International
IƎR Rectifier

IRFF9220
JANTX2N6847
JANTXV2N6847
REF:MIL-PRF-19500/563
200V, P-CHANNEL

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

Product Summary

Part Number	BVDSS	R_DS(on)	I_D
IRFF9220	-200V	1.5Ω	-2.5A

The HEXFET®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 parelleling 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.
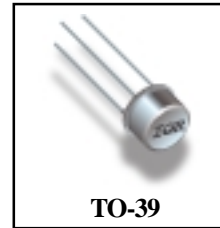
TO-39

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°C	Continuous Drain Current	-2.5	A
I_D @ V_{GS} = -10V, T_C = 100°C	Continuous Drain Current	-1.6	
I_{DM}	Pulsed Drain Current ①	-10	
P_D @ T_C = 25°C	Max. Power Dissipation	20	W
	Linear Derating Factor	0.16	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	180	mJ
I_{AR}	Avalanche Current ①	—	A
E_{AR}	Repetitive Avalanche Energy ①	—	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-5.0	V/ns
T_J	Operating Junction	-55 to 150	°C
T_{STG}	Storage Temperature Range		
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)	
	Weight	0.98(typical)	g

For footnotes refer to the last page

Electrical Characteristics @ Tj = 25°C (Unless Otherwise Specified)

	Parameter	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	-200	—	—	V	$V_{GS} = 0V$, $I_D = -1.0mA$
$\Delta BV_{DSS}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	—	-0.22	—	V/°C	Reference to 25°C, $I_D = -1.0mA$
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	1.5	Ω	$V_{GS} = -10V$, $I_D = -1.6A$ ④
		—	—	1.725		$V_{GS} = -10V$, $I_D = -2.5A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	—	-4.0	V	$V_{DS} = V_{GS}$, $I_D = -250\mu A$
gfs	Forward Transconductance	1.0	—	—	S (℧)	$V_{DS} > -15V$, $I_{DS} = -1.6A$ ④
I_{DSS}	Zero Gate Voltage Drain Current	—	—	-25	μA	$V_{DS} = -160V$, $V_{GS} = 0V$
		—	—	-250		$V_{DS} = -160V$ $V_{GS} = 0V$, $T_J = 125°C$
I_{GSS}	Gate-to-Source Leakage Forward	—	—	-100	nA	$V_{GS} = -20V$
I_{GSS}	Gate-to-Source Leakage Reverse	—	—	100		$V_{GS} = 20V$
Q_g	Total Gate Charge	4.0	—	15	nC	$V_{GS} = -10V$, $I_D = -2.5A$ $V_{DS} = -100V$
Q_{gs}	Gate-to-Source Charge	1.1	—	3.2		
Q_{gd}	Gate-to-Drain ('Miller') Charge	0.8	—	8.4		
$t_{d(on)}$	Turn-On Delay Time	—	—	50	n s	$V_{DD} = -100V$, $I_D = -2.5A$, $R_G = 7.5\Omega$
t_r	Rise Time	—	—	70		
$t_{d(off)}$	Turn-Off Delay Time	—	—	40		
t_f	Fall Time	—	—	50		
$L_S + L_D$	Total Inductance	—	7.0	—	nH	Measured from drain lead (6mm/0.25in. from package) to source lead (6mm/0.25in. from package)
C_{iss}	Input Capacitance	—	330		pF	$V_{GS} = 0V$, $V_{DS} = -25V$ f = 1.0MHz
C_{oss}	Output Capacitance	—	100	—		
C_{rss}	Reverse Transfer Capacitance	—	33	—		

Source-Drain Diode Ratings and Characteristics

	Parameter	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-2.5	A	
I_{SM}	Pulse Source Current (Body Diode) ①	—	—	-10		
V_{SD}	Diode Forward Voltage	—	—	-4.8	V	$T_j = 25°C$, $I_S = -2.5A$, $V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	—	300	nS	$T_j = 25°C$, $I_F = -2.5A$, di/dt ≤ -100A/μs
Q_{RR}	Reverse Recovery Charge	—	—	3.0	μC	$V_{DD} ≤ -50V$ ④
t_{on}	Forward Turn-On Time			Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S + L_D$.		

Thermal Resistance

	Parameter	Min	Typ	Max	Units	Test Conditions
R_{thJC}	Junction-to-Case	—	—	6.25	°C/W	
R_{thJA}	Junction-to-Ambient	—	—	175		Typical socket mount

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

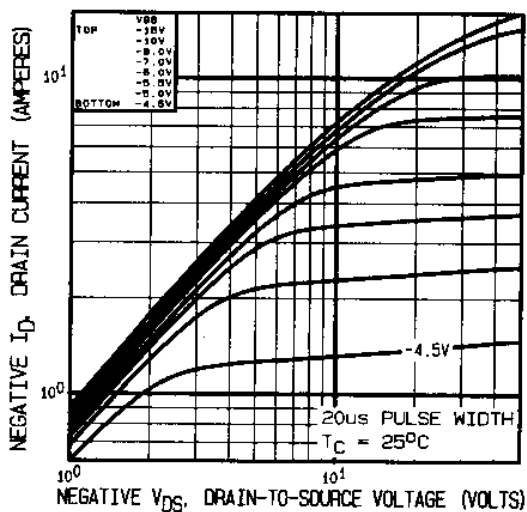For footnotes refer to the last page

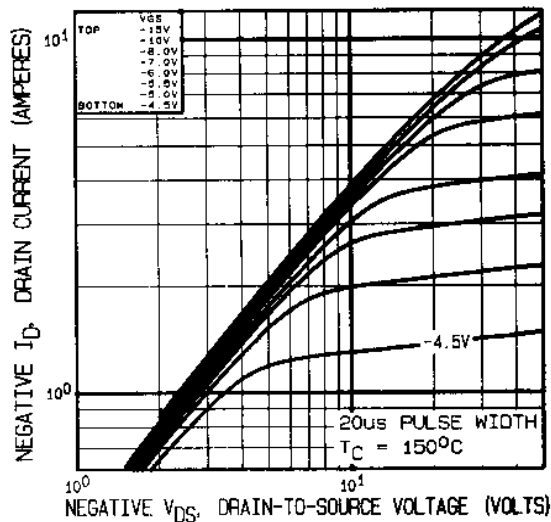**Fig 1.** Typical Output Characteristics

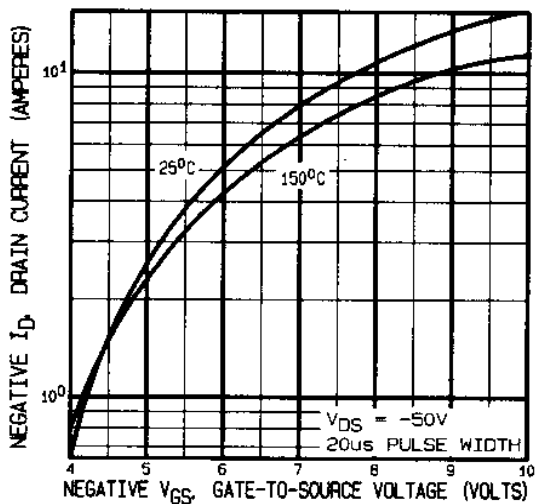**Fig 2.** Typical Output Characteristics

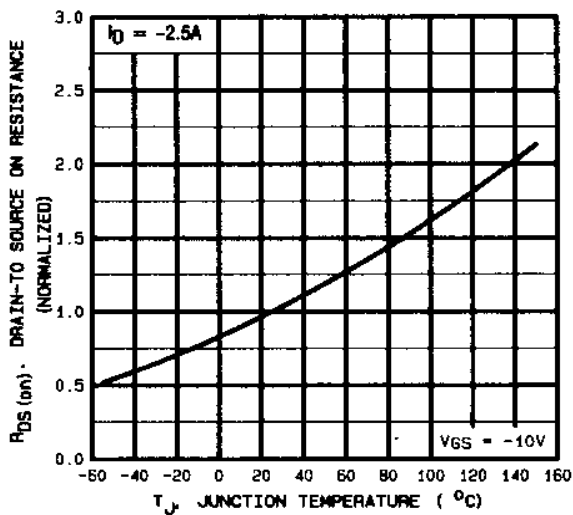**Fig 3.** Typical Transfer Characteristics

Fig 4. Normalized On-Resistance
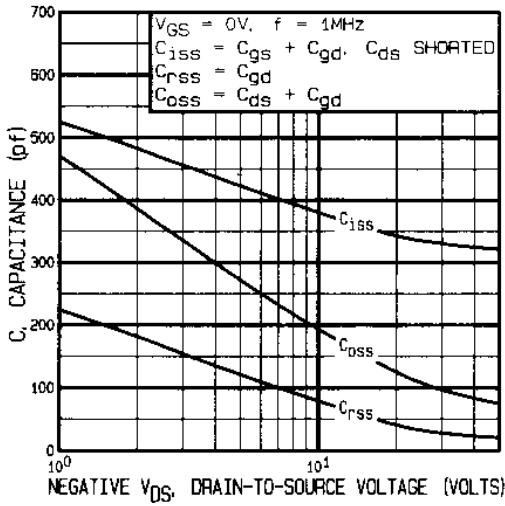Vs. Temperature

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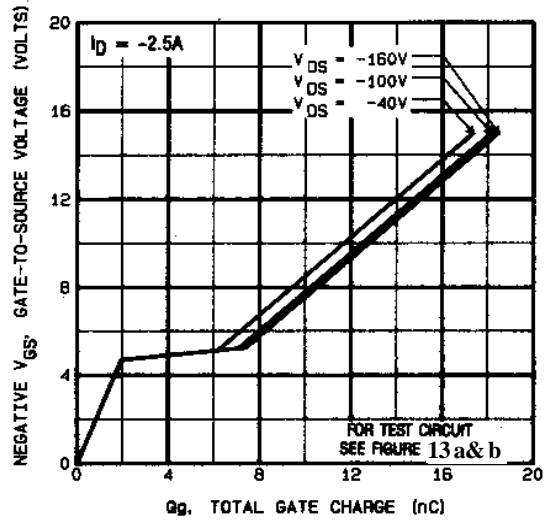Drain-to-Source Voltage
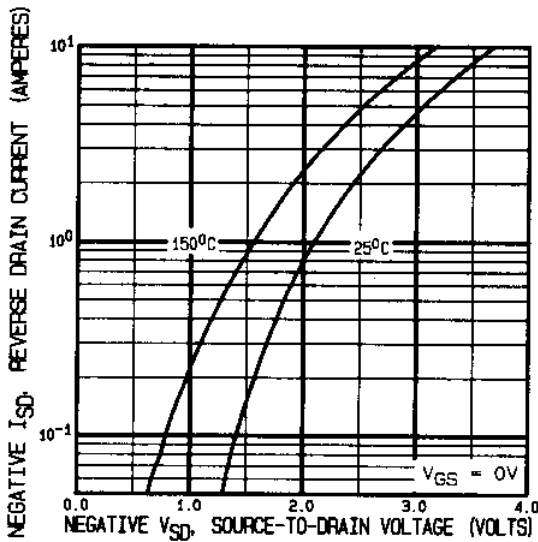

Fig 6. Typical Gate Charge Vs.
Gate-to-Source Voltage
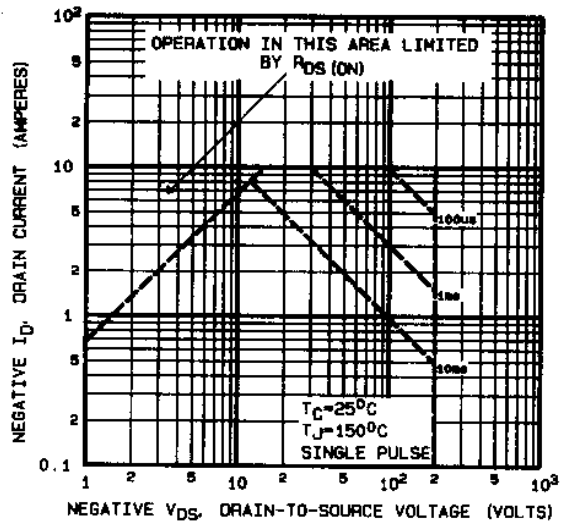

Fig 7. Typical Source-Drain Diode
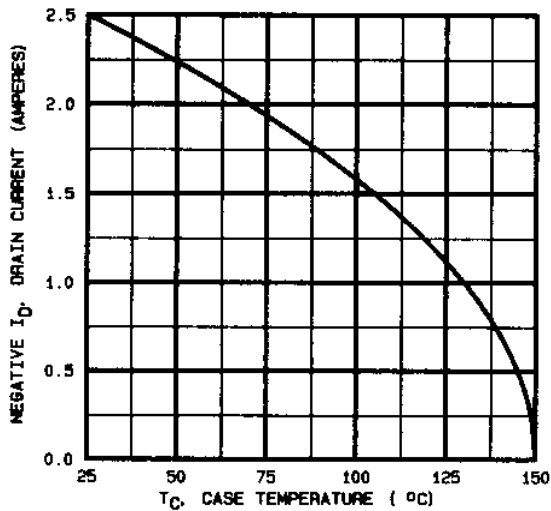Forward Voltage

Fig 8. Maximum Safe Operating Area
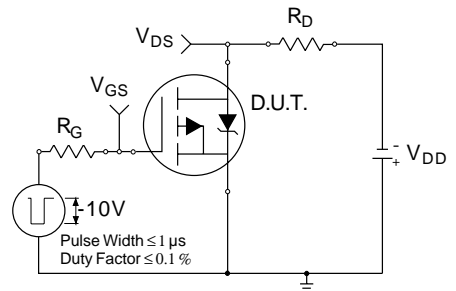
Fig 9. Maximum Drain Current Vs.
Case Temperature

Fig 10a. Switching Time Test Circuit
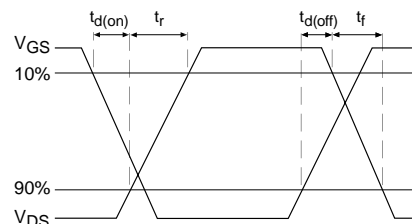
Fig 10b. Switching Time Waveforms
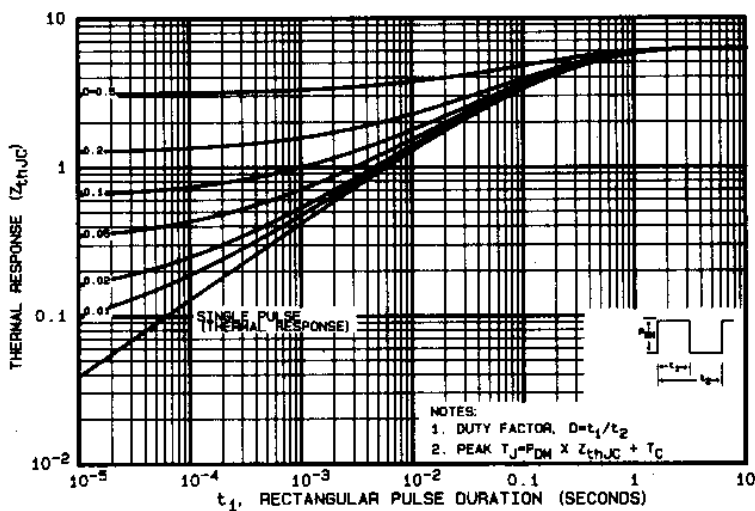
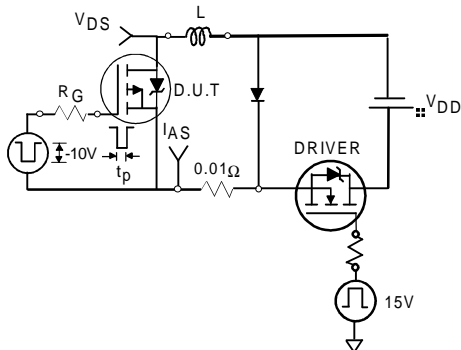**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

Fig 12a. Unclamped Inductive Test Circuit
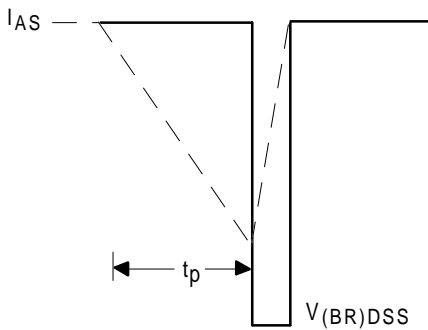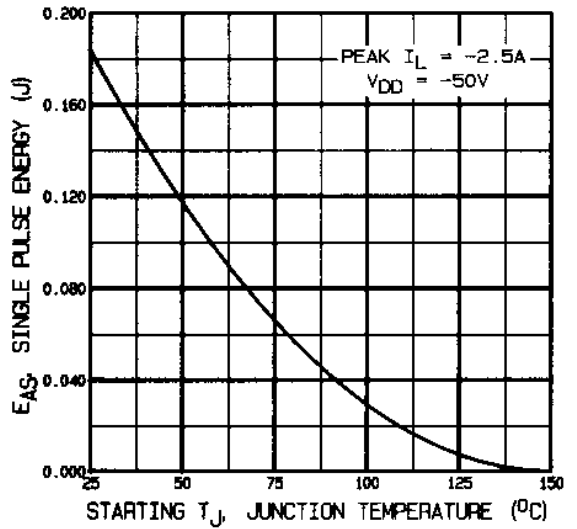

Fig 12b. Unclamped Inductive Waveforms

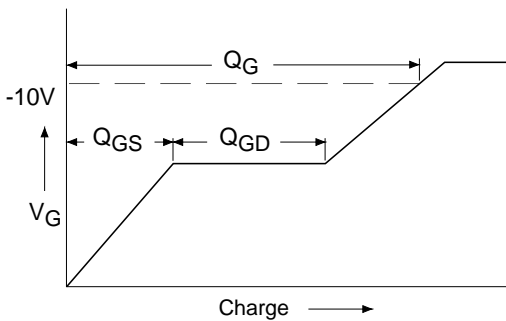**Fig 12c.** Maximum Avalanche Energy
Vs. Drain Current

Fig 13a. Basic Gate Charge Waveform

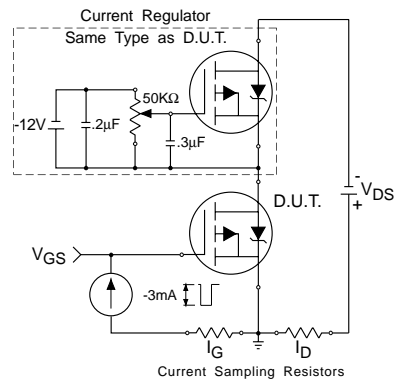**Fig 13b.** Gate Charge Test Circuit

International
IQR Rectifier
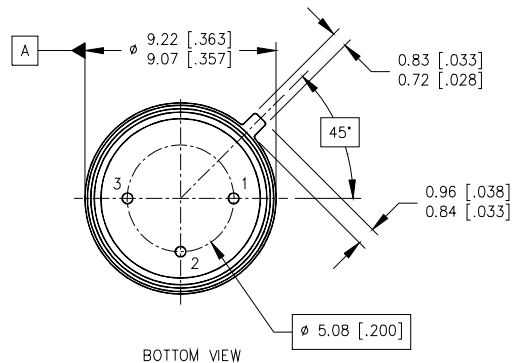
Foot Notes:

① Repetitive Rating; Pulse width limited by maximum junction temperature.

② V_{DD} = -50V, starting T_J = 25°C, Peak I_L = -2.5A,

③ I_{SD} ≤ -2.5A, di/dt ≤ -95A/µs, V_{DD} ≤ -200V, T_J ≤ 150°C
Suggested RG = 7.5 Ω

④ Pulse width ≤ 300 µs; Duty Cycle ≤ 2%

Case Outline and Dimensions —TO-205AF
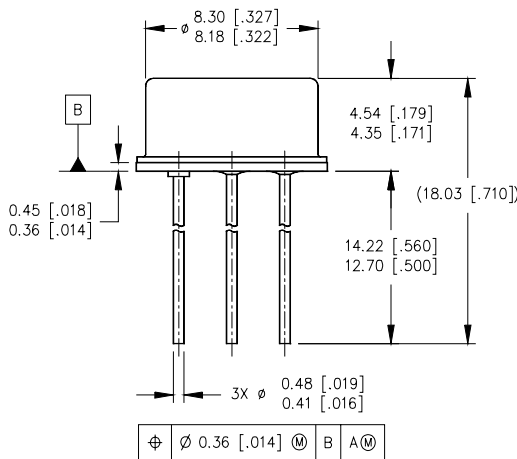
SIDE VIEW

BOTTOM 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).

LEGEND
1- SOURCE
2- GATE
3- DRAIN

International
IQR Rectifier

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for MOSFET *category:*

Click to view products by Infineon *manufacturer:*

Other Similar products are found below :

614233C 648584F MCH3443-TL-E MCH6422-TL-E FDPF9N50NZ FW216A-TL-2W FW231A-TL-E APT5010JVR NTNS3A92PZT5G IRF100S201 JANTX2N5237 2SK2464-TL-E 2SK3818-DL-E FCA20N60_F109 FDZ595PZ STD6600NT4G FSS804-TL-E 2SJ277-DL-E 2SK1691-DL-E 2SK2545(Q,T) D2294UK 405094E 423220D MCH6646-TL-E TPCC8103,L1Q(CM 367-8430-0972-503 VN1206L 424134F 026935X 051075F SBVS138LT1G 614234A 715780A NTNS3166NZT5G 751625C 873612G IRF7380TRHR IPS70R2K0CEAKMA1 RJK60S3DPP-E0#T2 RJK60S5DPK-M0#T0 APT5010JVFR APT12031JFLL APT12040JVR DMN3404LQ-7 NTE6400 JANTX2N6796U JANTX2N6784U JANTXV2N5416U4 SQM110N05-06L-GE3 SIHF35N60E-GE3