Part Marking Information



TO-262 Package Outline



LEAD ASSIGNMENTS

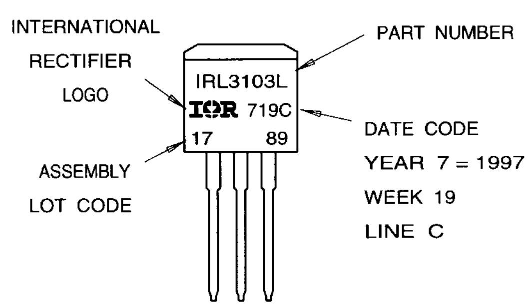
1 = GATE   3 = SOURCE
2 = DRAIN   4 = DRAIN

NOTES:

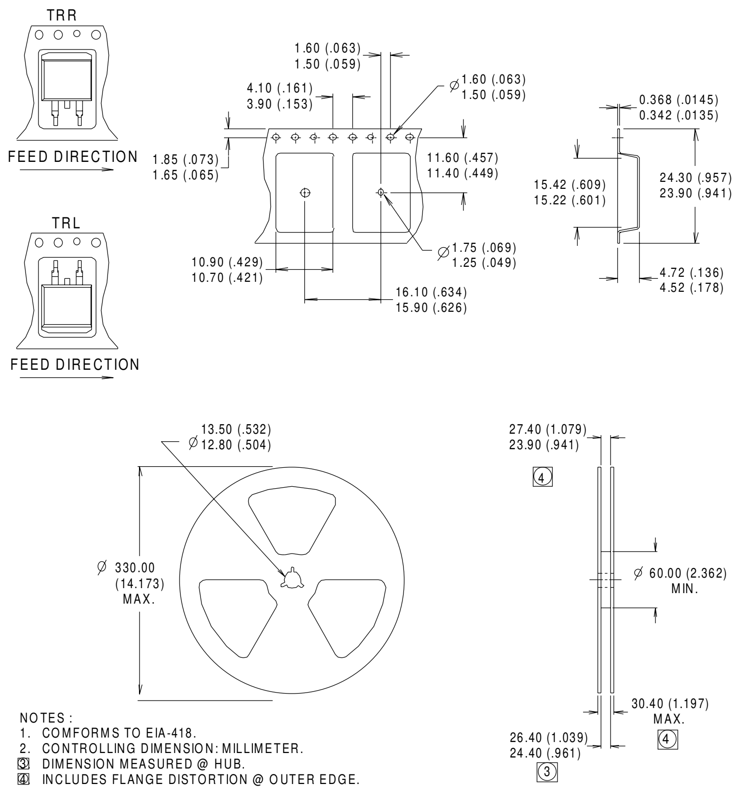
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

TO-262 Part Marking Information

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



D^2Pak Tape & Reel Information



Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting T_J = 25°C, L = 0.85mH R_G = 25Ω, I_{AS} = 30A.

③ Pulse width ≤ 400µs; duty cycle ≤ 2%.

④ This is only applied to TO-220AB package

⑤ This is applied to D^2Pak, when mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.

⑥ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.

Data and specifications subject to change without notice.
This product has been designed and qualified for the industrial market.
Qualification Standards can be found on IR's Web site.

International
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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.01/01

Note: For the most current drawings please refer to the IR website at:
http://www.irf.com/package/