

The documentation and process conversion measures necessary to comply with this revision shall be completed by 22 May 2002.

INCH-POUND

MIL-PRF-19500/614B
 22 February 2002
 SUPERSEDING
 MIL-PRF-19500/614A
 3 May 1996

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, FIELD EFFECT RADIATION HARDENED TRANSISTOR,
 N-CHANNEL, SILICON, TYPES 2N7380 AND 2N7381
 JANTXV M, D, R, F, G, AND H, JANS M, D, R, F, G, AND H

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for an N-channel, radiation hardened, enhancement mode, MOSFET, power transistor intended for use in high density power switching applications. Two levels of product assurance are provided for each device type as specified in MIL-PRF-19500, with avalanche energy ratings (E_{AS}) and maximum avalanche current (I_{AS}).

1.2 Physical dimensions. See figure 1 (T0-257AA).

1.3 Maximum ratings. Unless otherwise specified, $T_C = +25^\circ\text{C}$.

Type	Min $V_{(BR)DSS}$ $V_{GS} = 0\text{ V}$ $I_D = 1.0\text{ mA dc}$	P_T (1) $T_C = +25^\circ\text{C}$	P_T $T_A = +25^\circ\text{C}$ (free air)	V_{GS}	I_{D1} (2) $T_C = +25^\circ\text{C}$	I_{D2} (2) $T_C = +100^\circ\text{C}$	T_J and T_{STG}
	<u>V dc</u>	<u>W</u>	<u>W</u>	<u>V dc</u>	<u>A dc</u>	<u>A dc</u>	<u>°C</u>
2N7380	100	75	2	± 20	14.4	9.1	-55 to +150
2N7381	200	75	2	± 20	9.4	6.0	-55 to +150

Type	I_S	I_{DM} (3)	Max $r_{DS(on)}$ (1) $V_{GS} = 12\text{ V dc}$ $I_D = I_{D2}$		$R_{\theta JC}$ max	E_{AS} max	I_{AS}
			$T_J = +25^\circ\text{C}$	$T_J = +150^\circ\text{C}$			
	<u>A dc</u>	<u>A(pk)</u>	<u>Ω</u>	<u>Ω</u>	<u>°C/W</u>	<u>mJ</u>	<u>A dc</u>
2N7380	14.4	57	0.18	0.33	1.67	150	14.4
2N7381	9.4	37	0.40	0.84	1.67	150	9.4

(1) Derate linearly by $0.6\text{ W}/^\circ\text{C}$ for $T_C > +25^\circ\text{C}$; $P_T = \frac{T_{JMAX} - T_C}{R_{\theta JC}}$

(2)
$$I_D = \sqrt{\frac{T_J \text{ max} - T_C}{(R_{\theta JC}) \times (R_{DS(on)} \text{ at } T_{Jmax})}}$$

(3) $I_{DM} = 4 \times I_{D1}$; I_{D1} as calculated by footnote (2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center Columbus, ATTN: DSCC-VAC, P.O. Box 3990 Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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1.4 Primary electrical characteristics. Unless otherwise specified, $T_C = +25^\circ\text{C}$.

Type	Min $V_{(BR)DSS}$ $V_{GS} = 0\text{ V}$ $I_D = 1.0\text{ mA dc}$	$V_{GS(th)1}$ $V_{DS} \geq V_{GS}$ $I_D = 1.0\text{ mA dc}$		$I_{DSS\text{ max}}$ $V_{GS} = 0\text{ V}$	Max $r_{DS(on)1}$ (1) $V_{GS} = 12\text{ V}; I_D = I_{D2}$
				$V_{DS} = 80\text{ percent}$ of rated V_{DS}	$T_J = +25^\circ\text{C}$
	<u>V dc</u>	<u>V dc</u>		<u>$\mu\text{A dc}$</u>	<u>Ω</u>
		Min	Max		
2N7380	100	2.0	4.0	25	0.18
2N7381	200	2.0	4.0	25	0.40

(1) Pulsed (see 4.5.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

\ DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

STANDARD

DEPARTMENT OF DEFENSE

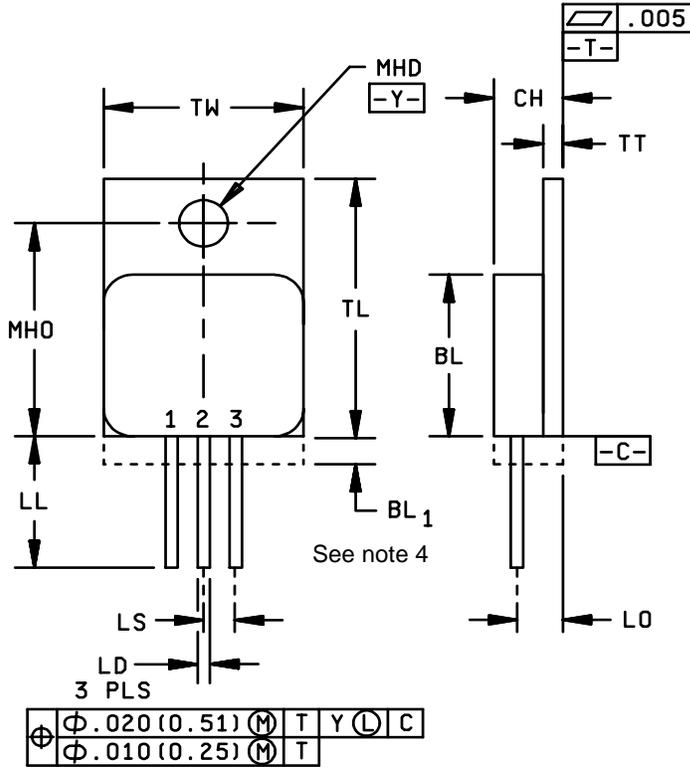
MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

* 3.1 General. The requirements for acquiring the product described herein shall consist of this document and MIL-PRF-19500.



Ltr	Inches		Millimeters	
	Min	Max	Min	Max
BL	.410	.420	10.41	10.67
BL ₁		.033		0.84
CH	.190	.200	4.83	5.08
LD	.025	.035	0.64	0.89
LL	.600	.650	15.24	16.51
LO	.120 BSC		3.05 BSC	
LS	.100 BSC		2.54 BSC	
MHD	.140	.150	3.56	3.81
MHO	.527	.537	13.39	13.64
TL	.645	.665	16.38	16.89
TT	.035	.045	0.89	1.14
TW	.410	.420	10.41	10.67
Term 1	Drain			
Term 2	Source			
Term 3	Gate			

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. All terminals are isolated from case.
4. This area is for the lead feed-thru eyelets (configuration is optional, but will not extend beyond this zone).

FIGURE 1. Dimensions and configuration (T0-257AA).

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* 3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.3).

* 3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500

* 3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1. Methods used for electrical isolation of the terminal feedthroughs shall employ materials that contain a minimum of 90 percent AL_2O_3 (ceramic). Examples of such construction techniques are metallized ceramic eyelets or ceramic walled packages.

* 3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.4.2 Internal construction. Multiple chip construction shall not be permitted.

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.6 Electrostatic discharge protection. The devices covered by this specification require electrostatic protection.

3.6.1 Handling. MOS devices must be handled with certain precautions to avoid damage due to the accumulation of static charge. The following handling procedures shall be followed:

- a. Devices shall be handled on benches with conductive handling devices.
- b. Ground test equipment, tools, and personnel handling devices.
- c. Do not handle devices by the leads.
- d. Store devices in conductive foam or carriers.
- e. Avoid use of plastic, rubber, or silk in MOS areas.
- f. Maintain relative humidity above 50 percent, if practical.
- g. Care shall be exercised, during test and troubleshooting, to apply not more than maximum rated voltage to any lead.
- h. Gate must be terminated to source. $R \leq 100 \text{ k}$, whenever bias voltage is to be applied drain to source.

* 3.7 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3.

* 3.8 Electrical test requirements. The electrical test requirements shall be group A as specified herein.

* 3.9 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

* 4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3).
- c. Conformance inspection (see 4.4 and tables I and II).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500.

* 4.2.1 Group E inspection. Group E inspection shall be conducted in accordance with MIL-PRF-19500, and table III herein.

* 4.3 Screening (JANS and JANTXV levels only). Screening shall be in accordance with table IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTXV level
(1)	Thermal response (see 4.5.3)	Thermal response (see 4.5.3)
(1) (2)	Method 3470 of MIL-STD-750. (see 4.5.5)	Method 3470 of MIL-STD-750. (see 4.5.5)
(1) (2)	Gate stress test (see 4.5.4)	Gate stress test (see 4.5.4)
(1) 9	I_{GSS1} , I_{DSS1} , subgroup 2 of table I herein;	Not applicable
10	Method 1042 of MIL-STD-750, test condition B	Method 1042 of MIL-STD-750, test condition B
11	I_{GSS1} , I_{DSS1} , $r_{DS(on)1}$, $V_{GS(th)1}$ Subgroup 2 of table I herein. $\Delta I_{GSS1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 25$ μ A dc or ± 100 percent of initial value, whichever is greater.	I_{GSS1} , I_{DSS1} , $r_{DS(on)1}$, $V_{GS(th)1}$ Subgroup 2 of table I herein.
12	Method 1042 of MIL-STD-750, test condition A t = 240 hours	Method 1042 of MIL-STD-750, test condition A
13	Subgroup 2 and 3 of table I herein. $\Delta I_{GSS1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 25$ μ A dc or ± 100 percent of initial value, whichever is greater. $\Delta r_{DS(on)1} = \pm 20$ percent of initial value. $\Delta V_{GS(th)1} = \pm 20$ percent of initial value.	Subgroup 2 of table I herein. $\Delta I_{GSS1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 25$ μ A dc or ± 100 percent of initial value, whichever is greater. $\Delta r_{DS(on)1} = \pm 20$ percent of initial value. $\Delta V_{GS(th)1} = \pm 20$ percent of initial value.

- (1) Shall be performed anytime before screen 10.
- (2) This is a stress test designed to ensure a rugged product.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500 and table I herein. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table I, subgroup 2 herein.

4.4.2 Group B inspection (JANTX and JANTXV). Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) and table VIb (JANTX and JANTXV) of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with the applicable inspections of table I, group A, subgroup 2 herein.

* 4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	1051	Condition G
B4	1042	The heating cycle shall be 1 minute minimum, 2,000 cycles. No heat sink nor forced air cooling on the device shall be permitted.
B5	1042	Condition A; $V_{DS} = 100$ percent of rated; $T_A = +175^\circ\text{C}$, $t = 120$ hours or $T_A = +150^\circ\text{C}$, $t = 240$ hours; read and record $V_{BR(DSS)}$ (pre and post) at $I_D = 1$ mA; read and record I_{DSS} (pre and post), in accordance with table I, group A, subgroup 2.
B5	1042	Condition B; $V_{GS} = 100$ percent of rated $T_A = +175^\circ\text{C}$, $t = 24$ or $T_A = +150^\circ\text{C}$, $t = 48$ hours;.
B6	3161	See 4.5.3.

4.4.2.2 Group B inspection, table VIb (JANTX and JANTXV) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	1051	Condition G
B3	1042	The heating cycle shall be 1 minute minimum.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with the applicable inspections of table I, group A, subgroup 2 herein.

4.4.3.1 Group C inspection, table VII of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Test condition A, weight = 10 lbs, $t = 10$ seconds.
C6	1042	The heating cycle shall be 1 minute minimum.

4.5 Methods of inspection. Methods of inspection shall be as specified in appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurements shall be as specified in section 4 of MIL-STD-750.

* 4.5.2 Thermal resistance. Thermal resistance measurements shall be performed in accordance with method 3161 of MIL-STD-750. The maximum limit of $R_{\theta JC(max)}$ shall be $1.67^{\circ}C/W$. The following parameter measurements shall apply:

- a. Measuring current (I_M): 10 mA.
- b. Drain heating current (I_H): 2 A minimum.
- c. Heating time (t_H): Steady-state (see method 3161 of MIL-STD-750 for definition).
- d. Drain-source heating voltage (V_H): 15 V minimum.
- e. Measurement time delay (t_{MD}): 30 μs to 60 μs maximum.
- f. Sample window time (t_{SW}): 10 μs maximum.

* 4.5.3 Thermal impedance ($Z_{\theta JC}$ measurements). The $Z_{\theta JC}$ measurements shall be performed in accordance with MIL-STD-750, method 3161. The maximum limit (not to exceed figure 2, thermal impedance curves and the group A, subgroup 2 limits) for $Z_{\theta JC}$ in screening (table IV of MIL-PRF-19500) shall be derived by each vendor by means of statistical process control. When the process has exhibited control and capability, the capability data shall be used to establish the fixed screening limit. In addition to screening, once a fixed limit has been established, monitor all future sealing lots using a random five piece sample from each lot to be plotted on the applicable X, R chart. If a lot exhibits an out of control condition, the entire lot shall be removed from the line and held for engineering evaluation and disposition. This procedure may be used in lieu of an in line process monitor.

- a. Measuring current (I_M):10 mA.
- b. Drain heating current (I_H):2 A minimum.
- c. Heating time (t_H):50 ms.
- d. Drain-source heating voltage (V_H):15 V minimum.
- e. Measurement time delay (t_{MD}):30 μs to 60 μs maximum.
- f. Sample window time (t_{SW}):10 μs maximum.

4.5.4 Gate stress test.

- a. $V_{GS} = \pm 24$ V minimum.
- b. $t = 250$ μs minimum.

* 4.5.5 Single pulse avalanche energy (E_{AS}).

- a. Peak current (I_{AS}): I_{D1} .
- b. Peak gate voltage (V_{GS}): 12 V.
- c. Gate to source resistor (R_{GS}): $25 \leq R_{GS} \leq 200 \Omega$.
- d. Initial case temperature: $+25^{\circ}C$ $+10^{\circ}C$, $-5^{\circ}C$.
- e. Inductance: $(2 E_{AS}/I_{D1}^2)((V_{BR} - V_{DD})/V_{BR})$ mH minimum.
- f. Number of pulses to be applied: 1 pulse minimum.
- g. Supply voltage $V_{DD} = 50$ V, or 25 V for 100 V devices.

* TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical inspection	2071					
<u>Subgroup 2</u>						
Thermal impedance 2/	3161	See 4.5.3	$Z_{\theta JC}$		1.30	°C/W
Breakdown voltage drain to source 2N7380 2N7381	3407	$V_{GS} = 0V$, $I_D = 1$ mA dc, bias condition C	$V_{(BR)DSS}$	100 200		V dc V dc
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, $I_D = 1.0$ mA	$V_{GS(th)1}$	2.0	4.0	V dc
Gate current	3411	$V_{GS} = \pm 20$ V dc, $V_{DS} = 0$ V dc, bias condition C	I_{GSS1}		± 100	μA dc
Drain current	3413	$V_{GS} = 0$ V dc, $V_{DS} = 80$ percent of rated V_{DS} , bias condition C	I_{DSS1}		25	μA dc
Static drain to source on-state resistance 2N7380 2N7381	3421	$V_{GS} = 12$ V dc, condition A, pulsed (see 4.5.1), $I_D =$ rated I_{D2} (see 1.3)	$r_{DS(on)1}$		0.18 0.40	Ω Ω
Static drain to source on-state resistance 2N7380 2N7381	3421	$V_{GS} = 12$ V dc, condition A, pulsed (see 4.5.1), $I_D =$ rated I_{D1} (see 1.3)	$r_{DS(on)2}$		0.20 0.49	Ω Ω
Forward voltage (source drain diode) 2N7380 2N7381	4011	$V_{GS} = 0$ V dc, $I_D =$ rated I_{D1} pulsed (see 4.5.1)	V_{SD}		1.8 1.4	V dc V dc

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
<u>Subgroup 3</u>						
High temperature operation:						
Gate current	3411	$T_A = +125^\circ\text{C}$ Bias condition C, $V_{GS} = \pm 20\text{ V dc}$, $V_{DS} = 0\text{ V dc}$	I_{GSS2}		± 200	nA dc
Drain current	3413	Bias condition C, $V_{GS} = 0\text{ V dc}$, $V_{DS} = 80\text{ percent of rated } V_{DS}$	I_{DSS3}		0.25	nA dc
Static drain to source on-state 2N7380 2N7381	3421	$V_{GS} = 12\text{ V dc}$, pulsed (see 4.5.1), $I_D = \text{rated } I_{D2}$	$r_{DS(on)3}$		0.35 0.75	Ω Ω
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, $I_D = 1.0\text{ mA dc}$	$V_{GS(th)2}$	1.0		V dc
Low temperature operation:						
Gate to source voltage (threshold)	3403	$T_A = -55^\circ\text{C}$ $V_{DS} \geq V_{GS}$, $I_D = 1.0\text{ mA dc}$	$V_{GS(th)3}$		5.0	V dc
<u>Subgroup 4</u>						
Switching time test	3472	$I_D = \text{rated } I_{D1}$, $V_{GS} = 12\text{ V dc}$, gate drive impedance = $7.5\ \Omega$, $V_{DD} =$ 50 percent of $V_{BR(DSS)}$				
Turn-on delay time			$t_{d(on)}$		25	ns
Rise time			t_r		60 50	ns ns
Turn-off delay time			$t_{d(off)}$		40 70	ns ns
Fall time			t_f		30 60	ns ns

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
<u>Subgroup 4</u> - continued						
Forward transconductance	3475	$I_D = I_{D2}$, $V_{DD} = 15$ V dc see 4.5.1	g_{fs}		2.5	s
<u>Subgroup 5</u>						
Safe operating area test (high voltage)	3474	See figures 3 and 4; $t_p = 10$ ms, $V_{DS} = 80$ percent of rated $V_{BR(DSS)}$, $V_{DS} = 200$ V maximum				
Electrical measurements		See table I, group A, subgroup 2				
<u>Subgroup 6</u>						
Not applicable						
<u>Subgroup 7</u>						
Gate charge	3471	Condition B				
On-state gate charge 2N7380 2N7381			$Q_{g(on)}$		40 50	nC nC
Gate to source charge			Q_{gs}		10	nC
Gate to drain charge 2N7380 2N7381			Q_{gd}		20 25	nC nC
Reverse recovery time 2N7380 2N7381	3473	$dI/dt \leq 100$ A/ μ s, $V_{DD} \leq 50$ V, $I_D = I_{D1}$	t_{rr}		275 460	ns ns

1/ For sampling plan, see MIL-PRF-19500.

2/ This test is required for the following endpoint measurements only:

JANS - group B, subgroup 3 and 4; JANTX and JANTXV - group B, subgroup 2 and 3; group C, subgroup 6; group E, subgroup 1.

TABLE II. Group D inspection.

Inspection <u>1/ 2/ 3/</u>	MIL-STD-750		Symbol	Pre-irradiation limits				Post-irradiation limits				Unit
	Method	Conditions		M, D, and R		F, G, and H <u>4/</u>		M, D, and R		F, G, and H <u>4/</u>		
				Min	Max	Min	Max	Min	Max	Min	Max	
<u>Subgroup 2</u>		$T_C = +25^\circ\text{C}$										
Steady-state total dose irradiation (V_{GS} bias) <u>5/</u>	1019	$V_{GS} = 12\text{ V}$ $V_{DS} = 0\text{ V}$										
Steady-state total dose irradiation (V_{DS} bias) <u>5/</u>	1019	$V_{GS} = 0\text{ V}$, $V_{DS} = 80$ percent of rated V_{DS} (pre-irradiation)										
End-point electrical:												
Breakdown voltage, drain to source 2N7380 2N7381	3407	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$ bias condition C	$V_{(BR)DSS}$	100 200		100 200		100 200		100 200		V dc V dc
Gate to source voltage <u>4/</u> (threshold)	3403	$V_{DS} \geq V_{GS}$ $I_D = 1\text{ mA}$	V_{GSth}	2.0	4.0	2.0	4.0	2.0	4.0	1.25	4.5	V dc
Gate current	3411	$V_{GS} = 20\text{ V}$ $V_{DS} = 0\text{ V}$, bias condition C	I_{GSSF1}		100		100		100		100	nA dc
Gate current	3411	$V_{GS} = 20\text{ V}$ $V_{DS} = 0\text{ V}$, bias condition C	I_{GSSR1}		-100		-100		-100		-100	nA dc

See footnotes at end of table.

*TABLE II. Group D inspection - Continued.

Inspection <u>1/</u> <u>2/</u> <u>3/</u>	MIL-STD-750		Symbol	Pre-irradiation limits				Post-irradiation limits				Unit
	Method	Conditions		M, D, and R		F, G, and H <u>4/</u>		M, D, and R		F, G, and H <u>4/</u>		
				Min	Max	Min	Max	Min	Max	Min	Max	
<u>Subgroup 2</u> - Continued		T _C = +25°C										
Drain current 2N7380 2N7381	3413	V _{GS} = 0 V Bias condition C V _{DS} = 80 percent of rated V _{DS} (pre- irradiation)	I _{DSS}		25 25	25 25	25 25	50 50	μA dc μA dc			
Static drain to source on-state voltage 2N7380 2N7381	3405	V _{GS} = 12 V, Condition A pulsed, see 4.5.1. I _D = I _{D2}	V _{DS(ON)}		1.638 2.4	1.638 2.4	1.638 2.4	2.184 3.18	V dc V dc			
Forward voltage source drain diode 2N7380 2N7381	4011	V _{GS} = 0 V, I _D = I _{D1} , bias condition C	V _{SD}		1.8 1.4	1.8 1.4	1.8 1.4	1.8 1.4	V V			

1/ For sampling plan, see MIL-PRF-19500.

2/ Separate samples shall be pulled for each bias.

3/ Group D qualification may be performed anytime prior to lot formation. Wafers qualified to these group D QCI requirements may be used for any other specification sheet utilizing the same die design.

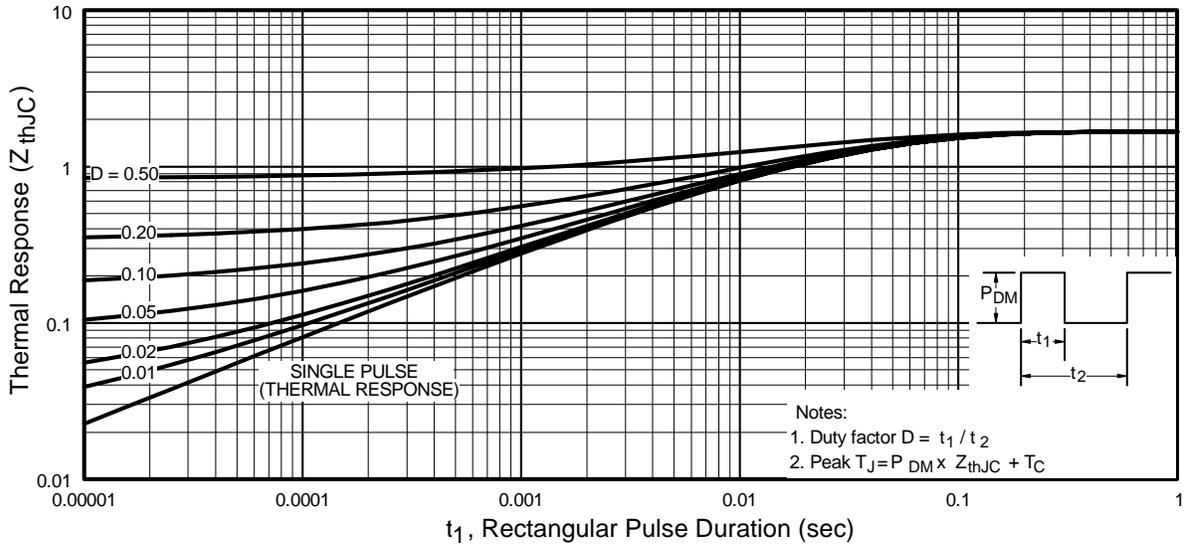
4/ The F designation represents devices which pass end-points at both 100K and 300K rads (Si). The G designation represents devices which pass 100K, 300K and 600K rad (Si) end-points.

5/ H must meet end points for 300K and 1,000K rad (Si).

TABLE III. Group E inspection (all quality levels) - for qualification only.

Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection
	Method	Conditions	
<u>Subgroup 1</u>			12 devices, c = 0
Temperature cycling	1051	Test condition G, 500 cycles	
Hermetic seal	1071		
Fine leak			
Gross leak			
Electrical measurements		See table I, group A, subgroup 2	
<u>Subgroup 2</u> ^{1/}			12 devices, c = 0
Steady-state reverse bias	1042	Condition A, 1,000 hours	
Electrical measurements		See table I, group A, subgroup 2	
Steady-state reverse bias	1042	Condition B, 1,000 hours	
<u>Subgroup 3</u>			
Not applicable			
<u>Subgroup 4</u>			12 devices, c = 0
Thermal resistance	3161	See 4.5.2	
<u>Subgroup 5</u>			
Not applicable			

^{1/} A separate sample for each test may be pulled.



* FIGURE 2. Thermal response curves.

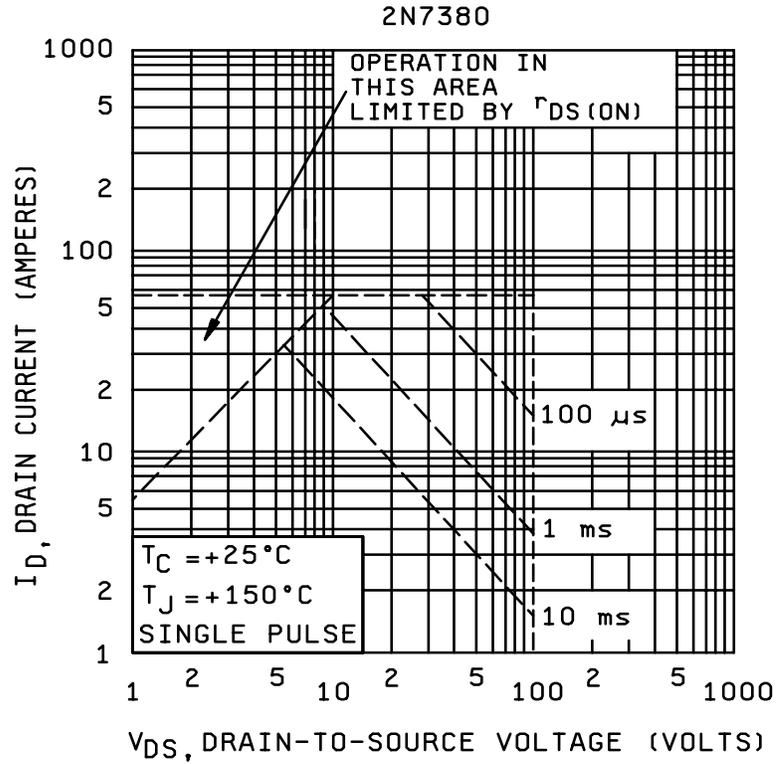


FIGURE 3. Safe operating area graphs.

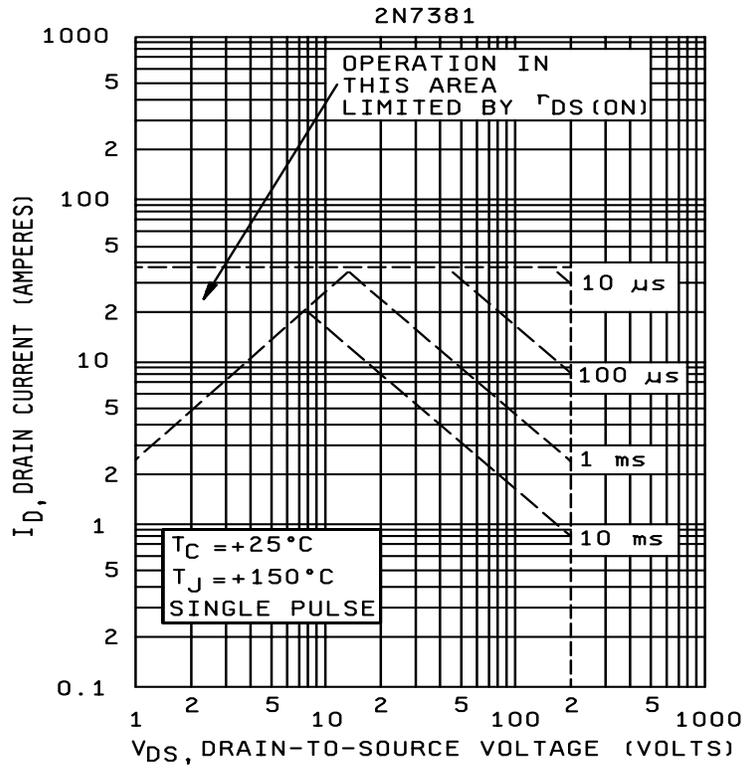


FIGURE 4. Safe operating area graphs.

5. PACKAGING

* 5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

* 6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
- c. Packaging requirements (see 5.1).
- d. Lead finish (see 3.3.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers' List (QML) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43216-5000.

6.4 Supersession data. This specification supersedes DESC drawing 89009, dated 19 December 1989.

* 6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:

Army - CR
Navy - EC
Air Force - 11
NASA - NA

Preparing activity:
DLA - CC

(Project 5961-2578)

Review activities:

Army - AR, SM
Navy - AS, MC, OS
Air Force - 19

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
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NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE
	MIL-PRF-19500/614B	22 February 2002

3. DOCUMENT TITLE
 SEMICONDUCTOR DEVICE, FIELD EFFECT RADIATION HARDENED TRANSISTOR, N-CHANNEL, SILICON, TYPES 2N7380 AND 2N7381 JANTXV M, D, R, F, G, AND H, JANS M, D, R, F, G, AND H

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) COMMERCIAL DSN FAX EMAIL	7. DATE SUBMITTED

8. PREPARING ACTIVITY

a. Point of Contact Alan Barone	b. TELEPHONE Commercial DSN FAX EMAIL 614-692-0510 850-0510 614-692-6939 alan.barone@dsccl.dla.mil
c. ADDRESS Defense Supply Center Columbus ATTN: DSCC-VAC P.O. Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888