

## RADIATION HARDENED P-CHANNEL MOSFET

Qualified per MIL-PRF-19500/630

**DEVICES**
**2N7389**
**2N7389U**
**LEVELS**
**JANSR(100K RAD(Si))**
**JANSF(300K RAD(Si))**
**ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$  unless otherwise noted)**

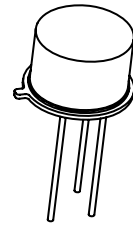
Parameters / Test Conditions	Symbol	Value	Unit
Drain – Source Voltage	$V_{DS}$	-100	Vdc
Gate – Source Voltage	$V_{GS}$	$\pm 20$	Vdc
Continuous Drain Current $T_C = +25^\circ\text{C}$	$I_{D1}$	-6.5	A <sub>dc</sub>
Continuous Drain Current $T_C = +100^\circ\text{C}$	$I_{D2}$	-4.1	A <sub>dc</sub>
Max. Power Dissipation	$P_{tl}$	25 <sup>(1)</sup>	W
Drain to Source On State Resistance	$R_{ds(on)}$	0.3 <sup>(2)</sup>	$\Omega$
Operating & Storage Temperature	$T_{op}, T_{stg}$	-55 to +150	$^\circ\text{C}$

**Note:** (1) Derated Linearly by 0.2 W/ $^\circ\text{C}$  for  $T_C > +25^\circ\text{C}$

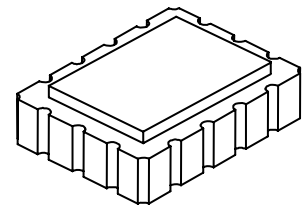
(2)  $V_{GS} = -12\text{Vdc}$ ,  $I_D = -4.1\text{A}$

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Drain-Source Breakdown Voltage $V_{GS} = 0\text{V}$ , $I_D = -1\text{mA}$	$V_{(BR)DSS}$	-100		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 $V_{GS} = 0\text{V}$ , $V_{DS} = -80\text{V}$ $V_{GS} = 0\text{V}$ , $V_{DS} = -80\text{V}$ , $T_j = +125^\circ\text{C}$	$I_{DSS1}$ $I_{DSS2}$		-25 -0.25	$\mu\text{A}$ <sub>dc</sub> mA <sub>dc</sub>
Static Drain-Source On-State Resistance $V_{GS} = -12\text{V}$ , $I_D = -4.1\text{A}$ pulsed $V_{GS} = -12\text{V}$ , $I_D = -6.5\text{A}$ pulsed $T_j = +125^\circ\text{C}$ $V_{GS} = -12\text{V}$ , $I_D = -4.1\text{A}$ pulsed	$r_{DS(on)1}$ $r_{DS(on)2}$ $r_{DS(on)3}$		0.3 0.35 0.54	$\Omega$ $\Omega$ $\Omega$
Diode Forward Voltage $V_{GS} = 0\text{V}$ , $I_D = -6.5\text{A}$ pulsed	$V_{SD}$		-3.0	Vdc



**TO-205AF**  
**(modified TO-39)**  
**JANSR2N7389, JANSF2N7389**  
 See Figure 1



**18 PIN LEADLESS CHIP**  
**CARRIER**  
**JANSR2N7389U, JANSF2N7389U**  
 See Figure 2

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### DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Gate Charge: On-State Gate Charge Gate to Source Charge Gate to Drain Charge	$Q_{g(on)}$ $Q_{gs}$ $Q_{gd}$		45 10 25	nC
		$V_{GS} = -12V, I_D = -6.5A$ $V_{DS} = -50V$		

### SWITCHING CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Switching time tests: Turn-on delay time Rinse time Turn-off delay time Fall time	$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$		30 50 70 70	ns
		$I_D = -6.5A, V_{GS} = -12Vdc,$ Gate drive impedance = $7.5\Omega,$ $V_{DD} = -50Vdc$		
Diode Reverse Recovery Time	$t_{rr}$		250	ns
		$di/dt \leq -100A/\mu s, V_{DD} \leq -50V,$ $I_F = -6.5A$		

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Drain-Source Breakdown Voltage $V_{GS} = 0V, I_D = -1mA$	$V_{(BR)DSS}$	-100		Vdc
Gate-Source Voltage (Threshold) $V_{DS} \geq V_{GS}, I_D = -1.0mA$ JANSR $V_{DS} \geq V_{GS}, I_D = -1.0mA$ JANSF	$V_{GS(th)1}$ $V_{GS(th)1}$	-2.0 -2.0	-4.0 -5.0	Vdc
Gate Current $V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS1}$		$\pm 100$	nA dc
Drain Current $V_{GS} = 0V, V_{DS} = -80V$	$I_{DSS1}$		-25	$\mu A$ dc
Static Drain-Source On-State Voltage $V_{GS} = -12V, I_D = -4.1A$ pulsed	$V_{DS(on)}$		1.23	Vdc
Diode Forward Voltage $V_{GS} = 0V, I_D = -6.5A$ pulsed	$V_{SD}$		-3.0	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 (80V) conditions.

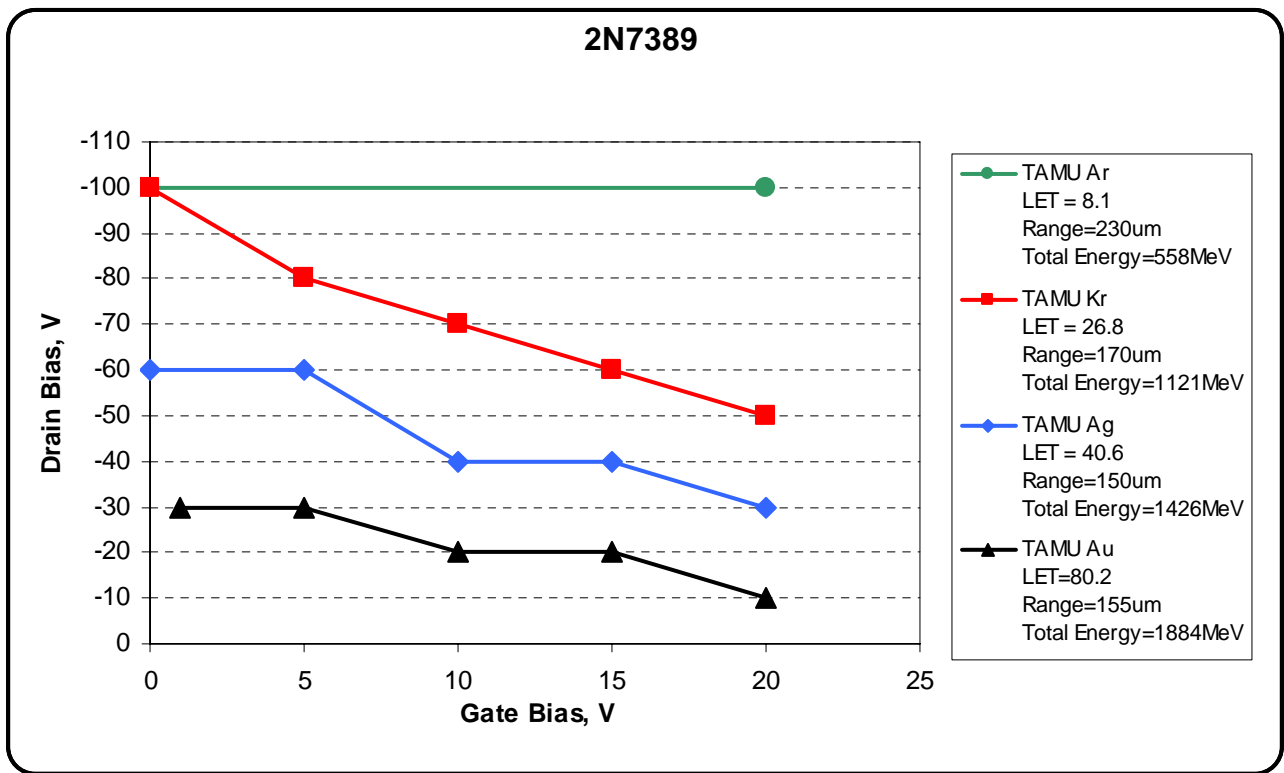
6 Lake Street, Lawrence, MA 01841  
 1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803  
 Website: <http://www.microsemi.com>

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### Single Event Effect (SEE) Characteristics:

Heavy Ion testing of the 2N7389 device 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:



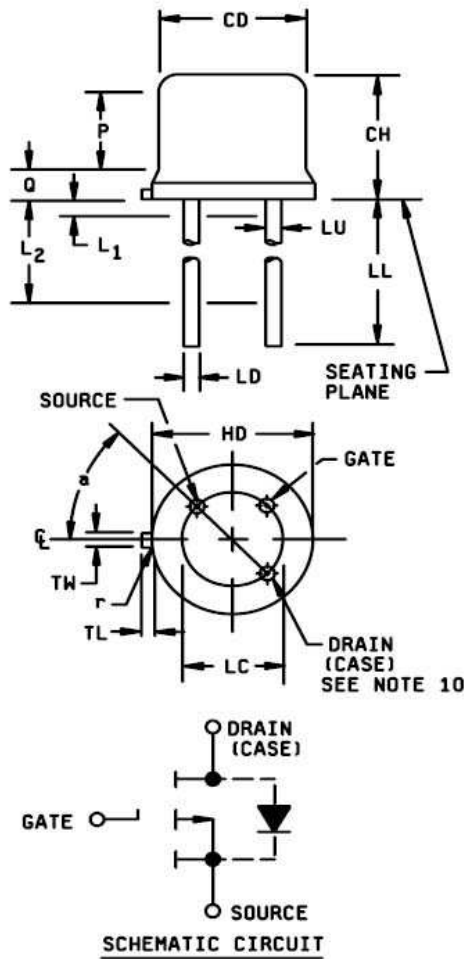
It should be noted that total energy levels are considered to be a factor in SEE characterization. Comparisons to other datasets should not be based on LET alone. Please consult factory for more information.

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Figure 1: Case Outline and Pin Configuration for JANSR2N7389 & JANSF2N7389



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	
CH	.160	.180	4.06	4.57	
HD	.335	.370	8.51	9.39	
LC	.200 TP		5.08 TP		6
LD	.016	.021	0.41	0.53	7, 8
LL	.500	.750	12.7	19.05	7, 8
LU	.016	.019	0.41	0.48	7, 8
L <sub>1</sub>		.050		1.27	7, 8
L <sub>2</sub>	.250		6.35		7, 8
P	.100		2.54		5
Q		.050		1.27	4
r		.010		0.25	9
TL	.029	.045	0.74	1.14	3
TW	.028	.034	0.71	0.86	2
α	45° TP		45° TP		6

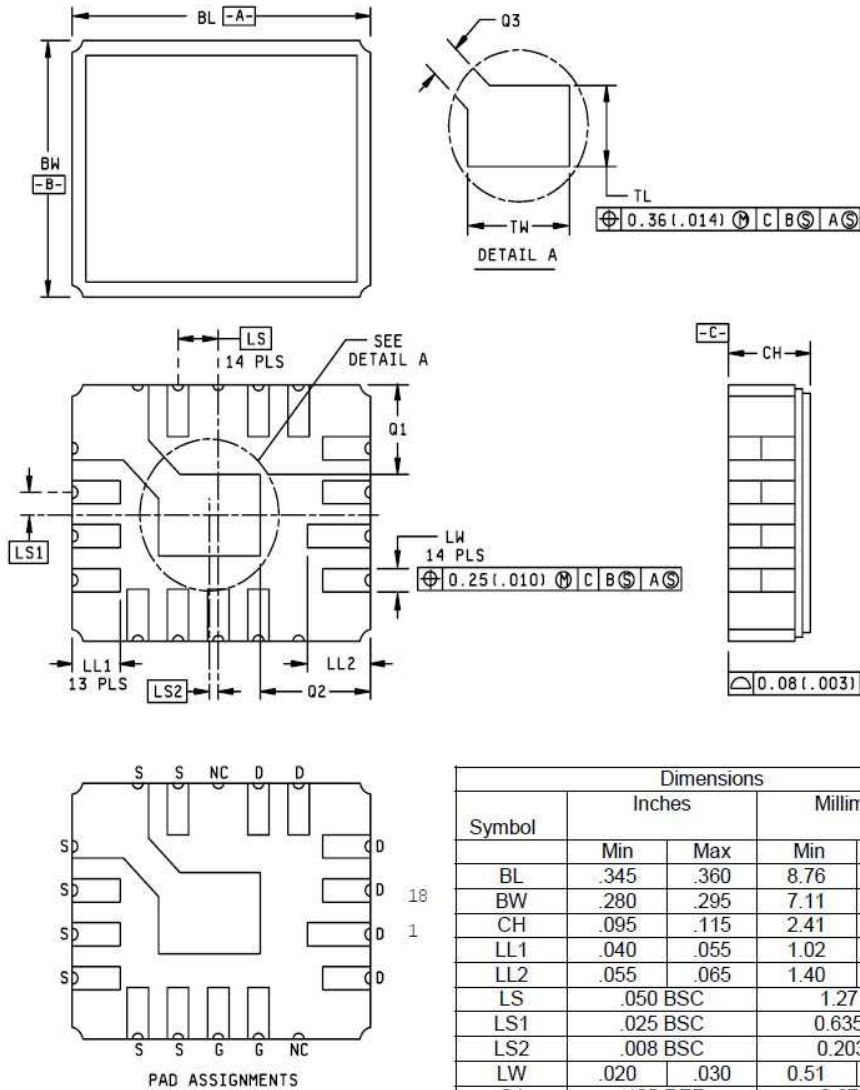
NOTES:

- Dimensions are in inches. Millimeters are given for general information only.
- Beyond radius (r) maximum, TW shall be held for a minimum length of .011 (0.28 mm).
- Dimension TL measured from maximum HD.
- Outline in this zone is not controlled.
- Dimension CD shall not vary more than .010 (0.25 mm) in zone P. This zone is controlled for automatic handling.
- Leads at gauge plane .054 +.001, -.000 (1.37 +0.03, -0.00 mm) below seating plane shall be within .007 (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
- LU applies between L<sub>1</sub> and L<sub>2</sub>. LD applies between L<sub>2</sub> and LL minimum. Diameter is uncontrolled in L<sub>1</sub> and beyond LL minimum.
- All three leads.
- Radius (r) applies to both inside corners of tab.
- Drain is electrically connected to the case.
- In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.

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## RADIATION HARDENED P-CHANNEL MOSFET Qualified per MIL-PRF-19500/630

**Figure 2: Case Outline and Pin Configuration for JANSR2N7389U & JANSF2N7389U**



**NOTES:**

- Dimensions are in inches.
- Millimeters are given for general information only.
- In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.