PD-94340B

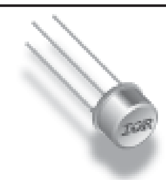
International
IOR Rectifier

HEXFET® POWER MOSFET THRU-HOLE (TO-39)

IRF7F3704 20V, N-CHANNEL

Product Summary

Part Number	BV_{DSS}	$R_{DS(on)}$	I_D
IRF7F3704	20V	0.035Ω	12A*


TO-39

Seventh Generation HEXFET® power MOSFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible on-resistance per silicon unit 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 device for use in a wide variety of applications.

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

Features:

- Low $R_{DS(on)}$
- Avalanche Energy Ratings
- Dynamic dv/dt Rating
- Simple Drive Requirements
- Ease of Paralleling
- Hermetically Sealed
- Light Weight

Absolute Maximum Ratings

	Parameter		Units
I_D @ V_{GS} = 10V, T_C = 25°C	Continuous Drain Current	12*	A
I_D @ V_{GS} = 10V, T_C = 100°C	Continuous Drain Current	12*	
I_{DM}	Pulsed Drain Current ①	48	
P_D @ T_C = 25°C	Max. Power Dissipation	20	W
	Linear Derating Factor	0.16	W/°C
V_{GS}	Gate-to-Source Voltage	±16	V
E_{AS}	Single Pulse Avalanche Energy ②	190	mJ
I_{AR}	Avalanche Current ①	12	A
E_{AR}	Repetitive Avalanche Energy ①	2.0	mJ
dv/dt	Peak Diode Recovery dv/dt ③	0.5	V/ns
T_J T_{STG}	Operating Junction Storage Temperature Range	-55 to 150	°C
	Lead Temperature	300 (0.063 in./1.6mm from case for 10s)	
	Weight	0.98 (Typical)	g

* Current is limited by package

For footnotes refer to the last page

10/10/05

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

	Parameter	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	20	—	—	V	V_{GS} = 0V, I_D = 250µA
$\Delta BV_{DSS}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	—	0.024	—	V/°C	Reference to 25°C, I_D = 1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	0.035	Ω	V_{GS} = 10V, I_D = 12A ④
		—	—	0.04		V_{GS} = 4.5V, I_D = 12A ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	3.0	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	20	—	—	S (℧)	V_{DS} =10V, I_{DS} = 12A ④
I_{DSS}	Zero Gate Voltage Drain Current	—	—	20	µA	V_{DS} = 20V ,V_{GS}=0V
		—	—	100		V_{DS} = 16V, V_{GS} = 0V, T_J =125°C
I_{GSS}	Gate-to-Source Leakage Forward	—	—	100	nA	V_{GS} = 16V
I_{GSS}	Gate-to-Source Leakage Reverse	—	—	-100		V_{GS} = -16V
Q_g	Total Gate Charge	—	—	19	nC	V_{GS} =4.5V, I_D = 12A
Q_{gs}	Gate-to-Source Charge	—	—	8.0		V_{DS} = 10V
Q_{gd}	Gate-to-Drain ('Miller') Charge	—	—	6.0		
$t_{d(on)}$	Turn-On Delay Time	—	—	30	ns	V_{DD} = 10V, I_D = 12A,
t_r	Rise Time	—	—	175		V_{GS} = 4.5V, R_G = 1.8Ω
$t_{d(off)}$	Turn-Off Delay Time	—	—	175		
t_f	Fall Time	—	—	100		
$L_S + L_D$	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	—	1860	—	pF	V_{GS} = 0V, V_{DS} = 10V
C_{oss}	Output Capacitance	—	990	—		f = 1.0MHz
C_{rss}	Reverse Transfer Capacitance	—	55	—		

Source-Drain Diode Ratings and Characteristics

	Parameter	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	12*	A	
I_{SM}	Pulse Source Current (Body Diode) ①	—	—	48		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_j = 25°C, I_S = 12A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	—	57	ns	T_j = 25°C, I_F = 12A, di/dt ≤ 100A/µs
Q_{RR}	Reverse Recovery Charge	—	—	60	nC	V_{DD} ≤ 16V ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S + L_D$.				

* Current is limited by package

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 International Rectifier Website.

For footnotes refer to the last page

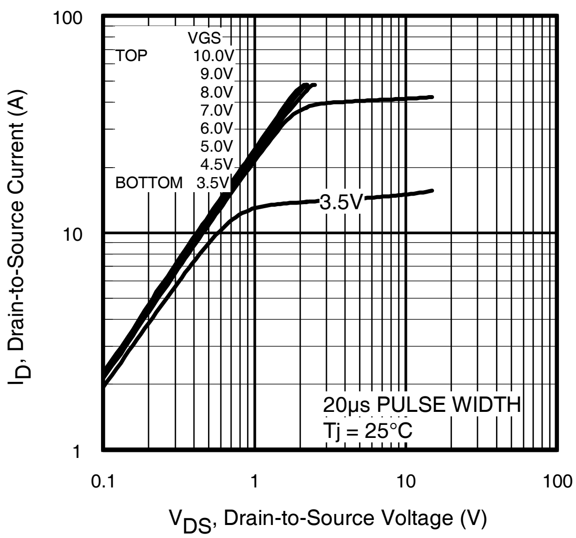


Fig 1. Typical Output Characteristics

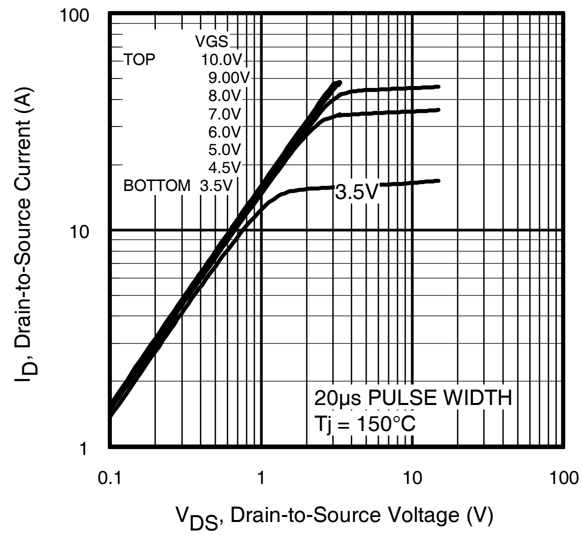


Fig 2. Typical Output Characteristics

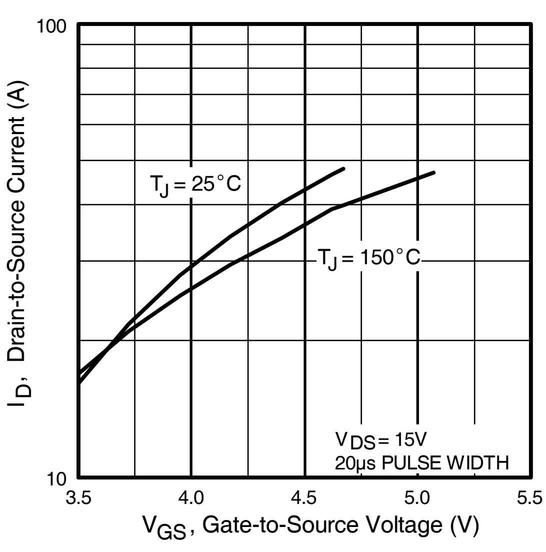


Fig 3. Typical Transfer Characteristics

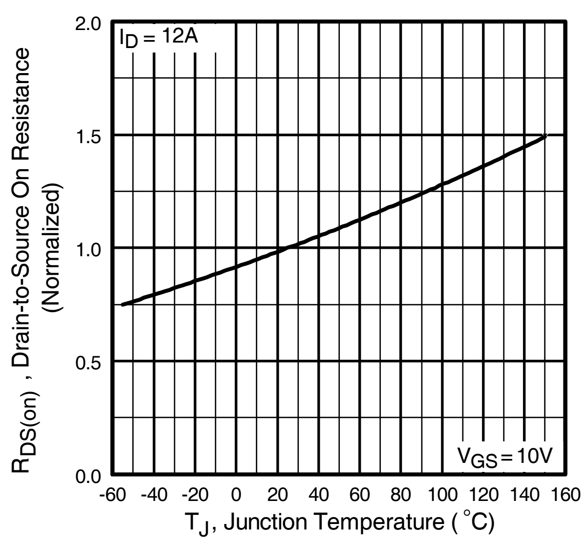


Fig 4. Normalized On-Resistance Vs. Temperature

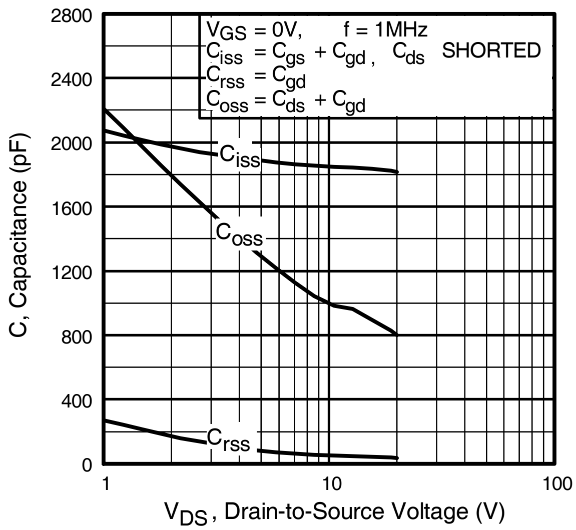


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

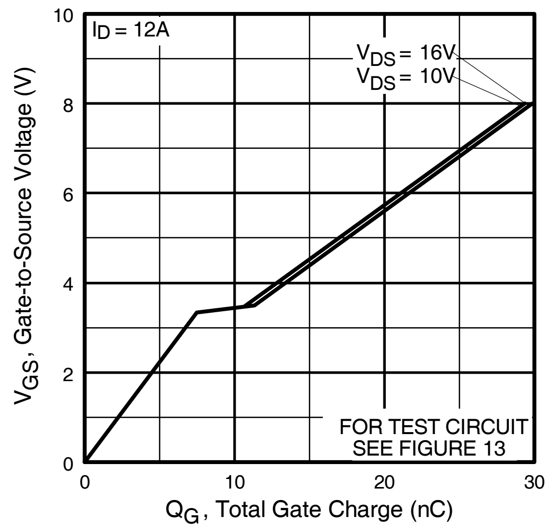


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

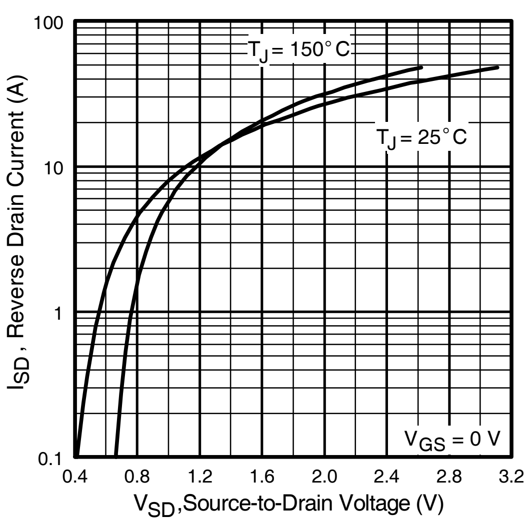


Fig 7. Typical Source-Drain Diode Forward Voltage

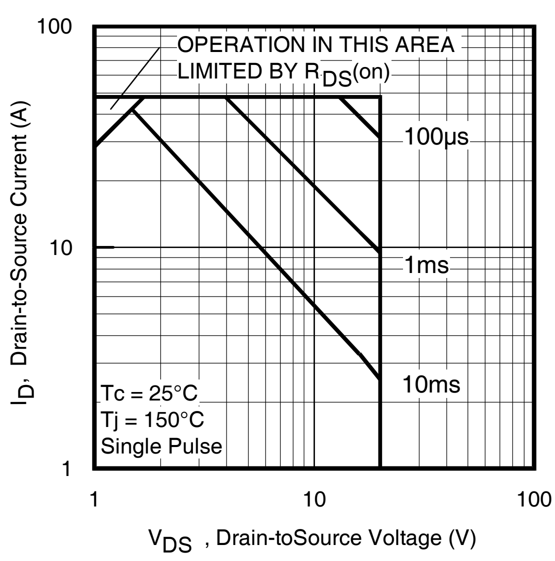


Fig 8. Maximum Safe Operating Area

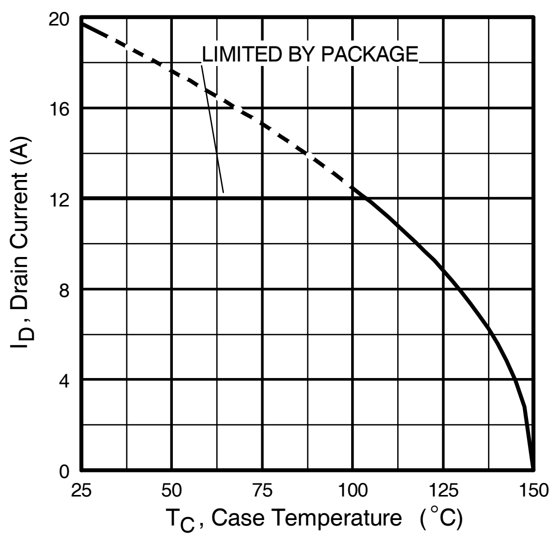


Fig 9. Maximum Drain Current Vs. Case Temperature

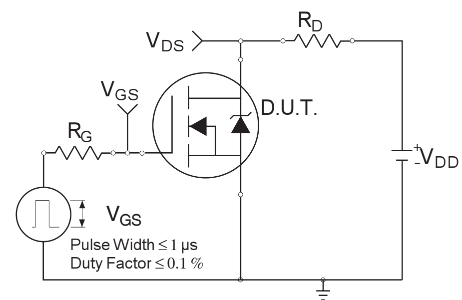


Fig 10a. Switching Time Test Circuit

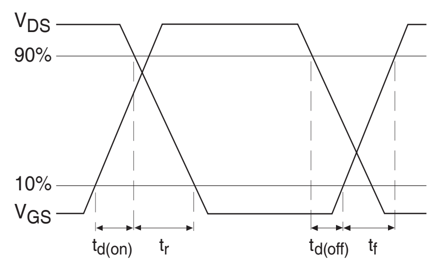


Fig 10b. Switching Time Waveforms

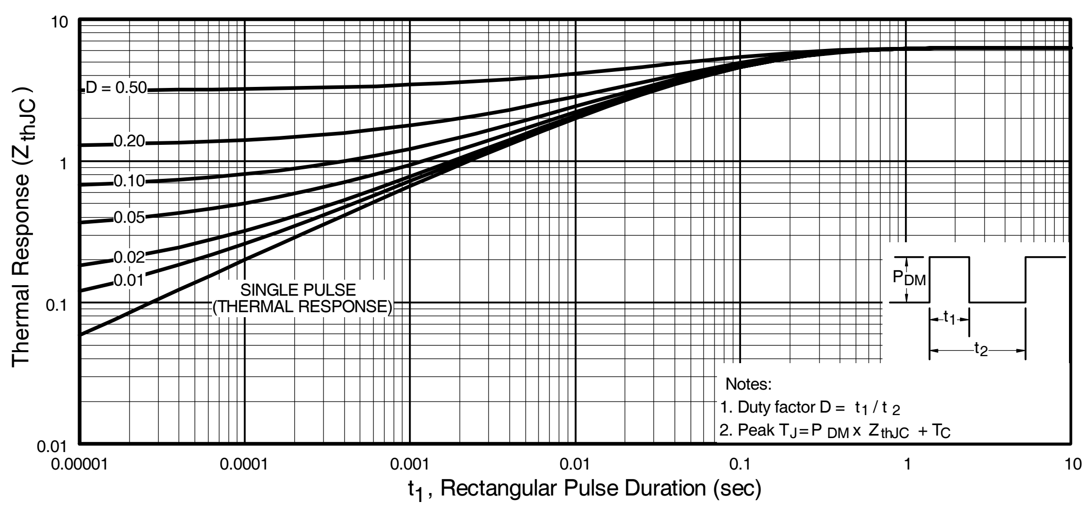


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

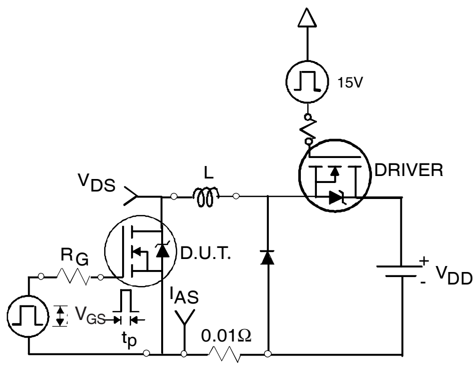


Fig 12a. Unclamped Inductive Test Circuit

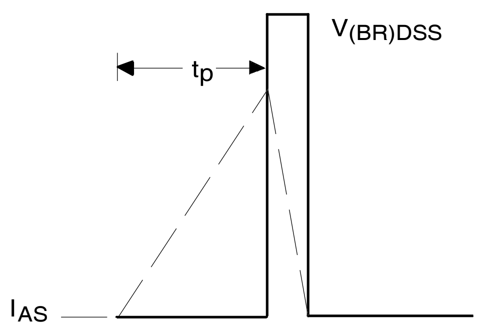


Fig 12b. Unclamped Inductive Waveforms

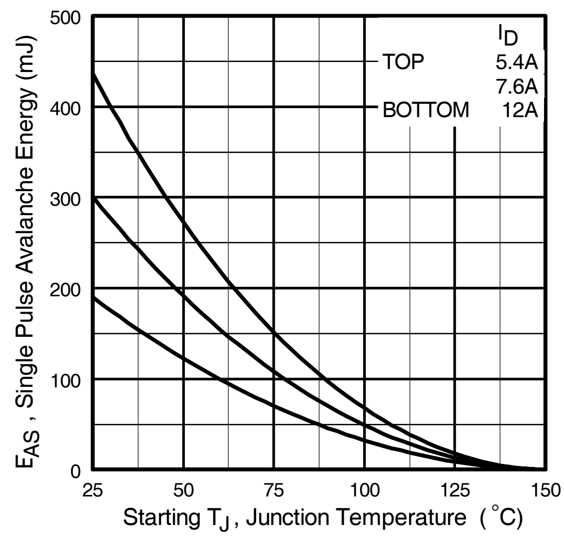


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

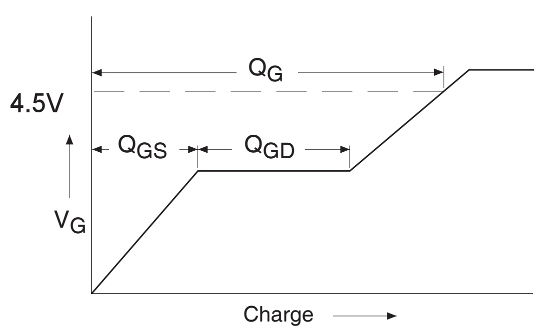


Fig 13a. Basic Gate Charge Waveform

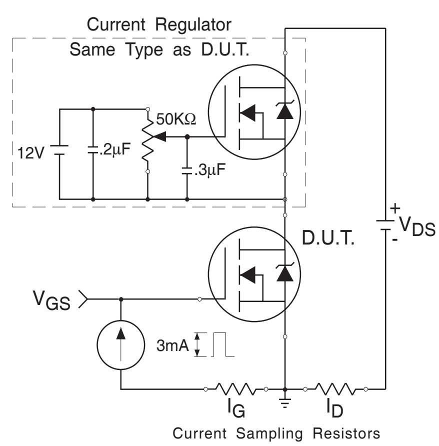
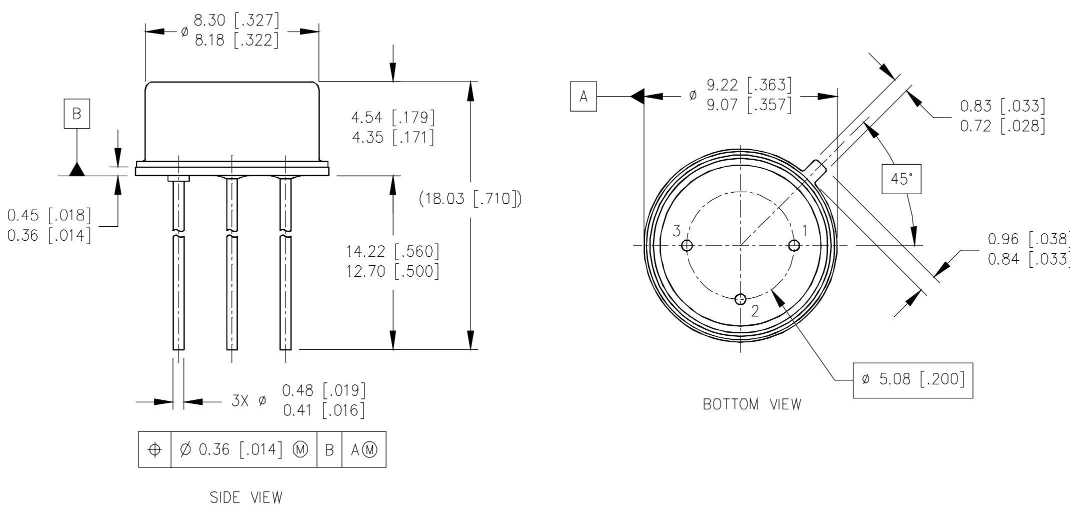


Fig 13b. Gate Charge Test Circuit

Footnotes:

① Repetitive Rating; Pulse width limited by maximum junction temperature.
② V_{DD} = 15 V, Starting T_J = 25°C, L= 2.7mH Peak I_{AS} =12A, V_{GS} = 10V, R_G= 25Ω
③ I_{SD} ≤ 12A, di/dt ≤ 80A/µs, V_{DD} ≤ 20V, T_J ≤ 150°C
④ Pulse width ≤ 300 µs; Duty Cycle ≤ 2%

Case Outline and Dimensions — TO-205AF (Modified TO-39)



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 Rectifier
IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
IR LEOMINSTER : 205 Crawford St., Leominster, Massachusetts 01453, USA Tel: (978) 534-5776
TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information.