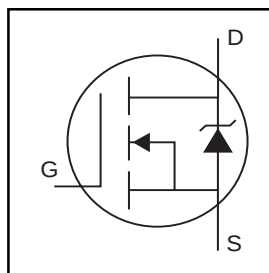


- Logic-Level Gate Drive
- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

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 and reliable device for use in a wide variety of applications.

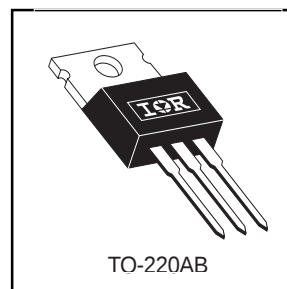
The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



$$V_{DS} = 40V$$

$$R_{DS(on)} = 0.0065W$$

$$I_D = 130A^{\textcircled{5}}$$



Absolute Maximum Ratings

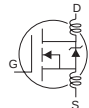
	Parameter	Max.	Units
I_D @ $T_C = 25^\circ C$	Continuous Drain Current, V_{GS} @ 10V	130 ^⑤	A
I_D @ $T_C = 100^\circ C$	Continuous Drain Current, V_{GS} @ 10V	92 ^⑤	
I_{DM}	Pulsed Drain Current ①	520	
P_D @ $T_C = 25^\circ C$	Power Dissipation	200	W
	Linear Derating Factor	1.3	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy ^②	700	mJ
I_{AR}	Avalanche Current ^①	78	A
E_{AR}	Repetitive Avalanche Energy ^①	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		
	Mounting torque, 6-32 or M3 screw	300 (1.6mm from case) 10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
R_{qJC}	Junction-to-Case	—	0.75	°C/W
R_{qCS}	Case-to-Sink, Flat, Greased Surface	0.50	—	
R_{qJA}	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	40	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$DV_{(BR)DSS}/DT_J$	Breakdown Voltage Temp. Coefficient	—	0.04	—	V/°C	Reference to 25°C , $I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.0065	W	$V_{GS} = 10V, I_D = 78A$ ④
		—	—	0.009		$V_{GS} = 4.5V, I_D = 65A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	63	—	—	S	$V_{DS} = 25V, I_D = 78A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 40V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 32V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
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	—	—	100	nC	$I_D = 78A$
Q_{gs}	Gate-to-Source Charge	—	—	32		$V_{DS} = 32V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	43		$V_{GS} = 4.5V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	16	—	ns	$V_{DD} = 20V$
t_r	Rise Time	—	210	—		$I_D = 78A$
$t_{d(off)}$	Turn-Off Delay Time	—	25	—		$R_G = 2.5W, V_{GS} = 4.5V$
t_f	Fall Time	—	14	—		$R_D = 0.18W$, See Fig. 10 ④
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package
L_S	Internal Source Inductance	—	7.5	—		and center of die contact
C_{iss}	Input Capacitance	—	5330	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1480	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	320	—		$f = 1.0MHz$, See Fig. 5



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	130	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	520		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 78A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	78	120	ns	$T_J = 25^\circ\text{C}, I_F = 78A$
Q_{rr}	Reverse Recovery Charge	—	180	270	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:

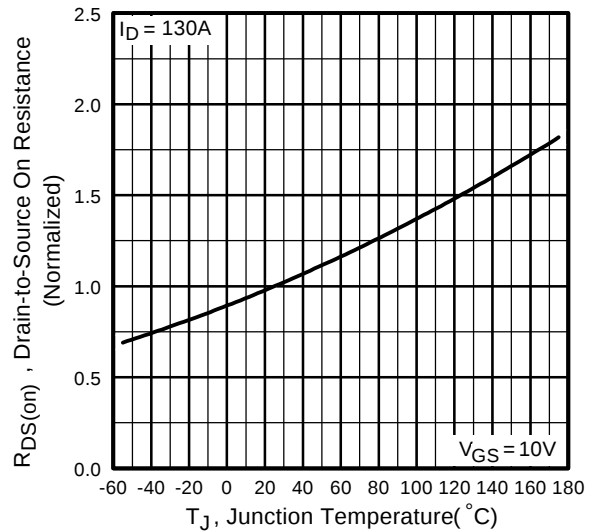
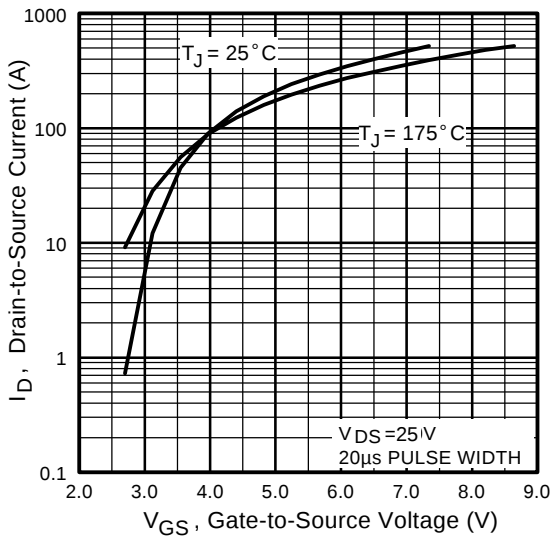
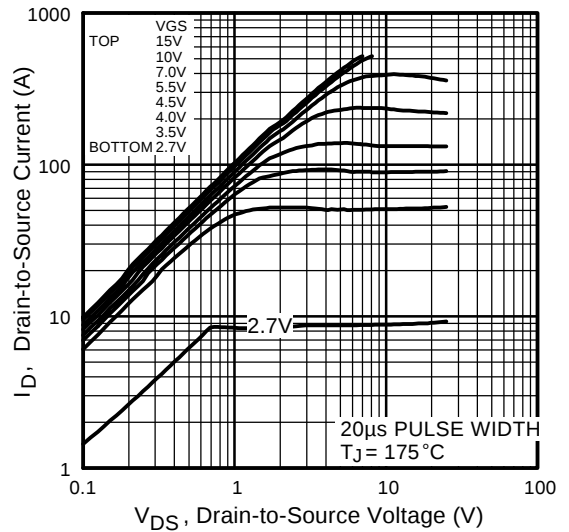
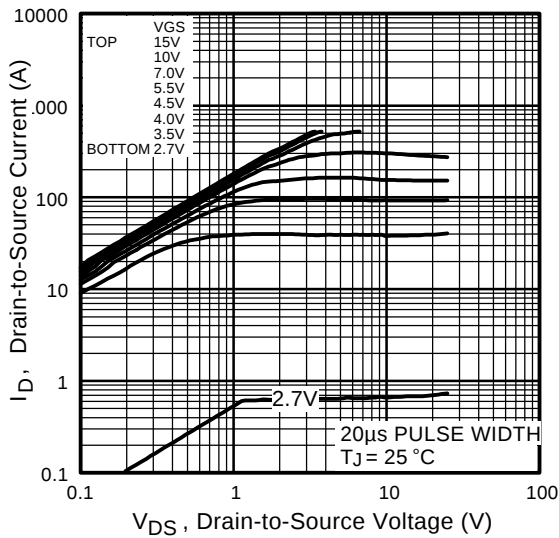
① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)

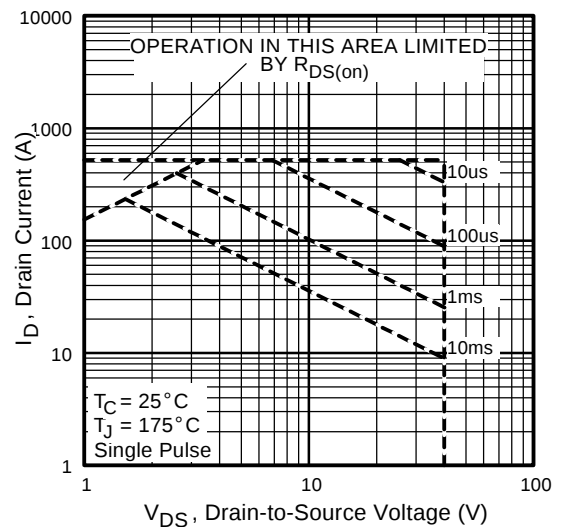
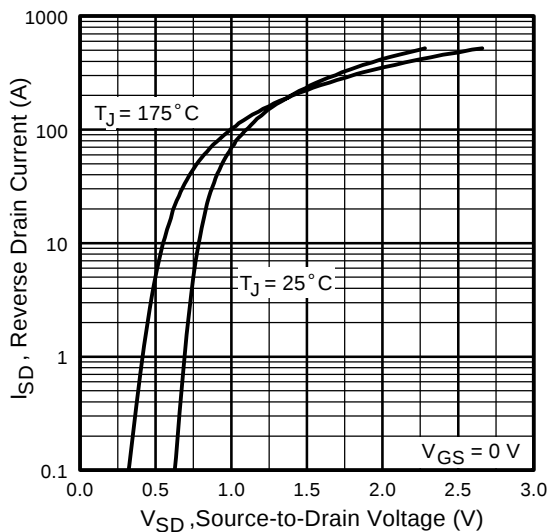
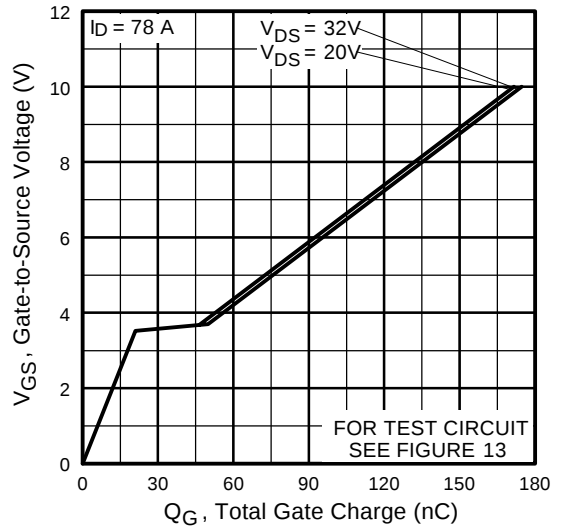
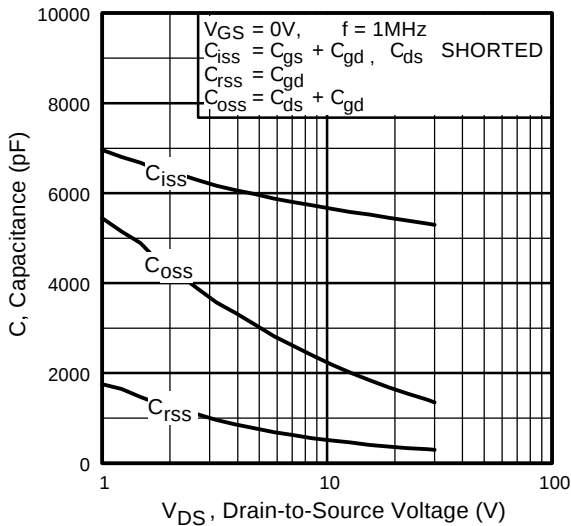
② Starting $T_J = 25^\circ\text{C}$, $L = 0.23mH$
 $R_G = 25W, I_{AS} = 78A$. (See Figure 12)

③ $I_{SD} \leq 78A$, $di/dt \leq 370A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 175^\circ\text{C}$

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





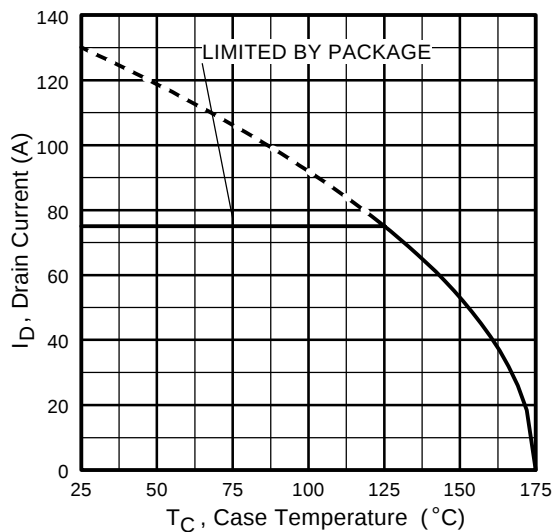


Fig 9. Maximum Drain Current Vs. Case Temperature

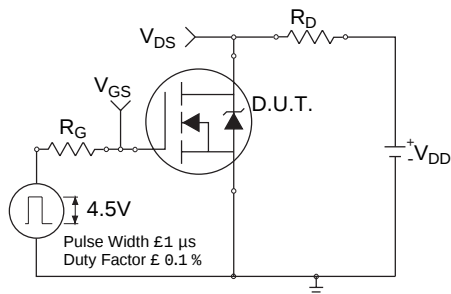


Fig 10a. Switching Time Test Circuit

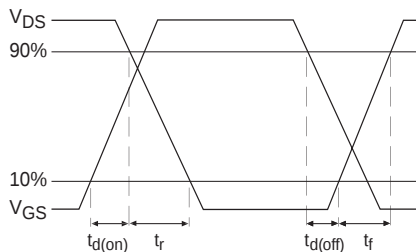


Fig 10b. Switching Time Waveforms

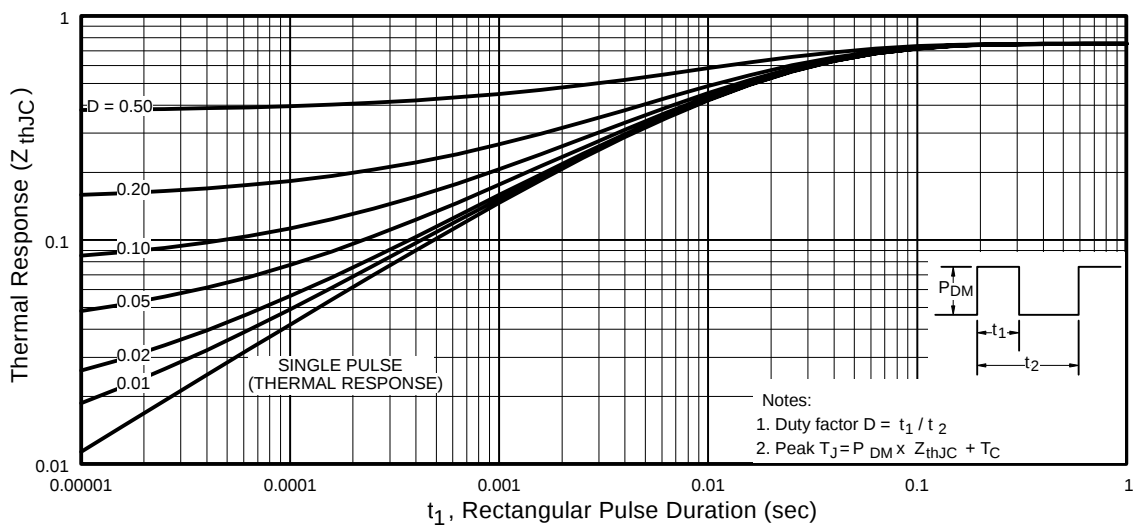


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

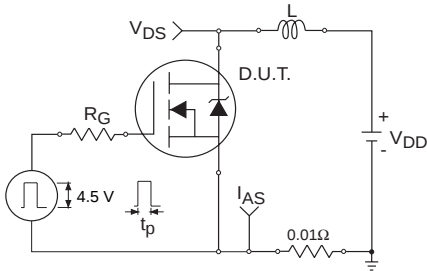


Fig 12a. Unclamped Inductive Test Circuit

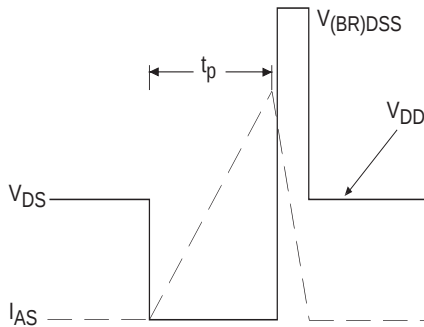


Fig 12b. Unclamped Inductive Waveforms

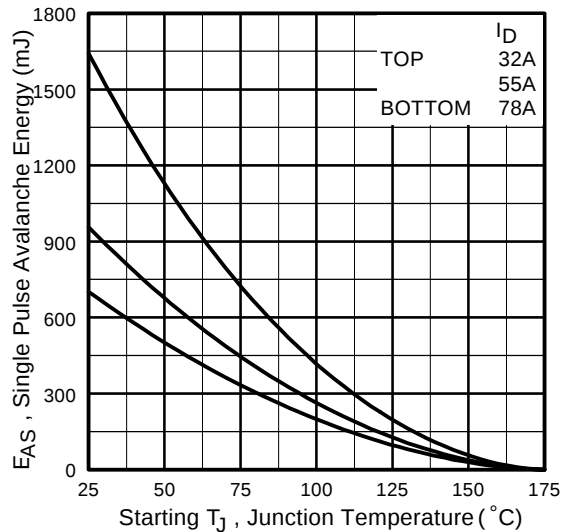


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

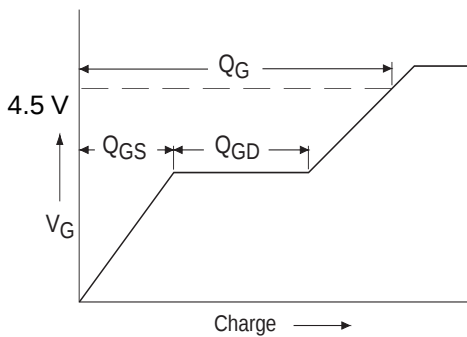


Fig 13a. Basic Gate Charge Waveform

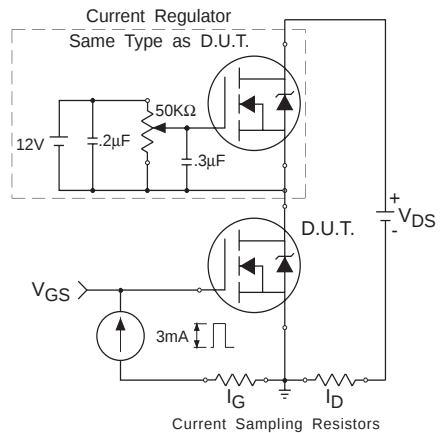
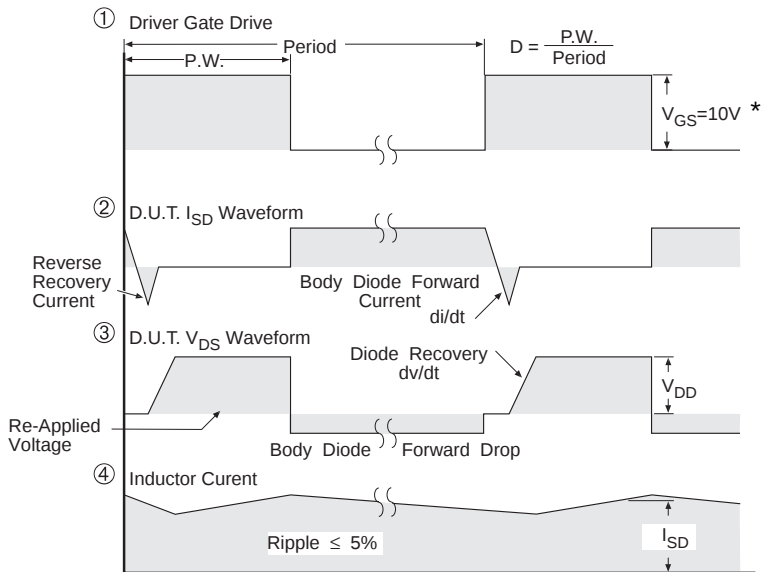
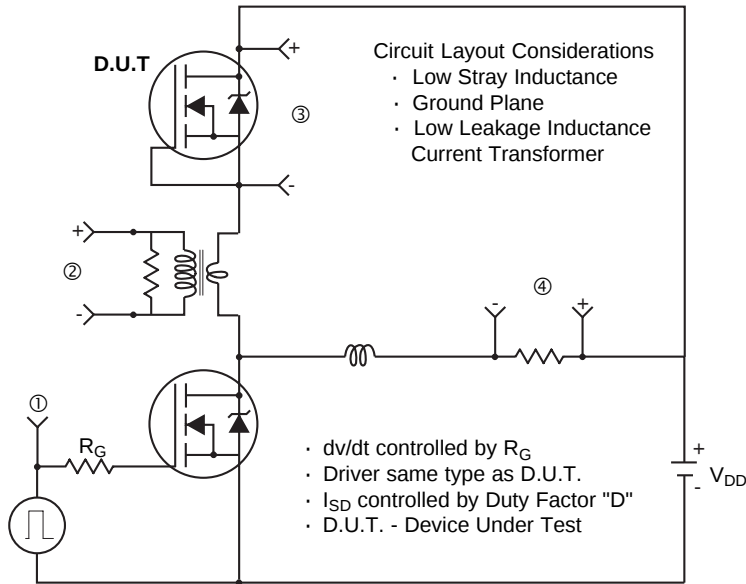


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



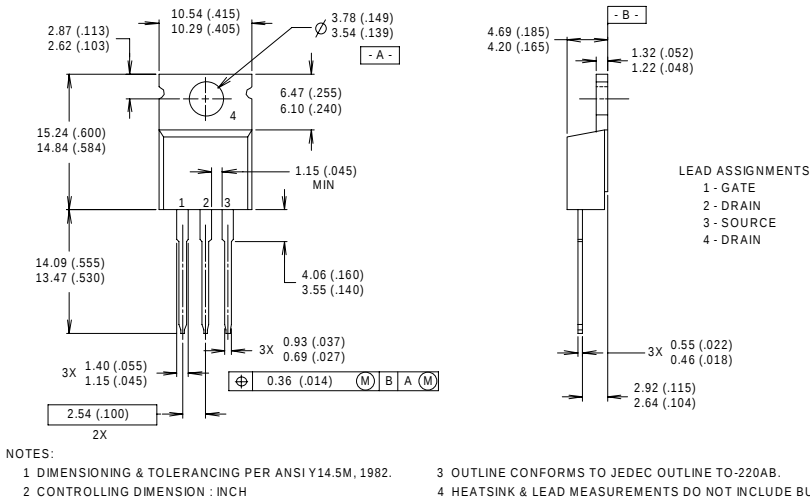
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFETS

Package Outline

TO-220AB Outline

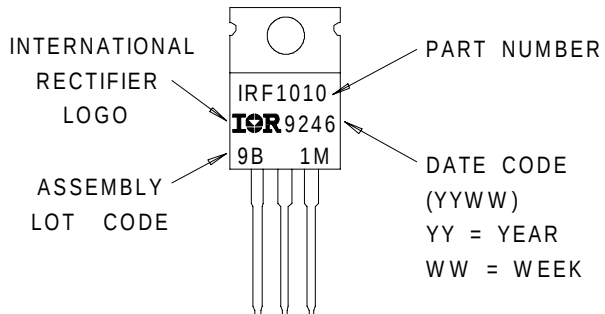
Dimensions are shown in millimeters (inches)



Part Marking Information

TO-220AB

EXAMPLE : THIS IS AN IRF1010
WITH ASSEMBLY
LOT CODE 9B1M



International
IR Rectifier

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IR GREAT BRITAIN: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020

IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200

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, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086

IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994 Tel: ++ 65 838 4630

IR TAIWAN: 16 Fl. Suite D. 207, Sec. 2, Tun Haw South Road, Taipei, 10673, Taiwan Tel: 886-2-2377-9936

<http://www.irf.com/> Data and specifications subject to change without notice. 10/98

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