

# International IOR Rectifier

## REPETITIVE AVALANCHE AND $dv/dt$ RATED HEXFET<sup>®</sup> TRANSISTORS THRU-HOLE (TO-205AF)

**IRFF9130**  
**JANTX2N6849**  
**JANTXV2N6849**  
**JANS2N6849**  
**REF:MIL-PRF-19500/564**  
**100V, P-CHANNEL**

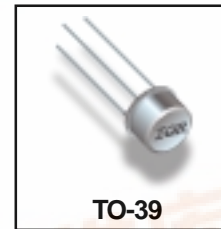
### Product Summary

Part Number	BVDSS	RDS(on)	Id
IRFF9130	-100V	0.30Ω	-6.5A

The HEXFET<sup>®</sup> technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of this latest "State of the Art" design achieves: very low on-state resistance combined with high transconductance.

The HEXFET transistors also feature all of the well established advantages of MOSFETs such as voltage control, very fast switching, ease of paralleling and temperature stability of the electrical parameters.

They are well suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers and high energy pulse circuits.



### Features:

- Repetitive Avalanche Ratings
- Dynamic  $dv/dt$  Rating
- Hermetically Sealed
- Simple Drive Requirements
- Ease of Paralleling

### Absolute Maximum Ratings

	Parameter		Units
$I_D$ @ $V_{GS} = -10V$ , $T_C = 25^\circ C$	Continuous Drain Current	-6.5	A
$I_D$ @ $V_{GS} = -10V$ , $T_C = 100^\circ C$	Continuous Drain Current	-4.1	
$I_{DM}$	Pulsed Drain Current ①	-25	
$P_D$ @ $T_C = 25^\circ C$	Max. Power Dissipation	25	W
	Linear Derating Factor	0.20	W/ $^\circ C$
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
EAS	Single Pulse Avalanche Energy ②	92	mJ
$I_{AR}$	Avalanche Current ①	—	A
EAR	Repetitive Avalanche Energy ①	—	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ ③	-5.5	V/ns
$T_J$	Operating Junction	-55 to 150	$^\circ C$
$T_{STG}$	Storage Temperature Range		
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)	
	Weight	0.98(typical)	g



**Electrical Characteristics @ T<sub>j</sub> = 25°C (Unless Otherwise Specified)**

	Parameter	Min	Typ	Max	Units	Test Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	-100	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -1.0mA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Temperature Coefficient of Breakdown Voltage	—	-0.10	—	V/°C	Reference to 25°C, I <sub>D</sub> = -1.0mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-State Resistance	—	—	0.30	Ω	V <sub>GS</sub> = -10V, I <sub>D</sub> = -4.1A ④
		—	—	0.345		V <sub>GS</sub> = -10V, I <sub>D</sub> = -6.5A ④
V <sub>GS(th)</sub>	Gate Threshold Voltage	-2.0	—	-4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
g <sub>fs</sub>	Forward Transconductance	2.5	—	—	S (r)	V <sub>DS</sub> > -15V, I <sub>DS</sub> = -4.1A ④
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	—	-25	μA	V <sub>DS</sub> = -80V, V <sub>GS</sub> = 0V
		—	—	-250		V <sub>DS</sub> = -80V V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Leakage Forward	—	—	-100	nA	V <sub>GS</sub> = -20V
I <sub>GSS</sub>	Gate-to-Source Leakage Reverse	—	—	100		V <sub>GS</sub> = 20V
Q <sub>g</sub>	Total Gate Charge	14.7	—	34.8	nC	V <sub>GS</sub> = -10V, I <sub>D</sub> = -6.5A V <sub>DS</sub> = -50V
Q <sub>gs</sub>	Gate-to-Source Charge	1.0	—	7.1		
Q <sub>gd</sub>	Gate-to-Drain ('Miller') Charge	2.0	—	21		
t <sub>d(on)</sub>	Turn-On Delay Time	—	—	60	ns	V <sub>DD</sub> = -50V, I <sub>D</sub> = -6.5A, V <sub>GS</sub> = -10V, R <sub>G</sub> = 7.5Ω
t <sub>r</sub>	Rise Time	—	—	140		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	—	140		
t <sub>f</sub>	Fall Time	—	—	140		
L <sub>S</sub> + L <sub>D</sub>	Total Inductance	—	7.0	—	nH	Measured from drain lead (6mm/0.25in. from package) to source lead (6mm/0.25in. from package)
C <sub>iss</sub>	Input Capacitance	—	800	—	pF	V <sub>GS</sub> = 0V, V <sub>DS</sub> = -25V f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	350	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	125	—		

**Source-Drain Diode Ratings and Characteristics**

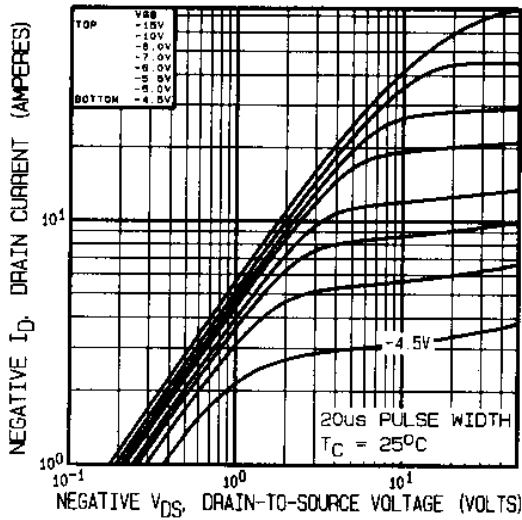
	Parameter	Min	Typ	Max	Units	Test Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	-6.5	A	T <sub>j</sub> = 25°C, I <sub>S</sub> = -6.5A, V <sub>GS</sub> = 0V ④
I <sub>SM</sub>	Pulse Source Current (Body Diode) ①	—	—	-25		
V <sub>SD</sub>	Diode Forward Voltage	—	—	-4.7	V	T <sub>j</sub> = 25°C, I <sub>F</sub> = -6.5A, di/dt ≤ -100A/μs
t <sub>rr</sub>	Reverse Recovery Time	—	—	250	rS	V <sub>DD</sub> ≤ -50V ④
Q <sub>RR</sub>	Reverse Recovery Charge	—	—	3.0	μC	
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L <sub>S</sub> + L <sub>D</sub> .				

**Thermal Resistance**

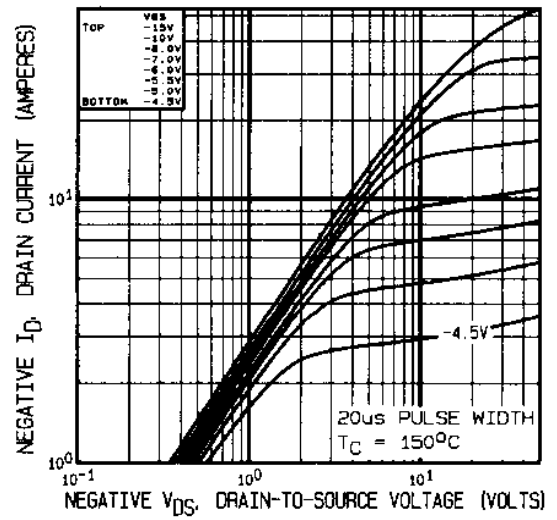
	Parameter	Min	Typ	Max	Units	Test Conditions
R <sub>thJC</sub>	Junction-to-Case	—	—	5.0	°C/W	Typical socket mount
R <sub>thJA</sub>	Junction-to-Ambient	—	—	175		

**Note:** Corresponding Spice and Saber models are available on the G&S Website.

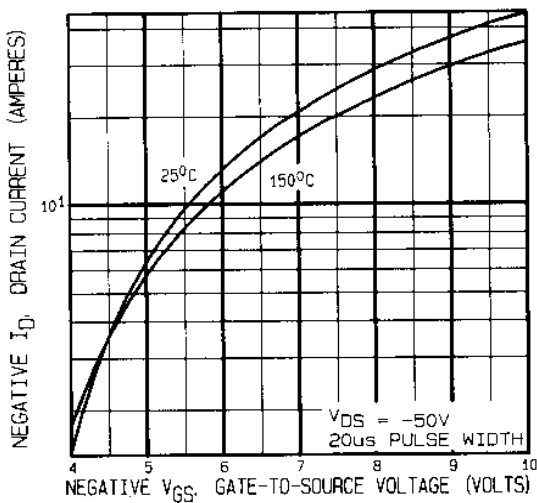
For footnotes refer to the last page



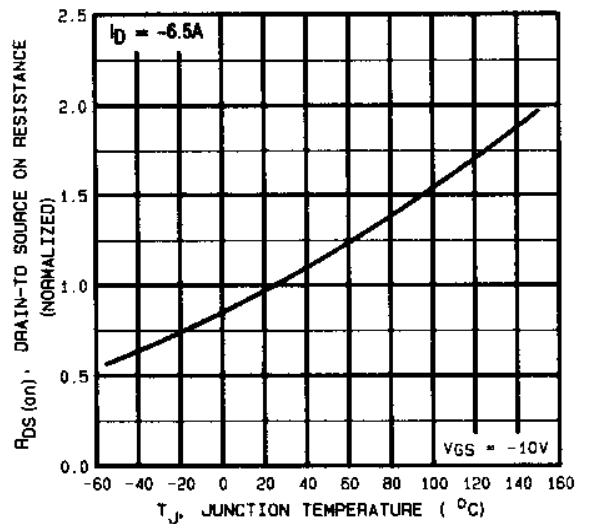
**Fig1.** Typical Output Characteristics



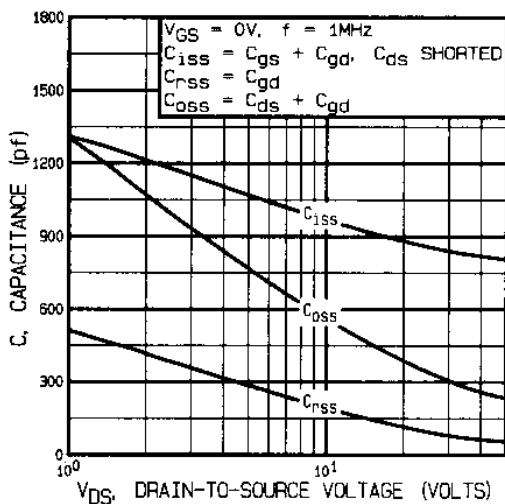
**Fig2.** Typical Output Characteristics



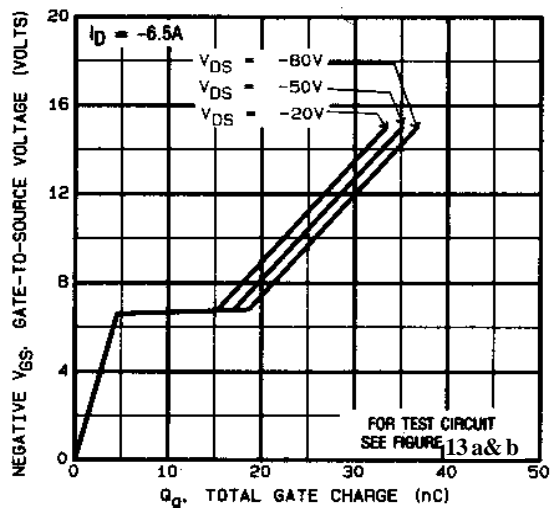
**Fig3.** Typical Transfer Characteristics



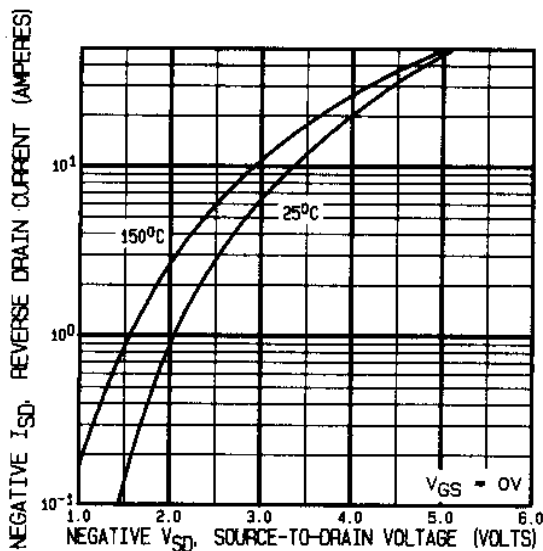
**Fig4.** Normalized On-Resistance  
Vs. Temperature



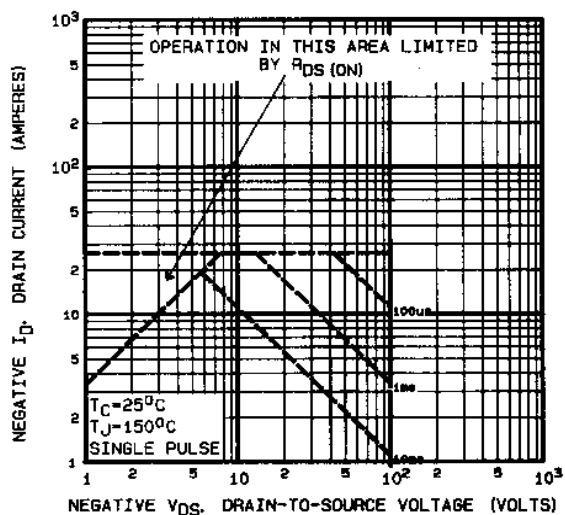
**Fig5.** Typical Capacitance Vs.  
Drain-to-Source Voltage



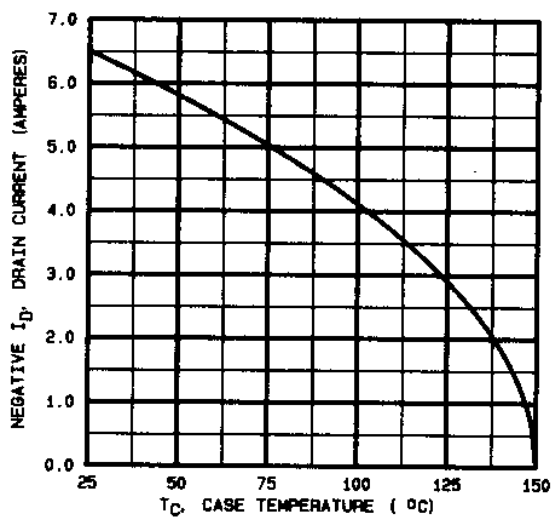
**Fig6.** Typical Gate Charge Vs.  
Gate-to-Source Voltage



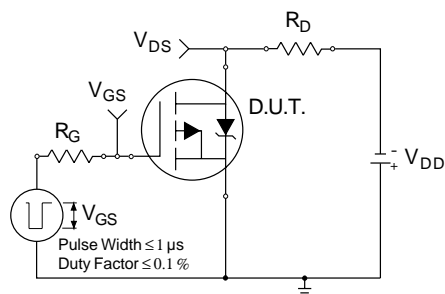
**Fig7.** Typical Source-Drain Diode  
Forward Voltage



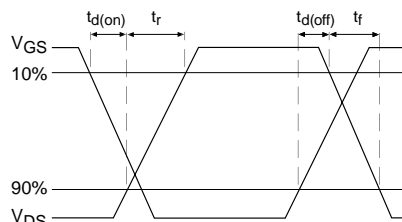
**Fig8.** Maximum Safe Operating Area



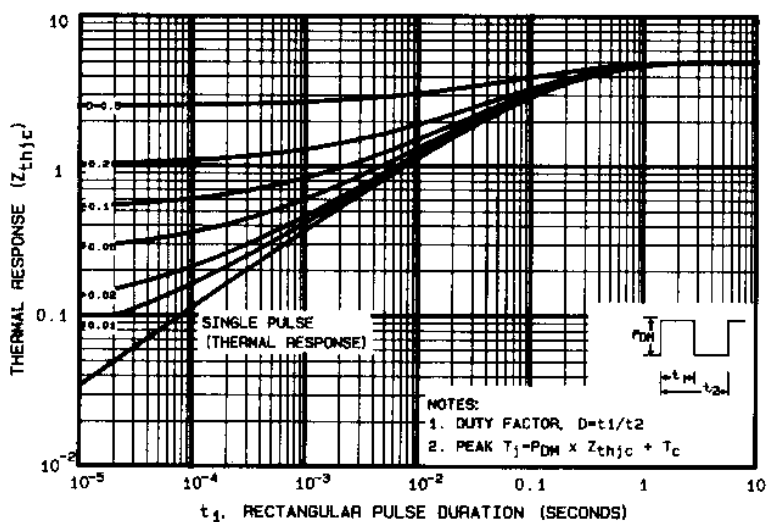
**Fig9.** Maximum Drain Current Vs. Case Temperature



**Fig10a.** Switching Time Test Circuit



**Fig10b.** Switching Time Waveforms



**Fig11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

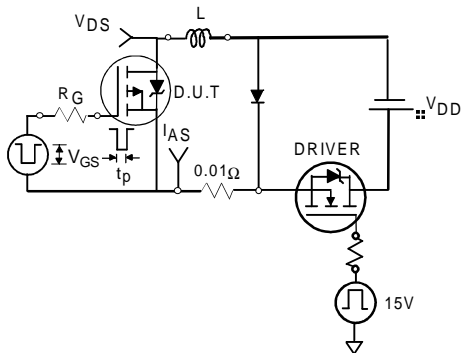


Fig 12a. Unclamped Inductive Test Circuit

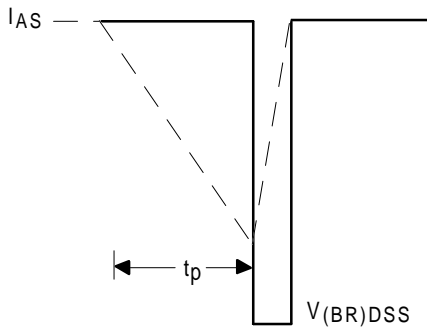


Fig 12b. Unclamped Inductive Waveforms

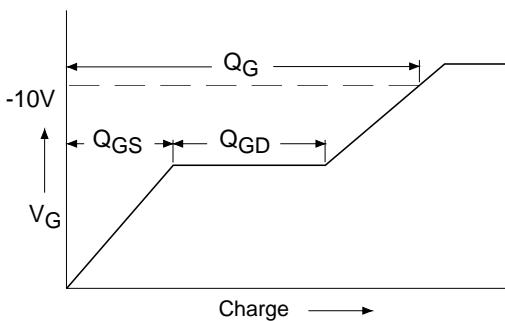


Fig 13a. Basic Gate Charge Waveform

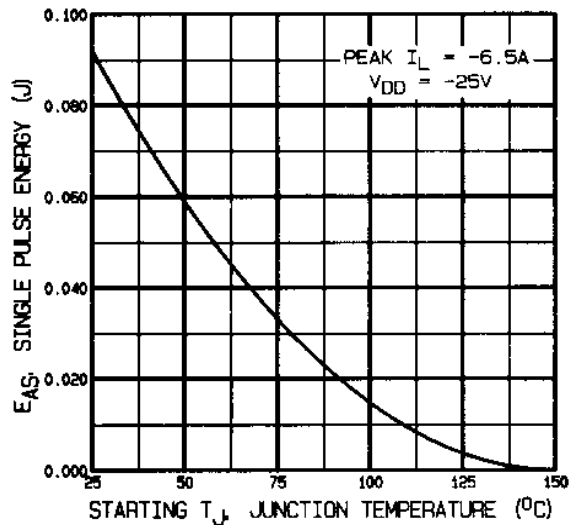
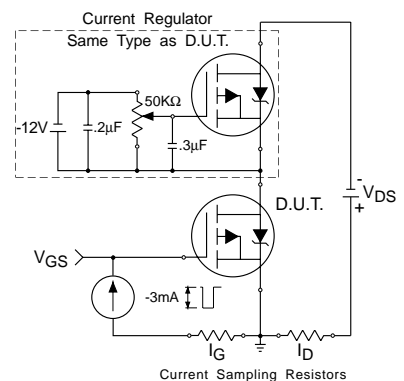
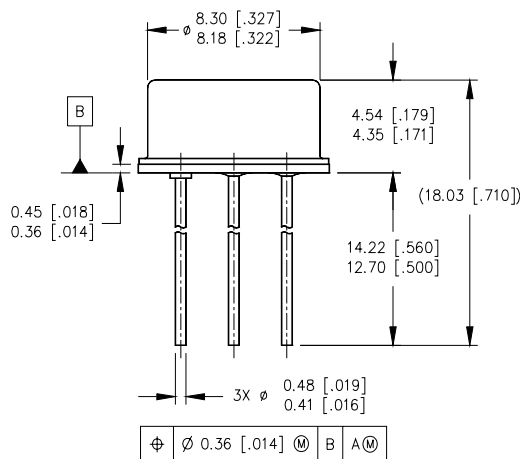
Fig 12c. Maximum Avalanche Energy  
Vs. Drain Current

Fig 13b. Gate Charge Test Circuit

## Foot Notes:

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ②  $V_{DD} = -25V$ , starting  $T_J = 25^{\circ}C$ ,  
Peak  $I_L = -6.5A$ ,  $V_{GS} = -10V$
- ③  $I_{SD} \leq -6.5A$ ,  $di/dt \leq -140A/\mu s$ ,  
 $V_{DD} \leq -100V$ ,  $T_J \leq 150^{\circ}C$   
Suggested  $R_G = 7.5 \Omega$
- ④ Pulse width  $\leq 300 \mu s$ ; Duty Cycle  $\leq 2\%$

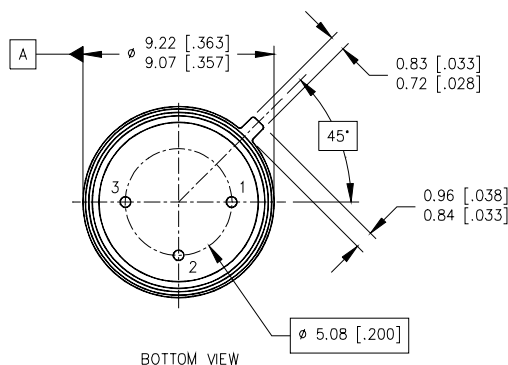
## Case Outline and Dimensions —TO-205AF



SIDE VIEW

### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME 14.5M-1994.
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. CONTROLLING DIMENSION: INCH.
4. CONFORMS TO JEDEC OUTLINE TO-205AF (TO-39).



BOTTOM VIEW

### LEGEND

- 1- SOURCE
- 2- GATE
- 3- DRAIN