PD - 95363

International
IOR Rectifier

SMPS MOSFET

IRF3708PbF
IRF3708SPbF
IRF3708LPbF

HEXFET® Power MOSFET

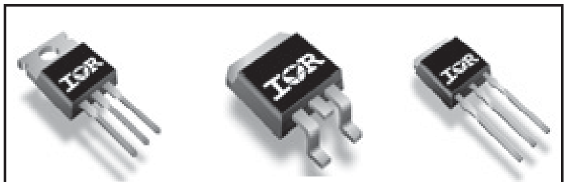
V_{DSS}	$R_{DS(on)}$ max	I_D
30V	**12mΩ**	**62A**

Applications

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

Benefits

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



TO-220AB	D²Pak	TO-262
IRF3708	IRF3708S	IRF3708L

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	±12	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 Current①	248	
P_D @T_C = 25°C	Maximum Power Dissipation③	87	W
P_D @T_C = 70°C	Maximum Power Dissipation③	61	W
	Linear Derating Factor	0.58	W/°C
T_J , T_{STG}	Junction and Storage Temperature Range	-55 to + 175	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	–––	1.73	°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)*	–––	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

6/10/04

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	–––	0.028	–––	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	8	12.0	mΩ	V_{GS} = 10V, I_D = 15A ③
		–––	9.5	13.5		V_{GS} = 4.5V, I_D = 12A ③
		–––	14.5	29		V_{GS} = 2.8V, I_D = 7.5A 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} = 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} = 12V
	Gate-to-Source Reverse Leakage	–––	–––	-200		V_{GS} = -12V

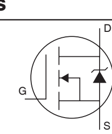
Dynamic @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	49	–––	–––	S	V_{DS} = 15V, I_D = 50A
Q_g	Total Gate Charge	–––	24	–––	nC	I_D = 24.8A
Q_{gs}	Gate-to-Source Charge	–––	6.7	–––		V_{DS} = 15V
Q_{gd}	Gate-to-Drain ("Miller") Charge	–––	5.8	–––		V_{GS} = 4.5V ③
Q_{oss}	Output Gate Charge	–––	14	21		V_{GS} = 0V, I_D = 24.8A, V_{DS} = 15V
$t_{d(on)}$	Turn-On Delay Time	–––	7.2	–––	ns	V_{DD} = 15V
t_r	Rise Time	–––	50	–––		I_D = 24.8A
$t_{d(off)}$	Turn-Off Delay Time	–––	17.6	–––		R_G = 0.6Ω
t_f	Fall Time	–––	3.7	–––		V_{GS} = 4.5V ③
C_{iss}	Input Capacitance	–––	2417	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	707	–––		V_{DS} = 15V
C_{rss}	Reverse Transfer Capacitance	–––	52	–––		ƒ = 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°C, I_S = 31A, V_{GS} = 0V ③
		–––	0.80	–––		T_J = 125°C, I_S = 31A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	–––	41	62	ns	T_J = 25°C, I_F = 31A, V_R=20V
Q_{rr}	Reverse Recovery Charge	–––	64	96	nC	di/dt = 100A/μs ③
t_{rr}	Reverse Recovery Time	–––	43	65	ns	T_J = 125°C, I_F = 31A, V_R=20V
Q_{rr}	Reverse Recovery Charge	–––	70	105	nC	di/dt = 100A/μs ③

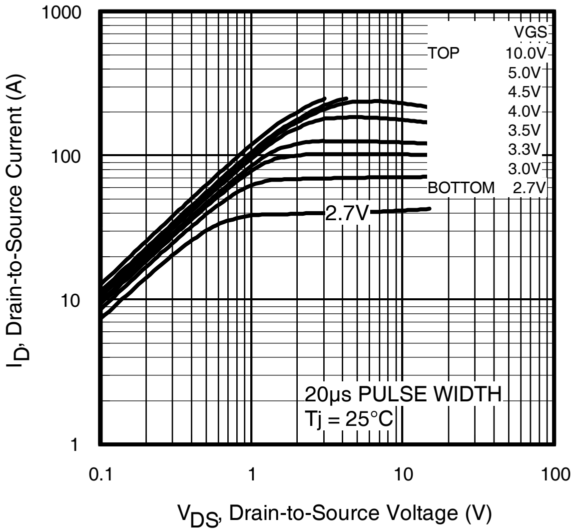


Fig 1. Typical Output Characteristics

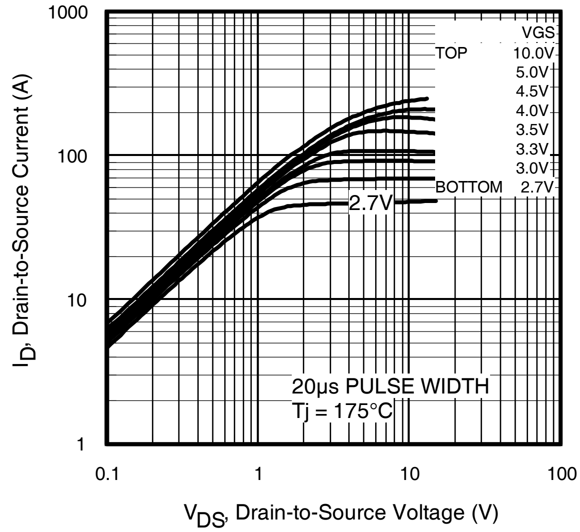


Fig 2. Typical Output Characteristics

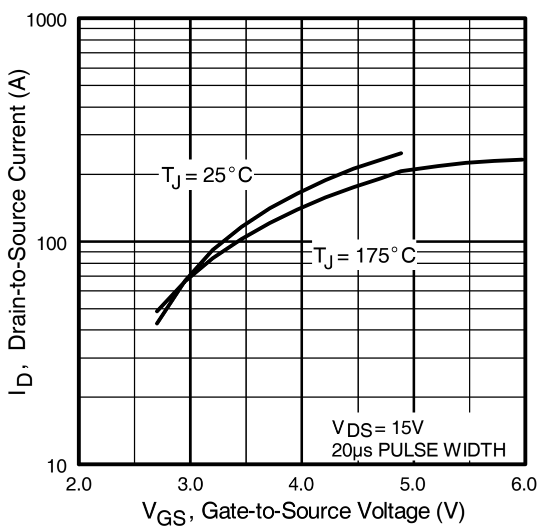


Fig 3. Typical Transfer Characteristics

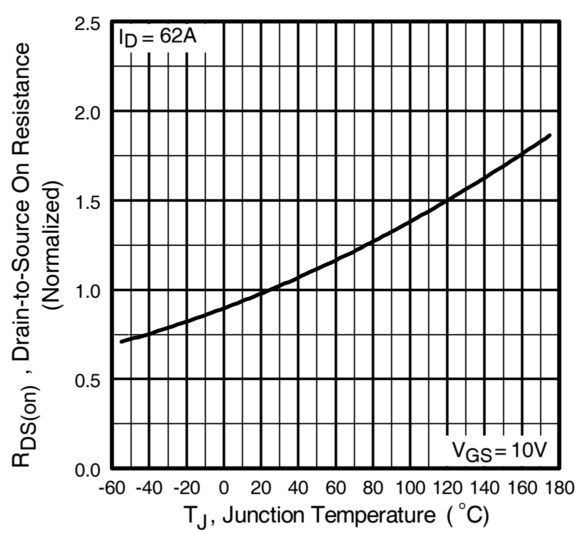


Fig 4. Normalized On-Resistance
Vs. Temperature

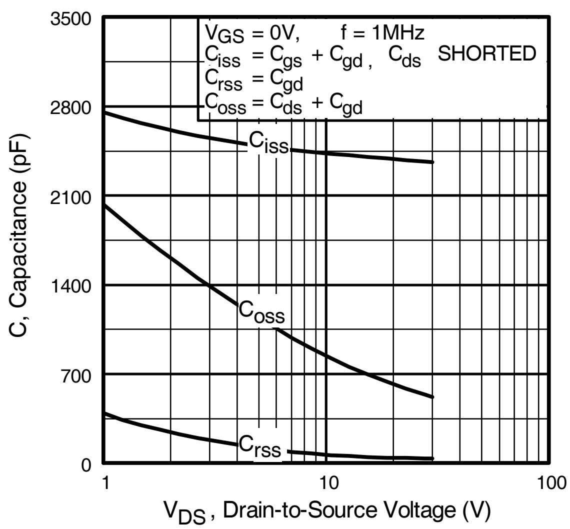


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

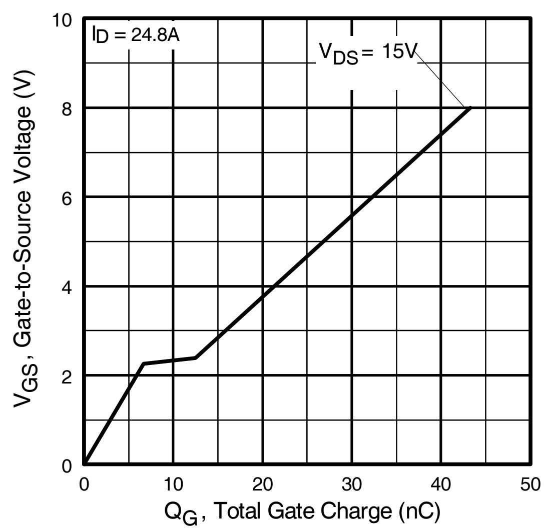


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

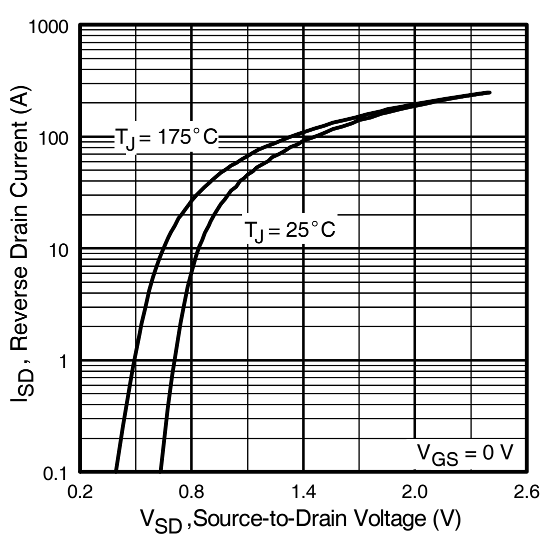


Fig 7. Typical Source-Drain Diode Forward Voltage

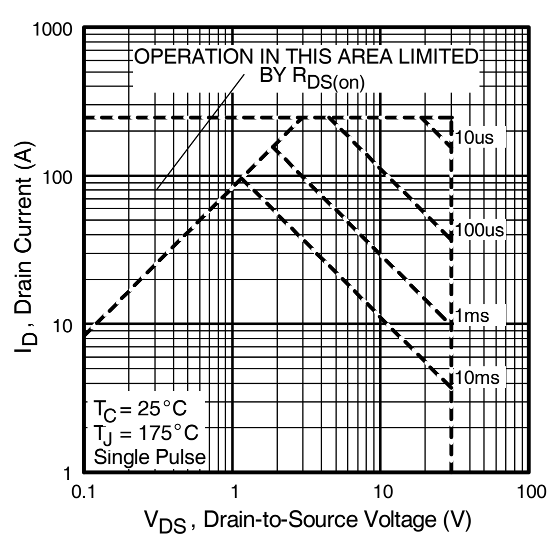


Fig 8. Maximum Safe Operating Area

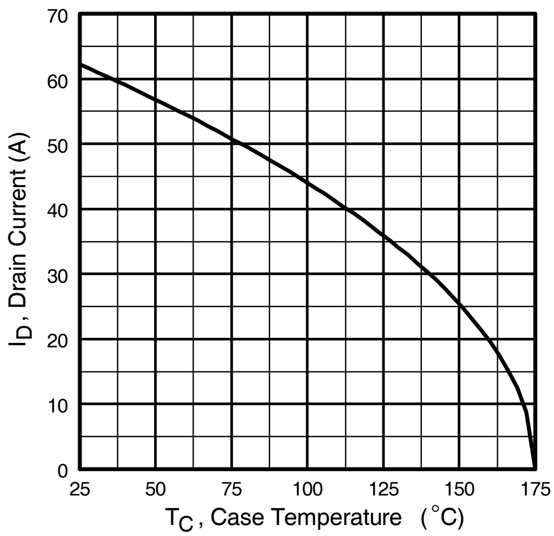


Fig 9. Maximum Drain Current Vs. Case Temperature

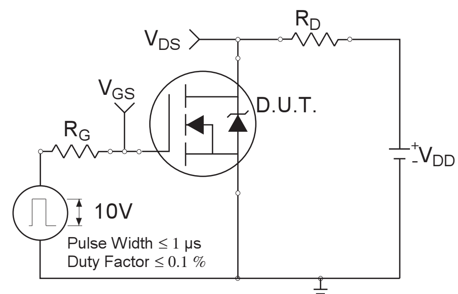


Fig 10a. Switching Time Test Circuit

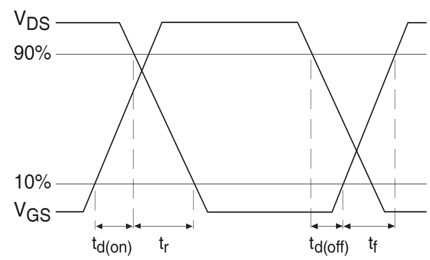


Fig 10b. Switching Time Waveforms

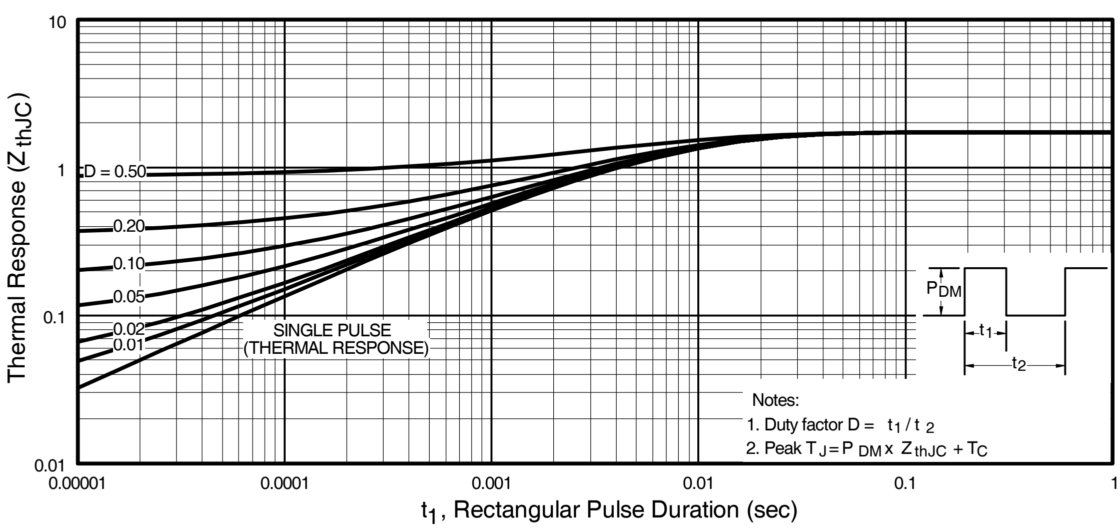


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

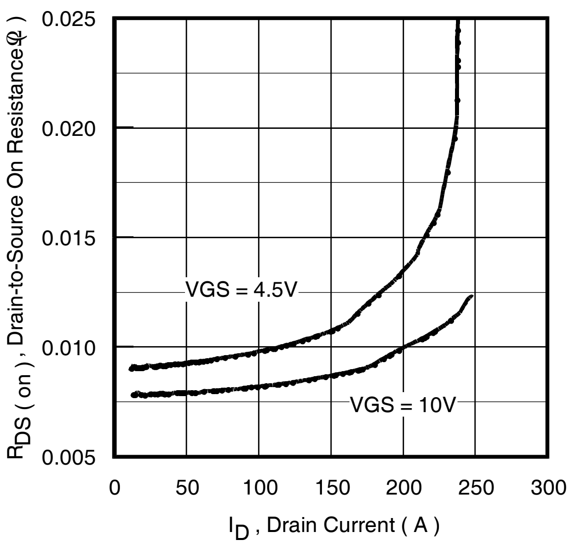


Fig 12. On-Resistance Vs. Drain Current

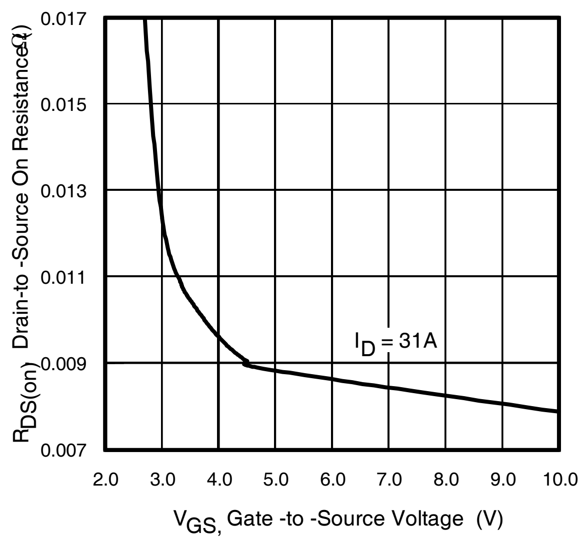


Fig 13. On-Resistance Vs. Gate Voltage

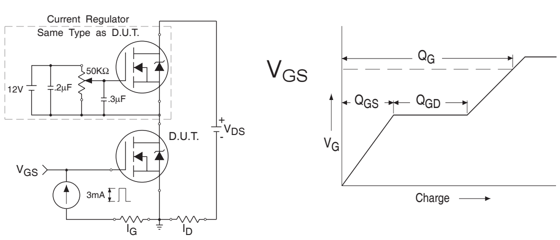


Fig 14a&b. Gate Charge Test Circuit and Waveform

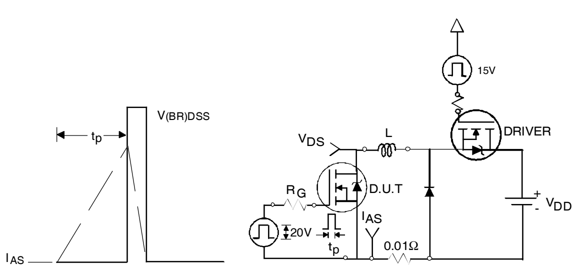


Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

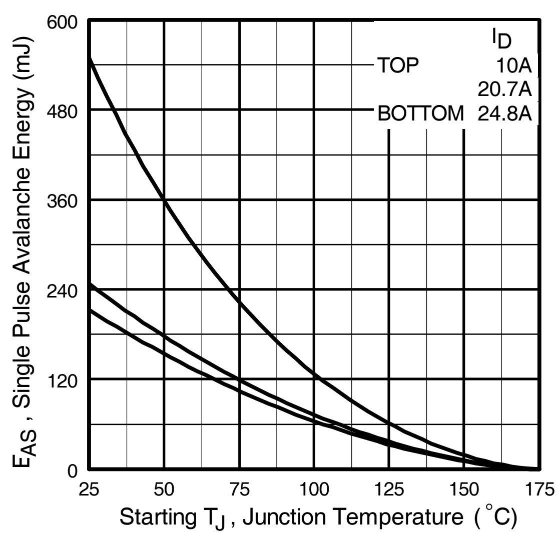
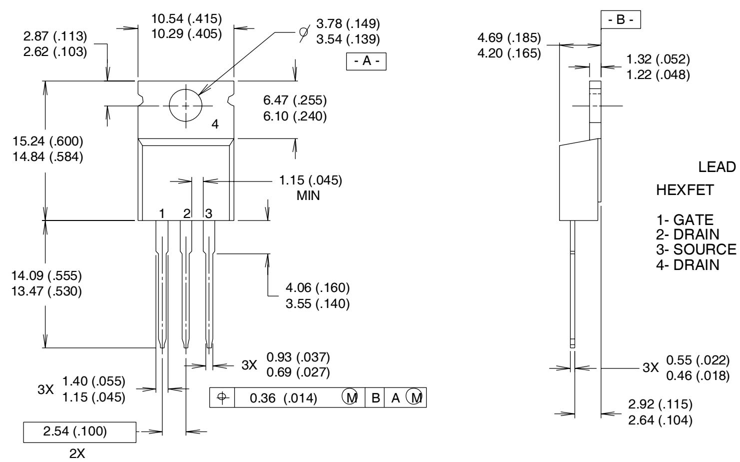


Fig 15c. Maximum Avalanche Energy Vs. Drain Current

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



LEAD ASSIGNMENTS

HEXFET	IGBTs, CoPACK
1- GATE	1- GATE
2- DRAIN	2- COLLECTOR
3- SOURCE	3- EMITTER
4- DRAIN	4- COLLECTOR

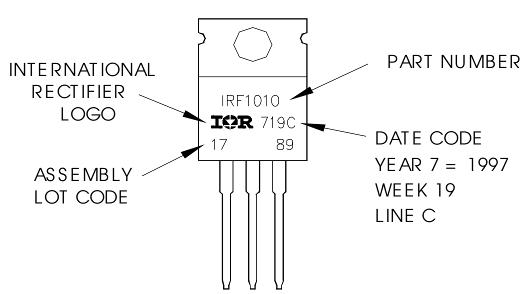
NOTES:

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

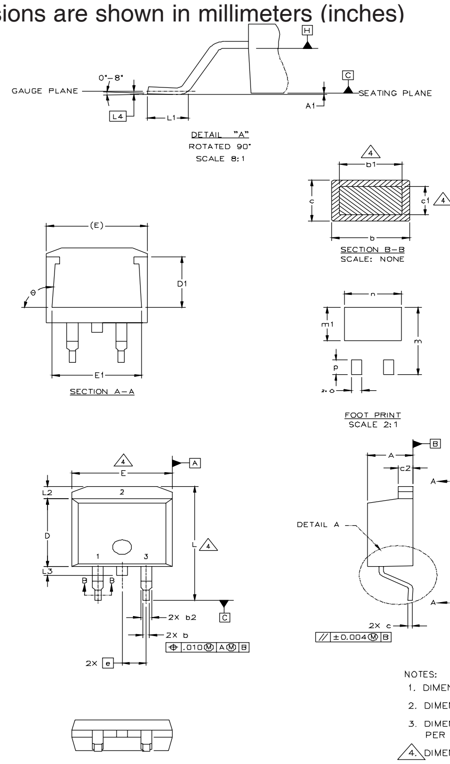
EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

Note: "P" in assembly line position indicates "Lead-Free"



D^2Pak Package Outline

Dimensions are shown in millimeters (inches)



SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1		0.127		.005	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	4
b2	1.14	1.40	.045	.055	
c	0.43	0.63	.017	.025	
c1	0.38	0.74	.015	.029	4
c2	1.14	1.40	.045	.055	
D	8.51	9.65	.335	.380	3
D1	5.33		.210		
E	9.65	10.67	.380	.420	3
E1	6.22		.245		
e	2.54 BSC		.100 BSC		
L	14.61	15.88	.575	.625	
L1	1.78	2.79	.070	.110	
L2		1.65		.065	
L3	1.27	1.78	.050	.070	
L4	0.25 BSC		.010 BSC		
m	17.78		.700		
m1	8.89		.350		
n	11.43		.450		
o	2.08		.082		
p	3.81		.150		
θ	90°	93°	90°	93°	

LEAD ASSIGNMENTS

HEXFET	IGBTs, CoPACK	DIODES
1.– GATE	1.– GATE	1.– ANODE *
2.– DRAIN	2.– COLLECTOR	2.– CATHODE
3.– SOURCE	3.– EMITTER	3.– ANODE

* PART DEPENDENT.

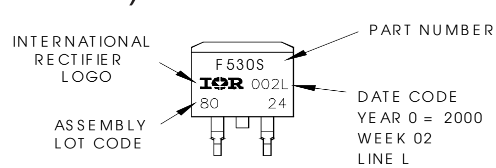
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
5. CONTROLLING DIMENSION: INCH.

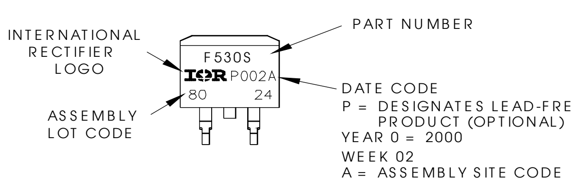
D^2Pak Part Marking Information (Lead-Free)

EXAMPLE: THIS IS AN IRF530S WITH LOT CODE 8024
ASSEMBLED ON WW 02, 2000
IN THE ASSEMBLY LINE "L"

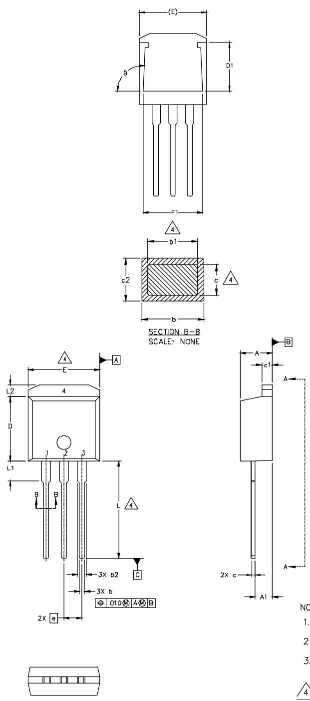
Note: "P" in assembly line position indicates "Lead-Free"



OR



TO-262 Package Outline



SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	2.03	2.92	.080	.115	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	4
b2	1.14	1.40	.045	.055	
c	0.38	0.63	.015	.025	4
c1	1.14	1.40	.045	.055	
c2	0.43	.063	.017	.029	
D	8.51	9.65	.335	.380	3
D1	5.33		.210		
E	9.65	10.67	.380	.420	3
E1	6.22		.245		
e	2.54 BSC		.100 BSC		
L	13.46	14.09	.530	.555	
L1	3.56	3.71	.140	.146	
L2		1.65		.065	

LEAD ASSIGNMENTS

HEXFET
1.– GATE
2.– DRAIN
3.– SOURCE
4.– DRAIN

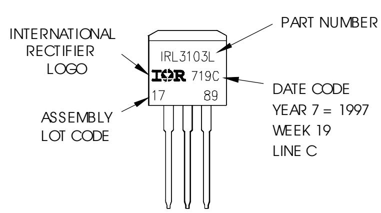
IGBT
1- GATE
2- COLLECTOR
3- EMITTER

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
5. CONTROLLING DIMENSION: INCH.

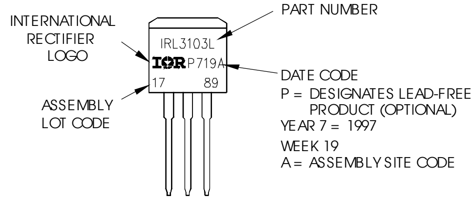
TO-262 Part Marking Information

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

Note: "P" in assembly line position indicates "Lead-Free"

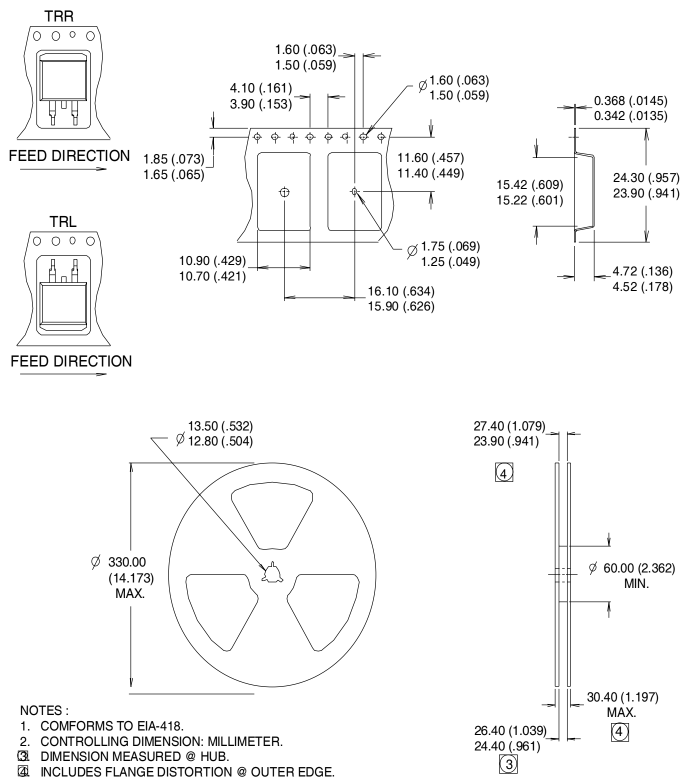


OR



D²Pak Tape & Reel Infomation

Dimensions are shown in millimeters (inches)



Notes:

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

② Starting $T_J = 25°C$, L = 0.7 mH $R_G = 25\Omega$, $I_{AS} = 24.8$ A.

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

④ This is only applied to TO-220AB package

Data and specifications subject to change without notice.

International
IOR Rectifier

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Visit us at www.irf.com for sales contact information.06/04

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