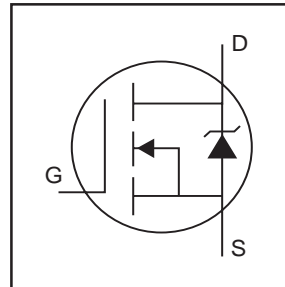


IRL3803

HEXFET® Power MOSFET

- Logic-Level Gate Drive
- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

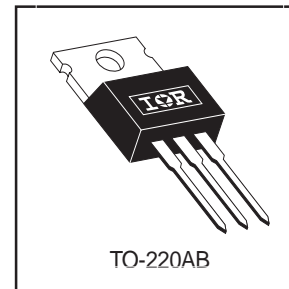


$V_{DS} = 30V$
$R_{DS(on)} = 0.006\Omega$
$I_D = 140A$ ⑤

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible 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 device for use in a wide variety of applications.

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



Absolute Maximum Ratings

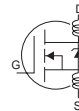
	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	140⑤	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	98⑤	
I_{DM}	Pulsed Drain Current ①	470	
$P_D @ T_C = 25^\circ C$	Power Dissipation	200	W
	Linear Derating Factor	1.3	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy ②	610	mJ
I_{AR}	Avalanche Current①	71	A
E_{AR}	Repetitive Avalanche Energy①	20	mJ
dv/dt	Peak Diode Recovery dv/dt ③	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)	
	Mounting torque, 6-32 or M3 screw.	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	0.75	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	—	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient	—	—	62	

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	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.052	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.006	Ω	$V_{GS} = 10V, I_D = 71A$ ④
		—	—	0.009		$V_{GS} = 4.5V, I_D = 59A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	55	—	—	S	$V_{DS} = 25V, I_D = 71A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 30V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 24V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
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	—	—	140	nC	$I_D = 71A$
Q_{gs}	Gate-to-Source Charge	—	—	41		$V_{DS} = 24V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	78		$V_{GS} = 4.5V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	14	—		ns
t_r	Rise Time	—	230	—	$I_D = 71A$	
$t_{d(off)}$	Turn-Off Delay Time	—	29	—	$R_G = 1.3\Omega, V_{GS} = 4.5V$	
t_f	Fall Time	—	35	—	$R_D = 0.20\Omega$, See Fig. 10 ④	
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L_S	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	5000	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1800	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	880	—		$f = 1.0MHz$, See Fig. 5



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	140	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	470		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 71A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	120	180	ns	$T_J = 25^\circ\text{C}, I_F = 71A$
Q_{rr}	Reverse Recovery Charge	—	450	680	nC	$di/dt = 100A/\mu s$ ④
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 $V_{DD} = 15V$, starting $T_J = 25^\circ\text{C}$, $L = 180\mu H$
 $R_G = 25\Omega, I_{AS} = 71A$. (See Figure 12)
- ③ $I_{SD} \leq 71A, di/dt \leq 130A/\mu s, V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 175^\circ\text{C}$

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

⑤ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip # 93-4

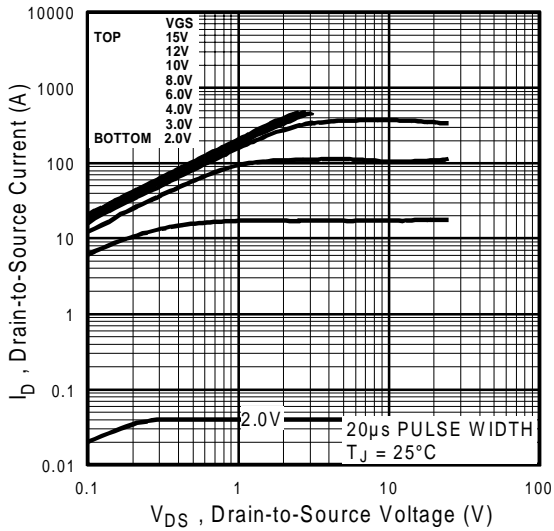


Fig 1. Typical Output Characteristics,
 $T_J = 25^\circ\text{C}$

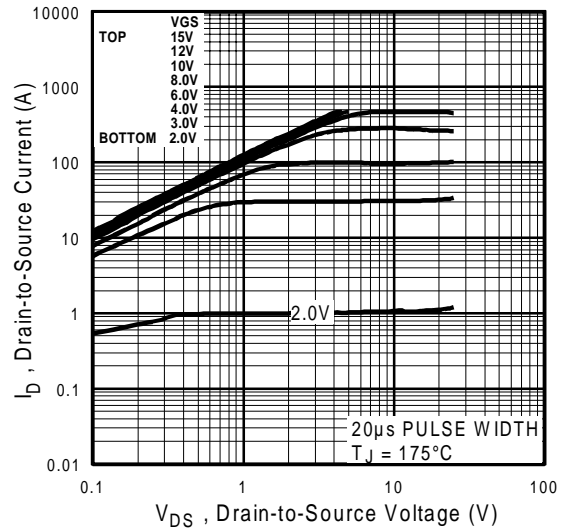


Fig 2. Typical Output Characteristics,
 $T_J = 175^\circ\text{C}$

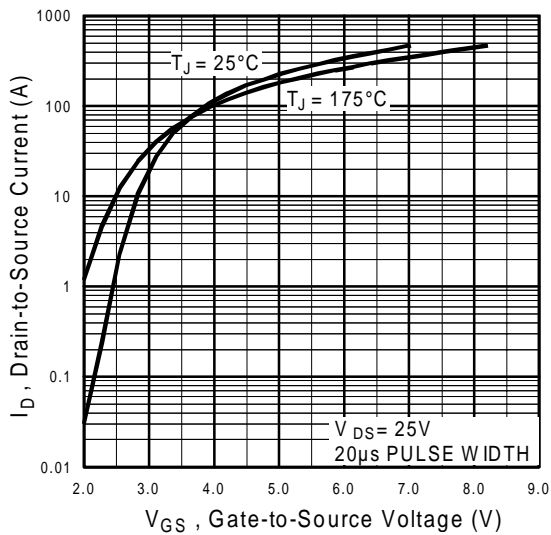


Fig 3. Typical Transfer Characteristics

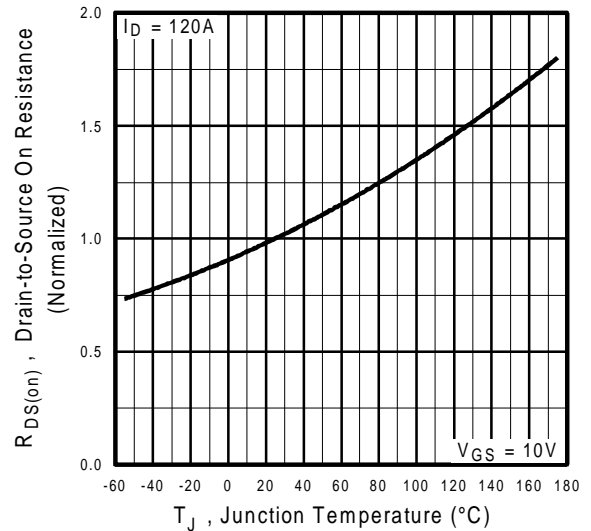


Fig 4. Normalized On-Resistance
 Vs. Temperature

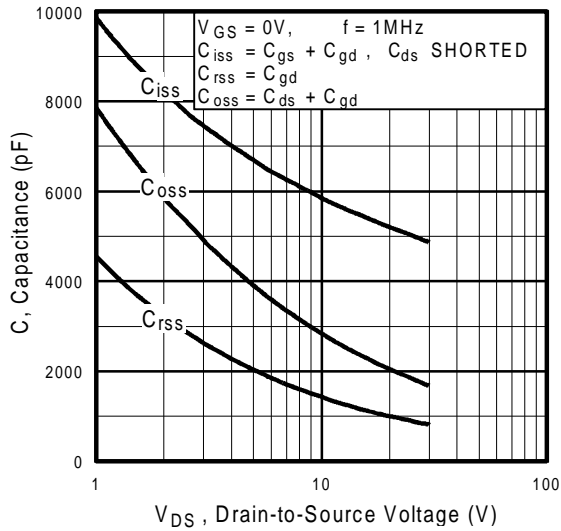


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

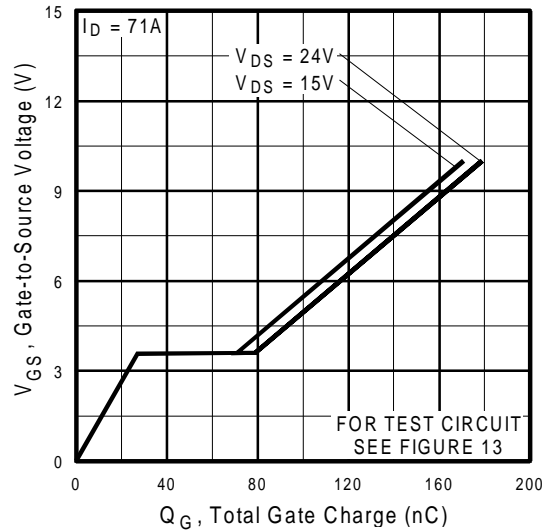


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

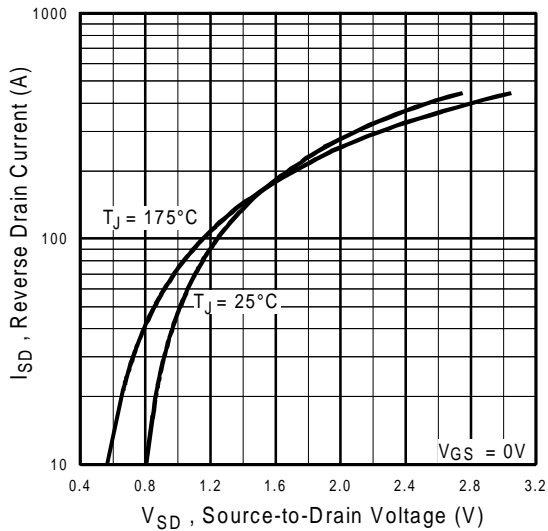


Fig 7. Typical Source-Drain Diode Forward Voltage

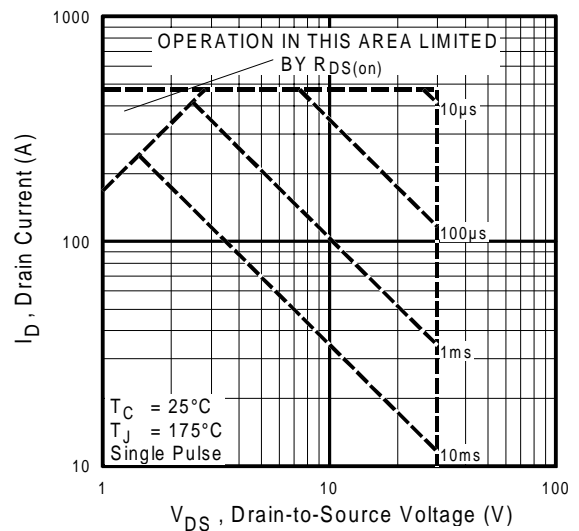


Fig 8. Maximum Safe Operating Area

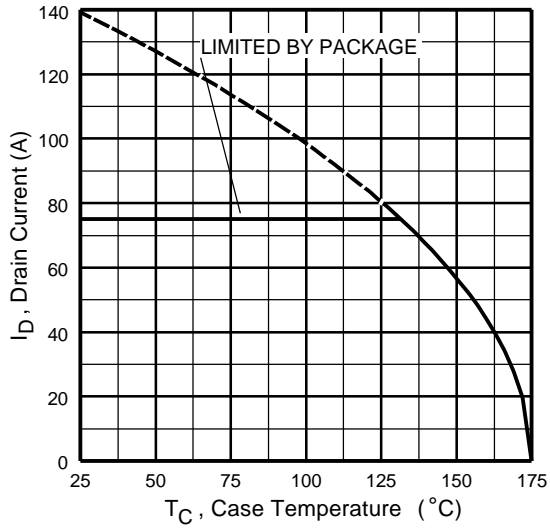


Fig 9. Maximum Drain Current Vs. Case Temperature

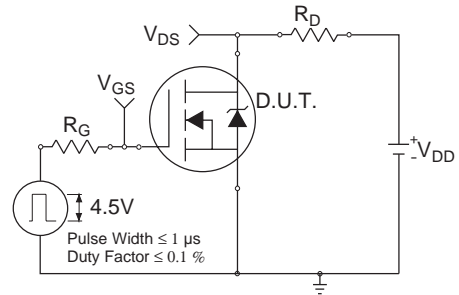


Fig 10a. Switching Time Test Circuit

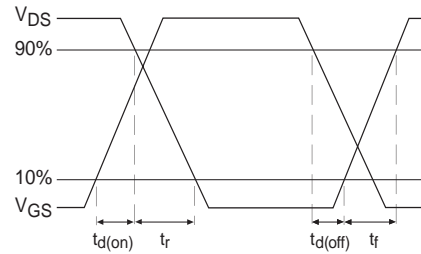


Fig 10b. Switching Time Waveforms

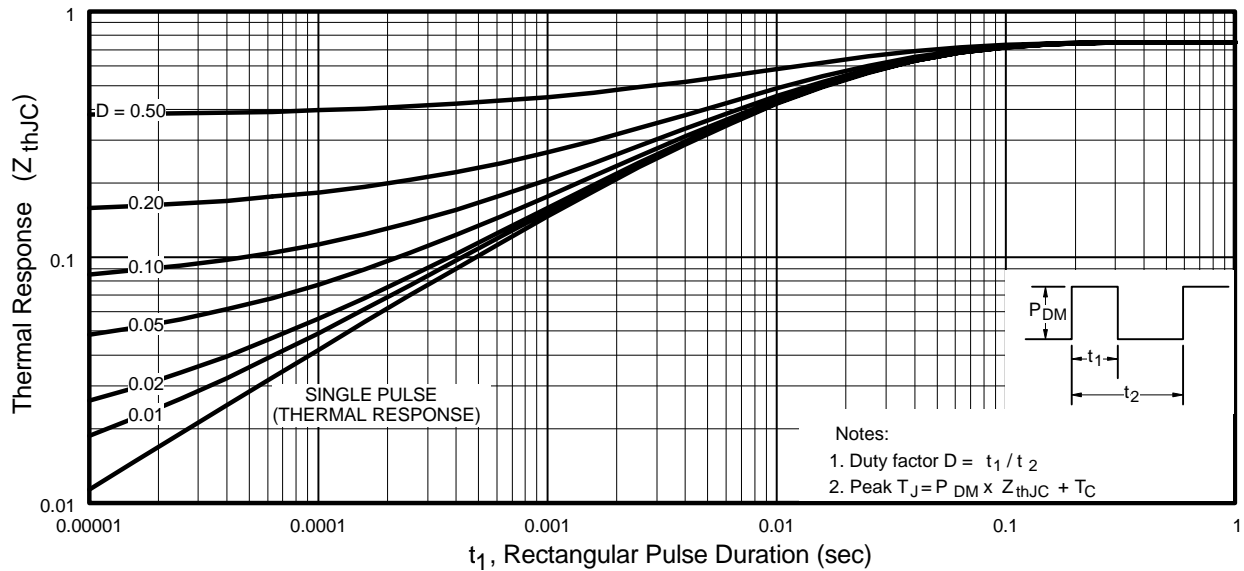


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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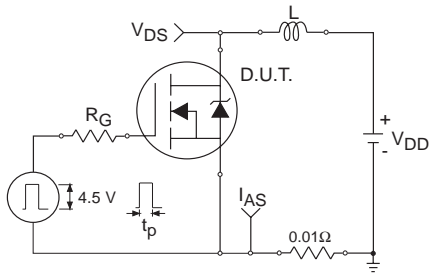


Fig 12a. Unclamped Inductive Test Circuit

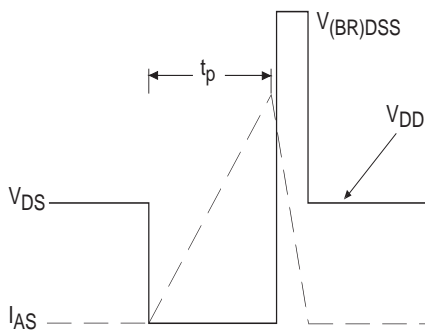


Fig 12b. Unclamped Inductive Waveforms

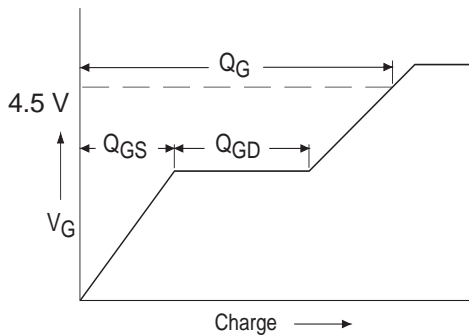


Fig 13a. Basic Gate Charge Waveform

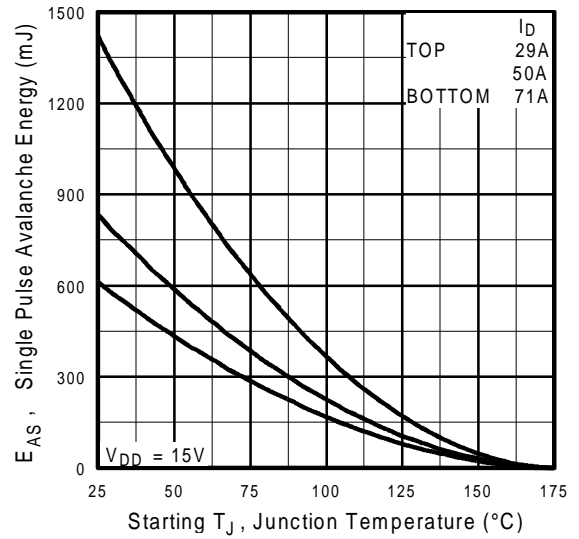


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

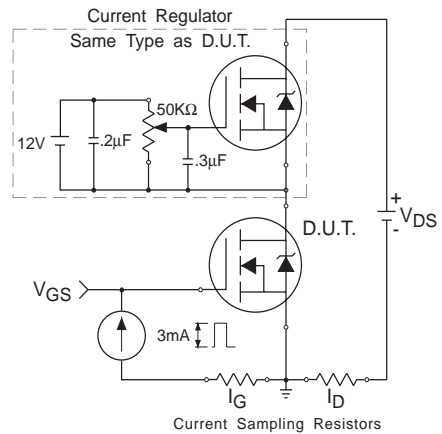
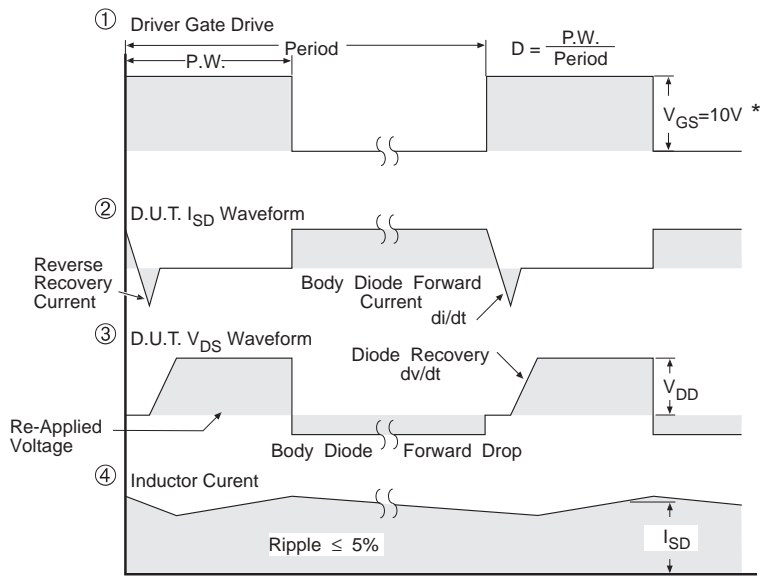
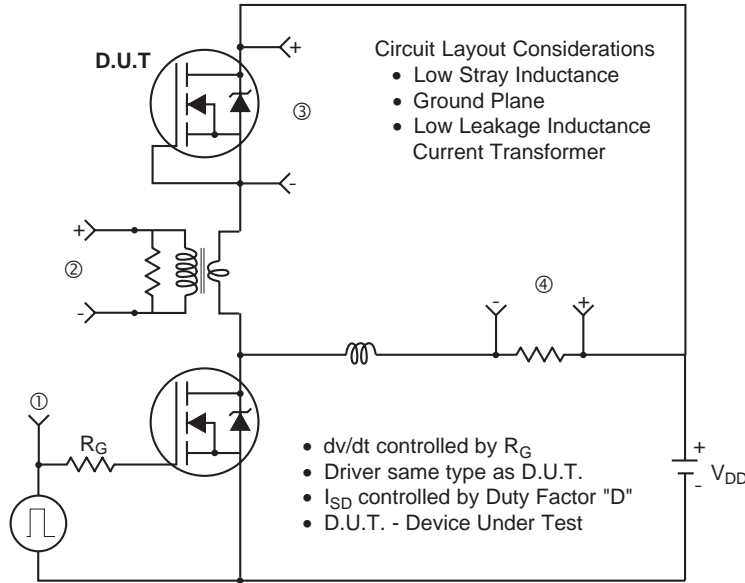


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

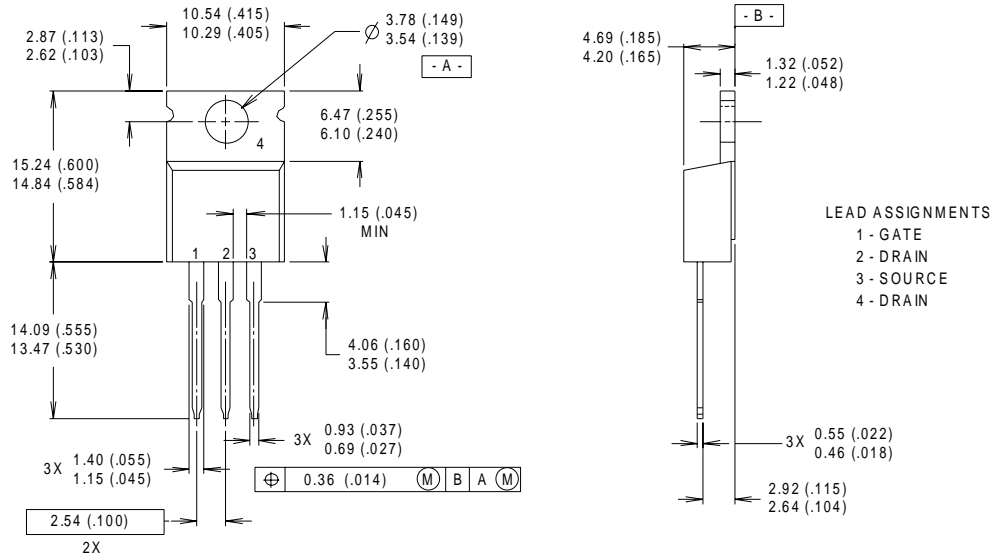
Fig 14. For N-Channel HEXFETS

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IR Rectifier

TO-220AB Package Outline

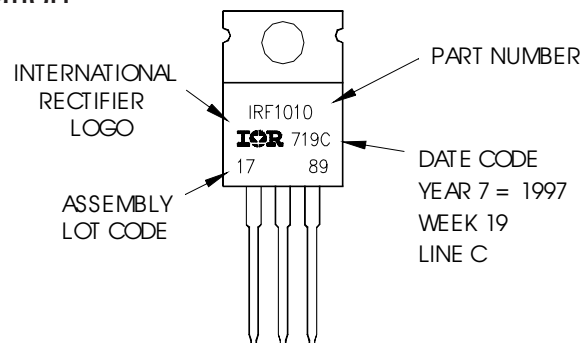
Dimensions are shown in millimeters (inches)



- NOTES:
- 1 DIMENSIONING & TOLERANCING PER ANS I Y14.5M, 1982.
 - 2 CONTROLLING DIMENSION : INCH
 - 3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
 - 4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

TO-220AR Part Marking Information

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



International
IR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331
EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020
IR CANADA: 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 2Z8, Tel: (905) 475 1897
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111
IR FAR EAST: K&H Bldg., 2F, 3-30-4 Nishi-Ikeburo 3-Chome, Toshima-Ki, Tokyo Japan 171 Tel: 81 3 3983 0086
IR SOUTHEAST ASIA: 315 Outram Road, #10-02 Tan Boon Liat Building, Singapore 0316 Tel: 65 221 8371
<http://www.irf.com/> Data and specifications subject to change without notice. 1/04

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