

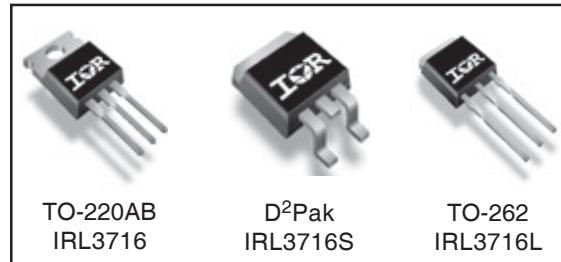
IRL3716PbF
IRL3716SPbF
IRL3716LPbF

Applications

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

HEXFET® Power MOSFET

V _{DSS}	R _{DS(on)} max	I _D
20V	4.0mΩ	180A ^⑥



Benefits

- Ultra-Low Gate Impedance
- Very Low R_{DS(on)} at 4.5V V_{GS}
- 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	± 20	V
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V	180 ^⑥	
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 10V	130	A
I _{DM}	Pulsed Drain Current ^①	720	
P _D @ T _C = 25°C	Maximum Power Dissipation ^③	210	W
P _D @ T _C = 100°C	Maximum Power Dissipation ^③	100	W
	Linear Derating Factor	1.4	W/°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	—	0.72	
R _{θCS}	Case-to-Sink, Flat, Greased Surface ^④	0.50	—	°C/W
R _{θJA}	Junction-to-Ambient ^④	—	62	
R _{θJA}	Junction-to-Ambient (PCB mount) ^⑤	—	40	

Notes ① through ⑥ are on page 11

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International
Rectifier

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(\text{BR})\text{DSS}}$	Drain-to-Source Breakdown Voltage	20	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
$\Delta V_{(\text{BR})\text{DSS}/\Delta T_J}$	Breakdown Voltage Temp. Coefficient	—	0.021	—	$\text{V}/^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(\text{on})}$	Static Drain-to-Source On-Resistance	—	3.0	4.0	$\text{m}\Omega$	$V_{GS} = 10\text{V}, I_D = 90\text{A}$ ③
		—	4.0	4.8		$V_{GS} = 4.5\text{V}, I_D = 72\text{A}$ ③
$V_{GS(\text{th})}$	Gate Threshold Voltage	1.0	—	3.0	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}$
		—	—	250		$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 16\text{V}$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -16\text{V}$

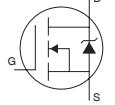
Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	100	—	—	S	$V_{DS} = 10\text{V}, I_D = 72\text{A}$
Q_g	Total Gate Charge	—	53	79	nC	$I_D = 72\text{A}$
Q_{gs}	Gate-to-Source Charge	—	17	26		$V_{DS} = 16\text{V}$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	24	35		$V_{GS} = 4.5\text{V}$
Q_{oss}	Output Gate Charge	—	50	75		$V_{GS} = 0\text{V}, V_{DS} = 10\text{V}$
$t_{d(on)}$	Turn-On Delay Time	—	18	—	ns	$V_{DD} = 10\text{V}$
t_r	Rise Time	—	140	—		$I_D = 72\text{A}$
$t_{d(off)}$	Turn-Off Delay Time	—	38	—		$R_G = 3.9\Omega$
t_f	Fall Time	—	36	—		$V_{GS} = 4.5\text{V}$ ③
C_{iss}	Input Capacitance	—	5090	—	pF	$V_{GS} = 0\text{V}$
C_{oss}	Output Capacitance	—	3440	—		$V_{DS} = 10\text{V}$
C_{rss}	Reverse Transfer Capacitance	—	560	—		$f = 1.0\text{MHz}$

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	640	mJ
I_{AR}	Avalanche Current ①	—	72	A

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	180 ⑥	A	MOSFET symbol showing the integral reverse p-n junction diode.
	Pulsed Source Current (Body Diode) ①	—	—	720		
V_{SD}	Diode Forward Voltage	—	0.93	1.3	V	$T_J = 25^\circ\text{C}, I_S = 72\text{A}, V_{GS} = 0\text{V}$ ③
		—	0.80	—		$T_J = 125^\circ\text{C}, I_S = 72\text{A}, V_{GS} = 0\text{V}$ ③
t_{rr}	Reverse Recovery Time	—	180	280	ns	$T_J = 25^\circ\text{C}, I_F = 72\text{A}, V_R = 20\text{V}$ $dI/dt = 100\text{A}/\mu\text{s}$ ③
Q_{rr}	Reverse Recovery Charge	—	87	130	nC	
t_{rr}	Reverse Recovery Time	—	190	280	ns	$T_J = 125^\circ\text{C}, I_F = 72\text{A}, V_R = 20\text{V}$ $dI/dt = 100\text{A}/\mu\text{s}$ ③
Q_{rr}	Reverse Recovery Charge	—	85	130	nC	

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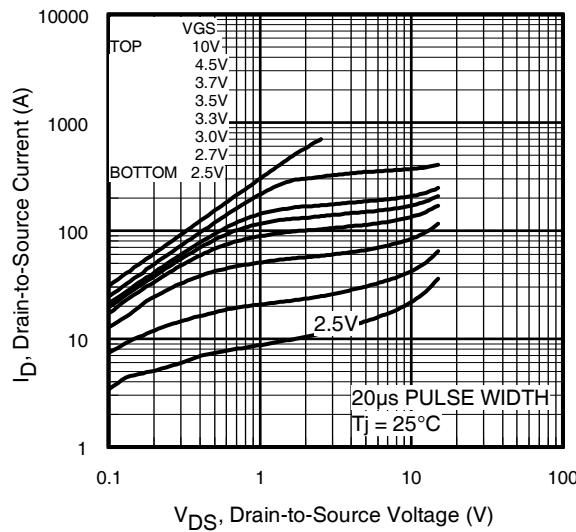


Fig 1. Typical Output Characteristics

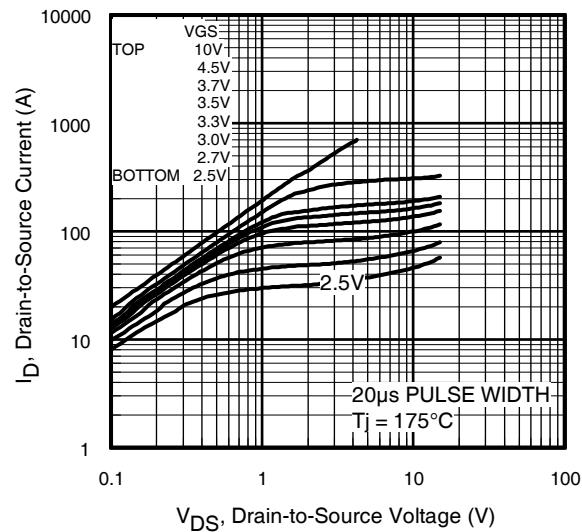


Fig 2. Typical Output Characteristics

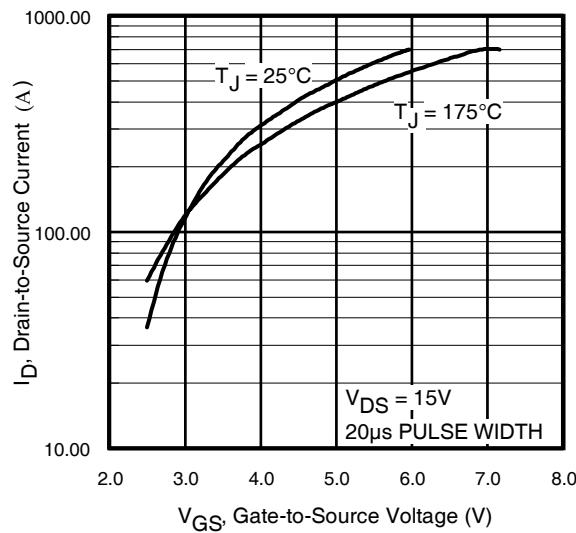


Fig 3. Typical Transfer Characteristics

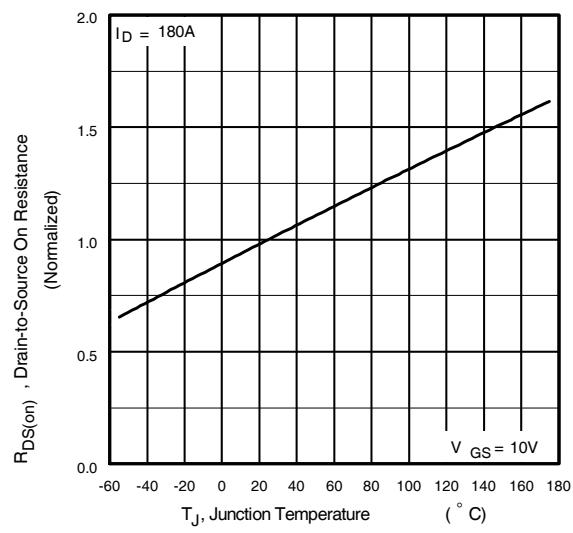


Fig 4. Normalized On-Resistance
Vs. Temperature

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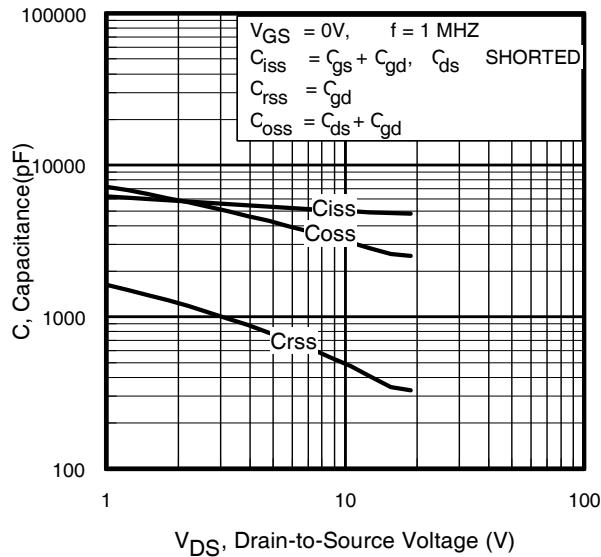


Fig 5. Typical Capacitance Vs.
Drain-to-Source Voltage

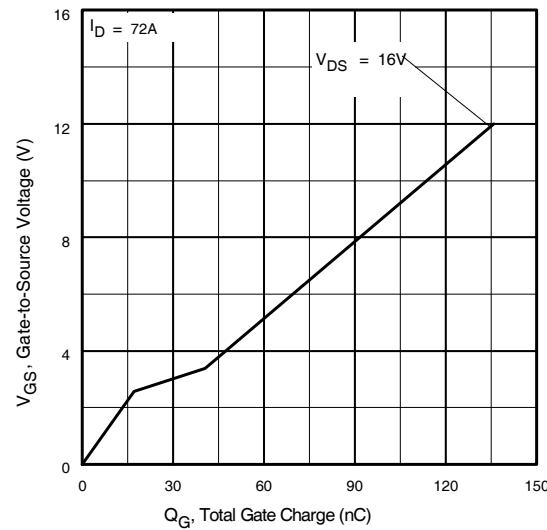


Fig 6. Typical Gate Charge Vs.
Gate-to-Source Voltage

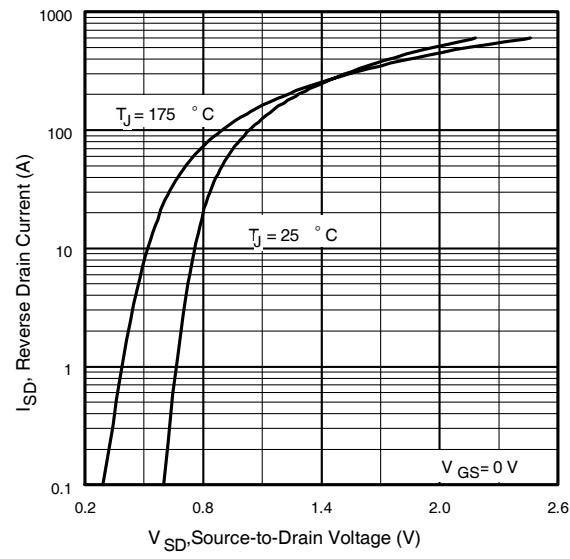


Fig 7. Typical Source-Drain Diode
Forward Voltage

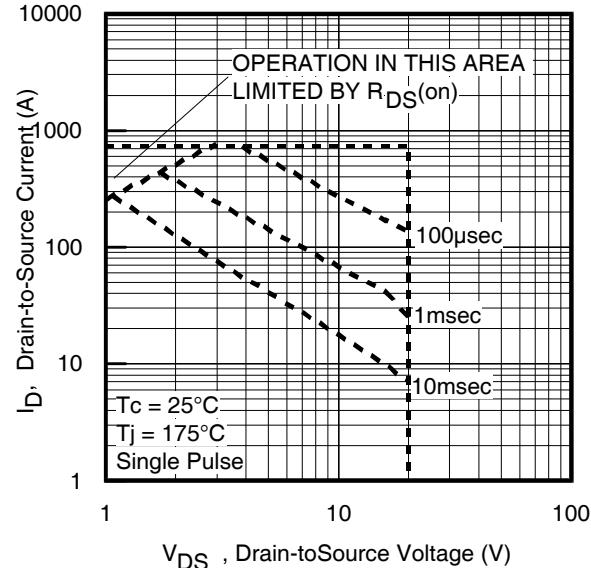


Fig 8. Maximum Safe Operating Area

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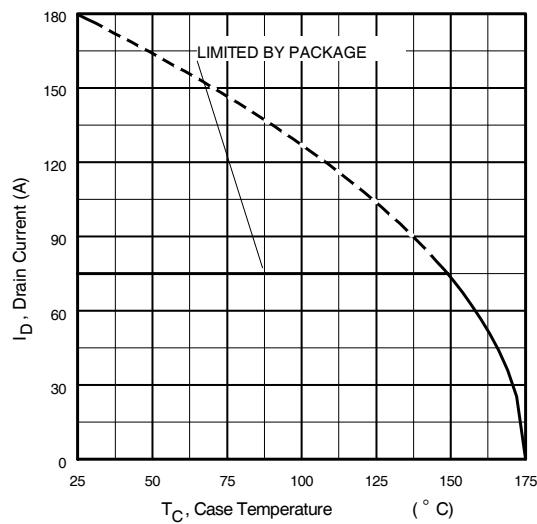


Fig 9. Maximum Drain Current Vs.
Case Temperature

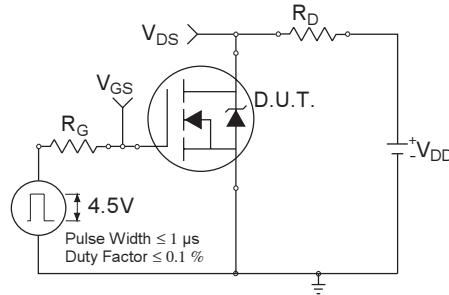


Fig 10a. Switching Time Test Circuit

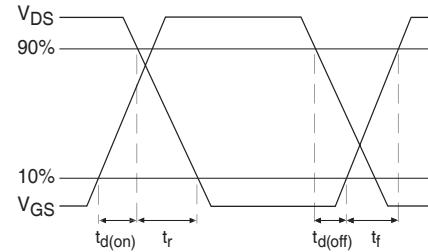


Fig 10b. Switching Time Waveforms

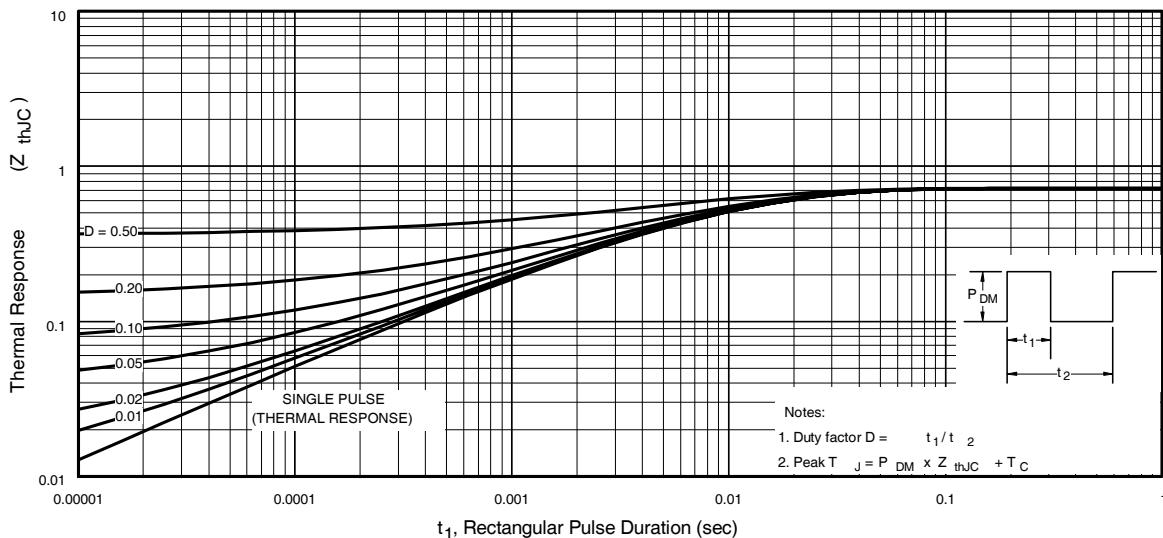


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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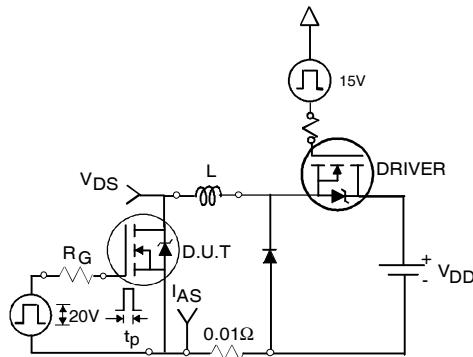


Fig 12a. Unclamped Inductive Test Circuit

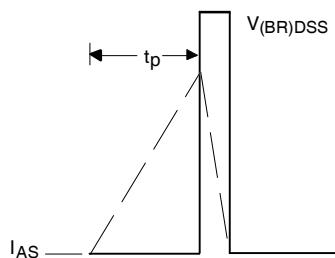


Fig 12b. Unclamped Inductive Waveforms

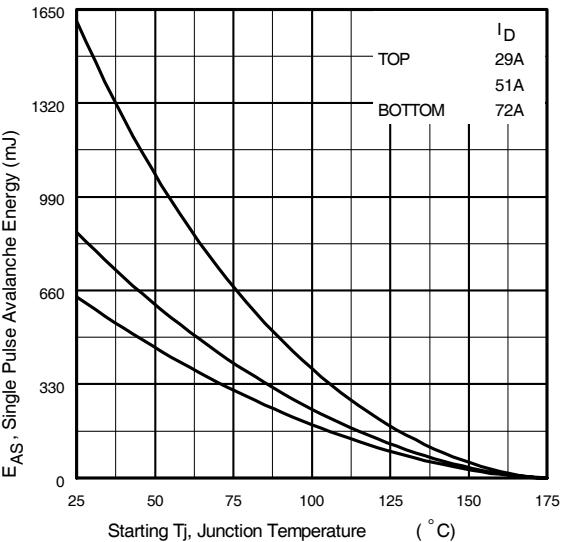


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

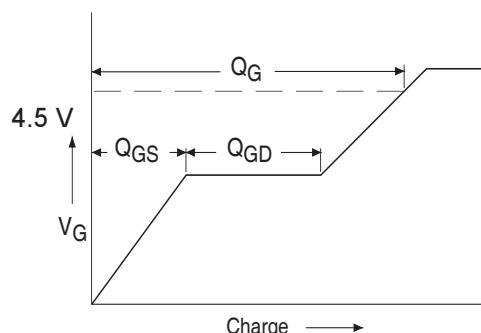


Fig 13a. Basic Gate Charge Waveform

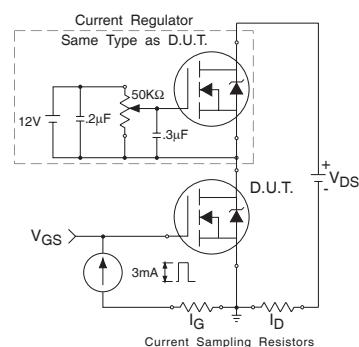
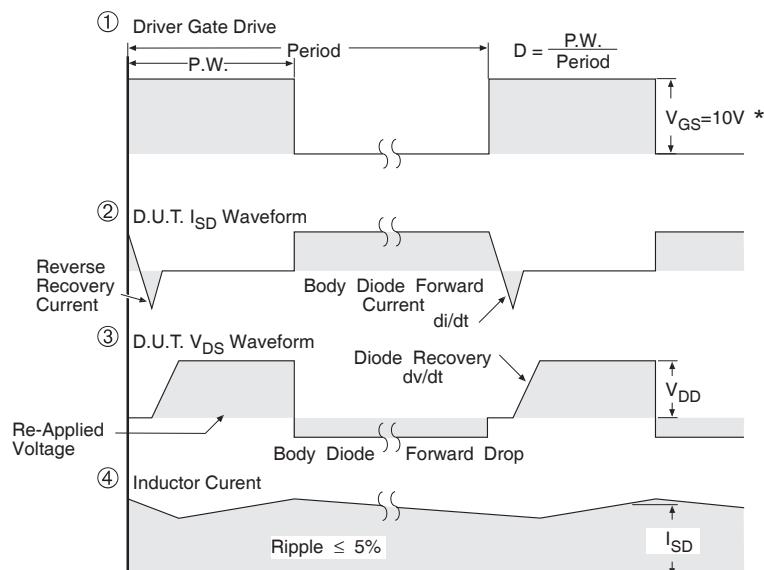
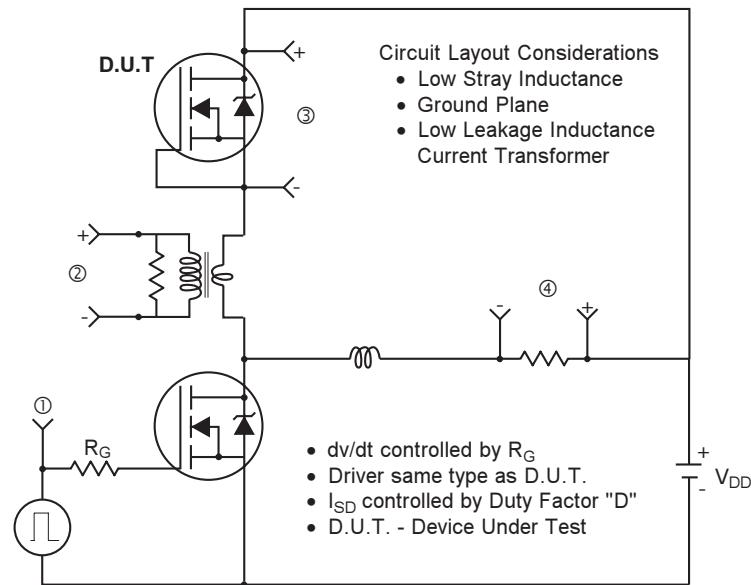


Fig 13b. Gate Charge Test Circuit

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Peak Diode Recovery dv/dt Test Circuit

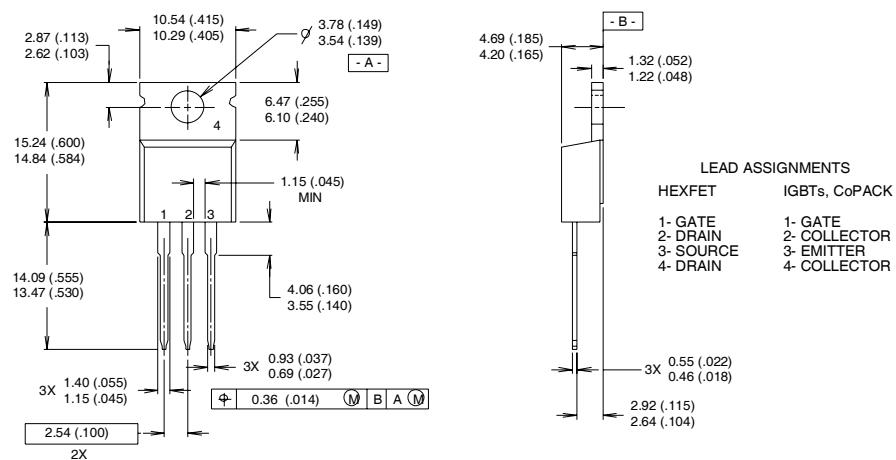


* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFET® Power MOSFETs

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

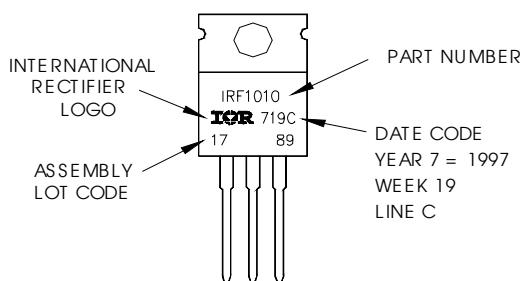
- 1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
- 2 CONTROLLING DIMENSION : INCH

3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.

4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

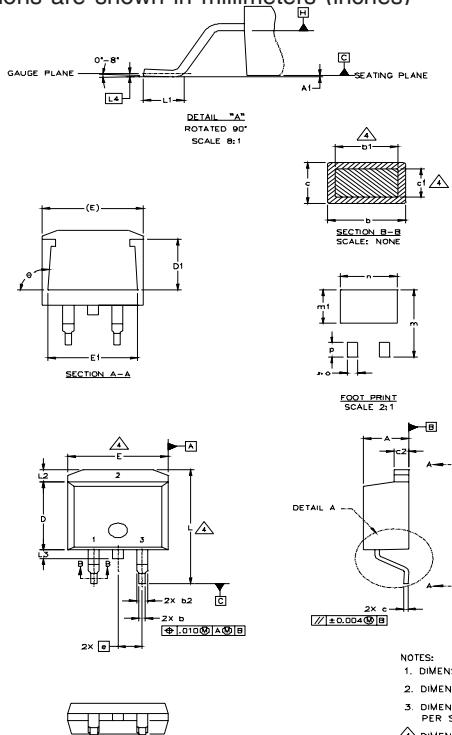
TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"
Note: "P" in assembly line
position indicates "Lead-Free"



D²Pak Package Outline

Dimensions are shown in millimeters (inches)



SYM BO L	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 2.- DRAIN 3.- SOURCE	1.- GATE 2.- COLLECTOR 3.- Emitter	1.- ANODE ↑ 2.- CATHODE 3.- ANODE

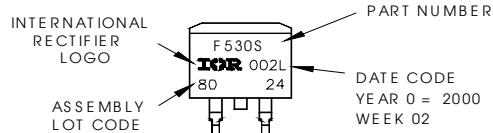
* PART DEPENDENT.

- 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.

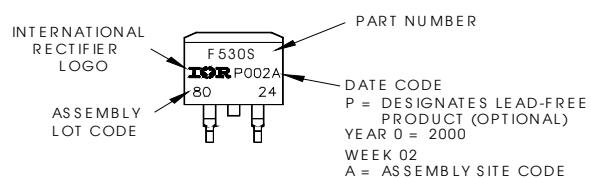
D²Pak Part Marking Information (Lead-Free)

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

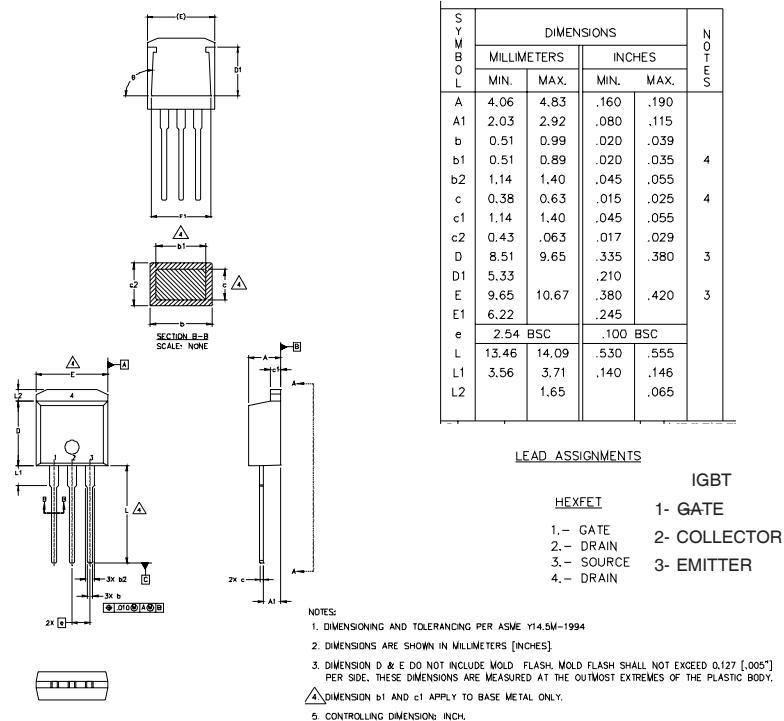
Note: "P" in assembly line
 position indicates "Lead-Free"



OR



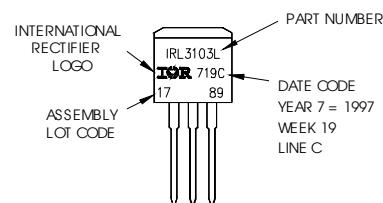
TO-262 Package Outline



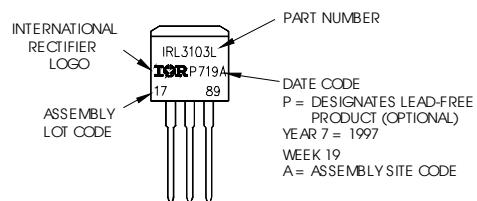
TO-262 Part Marking Information

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

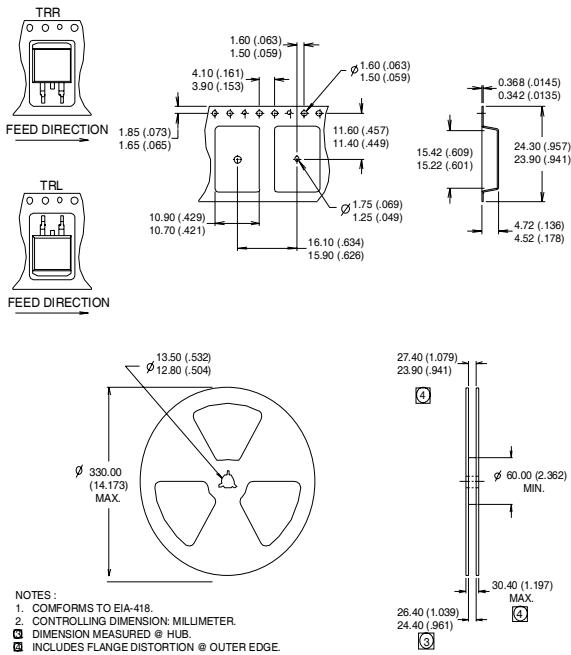
Note: "P" in assembly line
position indicates "Lead-Free"



OR



D²Pak Tape & Reel Infomation



Notes:

- ① Repetitive rating: pulse width limited by max. junction temperature.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.25\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 72\text{A}$.
- ④ This is only applied to TO-220AB package
- ⑤ This is applied to D²Pak, 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
IR Rectifier

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TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information.06/04
www.irf.com

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