

- Logic-Level Gate Drive
- Advanced Process Technology
- Surface Mount (IRL3803S)
- Low-profile through-hole (IRL3803L)
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The D²Pak is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D²Pak is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0W in a typical surface mount application.

The through-hole version (IRL3803L) is available for low-profile applications.

Absolute Maximum Ratings

Parameter	Max.	Units
I_D @ $T_C = 25^\circ\text{C}$ Continuous Drain Current, $V_{DS} @ 10V$	140	A
I_D @ $T_C = 100^\circ\text{C}$ Continuous Drain Current, $V_{DS} @ 10V$	98	A
I_{DM} Pulsed Drain Current	470	A
P_D @ $T_A = 25^\circ\text{C}$ Power Dissipation	3.8	W
P_D @ $T_C = 25^\circ\text{C}$ Power Dissipation	200	W
Linear Derating Factor	1.3	W/°C
V_{GS} Gate-to-Source Voltage	±16	V
E_{AS} Single Pulse Avalanche Energy	610	mJ
I_{AS} Avalanche Current	71	A
E_{AR} Repetitive Avalanche Energy	20	mJ
dv/dt Peak Diode Recovery dv/dt	5.0	V/ns
T_J Operating Junction and	-55 to +175	°C
T_{SLD} Storage Temperature Range		
Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

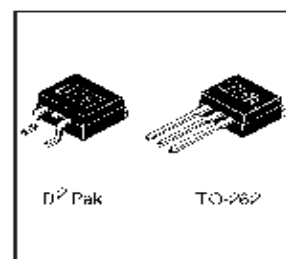
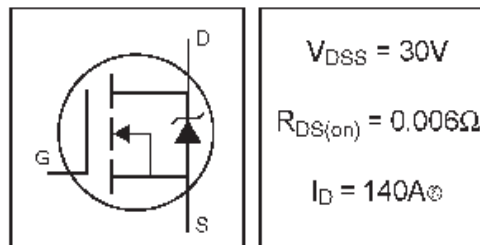
Thermal Resistance

Parameter	Typ.	Max.	Units
$R_{\theta JC}$ Junction-to-Case	—	0.75	°C/W
$R_{\theta JA}$ Junction-to-Ambient (PCB Mounted, steady-state)**	—	40	°C/W

IRL3803SPbF

IRL3803LPbF

HEXFET® Power MOSFET



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

Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{\text{BR,DS}}$	30	—	—	V	$V_{\text{GS}} = 0\text{V}$, $I_D = 250\mu\text{A}$
$\Delta V_{\text{BR,DS}}/\Delta T_J$	—	0.052	—	$\text{V}/^\circ\text{C}$	Reference to 25°C , $I_D = 1\text{mA}$ ①
$R_{\text{DS(on)}}$	—	—	0.006	Ω	$V_{\text{DS}} = 10\text{V}$, $I_D = 71\text{A}$ ②
	—	—	0.009		$V_{\text{DS}} = 4.5\text{V}$, $I_D = 59\text{A}$ ②
$V_{\text{GS(th)}}$	1.0	—	—	V	$V_{\text{DS}} = V_{\text{GS}}$, $I_D = 250\mu\text{A}$
g_{fs}	55	—	—	S	$V_{\text{DS}} = 25\text{V}$, $I_D = 71\text{A}$ ③
I_{DSS}	—	—	25	μA	$V_{\text{DS}} = 30\text{V}$, $V_{\text{GS}} = 0\text{V}$
	—	—	250		$V_{\text{DS}} = 24\text{V}$, $V_{\text{GS}} = 0\text{V}$, $T_J = 150^\circ\text{C}$
I_{GSS}	—	—	100	nA	$V_{\text{DS}} = 16\text{V}$
	—	—	-100		$V_{\text{GS}} = -16\text{V}$
Q_g	—	—	140		$I_D = 71\text{A}$
Q_{gs}	—	—	41	nC	$V_{\text{DS}} = 24\text{V}$
Q_{gd}	—	—	78		$V_{\text{DS}} = 4.5\text{V}$, See Fig. 6 and 13 ④⑤
$t_{\text{d(on)}}$	—	14	—		$V_{\text{DD}} = 15\text{V}$
t_r	—	230	—		$I_D = 71\text{A}$
$t_{\text{d(off)}}$	—	29	—		$R_{\text{G}} = 1.3\Omega$
t_f	—	35	—		$R_{\text{D}} = 0.20\Omega$, See Fig. 10 ④⑤
L_S	—	7.5	—	nH	Between lead and center of die contact
C_{iss}	—	5000	—		$V_{\text{DS}} = 0\text{V}$
C_{oss}	—	1800	—	pF	$V_{\text{DS}} = 25\text{V}$
C_{rss}	—	880	—		$f = 1.0\text{MHz}$, See Fig. 5⑥

Source-Drain Ratings and Characteristics

Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	—	—	140⑦	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{AS}	—	—	470		
V_{SD}	—	—	1.3	V	$T_J = 25^\circ\text{C}$, $I_S = 71\text{A}$, $V_{\text{GS}} = 0\text{V}$ ⑧
t_{rr}	—	120	180	ns	$T_J = 25^\circ\text{C}$, $I_F = 71\text{A}$
Q_{rr}	—	450	680	nC	$di/dt = 100\text{A}/\mu\text{s}$ ⑧⑨
t_{st}	—	—	—		Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)

Notes:

① Repetitive rating: pulse width limited by max. junction temperature. (See fig. 11)

② $V_{\text{DD}} = 15\text{V}$, starting $T_J = 25^\circ\text{C}$, $L = 180\mu\text{H}$, $R_G = 25\Omega$, $I_{\text{AS}} = 71\text{A}$. (See Figure 12)

③ $I_{\text{SD}} \leq 71\text{A}$, $di/dt \leq 130\text{A}/\mu\text{s}$, $V_{\text{DD}} \leq V_{\text{BR,DS}}$, $T_J \leq 175^\circ\text{C}$

** When mounted on 1" square PCB (FR-4 or G-10 Material).

For recommended footprint and soldering techniques refer to application note #AN-994.

④ Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.

⑤ Uses IRL3803 data and test conditions.

⑥ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip # 93-4

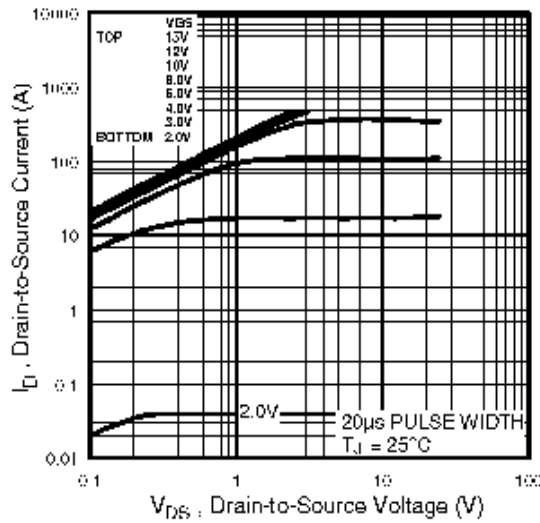


Fig 1. Typical Output Characteristics

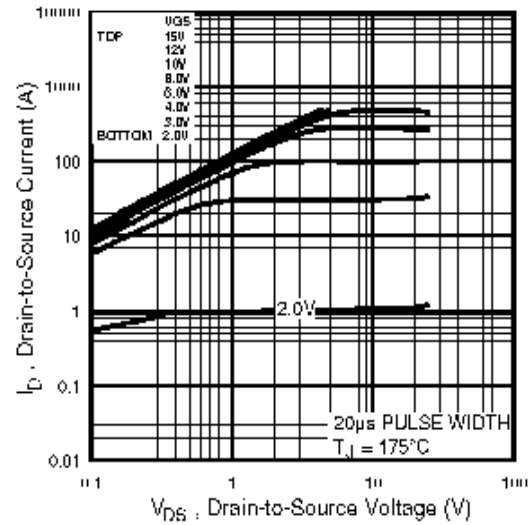


Fig 2. Typical Output Characteristics

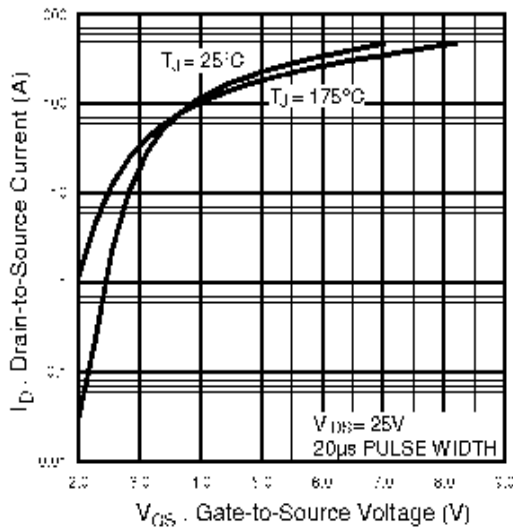
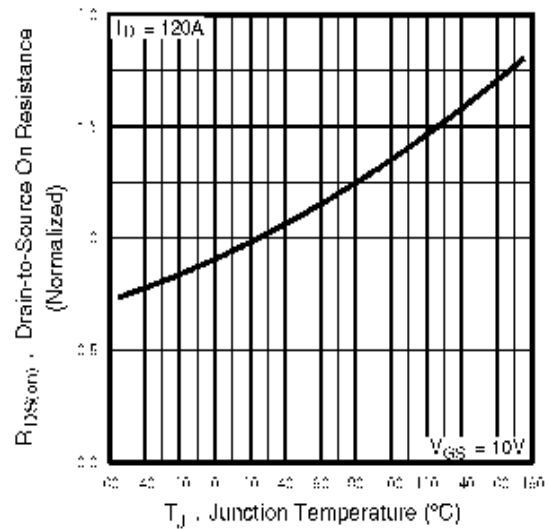


Fig 3. Typical Transfer Characteristics



**Fig 4. Normalized On-Resistance
Vs. Temperature**

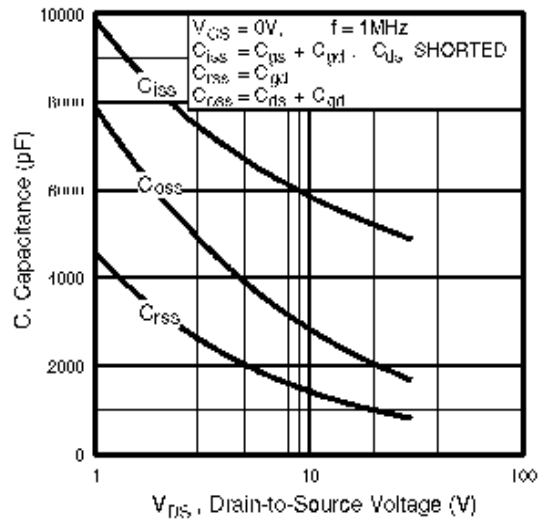


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

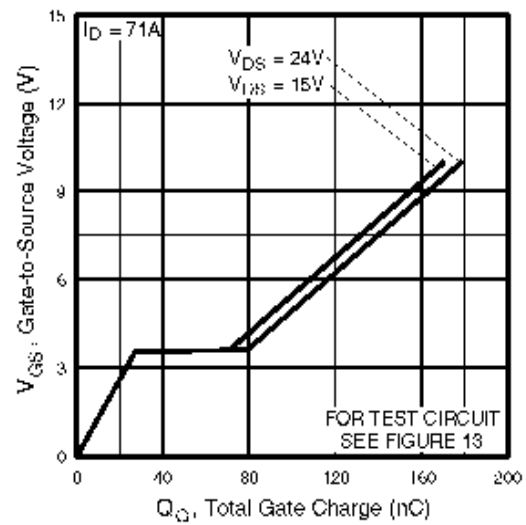


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

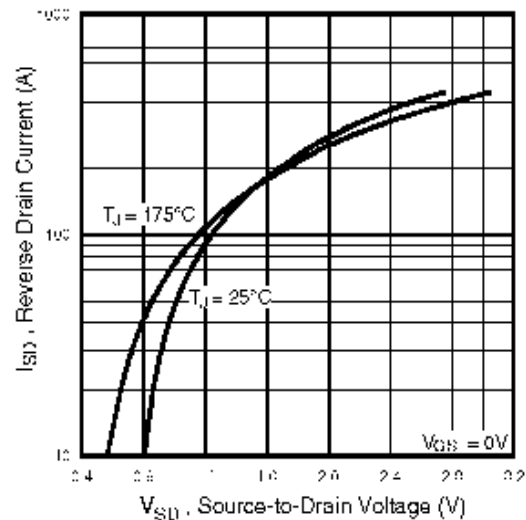


Fig 7. Typical Source-Drain Diode Forward Voltage

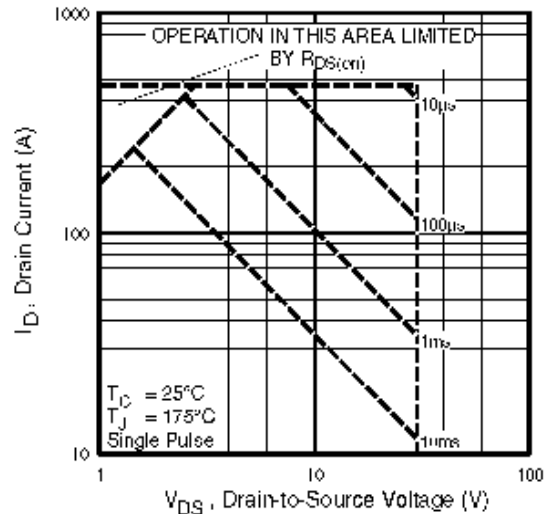


Fig 8. Maximum Safe Operating Area

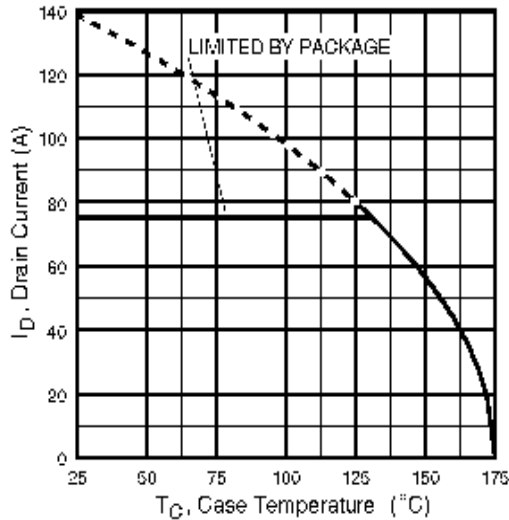


Fig 9. Maximum Drain Current vs. Case Temperature

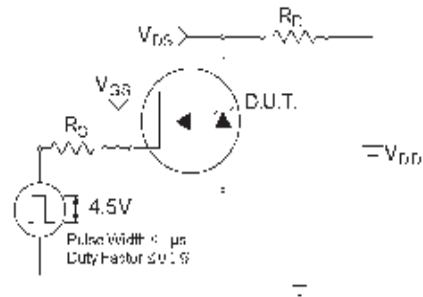


Fig 10a. Switching Time Test Circuit

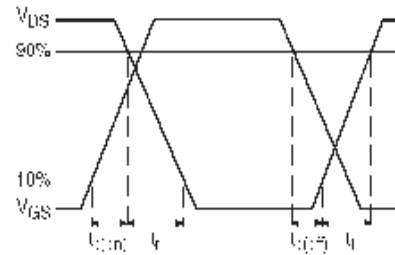


Fig 10b. Switching Time Waveforms

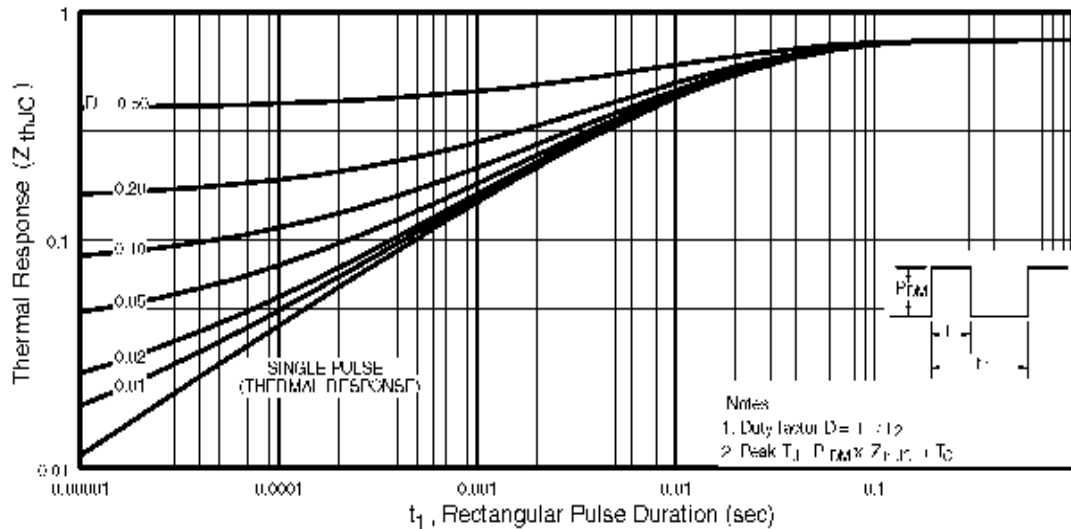


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

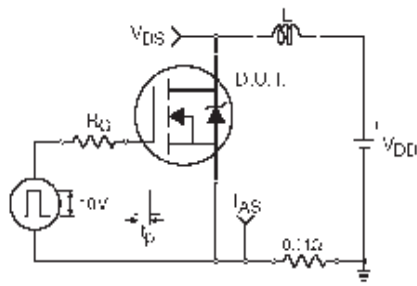


Fig 12a. Unclamped Inductive Test Circuit

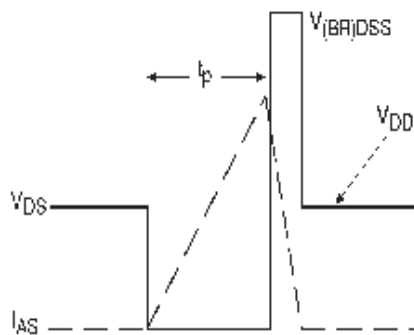


Fig 12b. Unclamped Inductive Waveforms

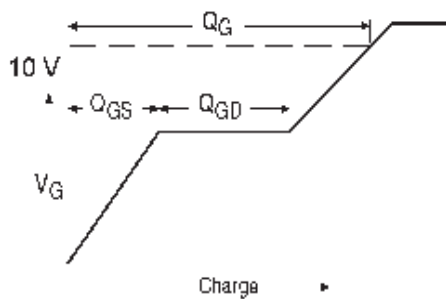


Fig 13a. Basic Gate Charge Waveform

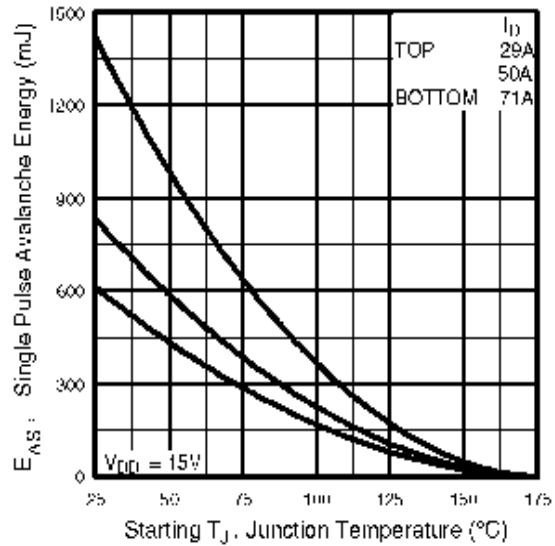


Fig 12c. Maximum Avalanche Energy
Vs. Drain Current

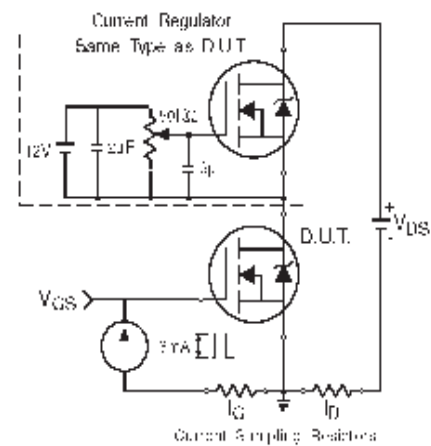


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit

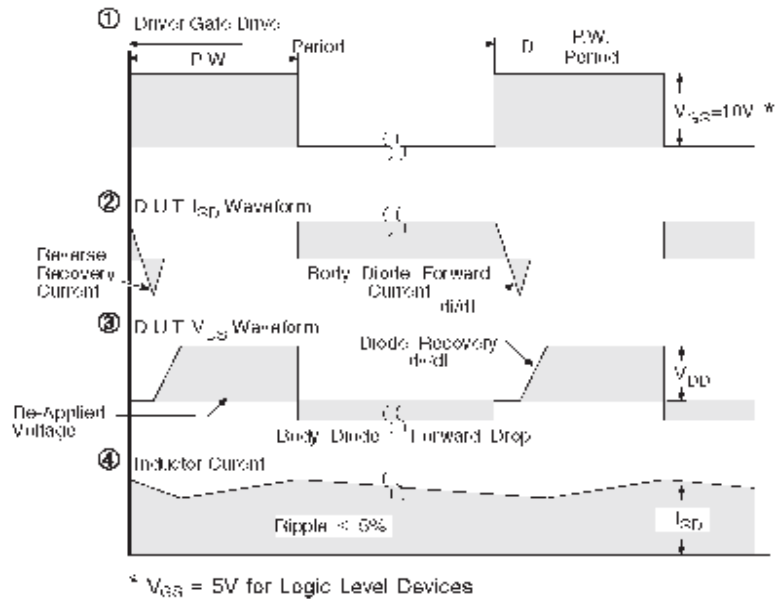
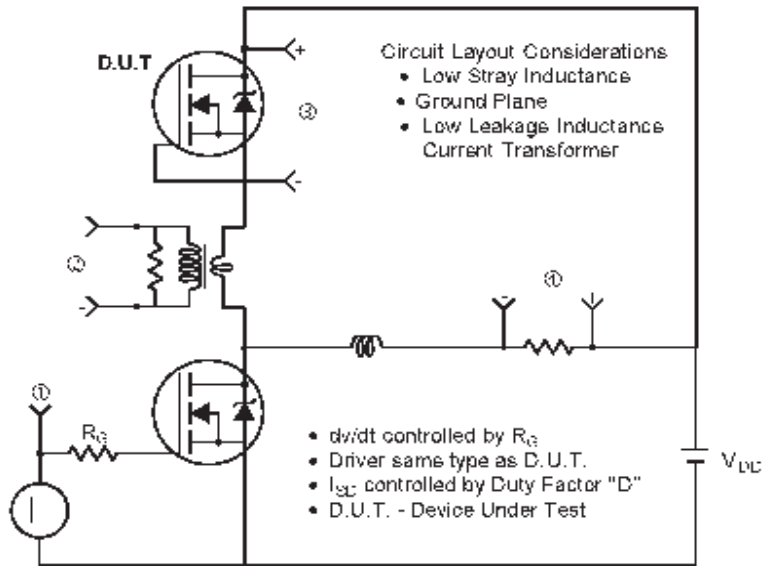


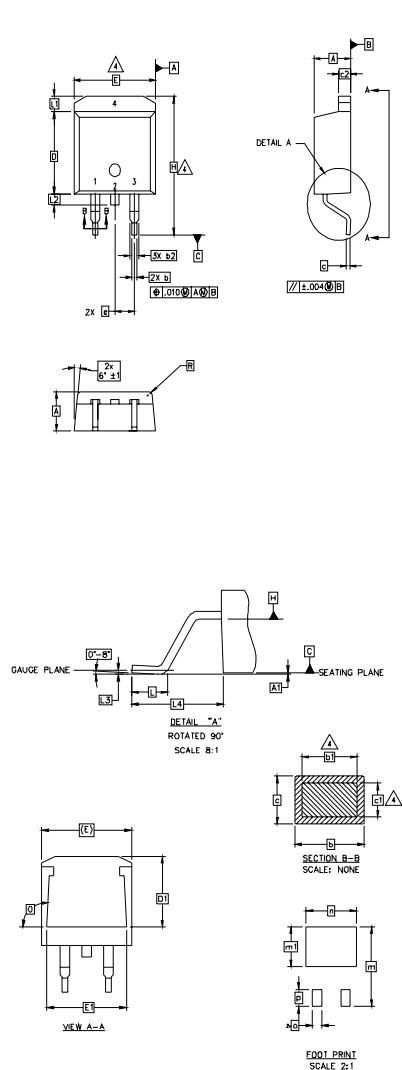
Fig 14. For N-Channel HEXFETS

IRL3803S/LPbF

International
IR Rectifier

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 [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.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	4
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	
b2	1.14	1.78	.045	.070	4
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	
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

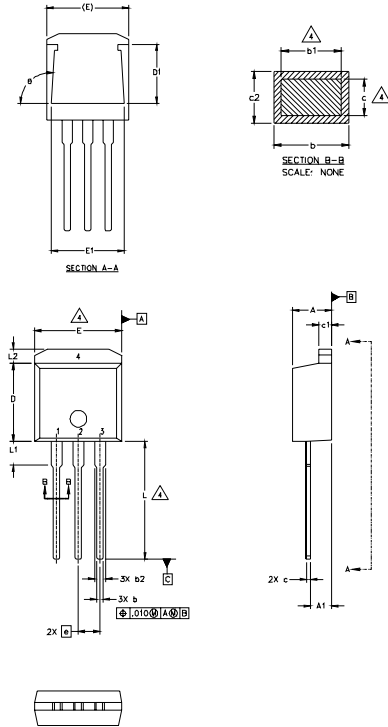
- 1.- ANODE *
- 2, 4.- CATHODE
- 3.- ANODE

* PART DEPENDENT.

IRL3803S/LPbF

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	
c	0.38	0.63	.015	.025	4
c1	1.14	1.40	.045	.055	
c2	0.43	.063	.017	.029	3
D	8.51	9.65	.335	.380	
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

IGBT

HEXFET

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

- 1 - GATE
2 - COLLECTOR
3 - EMITTER

NOTES:

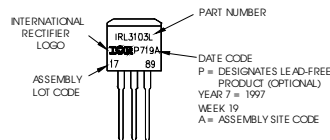
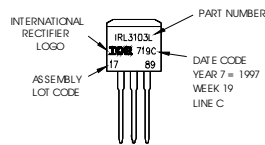
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4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
5. CONTROLLING DIMENSION: INCH.

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

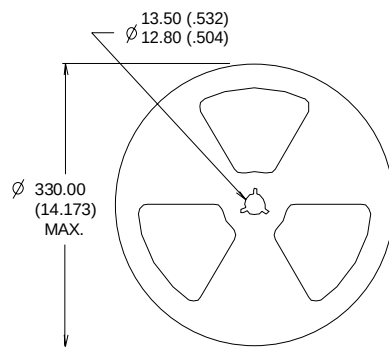
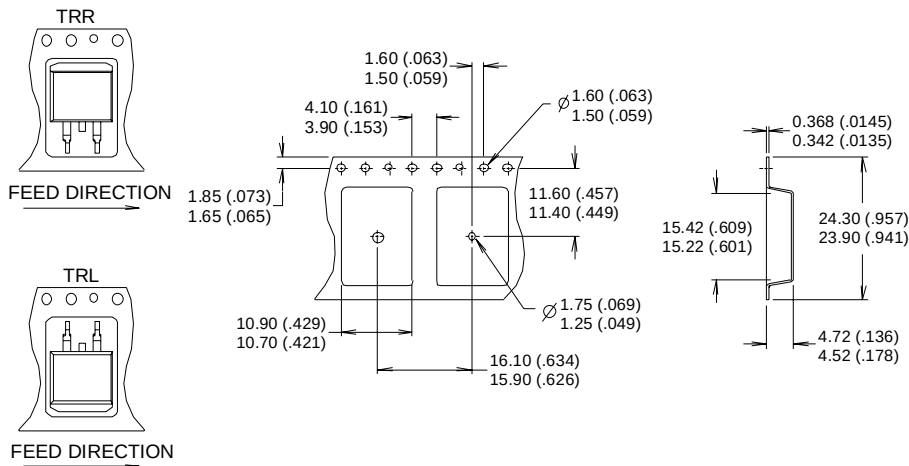


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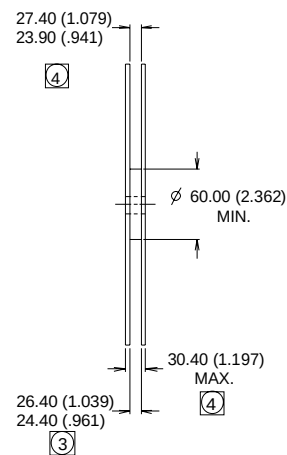
D²Pak Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES :

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



Data and specifications subject to change without notice.

International
IR Rectifier

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Visit us at www.irf.com for sales contact information.12/04

www.irf.com

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

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