

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

	Parameter	Min	Typ	Max	Units	Test Conditions
B <sub>V</sub> DSS	Drain-to-Source Breakdown Voltage	-100	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -1.0mA
ΔB <sub>V</sub> DSS/ΔT <sub>J</sub>	Temperature Coefficient of Breakdown Voltage	—	-0.093	—	V/°C	Reference to 25°C, I <sub>D</sub> = -1.0mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-State Resistance	—	—	0.080	Ω	V <sub>GS</sub> = -12V, I <sub>D</sub> = -14A <sup>④</sup>
		—	—	0.085		V <sub>GS</sub> = -12V, I <sub>D</sub> = -22A <sup>④</sup>
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> = -1.0mA
g <sub>fs</sub>	Forward Transconductance	11	—	—	S	V <sub>DS</sub> = -15V, I <sub>DS</sub> = -14A <sup>④</sup>
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	—	—	200	nC	V <sub>GS</sub> = -12V, I <sub>D</sub> = -22A V <sub>DS</sub> = -50V
Q <sub>gs</sub>	Gate-to-Source Charge	—	—	35		
Q <sub>gd</sub>	Gate-to-Drain ('Miller') Charge	—	—	48		
t <sub>d(on)</sub>	Turn-On Delay Time	—	—	40	ns	V <sub>DD</sub> = -50V, I <sub>D</sub> = -22A, V <sub>GS</sub> = -12V, R <sub>G</sub> = 2.35Ω
t <sub>r</sub>	Rise Time	—	—	170		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	—	190		
t <sub>f</sub>	Fall Time	—	—	190		
L <sub>S</sub> + L <sub>D</sub>	Total Inductance	—	6.8	—	nH	Measured from drain lead (6mm/0.25in. from package) to source lead (6mm/0.25in. from package)
C <sub>iss</sub>	Input Capacitance	—	4300	—	pF	V <sub>GS</sub> = 0V, V <sub>DS</sub> = -25V f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	1100	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	310	—		

**Source-Drain Diode Ratings and Characteristics**

	Parameter	Min	Typ	Max	Units	Test Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	-22	A	
I <sub>SM</sub>	Pulse Source Current (Body Diode) <sup>①</sup>	—	—	-88		
V <sub>SD</sub>	Diode Forward Voltage	—	—	-3.0	V	T <sub>j</sub> = 25°C, I <sub>S</sub> = -22A, V <sub>GS</sub> = 0V <sup>④</sup>
t <sub>rr</sub>	Reverse Recovery Time	—	—	300	ns	T <sub>j</sub> = 25°C, I <sub>F</sub> = -22A, di/dt ≤ -100A/μs V <sub>DD</sub> ≤ -50V <sup>④</sup>
Q <sub>RR</sub>	Reverse Recovery Charge	—	—	1.5	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	—	—	0.83	°C/W	Typical socket mount
R <sub>thJA</sub>	Junction-to-Ambient	—	—	48		
R <sub>thCS</sub>	Case-to-Sink	—	0.21	—		

Note: Corresponding Spice and Saber models are available on International Rectifier Web site.

For footnotes refer to the last page

## Radiation Characteristics

## IRHM9150, JANSR2N7422

International Rectifier Radiation Hardened MOSFETs are tested to verify their radiation hardness capability. The hardness assurance program at International Rectifier is comprised of two radiation environments. Every manufacturing lot is tested for total ionizing dose (per notes 5 and 6) using the TO-3 package. Both pre- and post-irradiation performance are tested and specified using the same drive circuitry and test conditions in order to provide a direct comparison.

**Table 1. Electrical Characteristics @ Tj = 25°C, Post Total Dose Irradiation** ⑤⑥

	Parameter	100K Rads(Si) <sup>1</sup>		300K Rads (Si) <sup>2</sup>		Units	Test Conditions
		Min	Max	Min	Max		
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	-100	—	-100	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -1.0mA
V <sub>GS(th)</sub>	Gate Threshold Voltage	-2.0	-4.0	-2.0	-5.0		V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -1.0mA
I <sub>GSS</sub>	Gate-to-Source Leakage Forward	—	-100	—	-100	nA	V <sub>GS</sub> = -20V
I <sub>GSS</sub>	Gate-to-Source Leakage Reverse	—	100	—	100		V <sub>GS</sub> = 20V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	-25	—	-25	μA	V <sub>DS</sub> = -80V, V <sub>GS</sub> = 0V
R <sub>DS(on)</sub>	Static Drain-to-Source ④ On-State Resistance (TO-3)	—	0.080	—	0.080	Ω	V <sub>GS</sub> = -12V, I <sub>D</sub> = -14A
R <sub>DS(on)</sub>	Static Drain-to-Source ④ On-State Resistance (TO-254)	—	0.080	—	0.080	Ω	V <sub>GS</sub> = -12V, I <sub>D</sub> = -14A
V <sub>SD</sub>	Diode Forward Voltage ④	—	-3.0	—	-3.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -22A

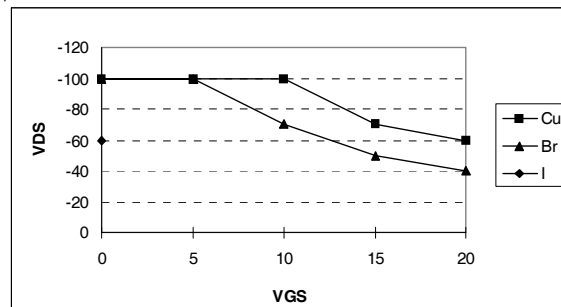
1. Part number IRHM9150 (JANSR2N7422)

2. Part number IRHM93150 (JANSF2N7422)

International Rectifier radiation hardened MOSFETs have been characterized in heavy ion environment for Single Event Effects (SEE). Single Event Effects characterization is illustrated in Fig. a and Table 2.

**Table 2. Typical Single Event Effect Safe Operating Area**

Ion	LET MeV/(mg/cm <sup>2</sup> )	Energy (MeV)	Range (μm)	V <sub>DS</sub> (V)				
				@V <sub>GS</sub> =0V	@V <sub>GS</sub> =5V	@V <sub>GS</sub> =10V	@V <sub>GS</sub> =15V	@V <sub>GS</sub> =20V
Cu	28	285	43	-100	-100	-100	-70	-60
Br	36.8	305	39	-100	-100	-70	-50	-40
I	59.9	345	32.8	-60	—	—	—	—



**Fig a. Typical Single Event Effect, Safe Operating Area**

For footnotes refer to the last page

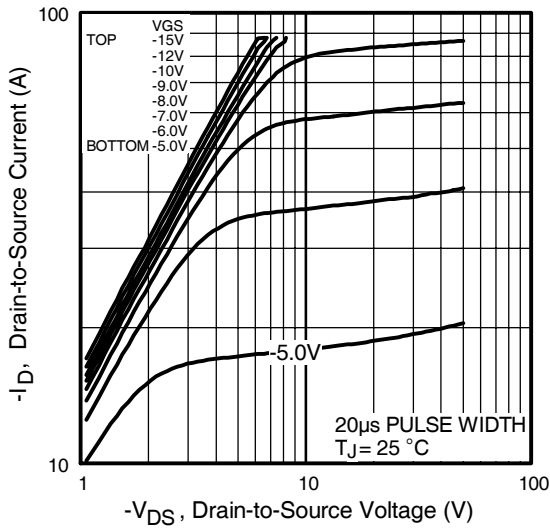


Fig 1. Typical Output Characteristics

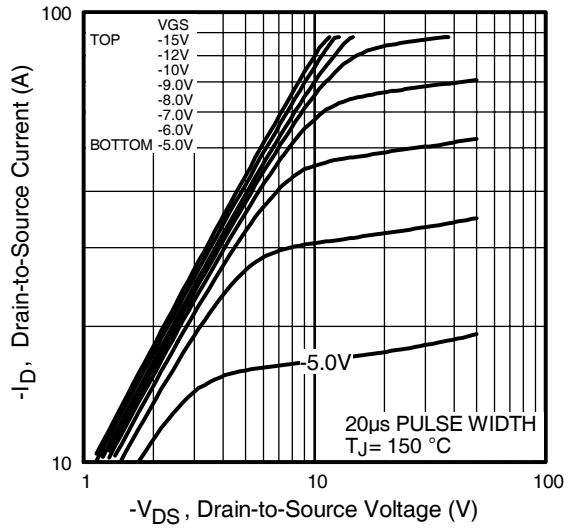


Fig 2. Typical Output Characteristics

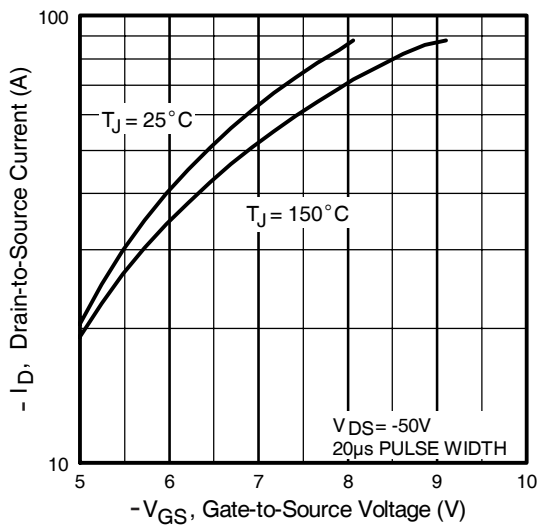


Fig 3. Typical Transfer Characteristics

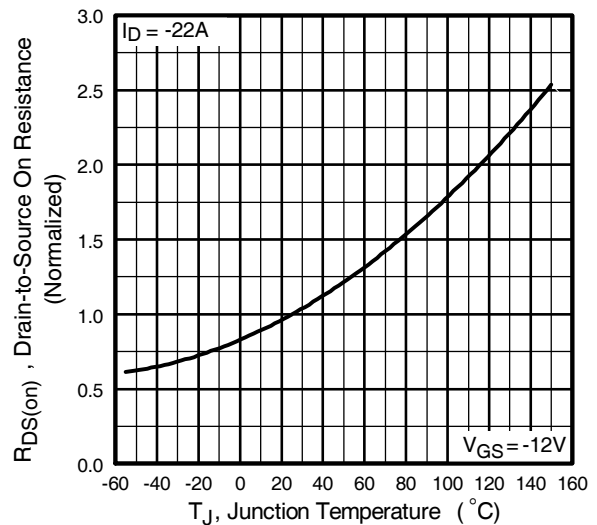


Fig 4. Normalized On-Resistance Vs. Temperature

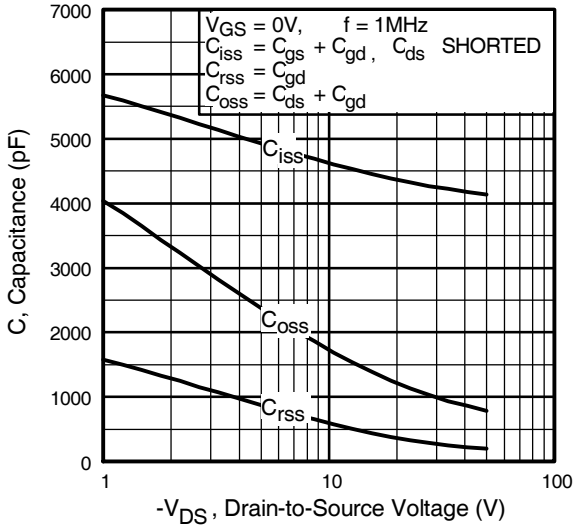


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

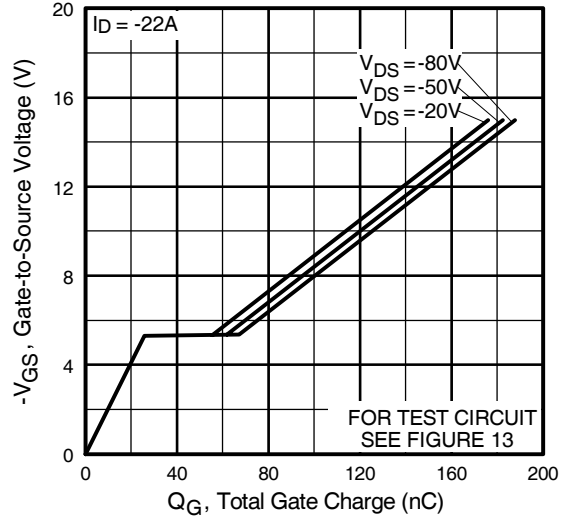


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

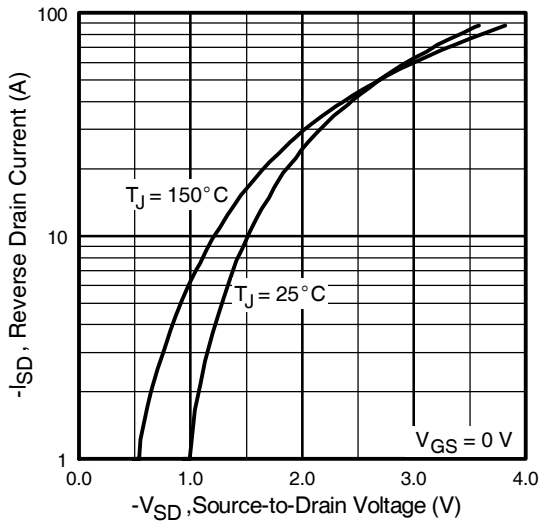


Fig 7. Typical Source-Drain Diode Forward Voltage

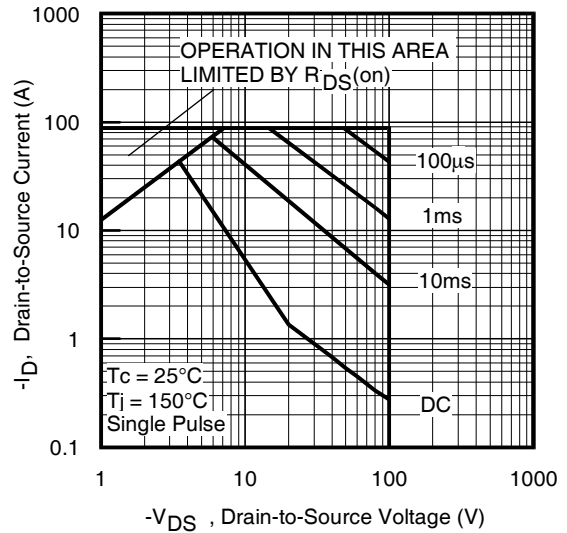
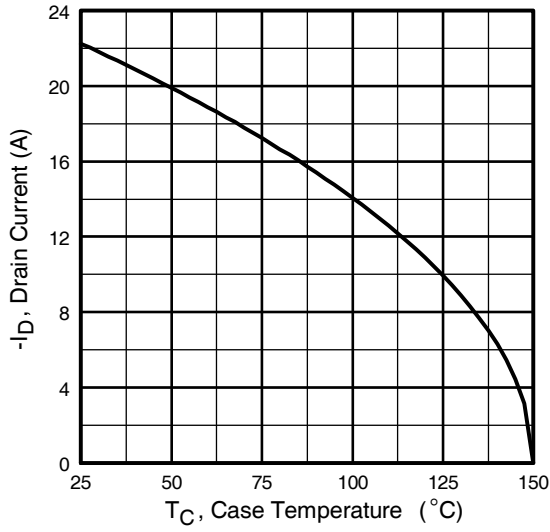
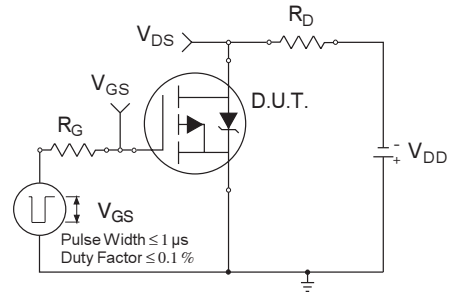


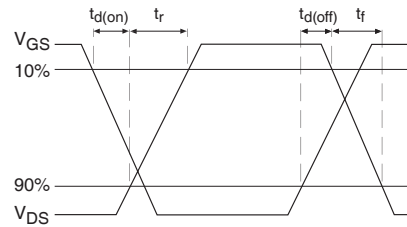
Fig 8. Maximum Safe Operating Area



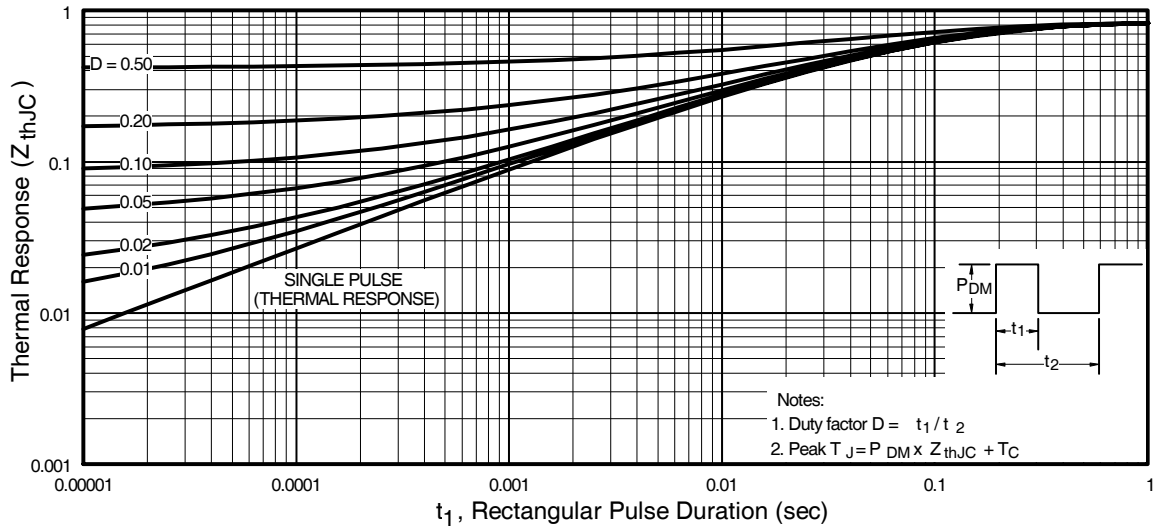
**Fig9.** Maximum Drain Current Vs. Case Temperature



**Fig10a.** Switching Time Test Circuit



**Fig10b.** Switching Time Waveforms



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

Pre-Irradiation

IRHM9150, JANSR2N7422

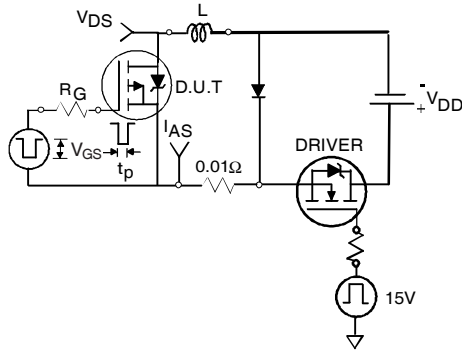


Fig 12a. Unclamped Inductive Test Circuit

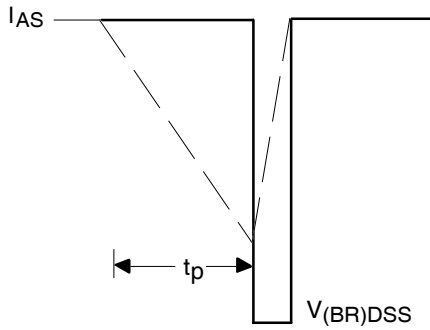


Fig 12b. Unclamped Inductive Waveforms

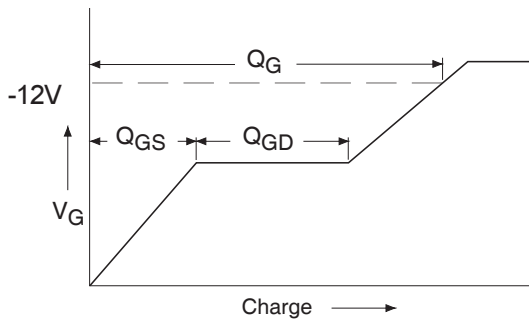


Fig 13a. Basic Gate Charge Waveform

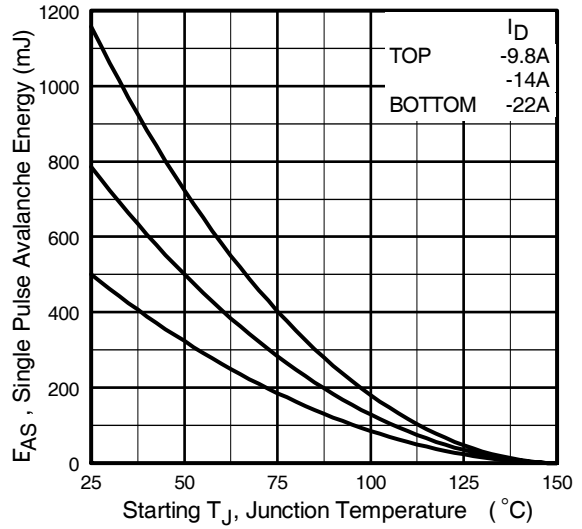


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

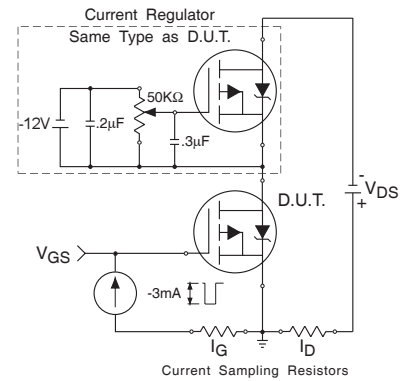
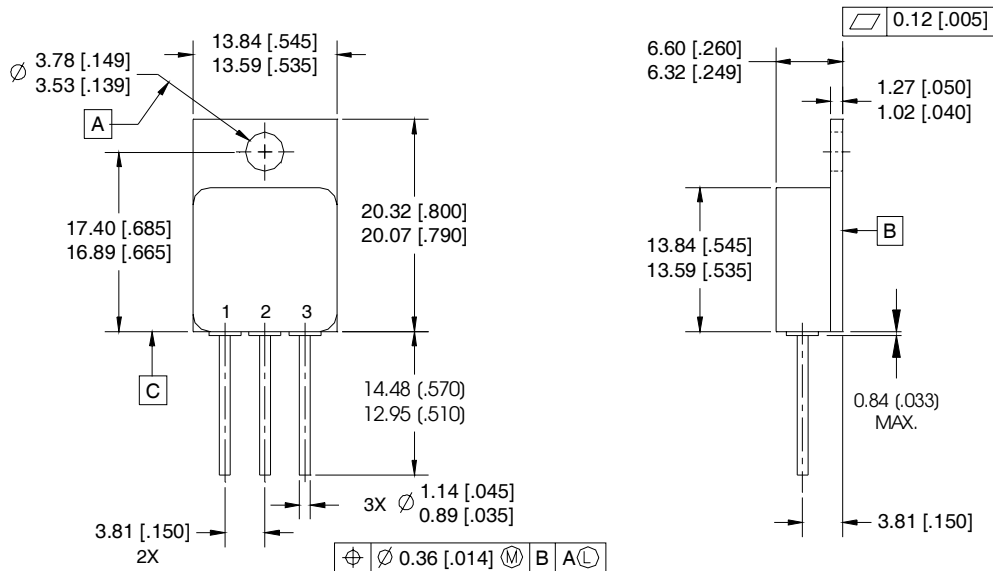


Fig 13b. Gate Charge Test Circuit

**Footnotes:**

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ②  $V_{DD} = -25V$ , starting  $T_J = 25^\circ C$ ,  $L = 2.1mH$   
Peak  $I_L = -22A$ ,  $V_{GS} = -12V$
- ③  $I_{SD} \leq -22A$ ,  $di/dt \leq -450A/\mu s$ ,  
 $V_{DD} \leq -100V$ ,  $T_J \leq 150^\circ C$
- ④ Pulse width  $\leq 300 \mu s$ ; Duty Cycle  $\leq 2\%$
- ⑤ **Total Dose Irradiation with  $V_{GS}$  Bias.**  
-12 volt  $V_{GS}$  applied and  $V_{DS} = 0$  during irradiation per MIL-STD-750, method 1019, condition A.
- ⑥ **Total Dose Irradiation with  $V_{DS}$  Bias.**  
-80 volt  $V_{DS}$  applied and  $V_{GS} = 0$  during irradiation per MIL-STD-750, method 1019, condition A.

**Case Outline and Dimensions — TO-254AA**



NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. CONTROLLING DIMENSION: INCH.
4. CONFORMS TO JEDEC OUTLINE TO-254AA.

PIN ASSIGNMENTS

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

**CAUTION**

**BERYLLIA WARNING PER MIL-PRF-19500**

Package containing beryllia shall not be ground, sandblasted, machined, or have other operations performed on them which will produce beryllia or beryllium dust. Furthermore, beryllium oxide packages shall not be placed in acids that will produce fumes containing beryllium.



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*Data and specifications subject to change without notice. 05/2014*