

International
IR Rectifier
 HEXFET® Power MOSFET

PD - 91354A

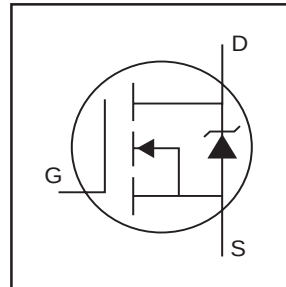
IRFZ24N

- Advanced Process Technology
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

Description

Fifth Generation HEXFET® power MOSFETs 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.

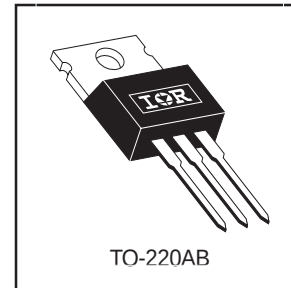
The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



$$V_{DS} = 55V$$

$$R_{DS(on)} = 0.07\Omega$$

$$I_D = 17A$$



Absolute Maximum Ratings

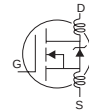
	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	17	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	12	
I_{DM}	Pulsed Drain Current ①	68	
$P_D @ T_C = 25^\circ C$	Power Dissipation	45	W
	Linear Derating Factor	0.30	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy ②	71	mJ
I_{AR}	Avalanche Current ①	10	A
E_{AR}	Repetitive Avalanche Energy ①	4.5	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	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	3.3	°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	55	—	—	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°C , $I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.07	Ω	$V_{GS} = 10V, I_D = 10A$ 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	4.5	—	—	S	$V_{DS} = 25V, I_D = 10A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 55V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 44V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
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	—	—	20	nC	$I_D = 10A$
Q_{gs}	Gate-to-Source Charge	—	—	5.3		$V_{DS} = 44V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	7.6		$V_{GS} = 10V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	4.9	—	ns	$V_{DD} = 28V$
t_r	Rise Time	—	34	—		$I_D = 10A$
$t_{d(off)}$	Turn-Off Delay Time	—	19	—		$R_G = 24\Omega$
t_f	Fall Time	—	27	—		$R_D = 2.6\Omega$, 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	—	370	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	140	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	65	—		$f = 1.0\text{MHz}$, See Fig. 5



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) ①	—	—	68		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 10A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	56	83	ns	$T_J = 25^\circ\text{C}, I_F = 10A$
Q_{rr}	Reverse Recovery Charge	—	120	180	nC	$di/dt = 100A/\mu s$ ④

Notes:

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

③ $I_{SD} \leq 10A, di/dt \leq 280A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^\circ\text{C}$

② $V_{DD} = 25V$, starting $T_J = 25^\circ\text{C}$, $L = 1.0\text{mH}$
 $R_G = 25\Omega, I_{AS} = 10A$. (See Figure 12)

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

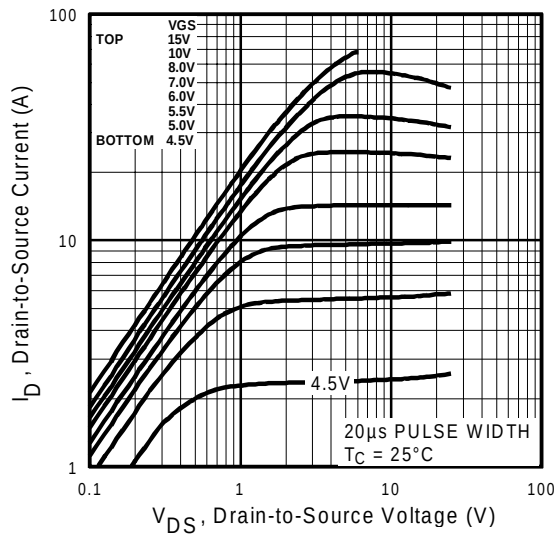


Fig 1. Typical Output Characteristics,
 $T_J = 25^\circ\text{C}$

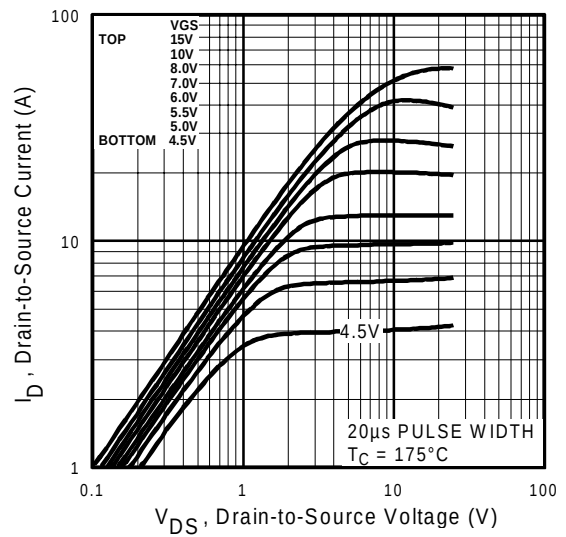


Fig 2. Typical Output Characteristics,
 $T_J = 175^\circ\text{C}$

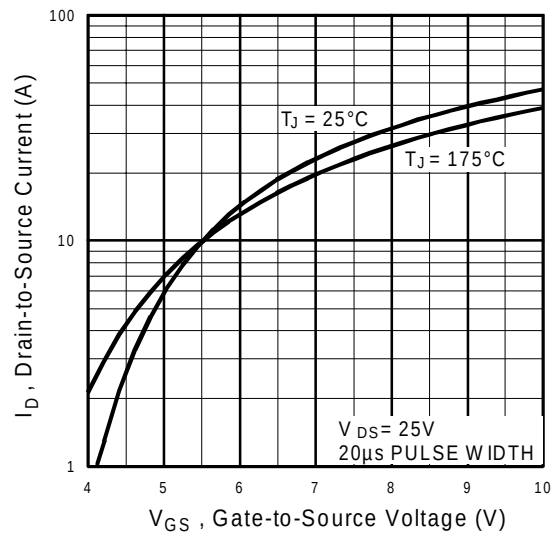


Fig 3. Typical Transfer Characteristics

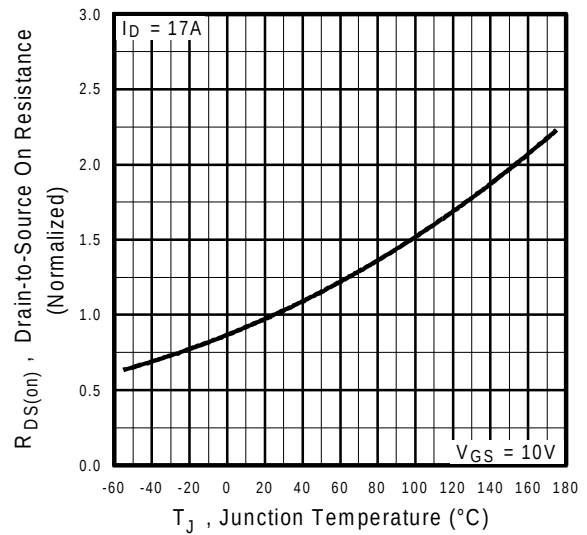


Fig 4. Normalized On-Resistance
Vs. Temperature

IRFZ24N

International
IR Rectifier

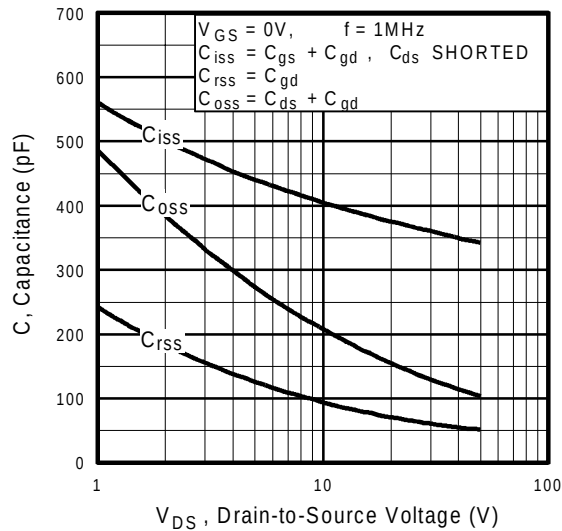


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

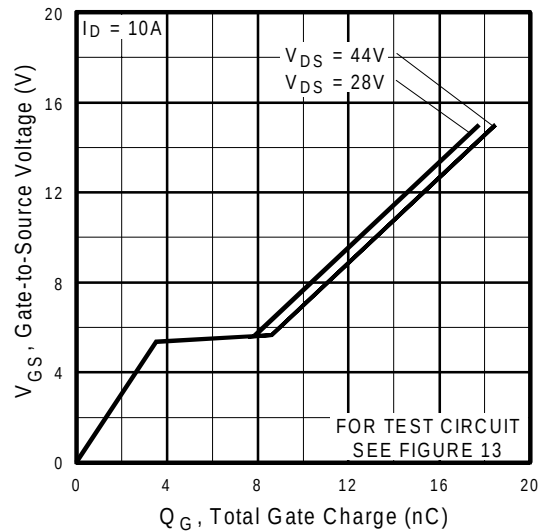


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

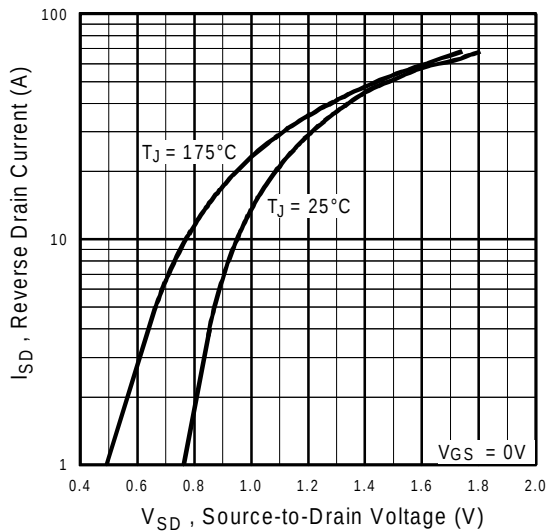


Fig 7. Typical Source-Drain Diode Forward Voltage

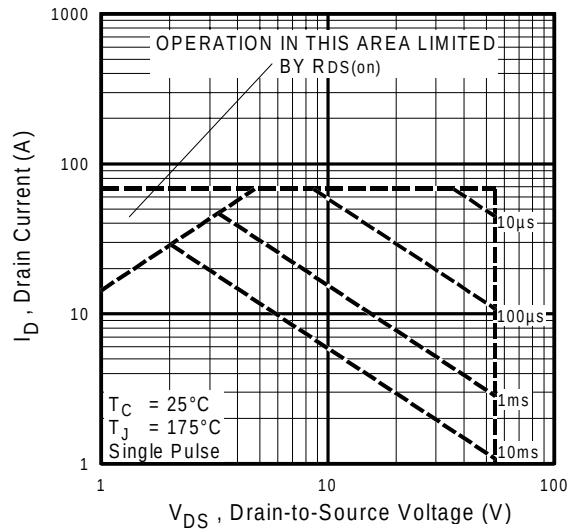


Fig 8. Maximum Safe Operating Area

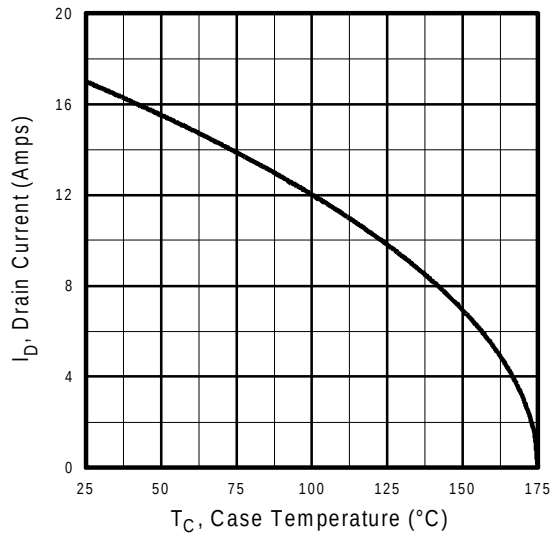


Fig 9. Maximum Drain Current Vs. Case Temperature

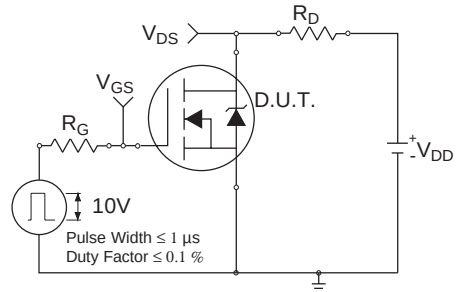


Fig 10a. Switching Time Test Circuit

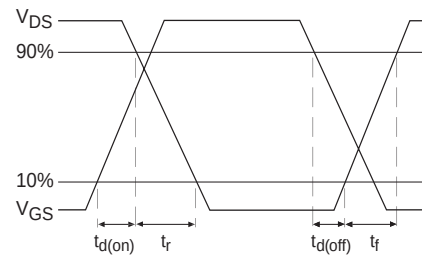


Fig 10b. Switching Time Waveforms

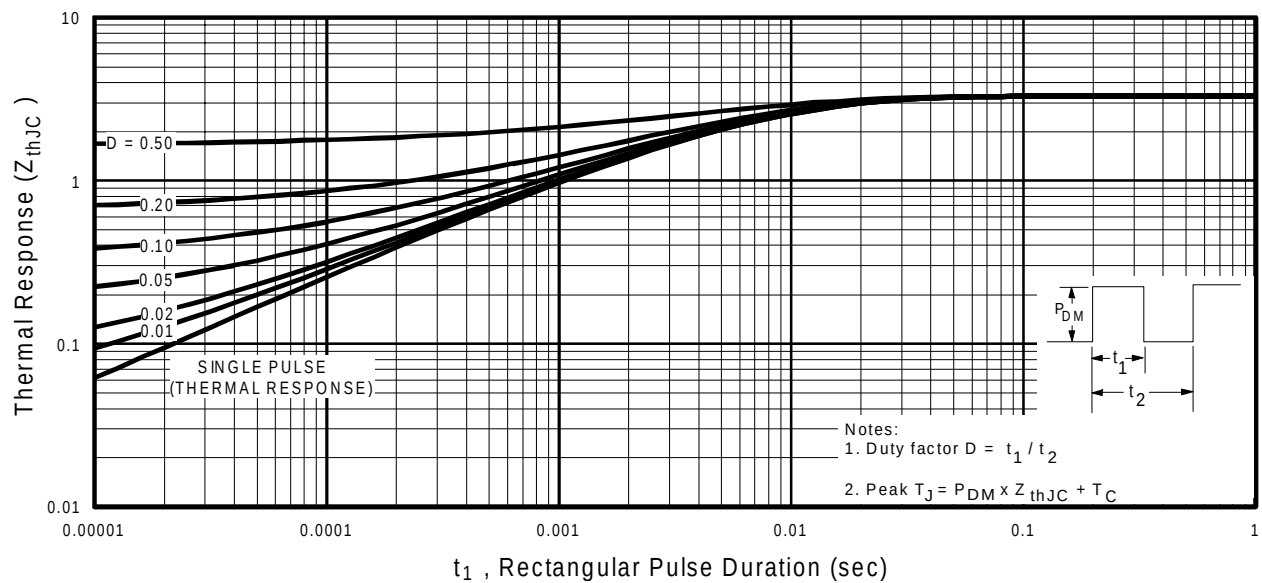


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRFZ24N

International
IR Rectifier

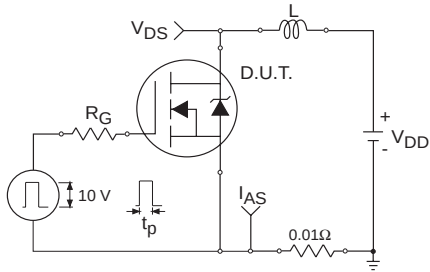


Fig 12a. Unclamped Inductive Test Circuit

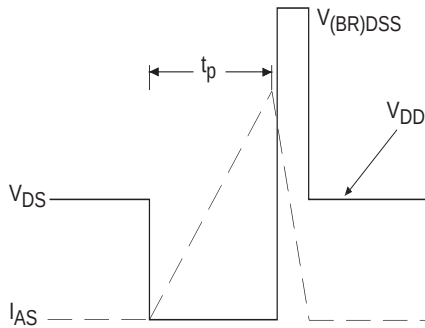


Fig 12b. Unclamped Inductive Waveforms

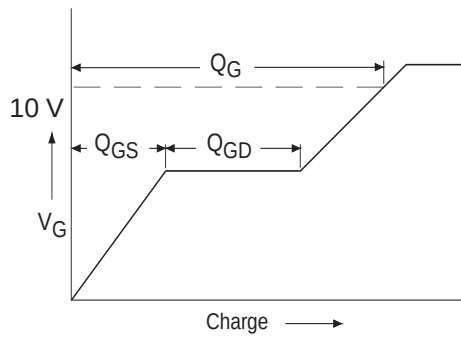


Fig 13a. Basic Gate Charge Waveform

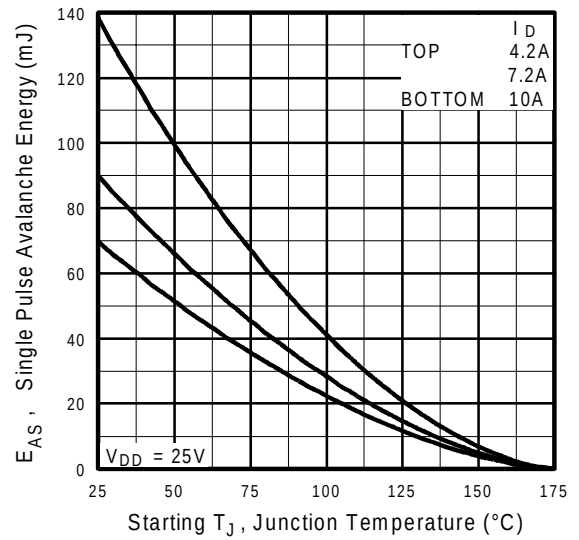


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

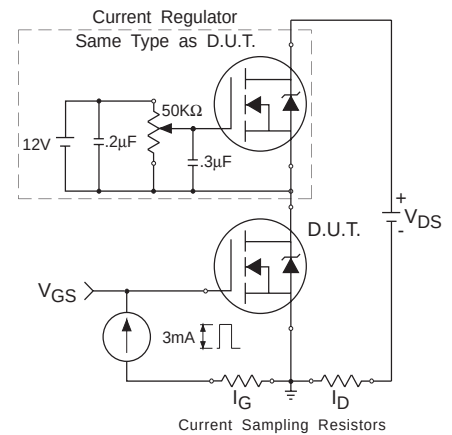


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit

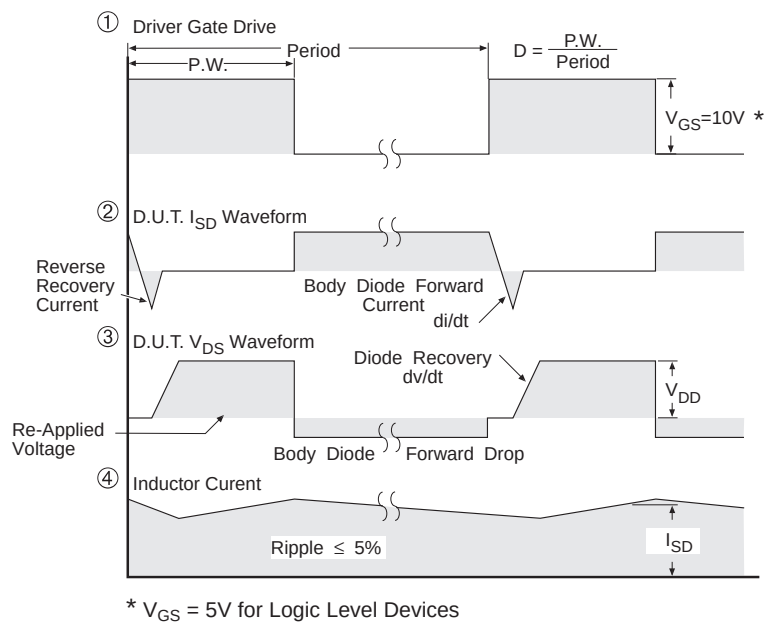
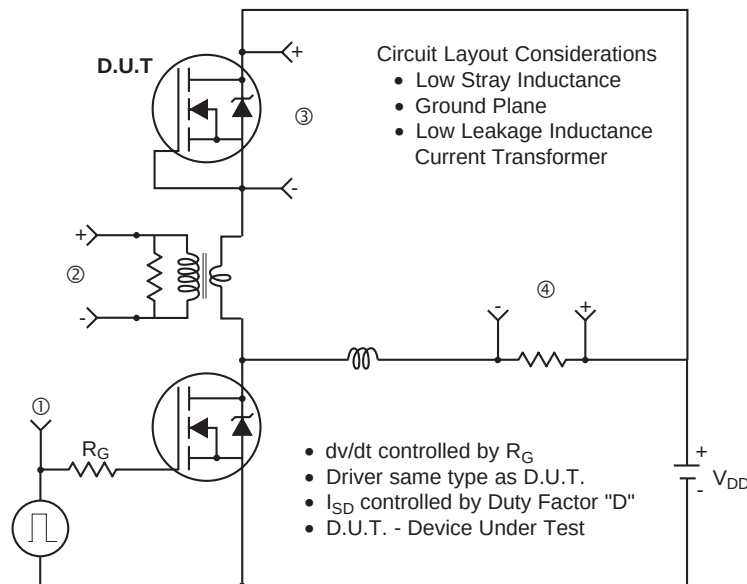


Fig 14. For N-Channel HEXFET® power MOSFETs

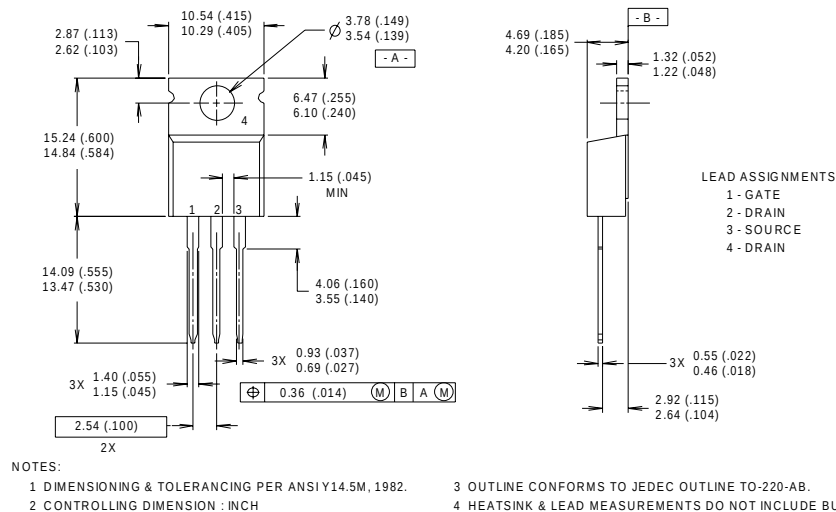
IRFZ24N

International
IR Rectifier

Package Outline

TO-220AB

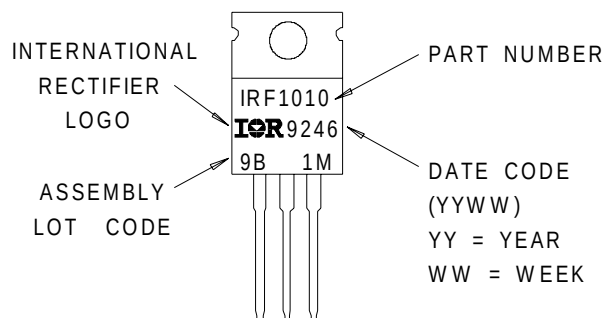
Dimensions are shown in millimeters (inches)



Part Marking Information

TO-220AB

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



International
IR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331

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. 9/99

www.irf.com