

IRLBA3803/P

HEXFET® Power MOSFET

- Logic-Level Gate Drive
- Advanced Process Technology
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

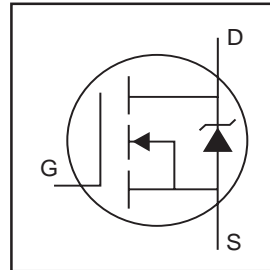
Description

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.

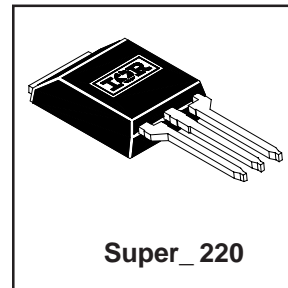
The Super-220 is a package that has been designed to have the same mechanical outline and pinout as the industry standard TO-220 but can house a considerably larger silicon die. It has increased current handling capability over both the TO-220 and the much larger TO-247 package.

This makes it ideal to reduce component count in multiparallel TO-220 applications, reduce system power dissipation, upgrade existing designs or have TO-247 performance in a TO-220 outline.

This package has also been designed to meet automotive qualification standard Q101.



$V_{DSS} = 30V$
 $R_{DS(on)} = 0.005\Omega$
 $I_D = 179A\text{⑥}$



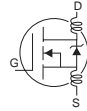
Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V$	179 ⑥	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V$	126 ⑥	
I_{DM}	Pulsed Drain Current ①	720	
$P_D @ T_C = 25^\circ\text{C}$	Power Dissipation	270	W
	Linear Derating Factor	1.8	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy ② ⑤	610	mJ
I_{AR}	Avalanche Current ① ⑤	71	A
E_{AR}	Repetitive Avalanche Energy ①	27	mJ
dv/dt	Peak Diode Recovery dv/dt ③ ⑤	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)	
	Recommended clip force	20	N

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.55	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.5	—	
$R_{\theta JA}$	Junction-to-Ambient	—	58	

Electrical Characteristics @ T_J = 25°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 = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.052	—	V/°C	Reference to 25°C, I _D = 1mA ^⑤
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	0.005	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 = 250μA
g _{fs}	Forward Transconductance	55	—	—	S	V _{DS} = 25V, I _D = 71A ^⑤
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°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 ^{④⑤}
t _{d(on)}	Turn-On Delay Time	—	14	—	nH	V _{DD} = 15V
t _r	Rise Time	—	230	—		I _D = 71A
t _{d(off)}	Turn-Off Delay Time	—	29	—		R _G = 1.3Ω
t _f	Fall Time	—	35	—		R _D = 0.20Ω, See Fig. 10 ^{④⑤}
L _D	Internal Drain Inductance	—	2.0	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L _S	Internal Source Inductance	—	5.0	—		
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 ^⑤

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	179 ^⑥	A	MOSFET symbol showing the integral reverse p-n junction diode.
I _{SM}	Pulsed Source Current (Body Diode) ^①	—	—	720		
V _{SD}	Diode Forward Voltage	—	—	1.3	V	T _J = 25°C, I _S = 71A, V _{GS} = 0V ^④
t _{rr}	Reverse Recovery Time	—	120	180	ns	T _J = 25°C, I _F = 71A
Q _{rr}	Reverse Recovery Charge	—	450	680	nC	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)
- ② V_{DD} = 15V, starting T_J = 25°C, L = 180μH
R_G = 25Ω, I_{AS} = 71A. (See Figure 12)
- ③ I_{SD} ≤ 71A, di/dt ≤ 130A/μs, V_{DD} ≤ V_{(BR)DSS},
T_J ≤ 175°C

- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

- ⑤ Uses IRL3803 data and test conditions.

- ⑥ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip # 93-4

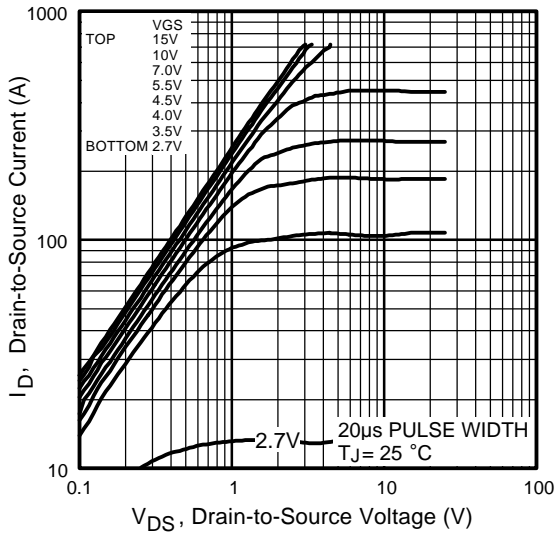


Fig 1. Typical Output Characteristics

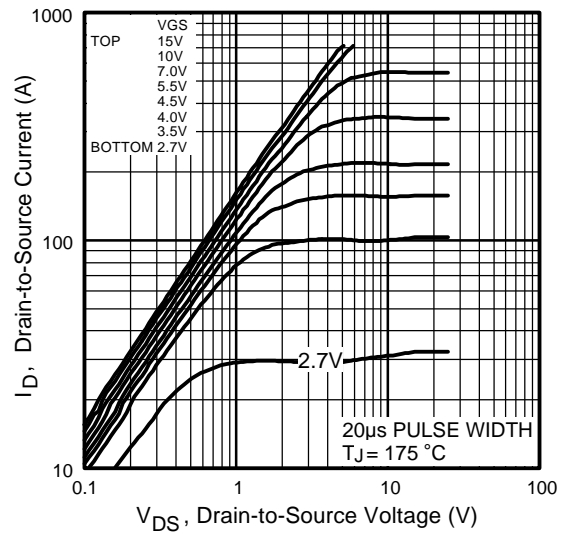


Fig 2. Typical Output Characteristics

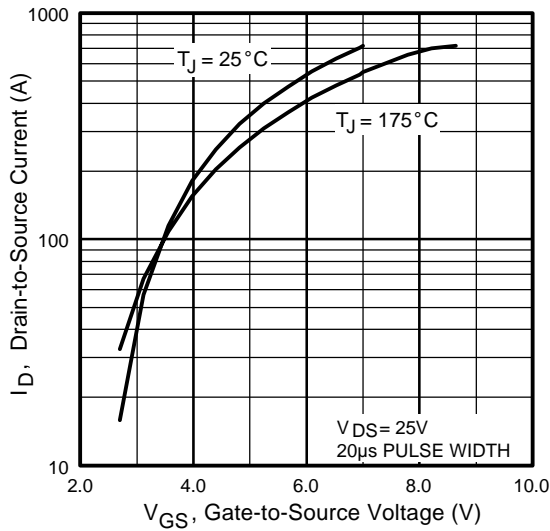


Fig 3. Typical Transfer Characteristics

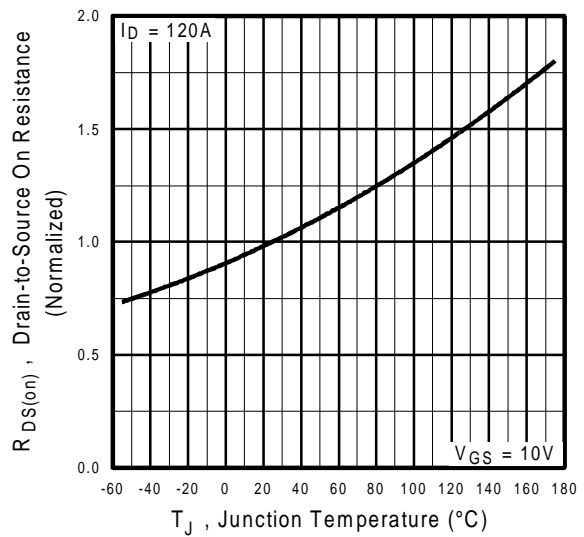


Fig 4. Normalized On-Resistance Vs. Temperature

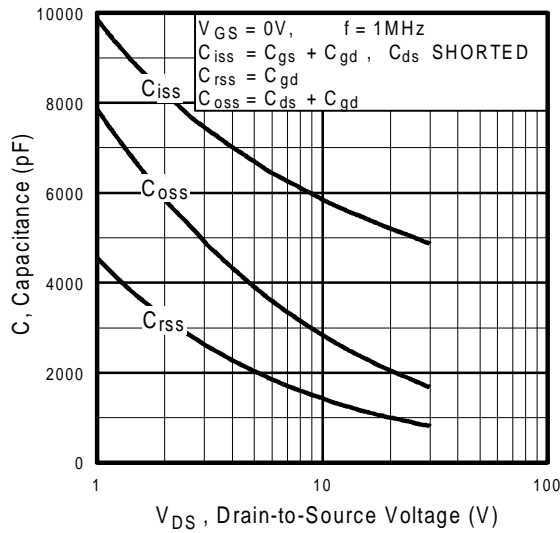


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

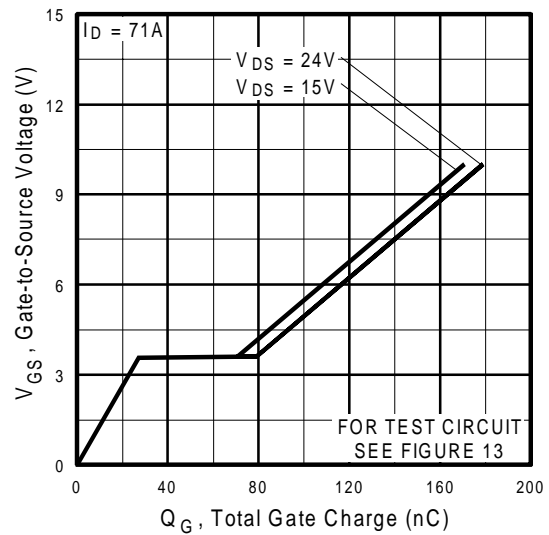


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

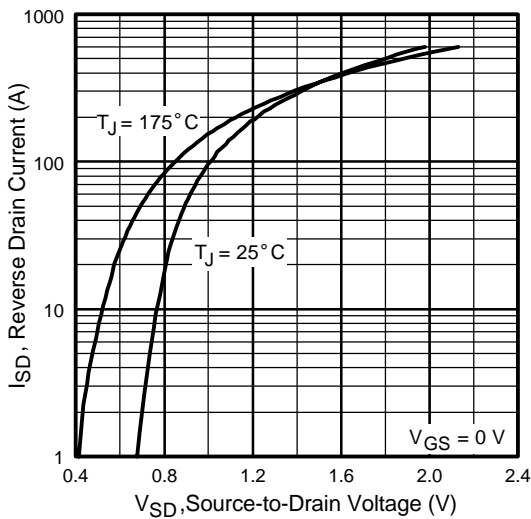


Fig 7. Typical Source-Drain Diode Forward Voltage

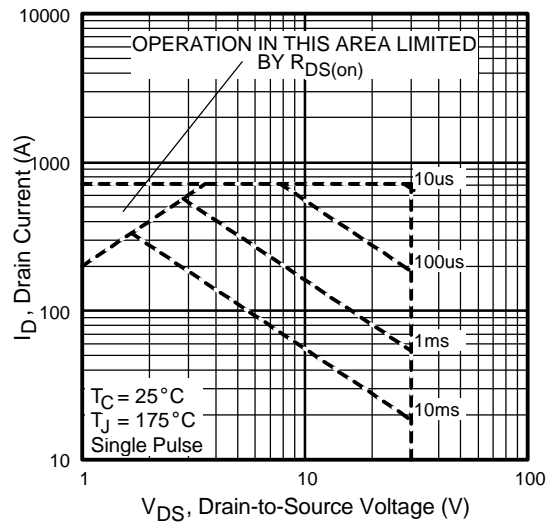


Fig 8. Maximum Safe Operating Area

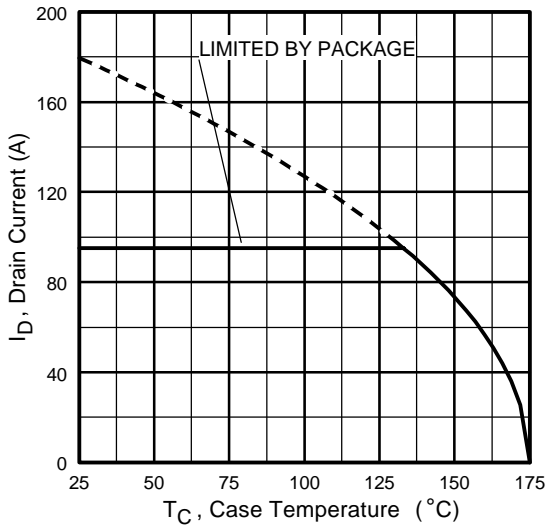


Fig 9. Maximum Drain Current Vs. Case Temperature

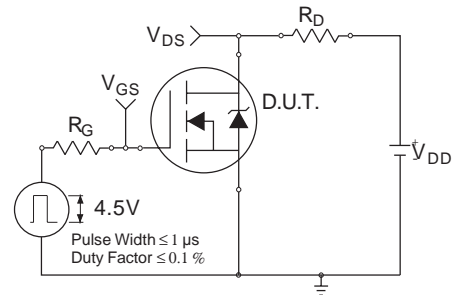


Fig 10a. Switching Time Test Circuit

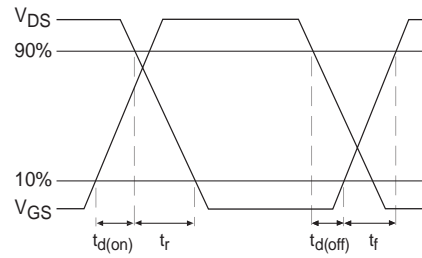


Fig 10b. Switching Time Waveforms

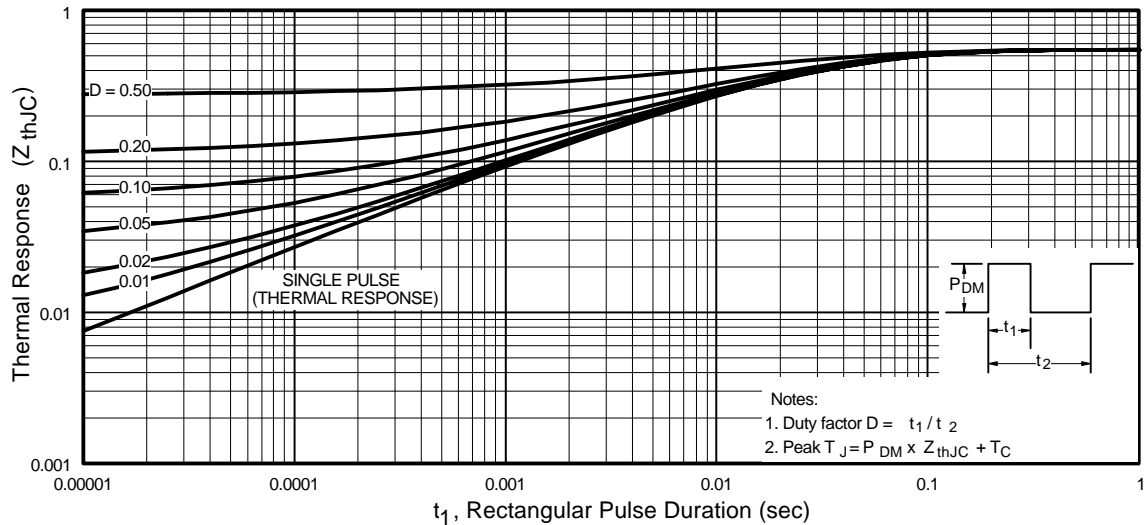


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

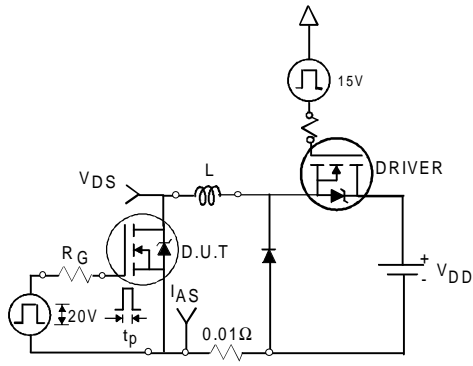


Fig 12a. Unclamped Inductive Test Circuit

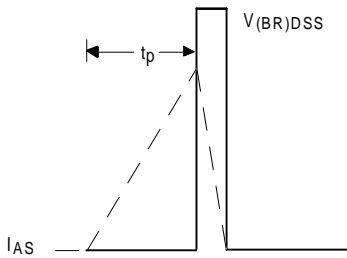


Fig 12b. Unclamped Inductive Waveforms

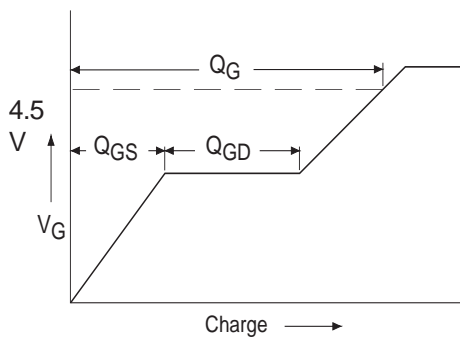


Fig 13a. Basic Gate Charge Waveform

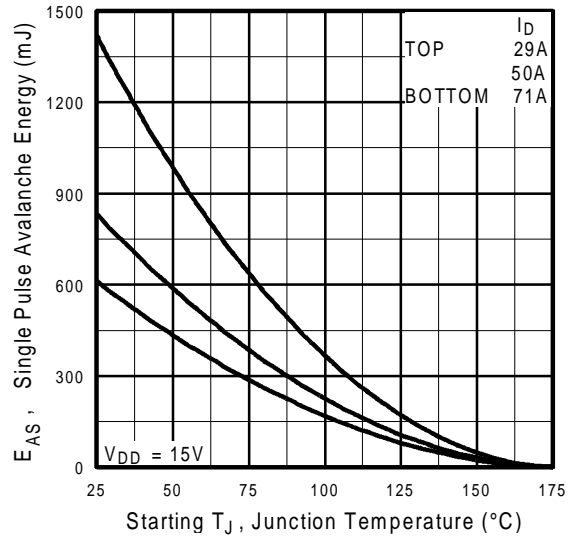


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

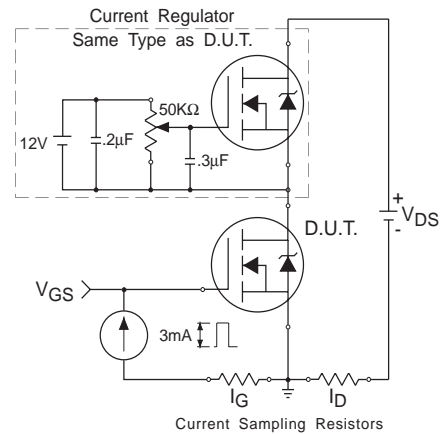
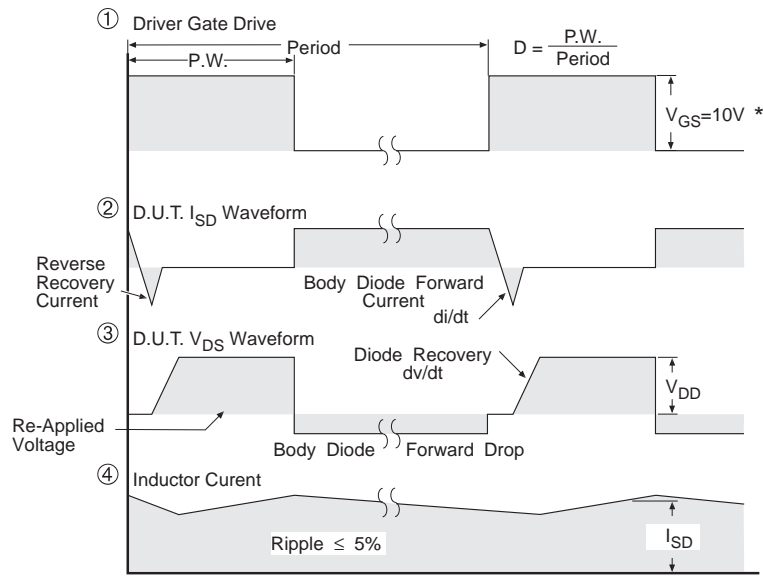


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



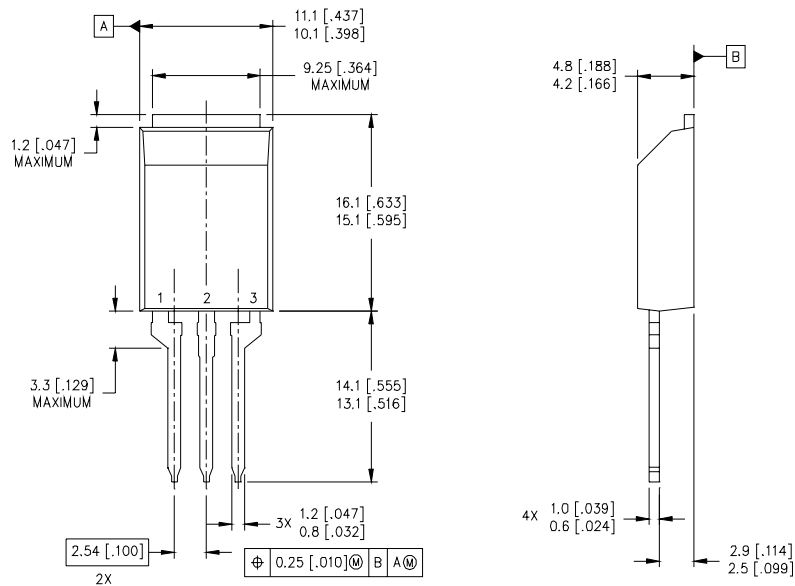
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFETS

IRLBA3803/P

International
IR Rectifier

Super_220 Package Outline



NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].

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. 1/99