International
IOR Rectifier

REPETITIVE AVALANCHE AND dv/dt RATED
HEXFET® TRANSISTORS THRU-HOLE (TO-204AA/AE)

IRFAE30
800V, N-CHANNEL

Product Summary

Part Number	BVDSS	RDS(on)	ID
IRFAE30	800V	3.2Ω	3.1A

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; superior reverse energy and diode recovery dv/dt capability.

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.



TO-3

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} =0V, T_C = 25°C	Continuous Drain Current	3.1	A
I_D @ V_{GS} = 0V, T_C = 100°C	Continuous Drain Current	2.0	
I_{DM}	Pulsed Drain Current ①	12	
P_D @ T_C = 25°C	Max. Power Dissipation	75	W
	Linear Derating Factor	0.6	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	100	mJ
I_{AR}	Avalanche Current ①	3.1	A
E_{AR}	Repetitive Avalanche Energy ①	7.5	mJ
dv/dt	Peak Diode Recovery dv/dt ③	2.0	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	11.5(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	800	—	—	V	V_{GS} = 0V, I_D = 1.0mA
$\Delta BV_{DSS}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	—	0.98	—	V/°C	Reference to 25°C, I_D = 1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	3.2	Ω	V_{GS} = 10V, I_D = 2.0A④
		—	—	3.7		V_{GS} = 10V, I_D =3.1A④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS} = V_{GS}, I_D =250µA
g_{fs}	Forward Transconductance	2.5	—	—	S (℧)	V_{DS} > 15V, I_{DS} = 2.0A ④
I_{DSS}	Zero Gate Voltage Drain Current	—	—	25	µA	V_{DS}= 640V,V_{GS}=0V
		—	—	250		V_{DS} =640V, 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	30	—	69	nC	V_{GS}=10V, ID=3.1A, V_{DS} = 400V
Q_{gs}	Gate-to-Source Charge	3.1	—	7.1		
Q_{gd}	Gate-to-Drain ('Miller') Charge	17	—	40		
$t_{d(on)}$	Turn-On Delay Time	—	—	23	ns	V_{DD} =400V, I_D =3.1A, R_G =7.5Ω
t_r	Rise Time	—	—	32		
$t_{d(off)}$	Turn-Off Delay Time	—	—	120		
t_f	Fall Time	—	—	44		
$L_S + L_D$	Total Inductance	—	6.1	—	nH	Measured from drain lead (6mm/0.25in. from package) to source lead (6mm/0.25in. from package)
C_{iss}	Input Capacitance	—	950		pF	V_{GS} = 0V, V_{DS} = 25V, f = 1.0MHz
C_{oss}	Output Capacitance	—	170	—		
C_{rss}	Reverse Transfer Capacitance	—	80	—		

Source-Drain Diode Ratings and Characteristics

	Parameter	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	3.1	A	
I_{SM}	Pulse Source Current (Body Diode) ①	—	—	12		
V_{SD}	Diode Forward Voltage	—	—	1.8	V	T_j = 25°C, I_S =3.1A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	—	800	nS	T_j = 25°C, I_F = 3.1A, di/dt ≤ 100A/µs
Q_{RR}	Reverse Recovery Charge	—	—	3.6	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	—	—	1.67	°C/W	
R_{thJA}	Junction to Ambient	—	—	30		Typical socket mount

For footnotes refer to the last page

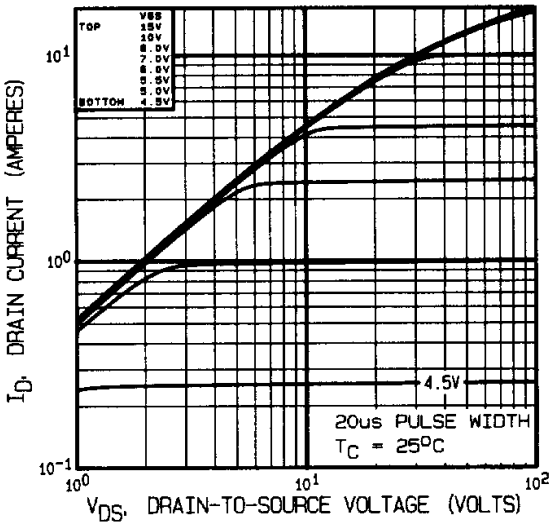


Fig 1. Typical Output Characteristics

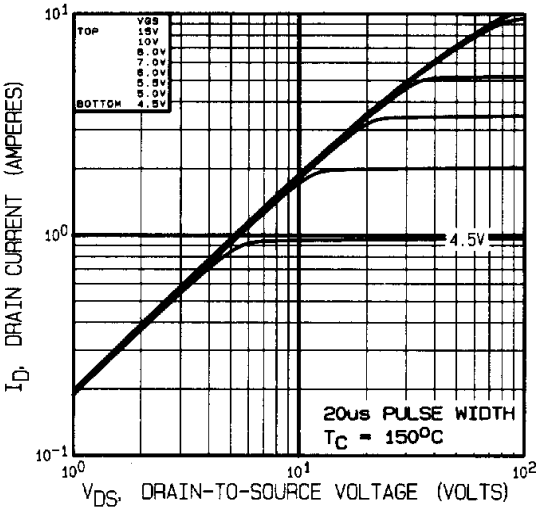


Fig 2. Typical Output Characteristics

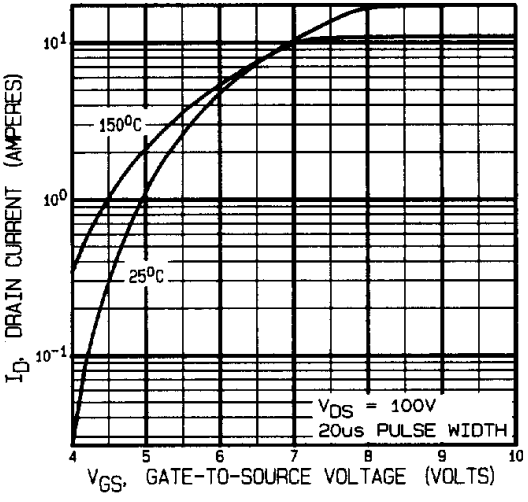


Fig 3. Typical Transfer Characteristics

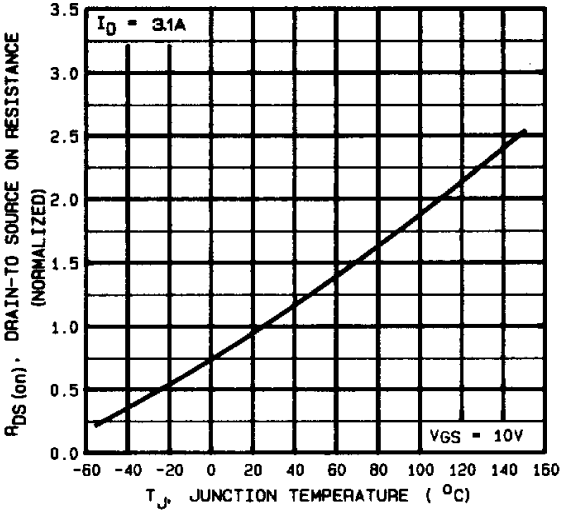


Fig 4. Normalized On-Resistance Vs. Temperature

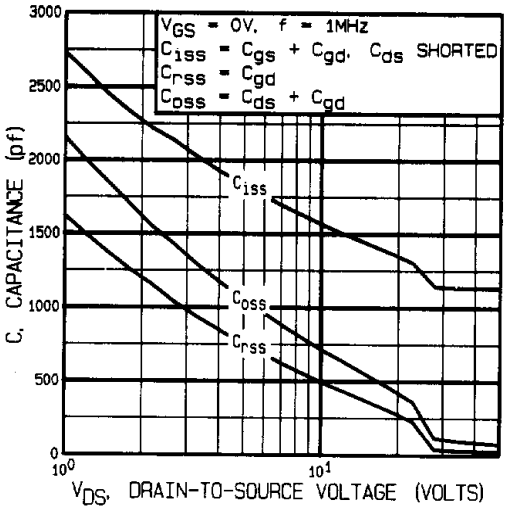


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

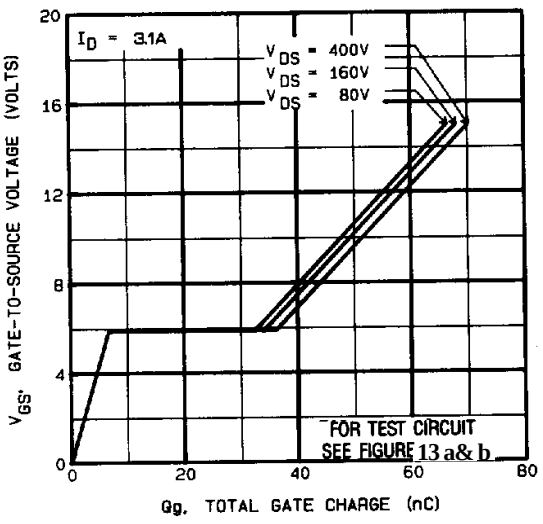


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

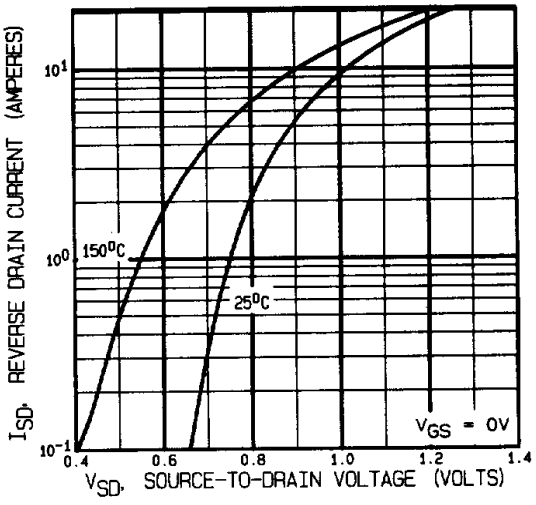


Fig 7. Typical Source-Drain Diode Forward Voltage

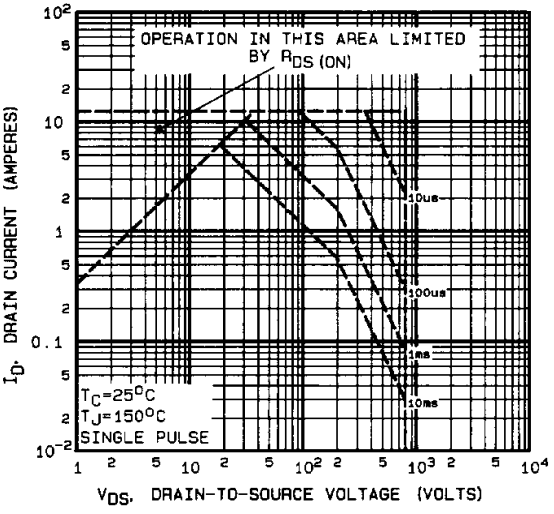


Fig 8. Maximum Safe Operating Area

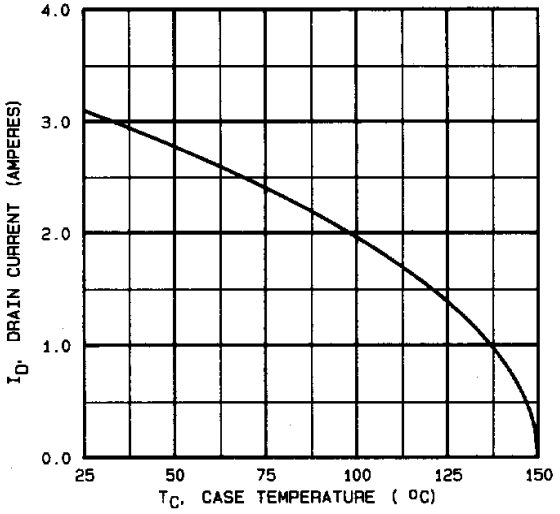


Fig 9. Maximum Drain Current Vs. Case Temperature

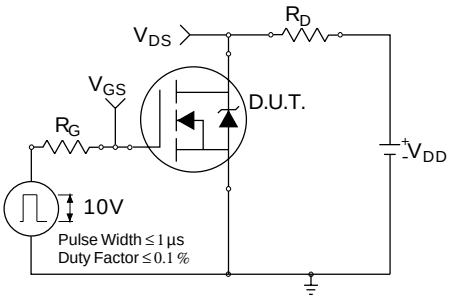


Fig 10a. Switching Time Test Circuit

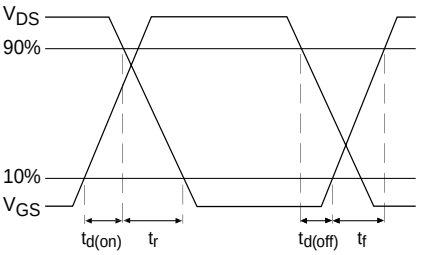


Fig 10b. Switching Time Waveforms

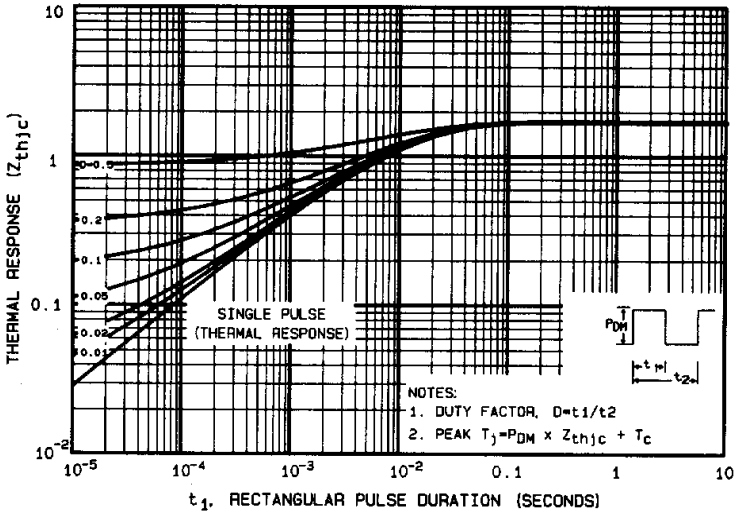


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

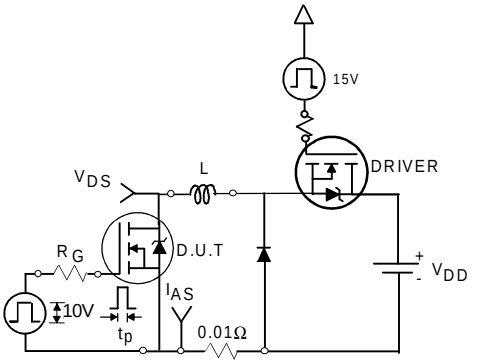


Fig 12a. Unclamped Inductive Test Circuit

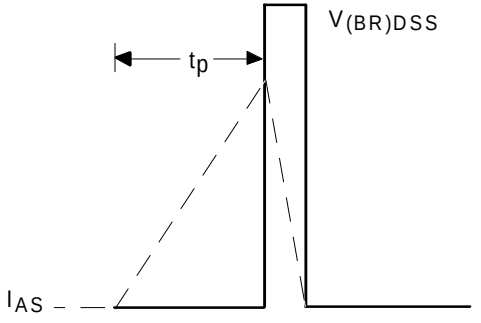


Fig 12b. Unclamped Inductive Waveforms

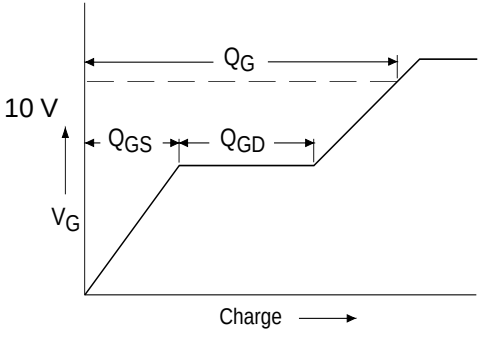


Fig 13a. Basic Gate Charge Waveform

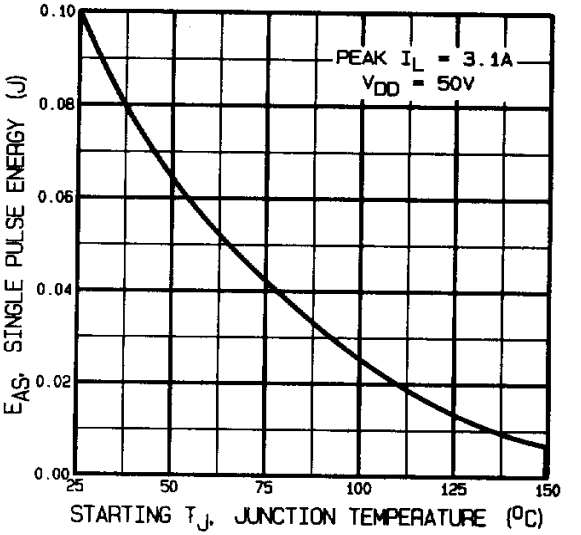


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

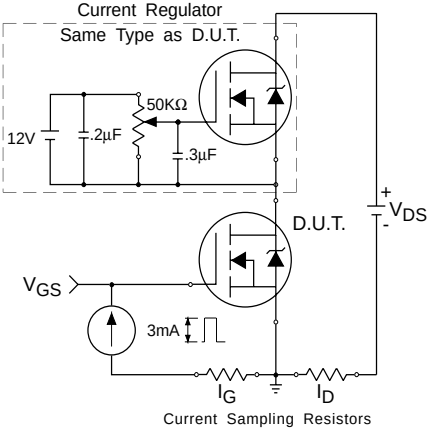


Fig 13b. Gate Charge Test Circuit

Foot Notes:

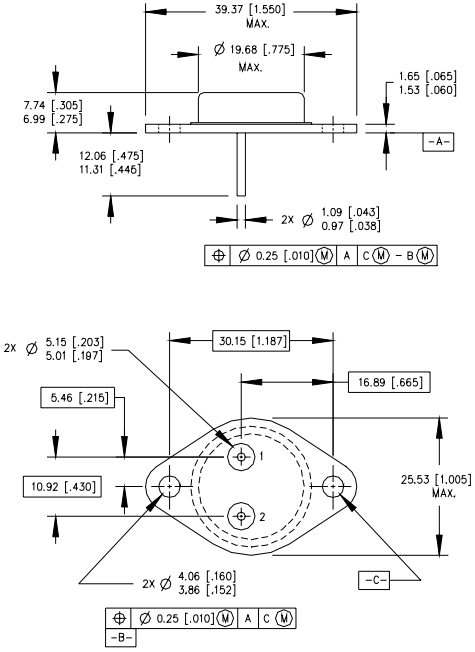
① Repetitive Rating; Pulse width limited by maximum junction temperature.

② V_{DD} = 50V, starting T_J = 25°C, Peak I_L = 3.1A,

③ $I_{SD} \leq 3.1A$, di/dt ≤ 100A/μs, $V_{DD} \leq$ 800V, $T_J \leq 150°C$ Suggested RG =7.5 Ω

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

Case Outline and Dimensions —TO-204AA (Modified TO-3)



PIN ASSIGNMENTS

HEXFET	SCHOTTKY	IGBT
1 – SOURCE	1 – ANODE 1	1 – GATE
2 – GATE	2 – ANODE 2	2 – EMITTER
3 – DRAIN (CASE)	3 – COMMON CATHODE (CASE)	3 – COLLECTOR (CASE)

NOTES:

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M–1982.
2. CONTROLLING DIMENSION : INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE TO–204–AA.

International
IOR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
IR EUROPEAN REGIONAL CENTRE: 439/445 Godstone Rd, Whyteleafe, Surrey CR3 OBL, UK Tel: ++ 44 (0)20 8645 8000
IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 (0) 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 011 451 0111
IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo 171 Tel: 81 (0)3 3983 0086
IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994 Tel: ++ 65 (0)838 4630
IR TAIWAN:16 Fl. Suite D. 207, Sec. 2, Tun Haw South Road, Taipei, 10673 Tel: 886-(0)2 2377 9936
Data and specifications subject to change without notice. 1/01