The documentation and process conversion measures necessary to comply with this revision shall be completed by 31 January 2004.

INCH-POUND

MIL-PRF-19500/599D
31 October 2003
SUPERSEDING
MIL-PRF-19500/599C
30 December 1997

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, QUAD, FIELD EFFECT TRANSISTORS,
P-CHANNEL, SILICON TYPE 2N7335
JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

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 performance requirements for quad P-channel, enhancement-mode, MOSFET, power transistor. Four levels of product assurance are provided for each encapsulated device type as specified in MIL-PRF-19500, with avalanche energy ratings (E_{AS} and E_{AR}) and maximum avalanche current (I_{AR}). Two levels of product assurance for each unencapsulated device type die (element evaluation).

1.2 Physical dimensions. See figures 1 (MO-036AB) and 2 for JANHC and JANKC die dimensions.

* 1.3 Unless otherwise specified, maximum ratings (T_A = +25°C).

Type	P_T (1) T_C = +25°C (free air)	V_{GS}	I_{D1} (2) (3) T_C = +25°C	I_{D2} (2) T_C = +100°C	I_S
	W	V dc	A dc	A dc	A dc
2N7335	1.4	±20	-.75	-0.50	-.75

E_{AS}	E_{AR}	I_{AR} (2)	I_{DM} (4)	T_J and T_{STG}	Max $r_{DS(on)}$ (1) V_{GS} = 10 V dc, $I_D = I_{D2}$		$R_{\theta JA1}$ maximum (1 die)	$R_{\theta JA2}$ maximum (4 die)	$R_{\theta JC}$ maximum (1 die)
					T_J = +25°C	T_J = +150°C			
mJ	mJ	A	A(pk)	°C	Ω	Ω	°C/W	°C/W	°C/W
75	.14	-.75	-3.0	-55 to +150	1.4	2.5	90	50	17

(1) Derate linearly 0.011 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 3, maximum drain current graph.
(4) I_{DM} = 4 x I_{D1} as calculated in note 3.

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, Post Office 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 at T_A = +25°C.

Type	Min $V_{(BR)DSS}$ V_{GS} = 0 V I_D = 1 mA dc	$V_{GS(th)1}$ $V_{DS} \geq V_{GS}$ I_D = 0.25 mA		Max I_{DSS1} V_{GS} = 0 V V_{DS} = 80 percent of rated V_{DS}	Max $r_{DS(on)1}$ (1) V_{GS} = 10 V dc $I_D = I_{D2}$ T_J = +25°C
	V dc	V dc		μA dc	Ω
		Min	Max		
2N7335	-100	-2.0	-4.0	-25	1.4

(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.

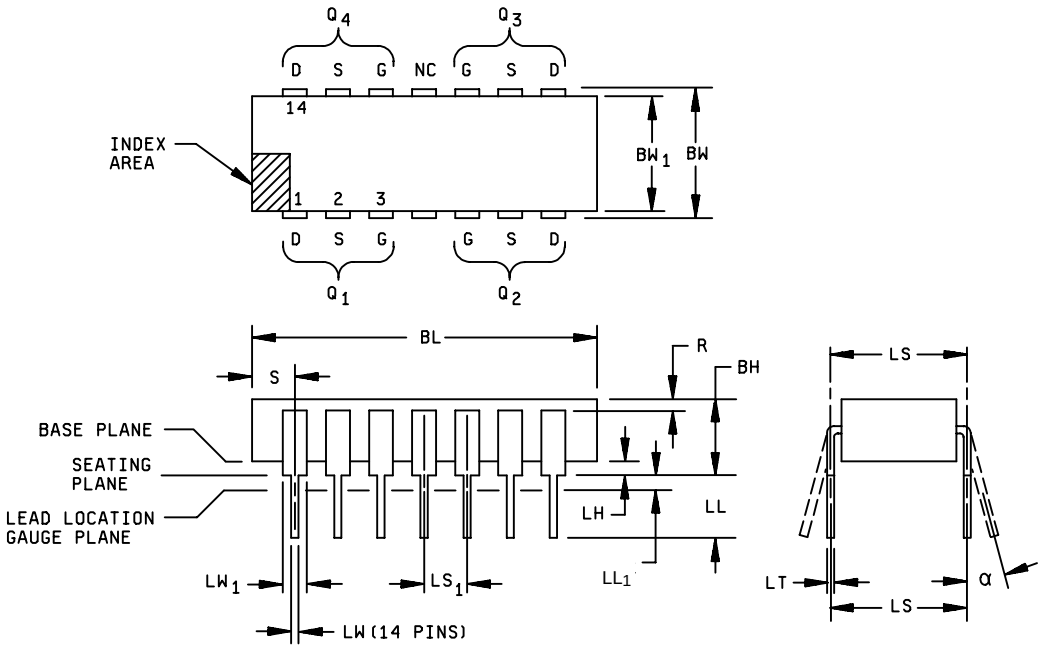
STANDARD

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.



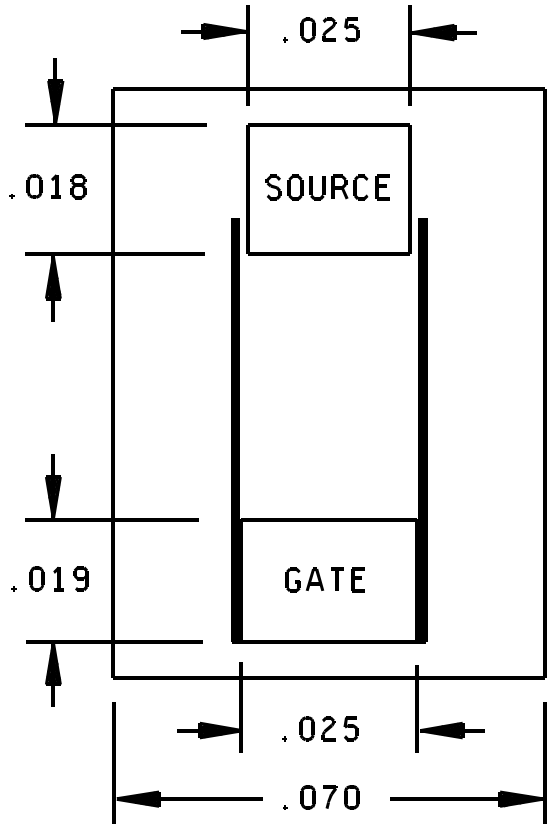
* FIGURE 1. Dimensions and configuration (MO-036AB).

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
BH	.105	.175	2.67	4.45	11
BL	.690	.770	17.53	19.56	
BW	.290	.325	7.37	8.26	
BW_1	.280	.310	7.11	7.87	10
LH	.025	.055	0.64	1.40	11
LL	.125	.175	3.18	4.45	11
LL_1	.000	.030	0.00	0.76	
LS	.300 TP		7.62 TP		5, 6
LS_1	.100 TP		2.54 TP		5, 6
LT	.008	.012	0.203	0.305	
LW	.015	.021	0.381	0.533	
LW_1	.038	.060	0.97	1.52	
N	14		14		8
R	.010		0.25		
S	.030	.095	0.76	2.41	
α	0°	15°	0°	15°	7

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Refer to applicable symbol list.
4. Dimensioning and tolerancing in accordance with ASME Y14.5.
5. Leads within $\pm$.005 in. (0.13 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
6. LS_1 and LS applies in zone LL_2 when unit installed.
7. α applies to spread leads prior to installation.
8. N is the number of terminal positions.
9. Outlines on which the seating plane is coincident with the base plane ($A_1 = 0$), terminals lead standoffs are not required, and LW_1 may equal LW along any part of the lead above the seating/base plane.
10. BW_1 does not include particles of package materials.
11. This dimension shall be measured with the device seated in the seating plane gauge JEDEC Outline No. GS-3.

* FIGURE 1. Dimensions and configuration (MO-036AB) - Continued.



HEX-1: 100V, P-CHANNEL

Inches	mm
.018	0.46
.019	0.48
.025	0.64
.070	1.78

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Unless otherwise specified, tolerance is ±.005 inch (0.13 mm).
4. The physical characteristics of the die thickness are .0187 inch (0.474 mm). The back metals are chromium, nickel, and silver. The top metal is aluminum and the back contact is the drain.

* FIGURE 2. JANHCA and JANKCA die dimensions.

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).

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

nC - nano Coulomb.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1.

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).

3.5 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 electrostatic charge. The following handling practices 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 the subgroups specified in 4.4.2 and 4.4.3 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, and herein.

* 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, JANTX and JANTXV levels only). Screening shall be in accordance with MIL-PRF-19500 (Appendix E, table IV), 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 appendix E, table IV of MIL-PRF-19500) (1) (2)	Measurement	
	JANS level	JANTX and JANTXV levels
(3)	Gate stress test (see 4.3.2)	Gate stress test (see 4.3.2)
(3)	Method 3470 of MIL-STD-750, (see 4.3.3) optional	Method 3470 of MIL-STD-750, (see 4.3.3) optional
(3) 3c	Method 3161 of MIL-STD-750, (see 4.3.4)	Method 3161 of MIL-STD-750, (see 4.3.4)
9	I_{GSSF1}, I_{GSSR1}, I_{DSS1}, subgroup 2 of table I herein	Subgroup 2 of table II herein
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 or accelerated, T_A = 175°C, t = 48 hours
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} = ± 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 Screening (JANHC and JANKC). Screening shall be in accordance with MIL-PRF-19500 (appendix G). As a minimum, die shall be 100 percent probed in accordance with group A.

* 4.3.2 Gate stress test. Apply V_{GS} = ±30 V minimum for t = 250 µs minimum.

* 4.3.3 Single pulse unclamped inductive switching.

a. Peak current (I_{AS}) ..... I_{D1}.

b. Peak gate voltage (V_{GS}) ..... -10 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 ..... $\left[\frac{2 E_{AS}}{(I_D 1)^2}\right]\left[\frac{(V_{BR} - V_{DD})}{V_{BR}}\right]$ *mH minimum*

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

g. Supply voltage (V_{DD}) ..... -25 V.

* 4.3.4 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 4, 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 inline process monitor.

a. I_M measuring current ..... 10 mA.

b. I_H drain heating current ..... 0.15 A minimum.

c. t_H heating time..... 100 ms.

d. V_H drain-source heating voltage..... 15 V minimum.

e. t_{MD} measurement time delay..... 30 to 60 µs.

f. t_{SW} sample window time..... 10 µs maximum.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein. Alternate flow is allowed for conformance inspection in accordance with MIL-PRF-19500.

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

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

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

Subgroup	Method	Conditions
B3	1051	Test condition G.
B3	2077	
B4	1042	Not applicable.
B5	1042	Accelerated steady-state gate stress, method 1042, condition B, T_A = +175°C, t = 24 hours. Test condition A, T_A = +175°C, t = 120 hours. Read and record $V_{BR(DSS)}$ (pre and post) at I_D = 1 mA.
B6	3161	See 4.5.2.

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

Subgroup	Method	Conditions
B2	1051	Test condition G.
B3	1042	Test condition A, T_A = +150°C, t = 160 hours.
B3	1042	Test condition B, T_A = +150°C, t = 24 hours.

* 4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table VII of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta requirements shall be in accordance with the applicable steps of table II herein.

Subgroup	Method	Conditions
C2	2036	Test condition E.
C5	3161	See 4.5.2.
C6	1042	Test condition A, T_A = +150°C, t = 340 hours.
C6	1042	Test condition B, T_A = +150°C, t = 24 hours.

* 4.4.4 Group E inspection (except JANHC and JANKC). 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 in table III herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta requirements shall be in accordance with the applicable steps of table II herein.

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. $R_{\theta JA1}$ maximum = 90°C/W, for each die.

a. I_M measuring current ..... 10 mA.

b. I_H drain heating current ..... 0.15 A minimum.

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

d. V_H drain-source heating voltage ..... 15 V.

e. t_{MD} measurement time delay ..... 30 to 60 μs.

f. t_{SW} sample window time ..... 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 4.3.4	$Z_{\theta JC}$		10	°C/W
Breakdown voltage, drain to source	3407	Bias condition C, V_{GS} = 0V, I_D = -1 mA dc	$V_{(BR)DSS}$	-100		V dc
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = -0.25 mA	$V_{GS(th)1}$	-2.0	-4.0	V dc
Gate current	3411	Bias condition C, V_{GS} = +20V dc, V_{DS} = 0 V dc	I_{GSSF1}		±100	nA dc
Gate current	3411	Bias condition C, - 20 V dc, V_{DS} = 0 V dc	I_{GSSR1}		±100	nA dc
Drain current	3413	Bias condition C, V_{GS} = 0 V dc, V_{DS} = 80 percent of rated V_{DS}	I_{DSS1}		-25	µA dc
Static drain to source on-state resistance	3421	V_{GS} = -10 V dc, condition A, pulsed (see 4.5.1), I_D = rated I_{D2} (see 1.3)	$r_{DS(on)1}$		1.4	Ω
Forward voltage	4011	V_{GS} = 0 V dc, I_D = rated I_{D1}, pulsed (see 4.5.1)	V_{SD}		5.5	V
Subgroup 3						
High temperature operation:		$T_C = T_J$ = +125°C				
Gate current	3411	Bias condition C, V_{GS} = +20V dc and - 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_{DSS2}		-0.25	mA dc
Static drain to source on-state resistance	3421	V_{GS} = -10 V dc, pulsed (see 4.5.1), I_D = rated I_{D2}	$r_{DS(on)2}$			

See footnote at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
Subgroup 3 - Continued						
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = -0.25 mA	$V_{GS(th)2}$	-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 = -0.25 mA	$V_{GS(th)3}$		-5.0	V dc
Subgroup 4						
Switching time test	3472	I_D = rated I_{D1}; V_{GS} = -10 V dc; R_G = 7.5 Ω; V_{DD} = 50 percent of $V_{(BR)DSS}$				
Turn-on delay time			$t_{d(on)}$		30	ns
Rise time			t_r		60	ns
Turn-off delay time			$t_{d(off)}$		70	ns
Fall time			t_f		80	ns
Subgroup 5						
Single pulse unclamped inductive switching 3/	3470	See 4.3.3, n = 116, c = 0	E_{AS}			
Electrical measurements		See table I, subgroup 2				
Safe operating area test (high voltage)	3474	t_p = 10 ms, V_{DS} = 80 percent of rated $V_{(BR)DSS}$, I_D = 0.5 A (see figure 5)				
Electrical measurements		See table I, subgroup 2				
Subgroup 6						
Not applicable						

See footnote at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
Subgroup 7						
Gate charge	3471	Condition B				
On-state gate charge			$Q_{g(on)}$		15	nC
Gate to source charge			Q_{gs}		7.0	nC
Gate to drain charge			Q_{gd}		8.0	nC
Reverse recovery time	3473	$d_i/d_t \leq$ -100 A/μs, $V_{DD} \leq$ -30 V, $I_D = I_{D1}$, (see 1.3)	t_{rr}		200	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; JAN, JANTX, and 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, subgroups 1 and 2.
3/ This test need not be performed in group A if performed in screening.

TABLE II. Groups A, B and C delta measurements. 1/

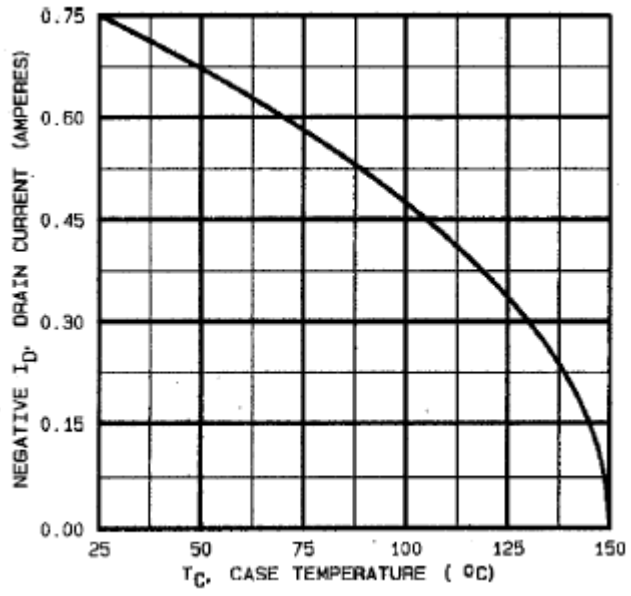
Step	Inspection	MIL-STD-750		Symbol	Limit		Unit
		Method	Conditions		Min	Max	
1.	Breakdown voltage drain to source	3407	V_{GS} = 0 V dc, I_D = -1 mA dc test condition C	$\Delta V_{(BR)DSS}$	± 10 percent		
2.	Drain current	3413	V_{GS} = 0 V dc, V_{DS} = 80 percent of rated V_{DS}; bias condition C	ΔI_{DSS1}	ΔI_{DSS1} = ± 25 μA dc or ± 100 percent of initial value, whichever is greater.		

1/ The delta measurements for appendix E, table VIa (JANS) of MIL-PRF-19500 are as follows: Subgroup 5, see table II herein, steps 1 and 2.

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

Inspection	MIL-STD-750		Qualification inspection
	Method	Conditions	
Subgroup 1			12 devices c = 0
Temperature cycle	1051	Condition G, 500 cycles	
Hermetic seal	1071		
Fine leak Gross leak			
Electrical measurements		See table I, subgroup 2	
Subgroup 2 1/			45 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	
Electrical measurements		See table I, subgroup 2	
Subgroup 3			3 devices, c = 0
DPA	2102		
Subgroup 4			sample size N/A
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		

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



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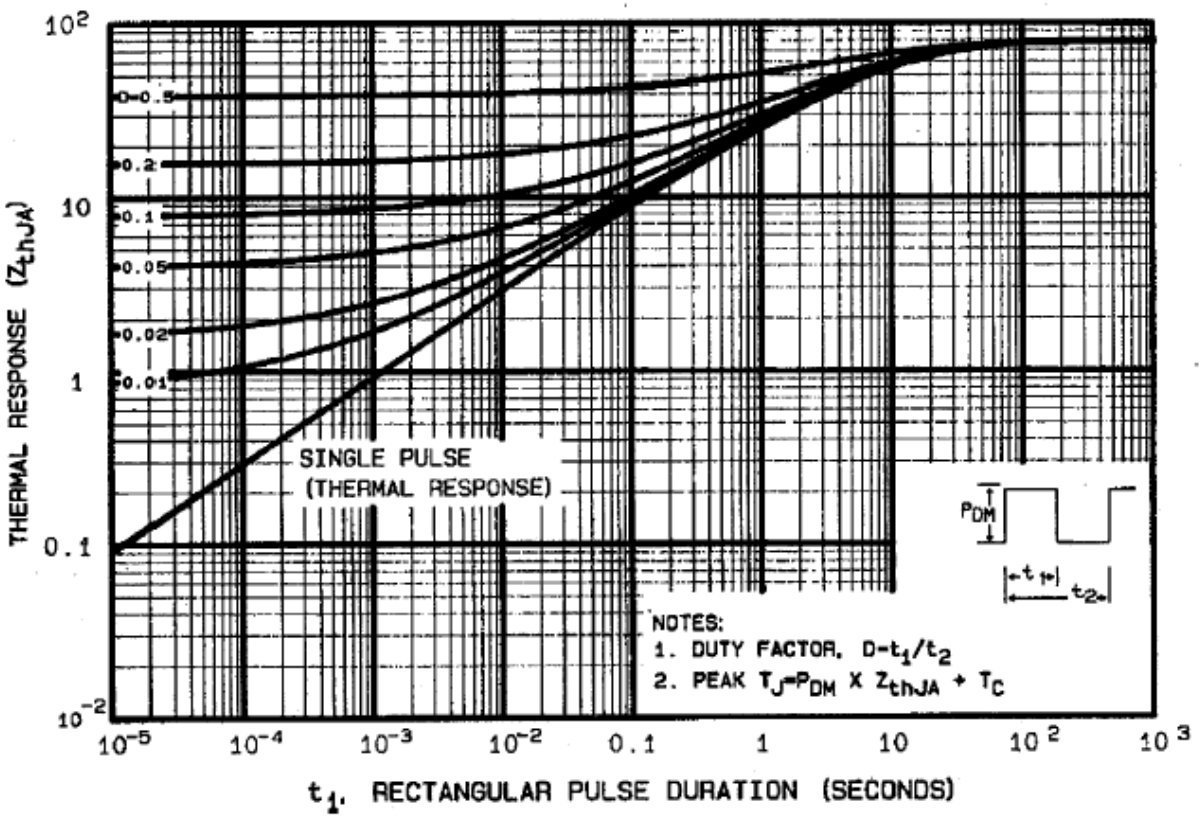
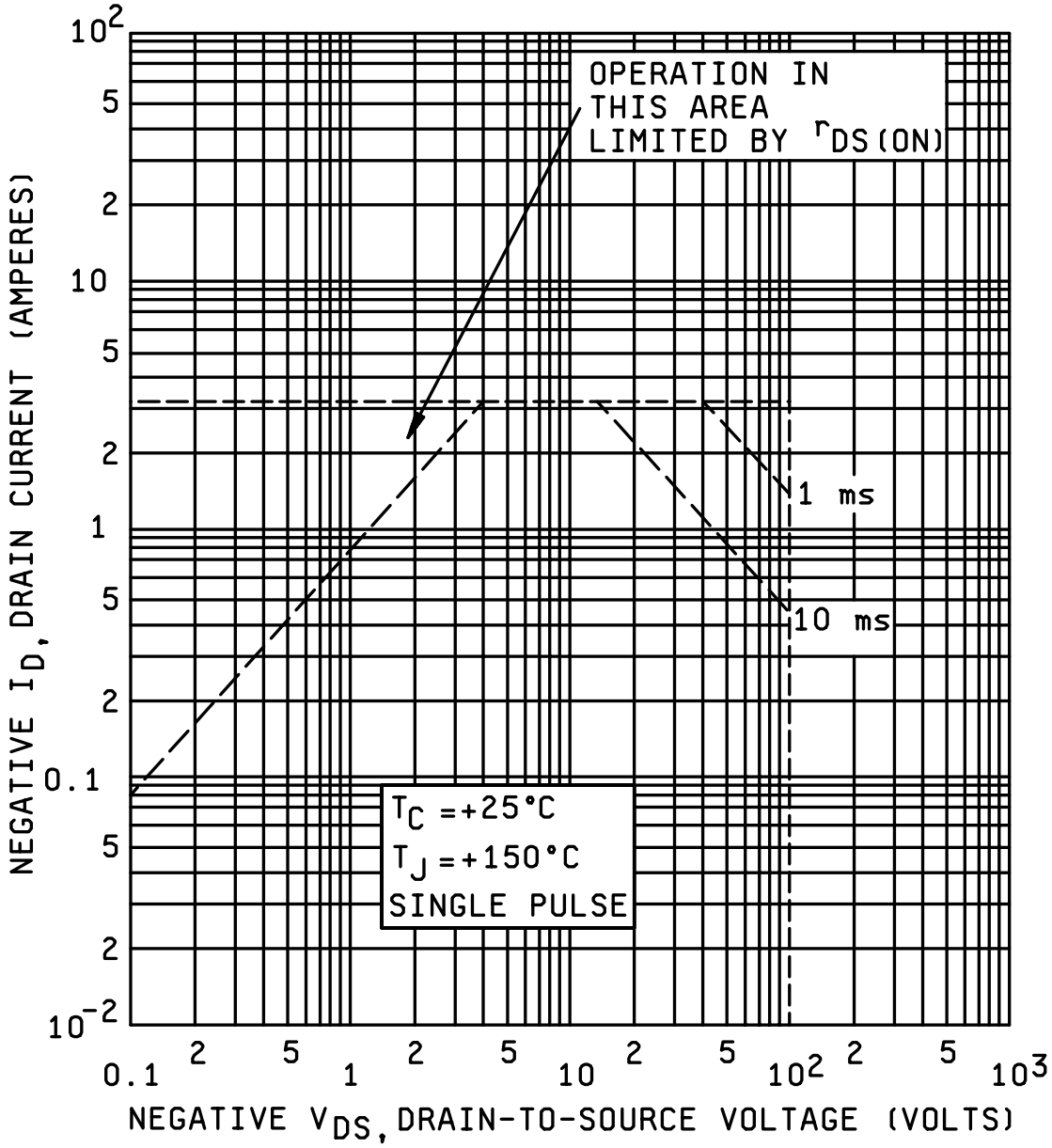
* FIGURE 3. Maximum drain current vs case temperature graph.



* FIGURE 4. Normalized Transient thermal impedance.



* FIGURE 5. Maximum safe operating area.

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 2.2.1).

c. Packaging requirements (see 5.1).

d. Lead finish (see 3.4.1).

e. Type designation and quality assurance level.

* 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 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.

Military PIN	Manufacturers' CAGE code	Manufacturers' and users' PIN
2N7335	59993	IRFG9110

* 6.5 Suppliers of JANHC and JANKC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example JANHC2N7335) will be identified on the QML.

JANHC and JANKC ordering information		
PIN	Manufacturer CAGE 59993	
2N7335	JANHC2N7335	JANKC2N7335

* 6.6 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
DLA - CC

Review activities:
Army - SM
Navy - AS, MC
Air Force - 19, 99

Preparing activity:
DLA - CC

(Project 5961-2786)

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-PRF-19500/599D	2. DOCUMENT DATE 31 October 2003

3. **DOCUMENT TITLE** SEMICONDUCTOR DEVICE, QUAD, FIELD EFFECT TRANSISTORS, P-CHANNEL, SILICON TYPE 2N7335 JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

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 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