

## RADIATION HARDENED N-CHANNEL MOSFET

Reference MIL-PRF-19500/614

**DEVICES**
**2N7381**
**LEVELS**

**JANSM (3K RAD(Si))**  
**JANSJ (10K RAD(Si))**  
**JANSR (100K RAD(Si))**  
**JANSF (300K RAD(Si))**

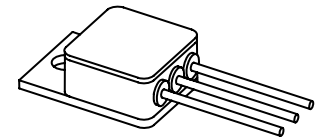
**ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$  unless otherwise noted)**

Parameters / Test Conditions	Symbol	Value	Unit
Drain – Source Voltage	$V_{DS}$	200	Vdc
Gate – Source Voltage	$V_{GS}$	$\pm 20$	Vdc
Continuous Drain Current $T_C = +25^\circ\text{C}$	$I_{D1}$	9.4	A <sub>dc</sub>
Continuous Drain Current $T_C = +100^\circ\text{C}$	$I_{D2}$	6.0	A <sub>dc</sub>
Max. Power Dissipation	$P_{tl}$	75 <sup>(1)</sup>	W
Drain to Source On State Resistance	$R_{ds(on)}$	0.40 <sup>(2)</sup>	$\Omega$
Operating & Storage Temperature	$T_{op}, T_{stg}$	-55 to +150	$^\circ\text{C}$

**Note:** (1) Derated Linearly by 0.6 W/ $^\circ\text{C}$  for  $T_C > +25^\circ\text{C}$   
 (2)  $V_{GS} = 12\text{Vdc}$ ,  $I_D = 6.0\text{A}$

**PRE-IRRADIATION ELECTRICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise noted)**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Drain-Source Breakdown Voltage $V_{GS} = 0\text{V}$ , $I_D = 1\text{mA}$	$V_{(BR)DSS}$	200		Vdc
Gate-Source Voltage (Threshold) $V_{DS} \geq V_{GS}$ , $I_D = 1.0\text{mA}$ $V_{DS} \geq V_{GS}$ , $I_D = 1.0\text{mA}$ , $T_j = +125^\circ\text{C}$ $V_{DS} \geq V_{GS}$ , $I_D = 1.0\text{mA}$ , $T_j = -55^\circ\text{C}$	$V_{GS(th)1}$ $V_{GS(th)2}$ $V_{GS(th)3}$	2.0 1.0	4.0 5.0	Vdc
Gate Current $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$ $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$ , $T_j = +125^\circ\text{C}$	$I_{GSS1}$ $I_{GSS2}$		$\pm 100$ $\pm 200$	nA <sub>dc</sub>
Drain Current $V_{GS} = 0\text{V}$ , $V_{DS} = 160\text{V}$ $V_{GS} = 0\text{V}$ , $V_{DS} = 160\text{V}$ , $T_j = +125^\circ\text{C}$	$I_{DSS1}$ $I_{DSS2}$		25 0.25	$\mu\text{A}$ <sub>dc</sub> mA <sub>dc</sub>
Static Drain-Source On-State Resistance $V_{GS} = 12\text{V}$ , $I_D = 6.0\text{A}$ pulsed $V_{GS} = 12\text{V}$ , $I_D = 9.4\text{A}$ pulsed $T_j = +125^\circ\text{C}$ $V_{GS} = 12\text{V}$ , $I_D = 6.0\text{A}$ pulsed	$r_{DS(on)1}$ $r_{DS(on)2}$ $r_{DS(on)3}$		0.40 0.49 0.75	$\Omega$ $\Omega$ $\Omega$
Diode Forward Voltage $V_{GS} = 0\text{V}$ , $I_D = 9.4\text{A}$ pulsed	$V_{SD}$		1.4	Vdc



**TO-257AA**  
**JANSR2N7381, JANSF2N7381**  
 See Figure 1

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### DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Gate Charge:				
On-State Gate Charge	$Q_{g(on)}$		50	nC
Gate to Source Charge	$Q_{gs}$		10	
Gate to Drain Charge	$Q_{gd}$		25	
	$V_{GS} = 12V, I_D = 9.4A$ $V_{DS} = 100V$			

### SWITCHING CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Switching time tests:				
Turn-on delay time	$t_{d(on)}$		25	ns
Rinse time	$t_r$		50	
Turn-off delay time	$t_{d(off)}$		70	
Fall time	$t_f$		60	
Diode Reverse Recovery Time	$t_{rr}$		460	ns
	$I_D = 9.4A, V_{GS} = 12Vdc,$ Gate drive impedance = $7.5\Omega,$ $V_{DD} = 100Vdc$			
	$di/dt \leq 100A/\mu s, V_{DD} \leq 30V,$ $I_F = 9.4A$			

### POST-IRRADIATION ELECTRICAL CHARACTERISTICS (3) ( $T_A = +25^\circ C$ , unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Drain-Source Breakdown Voltage $V_{GS} = 0V, I_D = 1mA_{dc}$	$V_{(BR)DSS}$	200		Vdc
Gate-Source Voltage (Threshold) $V_{DS} \geq V_{GS}, I_D = 1.0mA$ MSR $V_{DS} \geq V_{GS}, I_D = 1.0mA$ MSF	$V_{GS(th)1}$ $V_{GS(th)1}$	2.0 1.25	4.0 4.5	Vdc
Gate Current $V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS1}$		$\pm 100$	nA <sub>dc</sub>
Drain Current $V_{GS} = 0V, V_{DS} = 160V$ MSR $V_{GS} = 0V, V_{DS} = 160V$ MSF	$I_{DSS1}$		25 50	$\mu A_{dc}$
Static Drain-Source On-State Voltage $V_{GS} = 12V, I_D = 6.0A$ pulsed MSR $V_{GS} = 12V, I_D = 6.0A$ pulsed MSF	$V_{DS(on)}$		2.4 3.18	Vdc
Diode Forward Voltage $V_{GS} = 0V, I_D = 9.4A$ pulsed	$V_{SD}$		1.4	Vdc

#### NOTE:

- (3) Post-Irradiation Electrical Characteristics apply to devices subjected to Steady State Total Dose Irradiation testing in accordance with MIL-STD-750 Method 1019. Separate samples are tested for VGS bias (12V), and VDS bias (160V) conditions.

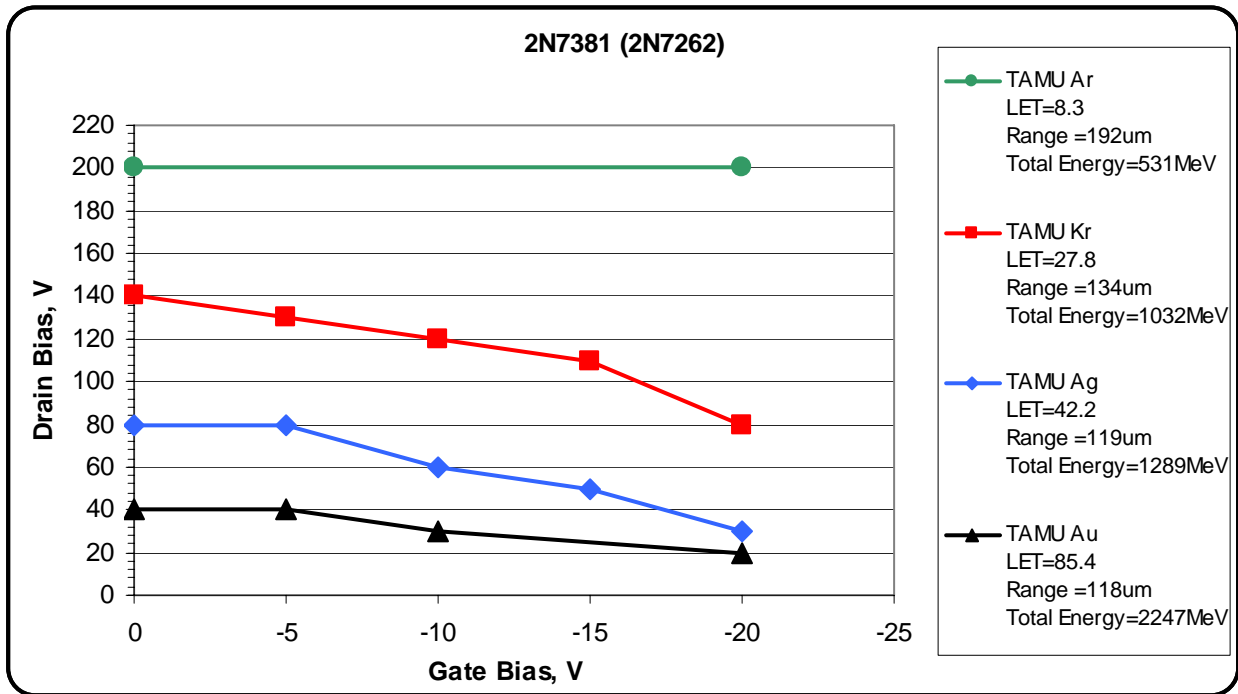
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 1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803  
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### Single Event Effect (SEE) Characteristics:

Heavy Ion testing of the 2N7381 device was completed by similarity of die structure to the 2N7262. The 2N7262 has been characterized at the Texas A&M cyclotron. The following SOA curve has been established using the elements, LET, range, and Total Energy conditions as shown:

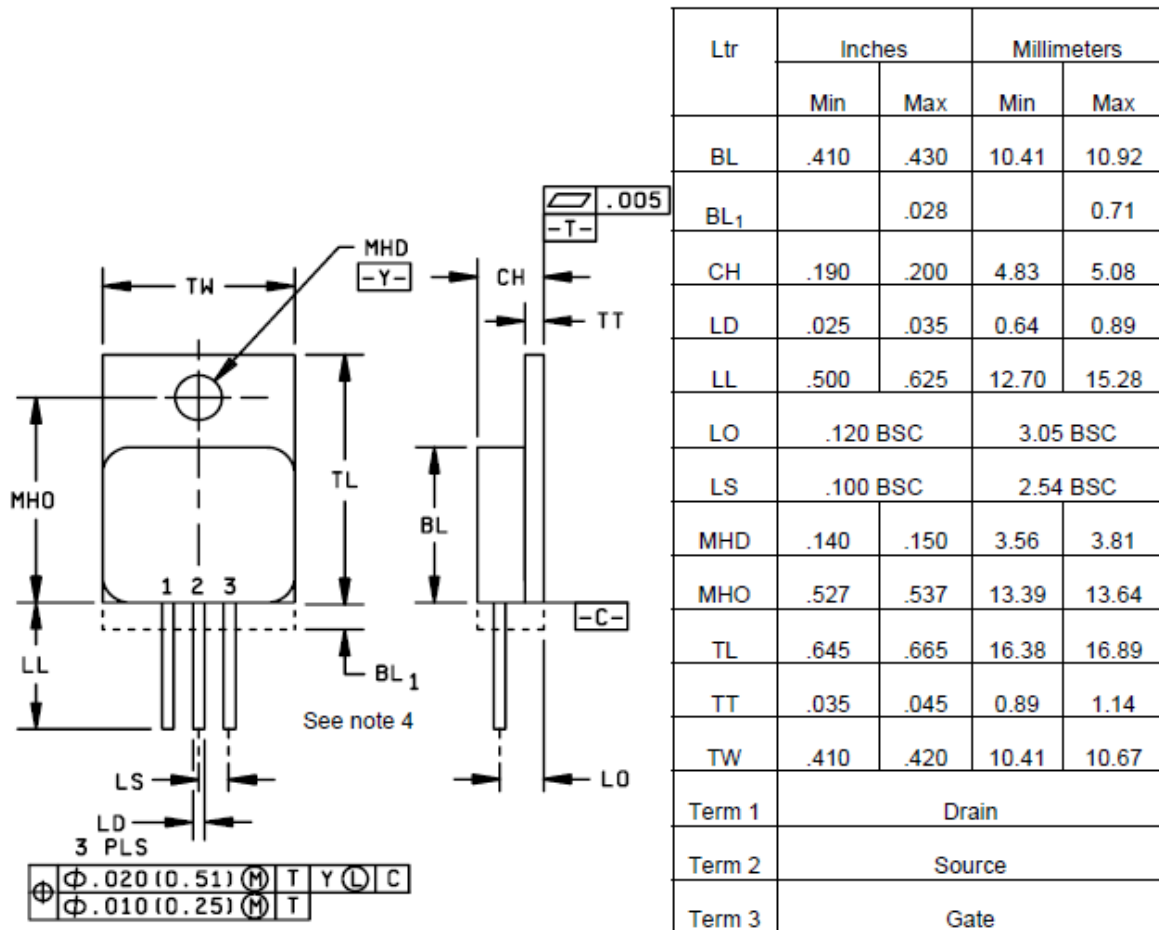


It should be noted that total energy levels are considered to be a factor in SEE characterization. Comparisons to other datasets should not be based on LET alone. Please consult factory for more information.

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**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. All terminals are isolated from case.
4. This area is for the lead feed-through eyelets (configuration is optional, but will not extend beyond this zone).
5. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi$ x symbology.

**Figure 1: Case Outline and Pin Configuration for JANSR2N7381 & JANSF2N7381**