

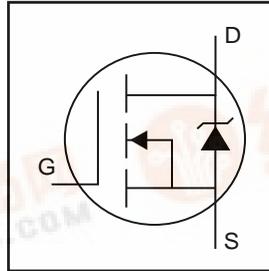
# International Rectifier

PRELIMINARY

# IRFBC30S/L

HEXFET® Power MOSFET

- Surface Mount (IRFBC30S)
- Low-profile through-hole (IRFBC30L)
- Available in Tape & Reel (IRFBC30S)
- Dynamic dv/dt Rating
- 150°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated



$V_{DSS} = 600V$
$R_{DS(on)} = 2.2\Omega$
$I_D = 3.6A$

## Description

Third generation HEXFETs from international Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The D<sup>2</sup>Pak 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 D<sup>2</sup>Pak 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 (IRFBC30L) is available for low-profile applications.



## Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ⑤	3.6	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ⑤	2.3	
$I_{DM}$	Pulsed Drain Current ①⑤	14	
$P_D @ T_A = 25^\circ C$	Power Dissipation	3.1	W
$P_D @ T_C = 25^\circ C$	Power Dissipation	74	W
	Linear Derating Factor	0.59	W/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulse Avalanche Energy②⑤	290	mJ
$I_{AR}$	Avalanche Current①	3.6	A
$E_{AR}$	Repetitive Avalanche Energy①	7.4	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑤	3.0	V/ns
$T_J$	Operating Junction and	-55 to + 150	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case )	

## Thermal Resistance

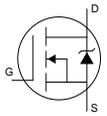
	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.7	°C/W
$R_{\theta JA}$	Junction-to-Ambient ( PCB Mounted steady-state)**	—	40	



## 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	600	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.62	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}$ , $I_D = 1mA$ ⑤
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	2.2	$\Omega$	$V_{GS} = 10V, I_D = 2.2A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$g_{fs}$	Forward Transconductance	2.5	—	—	S	$V_{DS} = 50V, I_D = 2.2A$ ⑤
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	100	$\mu A$	$V_{DS} = 600V, V_{GS} = 0V$
		—	—	500		$V_{DS} = 480V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$
$Q_g$	Total Gate Charge	—	—	31	nC	$I_D = 3.6A$
$Q_{gs}$	Gate-to-Source Charge	—	—	4.6		$V_{DS} = 360V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	17		$V_{GS} = 10V$ , See Fig. 6 and 13 ④⑤
$t_{d(on)}$	Turn-On Delay Time	—	11	—	ns	$V_{DD} = 300V$
$t_r$	Rise Time	—	13	—		$I_D = 3.6A$
$t_{d(off)}$	Turn-Off Delay Time	—	35	—		$R_G = 12\Omega$
$t_f$	Fall Time	—	14	—		$R_D = 82\Omega$ , See Fig. 10 ④⑤
$L_S$	Internal Source Inductance	—	7.5	—	nH	Between lead, and center of die contact
$C_{iss}$	Input Capacitance	—	660	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	86	—		$V_{DS} = 25V$
$C_{rss}$	Reverse Transfer Capacitance	—	19	—		$f = 1.0MHz$ , See Fig. 5⑤

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	3.6	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	14		
$V_{SD}$	Diode Forward Voltage	—	—	1.6	V	$T_J = 25^\circ\text{C}, I_S = 3.6A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	370	810	ns	$T_J = 25^\circ\text{C}, I_F = 3.6A$
$Q_{rr}$	Reverse Recovery Charge	—	2.0	4.2	$\mu C$	$di/dt = 100A/\mu s$ 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 )

②  $V_{DD} = 50V$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 41mH$   
 $R_G = 25\Omega$ ,  $I_{AS} = 3.6A$ . (See Figure 12)

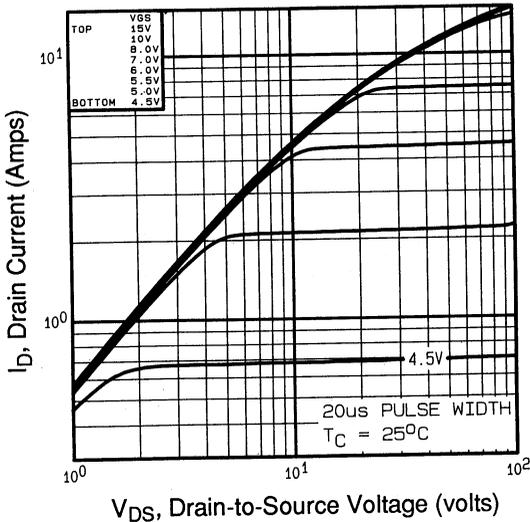
③  $I_{SD} \leq 3.6A$ ,  $di/dt \leq 60A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  
 $T_J \leq 150^\circ\text{C}$

④ Pulse width  $\leq 3000\mu s$ ; duty cycle  $\leq 2\%$ .

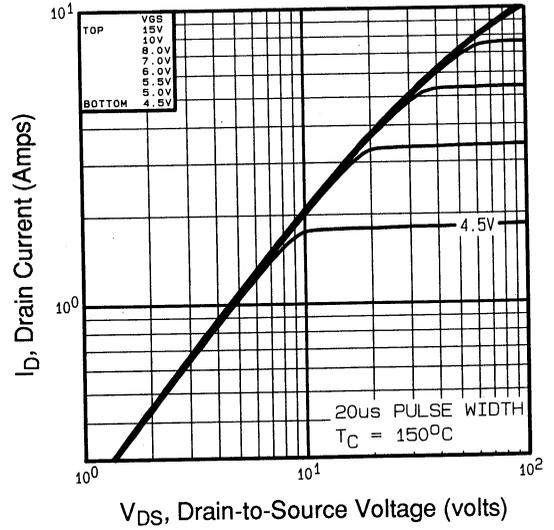
⑤ Uses IRFBC30 data and test conditions

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

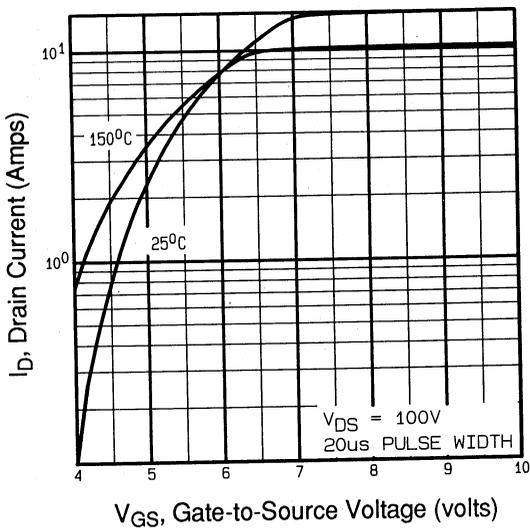
For recommended footprint and soldering techniques refer to application note #AN-994.



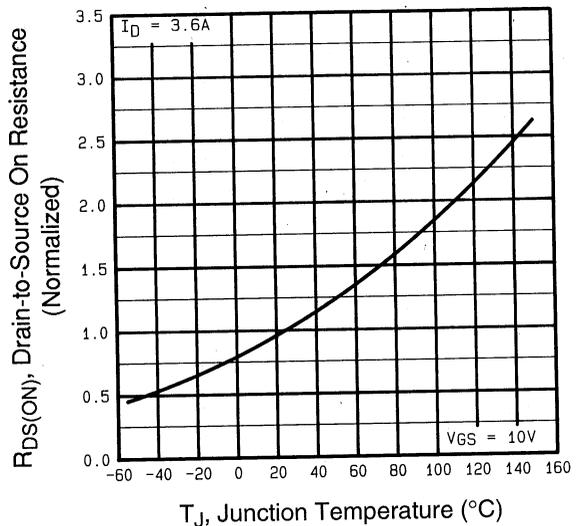
**Fig 1.** Typical Output Characteristics,



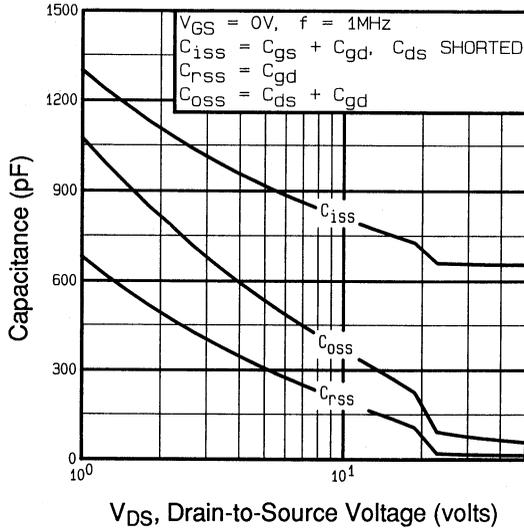
**Fig 2.** Typical Output Characteristics,



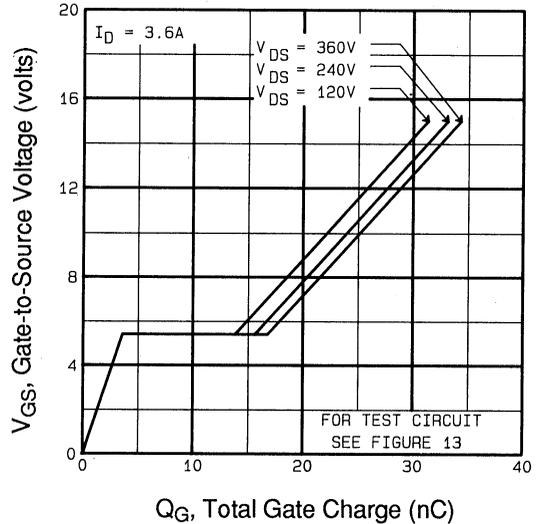
**Fig 3.** Typical Transfer Characteristics



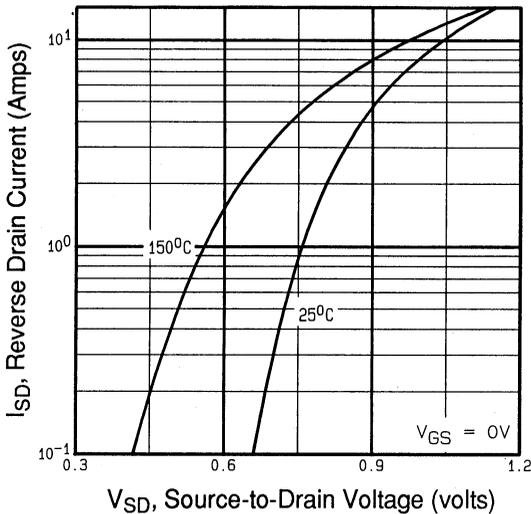
**Fig 4.** Normalized On-Resistance  
 Vs. Temperature



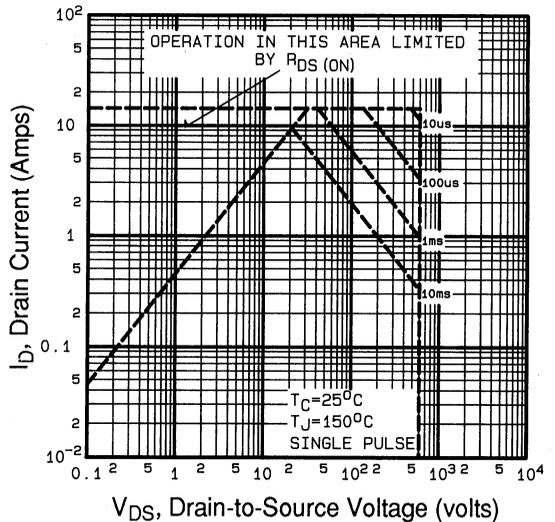
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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



**Fig 7.** Typical Source-Drain Diode Forward Voltage



**Fig 8.** Maximum Safe Operating Area

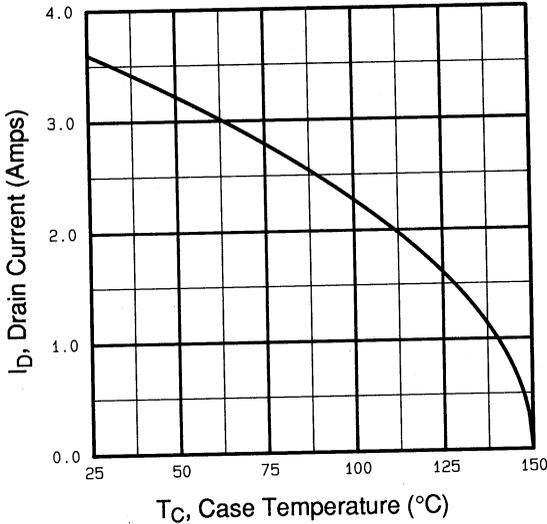


Fig 9. Maximum Drain Current Vs. Case Temperature

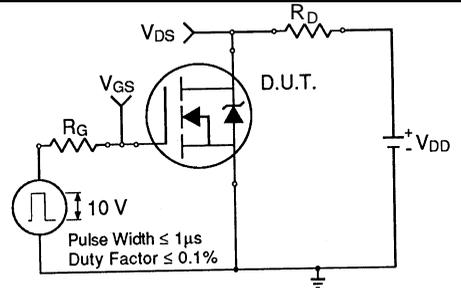


Fig 10a. Switching Time Test Circuit

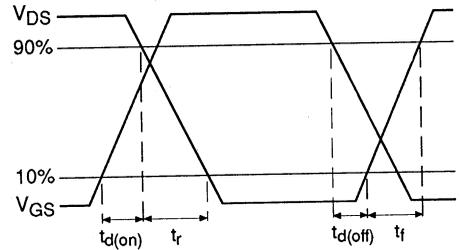


Fig 10b. Switching Time Waveforms

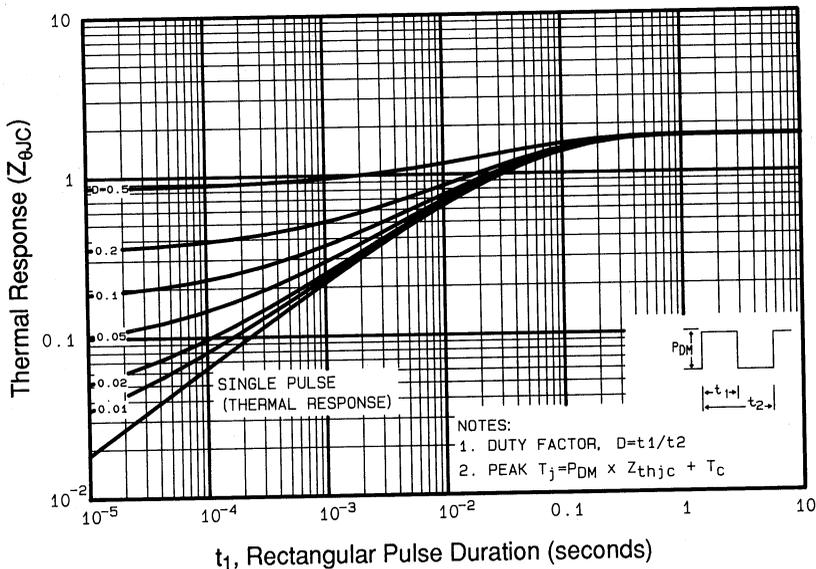
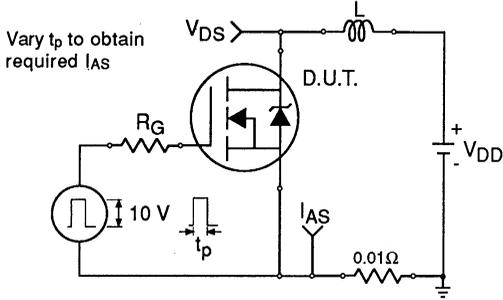
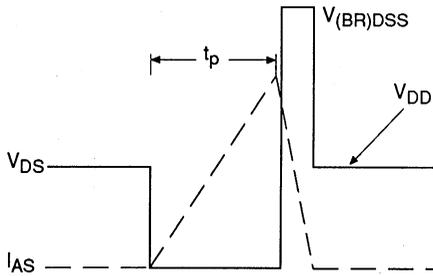


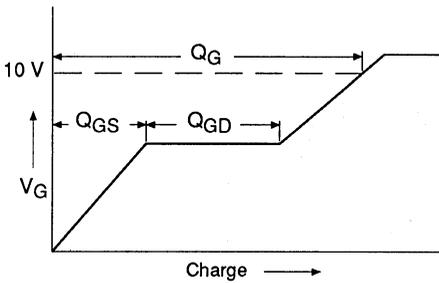
Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case



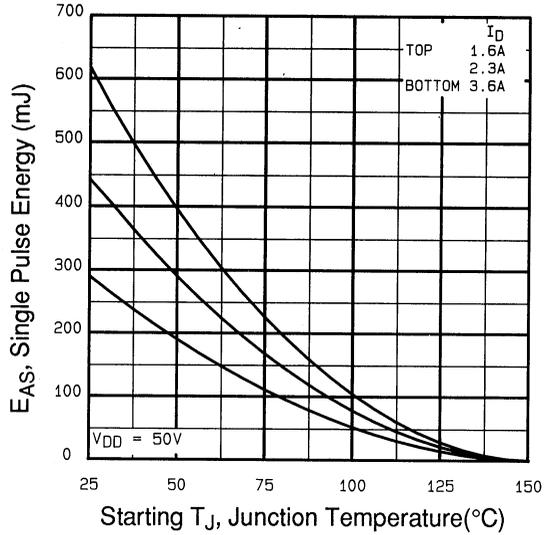
**Fig 12a.** Unclamped Inductive Test Circuit



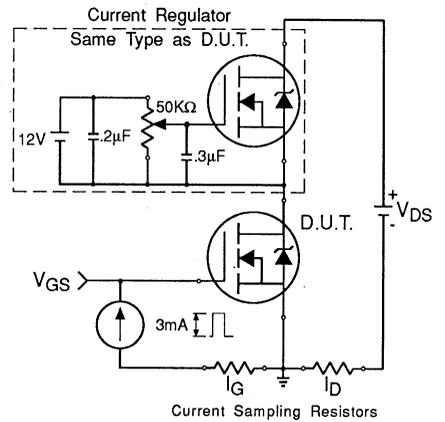
**Fig 12b.** Unclamped Inductive Waveforms



**Fig 13a.** Basic Gate Charge Waveform

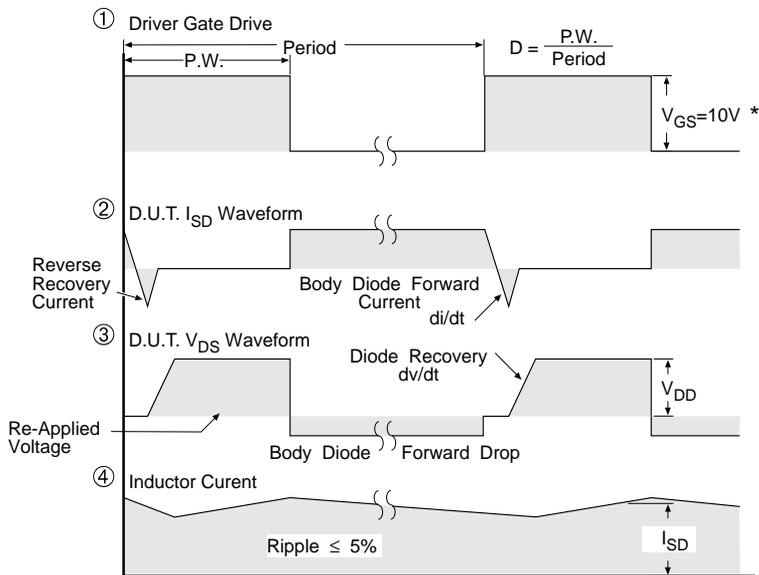
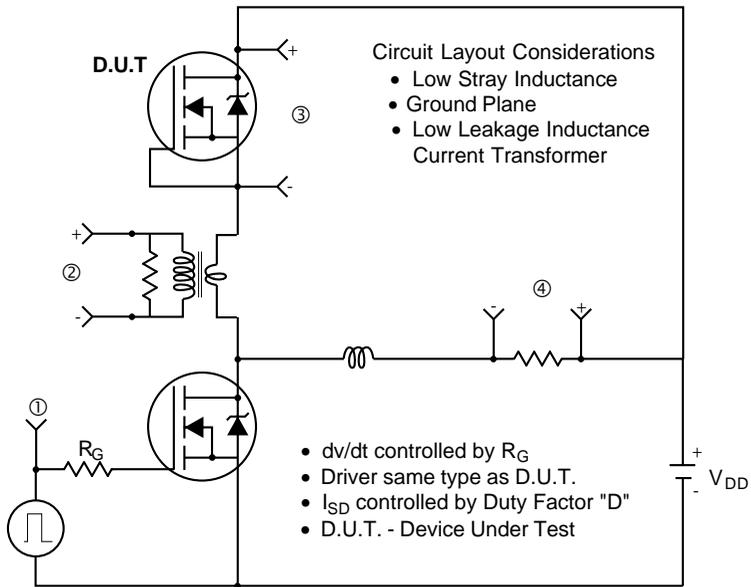


**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



**Fig 13b.** Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



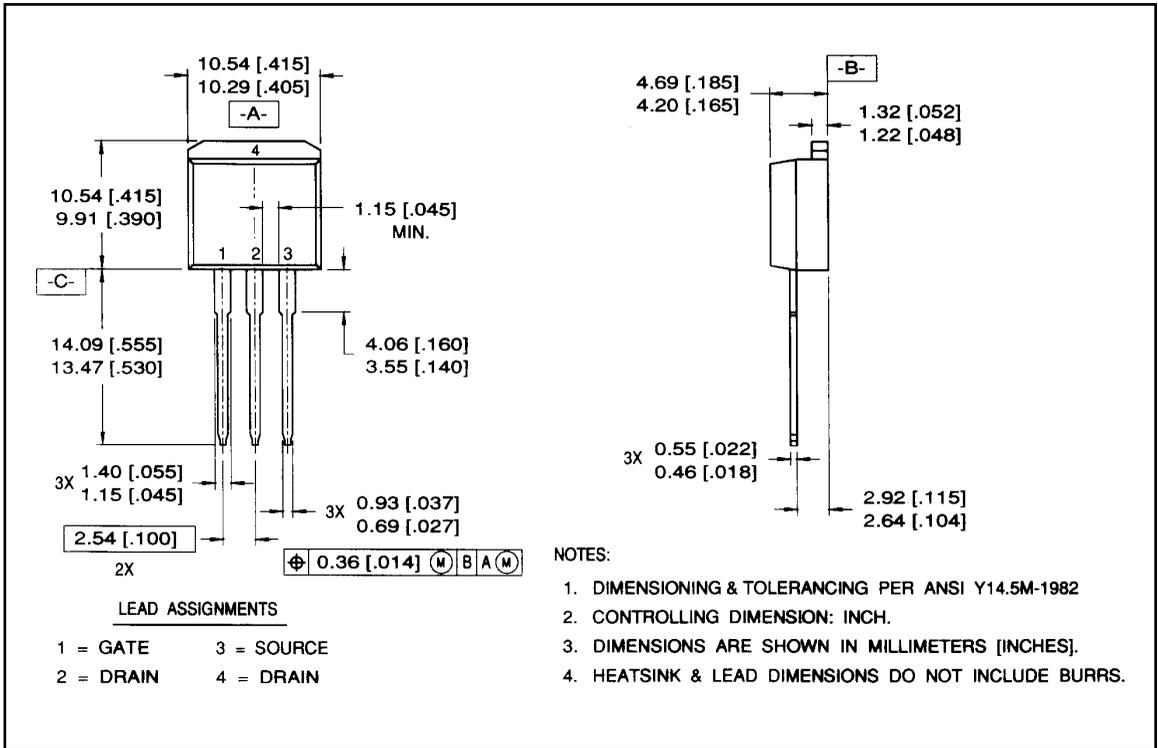
\*  $V_{GS} = 5V$  for Logic Level Devices

Fig 14 For N-Channel HEXFETs



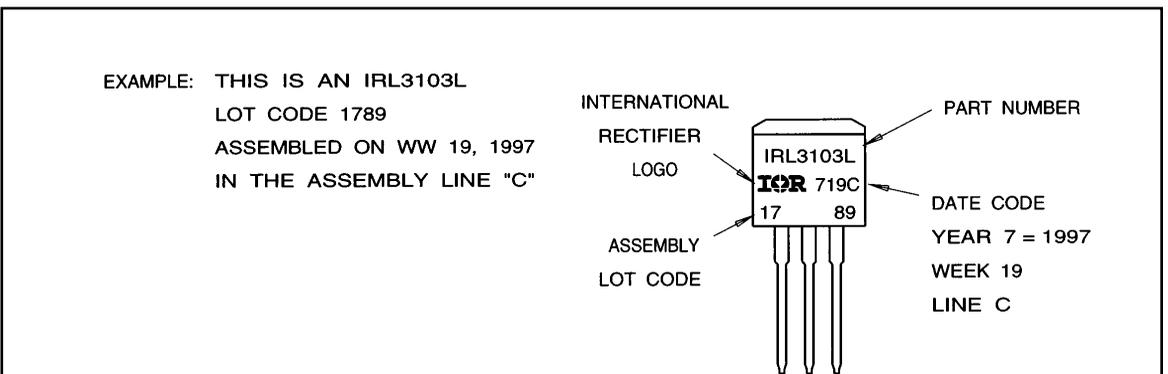
## Package Outline

### TO-262 Outline



## Part Marking Information

### TO-262



# IRFBC30S/L

## Tape & Reel Information

D<sup>2</sup>Pak

