The documentation and process conversion measures necessary to comply with this revision shall be completed by 8 December 2003.

INCH-POUND

MIL-PRF-19500/614C
8 September 2003
SUPERSEDING
MIL-PRF-19500/614B
22 February 2002

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 (TO-257AA).

* 1.3 Maximum ratings. Unless otherwise specified, T_C = +25°C.

Type	Min $V_{(BR)DSS}$ V_{GS} = 0 V I_D = 1.0 mA dc	P_T (1) T_C = +25°C	P_T T_A = +25°C (free air)	V_{GS}	I_{D1} (2) (3) T_C = +25°C	I_{D2} (2) T_C = +100°C	T_J and T_{STG}
	V dc	W	W	V dc	A dc	A dc	°C
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} (4)	Max $r_{DS(on)}$ (1) V_{GS} = 12 V dc $I_D = I_{D2}$		$R_{\theta JC}$ max	E_{AS} max	I_{AS}
			T_J = +25°C	T_J = +150°C			
	A dc	A(pk)	Ω	Ω	°C/W	mJ	A dc
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 W/°C for T_C > +25°C;
(2) The following formula derives the maximum theoretical I_D limit. I_D is limited by package and internal wires and may be limited by pin diameter:

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

(3) See figure 2, maximum drain current graph.
(4) I_{DM} = 4 X I_{D1} as calculated in note (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.

AMSC N/A FSC 5961

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

1.4 Primary electrical characteristics. Unless otherwise specified, T_C = +25°C.

Type	Min $V_{(BR)DSS}$ V_{GS} = 0 V I_D = 1.0 mA dc	$V_{GS(th)1}$ $V_{DS} \geq V_{GS}$ I_D = 1.0 mA dc		I_{DSS} max V_{GS} = 0 V V_{DS} = 80 percent of rated V_{DS}	Max $r_{DS(on)1}$ (1) V_{GS} = 12 V; $I_D = I_{D2}$ T_J = +25°C
	V dc	V dc		µA dc	Ω
		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.

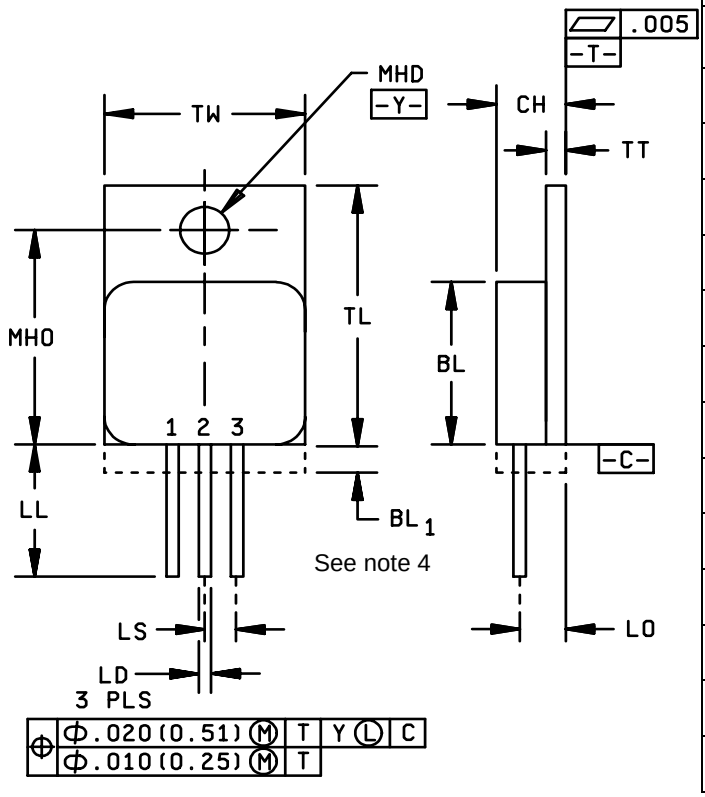
(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

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 individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

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).



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. Millimeters 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 (TO-257AA).

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. $R \leq 100\ k\Omega$, 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, 1.4, and table I herein.

* 3.8 Electrical test requirements. The electrical test requirements shall be table I 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, II, and III).

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

* 4.2.1 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the associated specification that did not request the performance of table III tests, the tests specified in table III herein shall be performed by the first inspection lot of this revision to maintain qualification.

* 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) (1) (2)	Measurement	
	JANS level	JANTXV level
(3)	Gate stress test (see 4.3.1)	Gate stress test (see 4.3.1)
(3)	Method 3470 of MIL-STD-750. (see 4.3.2)	Method 3470 of MIL-STD-750. (see 4.3.2)
(3) 3c	Method 3161 of MIL-STD-750 (see 4.3.3)	Method 3161 of MIL-STD-750 (see 4.3.3)
9	I_{GSSF1}, I_{GSSR1}, 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_{GSSF1}, I_{GSSR1}, I_{DSS1}, $r_{DS(on)1}$, $V_{GS(th)1}$ Subgroup 2 of table I herein. ΔI_{GSSF1} = ±20 nA dc or ± 100 percent of initial value, whichever is greater. ΔI_{GSSR1} = ±20 nA dc or ± 100 percent of initial value, whichever is greater. ΔI_{DSS1} = ±25 µA dc or ± 100 percent of initial value, whichever is greater.	I_{GSSF1}, I_{GSSR1}, 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. ΔI_{GSSF1} = ±20 nA dc or ± 100 percent of initial value, whichever is greater. ΔI_{GSSR1} = ±20 nA dc or ± 100 percent of initial value, whichever is greater. ΔI_{DSS1} = ±25 µA dc or ± 100 percent of initial value, whichever is greater. $\Delta r_{DS(on)1}$ = ±20 percent of initial value. $\Delta V_{GS(th)1}$ = ±20 percent of initial value.	Subgroup 2 of table I herein. ΔI_{GSSF1} = ±20 nA dc or ± 100 percent of initial value, whichever is greater. ΔI_{GSSR1} = ±20 nA dc or ± 100 percent of initial value, whichever is greater. ΔI_{DSS1} = ±25 µA dc or ± 100 percent of initial value, whichever is greater. $\Delta r_{DS(on)1}$ = ±20 percent of initial value. $\Delta V_{GS(th)1}$ = ±20 percent of initial value.

(1) At the end of the test program, I_{GSSF1}, I_{GSSR1} and I_{DSS1} are measured.
(2) An out-of-family program to characterize I_{GSSF1}, I_{GSSR1}, I_{DSS1} and $V_{GS(th)1}$ shall be invoked.
(3) Shall be performed anytime before screen 9.

* 4.3.1 Gate stress test. Apply V_{GS} = ±24 V minimum for t = 250 µs minimum.

* 4.3.2 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°C +10°C, -5°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.

* 4.3.3 Thermal impedance ($Z_{\theta JC}$ measurements). The $Z_{\theta JC}$ measurements shall be performed in accordance with method 3161 of MIL-STD-750. The maximum limit (not to exceed figure 3, thermal impedance curves and the table I, 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 bar 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.

4.4 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) shall be in accordance with table I, subgroup 2 herein.

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

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

Subgroup	Method	Condition
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°C, t = 120 hours or T_A = +150°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, subgroup 2.
B5	1042	Condition B; V_{GS} = 100 percent of rated T_A = +175°C, t = 24 or T_A = +150°C, t = 48 hours;.
B6	3161	See 4.5.2.

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

Subgroup	Method	Condition
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 table I, subgroup 2 herein.

Subgroup	Method	Condition
C2	2036	Test condition A, weight = 10 lbs, t = 10 seconds.
C5	3161	See 4.5.2.
C6	1042	The heating cycle shall be 1 minute minimum.

* 4.4.4 Group D Inspection. Group D inspection shall be conducted in accordance with appendix E, table VIII of MIL-PRF-19500 and table II herein.

* 4.4.5 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table IX of MIL-PRF-19500 and as specified herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

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°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 60µs maximum.

f. Sample window time (t_{SW}): ..... 10 µs maximum.

* TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
Subgroup 1						
Visual and mechanical inspection	2071					
Subgroup 2						
Thermal impedance 2/	3161	See 4.3.3	$Z_{\theta JC}$		1.30	°C/W
Breakdown voltage drain to source	3407	V_{GS} = 0V, I_D = 1 mA dc, bias condition C	$V_{(BR)DSS}$			
2N7380				100		V dc
2N7381				200		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} = ±20 V dc, V_{DS} = 0 V dc, bias condition C	I_{GSS1}		±100	nA 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	3421	V_{GS} = 12 V dc, condition A, pulsed (see 4.5.1), I_D = rated I_{D2} (see 1.3)	$r_{DS(on)1}$			
2N7380					0.18	Ω
2N7381					0.40	Ω
Static drain to source on-state resistance	3421	V_{GS} = 12 V dc, condition A, pulsed (see 4.5.1), I_D = rated I_{D1} (see 1.3)	$r_{DS(on)2}$			
2N7380					0.20	Ω
2N7381					0.49	Ω
Forward voltage (source drain diode)	4011	V_{GS} = 0 V dc, I_D = rated I_{D1} pulsed (see 4.5.1)	V_{SD}			
2N7380					1.8	V dc
2N7381					1.4	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	
Subgroup 3						
High temperature operation:		T_A = +125°C				
Gate current	3411	Bias condition C, V_{GS} = ±20 V dc, V_{DS} = 0 V dc	I_{GSS2}		±200	nA dc
Drain current	3413	Bias condition C, V_{GS} = 0 V dc, V_{DS} = 80 percent of rated V_{DS}	I_{DSS3}		0.25	mA dc
Static drain to source on-state	3421	V_{GS} = 12 V dc, pulsed (see 4.5.1), I_D = rated I_{D2}	$r_{DS(on)3}$			
2N7380					0.35	Ω
2N7381					0.75	Ω
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = 1.0 mA dc	$V_{GS(th)2}$	1.0		V dc
Low temperature operation:		T_A = -55°C				
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = 1.0 mA dc	$V_{GS(th)3}$		5.0	V dc
Subgroup 4						
Switching time test	3472	I_D = rated I_{D1}, V_{GS} = 12 V dc, gate drive impedance = 7.5 Ω, V_{DD} = 50 percent of $V_{BR(DSS)}$				
Turn-on delay time			$t_{d(on)}$		25	ns
Rise time			t_r			
2N7380					60	ns
2N7381					50	ns
Turn-off delay time			$t_{d(off)}$			
2N7380					40	ns
2N7381					70	ns
Fall time			t_f			
2N7380					30	ns
2N7381					60	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	
Subgroup 4 - Continued.						
Forward transconductance	3475	$I_D = I_{D2}$, V_{DD} = 15 V dc see 4.5.1	g_{fs}	2.5		s
Subgroup 5						
Safe operating area test (high voltage)	3474	See figure 4; t_p = 10 ms, V_{DS} = 80 percent of rated $V_{BR(DSS)}$, V_{DS} = 200 V maximum				
Electrical measurements		See table I, subgroup 2				
Subgroup 6						
Not applicable						
Subgroup 7						
Gate charge	3471	Condition B				
On-state gate charge			$Q_{g(on)}$			
2N7380					40	nC
2N7381					50	nC
Gate to source charge			Q_{gs}		10	nC
Gate to drain charge			Q_{gd}			
2N7380					20	nC
2N7381					25	nC
Reverse recovery time	3473	$d_i/d_t \leq 100$ A/µs, $V_{DD} \leq 50$ V, $I_D = I_{D1}$	t_{rr}			
2N7380					275	ns
2N7381					460	ns

1/ For sampling plan, see MIL-PRF-19500.
2/ This test is required for the following end-point measurement only (not intended for screen 9, 11, or 13): JANS, table VIa of MIL-PRF-19500, group B, subgroups 3 and 4; JANTXV, table VIb of MIL-PRF-19500, group B, subgroups 2 and 3; and table VII of MIL-PRF-19500, group C, subgroup 6, and table IX of MIL-PRF-19500, group E, subgroup 1.

* TABLE II. Group D inspection.

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

See footnotes at end of table.

* TABLE II. Group D inspection - Continued.

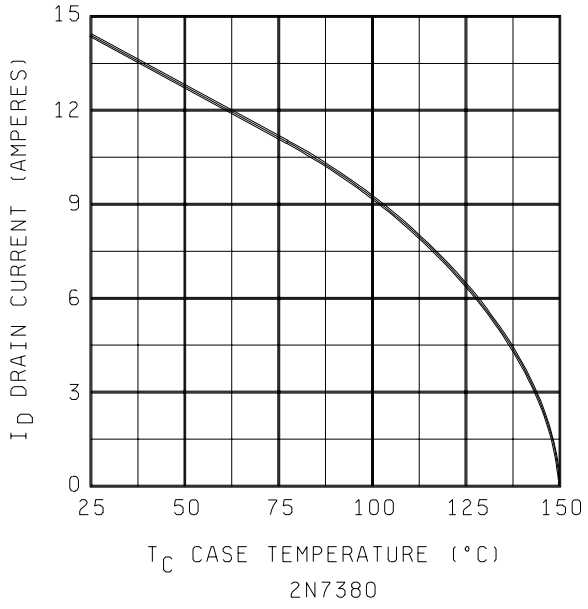
Inspection 1/ 2/ 3/	MIL-STD-750		Symbol	Pre-irradiation limits				Post-irradiation limits				Unit
	Method	Conditions		M, D, and R		F, G, and H 4/		M, D, and R		F, G, and H 4/		
				Min	Max	Min	Max	Min	Max	Min	Max	
Subgroup 2 - Continued		T_C = +25°C										
Drain current	3413	V_{GS} = 0 V, Bias condition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

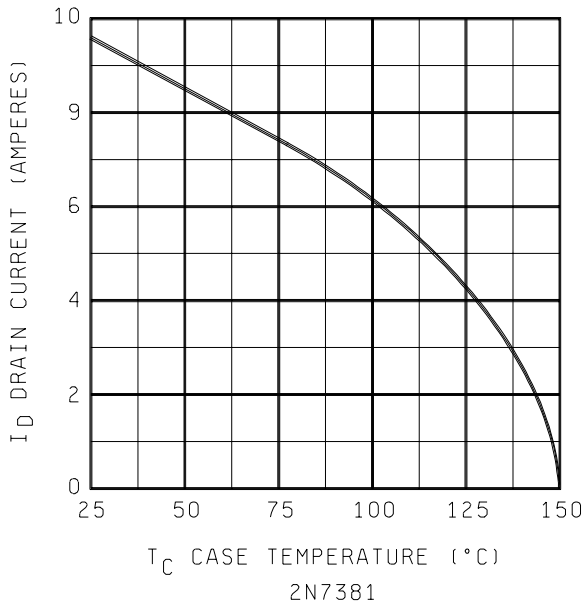
1/ For sampling plan, see MIL-PRF-19500.
2/ Separate samples shall be pulled for each bias.
3/ Group D qualification may be performed anytime prior to lot formation. Wafers qualified to these group D QCI requirements may be used for any other specification sheet utilizing the same die design.
4/ The 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 or re-qualification only.

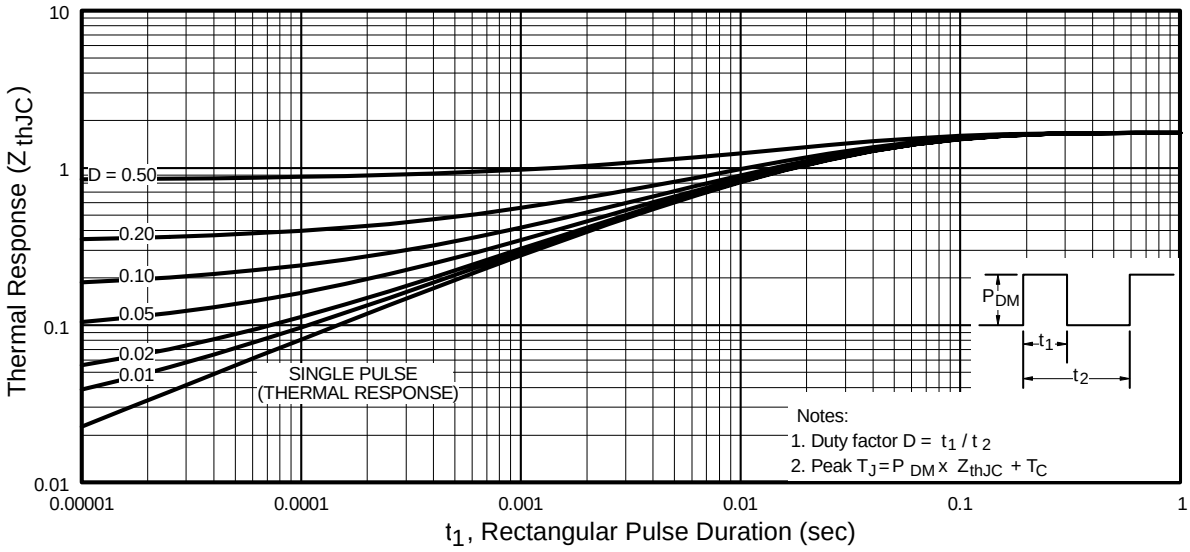
Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection
	Method	Conditions	
Subgroup 1			12 devices, c = 0
Temperature cycling	1051	Test condition G, 500 cycles	
Hermetic seal Fine leak Gross leak	1071		
Electrical measurements		See table I, subgroup 2	
Subgroup 2 1/			12 devices, c = 0
Steady-state reverse bias	1042	Condition A, 1,000 hours	
Electrical measurements		See table I, subgroup 2	
Steady-state gate bias	1042	Condition B, 1,000 hours	
Subgroup 3			3 devices c = 0
Destructive physical analysis	2102		
Subgroup 4			sample size N/A
Thermal resistance, thermal impedance curves		Each supplier shall submit their (typical) design thermal impedance curves. In addition, test conditions and $Z_{\theta JX}$ limit shall be provided to the qualifying activity in the qualification report	
Subgroup 5			
Not applicable			
Subgroup 6			3 devices
ESD	1020		
Subgroup 7			45 devices, c = 0
Commutating diode for safe operating area test procedure for measuring dv/dt during reverse recovery of power MOSFET transistors or insulated gate bipolar transistors	3476		
Soldering heat	2031	1 cycle	

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

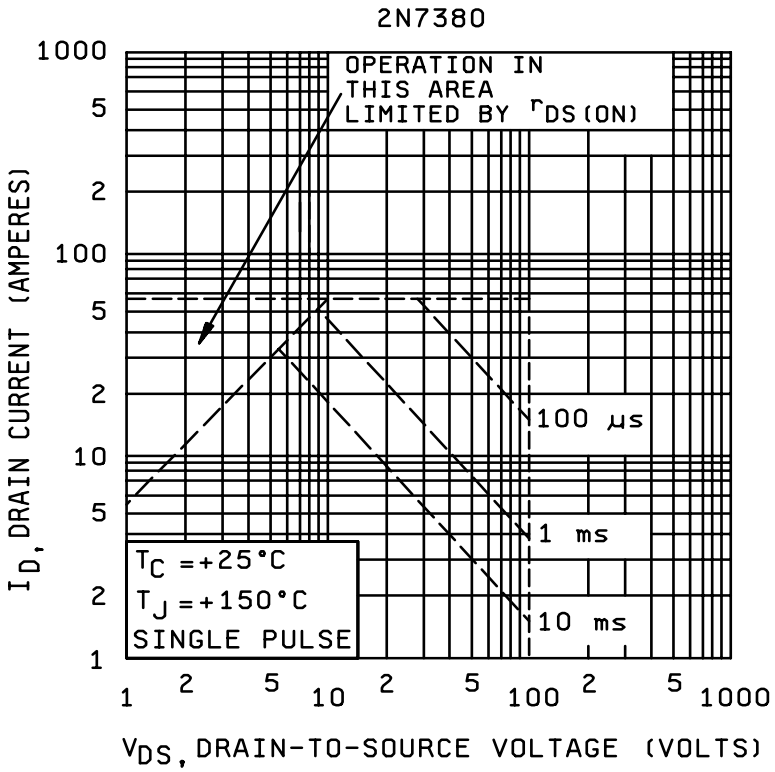




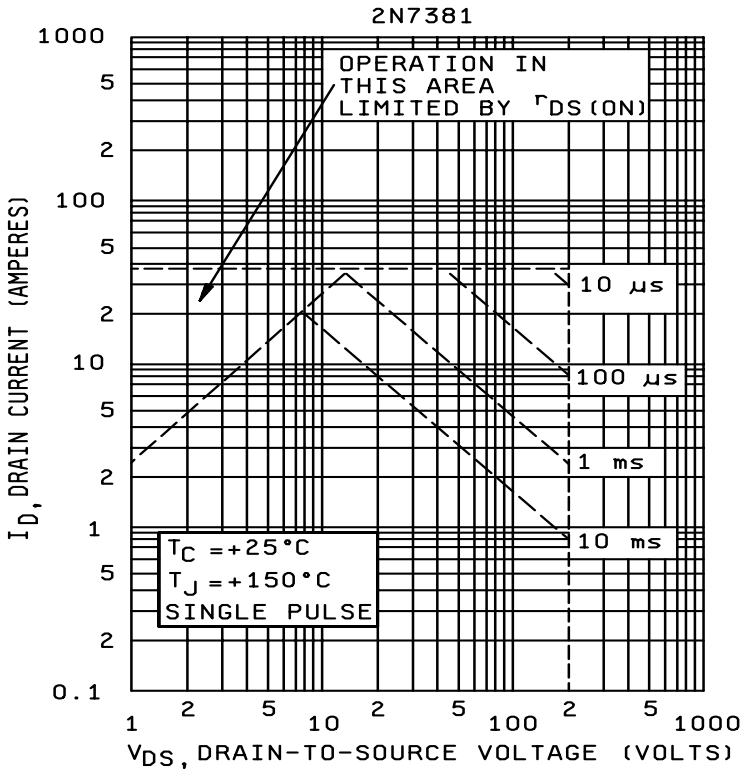
* FIGURE 2. Maximum drain current vs case temperature.



* FIGURE 3. Thermal response curves.



* FIGURE 4. Safe operating area graphs.



* FIGURE 4. Safe operating area graphs - Continued.

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 3.4.1).

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.

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Navy - EC
Air Force - 11
NASA - NA
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Review activities:
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Air Force - 19

Preparing activity:
DLA - CC

(Project 5961-2770)

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-19500/614C	2. DOCUMENT DATE 8 September 2003

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.)

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8. PREPARING ACTIVITY

a. Point of Contact Alan Barone	b. TELEPHONE Commercial: 614-692-0510 DSN: 850-0510 FAX: 614-692-6939 EMAIL: alan.barone@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

DD Form 1426, Feb 1999 (EG) Previous editions are obsolete WHS/DIOR, Feb 99