The documentation and process conversion measures necessary to comply with this revision shall be completed by 30 NOV 92

INCH-POUND

MIL-S-19500/336C
31 AUGUST 1992
SUPERSEDING
MIL-S-19500/336B
15 June 1979

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, UNITIZED, DUAL-TRANSISTOR, PNP, SILICON TYPES 2N3810, 2N3810L, 2N3811, AND 2N3811L JANTX, JANTXV, AND JANS

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 two electrically isolated, matched PNP, silicon transistors as one dual unit. Three levels of product assurance are provided for each device type as specified in MIL-S-19500.

1.2 Physical dimensions. See figure 1.

1.3 Maximum ratings.

P_T T_A = 25°C		V_{CBO}	V_{EBO}	V_{CEO}	I_C	T_{STG} and T_J
One section 1/	Both sections 2/					
W	W	V dc	V dc	V dc	mA dc	°C
0.5	0.6	60	5	60	50	-65 to +200

1/ Derate linearly, 2.86 mW/°C for T_A > 25°C.
2/ Derate linearly, 3.43 mW/°C for T_A > 25°C.

1.4 Primary electrical characteristics at T_A = 25°C.

Limit	h_{FE3} through h_{FE5} V_{CE} = 5 V dc; I_C = 100 µA dc through I_C = 1 mA dc		$\lvert h_{fe} \rvert_2$ V_{CE} = 5 V dc; I_C = 1 mA dc; f = 100 MHz	V_{BE} (sat) 2 I_C = 1 mA dc; I_B = 100 µA dc	V_{CE} (sat) 2 I_C = 1 mA dc; I_B = 100 µA dc
	2N3810 2N3810L	2N3811 2N3811L		V dc	V dc
Minimum	150	300	1		
Maximum	450	900	5	0.8	0.25

1/ Pulsed (see 4.5.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Electronics Supply Center, ATTN: DESC-ECT, 1507 Wilmington Pike, Dayton, OH 45444-5280 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.

1.5 Primary electrical matching characteristics of each individual section.

Limit	$\frac{h_{FE3-1}}{h_{FE3-2}}$ V_{CE} = 5 V dc; I_C = 100 µA dc; 1/	$\lvert V_{BE1} - V_{BE2} \rvert_2$ V_{CE} = 5 V dc; I_C = 100 µA dc	$\lvert \Delta(V_{BE1} - V_{BE2})\ \Delta T_A \rvert 1$ V_{CE} = 5 V dc; I_C = 100 µA dc; T_A = 25°C and -65°C	$\lvert \Delta(V_{BE1} - V_{BE2})\ \Delta T_A \rvert 2$ V_{CE} = 5 V dc; I_C = 100 µA dc; T_A = 125°C and 25°C
		mV dc	mV dc	mV dc
Minimum	0.9			
Maximum	1.0	3	0.8	1.0

1/ The larger number will be placed in the denominator.

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.

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.

SPECIFICATIONS

MILITARY

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

STANDARDS

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.)

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. The abbreviations, symbols, and definitions used herein are defined in MIL-S-19500, and as follows:

$\frac{h_{FE3-1}}{h_{FE3-2}}$	Static forward-current-gain-ratio. The matching ratio of the static forward-current transfer ratios of each section.
$\lvert V_{BE1} - V_{BE2} \rvert$	Absolute value of base-emitter-voltage differential between the individual sections.
$\lvert \Delta(V_{BE1} - V_{BE2})\ \Delta T_A \rvert$	Absolute value of the algebraic difference between the base-emitter-voltage differentials between the individual sections at two different temperatures.

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

3.3.1 Lead finish. Lead finish shall be solderable in accordance with MIL-STD-750 and MIL-S-19500 and herein.

3.4 Marking. Devices shall be marked in accordance with MIL-S-19500. At the option of the manufacturer, the marking of the country of origin may be omitted from the body of the transistor.

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 Screening (JANS, JANTX, and JANTXV levels only). Screening shall be in accordance with MIL-S-19500 (table II) 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	JANTX and JANTXV levels
9	I_{CBO1}, $\frac{h_{FE3} - 1}{h_{FE3-2}}$, and h_{FE5}	Not applicable
11	I_{CBO1} and h_{FE5} ΔI_{CBO1} = 100% of initial value or 2 nA dc whichever is greater; Δh_{FE5} = ±15%	I_{CBO1} and h_{FE5}
12	See 4.2.1	See 4.2.1
13	Subgroups 2 and 3 of table I herein; ΔI_{CBO1} = 100% of initial value or 2 nA dc, whichever is greater; Δh_{FE5} = ±15%	Subgroup 2 of table I herein, ΔI_{CBO1} = 100% of initial value or 2 nA dc, whichever is greater; Δh_{FE5} = ±15%

4.2.1 Power burn-in conditions. Power burn-in conditions are as follows:

JANS level (all device types) - - - - V_{CB} = 10 V dc, P_T = 300 mW (each section) at T_A = 25° ±3°C.
V_{CB} = 10 V dc, P_T = 600 mW (both sections) at T_A = 25° ±3°C.

JANTX and JANTXV levels
(all device types) - - - - - - - - V_{CB} = 45 V dc, P_T = 300 mW (each section) at T_A = 25° ±3°C.
V_{CB} = 45 V dc, P_T = 600 mW (both sections) at T_A = 25° ±3°C.

NOTE: No heat sink or forced air cooling on the devices shall be permitted.

4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-S-19500 and as specified herein.

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-S-19500 and as specified herein. Group A inspection shall be performed on each sublot.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-S-19500 and table I 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 (JAN, JANTX and JANTXV), of MIL-S-19500. Electrical measurements (end points) and delta requirements shall be in accordance with the applicable steps of table II herein.

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

a. Condition for bond strength is test condition A.

b. Condition for intermittent operation life are as follows:

V_{CB} = 10 V dc; P_T = 300 mW (each section); P_T = 600 mW (both sections) at T_A = 25° ±3°C; t_{on} = t_{off} = three minutes minimum for 2,000 cycles. No heat sink or forced-air cooling on devices shall be permitted.

c. Condition for steady-state operation life (accelerated) are as follows:

V_{CB} = 10 V dc; P_T = 300 mW (each section); P_T = 600 mW (both sections) at T_A = 100°C for 96 hours, or T_A = 125°C ±25°C for 96 hours with P_T adjusted according to the chosen T_A to give and average T_J = 275°C.

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

a. Condition for bond strength is test condition A.

b. Condition for steady-state operation life (accelerated) are as follows:

V_{CB} = 10 V dc; P_T = 300 mW (each section); P_T = 600 mW (both sections) at T_A = 25° ±3°C. No heat sink or forced-air cooling on the devices shall be permitted.

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. Electrical measurements (end points) and delta requirements shall be in accordance with the applicable steps of table II herein.

4.4.3.1 Group C inspection, table V of MIL-S-19500.

a. Condition for terminal strength is test condition E.

b. Condition for steady-state operation life (accelerated) are as follows:

1,000 hours at V_{CB} = 10 V dc; P_T = 300 mW (each section); P_T = 600 mW (both section) at T_A = 25° ±3°C. No heat sink or forced-air cooling on device shall be permitted.

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

4.5.1 Testing of units. All specified electrical tests, including electrical measurements (end points) and delta requirement tests, shall be performed equally on both sections of the transistor types covered herein, except where the electrical characteristic being evaluated applies to the transistor as a device entity.

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

4.5.3 Disposition of leads when testing characteristics of each section. During the measurement of the characteristic of each section, the leads of the section not under test shall be open-circuited.

4.5.4 Forward-current-gain ratio. The value for the forward-current-gain ratio for each individual section of a dual unit shall be measured using method 3076 of MIL-STD-750. The forward-current-gain ratio shall be calculated by dividing one of the values by the other. If possible, this ratio shall be measured directly to improve accuracy.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Breakdown voltage, collector to base	3001	Bias condition D, I_C = 10 μA dc	$V_{(BR)CBO}$	60		V dc
Breakdown voltage, collector to emitter	3011	Bias condition D, I_C = 10 mA dc pulsed (see 4.5.1)	$V_{(BR)CEO}$	60		V dc
Breakdown voltage, emitter to base	3026	Bias condition D, I_E = 10 μA dc	$V_{(BR)EBO}$	5		V dc
Collector to base cutoff current	3036	Bias condition D, V_{CB} = 50 V dc	I_{CBO1}		10	nA dc
Emitter to base cutoff current	3061	Bias condition D, V_{EB} = 4 V dc	I_{EBO}		10	nA dc
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 μA dc	h_{FE1}			
2N3811, 2N3811L only				75 75		
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 μA dc	h_{FE2}			
2N3810, 2N3810L 2N3811, 2N3811L				100 225		
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 100 μA dc	h_{FE3}			
2N3810, 2N3810L 2N3811, 2N3811L				150 300	450 900	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 500 μA dc	h_{FE4}			
2N3810, 2N3810L 2N3811, 2N3811L				150 300	450 900	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc	h_{FE5}			
2N3810, 2N3810L 2N3811, 2N3811L				150 300	450 900	

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 2 - Continued						
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 mA dc	h_{FE6}			
2N3810, 2N3810L 2N3811, 2N3811L				125 250		
Collector to emitter voltage (saturated)	3071	I_C = 100 µA dc; I_B = 10 µA dc	$V_{CE(sat)1}$		0.2	V dc
Collector to emitter voltage (saturated)	3071	I_C = 1 mA dc; I_B = 100 µA dc	$V_{CE(sat)2}$		0.25	V dc
Base-emitter voltage (saturated)	3066	Test condition A I_C = 100 µA dc; I_B = 10 µA dc	$V_{BE(sat)1}$		0.7	V dc
Base-emitter voltage (saturated)	3066	Test condition A I_C = 1 mA dc; I_B = 100 µA dc	$V_{BE(sat)2}$		0.8	V dc
Base-emitter voltage (nonsaturated)	3066	Test condition A V_{CE} = 5 V dc; I_C = 100 µA dc	$V_{BE(sat)3}$		0.7	V dc
Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 100 µA dc (see 4.5.4)	$\frac{h_{FE3-1}}{h_{FE3-2}}$	0.9	1.0	
Base emitter voltage (nonsaturated) (absolute value of differential)	3066	Test condition B V_{CE} = 5 V dc; I_C = 10 µA dc (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert_1$		5	mV dc
Base emitter voltage (nonsaturated) (absolute value of differential)	3066	Test condition B V_{CE} = 5 V dc; I_C = 100 µA dc (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert_2$		3	mV dc
Base emitter voltage (nonsaturated) (absolute value of differential)	3066	Test condition B V_{CE} = 5 V dc; I_C = 10 mA dc (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert_3$		5	mV dc
Base emitter voltage (nonsaturated) (absolute value of differential-change with temperature)	3066	Test condition B V_{CE} = 5 V dc; I_C = 100 µA dc T_A = 25° and -55°C (see 4.5.6)	$\lvert \Delta V_{BE1} - V_{BE2} \rvert_{\Delta T_A 1}$		0.8	mV dc
Base emitter voltage (nonsaturated) (absolute value of differential-change with temperature)	3066	Test condition B V_{CE} = 5 V dc; I_C = 100 µA dc T_A = 125° and 25°C (see 4.5.6)	$\lvert \Delta V_{BE1} - V_{BE2} \rvert_{\Delta T_A 2}$		1.0	mV dc

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_A = +150°C				
Collector to base cutoff current	3036	Bias condition D, V_{CB} = 50 V dc	I_{CBO2}		10	µA dc
Low-temperature operation		T_A = -55°C				
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 100 µA dc	h_{FE7}			
2N3810, 2N3810L				60		
2N3811, 2N3811L				100		
Subgroup 4						
Open circuit output capacitance	3236	V_{CB} = 5 V dc; I_E = 0; 100 kHz ≤ f ≤ 1 MHz	C_{obo}		5	pF
Input capacitance (output open-circuited)	3240	V_{EB} = 0.5 V dc; I_C = 0; 100 kHz ≤ f ≤ 1 MHz	C_{ibo}		8	pF
Magnitude of small-signal short-circuit forward-current transfer ratio	3306	V_{CE} = 5 V dc; I_C = 500 µA dc; f = 30 MHz	$\|h_{FE}\|_1$	1.0		
Magnitude of small-signal short-circuit forward-current transfer ratio	3306	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 100 MHz	$\|h_{FE}\|_2$	1.0	5	
Small-signal short-circuit forward current transfer ratio	3206	V_{CE} = 10 V dc; I_C = 1 mA dc; f = 1 kHz	h_{fe}			
2N3810, 2N3810L				150	600	
2N3811, 2N3811L				300	900	
Small-signal short-circuit input impedance	3201	V_{CE} = 10 V dc; I_C = 10 mA dc; f = 1 kHz	h_{ie}			
2N3810, 2N3810L				3	30	kΩ
2N3811, 2N3811L				3	40	kΩ
Small-signal open-circuit output admittance	3216	V_{CE} = 10 V dc; I_C = 1 mA dc; f = 1 kHz	h_{oe}	5	60	µmhos

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						
Small-signal open-circuit reverse-voltage transfer ratio	3211	V_{CE} = 10 V dc; I_C = 1 mA dc; f = 1 kHz	h_{re}		$25x10^{-4}$	
Noise figure	3246	V_{CE} = 10 V dc; I_C = 100 µA dc; R_g = 3 kΩ; f = 100 Hz (see 4.5.7)	F1			
2N3810, 2N3810L					7	dB
2N3811, 2N3811L					4	dB
Noise figure	3246	V_{CE} = 10 V dc; I_C = 100 µA dc; R_g = 3 kΩ; f = 1 kHz (see 4.5.7)	F2			
2N3810, 2N3810L					3	dB
2N3811, 2N3811L					1.5	dB
Noise figure	3246	V_{CE} = 10 V dc; I_C = 100 µA dc; R_g = 3 kΩ; f = 10 kHz (see 4.5.7)	F3			
2N3810, 2N3810L					2.5	dB
2N3811, 2N3811L					2.0	dB
Noise figure (wideband)	3246	V_{CE} = 10 V dc; I_C = 100 µA dc; R_g = 3 kΩ; noise bandwidth 10 Hz to 15.7 kHz (see 4.5.8)	F3			
2N3810, 2N3810L					3.5	dB
2N3811, 2N3811L					2.5	dB
Subgroup 5, 6, and 7						
Not applicable						

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

TABLE II. Groups B and C electrical measurements.

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1	Collector to base cutoff current	3036	Bias condition D; V_{CB} = 50 V dc	I_{CBO1}		10	nA dc
2	Collector to base cutoff current	3036	Bias condition D; V_{CB} = 50 V dc	I_{CBO1}		20	nA dc
3	Emitter to base cutoff current	3061	Bias condition D; V_{EB} = 4 V dc	I_{EBO}		10	nA dc
4	Base emitter voltage (nonsaturated) (absolute value of differential)	3066	Test condition B; V_{CE} = 5 V dc; I_C = 100 µA dc; (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert 2$		3	mV dc
5	Base emitter voltage (nonsaturated) (absolute value of differential)	3066	Test condition B; V_{CE} = 5 V dc; I_C = 100 µA dc; (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert 2$		6	mV dc
6	Collector to emitter voltage (saturated)	3071	I_C = 100 µA dc; I_B = 10 µA dc	$V_{CE(sat)1}$		0.2	V dc
7	Base emitter voltage (saturated)	3066	Test condition A; I_C = 100 µA dc; I_B = 10 µA dc	$V_{BE(sat)1}$		0.7	V dc
8	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 µA dc	h_{FE2}			
	2N3810, 2N3810L 2N3811, 2N3811L				100 225		
9	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc	h_{FE5}			
	2N3810, 2N3810L 2N3811, 2N3811L				150 300	450 900	
10	Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 100 µA dc; (see 4.5.4)	$\frac{h_{FE3-1}}{h_{FE3-2}}$ 1/	0.9	1.0	
11	Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 100 µA dc; (see 4.5.4)	$\frac{h_{FE3-1}}{h_{FE3-2}}$ 1/	0.85	1.0	
12	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 mA dc; pulsed (see 4.5.2)	Δh_{FE6} 2/		±25% of initial recorded value	
13	Collector to base cutoff current	3036	Bias condition D; V_{CB} = 50 V dc	ΔI_{CBO1} 2/		±100% of initial reading or 4 nA dc, whichever is greater	

See footnotes at end of table.

TABLE II. Groups B and C electrical measurements - Continued.

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
14	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc	Δh_{FE5} 2/		±25% of initial recorded value	

1/ The larger number will be placed in the denominator.

2/ Devices which exceed the group A limits for this test shall not be accepted.

3/ The electrical measurements for table IVa (JANS) of MIL-S-19500 are as follows:

a. Subgroup 3, see table II herein, steps 1, 3, 4, 6, 7, 8, 9, and 10.

b. Subgroup 4, see table II herein, steps 1, 3, 4, 6, 7, 8, 9, and 10.

c. Subgroup 5, see table II herein, steps 1, 3, 4, 6, 7, 8, 9, 10, 13, and 14.

4/ The electrical measurements for table IVb (JANTX and JANTXV) of MIL-S-19500 are as follows:

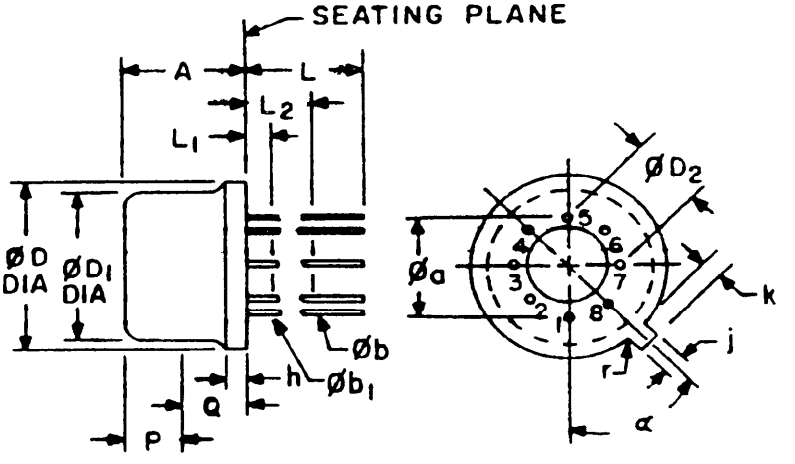
a. Subgroup 2, see table II herein, steps 1 and 9.

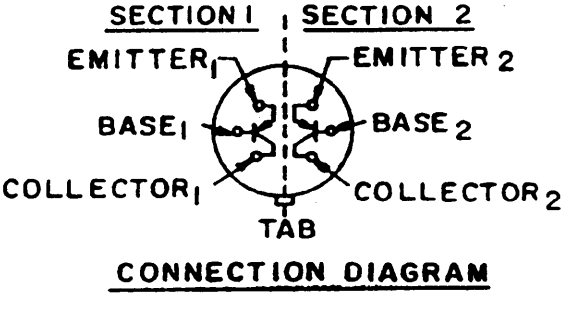
b. Subgroups 3 and 6, see table II herein, steps 2, 5, 11, and 12.

5/ The electrical measurements for table V of MIL-S-19500 are as follows:

a. Subgroups 2 and 3, see table II herein, steps 1, 3, 4, 6, 7, 8, 9, and 10 for JANS and steps 1 and 9 for JANTX and JANTXV.

b. Subgroup 6, see table II herein, steps 1, 3, 4, 6, 7, 8, 9, 10, 13, and 14 for JANS and steps 2, 5, 11, and 12 for JANTX and JANTXV.





CONNECTION DIAGRAM

FIGURE 1. Physical dimensions.

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
ϕa	.200 TP		5.08 TP		9
A	.150	.260	3.81	7.60	
ϕb	.016	.021	0.41	0.53	10
ϕb_1	.016	.019	0.41	0.48	10
ϕD	.335	.370	8.51	9.40	
ϕD_1	.305	.335	7.75	8.51	
ϕD_2	.140	.160	3.56	4.06	
h	.009	.041	0.23	1.04	
j	.028	.034	0.71	0.86	4,5
k	.029	.045	0.74	1.14	5,6
L	See notes 10, 11, and 13				
L_1	----	.050	----	1.27	10
L_2	.250	----	6.35	----	10
P	.100	----	2.54	----	8
Q	----	.050	----	1.27	7
r	----	.010	----	0.25	11
α	45° TP		45°TP		9

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Refer to rules for dimensioning Semiconductor Product Outlines included in Publication No. 95.
4. Lead number 4 and 8 omitted on this variation.
5. Beyond r, j must be held to a minimum length of .021 (.53 mm).
6. K measured from maximum ϕD.
7. Details of outline in this zone optional.
8. ϕD_1 shall not vary more than .010 (.25mm) in zone P. This zone is controlled for automatic handling.
9. Leads at gauge plane .054 - .055 (1.37 - 1.40 mm) below seating plane shall be within .007 (.18 mm) radius of true position (TP) at a maximum material condition (MMC) relative to the tab at MMC. The device may be measured by direct methods or by the gauge and gauging procedure described on gauge drawing GS-1.
10. ϕb_1 applies between L_1 and L_2. ϕb applies between L_2 and L minimum. Diameter is uncontrolled in L_1 and beyond minimum.
11. r (radius) applies to both inside corners of tab.
12. For transistor types 2N3810 and 2N3811, L is .500 (12.70 mm) minimum, and .750 (19.50 mm) maximum. (TO-99)
13. For transistor types 2N3810L and 2N3811L, L is 1.500 (38.10 mm) minimum, and 1.750 (44.45 mm) maximum.

FIGURE 1. Physical dimensions - Continued.

4.5.5 Base-emitter-voltage differential. The base-emitter-voltage differential shall be determined by connecting the emitters of the individual sections together, applying specified electrical test conditions to each individual section in accordance with test condition B, method 3066 of MIL-STD-750, and measuring the absolute value of the voltage between the bases of the individual sections of a dual unit.

4.5.6 Base-emitter-voltage differential change with temperature. The value of the base-emitter-voltage differential shall be measured at the two specified temperatures in accordance with 4.4.5 except that the identities of the individual sections shall be maintained. The absolute value of the algebraic difference between the values at the two temperature extremes shall be calculated. A mathematical formula for this parameter is:

$$\left| (V_{BE1} - V_{BE2})_{T1} - (V_{BE1} - V_{BE2})_{T2} \right|$$

4.5.7 Noise figure test. Noise figure shall be measured using a model No. 2173C/2181 Quan Tech Laboratories test set, or equivalent. Conditions shall be as specified in table I.

4.5.8 Noise figure (wideband) test. Wideband noise figure shall be measured using a model No. 512 Quan Tech Laboratories test set, or equivalent. Conditions shall be as specified in table I.

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 finish as specified (see 3.3.1).

c. Product assurance level and type designation.

6.3 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.

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

Review activities:
Army - AV, MI
Air Force - 85, 99
DLA - ES
NASA - LRC, MSF

User activities:
Navy - AS, CG, MC
Air Force - 13, 15

Preparing activity:
Navy - EC

Agent:
DLA - ES

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