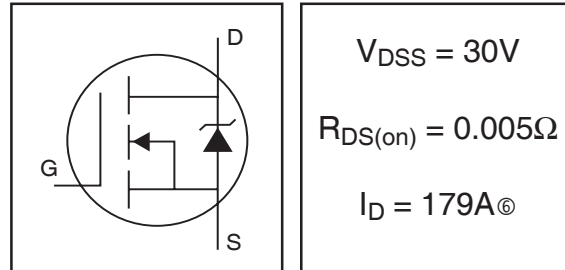


# IRLBA3803PbF

HEXFET® Power MOSFET

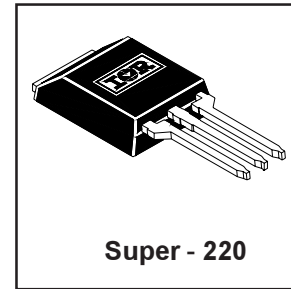
- Logic-Level Gate Drive
- Advanced Process Technology
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free



## 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 multiparalleled TO-220 applications, reduce system power dissipation, upgrade existing designs or have TO-247 performance in a TO-220 outline.



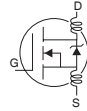
## Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	179 Ⓢ	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	126 Ⓢ	
$I_{DM}$	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	$\pm 16$	V
$E_{AS}$	Single Pulse Avalanche Energy②⑤	610	mJ
$I_{AR}$	Avalanche Current②⑥	71	A
$E_{AR}$	Repetitive Avalanche Energy④	27	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑤	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<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.052	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA <sup>⑤</sup>
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	0.005	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 71A <sup>④</sup>
		—	—	0.009		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 59A <sup>④</sup>
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.0	—	—	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	55	—	—	S	V <sub>DS</sub> = 25V, I <sub>D</sub> = 71A <sup>⑤</sup>
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	25	μA	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	100	nA	V <sub>GS</sub> = 16V
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -16V
Q <sub>g</sub>	Total Gate Charge	—	—	140	nC	I <sub>D</sub> = 71A
Q <sub>gs</sub>	Gate-to-Source Charge	—	—	41		V <sub>DS</sub> = 24V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	—	78		V <sub>GS</sub> = 4.5V, See Fig. 6 and 13 <sup>④⑤</sup>
t <sub>d(on)</sub>	Turn-On Delay Time	—	14	—	nH	V <sub>DD</sub> = 15V
t <sub>r</sub>	Rise Time	—	230	—		I <sub>D</sub> = 71A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	29	—		R <sub>G</sub> = 1.3Ω
t <sub>f</sub>	Fall Time	—	35	—		R <sub>D</sub> = 0.20Ω, See Fig. 10 <sup>④⑤</sup>
L <sub>D</sub>	Internal Drain Inductance	—	2.0	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L <sub>S</sub>	Internal Source Inductance	—	5.0	—		
C <sub>iss</sub>	Input Capacitance	—	5000	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	1800	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	880	—		f = 1.0MHz, See Fig. 5 <sup>⑤</sup>

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	179 <sup>⑥</sup>	A	MOSFET symbol showing the integral reverse p-n junction diode.
I <sub>SM</sub>	Pulsed Source Current (Body Diode) <sup>①</sup>	—	—	720		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 71A, V <sub>GS</sub> = 0V <sup>④</sup>
t <sub>rr</sub>	Reverse Recovery Time	—	120	180	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 71A
Q <sub>rr</sub>	Reverse Recovery Charge	—	450	680	nC	di/dt = 100A/μs <sup>④⑤</sup>
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				

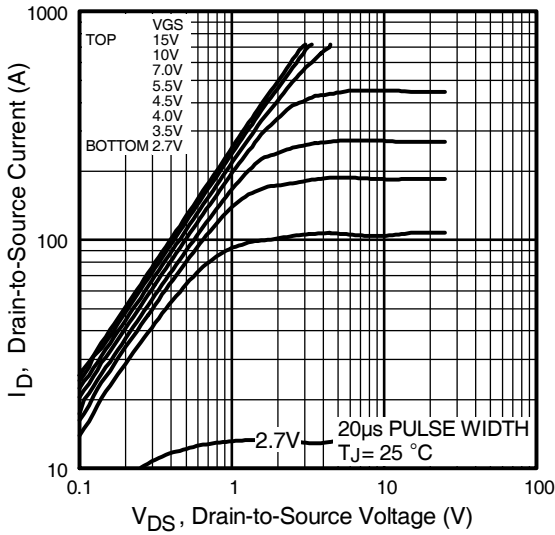
### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ② V<sub>DD</sub> = 15V, starting T<sub>J</sub> = 25°C, L = 180μH  
R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 71A. (See Figure 12)
- ③ I<sub>SD</sub> ≤ 71A, di/dt ≤ 130A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>,  
T<sub>J</sub> ≤ 175°C

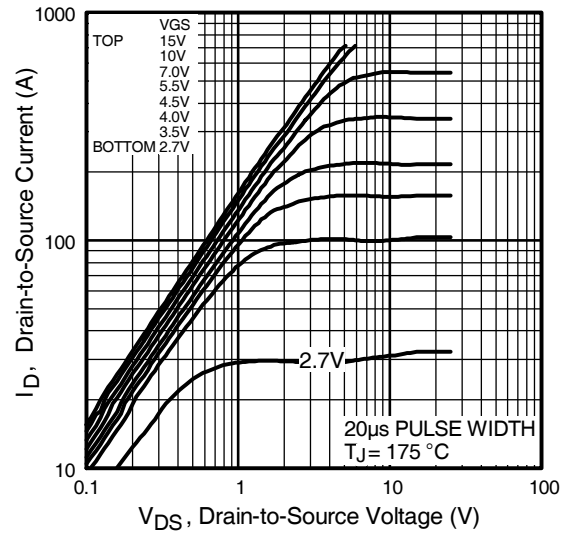
- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

- ⑤ Uses IRL3803 data and test conditions.

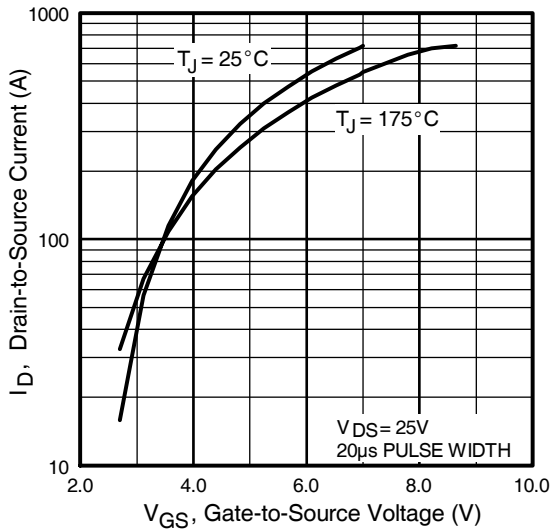
- ⑥ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip # 93-4



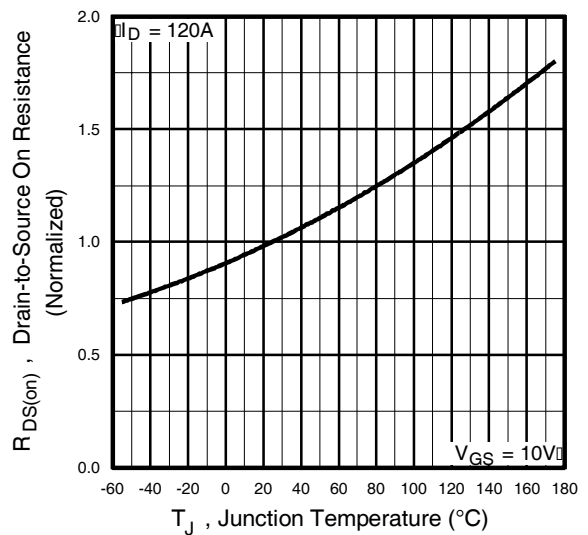
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics

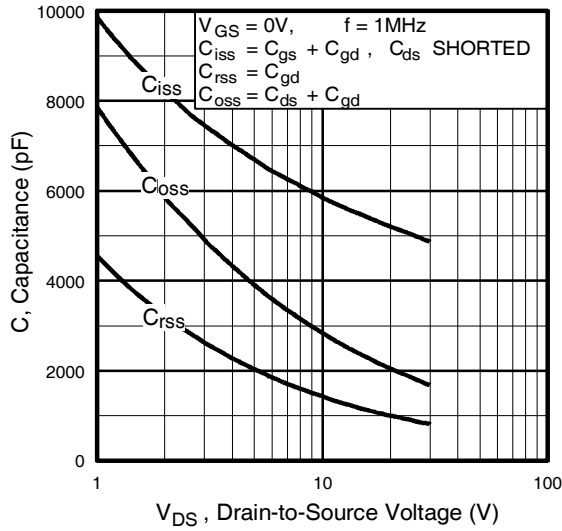


**Fig 3.** Typical Transfer Characteristics

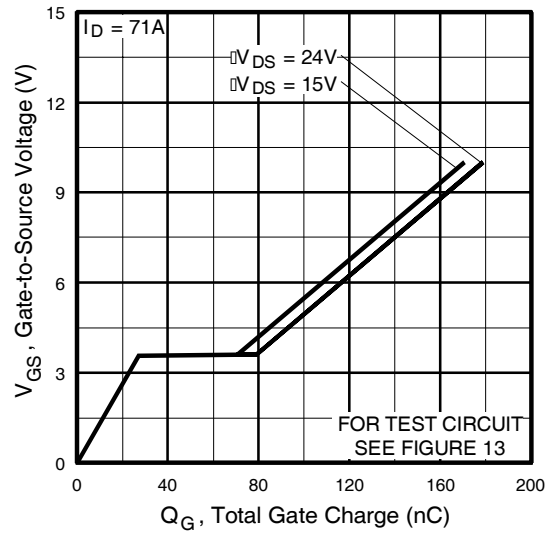


**Fig 4.** Normalized On-Resistance Vs. Temperature

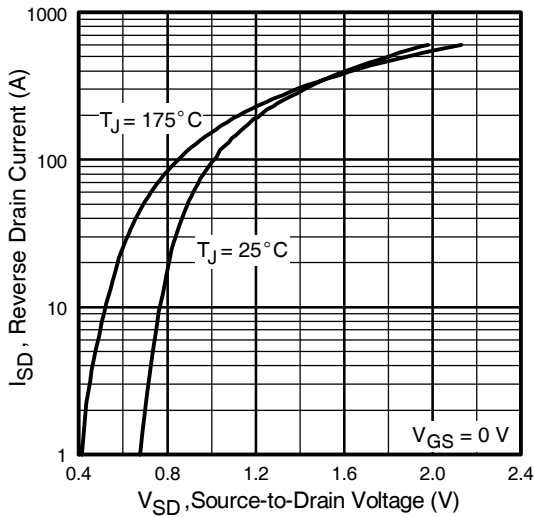
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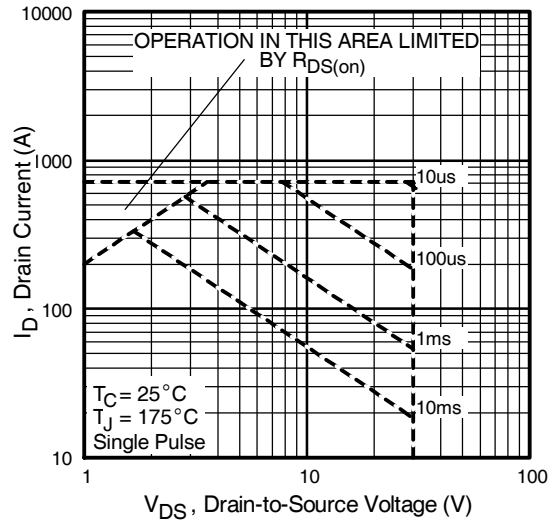
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



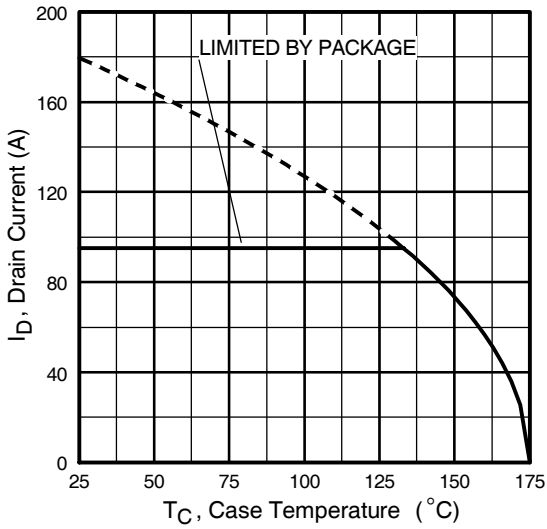
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



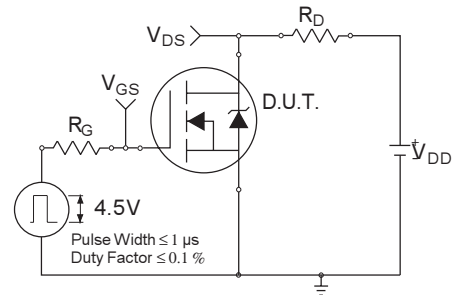
**Fig 7.** Typical Source-Drain Diode Forward Voltage



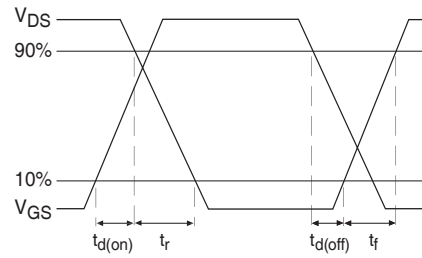
**Fig 8.** Maximum Safe Operating Area



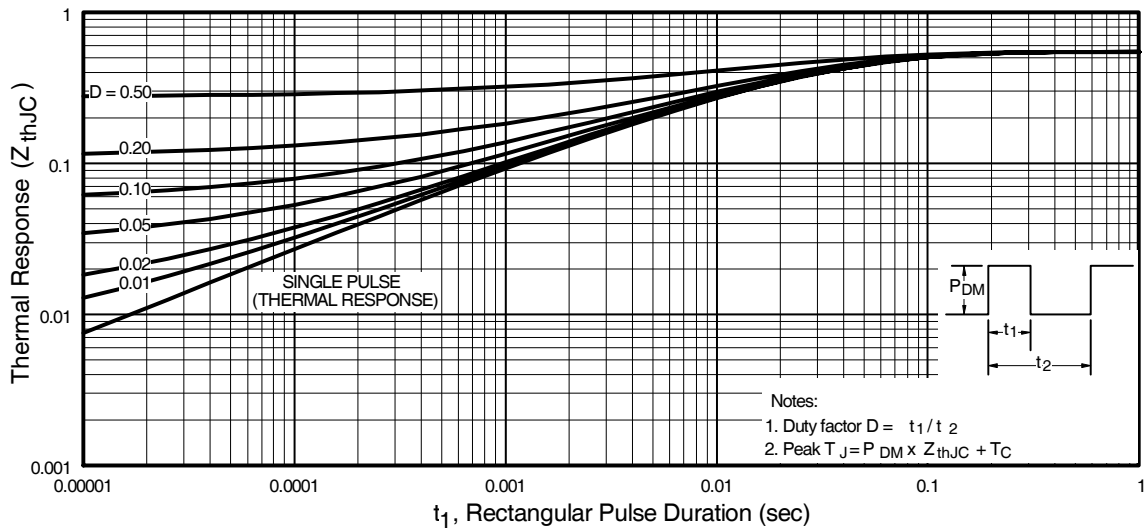
**Fig 9.** Maximum Drain Current Vs. Case Temperature



**Fig 10a.** Switching Time Test Circuit



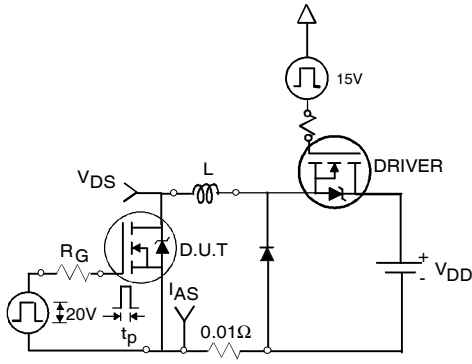
**Fig 10b.** Switching Time Waveforms



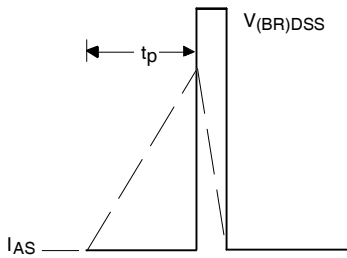
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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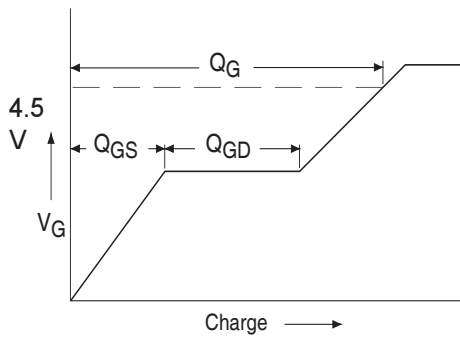
International  
**IRF** Rectifier



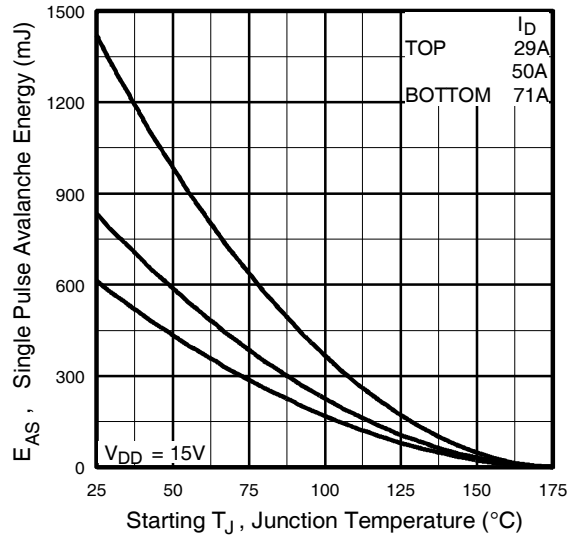
**Fig 12a.** Unclamped Inductive Test Circuit



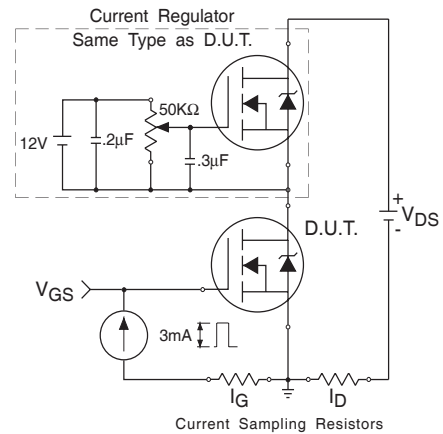
**Fig 12b.** Unclamped Inductive Waveforms



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

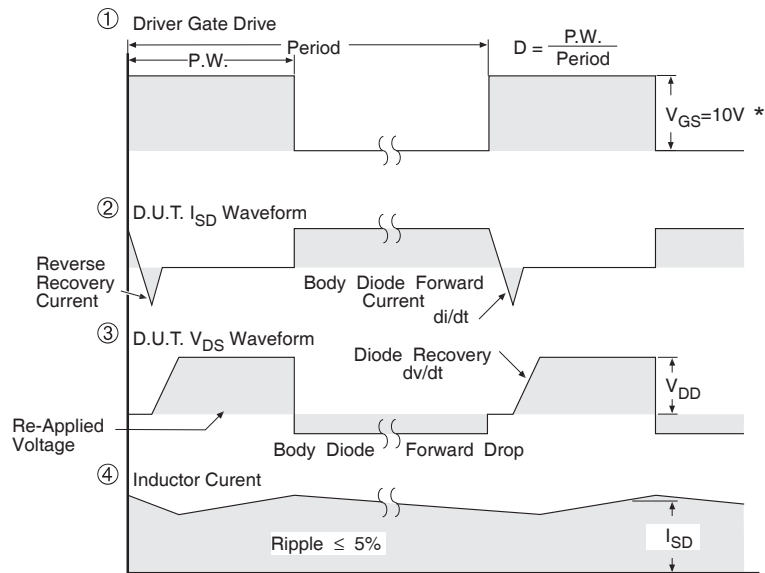
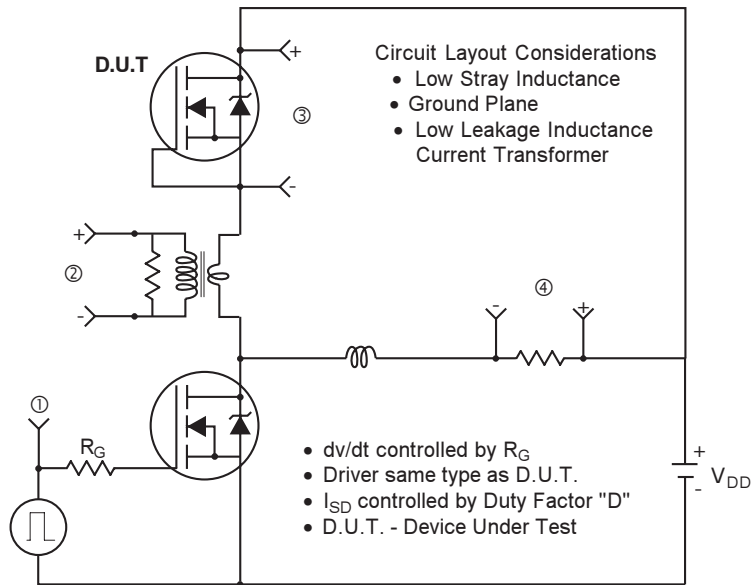


**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



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

## Peak Diode Recovery dv/dt Test Circuit



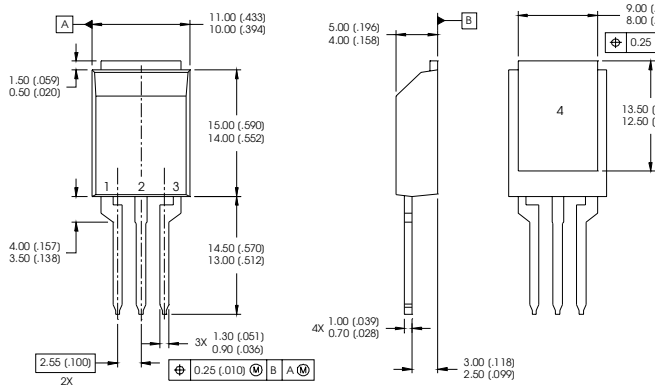
\*  $V_{GS} = 5V$  for Logic Level Devices

**Fig 14.** For N-Channel HEXFETS

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International  
**IR** Rectifier

## Super-220™ ( TO-273AA ) Package Outline



**NOTES:**

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE TO-273AA.

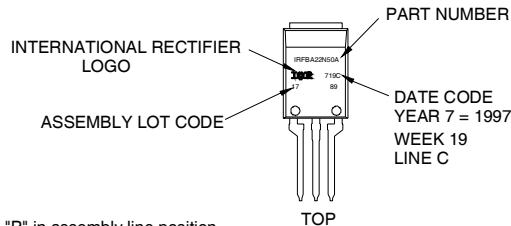
**LEAD ASSIGNMENTS**

**MOSFET**

- |            |               |
|------------|---------------|
| 1 - GATE   | 1 - GATE      |
| 2 - DRAIN  | 2 - COLLECTOR |
| 3 - SOURCE | 3 - EMITTER   |
| 4 - DRAIN  | 4 - COLLECTOR |

## Super-220 (TO-273AA) Part Marking Information

EXAMPLE: THIS IS AN IRFBA22N50A WITH  
ASSEMBLY LOT CODE 1789  
ASSEMBLED ON WW 19, 1997  
IN THE ASSEMBLY LINE "C"



Note: "P" in assembly line position indicates "Lead-Free"

**Notes:**

1. For an Automotive Qualified version of this part please see <http://www.irf.com/product-info/automotive/>
2. For the most current drawing please refer to IR website at <http://www.irf.com/package/>

Data and specifications subject to change without notice.  
This product has been designed and qualified for the Consumer market.  
Qualification Standards can be found on IR's Web site.

International  
**IR** Rectifier

**IR WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105  
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