

Applications

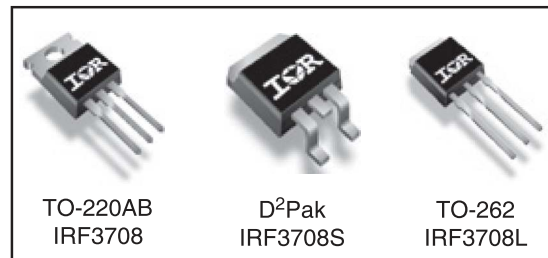
- High Frequency DC-DC Isolated Converters with Synchronous Rectification for Telecom and Industrial Use
- High Frequency Buck Converters for Computer Processor Power
- Lead-Free

Benefits

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

HEXFET® Power MOSFET

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



Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	± 12	V
I_D @ $T_C = 25^\circ C$	Continuous Drain Current, V_{GS} @ 10V	62	A
I_D @ $T_C = 70^\circ C$	Continuous Drain Current, V_{GS} @ 10V	52	
I_{DM}	Pulsed Drain Current ^①	248	
P_D @ $T_C = 25^\circ C$	Maximum Power Dissipation ^③	87	W
P_D @ $T_C = 70^\circ C$	Maximum Power Dissipation ^③	61	W
	Linear Derating Factor	0.58	W/ $^\circ C$
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 175	$^\circ C$

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.73	$^\circ C/W$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface ^④	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient ^④	—	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

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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
ΔV _{(BR)DSS} /ΔT _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

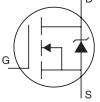
Dynamic @ T_J = 25°C (unless otherwise specified)

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	—		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°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

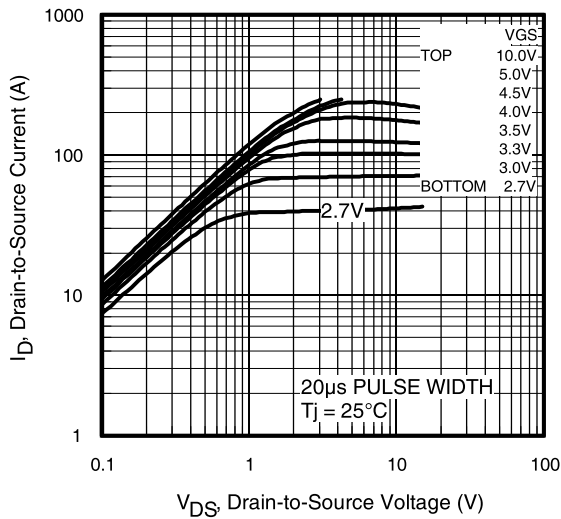


Fig 1. Typical Output Characteristics

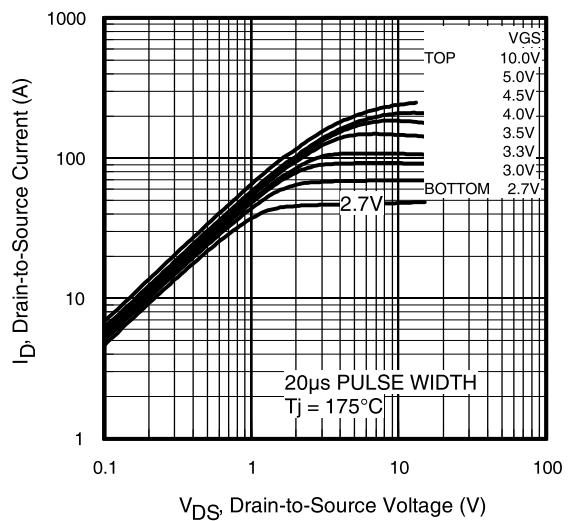


Fig 2. Typical Output Characteristics

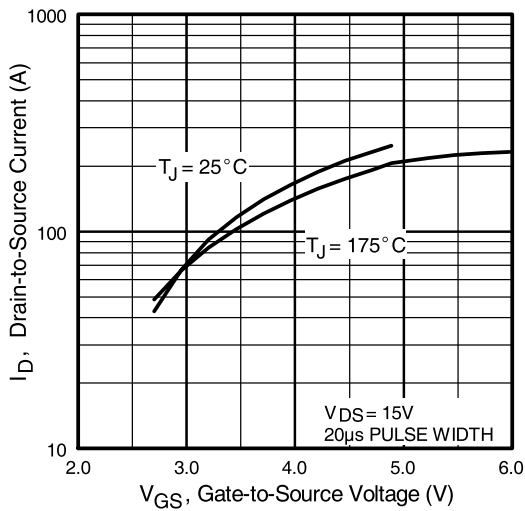


Fig 3. Typical Transfer Characteristics

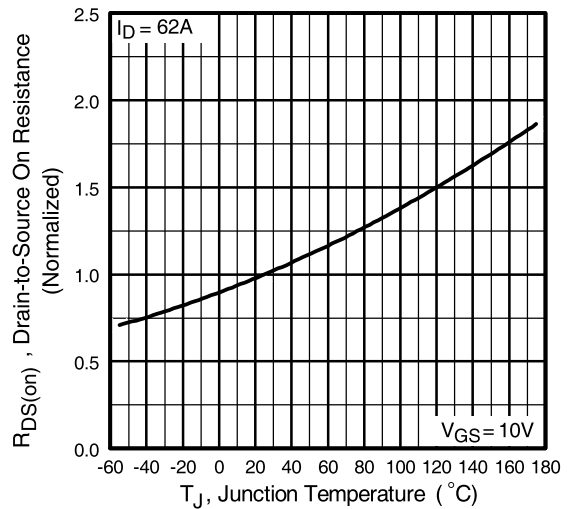


Fig 4. Normalized On-Resistance Vs. Temperature

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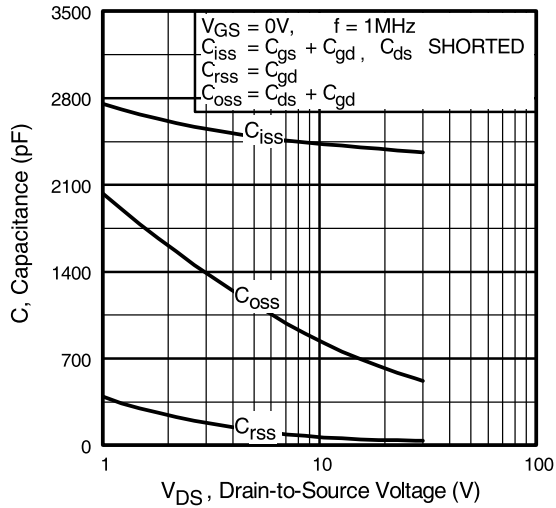


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

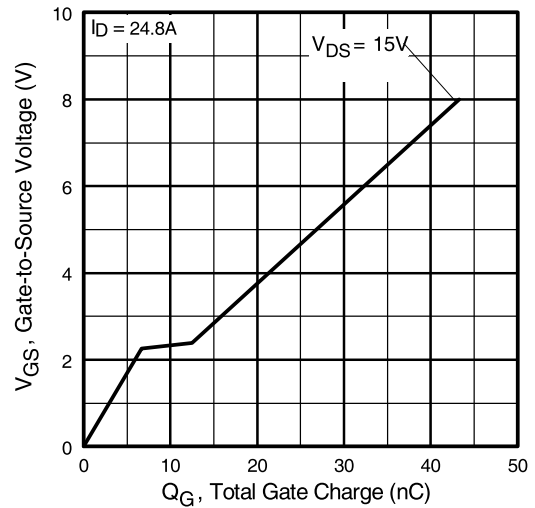


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

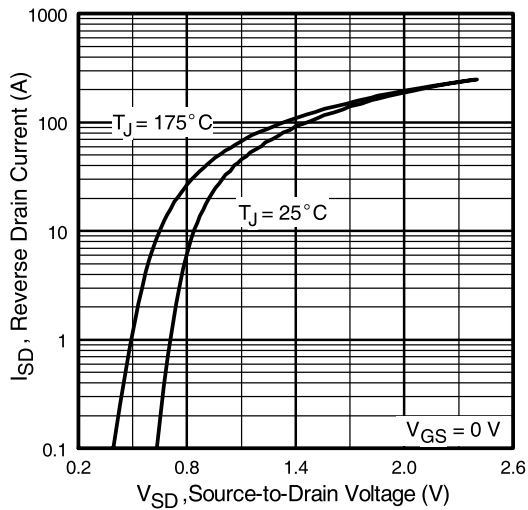


Fig 7. Typical Source-Drain Diode Forward Voltage

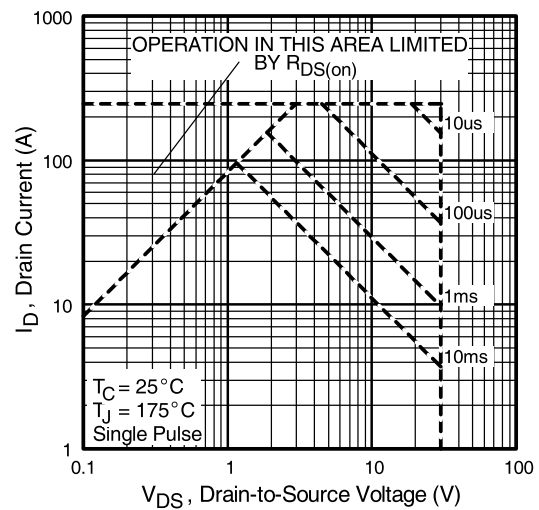


Fig 8. Maximum Safe Operating Area

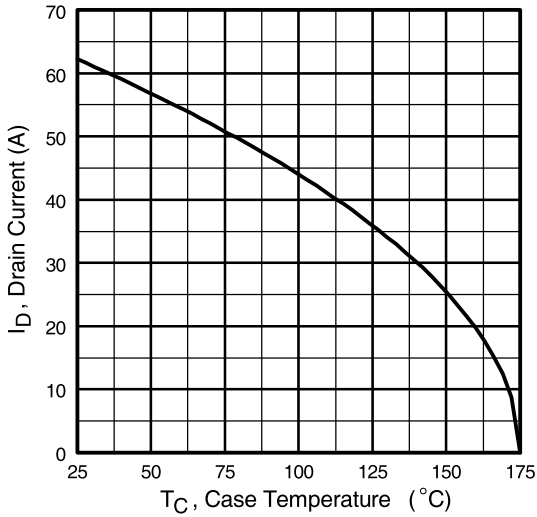


Fig 9. Maximum Drain Current Vs. Case Temperature

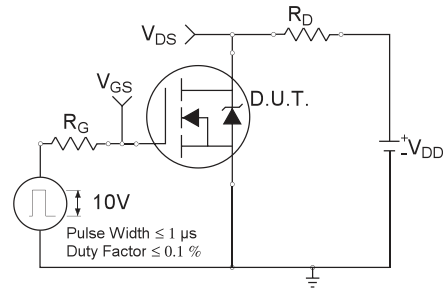


Fig 10a. Switching Time Test Circuit

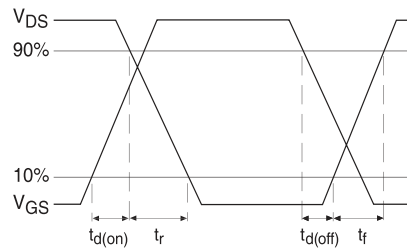


Fig 10b. Switching Time Waveforms

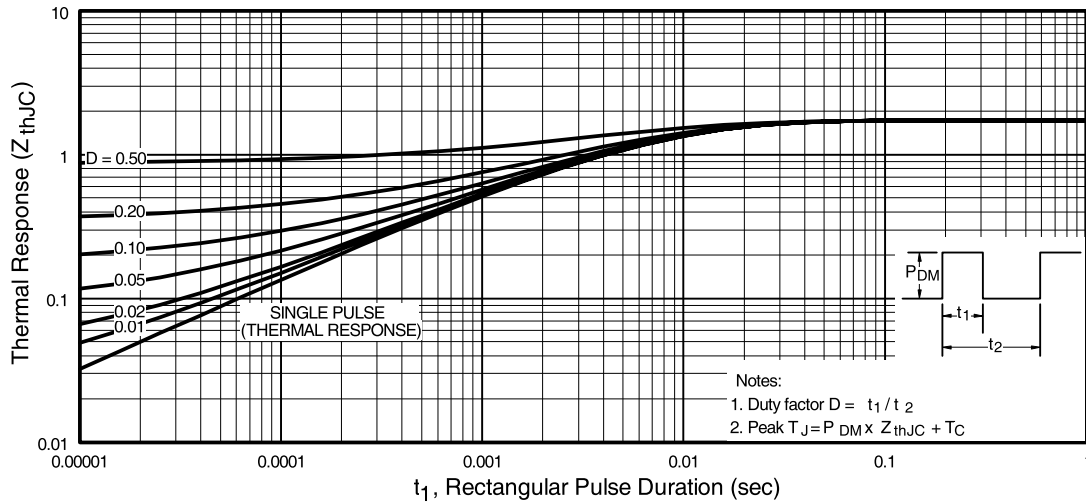


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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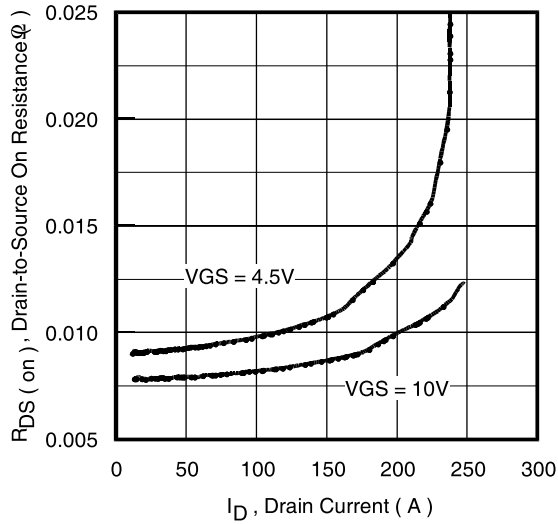


Fig 12. On-Resistance Vs. Drain Current

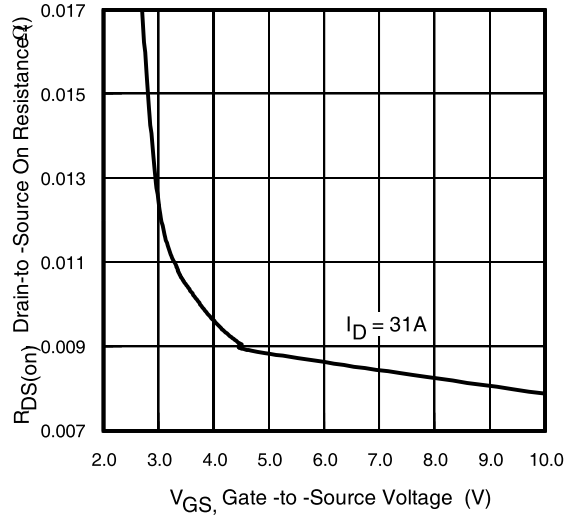


Fig 13. On-Resistance Vs. Gate Voltage

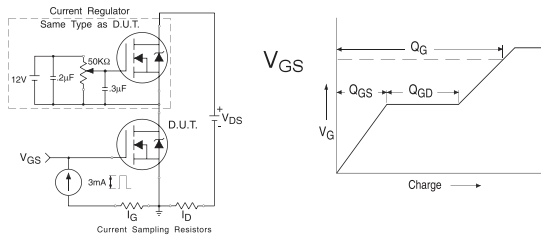


Fig 14a&b. Gate Charge Test Circuit and Waveform

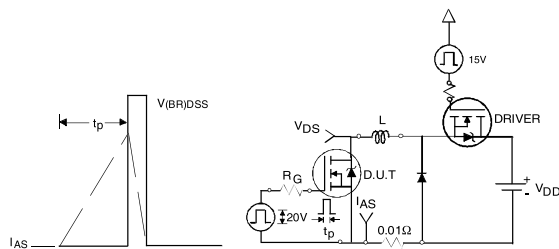


Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

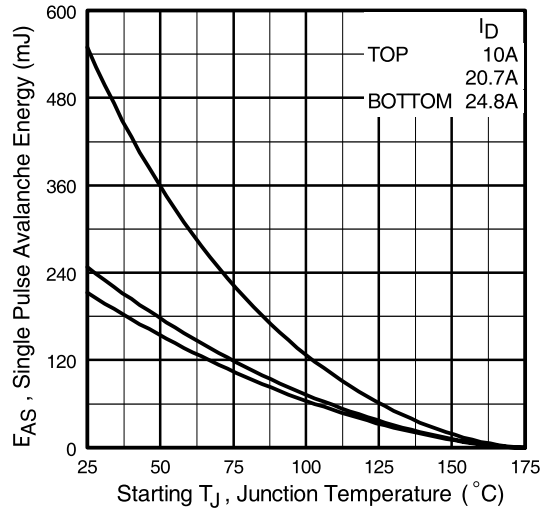
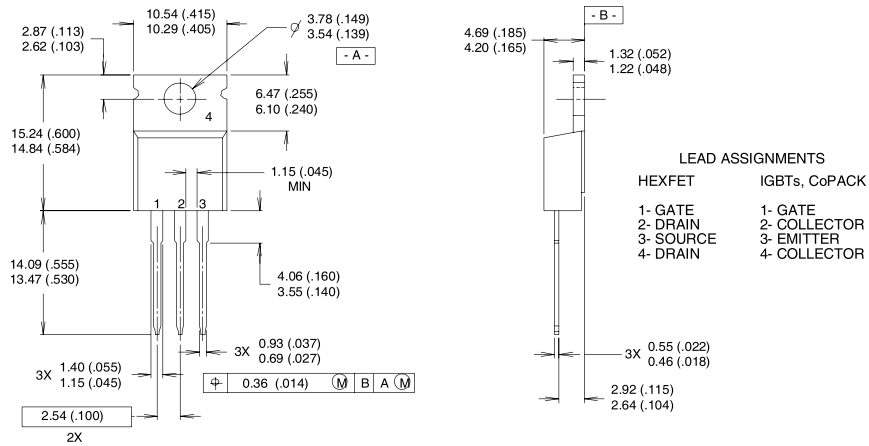


Fig 15c. Maximum Avalanche Energy Vs. Drain Current

TO-220AB Package Outline

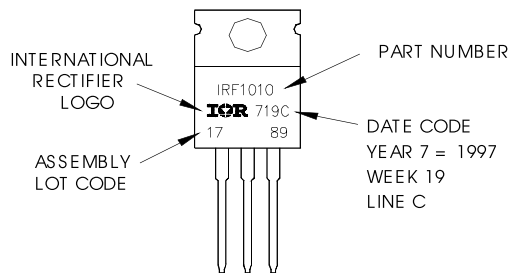
Dimensions are shown in millimeters (inches)



- 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"

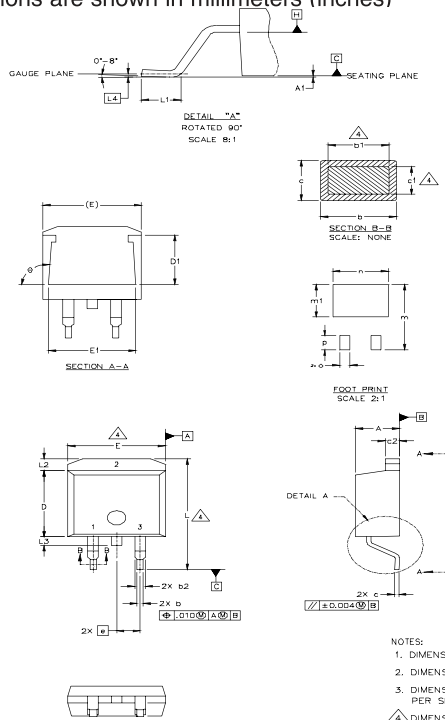


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D²Pak Package Outline

Dimensions are shown in millimeters (inches)



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

LEAD ASSIGNMENTS

HEFET	IGBTs, CoPACK	DIODES
1.- GATE	1.- GATE	1.- ANODE
2.- DRAIN	2.- COLLECTOR	2.- CATHODE
3.- SOURCE	3.- EMITTER	3.- ANODE

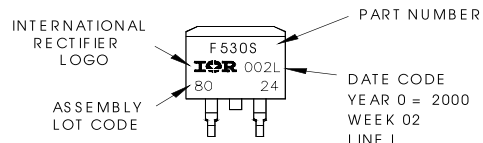
* PART DEPENDENT.

- 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 [0.005"] 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.

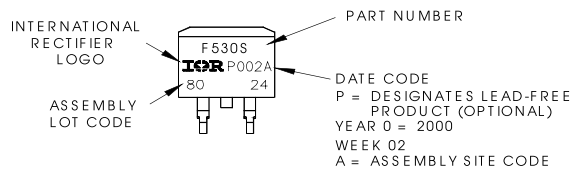
D²Pak Part Marking Information (Lead-Free)

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

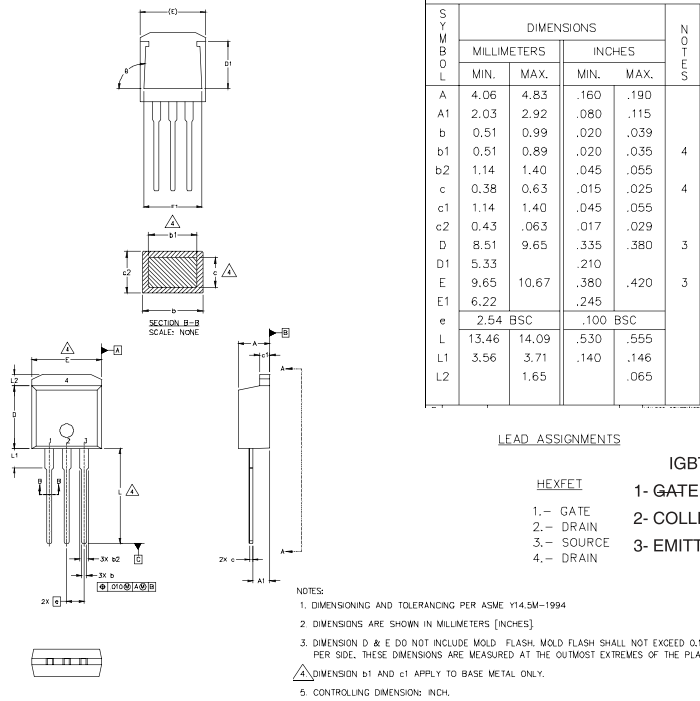
Note: "P" in assembly line
position indicates "Lead-Free"



OR

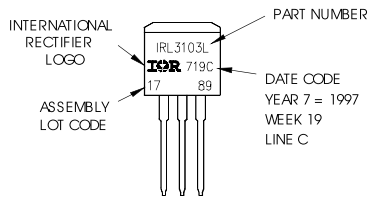


TO-262 Package Outline

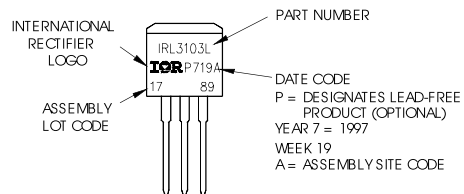


TO-262 Part Marking Information

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

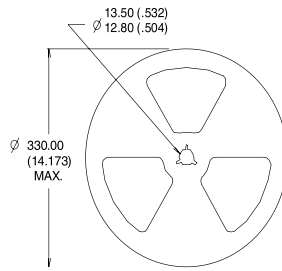
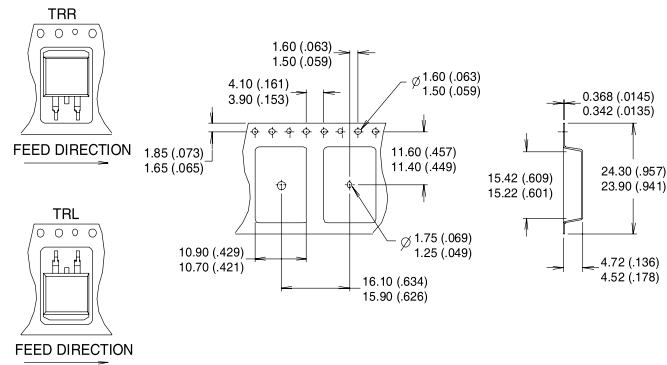


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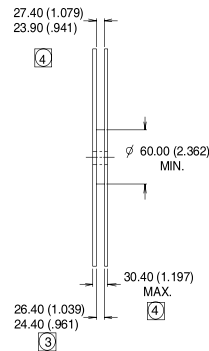
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D²Pak Tape & Reel Infomation

Dimensions are shown in millimeters (inches)



NOTES:
 1. CONFORMS TO EIA-418.
 2. CONTROLLING DIMENSION: MILLIMETER.
 ③ DIMENSION MEASURED @ HUB.
 ④ INCLUDES FLANGE DISTORTION @ OUTER EDGE.



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

Data and specifications subject to change without notice.

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TAC Fax: (310) 252-7903

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/>