

International **IR** Rectifier

PD-91535

IRL540NS/L

HEXFET® Power MOSFET

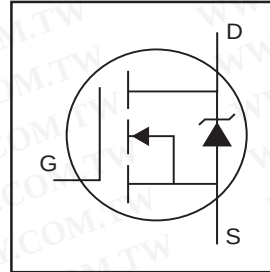
- Advanced Process Technology
- Surface Mount (IRL540NS)
- Low-profile through-hole (IRL540NL)
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

Description

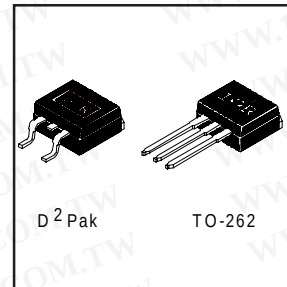
Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with 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 (IRF540NL) is available for low-profile applications.



$V_{DS} = 100V$
$R_{DS(on)} = 0.044\Omega$
$I_D = 36A$



Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ⑤	36	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ⑤	26	
I_{DM}	Pulsed Drain Current ①⑤	120	
$P_D @ T_A = 25^\circ C$	Power Dissipation	3.8	W
$P_D @ T_C = 25^\circ C$	Power Dissipation	140	W
	Linear Derating Factor	0.91	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy②⑤	310	mJ
I_{AR}	Avalanche Current①	18	A
E_{AR}	Repetitive Avalanche Energy①	14	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	300 (1.6mm from case)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.1	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mounted, steady-state)**	—	40	

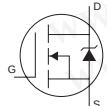
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Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	100	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.11	—	V/°C	Reference to 25°C, I _D = 1mA⑤
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	0.044	Ω	V _{GS} = 10V, I _D = 18A ④
		—	—	0.053		V _{GS} = 5.0V, I _D = 18A ④
		—	—	0.063		V _{GS} = 4.0V, I _D = 15A ④
V _{GS(th)}	Gate Threshold Voltage	1.0	—	2.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Transconductance	14	—	—	S	V _{DS} = 25V, I _D = 18A⑤
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°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	—	—	74	nC	I _D = 18A
Q _{gs}	Gate-to-Source Charge	—	—	9.4		V _{DS} = 80V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	38		V _{GS} = 5.0V, See Fig. 6 and 13 ④⑤
t _{d(on)}	Turn-On Delay Time	—	11	—	ns	V _{DD} = 50V
t _r	Rise Time	—	81	—		I _D = 18A
t _{d(off)}	Turn-Off Delay Time	—	39	—		R _G = 5.0Ω, V _{GS} = 5.0V
t _f	Fall Time	—	62	—		R _D = 2.7Ω, See Fig. 10 ④⑤
L _S	Internal Source Inductance	—	7.5	—	nH	Between lead, and center of die contact
C _{iss}	Input Capacitance	—	1800	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	350	—		V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	—	170	—		f = 1.0MHz, See Fig. 5⑤

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	36	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode) ①⑤	—	—	120		
V _{SD}	Diode Forward Voltage	—	—	1.3	V	T _J = 25°C, I _S = 18A, V _{GS} = 0V ④⑤
t _{rr}	Reverse Recovery Time	—	190	290	ns	T _J = 25°C, I _F = 18A
Q _{rr}	Reverse Recovery Charge	—	1.1	1.7	μC	di/dt = 100A/μs 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 ≤ 300μs; duty cycle ≤ 2%.
- ② Starting T_J = 25°C, L = 1.9mH
- ⑤ Uses IRL540N data and test conditions
- R_G = 25Ω, I_{AS} = 18A. (See Figure 12)
- ③ I_{SD} ≤ 18A, di/dt ≤ 180A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 175°C

** When mounted on 1" square PCB (FR-4 or G-10 Material).
 For recommended soldering techniques refer to application note #AN-994.

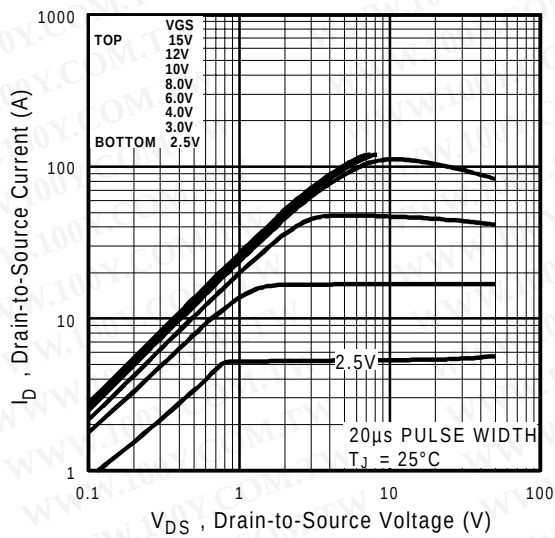


Fig 1. Typical Output Characteristics

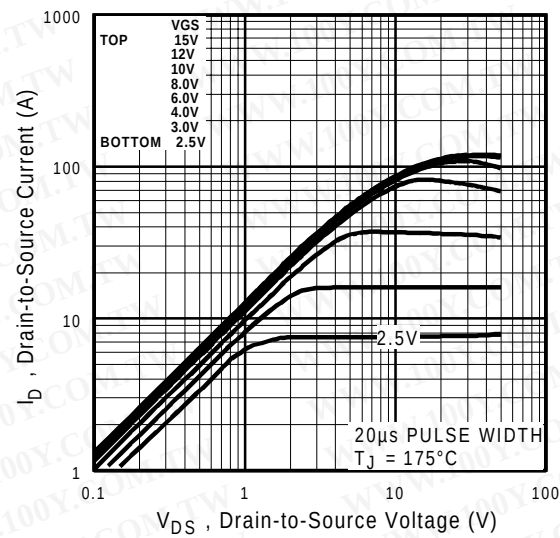


Fig 2. Typical Output Characteristics

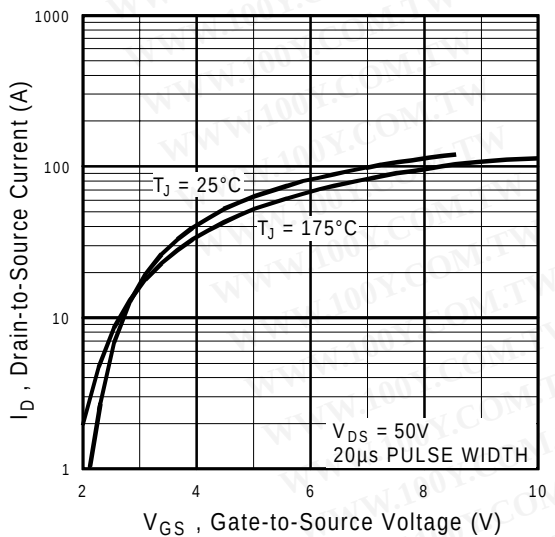


Fig 3. Typical Transfer Characteristics

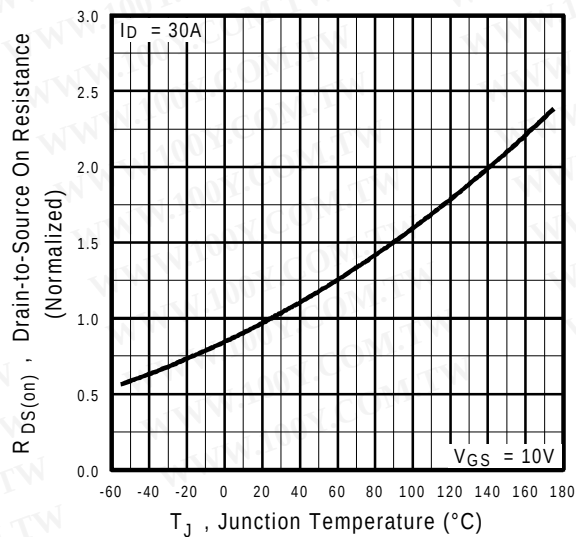
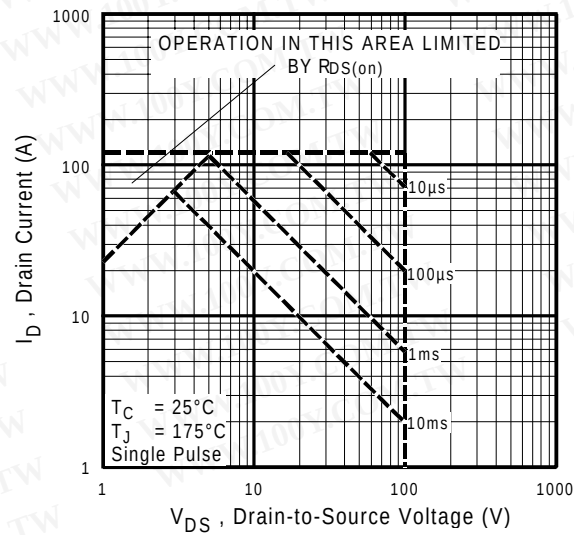
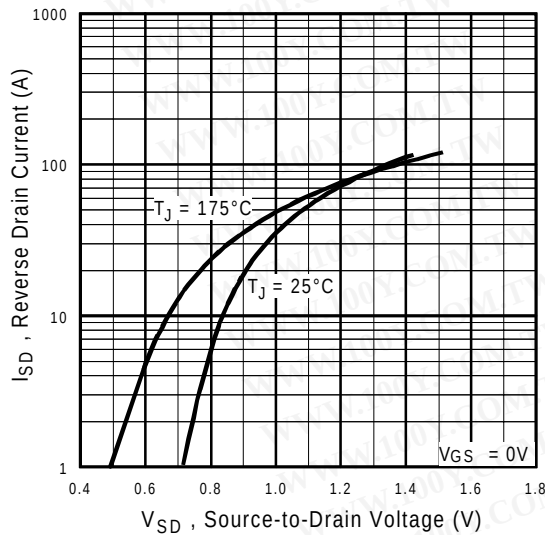
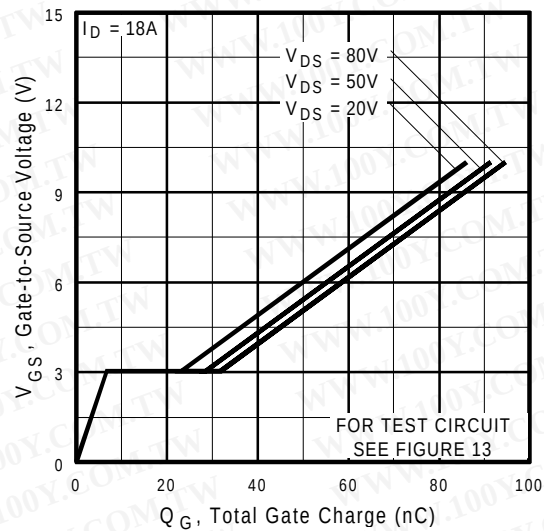
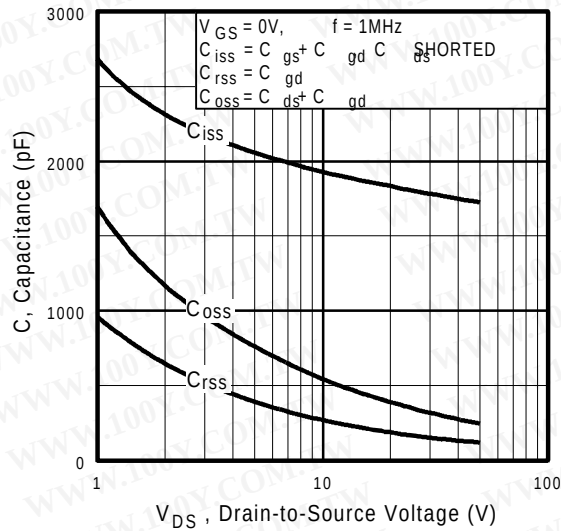


Fig 4. Normalized On-Resistance Vs. Temperature

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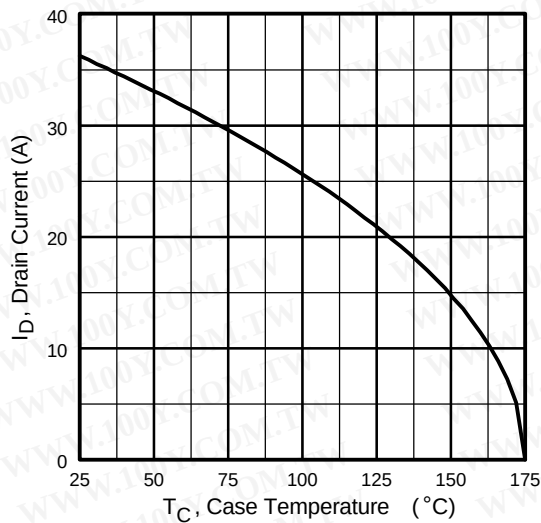


Fig 9. Maximum Drain Current Vs. Case Temperature

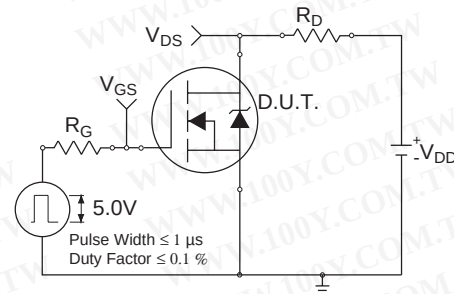


Fig 10a. Switching Time Test Circuit

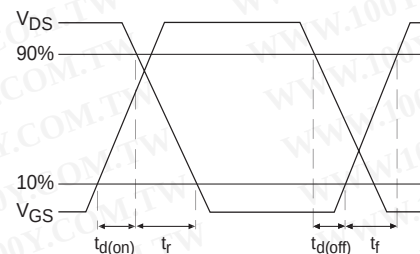


Fig 10b. Switching Time Waveforms

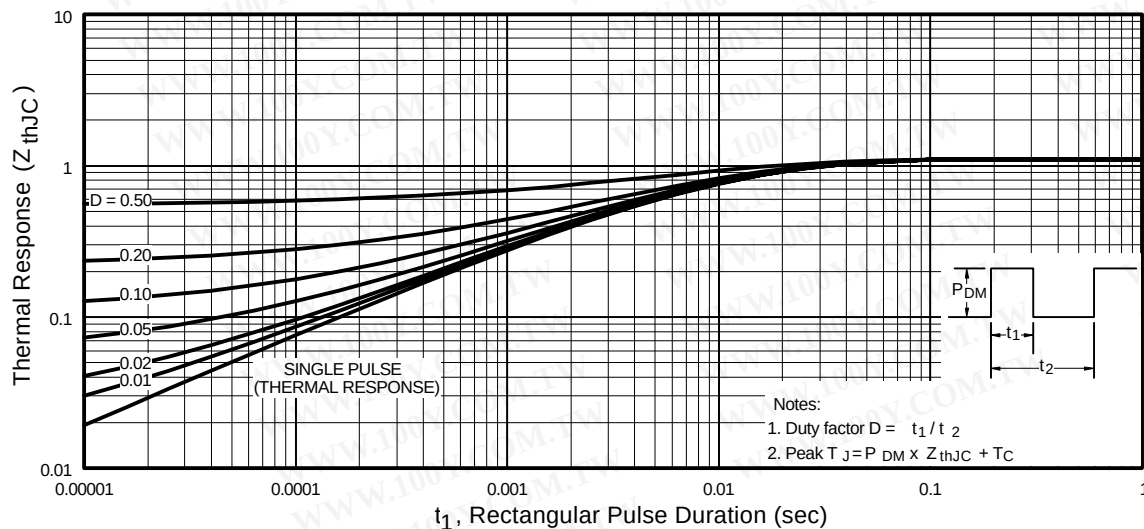


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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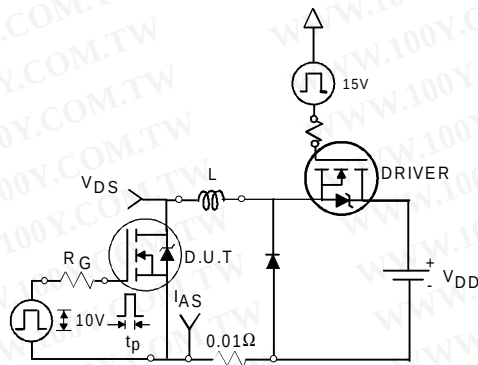


Fig 12a. Unclamped Inductive Test Circuit

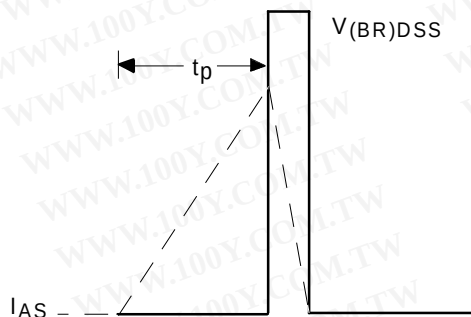


Fig 12b. Unclamped Inductive Waveforms

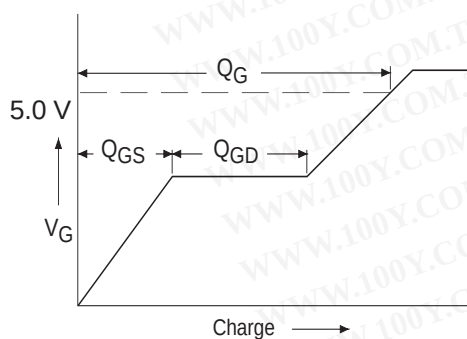


Fig 13a. Basic Gate Charge Waveform

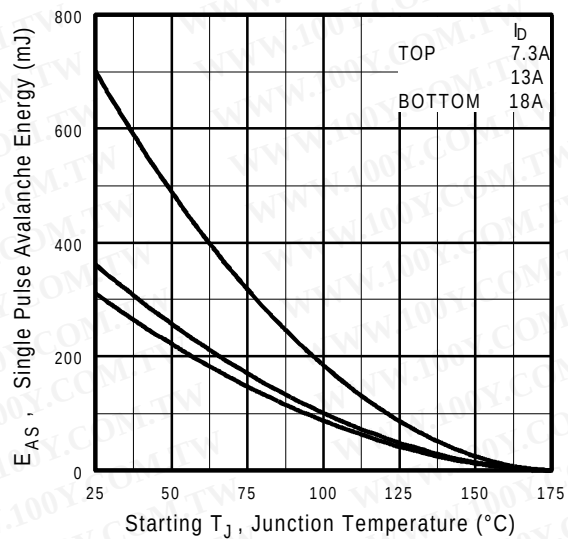


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

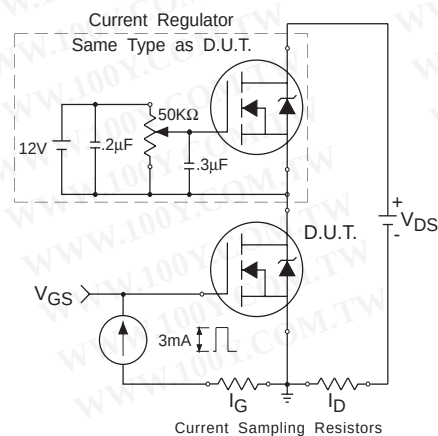
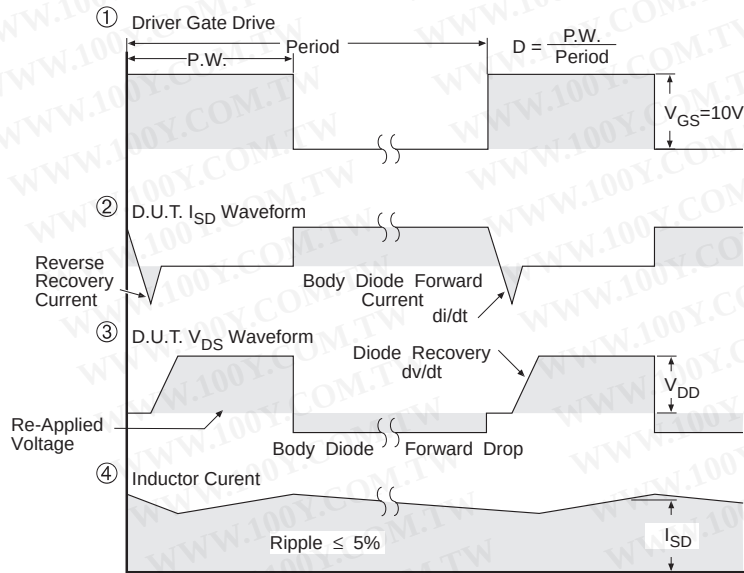
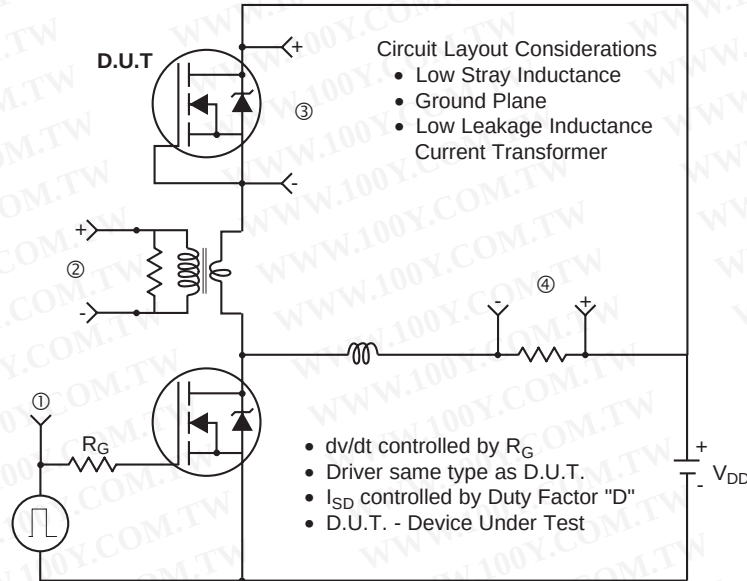


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



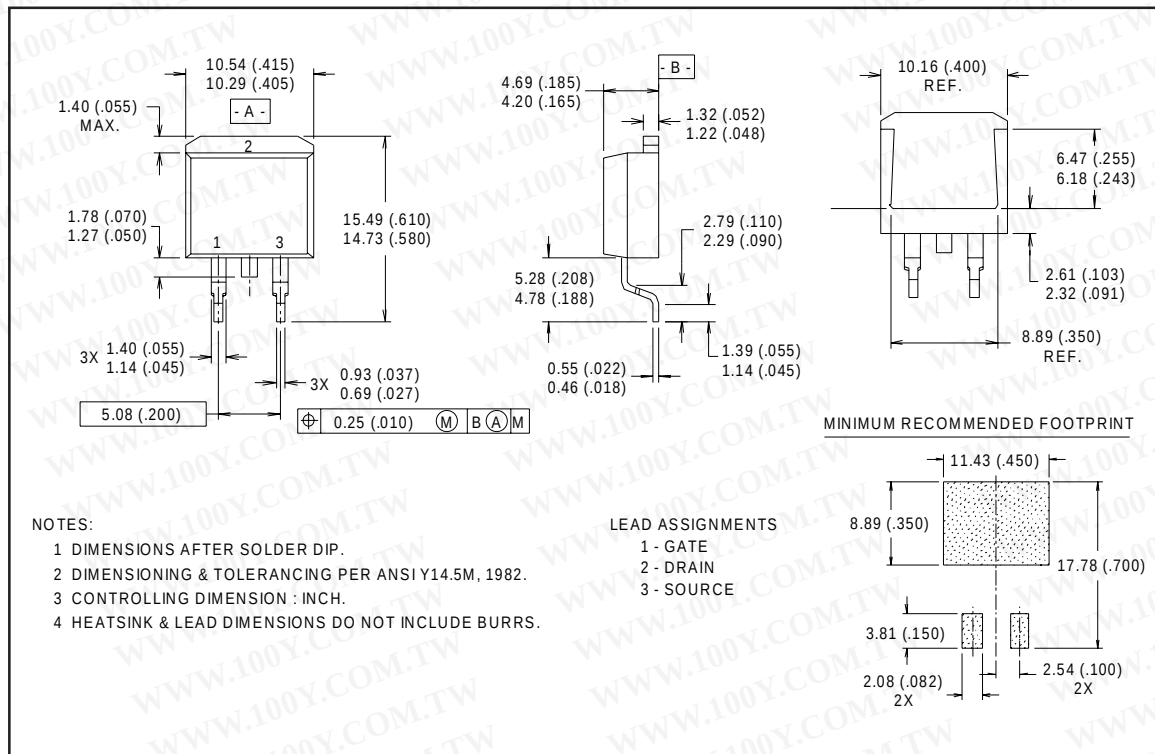
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFETS

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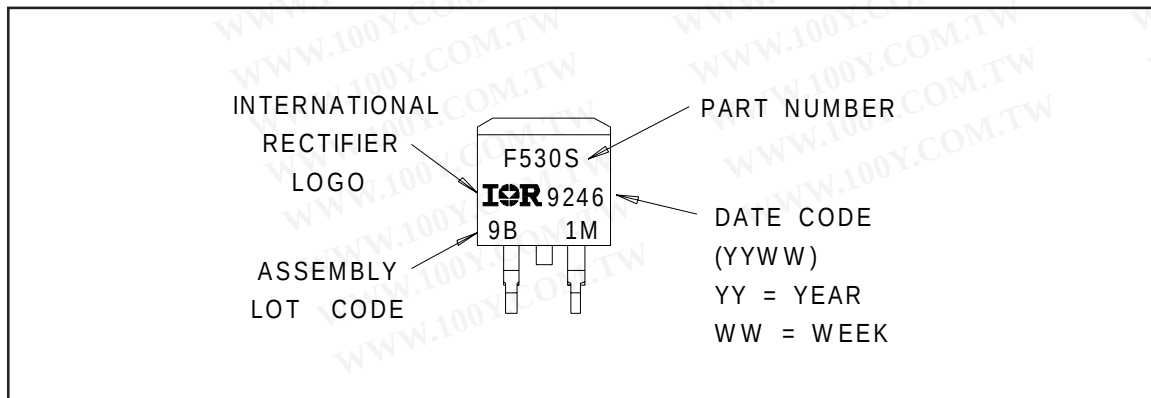
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D²Pak Package Outline



Part Marking Information

D²Pak

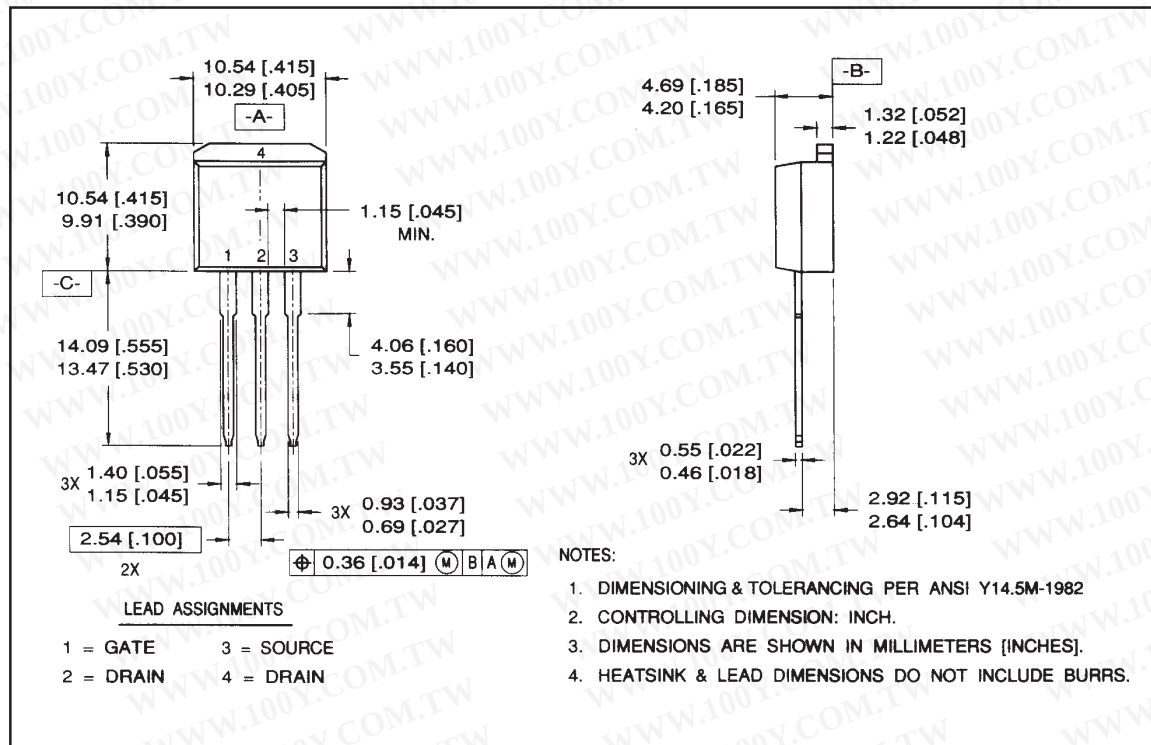


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Package Outline

TO-262 Outline

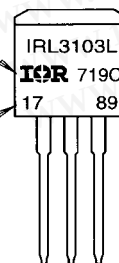


Part Marking Information

TO-262

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

INTERNATIONAL
RECTIFIER
LOGO
ASSEMBLY
LOT CODE



PART NUMBER

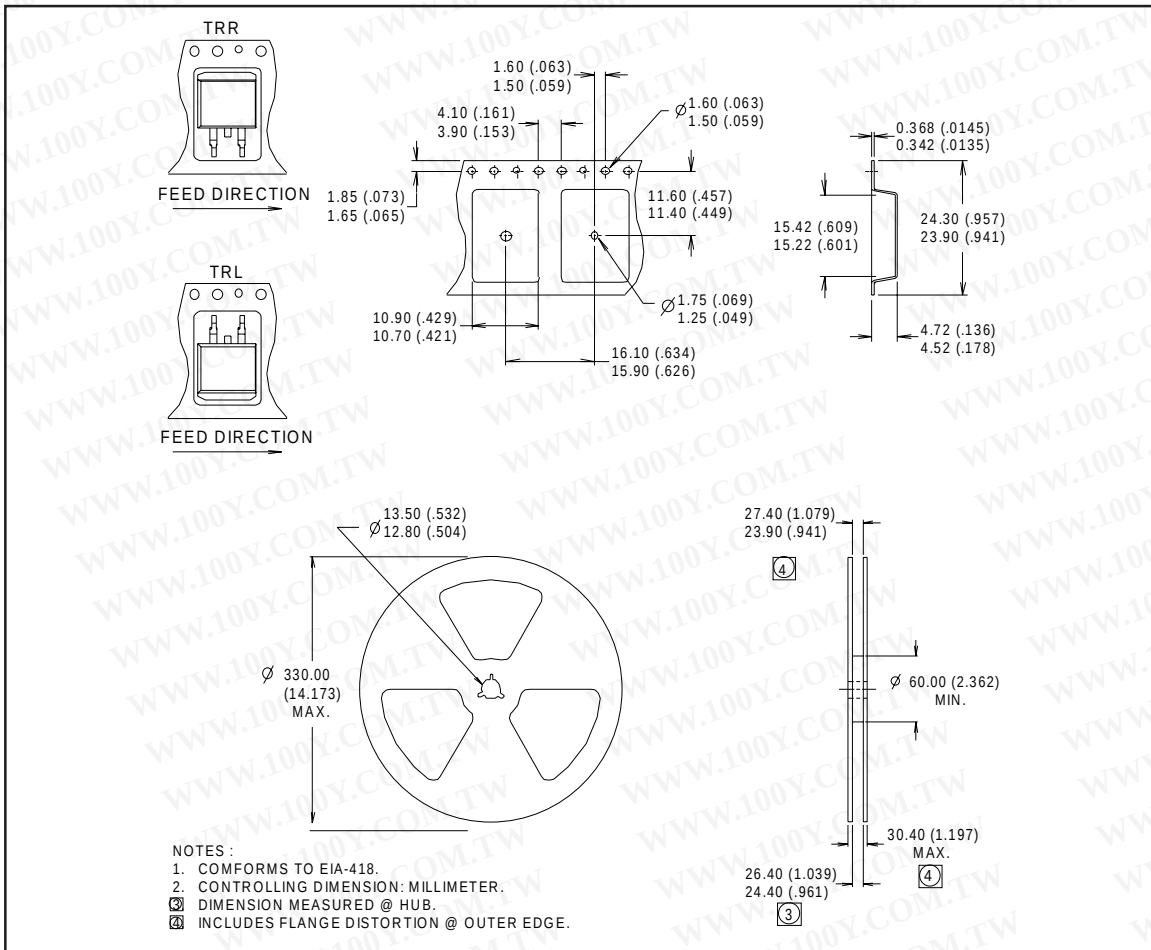
DATE CODE
YEAR 7 = 1997
WEEK 19
LINE C

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Tape & Reel Information

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<http://www.irf.com/>

Data and specifications subject to change without notice.

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