International
IOR Rectifier

SMPS MOSFET

IRL3713PbF
IRL3713SPbF
IRL3713LPbF

HEXFET® Power MOSFET

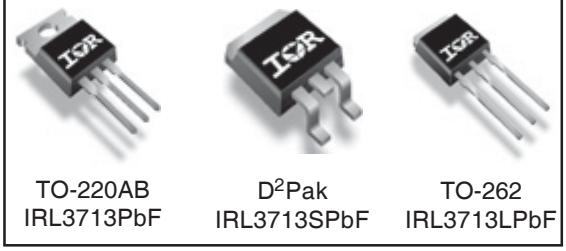
V_{DSS}	$R_{DS(on)}$ max (mΩ)	I_D
30V	3.0@V_{GS} = 10V	260A⑥

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
- 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 IRL3713PbF | D^2Pak IRL3713SPbF | TO-262 IRL3713LPbF

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	260⑥	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	180⑥	
I_{DM}	Pulsed Drain Current ①	1040⑥	
P_D @T_C = 25°C	Maximum Power Dissipation	330	W
P_D @Tc = 100°C	Maximum Power Dissipation	170	
	Linear Derating Factor	2.2	W/°C
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to +175	°C

Thermal Resistance

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Junction-to-Case ⑦	–––	0.45*	°C/W
R_{qCS}	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	

* $R_{\theta JC}$ (end of life) for D^2Pak and TO-262 = 0.50°C/W. This is the maximum measured value after 1000 temperature cycles from -55 to 150°C and is accounted for by the physical wearout of the die attach medium.

Notes ① through ⑦ are on page 11

Static @ T_J = 25°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 = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.027	—	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	2.6	3.0	mΩ	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 = 250µA
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°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°C (unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Units	Conditions
gfs	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 = 1.8Ω
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 ⑤	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°C, I_S = 30A, V_{GS} = 0V ③
		—	0.68	—		T_J = 125°C, I_S = 30A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	—	75	110	ns	T_J = 25°C, I_F = 30A, V_R = 0V
Q_{rr}	Reverse Recovery Charge	—	140	210	nC	di/dt = 100A/µs ③
t_{rr}	Reverse Recovery Time	—	78	120	ns	T_J = 125°C, I_F = 30A, V_R = 20V
Q_{rr}	Reverse Recovery Charge	—	160	240	nC	di/dt = 100A/µs ③

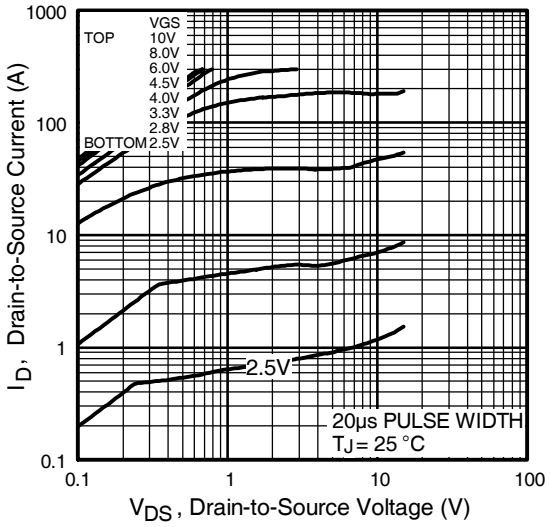


Fig 1. Typical Output Characteristics

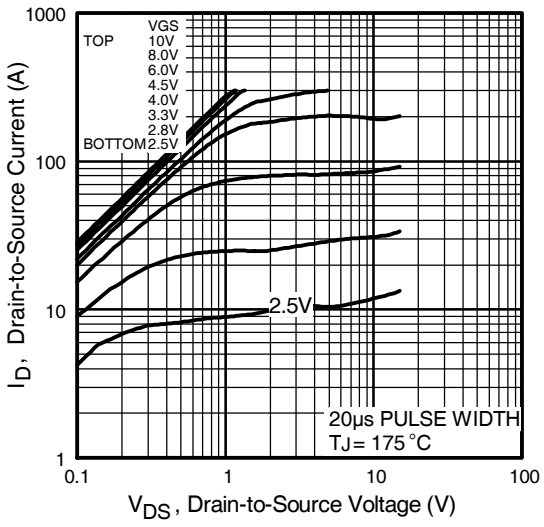


Fig 2. Typical Output Characteristics

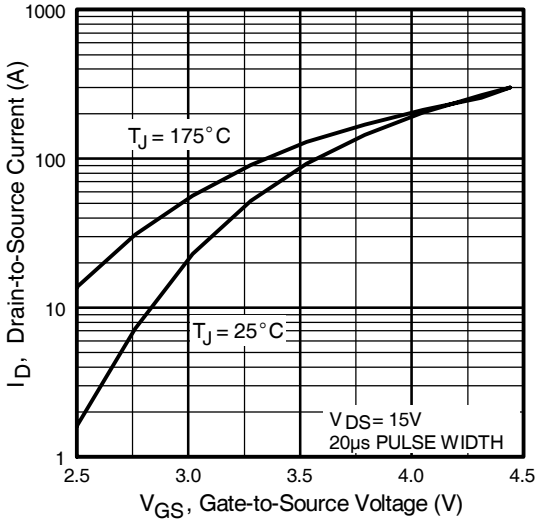


Fig 3. Typical Transfer Characteristics

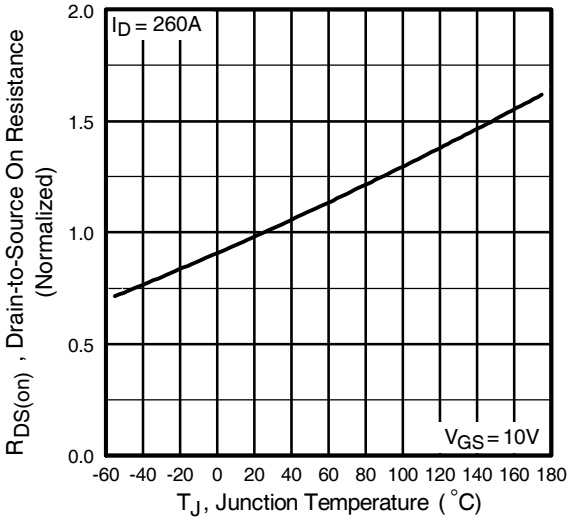


Fig 4. Normalized On-Resistance Vs. Temperature

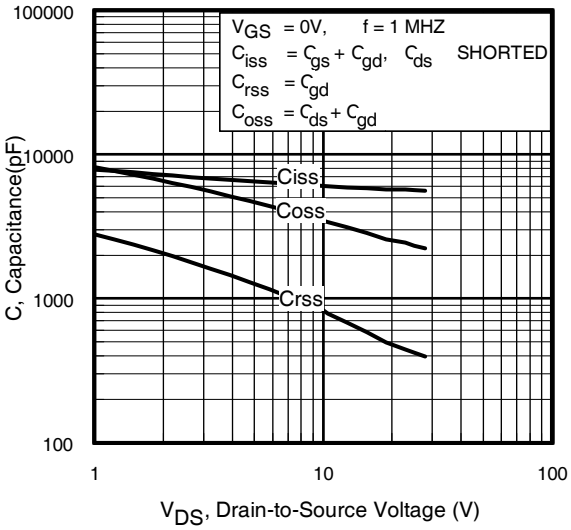


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

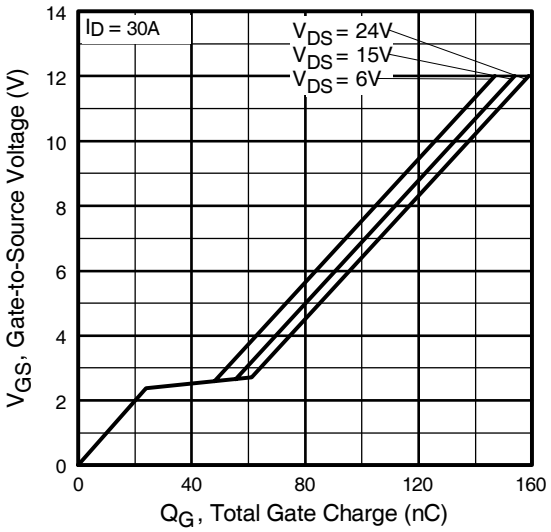


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

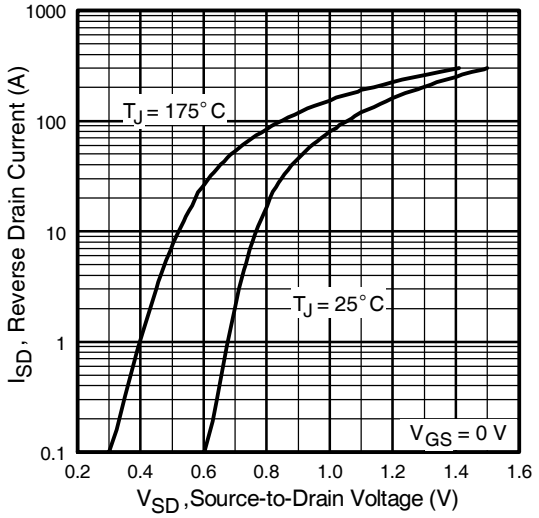


Fig 7. Typical Source-Drain Diode Forward Voltage

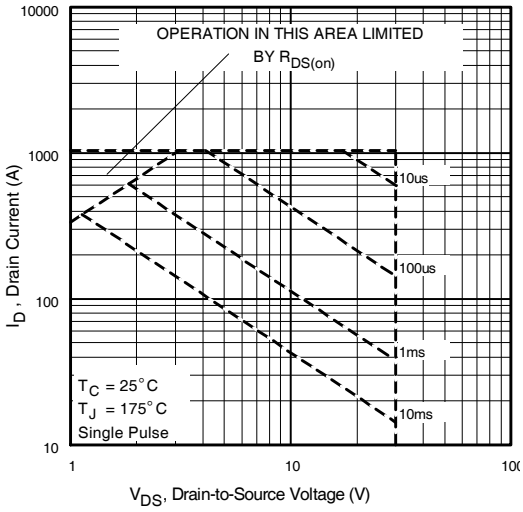


Fig 8. Maximum Safe Operating Area

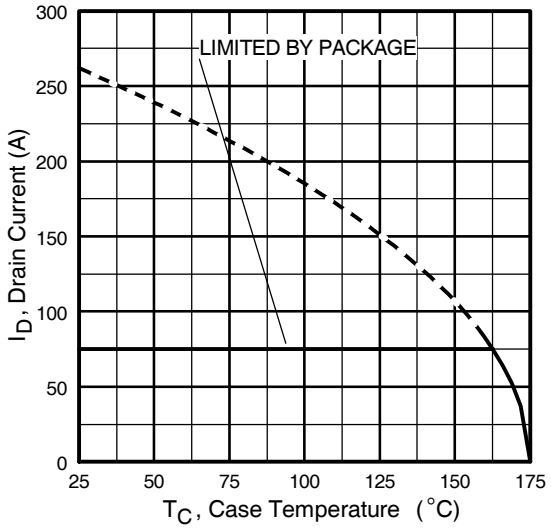


Fig 9. Maximum Drain Current Vs. Case Temperature

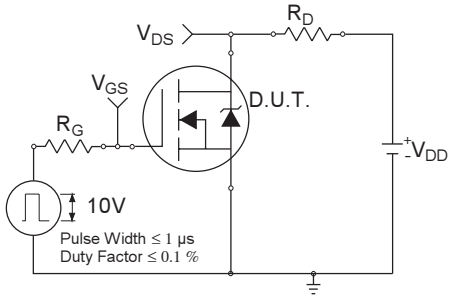


Fig 10a. Switching Time Test Circuit

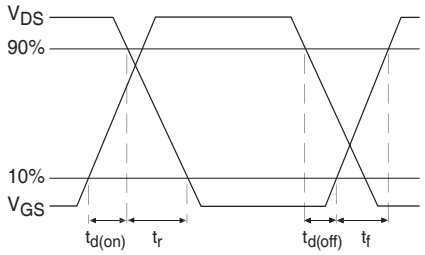


Fig 10b. Switching Time Waveforms

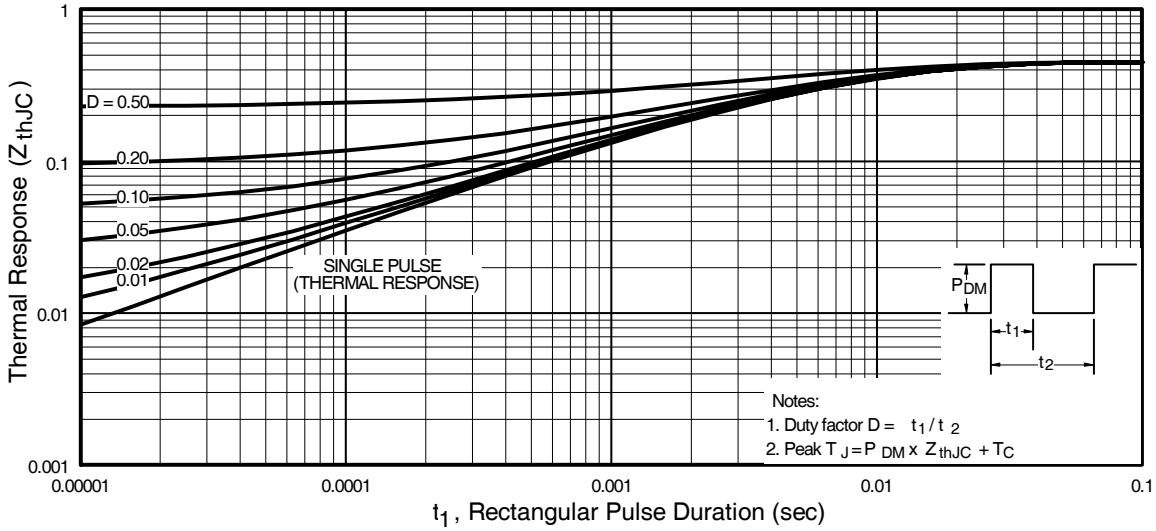


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

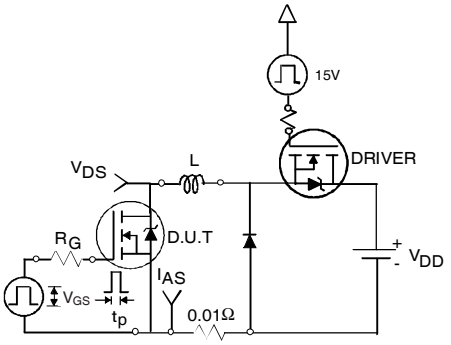


Fig 12a. Unclamped Inductive Test Circuit

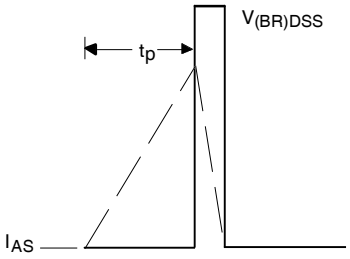


Fig 12b. Unclamped Inductive Waveforms

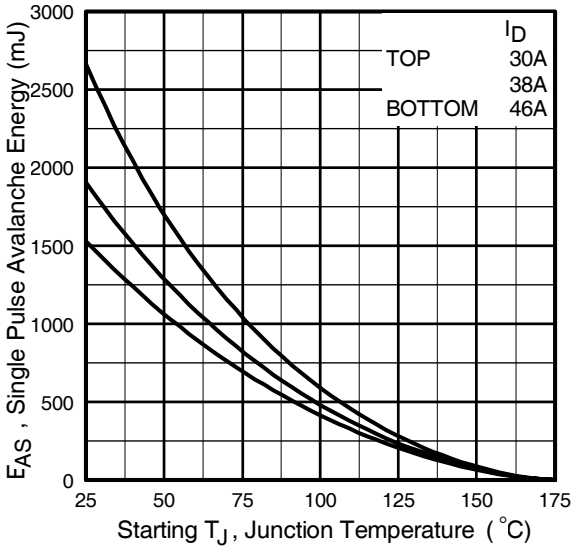


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

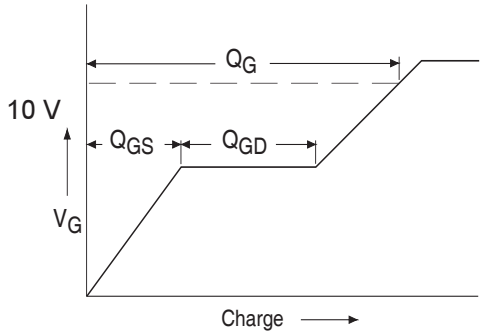


Fig 13a. Basic Gate Charge Waveform

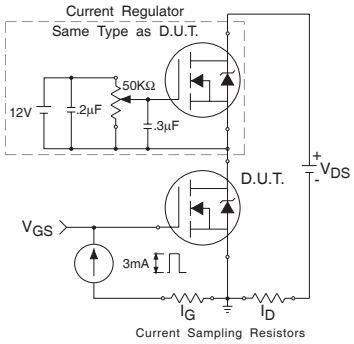


Fig 13b. Gate Charge Test Circuit

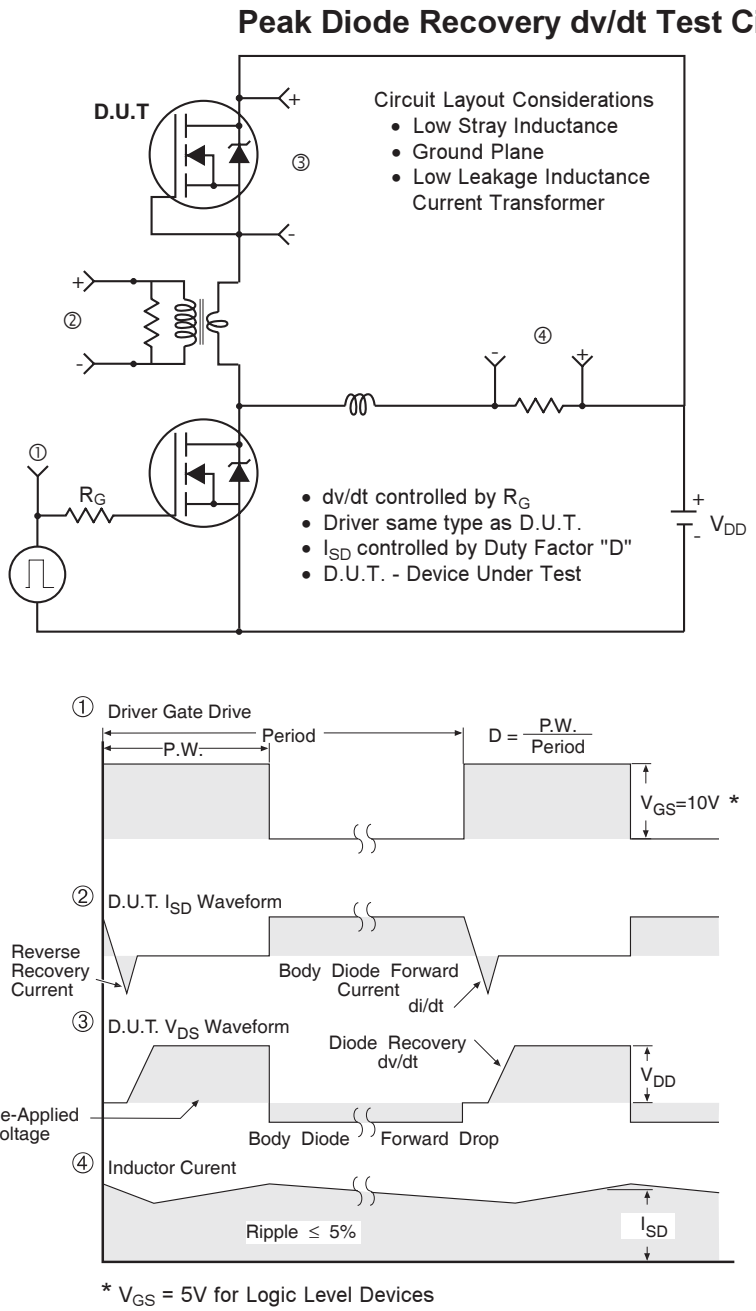
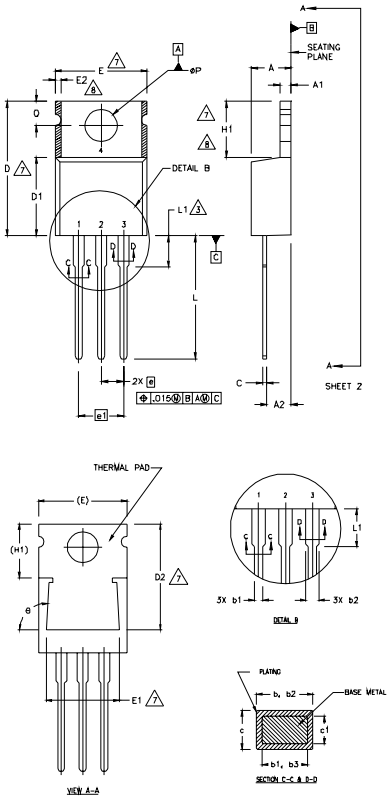


Fig 14. For N-Channel HEXFET® Power MOSFETs

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
2. DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3. LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
4. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5. DIMENSION b1 & c1 APPLY TO BASE METAL ONLY.
6. CONTROLLING DIMENSION : INCHES.
7. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
8. DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.82	.140	.190	
A1	0.51	1.40	.020	.055	
A2	2.04	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.96	.015	.038	5
b2	1.15	1.77	.045	.070	
b3	1.15	1.73	.045	.068	
c	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	
D2	12.19	12.88	.480	.507	7
E	9.66	10.66	.380	.420	4,7
E1	8.38	8.89	.330	.350	7
e	2.54 BSC		.100 BSC		
e1	5.08		.200 BSC		
H1	5.85	6.55	.230	.270	7,8
L	12.70	14.73	.500	.580	
L1	–	6.35	–	.250	3
øP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	
ø	90°-93°		90°-93°		

LEAD ASSIGNMENTS

HEXFET

1.- GATE
2.- DRAIN
3.- SOURCE

IGBTs, CoPACK

1.- GATE
2.- COLLECTOR
3.- EMITTER

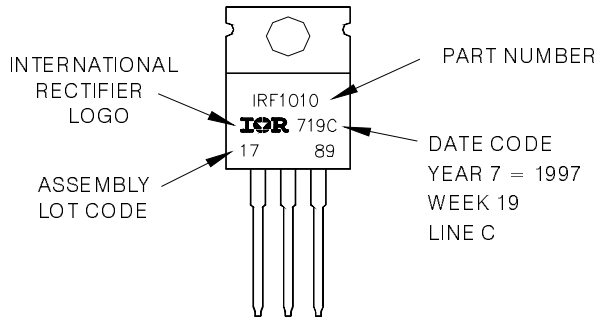
DIODES

1.- ANODE/OPEN
2.- CATHODE
3.- ANODE

TO-220AB Part Marking Information

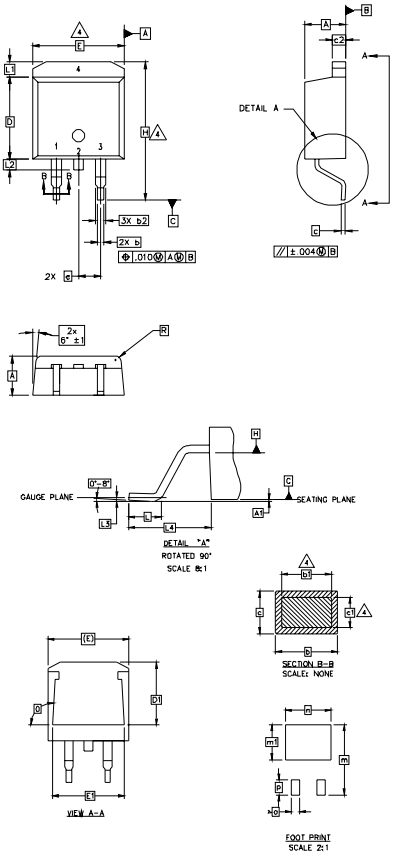
EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

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



D²Pak Package Outline

Dimensions are shown in millimeters (inches)



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.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	4
b2	1.14	1.78	.045	.070	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	4
c2	1.14	1.65	.045	.065	
D	8.51	9.65	.335	.380	3
D1	6.86		.270		
E	9.65	10.67	.380	.420	3
E1	6.22		.245		
e	2.54 BSC		.100 BSC		
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1		1.65		.065	
L2	1.27	1.78	.050	.070	
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	
m	17.78		.700		
m1	8.89		.350		
n	11.43		.450		
o	2.08		.082		
p	3.81		.150		
R	0.51	0.71	.020	.028	
θ	90°	93°	90°	93°	

LEAD ASSIGNMENTS

HEXFET

1.– GATE
2, 4.– DRAIN
3.– SOURCE

IGBTs, CoPACK

1.– GATE
2, 4.– COLLECTOR
3.– EMITTER

DIODES

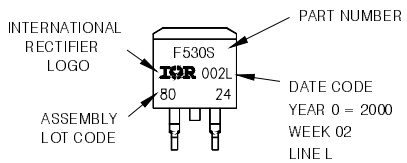
1.– ANODE *
2, 4.– CATHODE
3.– ANODE

* PART DEPENDENT.

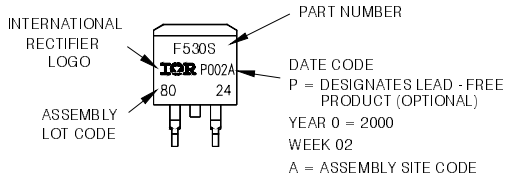
D²Pak Part Marking Information

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"



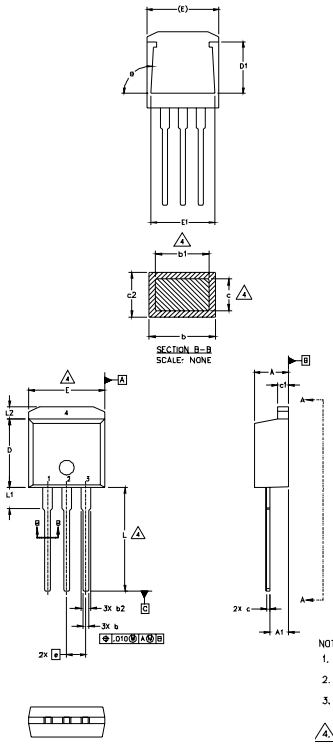
OR



International
IOR 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	
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

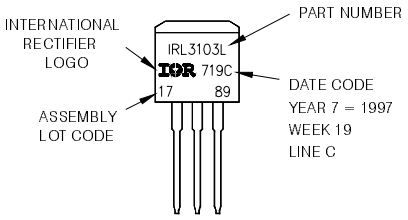
HEXFET	IGBT
1.– GATE	1 – GATE
2.– DRAIN	2 – COLLECTOR
3.– SOURCE	3 – EMITTER
4.– DRAIN	

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'



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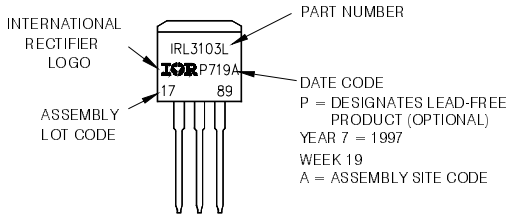
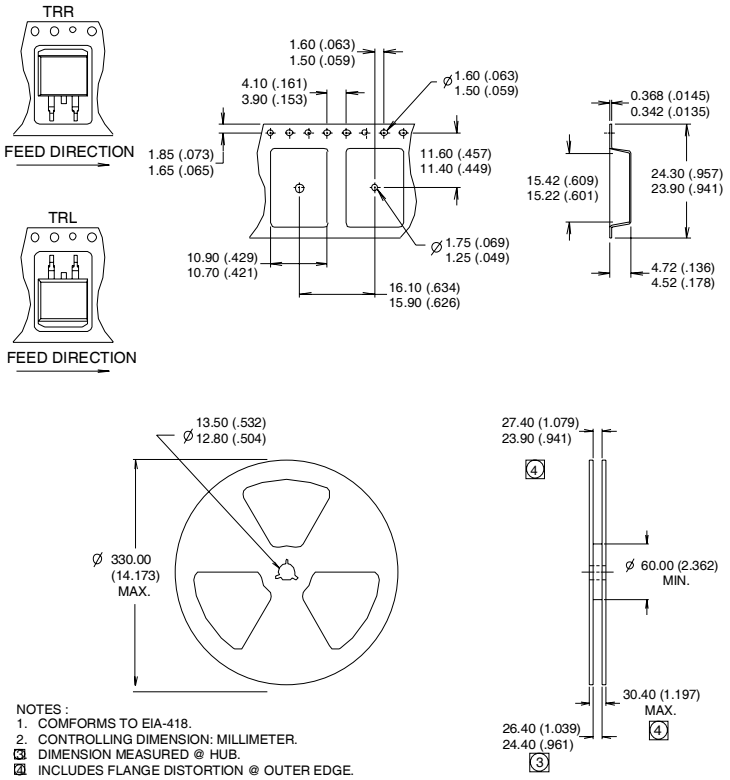


D²Pak Tape & Reel Information

Dimensions are shown in millimeters (inches)



Notes:

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

② Starting T_J = 25°C, L = 1.4mH, R_G = 25Ω, I_{AS} = 46A, V_{GS}=10V.

③ Pulse width ≤ 400µs; duty cycle ≤ 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
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Note: For the most current drawings please refer to the IR website at:
http://www.irf.com/package/