

Applications

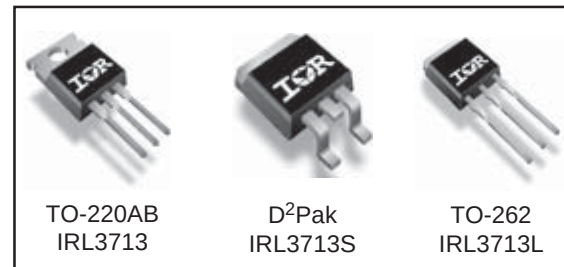
- High Frequency Isolated DC-DC Converters with Synchronous Rectification for Telecom and Industrial Use
- High Frequency Buck Converters for Computer Processor Power
- 100% R_G Tested

HEXFET® Power MOSFET

V_{DS}	$R_{DS(on)}$ max (m Ω)	I_D
30V	3.0@ $V_{GS} = 10V$	260A ^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	30	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D @ $T_C = 25^\circ C$	Continuous Drain Current, V_{GS} @ 10V	260 ^⑥	A
I_D @ $T_C = 100^\circ C$	Continuous Drain Current, V_{GS} @ 10V	180 ^⑥	
I_{DM}	Pulsed Drain Current ^①	1040 ^⑥	
P_D @ $T_C = 25^\circ C$	Maximum Power Dissipation	330	W
P_D @ $T_C = 100^\circ C$	Maximum Power Dissipation	170	
	Linear Derating Factor	2.2	W/ $^\circ C$
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to +175	$^\circ C$

Thermal Resistance

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Junction-to-Case ^②	—	0.45	$^\circ C/W$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface ^④	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient ^{④⑦}	—	62	
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) ^{⑤⑦}	—	40	

Notes ^① through ^⑦ are on page 11

IRL3713/S/L

International
IR Rectifier

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

Symbol	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	—	2.6	3.0	m Ω	$V_{GS} = 10V, I_D = 38A$ ③
		—	3.3	4.0		$V_{GS} = 4.5V, I_D = 30A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.5	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	50	μA	$V_{DS} = 30V, V_{GS} = 0V$
		—	—	20		$V_{DS} = 24V, V_{GS} = 0V$
		—	—	100		$V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -20V$

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

Symbol	Parameter	Min	Typ	Max	Units	Conditions
g_{fs}	Forward Transconductance	76	—	—	S	$V_{DS} = 15V, I_D = 30A$
Q_g	Total Gate Charge	—	75	110	nC	$I_D = 30A$
Q_{gs}	Gate-to-Source Charge	—	24	—		$V_{DS} = 15V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	37	—		$V_{GS} = 4.5V$ ④
Q_{oss}	Output Gate Charge	—	61	92		$V_{GS} = 0V, V_{DS} = 15V$
R_G	Gate Resistance	0.5	—	3.4	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	16	—	ns	$V_{DD} = 15V$
t_r	Rise Time	—	160	—		$I_D = 30A$
$t_{d(off)}$	Turn-Off Delay Time	—	40	—		$R_G = 1.8\Omega$
t_f	Fall Time	—	57	—		$V_{GS} = 4.5V$ ③
C_{iss}	Input Capacitance	—	5890	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	3130	—		$V_{DS} = 15V$
C_{rss}	Reverse Transfer Capacitance	—	630	—		$f = 1.0MHz$

Avalanche Characteristics

Symbol	Parameter	Typ	Max	Units
E_{AS}	Single Pulse Avalanche Energy②	—	1530	mJ
I_{AR}	Avalanche Current ①	—	46	A

Diode Characteristics

Symbol	Parameter	Min	Typ	Max	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	260 ⑥	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①⑥	—	—	1040 ⑥		
V_{SD}	Diode Forward Voltage	—	0.80	1.3	V	$T_J = 25^\circ\text{C}, I_S = 30A, V_{GS} = 0V$ ③
		—	0.68	—		$T_J = 125^\circ\text{C}, I_S = 30A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	75	110	ns	$T_J = 25^\circ\text{C}, I_F = 30A, V_R = 0V$
Q_{rr}	Reverse Recovery Charge	—	140	210	nC	$di/dt = 100A/\mu s$ ③
t_{rr}	Reverse Recovery Time	—	78	120	ns	$T_J = 125^\circ\text{C}, I_F = 30A, V_R = 20V$
Q_{rr}	Reverse Recovery Charge	—	160	240	nC	$di/dt = 100A/\mu s$ ③

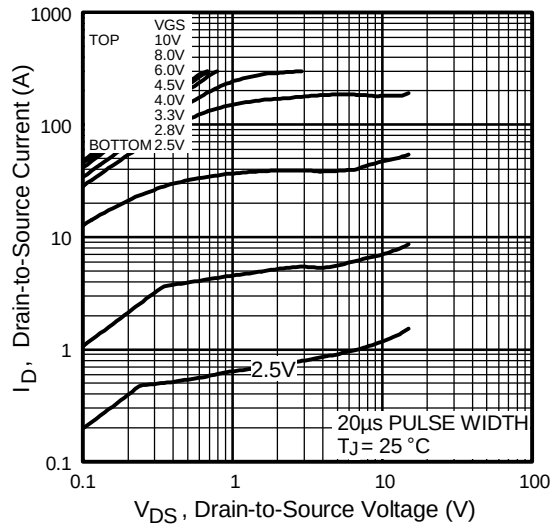


Fig 1. Typical Output Characteristics

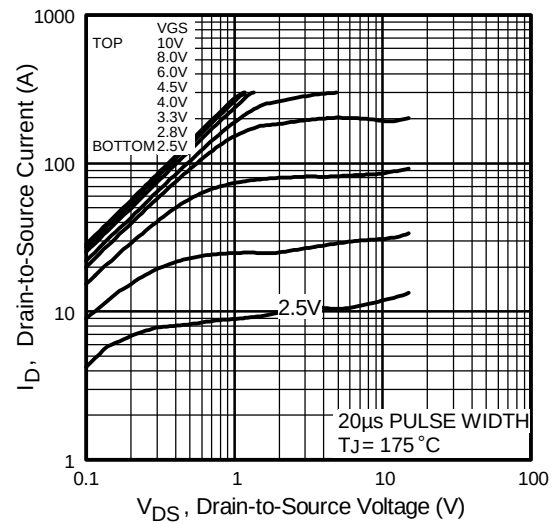


Fig 2. Typical Output Characteristics

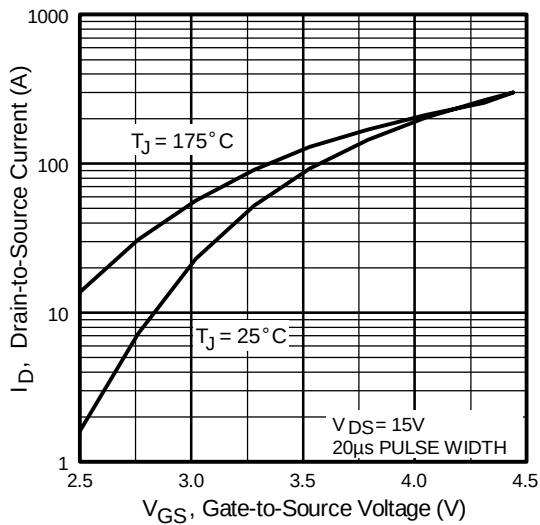


Fig 3. Typical Transfer Characteristics

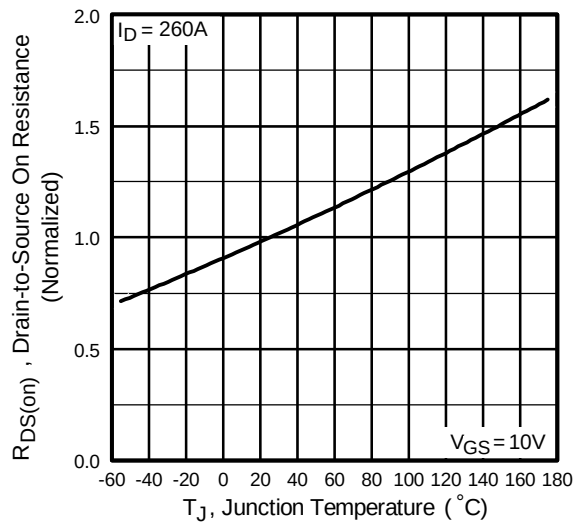


Fig 4. Normalized On-Resistance Vs. Temperature

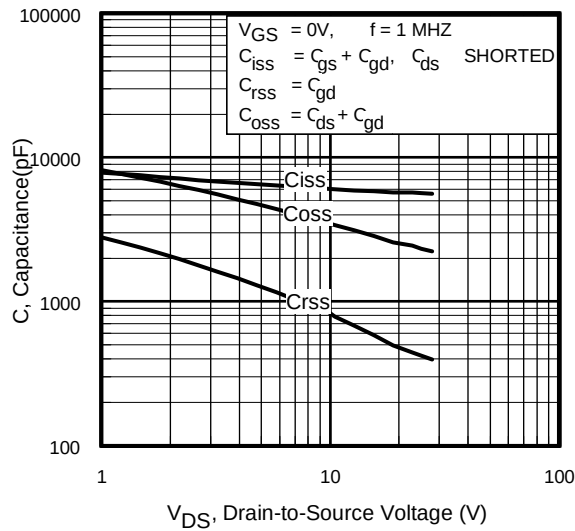


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

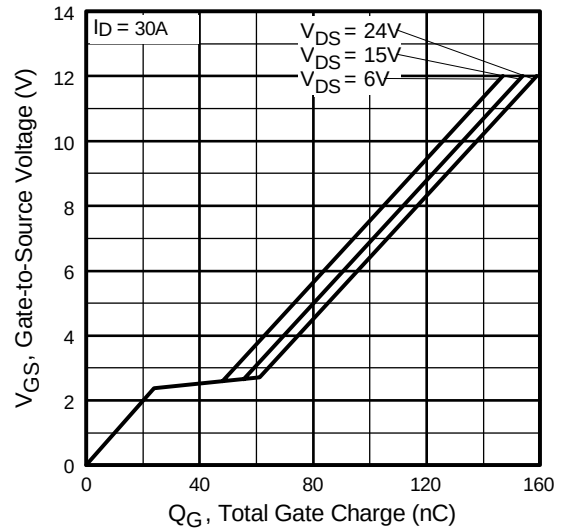


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

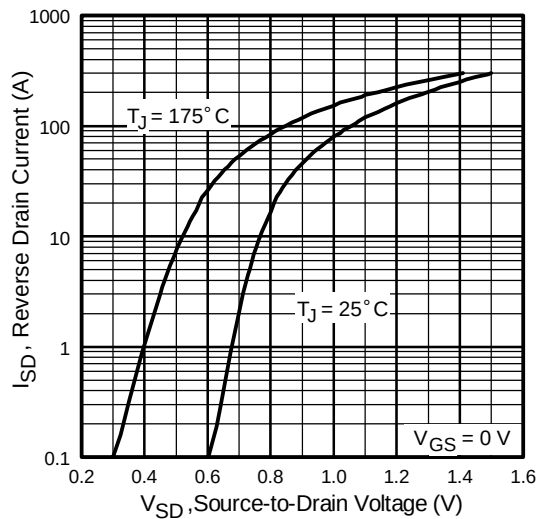


Fig 7. Typical Source-Drain Diode Forward Voltage

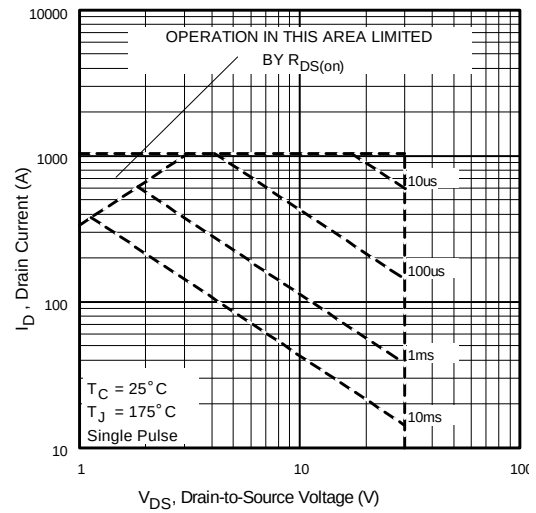


Fig 8. Maximum Safe Operating Area

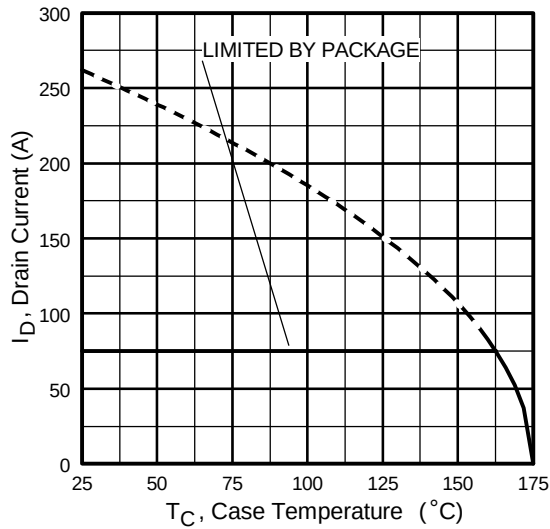


Fig 9. Maximum Drain Current Vs. Case Temperature

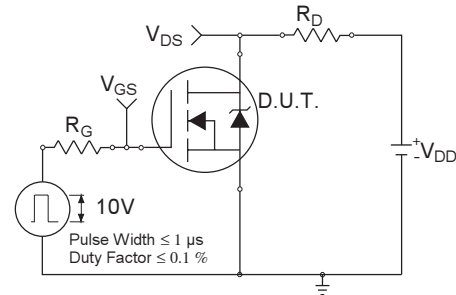


Fig 10a. Switching Time Test Circuit

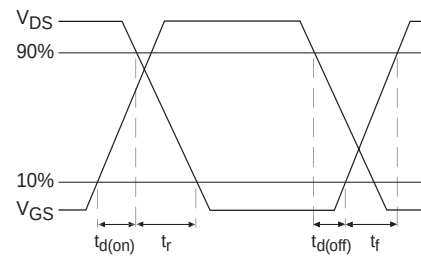


Fig 10b. Switching Time Waveforms

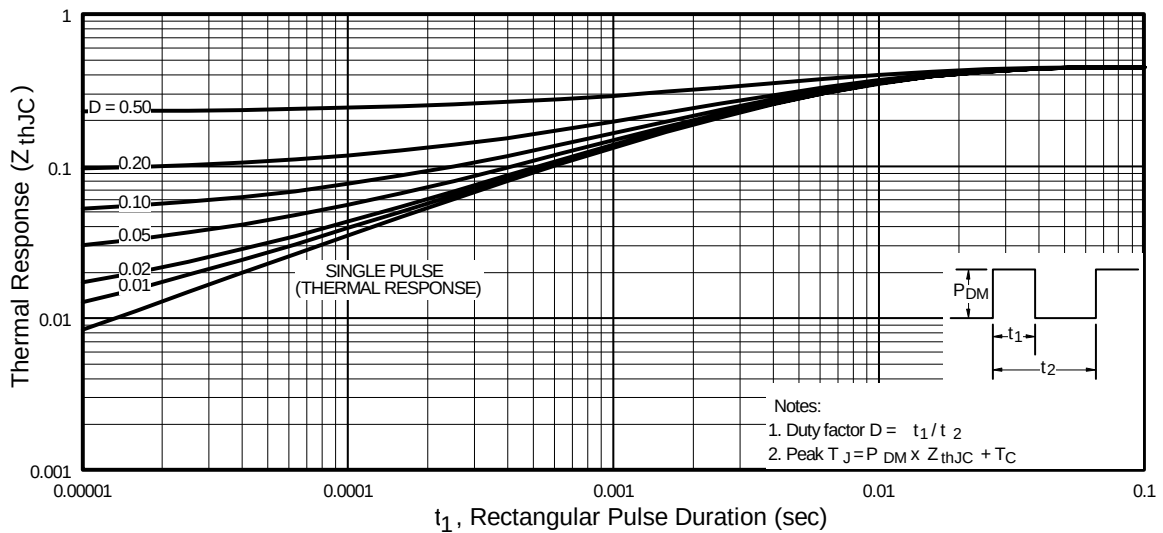


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

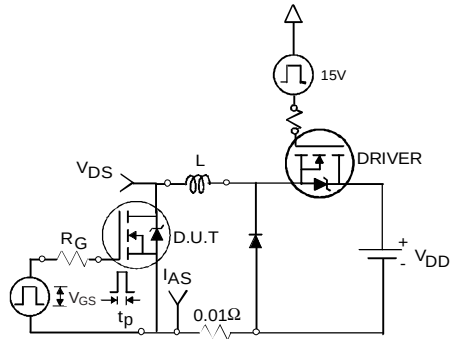


Fig 12a. Unclamped Inductive Test Circuit

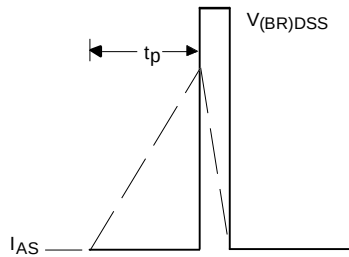


Fig 12b. Unclamped Inductive Waveforms

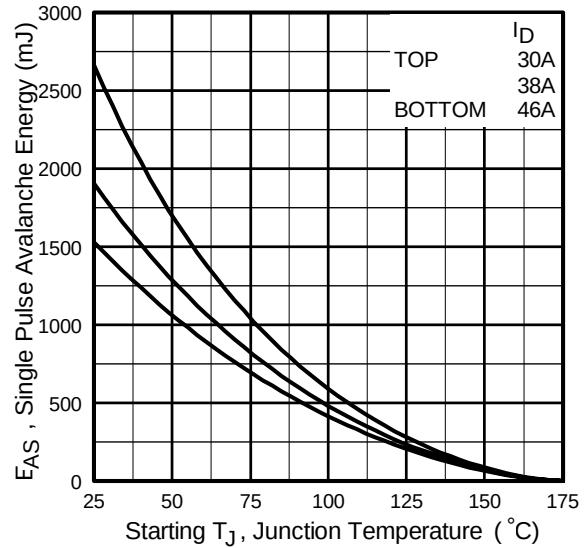


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

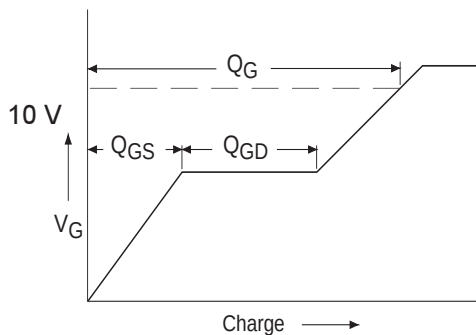


Fig 13a. Basic Gate Charge Waveform

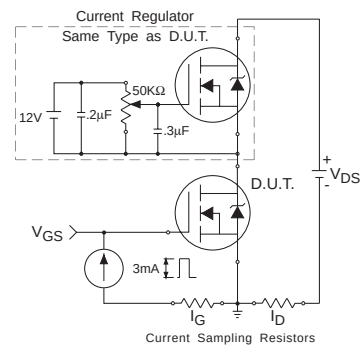
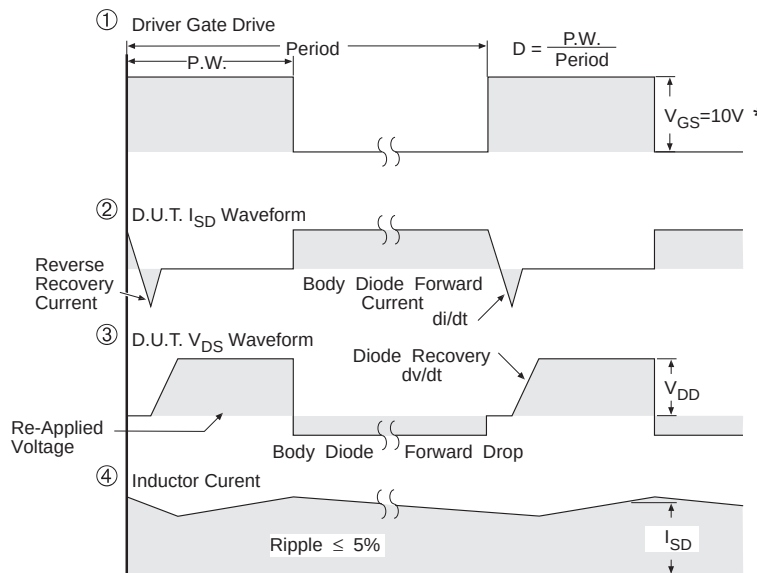
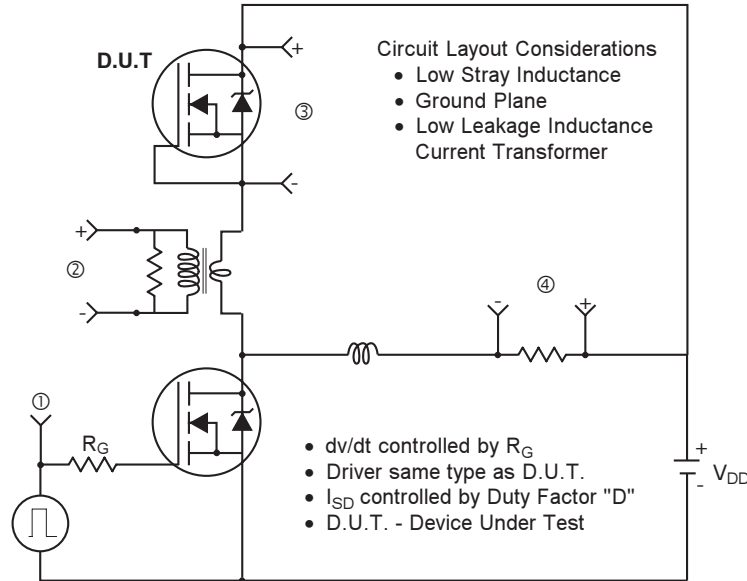


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit

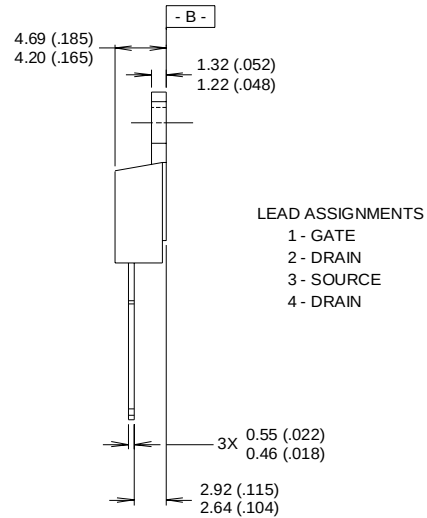
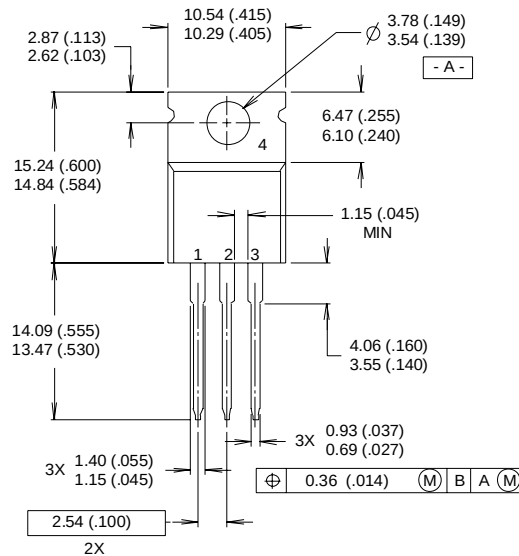


* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFET® Power MOSFETs

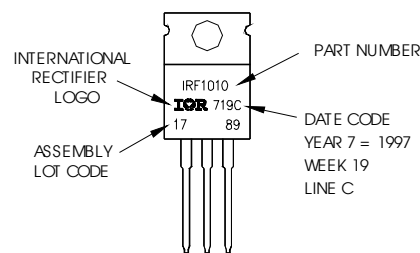
TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



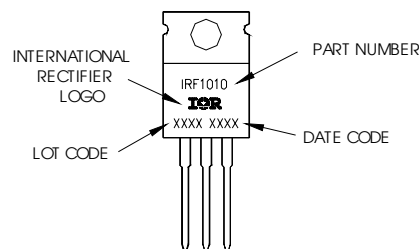
TO-220AB Part Marking Information

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



For GB Production

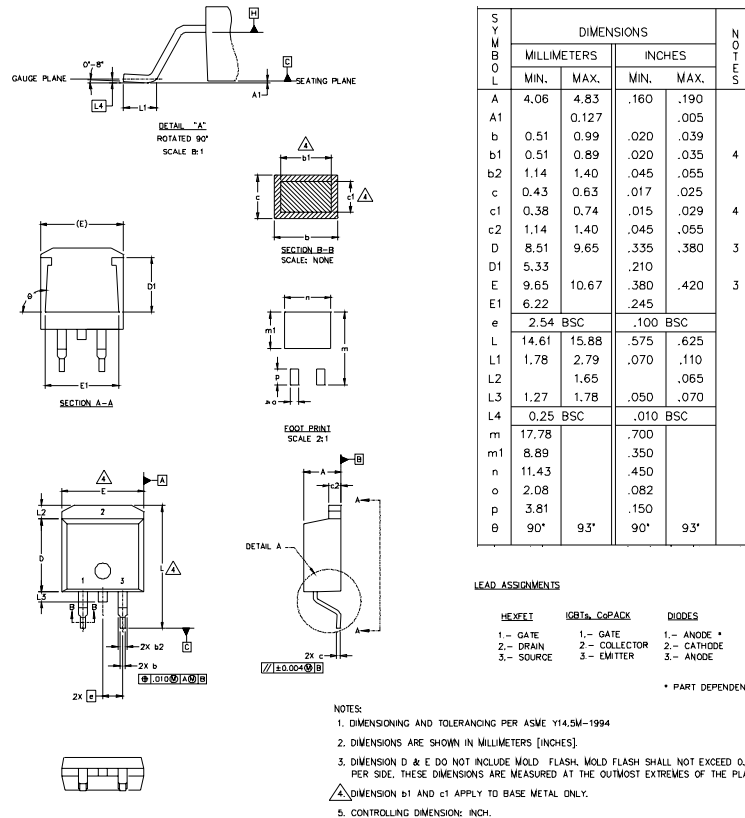
EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"



D²Pak Package Outline

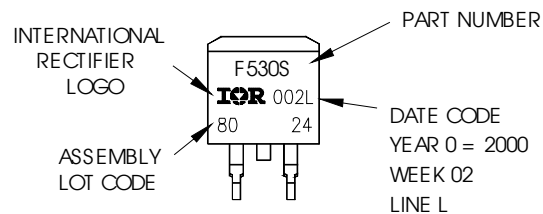
Dimensions are shown in millimeters (inches)

IRL3713/S/L



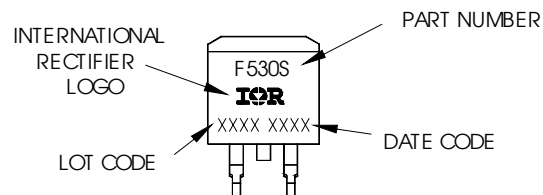
D²Pak Part Marking Information

EXAMPLE: THIS IS AN IRF530S WITH
LOT CODE 8024
ASSEMBLED ON WW02, 2000
IN THE ASSEMBLY LINE "L"



For GB Production

EXAMPLE: THIS IS AN IRF530S WITH
LOT CODE 8024
ASSEMBLED ON WW02, 2000
IN THE ASSEMBLY LINE "L"

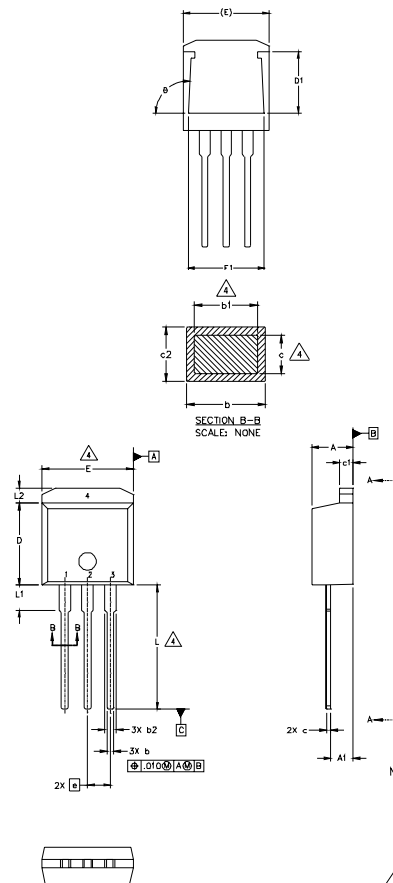


IRL3713/S/L

International
IR Rectifier

TO-262 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	2.03	2.92	.080	.115	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	
b2	1.14	1.40	.045	.055	4
c	0.38	0.63	.015	.025	
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		3
E	9.65	10.67	.380	.420	
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

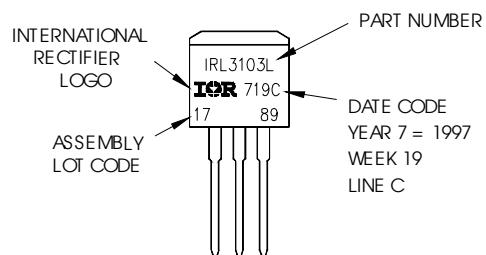
- 1- GATE
- 2- COLLECTOR

NOTES:

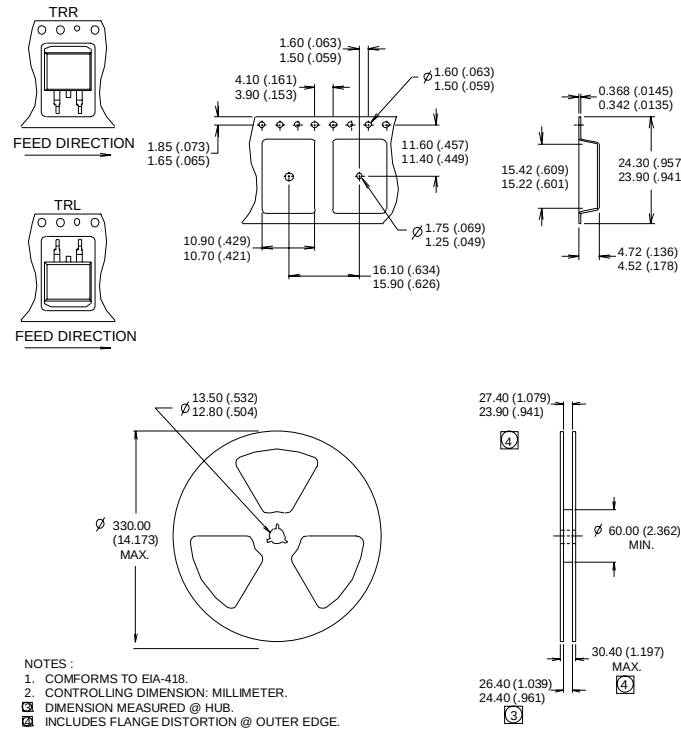
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
5. CONTROLLING DIMENSION: INCH.

TO-262 Part Marking Information

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



D²Pak Tape & Reel Information



Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 1.4\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 46\text{A}$, $V_{GS} = 10\text{V}$
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ This is only applied to TO-220A 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.
- ⑦ R_θ is measured at T_J approximately 90°C

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

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. 11/03