

IRL530NS/L

HEXFET® Power MOSFET

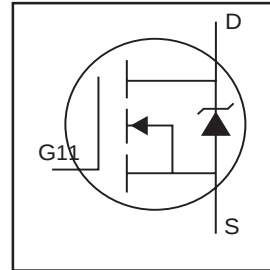
- Advanced Process Technology
- Surface Mount (IRL530NS)
- Low-profile through-hole (IRL530NL)
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

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.

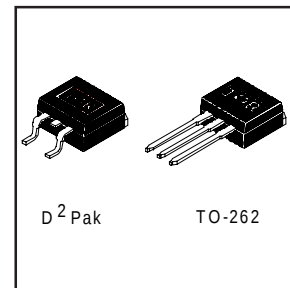
The through-hole version (IRL530NL) is available for low-profile applications.



$$V_{DS} = 100V$$

$$R_{DS(on)} = 0.10\Omega$$

$$I_D = 17A$$



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_C = 25^\circ C$	Continuous Drain Current, V_{GS} @ 10V⑤	17	A
I_D @ $T_C = 100^\circ C$	Continuous Drain Current, V_{GS} @ 10V⑤	12	
I_{DM}	Pulsed Drain Current ①⑤	60	
P_D @ $T_A = 25^\circ C$	Power Dissipation	3.8	W
P_D @ $T_C = 25^\circ C$	Power Dissipation	79	W
	Linear Derating Factor	0.53	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②⑤	150	mJ
I_{AR}	Avalanche Current①	9.0	A
E_{AR}	Repetitive Avalanche Energy①	7.9	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑤	5.0	V/ns
T_J	Operating Junction and	-55 to + 175	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds		

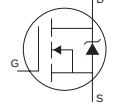
Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.9	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mounted, steady-state)**	—	40	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.122	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1mA$ ⑤
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.100	Ω	$V_{GS} = 10V, I_D = 9.0A$ ④
		—	—	0.120		$V_{GS} = 5.0V, I_D = 9.0A$ ④
		—	—	0.150		$V_{GS} = 4.0V, I_D = 8.0A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	7.7	—	—	S	$V_{DS} = 50V, I_D = 9.0A$ ⑤
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	A	$V_{DS} = 100V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 80V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 16V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -16V$
Q_g	Total Gate Charge	—	—	34	nC	$I_D = 9.0A$
Q_{gs}	Gate-to-Source Charge	—	—	4.8		$V_{DS} = 80V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	20		$V_{GS} = 5.0V$, See Fig. 6 and 13 ④⑤
$t_{d(on)}$	Turn-On Delay Time	—	7.2	—	ns	$V_{DD} = 50V$
t_r	Rise Time	—	53	—		$I_D = 9.0A$
$t_{d(off)}$	Turn-Off Delay Time	—	30	—		$R_G = 6.0\Omega, V_{GS} = 5.0V$
t_f	Fall Time	—	26	—		$R_D = 5.5\Omega$, See Fig. 10 ④⑤
L_S	Internal Source Inductance	—	7.5	—	nH	Between lead, and center of die contact
C_{iss}	Input Capacitance	—	800	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	160	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	90	—		$f = 1.0MHz$, See Fig. 5⑤

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	17	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①⑤	—	—	60		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 9.0A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	140	210	ns	$T_J = 25^\circ\text{C}, I_F = 9.0A$
Q_{rr}	Reverse Recovery Charge	—	740	1100	nC	$di/dt = 100A/\mu s$ ④⑤
t_{on}	Forward Turn-On Time	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)

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

② Starting $T_J = 25^\circ\text{C}$, $L = 3.7mH$
 $R_G = 25\Omega$, $I_{AS} = 9.0A$. (See Figure 12)

⑤ Uses IRL530N data and test conditions

③ $I_{SD} \leq 9.0A$, $di/dt \leq 540A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 175^\circ\text{C}$

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

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

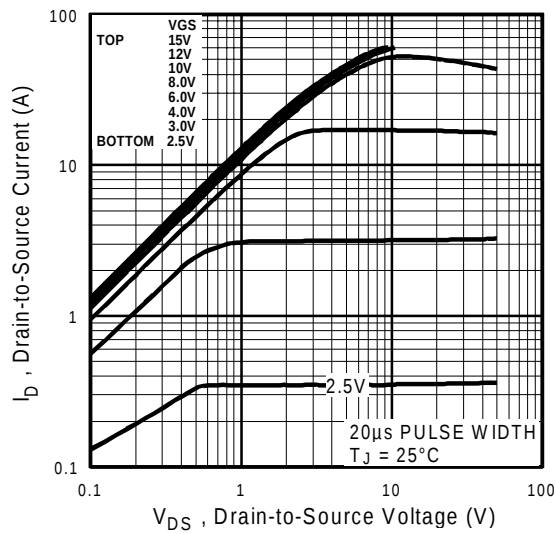


Fig 1. Typical Output Characteristics

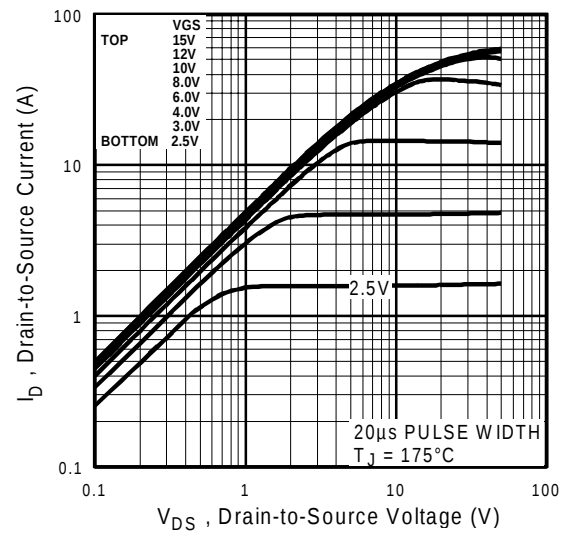


Fig 2. Typical Output Characteristics

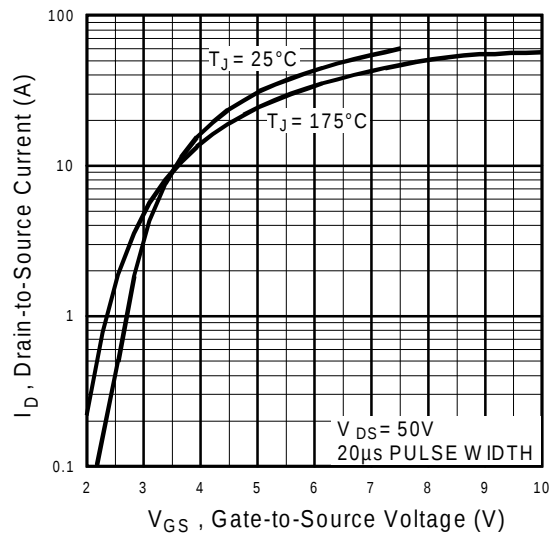


Fig 3. Typical Transfer Characteristics

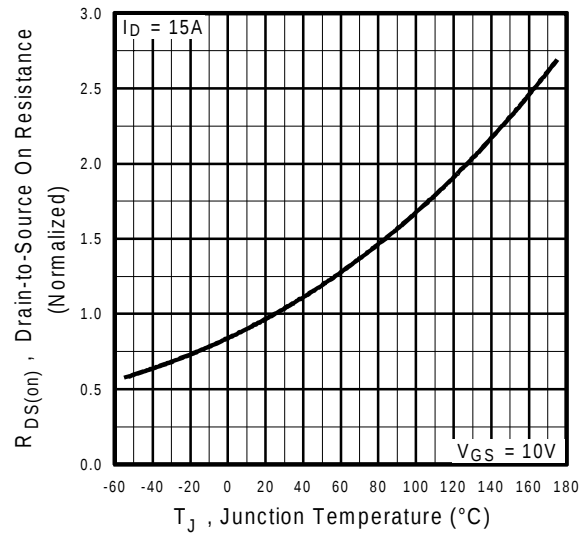


Fig 4. Normalized On-Resistance Vs. Temperature

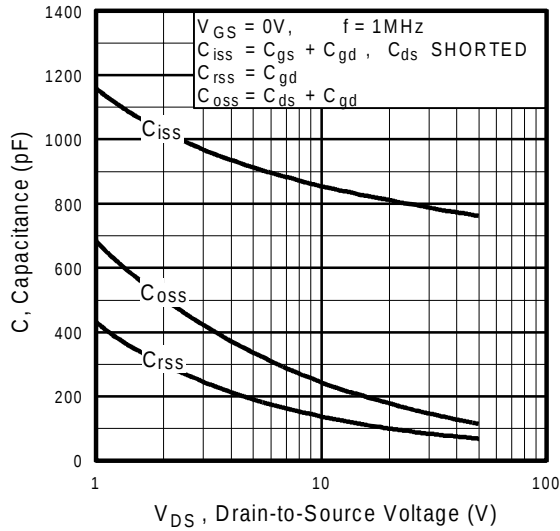


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

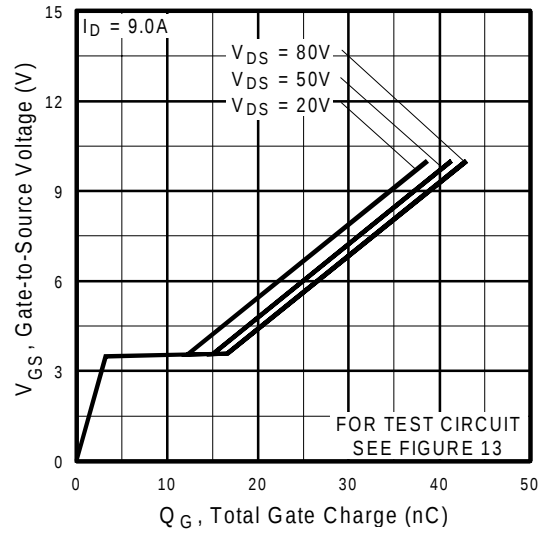


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

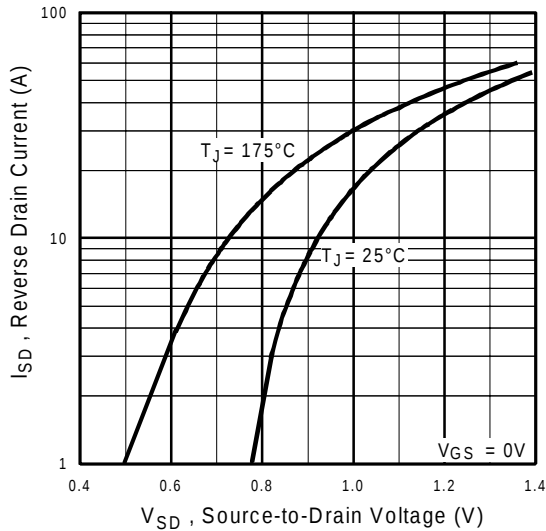


Fig 7. Typical Source-Drain Diode Forward Voltage

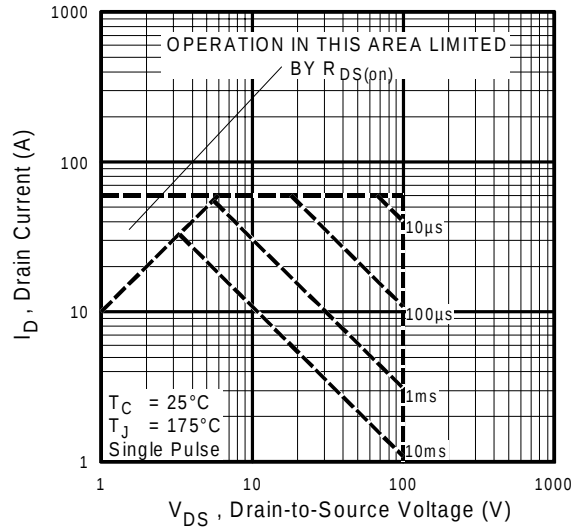


Fig 8. Maximum Safe Operating Area

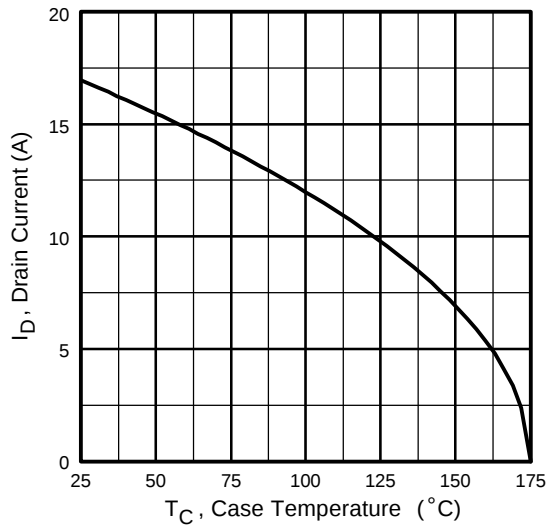


Fig 9. Maximum Drain Current Vs. Case Temperature

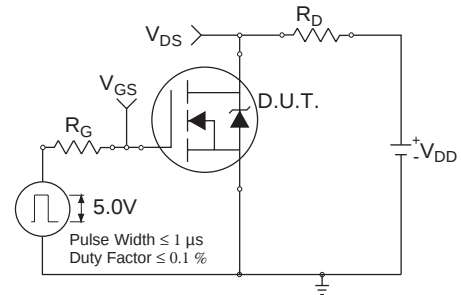


Fig 10a. Switching Time Test Circuit

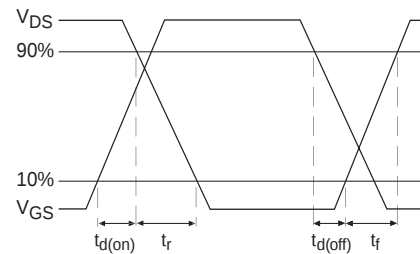


Fig 10b. Switching Time Waveforms

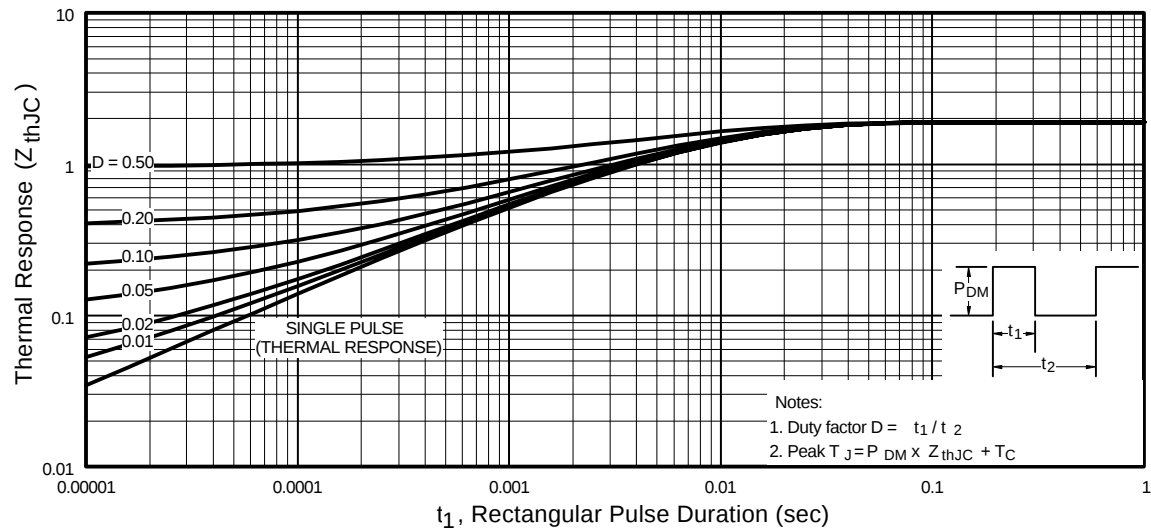


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

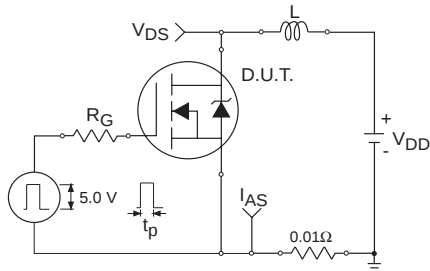


Fig 12a. Unclamped Inductive Test Circuit

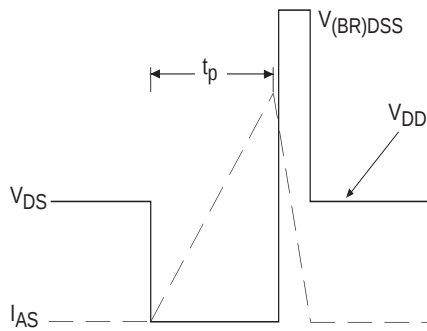


Fig 12b. Unclamped Inductive Waveforms

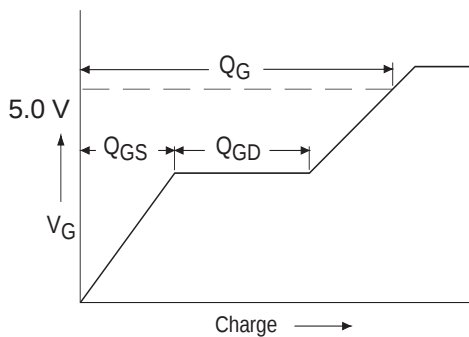


Fig 13a. Basic Gate Charge Waveform

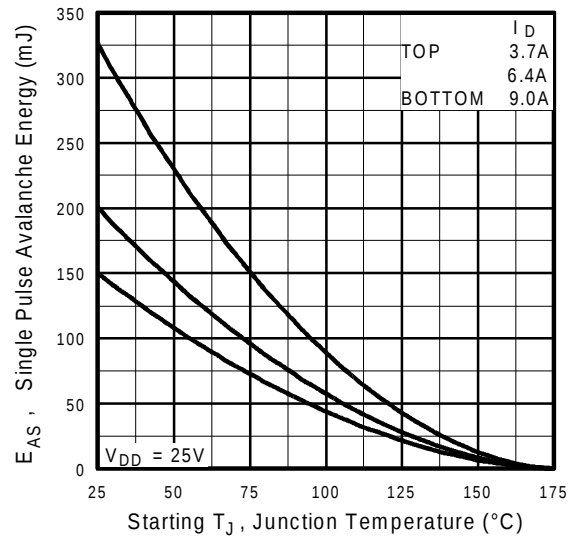


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

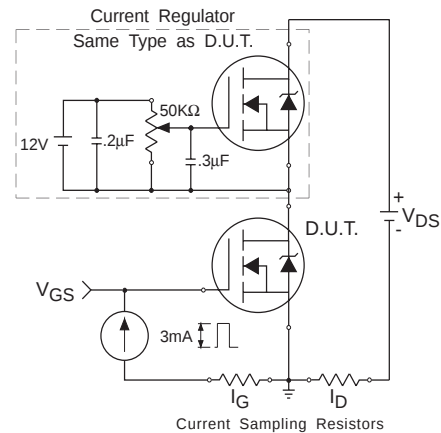
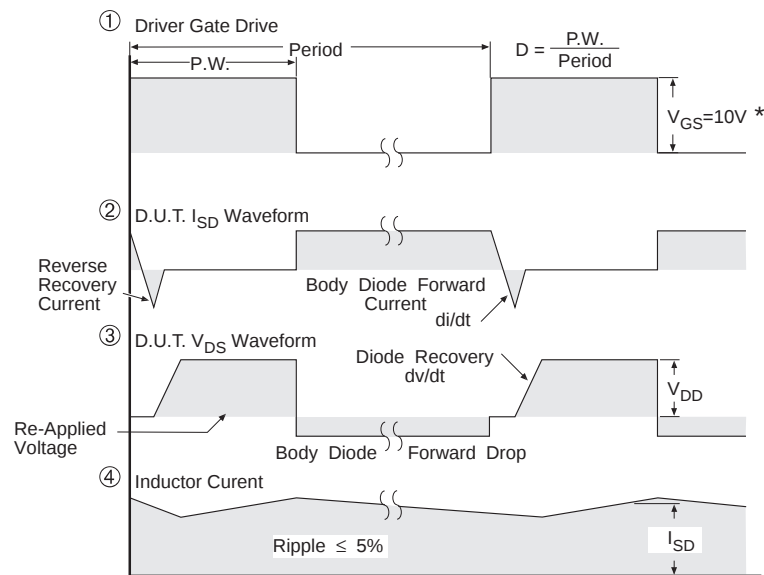
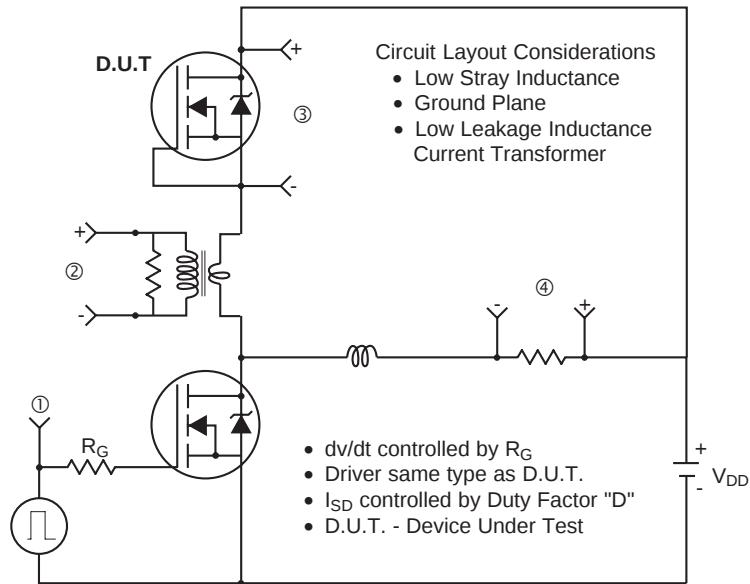


Fig 13b. Gate Charge Test Circuit

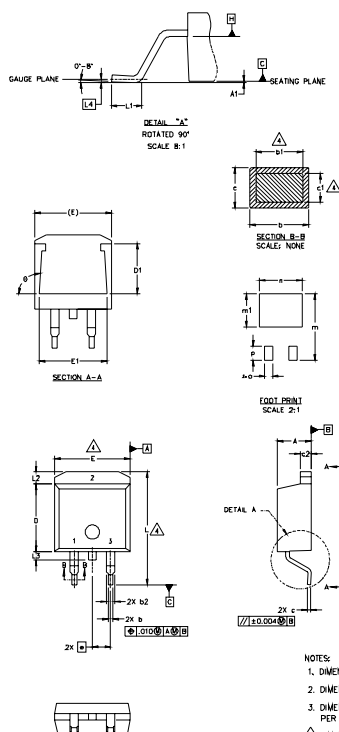
Peak Diode Recovery dv/dt Test Circuit



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

Fig 14. For N-Channel HEXFETS

D²Pak Package Outline



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	
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

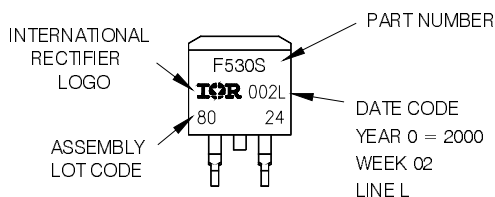
HEXFET	IGBTs, CO-PAK	DIODES
1.- GATE	1.- GATE	1.- ANODE *
2.- DRAIN	2.- COLLECTOR	2.- CATHODE
3.- SOURCE	3.- EMITTER	3.- ANODE

* PART DEPENDENT.

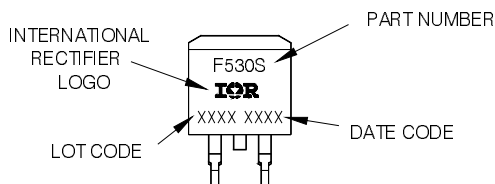
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
 3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
 4. DIMENSION b1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

D²Pak Part Marking Information

EXAMPLE: THIS IS AN IRL530S WITH
LOT CODE 8024
ASSEMBLED ON WW 02, 2000
IN THE ASSEMBLY LINE "L"



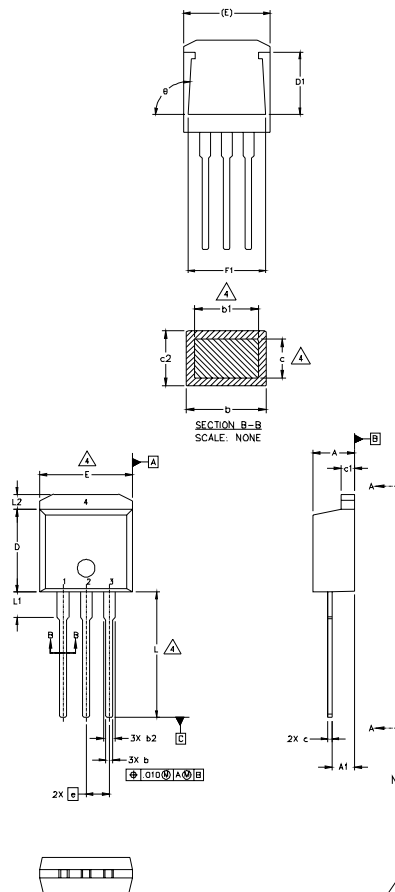
For GB Production
EXAMPLE: THIS IS AN IRL530S WITH
LOT CODE 8024
ASSEMBLED ON WW 02, 2000
IN THE ASSEMBLY LINE "L"



IRL530NS/L

International
IR Rectifier

TO-262 Package Outline



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	3
c2	0.43	.063	.017	.029	
D	8.51	9.65	.335	.380	
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

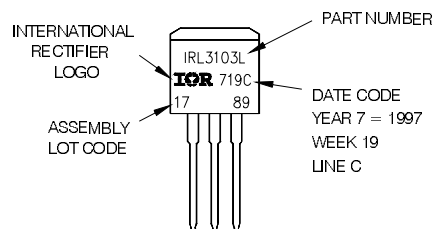
- 1- GATE
- 2- COLLECTOR

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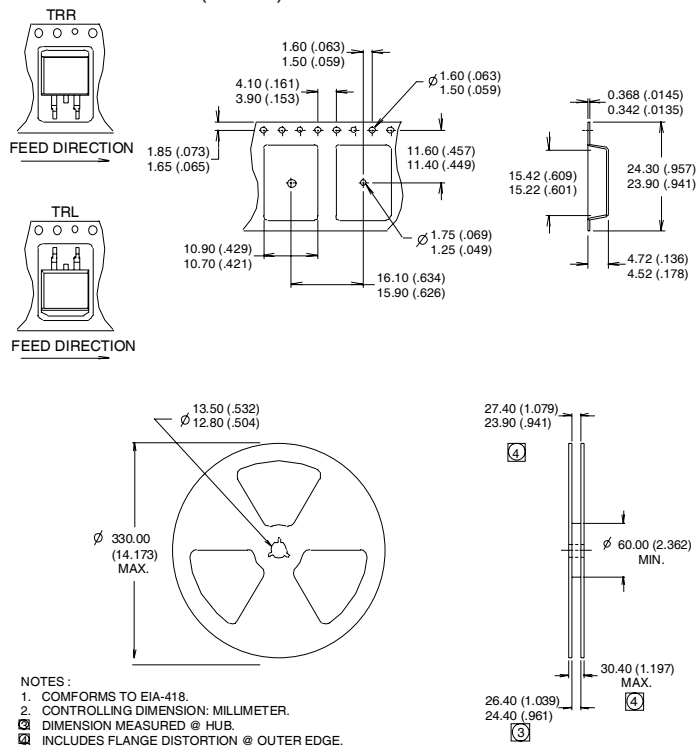
TO-262 Part Marking Information

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



D²Pak Tape & Reel Information

Dimensions are shown in millimeters (inches)



Data and specifications subject to change without notice.

International
IR Rectifier

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