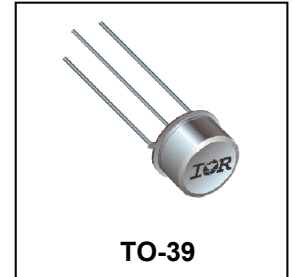


**HEXFET® POWER MOSFET  
THRU-HOLE TO-205AF (TO-39)**

**Product Summary**

Part Number	BVDSS	RDS(on)	I <sub>D</sub>
IRF7F3704	20V	0.035Ω	12A*



**Description**

Seventh Generation HEXFET® power MOSFETs from International Rectifier HiRel 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 RDS(on)
- Avalanche Energy Ratings
- Dynamic dv/dt Rating
- Simple Drive Requirements
- Hermetically Sealed
- Light Weight

**Absolute Maximum Ratings**

Symbol	Parameter	Value	Units
I <sub>D1</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 25°C	Continuous Drain Current	12*	A
I <sub>D2</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 100°C	Continuous Drain Current	12*	
I <sub>DM</sub> @ T <sub>C</sub> = 25°C	Pulsed Drain Current ①	48	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Maximum Power Dissipation	20	W
	Linear Derating Factor	0.16	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 16	V
E <sub>AS</sub>	Single Pulse Avalanche Energy ②	190	mJ
I <sub>AR</sub>	Avalanche Current ①	12	A
E <sub>AR</sub>	Repetitive Avalanche Energy ①	2.0	mJ
dv/dt	Peak Diode Recovery dv/dt ③	0.5	V/ns
T <sub>J</sub> T <sub>STG</sub>	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Lead Temperature	300 (0.063 in. /1.6 mm from case for 10s)	
	Weight	0.98 (Typical)	

\*Current is limited by package

For Footnotes refer to the page 2.

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.024	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1.0mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	0.035	Ω	V <sub>GS</sub> = 10V, I <sub>D2</sub> = 12A ④
		—	—	0.04		V <sub>GS</sub> = 4.5V, I <sub>D2</sub> = 12A ④
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.0	—	3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
G <sub>fs</sub>	Forward Transconductance	20	—	—	S	V <sub>DS</sub> = 10V, I <sub>D2</sub> = 12A ④
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	—	20	μA	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V
		—	—	100		V <sub>DS</sub> = 16V, 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> = 16V
	Gate-to-Source Leakage Reverse	—	—	-100		V <sub>GS</sub> = -16V
Q <sub>G</sub>	Total Gate Charge	—	—	19	nC	I <sub>D1</sub> = 12A
Q <sub>GS</sub>	Gate-to-Source Charge	—	—	8.0		V <sub>DS</sub> = 10V
Q <sub>GD</sub>	Gate-to-Drain ('Miller') Charge	—	—	6.0		V <sub>GS</sub> = 4.5V
t <sub>d(on)</sub>	Turn-On Delay Time	—	—	30	ns	V <sub>DD</sub> = 10V
t <sub>r</sub>	Rise Time	—	—	175		I <sub>D1</sub> = 12A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	—	175		R <sub>G</sub> = 1.8Ω
t <sub>f</sub>	Fall Time	—	—	100		V <sub>GS</sub> = 4.5V
L <sub>S</sub> + L <sub>D</sub>	Total Inductance	—	7.0	—	nH	Measured from Drain lead (6mm / 0.25 in from package) to Source lead (6mm / 0.25 in from package) with Source wire internally bonded from Source pin to Drain pin
C <sub>iss</sub>	Input Capacitance	—	1860	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	990	—		V <sub>DS</sub> = 10V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	55	—		f = 1.0MHz

**Source-Drain Diode Ratings and Characteristics**

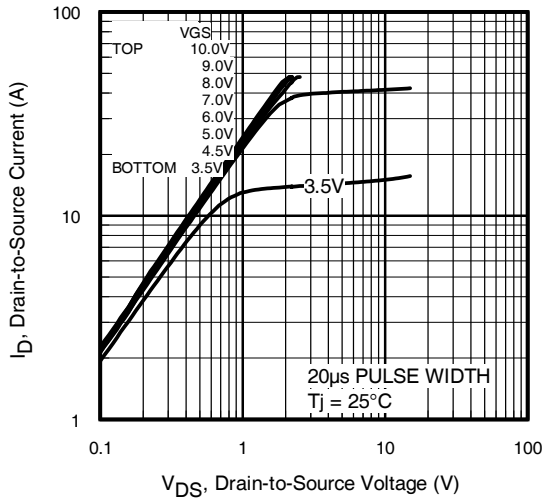
Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	12*	A	
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	48		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 12A, V <sub>GS</sub> = 0V④
t <sub>rr</sub>	Reverse Recovery Time	—	—	57	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 12A, V <sub>DD</sub> ≤ 16V
Q <sub>rr</sub>	Reverse Recovery Charge	—	—	60	nC	di/dt = 100A/μs ④
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> )				

**Thermal Resistance**

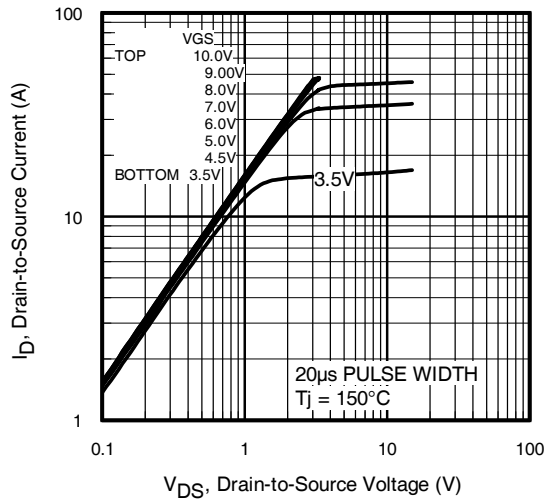
Symbol	Parameter	Min.	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case	—	—	6.25	°C/W
R <sub>θJA</sub>	Junction-to-Ambient (Typical socket mount)	—	—	175	

**Footnotes:**

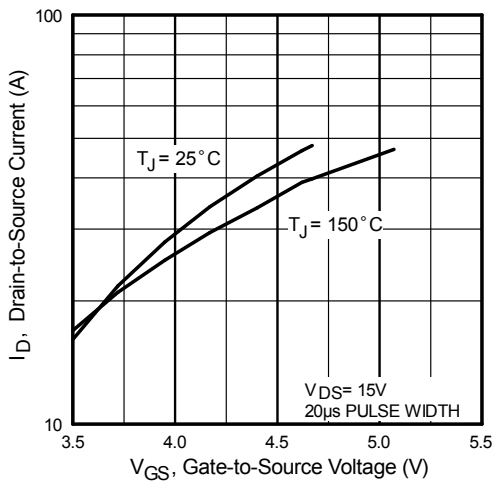
- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ② V<sub>DD</sub> = 15V, starting T<sub>J</sub> = 25°C, L = 2.7mH, Peak I<sub>L</sub> = 12A, V<sub>GS</sub> = 10V, R<sub>G</sub> = 25Ω
- ③ I<sub>SD</sub> ≤ 12A, di/dt ≤ 80A/μs, V<sub>DD</sub> ≤ 20V, T<sub>J</sub> ≤ 150°C
- ④ Pulse width ≤ 300 μs; Duty Cycle ≤ 2%



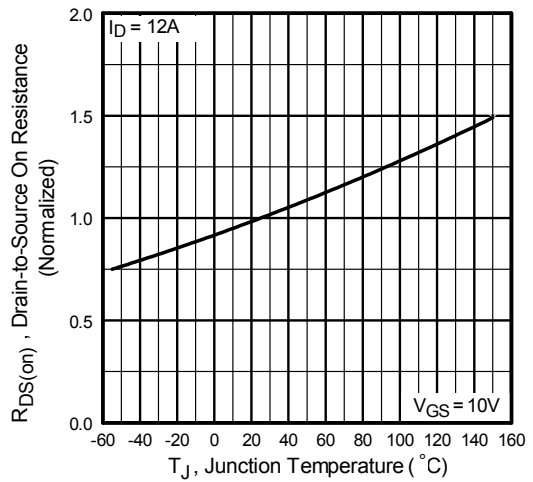
**Fig 1.** Typical Output Characteristics



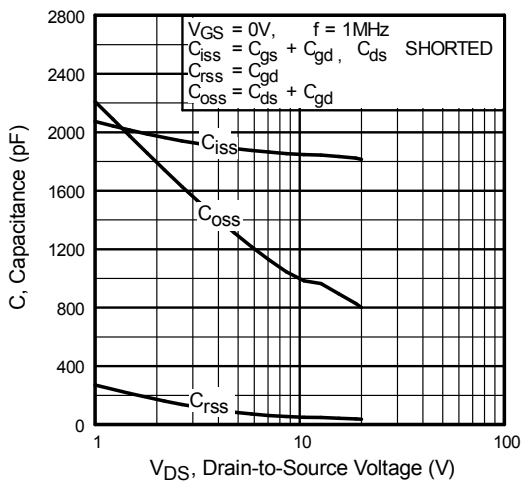
**Fig 2.** Typical Output Characteristics



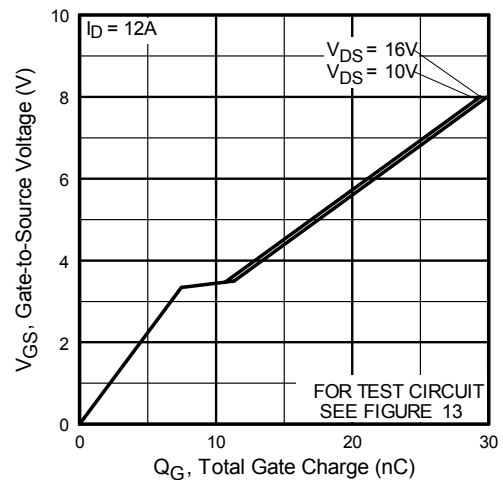
**Fig 3.** Typical Transfer Characteristics



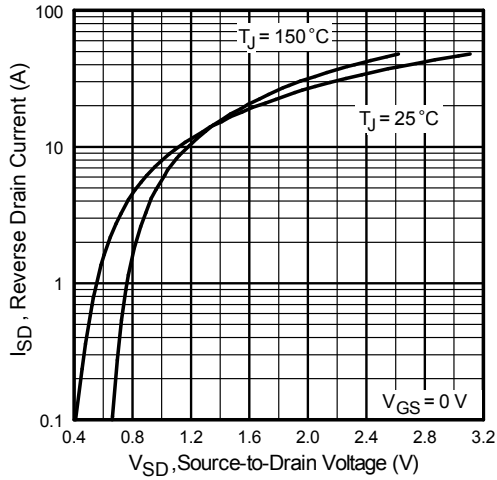
**Fig 4.** Normalized On-Resistance Vs. Temperature



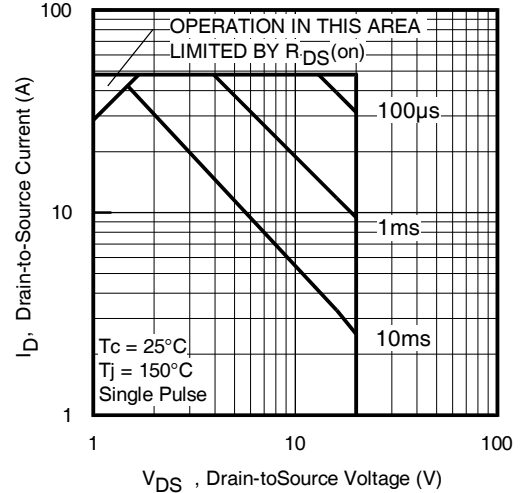
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



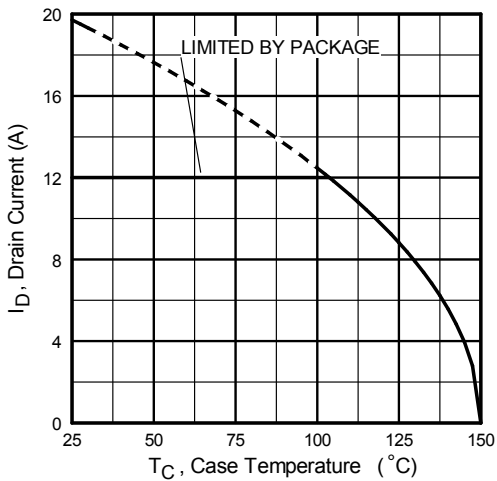
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



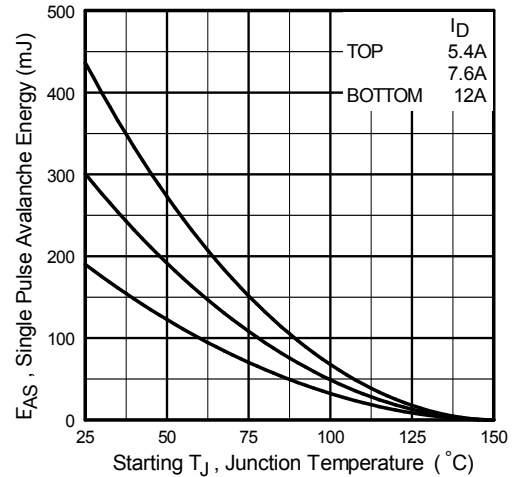
**Fig 7.** Typical Source-Drain Diode Forward Voltage



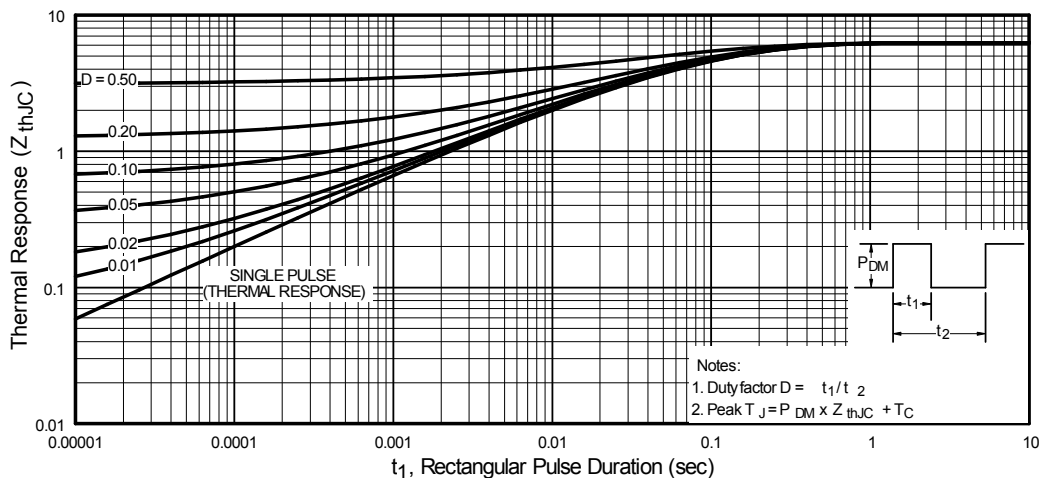
**Fig 8.** Maximum Safe Operating Area



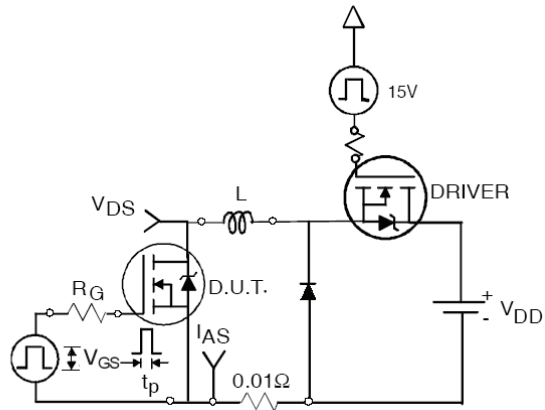
**Fig 9.** Maximum Drain Current Vs. Case Temperature



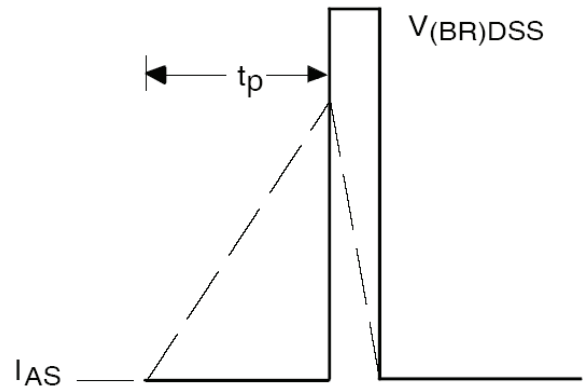
**Fig 10.** Maximum Avalanche Energy Vs. Drain Current



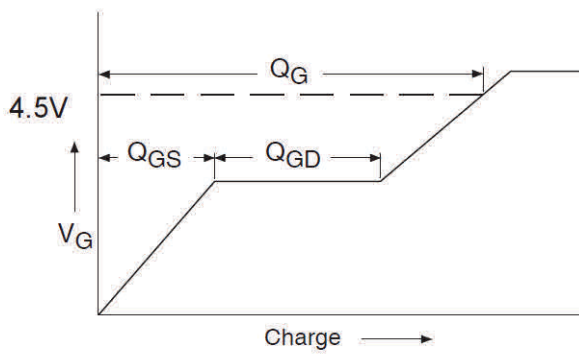
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



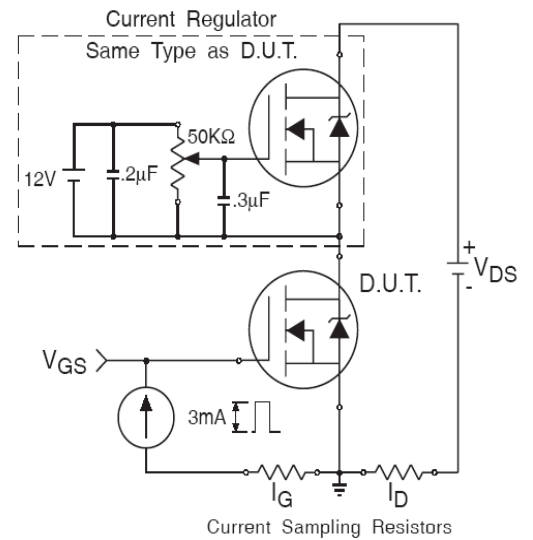
**Fig 12a.** Unclamped Inductive Test Circuit



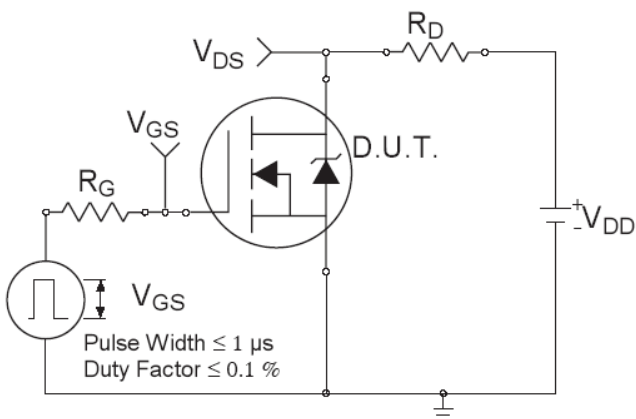
**Fig 12b.** Unclamped Inductive Waveforms



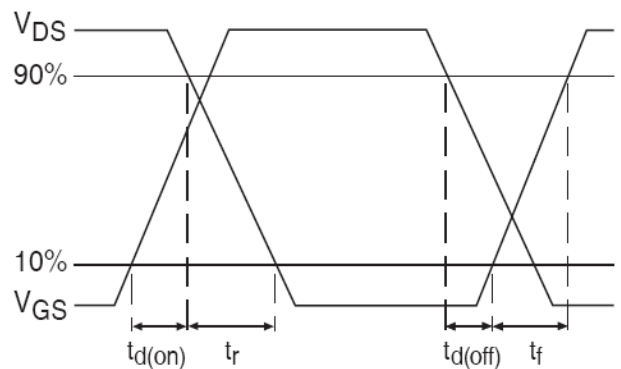
**Fig 13a.** Gate Charge Waveform



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

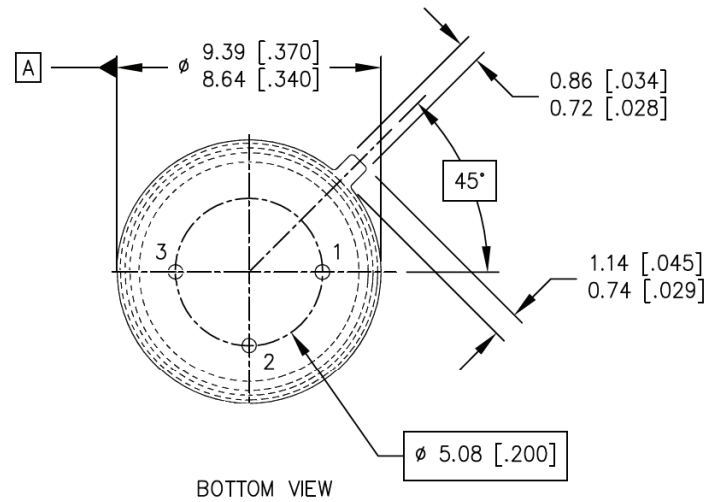
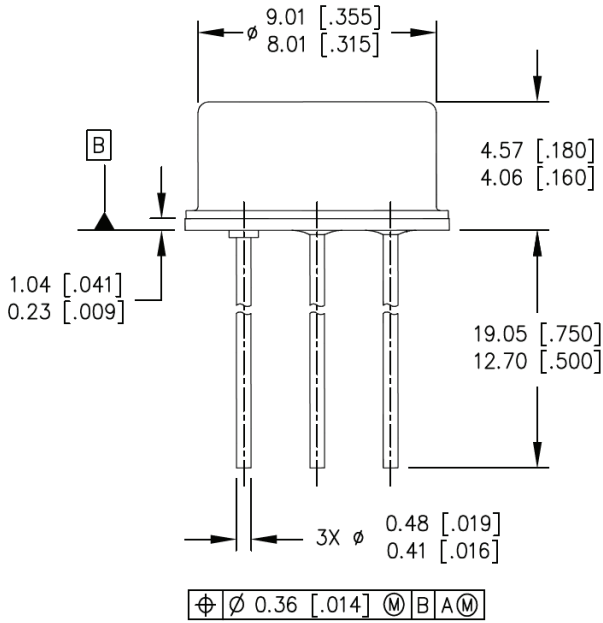


**Fig 14a.** Switching Time Test Circuit



**Fig 14b.** Switching Time Waveforms

**Case Outline and Dimensions - TO-205AF (TO-39)**



**LEGEND**  
1- SOURCE  
2- GATE  
3- DRAIN (CONNECTED TO THE CASE)

**NOTES:**

**SIDE VIEW**

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).

**IMPORTANT NOTICE**

The information given in this document shall be in no event regarded as guarantee of conditions or characteristic. The data contained herein is a characterization of the component based on internal standards and is intended to demonstrate and provide guidance for typical part performance. It will require further evaluation, qualification and analysis to determine suitability in the application environment to confirm compliance to your system requirements.

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