The documentation and process conversion measures necessary to comply with this revision shall be completed by 21 Apr 94.

INCH-POUND

MIL-S-19500/601A
21 January 1994
SUPERSEDING
MIL-S-19500/601
1 May 1992

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, FIELD EFFECT RADIATION HARDENED
(TOTAL DOSE ONLY) TRANSISTORS, N-CHANNEL,
SILICON TYPES 2N7261 AND 2N7262
JANTXVM, D, R, F, G, AND H AND JANSM, 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, enhancement-mode, MOSFET, radiation hardened (total dose only), 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-S-19500, with avalanche energy maximum rating (E_{AS}) and maximum avalanche current (I_{AS}).

1.2 Physical dimensions. See figure 1, TO-205AF (similar to TO-39).

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

Type	P_T 1/ T_C = +25°C	P_T T_A = +25°C	V_{DS}	V_{DG}	V_{GS}	I_{D1} 2/ T_C = +25°C	I_{D2} T_C = +100°C	I_S 2/	I_{DM}	T_{op} and T_{STG}	V_{ISO} 70,000 foot altitude
	W	W	V dc	V dc	V dc	A dc	A dc	A dc	A (pk)	°C	V dc
2N7261	25	0.8	100	100	±20	8.0	5.0	8.0	32	-55 to	N/A
2N7262	25	0.8	200	200	±20	5.5	3.5	5.5	22	+150	N/A

1/ Derate linearly 1.2 W/°C for T_C > +25°C;

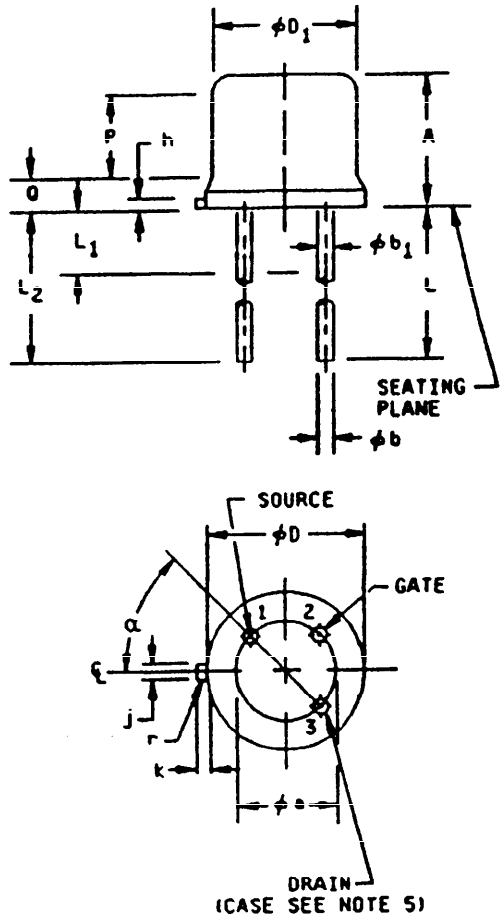
2/ $I_D = \sqrt{\dfrac{T_J max - T_C}{(R_{\theta JC}) \times (r_{DSon} \text{ at } T_J max)}}$

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: NASA/Parts Project Office (NPPD), NASA Goddard Space Flight Center Code 310.A, Greenbelt, MD 20771 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.

Symbol (see note 3)	AF			
	Millimeters		Inches	
	Min	Max	Min	Max
A	4.07	4.57	.160	.180
ϕe	5.08 BSC		.200 BSC	
ϕb	0.41	0.53	.016	.021
ϕb_1	0.41	0.48	.016	.019
ϕD	8.64	9.39	.340	.370
ϕD_1	8.01	9.01	.315	.355
h	0.23	1.04	.009	.041
j	0.72	0.86	.028	.034
k	0.74	1.14	.029	.045
L	12.70	19.05	.500	.750
L_1		1.27		.050
L_2	6.35		.250	
P	1.78		.070	
Q		1.27		.050
α	45° BSC			
Term 1	Source			
Term 2	Gate			
Term 3	Drain			



NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given in parentheses for general information only.
3. Refer to applicable symbol list.
4. The US Government preferred system of measurement is the metric SI system. However, this item was originally designed using inch-pound units of measurement. In the event of a conflict between the metric and inch-pound units, the inch-pound units shall take precedence.
5. Lead number 4 is omitted from this outline. The drain is electrically connected to the case.

FIGURE 1. Physical dimensions for TO-205AF.

1.4 Primary electrical characteristics at T_C = +25°C.

Type	Min $V_{(BR)DSS}$ V_{GS} = 0 I_D = 1.0 mA dc	$V_{GS(TH)1}$ $V_{DS} \geq V_{GS}$ I_D = 1.0 mA dc		Max I_{DSS1} V_{GS} = 0 V_{DS} = 80 percent of rated V_{DS}	Max $r_{DS(ON)}$ 1/ V_{GS} = 12 V dc		Max $R_{\theta JC}$	E_{AS} at I_{D1}	I_{AS}
		Min	Max		T_J = 25°C at I_{D2}	T_J = 150°C at I_{D2}			
2N7261	100	2.0	4.0	25	0.180	0.390	5.0	130	8.0
2N7262	200	2.0	4.0	25	0.400	0.840	5.0	240	5.5

1/ Pulsed (see 4.5.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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

MILITARY

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

STANDARD

MILITARY

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

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Document Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 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 Associated detail specification. The individual item requirements shall be in accordance with MIL-S-19500, and as specified herein.

3.2 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-S-19500.

E_{AS} - Single pulse avalanche energy capability

I_{AS} - Rated avalanche current, nonrepetitive

$V_{(ISO)}$ - Source pin to case isolation voltage

3.3 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-S-19500, and on figure 1 herein.

3.3.1 Lead material and finish. Lead material shall be Kovar or Alloy 52; a copper core or plated core is permitted. Lead finish shall be solderable as defined in MIL-S-19500, MIL-STD-750, and herein. Where a choice of lead material or finish is desired, it shall be specified in the acquisition document (see 6.3).

3.3.2 Internal construction. Multiple chip construction is not be permitted to meet the requirements of this specification.

3.4 Marking. Marking shall be in accordance with MIL-S-19500.

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

3.5.1 Handling. MOS devices must be handled with certain precautions to avoid damage due to the accumulation of static charge. However, the following handling practices are recommended (see 3.5).

a. Devices should 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 should 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, whenever bias voltage is to be applied drain to source.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500, and as specified herein.

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-S-19500, and as specified herein. Alternate flow is allowed for qualification inspection in accordance with figure 2 of MIL-S-19500.

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

4.3 Screening (JANS and JANTXV levels only). Screening shall be in accordance with table II of MIL-S-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 II of MIL-S-19500	Measurement	
	JANS level	JANTXV levels
1/	Method 3470 (see 4.5.4)	Method 3470 (see 4.5.4)
1/	Method 3161 (see 4.5.3)	Method 3161 (see 4.5.3)
1/	Gate stress test (see 4.5.5)	Gate stress test (see 4.5.5)
9 1/	Subgroup 2 of table I herein; I_{GSS}, I_{DSS1}	Subgroup 2 of table I herein
10	MIL-STD-750, method 1042 test condition B	MIL-STD-750, method 1042 test condition B
11	I_{GSSF1}, I_{GSSR1}, I_{DSS1}, $r_{DS(on)}$, $V_{GS(TH)}$ 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} = ±10 µA dc or ±100 percent of initial value, whichever is greater	I_{GSSF1}, I_{GSSR1}, I_{DSS1}, $r_{DS(on)}$, $V_{GS(th)}$ Subgroup 2 of table I herein
12	MIL-STD-750, method 1042, test condition A	MIL-STD-750, method 1042, condition A
13	Subgroups 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} = ±10 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	Subgroups 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} = ±10 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/ Shall be performed anytime before screen 10.

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-S-19500, and as specified herein. Alternate flow is allowed for quality conformance inspection in accordance with figure 2 of MIL-S-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-S-19500 and table I herein. End-point electrical measurements shall be in accordance with table I, group A, 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 IVa (JANS) and table IVb (JANTX and JANTXV) of MIL-S-19500, and herein. Electrical measurements (end-points) and delta requirements shall be in accordance with table I, group A, subgroup 2 herein.

4.4.2.1 Group B inspection, table IVa (JANS) of MIL-S-19500.

Subgroup	Method	Condition
3	1051	Test condition G, 100 cycles.
3	2075	See 3.3.2.
3	2077	Scanning electron microscope (SEM) qualification may be performed anytime prior to lot formation.
3	2037	Test condition A, all internal wired for each device shall be pulled separately.
4	1042	Condition D, 2,000 cycles. No heat sink nor forced-air cooling on the device shall be permitted during the on cycle. The heating cycle shall be 30 seconds minimum.
5	1042	Test condition A, V_{DS} = rated T_A = +175°C, t = 120 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. No more than 15 percent of the sample shall be permitted to have a $\Delta V_{BR(DSS)}$ shift of more than 10 percent and ΔI_{DSS} greater than 25 μA.
5	1042	Condition B, V_{GS} = rated; T_A = +175°C; t = 24 hours.
5	2037	Bond strength (Al-Au die interconnects only); test condition A.
6	3161	See 4.5.2.

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

Subgroup	Method	Condition
2	1051	Test condition G, 25 cycles.
3	1042	Test condition D, 2,000 cycles; The heating cycle shall be 30 seconds minimum.
4	2075	See 3.3.2.
4	2037	Test condition A. All internal bond wires for each device shall be pulled separately.
5 and 6		Not applicable.

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

Subgroup	Method	Condition
2	1056	Test condition B.
2	2036	Test condition A; weight = 10 pounds; t = 15 s.
2	1021	Omit initial conditioning.
5	1001	Test condition C. For device type 2N7270: V_{DS} = 500 V; $I_{(ISO)}$ < 0.25 mA.
6	1042	Test condition D, 6,000 cycles. The heating cycle shall be 30 seconds minimum.

4.4.4 Group D Inspection. Group D inspection shall be conducted in accordance with MIL-S-19500 and table II herein. Level F and G represent 300K and 600K rad (Si) respectively.

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

4.5.1 Pulse measurements. Conditions for pulse measurement 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 $R_{\theta JC(max)}$ = 5.0°C/W. The following parameter measurements shall apply:

a. Measuring current (I_M) - - - - - - - - - - - - - - - 10 mA.

b. Drain heating current (I_H) - - - - - - - - - - - - - 1 A.

c. Heating time (t_H) - - - - - - - - - - - - - - - - - - Steady-state (see MIL-STD-750, method 3161 for definition).

d. Drain-source heating voltage (V_H) - - - - - - - - - 25 V.

e. Measurement time delay (t_{MD}) - - - - - - - - - - - 30 μs to 60 μs.

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

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical inspection	2071					
Subgroup 2						
Thermal impedance 2/	3161	See 4.5.3	$Z_{\theta JC}$		1.75	°C/W
Breakdown voltage, drain to source	3407	V_{GS} = 0 V, I_D = 1 mA dc, bias condition C	$V_{(BR)DSS}$			
2N7261				100		V dc
2N7262				200		V dc
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = 1 mA dc	$V_{GS(TH)1}$	2.0	4.0	V dc
Gate current	3411	V_{GS} = +20 V dc and -20 V dc, bias condition C, V_{DS} = 0	I_{GSS1}		±100	nA dc
Drain current	3413	V_{GS} = 0 V dc, bias condition C, V_{DS} = 80 percent of rated V_{DS}	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 = I_{D2}	$r_{DS(on)1}$			
2N7261					0.180	ohm
2N7262					0.400	ohm
Static drain to source on-state resistance	3421	V_{GS} = 12 V dc, condition A, pulsed (see 4.5.1), I_D = I_{D1}	$r_{DS(on)2}$			
2N7261					0.200	ohm
2N7262					0.490	ohm
Forward voltage	4011	Pulsed (see 4.5.1), I_D = I_{D1}, V_{GS} = 0 V dc	V_{SD}			
2N7261					1.8	V
2N7262					1.4	V

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 3						
High temperature operation		$T_C = T_J = +125°C$				
Gate current	3411	V_{GS} = +20 V dc and -20 V dc, bias condition C, V_{DS} = 0	I_{GSS2}		±200	nA dc
Drain current	3413	V_{GS} = 0 V dc, bias condition C, V_{DS} = 100 percent of rated V_{DS}	I_{DSS2}		1.0	mA dc
		V_{DS} = 80 percent of rated V_{DS}	I_{DSS3}		0.25	mA dc
Static drain to source on-state resistance	3421	V_{GS} = 12 V dc, pulsed (see 4.5.1), $I_D = I_{D2}$	$r_{DS(on)3}$			
2N7261					0.350	ohm
2N7262					0.750	ohm
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = 1 mA dc	$V_{GS(TH)2}$	1.0		V dc
Low temperature operation		$T_C = T_J = -55°C$				
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = 1 mA dc	$V_{GS(TH)3}$		5.0	V dc
Subgroup 4						
Forward transconductance	3475	I_D = rated I_{D2}, V_{DD} = 15 V (see 4.5.1)	g_{FS}			
2N7261				2.5		S
2N7262				2.5		S
Switching time test	3472	$I_D = I_{D1}$, V_{GS} = 12 V dc, R_G = 2.35Ω, V_{DD} = 50 percent of rated V_{DS}				

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 4 - Continued						
Turn-on delay time			$t_{d(on)}$			
2N7261					30	ns
2N7262					30	ns
Rise time			t_r			
2N7261					75	ns
2N7262					50	ns
Turn-off delay time			$t_{d(off)}$			
2N7261					53	ns
2N7262					53	ns
Fall time			t_f			
2N7261					45	ns
2N7262					40	ns
Subgroup 5						
Safe operating area test (high voltage)	3474	See figure 3 and 4; t_p = 10 ms minimum, V_{DS} = 80 percent of maximum rated V_{DS}, ($V_{DS} \leq 200$)				
Electrical measurements		See table VI, steps 1, 2, 3, 4, 5, 6, and 7				
Subgroup 6						
Not applicable						
Subgroup 7						
Gate charge	3471	Condition B				
ON-state gate charge			$Q_{g(on)}$			
2N7261					50	nC
2N7262					50	nC

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 7 - Continued						
Gate to source charge			Q_{GS}			
2N7261					10	nC
2N7262					10	nC
Gate to drain charge			Q_{GD}			
2N7261					20	nC
2N7262					25	nC
Reverse recovery time	3473	$d_i/d_t \leq 100$ A/μs, $V_{DD} \leq 30$ V, $I_D = I_{D1}$	t_{rr}			
2N7261					370	ns
2N7262					460	ns

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

2/ This test is required for the following endpoint measurements only (not intended for screen 13):

JANS - group B, subgroups 3 and 4

JANTX and JANTXV - group B, subgroups 2 and 3;
group C, subgroup 6;
group E, subgroup 1

TABLE II. Group D inspection.

Inspection 1/ 2/ 3/	MIL-STD-750		Symbol	Pre-irradiation limits				Post-irradiation limits				Unit
				M, D, and R		3/ F, G, and H		M, D, and R		3/ F, G, and H		
	Method	Conditions		Min	Max	Min	Max	Min	Max	Min	Max	
Subgroup 1												
Not applicable												
Subgroup 2		T_C = +25°C										
Steady state total dose irradiation (V_{GS} bias) 4/	1019	V_{GS} = 12 V, V_{DS} = 0										
Steady state total dose irradiation (V_{DS} bias) 4/	1019	V_{GS} = 0, V_{DS} = 80 percent of rated V_{DS} (pre-irradiation)										
End-point electrical												
Breakdown voltage, drain to source	3407	V_{GS} = 0, I_D = 1 mA, bias condition C	V_{BRDSS}									
2N7261				100		100		100		100		V dc
2N7262				200		200		200		200		V dc
Gate to source 5/ voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = 1 mA	V_{GSth}									
2N7261				2	4	2	4	2	4	1.25	4.50	V dc
2N7262				2	4	2	4	2	4	1.25	4.50	V dc
Gate current	3411	V_{GS} = 20 V, V_{DS} = 0, Bias condition C	I_{GSSF1}		100		100		100		100	nA dc
Gate current	3411	V_{GS} = -20 V, V_{DS} = 0, 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		3/ F, G, and H		M, D, and R		3/ F, G, and H		
				Min	Max	Min	Max	Min	Max	Min	Max	
Subgroup 2 - Continued												
Drain current	3413	V_{GS} = 0 Bias condition C V_{DS} = 80 percent of rated V_{DS} (pre-irradiation)	I_{DSS}									
2N7261					25		25		25		50	µA dc
2N7262					25		25		25		50	µA dc
Static drain to source on-state resistance	3421	V_{GS} = 12 V Condition A pulsed see 4.5.1 I_D = I_{D2}	r_{DSon1}									
2N7261					0.180		0.180		0.180		0.240	Ω
2N7262					0.400		0.400		0.400		0.530	Ω
Forward voltage source drain diode	4011	V_{GS} = 0 V I_D = I_{D1}	V_{SD}									
2N7261					1.8		1.8		1.8		1.8	V
2N7262					1.4		1.4		1.4		1.4	V

1/ For sampling plan, see MIL-S-19500.
2/ 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 detail specification utilizing the same die design.
3/ The F designation represent devices which pass endpoints at both 100K and 300K rad (Si). The G designation represents devices which pass 100K, 300K, and 600K rad (Si) endpoints.
4/ Separate samples shall be pulled for each bias.
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	
Subgroup 1			12 devices c = 0
Thermal shock (temperature cycling)	1051	-55°C to +150°C, 500 cycles	
Hermetic seal	1071		
Fine leak Gross leak			
Electrical measurements		See table I, group A, subgroup 2	
Subgroup 2 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 gate bias	1042	Condition B: 1,000 hours	
Electrical measurements		See table I, group A, subgroup 2	
Subgroup 3			
Not applicable			
Subgroup 4			12 devices c = 0
Thermal resistance	3161	$R_{\theta JC}$ = 5.0 °C/W maximum. See 4.5.2	

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

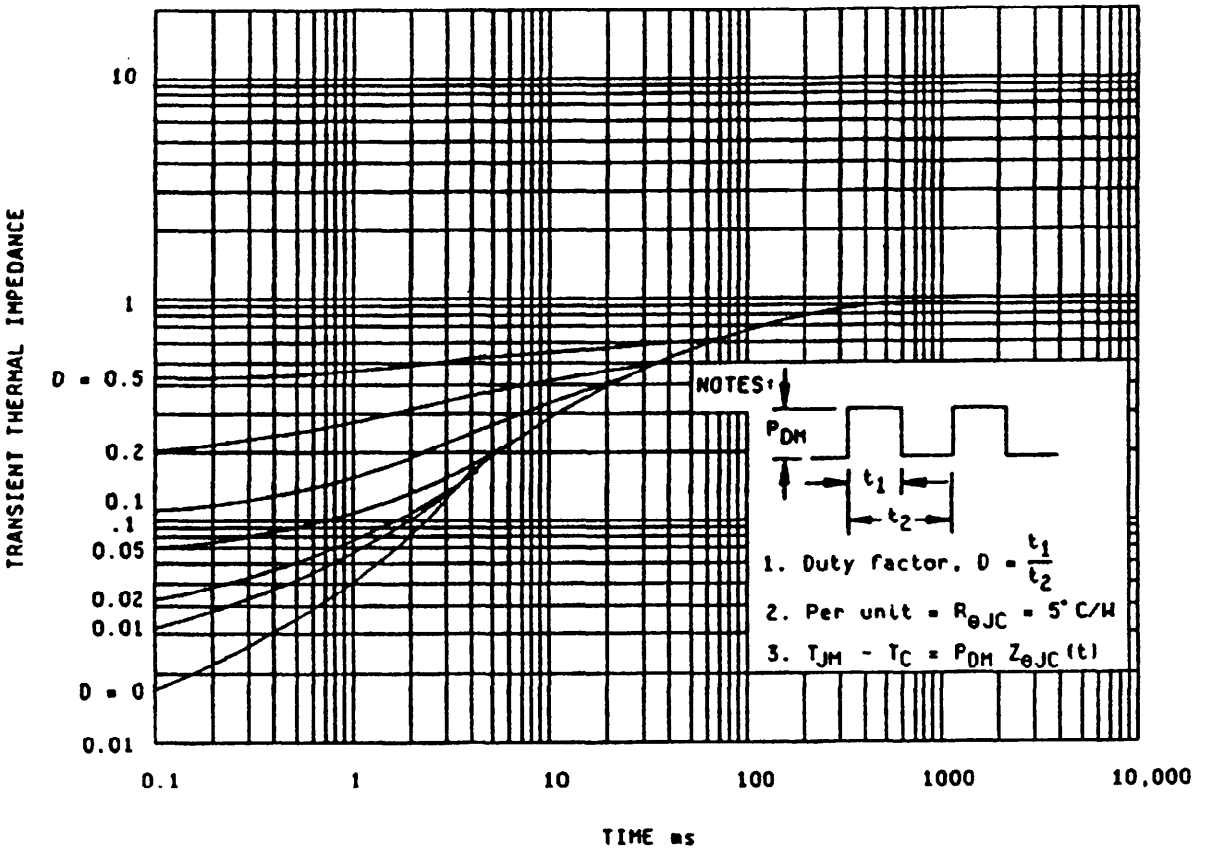


FIGURE 2. Thermal impedance curves.

2N7261

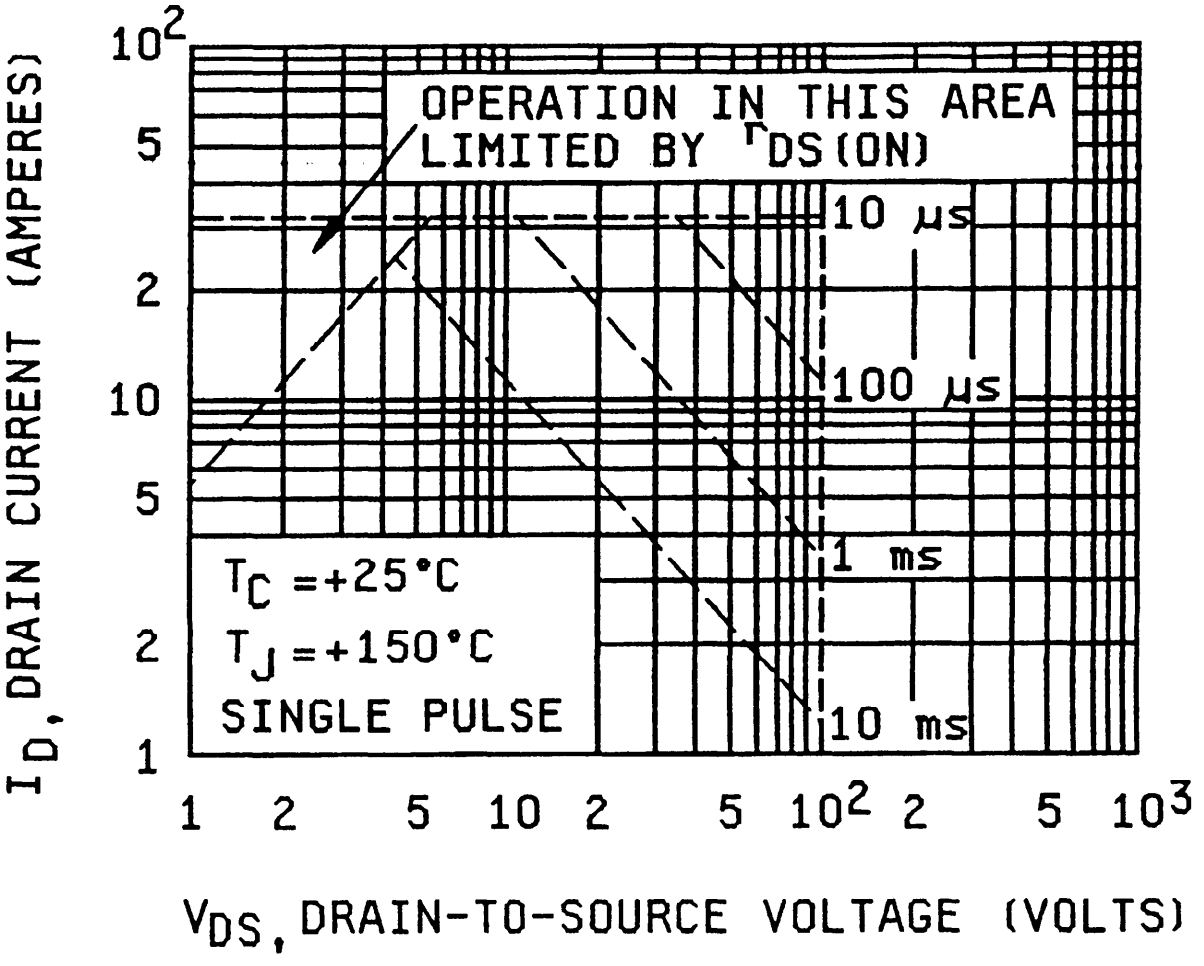


FIGURE 3. Safe operating area graph.

2N7262

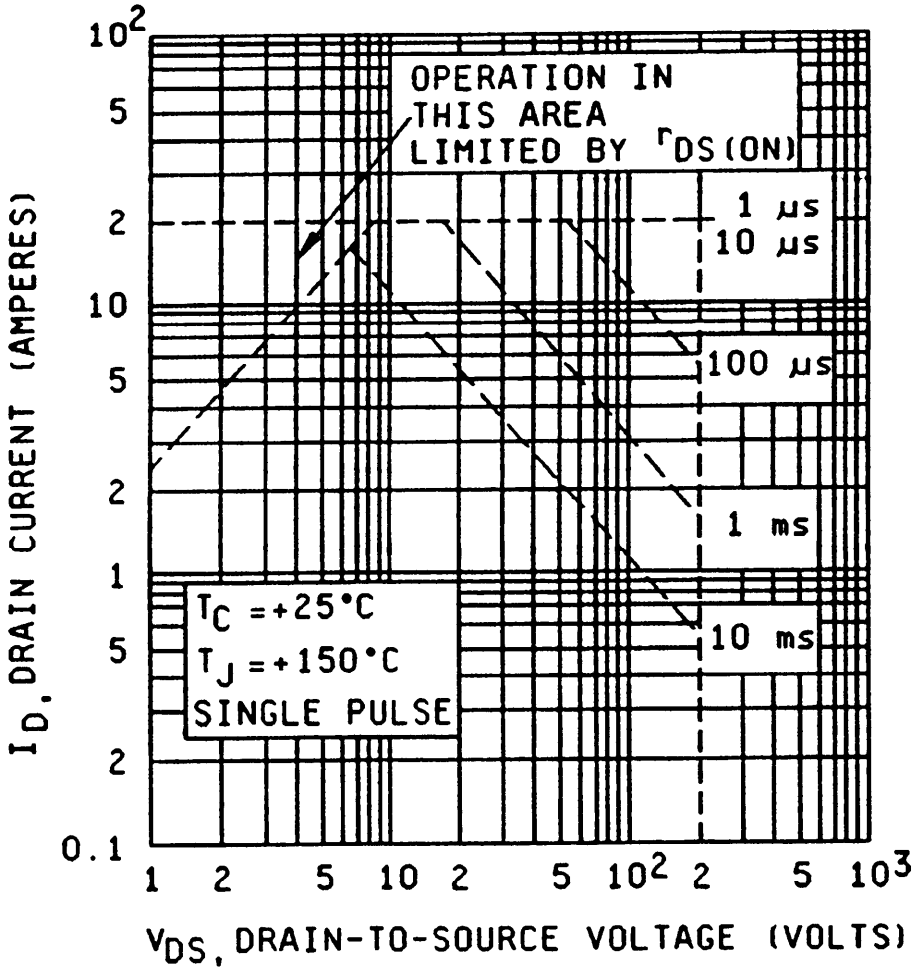


FIGURE 4. Safe operating area graph.

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 3, thermal impedance curves and the group A, subgroup 2 limits) for $Z_{\theta JC}$ in screening (table II of MIL-S-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 $\bar{X}$, 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 procedure.

a. Measuring current (I_M) - - - - - - - - - - - - - - - 10 mA.

b. Drain heating current (I_H) - - - - - - - - - - - - - 1 A minimum.

c. Heating time (t_H) - - - - - - - - - - - - - - - - - - 10 ms.

d. Drain-source heating voltage (V_H) - - - - - - - - - - 25 V.

e. Measurement time delay (t_{MD}) - - - - - - - - - - - - 30 μs to 60 μs.

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

4.5.4 Single pulse avalanche energy (E_{AS}).

a. Peak current (I_{AS}) - - - - - - - - - - - - - - - - - $I_{AS(max)}$

b. Peak gate voltage (V_{GS}) - - - - - - - - - - - - - - - 10 V.

c. Gate to source resistor (R_{GS}) - - - - - - - - - - - - $25\Omega \leq R_{GS} \leq 200\Omega$.

d. Initial case temperature (T_C) - - - - - - - - - - - - +25°C +10°C, -5°C.

e. Inductance (L) - $\left[\frac{2E_{AS}}{(I_{D1})^2}\right]\frac{[(V_{BR} - V_{DD})]}{V_{BR}}$ mH minimum

f. Number of pulses to be applied - - - - - - - - - - - - 1 pulse minimum.

g. Supply voltage (V_{DD}) - - - - - - - - - - - - - - - - 25 V for 2N7261, 50 V for 2N7262

4.5.5 Gate stress test.

a. V_{GS} = 24 V minimum.

b. t = 250 μs minimum.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-S-19500.

6. NOTES

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

6.1 Notes. The notes specified in MIL-S-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Issue of DODISS to be cited in the solicitation.

b. Lead material and finish as specified (see 3.3.1).

c. Type designator and quality level.

6.3 Substitution information. Devices covered by this specification are substitutable for the manufacturer's and user's Part or Identifying Number (PIN). This information in no way implies that manufacturer's PIN's are suitable for the military PIN.

Preferred types	Commercial types
2N7261	IRHF7130 1/ IRHF8130
2N7262	IRHF7230 1/ IRHF8230

1/ IRHF7130, IRHF7230, 3K, 10K, 100K rad (Si)
IRHF8130, IRHF8230, 1,000K rad (Si).

6.4 Ordering data. Acquisition documents may specify the material and finish (see 3.3.1).

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
Air Force - 17
NASA - NA

Review activities:
Navy - TD
Air Force - 19, 70, 80
DLA - ES

Preparing activity:
NASA - NA

Agent:
DLA - ES

(Project 5961-1578)

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.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

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 MIL-S-19500/601A	2. DOCUMENT DATE (YYMMDD)

3. DOCUMENT TITLE
SEMICONDUCTOR DEVICE, FIELD EFFECT RADIATION HARDENED (TOTAL DOSE ONLY) TRANSISTOR, N-CHANNEL, SILICON TYPES 2N7261 AND 2N7262, JANTXVM, D, R, F, G, AND H, AND JANSM, 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) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME	b. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON
c. ADDRESS (Include Zip Code)	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340