

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

	Parameter	Min	Typ	Max	Units	Test Conditions
BV _{DSS}	Drain-to-Source Breakdown Voltage	-100	—	—	V	V _{GS} = 0V, I _D = -1.0mA
ΔBV _{DSS} /ΔT _J	Temperature Coefficient of Breakdown Voltage	—	-0.093	—	V/°C	Reference to 25°C, I _D = -1.0mA
R _{DS(on)}	Static Drain-to-Source On-State Resistance	—	—	0.080	Ω	V _{GS} = -12V, I _D = -14A④
		—	—	0.085		V _{GS} = -12V, I _D = -22A④
V _{GS(th)}	Gate Threshold Voltage	-2.0	—	-4.0	V	V _{DS} = V _{GS} , I _D = -1.0mA
g _{fs}	Forward Transconductance	11	—	—	S (S)	V _{DS} > -15V, I _{DS} = -14A ④
I _{DSS}	Zero Gate Voltage Drain Current	—	—	-25	μA	V _{DS} = -80V, V _{GS} = 0V
		—	—	-250		V _{DS} = -80V, 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	—	—	200	nC	V _{GS} = -12V, I _D = -22A V _{DS} = -50V
Q _{gs}	Gate-to-Source Charge	—	—	35		
Q _{gd}	Gate-to-Drain ('Miller') Charge	—	—	48		
t _{d(on)}	Turn-On Delay Time	—	—	40	ns	V _{DD} = -50V, I _D = -22A, V _{GS} = -12V, R _G = 2.35Ω
t _r	Rise Time	—	—	170		
t _{d(off)}	Turn-Off Delay Time	—	—	190		
t _f	Fall Time	—	—	190		
L _S + L _D	Total Inductance	—	4.0	—	nH	Measured from the center of drain pad to center of source pad
C _{iss}	Input Capacitance	—	4300	—	pF	V _{GS} = 0V, V _{DS} = -25V f = 1.0MHz
C _{oss}	Output Capacitance	—	1100	—		
C _{rss}	Reverse Transfer Capacitance	—	310	—		

Source-Drain Diode Ratings and Characteristics

	Parameter	Min	Typ	Max	Units	Test Conditions
I _S	Continuous Source Current (Body Diode)	—	—	-22	A	
I _{SM}	Pulse Source Current (Body Diode) ①	—	—	-88		
V _{SD}	Diode Forward Voltage	—	—	-3.0	V	T _J = 25°C, I _S = -22A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	—	300	rS	T _J = 25°C, I _F = -22A, di/dt ≤ -100A/μs V _{DD} ≤ -50V ④
Q _{RR}	Reverse Recovery Charge	—	—	1.5	μC	
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	—	—	0.83	°C/W	soldered to a 1"sq. copper-clad board
R _{thJ-PCB}	Junction-to-PC board	—	6.6	—		

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

For footnotes refer to the last page

Radiation Characteristics

IRHN9150, JANSR2N7422U

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) ¹		300K Rads (Si) ²		Units	Test Conditions
		Min	Max	Min	Max		
BV _{DSS}	Drain-to-Source Breakdown Voltage	-100	—	-100	—	V	V _{GS} = 0V, I _D = -1.0mA
V _{GS(th)}	Gate Threshold Voltage	-2.0	-4.0	-2.0	-5.0		V _{GS} = V _{DS} , I _D = -1.0mA
I _{GSS}	Gate-to-Source Leakage Forward	—	-100	—	-100	nA	V _{GS} = -20V
I _{GSS}	Gate-to-Source Leakage Reverse	—	100	—	100		V _{GS} = 20 V
I _{DSS}	Zero Gate Voltage Drain Current	—	-25	—	-25	μA	V _{DS} = -80V, V _{GS} = 0V
R _{DS(on)}	Static Drain-to-Source ④ On-State Resistance (TO-3)	—	0.081	—	0.081	Ω	V _{GS} = -12V, I _D = -14A
R _{DS(on)}	Static Drain-to-Source ④ On-State Resistance (SMD-1)	—	0.080	—	0.080	Ω	V _{GS} = -12V, I _D = -14A
V _{SD}	Diode Forward Voltage ④	—	-3.0	—	-3.0	V	V _{GS} = 0V, I _S = -22A

1. Part number IRHN9150 (JANSR2N7422U)

2. Part numbers IRHN93150 (JANSF2N7422U)

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. Single Event Effect Safe Operating Area

Ion	LET MeV/(mg/cm ²)	Energy (MeV)	Range (μm)	V _{DS} (V)				
				@V _{GS} =0V	@V _{GS} =5V	@V _{GS} =10V	@V _{GS} =15V	@V _{GS} =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	—	—	—	—

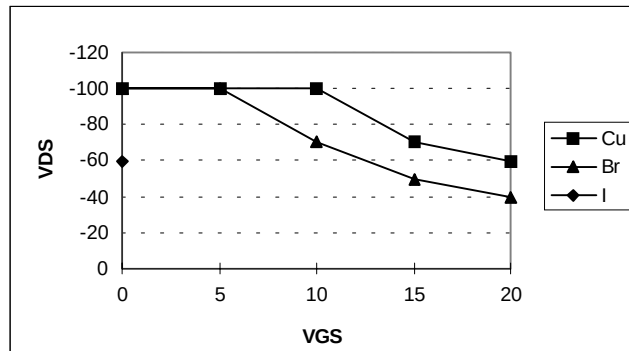


Fig a. Single Event Effect, Safe Operating Area

For footnotes refer to the last page

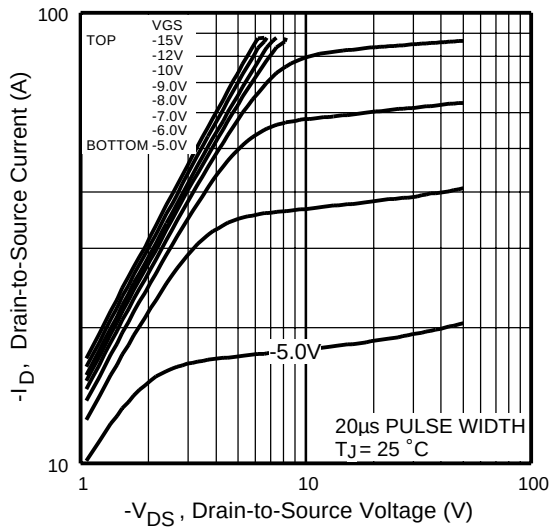


Fig1. Typical Output Characteristics

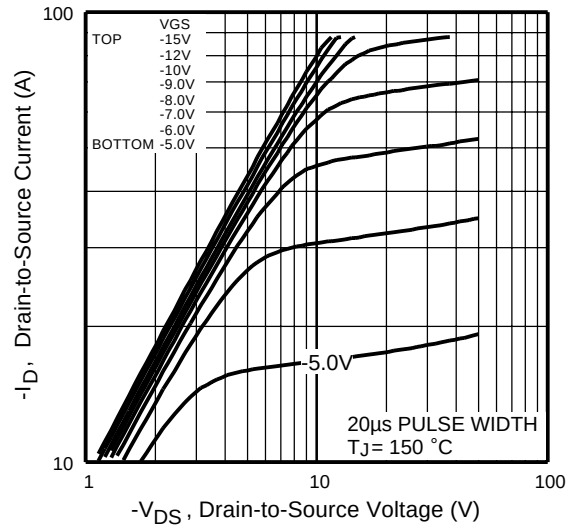


Fig2. Typical Output Characteristics

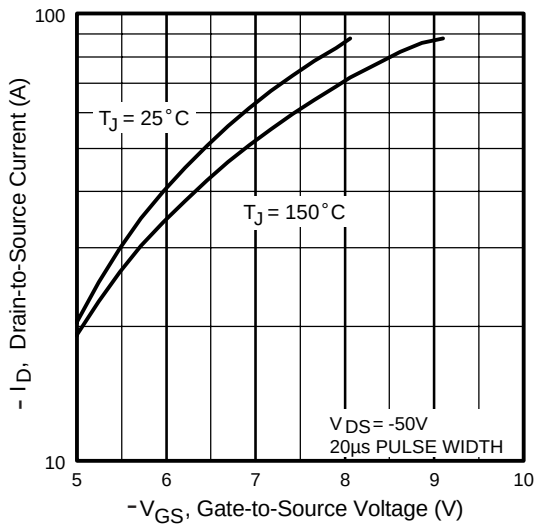
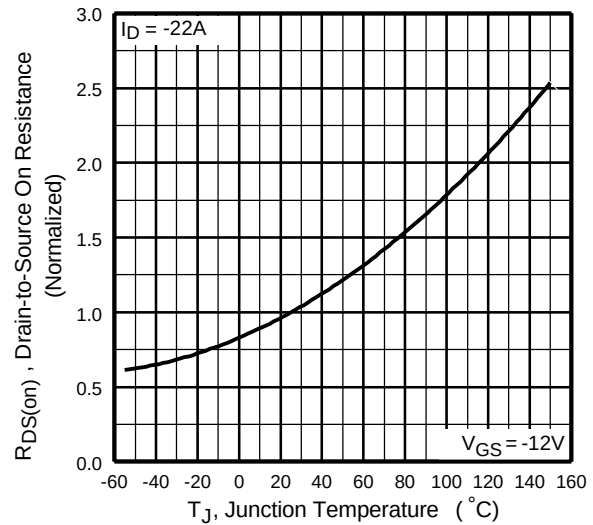


Fig3. Typical Transfer Characteristics

Fig4. Normalized On-Resistance
Vs. Temperature

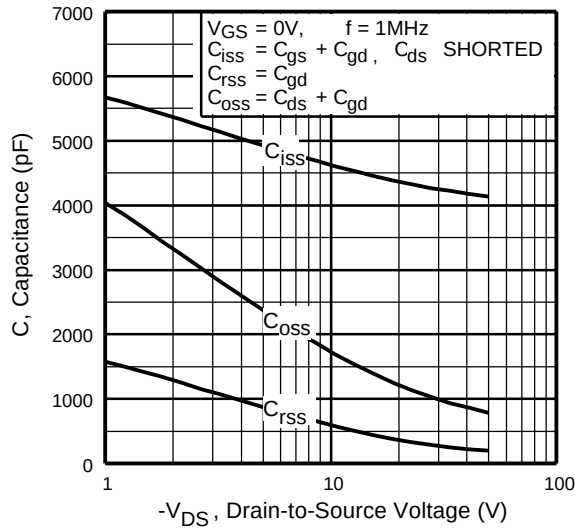


Fig5. Typical Capacitance Vs.
Drain-to-Source Voltage

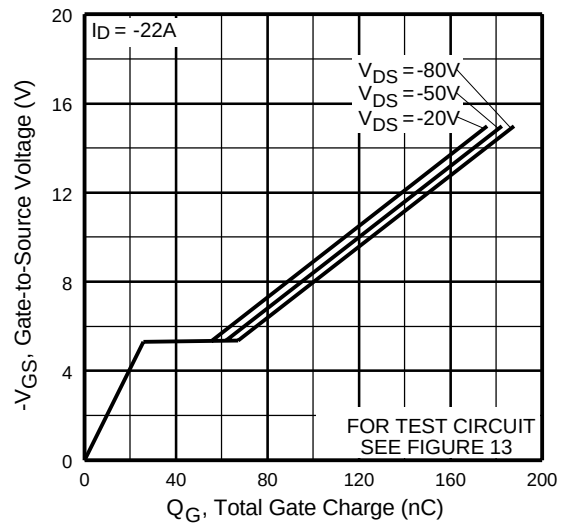


Fig6. Typical Gate Charge Vs.
Gate-to-Source Voltage

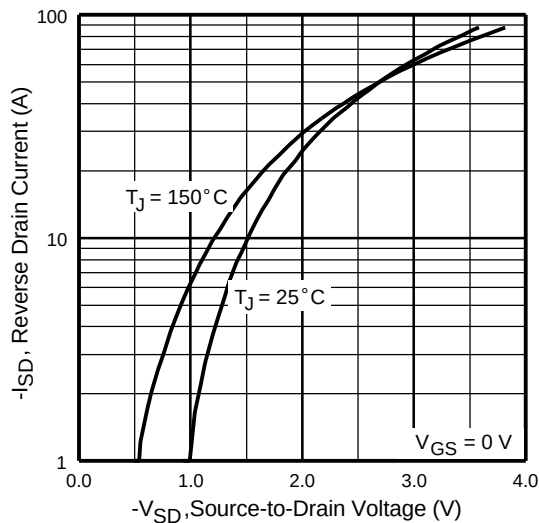


Fig7. Typical Source-Drain Diode
Forward Voltage

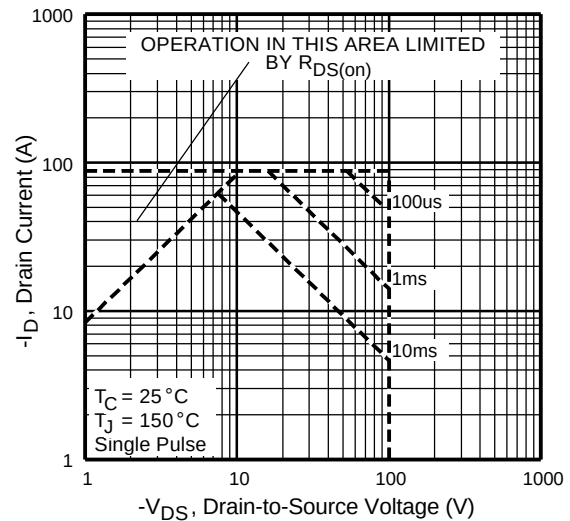


Fig8. Maximum Safe Operating Area

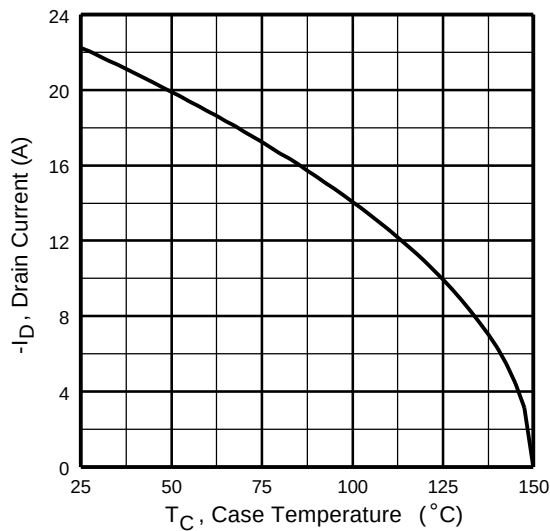


Fig9. Maximum Drain Current Vs. Case Temperature

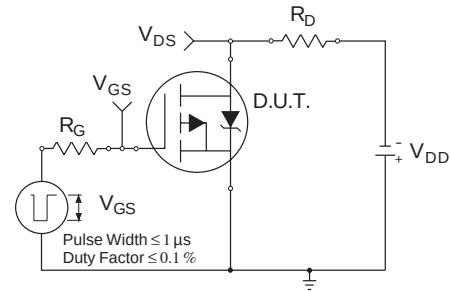


Fig10a. Switching Time Test Circuit

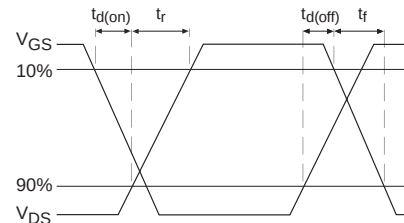


Fig10b. Switching Time Waveforms

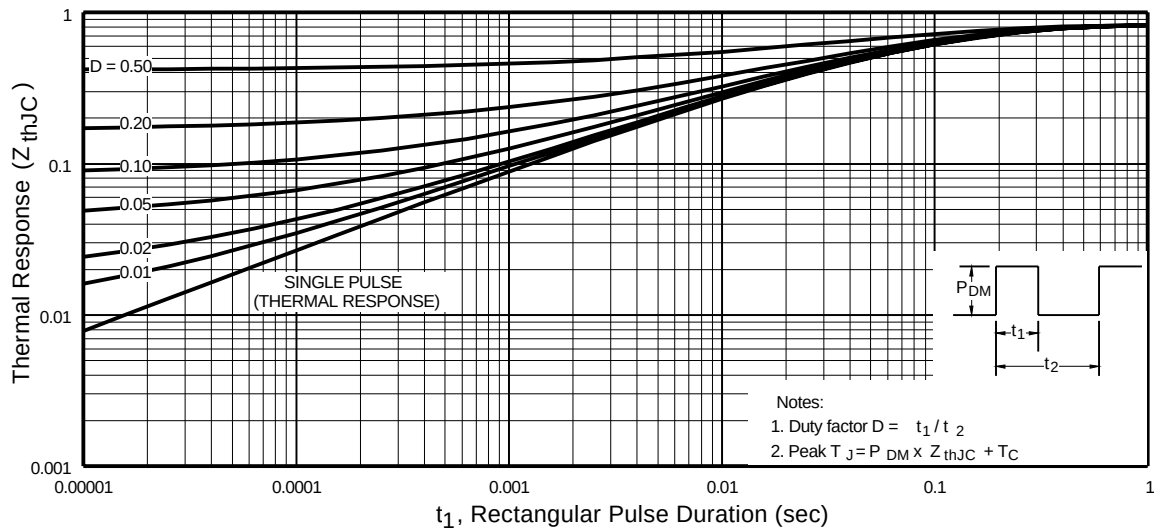


Fig11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Pre-Irradiation

IRHN9150, JANSR2N7422U

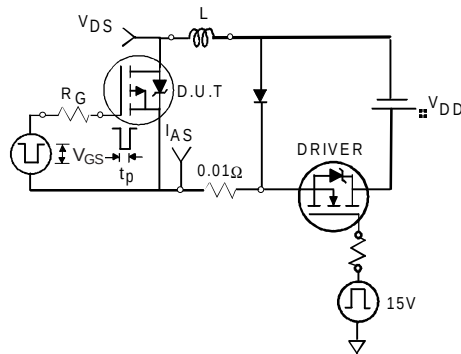


Fig 12a. Unclamped Inductive Test Circuit

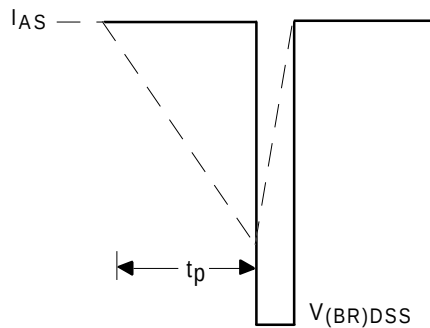


Fig 12b. Unclamped Inductive Waveforms

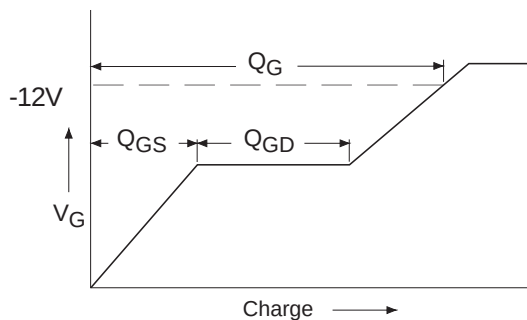


Fig 13a. Basic Gate Charge Waveform

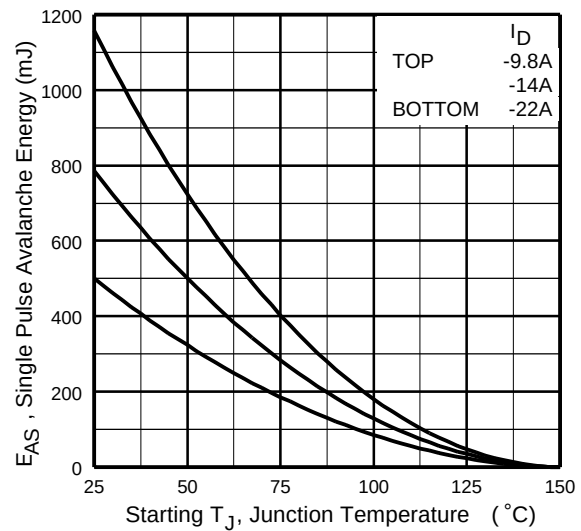


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

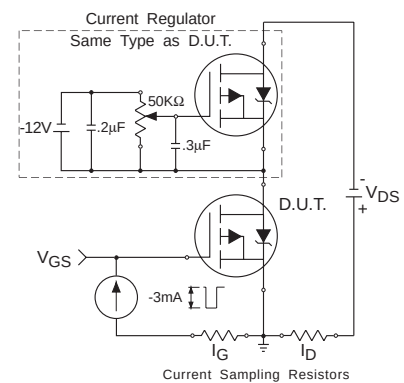
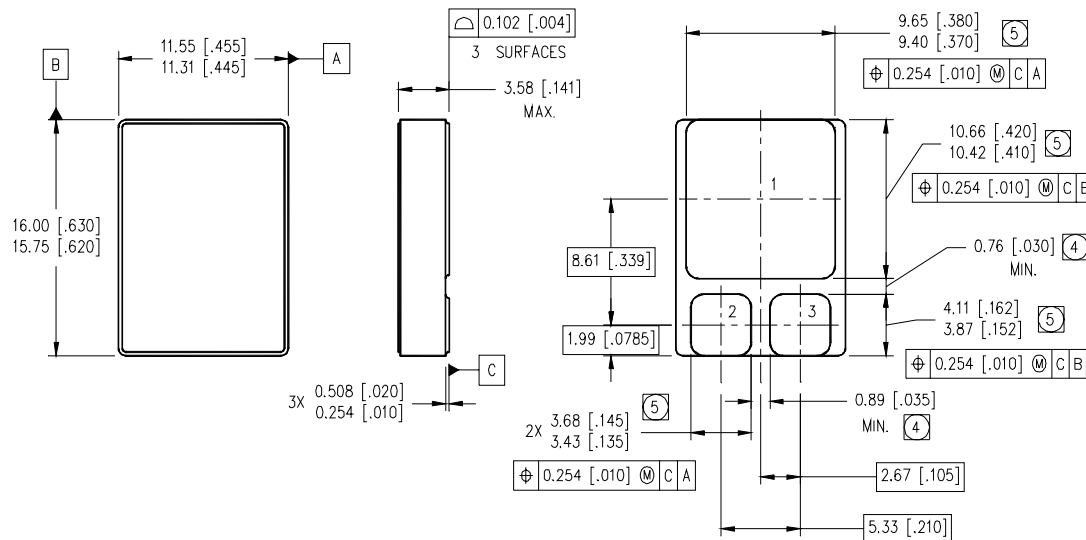


Fig 13b. Gate Charge Test Circuit

Foot Notes:

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ② $V_{DD} = -25V$, 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 — SMD-1**NOTES:**

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- ④ DIMENSION INCLUDES METALLIZATION FLASH.
- ⑤ DIMENSION DOES NOT INCLUDE METALLIZATION FLASH.

PAD ASSIGNMENTS

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

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