

The documentation and process conversion measures necessary to comply with this revision shall be completed by 21 August 1997

INCH POUND

MIL-PRF-19500/336D
 21 May 1997
 SUPERSEDING
 MIL-S-19500/336C
 31 August 1992

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, UNITIZED, DUAL-TRANSISTOR, PNP,
 SILICON TYPES 2N3810, 2N3810L, 2N3811, AND 2N3811L
 JAN, 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 performance requirements for two electrically isolated, matched PNP, silicon transistors as one dual unit. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1. Similar to TO-99.

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/					
<u>W</u>	<u>W</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>mA dc</u>	<u>°C</u>
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		h _{re} 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 <u>2N3810L</u>	2N3811 <u>2N3811L</u>		<u>V dc</u>	<u>V dc</u>
Minimum	150	300	1		
Maximum	450	900	5	0.8	0.25

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 Supply Center Columbus, ATTN: DSCC-VAT, 3900 East Broad Street, Columbus, OH 43216, 5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of the 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	$\frac{h_{FE3-1}}{h_{FE3-2}}$ $V_{CE} = 5 \text{ V dc};$ $I_C = 100 \mu\text{A dc}$ $\frac{1}{}$	$ V_{BE1} - V_{BE2} _2$ $V_{CE} = 5 \text{ V dc};$ $I_C = 100 \mu\text{A dc}$	$ \Delta(V_{BE1} - V_{BE2}) \Delta T_A _1$ $V_{CE} = 5 \text{ V dc}$ $I_C = 100 \mu\text{A dc}$ $T_A = +25^\circ\text{C and } -65^\circ\text{C}$	$ \Delta(V_{BE1} - V_{BE2}) \Delta T_A _2$ $V_{CE} = 5 \text{ V dc};$ $I_C = 100 \mu\text{A dc}$ $T_A = +125^\circ\text{C and } +25^\circ\text{C}$
		<u>mV dc</u>	<u>mV dc</u>	<u>mV dc</u>
Minimum	0.9	3	0.8	1.0
Maximum	1.0			

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

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.

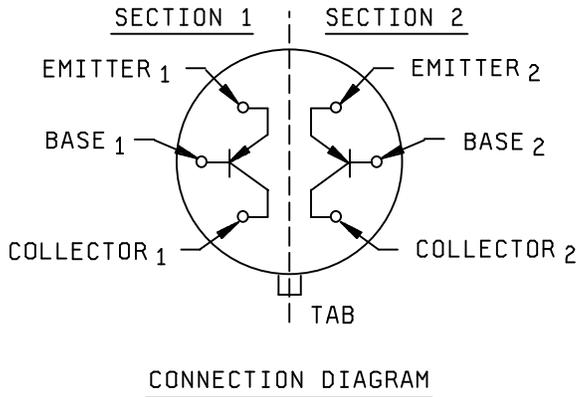
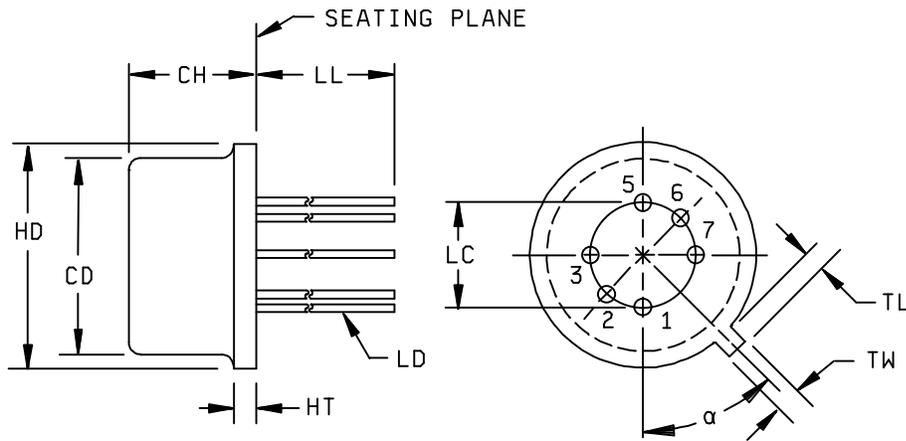
STANDARD

MILITARY

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

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, 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 (except for related associated specifications or specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.



Symbol	Dimensions				Notes
	Inches		Millimeters		
	Max	Min	Max	Min	
CD	.305	.335	7.75	8.51	
CH	.150	.260	3.81	7.60	
HD	.335	.370	8.51	9.40	
HT	.009	.041	0.23	1.04	
LC	.140	.160	3.56	4.06	
LD	.016	.021	0.41	0.53	10
LL	See notes 10, 11, and 13				
α	45°TP		45°TP		9
TL	.029	.045	0.74	1.14	5, 6
TW	.028	.034	0.71	0.86	4, 5

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. TW must be held to a minimum length of .021 inch (0.53 mm).
6. LL measured from maximum HD.
7. Details of outline in this zone optional.
8. CD shall not vary more than .010 inch (.25mm) in zone P. This zone is controlled for automatic handling.
9. Leads at gauge plane .054 - .055 inch (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. LD applies to LL minimum.
11. r (radius) applies to both inside corners of tab.
12. For transistor types 2N3810 and 2N3811, LL is .500 inch (12.70 mm) minimum, and .750 inch (19.50 mm) maximum. (TO-99)
13. For transistor types 2N3810L and 2N3811L, LL is 1.500 inches (38.10 mm) minimum, and 1.750 inches (44.45 mm) maximum.

FIGURE 1. Physical dimensions.

3. REQUIREMENTS

3.1 Qualification. Devices furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.2 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-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.
$ V_{BE1} - V_{BE2} $	-----	Absolute value of base-emitter-voltage differential between the individual sections.
$ \Delta(V_{BE1} - V_{BE2}) \Delta T_A $	-----	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. The design, construction, and physical dimensions for the purpose of interchangeability shall be as specified on figure 1 herein.

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

3.4 Marking. Devices shall be marked in accordance with MIL-PRF-19500.

3.5 Interface requirements and physical dimensions. The interface requirements and physical dimensions shall be as specified in MIL-PRF-19500 and figure 1 (similar to TO-99) herein.

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I.

3.7 Electrical test requirements. The electrical test requirements shall be the subgroups specified in 4.4.2 and 4.4.3.

4. QUALITY ASSURANCE PROVISIONS

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).

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

4.3 Screening (JANS, JANTX, and JANTXV levels only). Screening shall be in accordance with MIL-PRF-19500, appendix E, table VI 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)	Measurements	
	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 percent of initial value or 2 nA dc whichever is greater; Δh_{FE5} = ± 15 percent	I_{CBO1} and h_{FE5}
12	See 4.3.1	See 4.3.1
13	Subgroups 2 and 3 of table I herein; ΔI_{CBO1} = 100 percent of initial value or 2 nA dc, whichever is greater; Δh_{FE5} = ± 15 percent	Subgroup 2 of table herein, ΔI_{CBO1} = 100 percent of initial value or 2 nA dc, whichever is greater; Δh_{FE5} = ± 15 percent

4.3.1 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 $T_A = 25^\circ\text{C} \pm 3^\circ\text{C}$.
 $V_{CB} = 10$ V dc, $P_T = 600$ mW (both sections) at $T_A = 25^\circ\text{C} \pm 3^\circ\text{C}$.

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

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

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-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 appendix E, table VIa (JANS) and table VIb (JANTX and JANTXV), of MIL-PRF-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, appendix E, table VIa (JANS) of MIL-PRF-19500.

Subgroup	Method	Conditions
B4	1037	$V_{CB} = 10$ V dc; $P_T = 300$ mW (each section); $P_T = 600$ mW (both sections) at $T_A = +25^\circ\text{C} \pm 3^\circ\text{C}$; $t_{on} = t_{off} =$ three minutes minimum for 2,000 cycles. No heat sink or forced-air cooling on devices shall be permitted.
B5	1027	$V_{CB} = 10$ V dc; $P_T = 300$ mW (each section); $P_T = 600$ mW (both sections) at $T_A = +100^\circ\text{C}$ for 96 hours, or $T_A = +125^\circ\text{C} \pm 25^\circ\text{C}$ for 96 hours with P_T adjusted according to the chosen T_A to give and average $T_J = +275^\circ\text{C}$.

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

Subgroup	Method	Conditions
B3	2037	Test condition A.
B3	1027	$V_{CB} = 10$ V dc; $P_T = 300$ mW (each section); $P_T = 600$ mW (both sections) at $T_A = +25^\circ\text{C} \pm 3^\circ\text{C}$. 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 appendix E, table VII of MIL-PRF-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, appendix E, table VII of MIL-PRF-19500.

Subgroup	Method	Conditions
B2	2036	Test condition E.
6	1026	1,000 hours at $V_{CB} = 10$ V dc; $P_T = 300$ mW (each section); $P_T = 600$ mW (both section) at $T_A = +25^\circ\text{C} \pm 3^\circ\text{C}$. 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.

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:

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

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.

TABLE I. Group A inspection.

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

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/ <u>Subgroup 2</u> - Continued	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Forward-current transfer ratio 2N3810, 2N3810L 2N3811, 2N3811L	3076	$V_{CE} = 5 \text{ V dc}; I_C = 10 \text{ mA dc}$	h_{FE6}	125 250		
Collector to emitter voltage (saturated)	3071	$I_C = 100 \mu\text{A dc}; I_B = 10 \mu\text{A dc}$	$V_{CE(sat)1}$		0.2	V dc
Collector to emitter voltage (saturated)	3071	$I_C = 1 \text{ mA dc}; I_B = 100 \mu\text{A dc}$	$V_{CE(sat)2}$		0.25	V dc
Base-emitter voltage (saturated)	3066	Test condition A $I_C = 100 \mu\text{A dc}; I_B = 10 \mu\text{A dc}$	$V_{BE(sat)1}$		0.7	V dc
Base-emitter voltage (saturated)	3066	Test condition A $I_C = 1 \text{ mA dc}; I_B = 100 \mu\text{A dc}$	$V_{BE(sat)2}$		0.8	V dc
Base-emitter voltage (nonsaturated)	3066	Test condition A $V_{CE} = 5 \text{ V dc}; I_C = 100 \mu\text{A dc}$	$V_{BE(sat)3}$		0.7	V dc
Forward-current transfer ratio (gain ratio)	3076	$V_{CE} = 5 \text{ V dc}; I_C = 100 \mu\text{A dc}$ (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 $V_{CE} = 5 \text{ V dc}; I_C = 10 \mu\text{A dc}$ (see 4.5.5)	$\left \begin{array}{l} V_{BE1-} \\ V_{BE2} \end{array} \right _1$		5	mV dc
Base emitter voltage (nonsaturated) (absolute value of differential)	3066	Test condition B $V_{CE} = 5 \text{ V dc}; I_C = 100 \mu\text{A dc}$ (see 4.5.5)	$\left \begin{array}{l} V_{BE1-} \\ V_{BE2} \end{array} \right _2$		3	mV dc
Base emitter voltage (nonsaturated) (absolute value of differential)	3066	Test condition B $V_{CE} = 5 \text{ V dc}; I_C = 10 \text{ mA dc}$ (see 4.5.5)	$\left \begin{array}{l} V_{BE1-} \\ V_{BE2} \end{array} \right _3$		5	mV dc
Base emitter voltage (nonsaturated) (absolute value of differential-change with temperature)	3066	Test condition B $V_{CE} = 5 \text{ V dc}; I_C = 100 \mu\text{A dc}$ $T_A = +25^\circ \text{ and } -55^\circ\text{C}$ (see 4.5.6)	$\left \begin{array}{l} \Delta V_{BE1-} \\ V_{BE2} \\ \Delta T_A \end{array} \right _1$		0.8	mV dc

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method			Min	Max	
<u>Subgroup 2</u> - Continued						
Base emitter voltage (nonsaturated) (absolute value of differential-change with temperature)	3066	Test condition B $V_{CE} = 5 \text{ V dc}$; $I_C = 100 \mu\text{A dc}$ $T_A = +125^\circ$ and $+25^\circ\text{C}$ (see 4.5.6)	$\left \frac{\Delta V_{BE1} - V_{BE2}}{\Delta T_A} \right _2$		1.0	mV dc
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +150^\circ\text{C}$				
Collector to base cutoff current	3036	Bias condition D, $V_{CB} = 50 \text{ V dc}$	I_{CB02}		10	$\mu\text{A dc}$
Low-temperature operation:		$T_A = -55^\circ\text{C}$				
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}$; $I_C = 100 \mu\text{A dc}$	h_{FE7}			
2N3810, 2N3810L 2N3811, 2N3811L				60 100		
<u>Subgroup 4</u>						
Open circuit output capacitance	3236	$V_{CB} = 5 \text{ V dc}$; $I_E = 0$; $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{obo}		5	pF
Input capacitance (output open-circuited)	3240	$V_{EB} = 0.5 \text{ V dc}$; $I_C = 0$; $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{ibo}		8	pF
Magnitude of small-signal short-circuit forward-current transfer ratio	3306	$V_{CE} = 5 \text{ V dc}$; $I_C = 500 \mu\text{A dc}$; $f = 30 \text{ MHz}$	$ h_{FE} _1$	1.0		
Magnitude of small-signal short-circuit forward-current transfer ratio	3306	$V_{CE} = 5 \text{ V dc}$; $I_C = 1 \text{ mA dc}$; $f = 100 \text{ MHz}$	$ h_{FE} _2$	1.0	5	
Small-signal short-circuit forward current transfer ratio	3206	$V_{CE} = 10 \text{ V dc}$; $I_C = 1 \text{ mA dc}$; $f = 1 \text{ kHz}$	h_{ie}			
2N3810, 2N3810L 2N3811, 2N3811L				150 300	600 900	

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u> - Continued						
Small-signal short-circuit input impedance	3201	$V_{CE} = 10 \text{ V dc}; I_C = 1 \text{ mA dc};$ $f = 1 \text{ kHz}$	h_{ie}			
2N3810, 2N3810L				3	30	k Ω
2N3811, 2N3811L				3	40	k Ω
Small-signal open-circuit output admittance	3216	$V_{CE} = 10 \text{ V dc}; I_C = 1 \text{ mA dc};$ $f = 1 \text{ kHz}$	h_{oe}	5	60	μmhos
Small-signal open-circuit reverse-voltage transfer ratio	3211	$V_{CE} = 10 \text{ V dc}; I_C = 1 \text{ mA dc};$ $f = 1 \text{ kHz}$	h_{re}		25×10^{-4}	
Noise figure	3246	$V_{CE} = 10 \text{ V dc}; I_C = 100 \mu\text{A dc};$ $R_g = 3 \text{ k}\Omega;$ $f = 100 \text{ Hz (see 4.5.7)}$	F1			
2N3810, 2N3810L					7	dB
2N3811, 2N3811L					4	dB
Noise figure	3246	$V_{CE} = 10 \text{ V dc}; I_C = 100 \mu\text{A dc};$ $R_g = 3 \text{ k}\Omega;$ $f = 1 \text{ kHz (see 4.5.7)}$	F2			
2N3810, 2N3810L					3	dB
2N3811, 2N3811L					1.5	dB
Noise figure	3246	$V_{CE} = 10 \text{ V dc}; I_C = 100 \mu\text{A dc};$ $R_g = 3 \text{ k}\Omega;$ $f = 10 \text{ kHz (see 4.5.7)}$	F3			
2N3810, 2N3810L					2.5	dB
2N3811, 2N3811L					2.0	dB
Noise figure (wideband)	3246	$V_{CE} = 10 \text{ V dc}; I_C = 100 \mu\text{A dc};$ $R_g = 3 \text{ k}\Omega;$ noise bandwidth 10 Hz to 15.7 kHz (see 4.5.8)	F3			
2N3810, 2N3810L					3.5	dB
2N3811, 2N3811L					2.5	dB
<u>Subgroup 5, 6, and 7</u>						
Not applicable						

1/ For sampling plan, see MIL-PRF-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; $V_{CB} = 50 \text{ V dc}$	I_{CBO1}		10	nA dc
2	Collector to base cutoff current	3036	Bias condition D; $V_{CB} = 50 \text{ V dc}$	I_{CBO1}		20	nA dc
3	Emitter to base cutoff current	3061	Bias condition D; $V_{EB} = 4 \text{ V dc}$	I_{EBO}		10	nA dc
4	Base emitter voltage (nonsaturated) (absolute value of differential)	3066	Test condition B; $V_{CE} = 5 \text{ V dc}$; $I_C = 100 \mu\text{A dc}$; (see 4.5.5)	$ V_{BE1} - V_{BE2} _2$		3	mV dc
5	Base emitter voltage (nonsaturated) (absolute value of differential)	3066	Test condition B; $V_{CE} = 5 \text{ V dc}$; $I_C = 100 \mu\text{A dc}$; (see 4.5.5)	$ V_{BE1} - V_{BE2} _2$		6	mV dc
6	Collector to emitter voltage (saturated)	3071	$I_C = 100 \mu\text{A dc}$; $I_B = 10 \mu\text{A dc}$	$V_{CE(sat)1}$		0.2	V dc
7	Base emitter voltage (saturated)	3066	Test condition A; $I_C = 100 \mu\text{A dc}$; $I_B = 10 \mu\text{A dc}$	$V_{BE(sat)1}$		0.7	V dc
8	Forward-current transfer ratio 2N3810, 2N3810L 2N3811, 2N3811L	3076	$V_{CE} = 5 \text{ V dc}$; $I_C = 10 \mu\text{A dc}$	h_{FE2}	100 225		
9	Forward-current transfer ratio 2N3810, 2N3810L 2N3811, 2N3811L	3076	$V_{CE} = 5 \text{ V dc}$; $I_C = 1 \text{ mA dc}$	h_{FE5}	150 300	450 900	
10	Forward-current transfer ratio (gain ratio)	3076	$V_{CE} = 5 \text{ V dc}$; $I_C = 100 \mu\text{A dc}$; (see 4.5.4)	$h_{FE3-1} \underline{1/}$ h_{FE3-2}	0.9	1.0	
11	Forward-current transfer ratio (gain ratio)	3076	$V_{CE} = 5 \text{ V dc}$; $I_C = 100 \mu\text{A dc}$; (see 4.5.4)	$h_{FE3-1} \underline{1/}$ h_{FE3-2}	0.85	1.0	
12	Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}$; $I_C = 10 \text{ mA dc}$; pulsed (see 4.5.2)	$\Delta h_{FE6} \underline{2/}$			$\pm 25\%$ of initial recorded value
13	Collector to base cutoff current	3036	Bias condition D; $V_{CB} = 50 \text{ V dc}$	$\Delta I_{CBO1} \underline{2/}$			$\pm 100\%$ percent 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	$V_{CE} = 5 \text{ V dc};$ $I_C = 1 \text{ mA dc}$	Δh_{FE5} 2/		± 25 percent 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 appendix E, table VI a (JANS) of MIL-PRF-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 appendix E, table VI b (JANTX and JANTXV) of MIL-PRF-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 appendix E, table VII of MIL-PRF-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.

5. PACKAGING

5.1 Packaging. Packaging shall prevent mechanical damage of the devices during shipping and handling and shall not be detrimental to the device. When actual packaging of material 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 Points' packaging activity within the Military Department or Defense Agency, or within the Military Departments' System Command. Packaging data retrieval is available from the managing Military Departments' or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

5.2 Marking. Unless otherwise specified (see 6.2), marking shall be in accordance with MIL-STD-129.

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-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. See MIL-PRF-19500.

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 Products List QPL No.19500 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 purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, DSCC-EQE, Columbus, OH 43216.

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

Custodians:

Army - CR
Navy - EC
Air Force - 17
NASA - NA

Preparing activity:

DLA - CC

(Project 5961-1837)

Review activities:

Army - AV, MI
Navy - AS, CG, MC
Air Force - 13, 19, 85, 99

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-PRF-19500/336

2. DOCUMENT DATE (YYMMDD)
970521

3. DOCUMENT TITLE
SEMICONDUCTOR DEVICE, UNITIZED, DUAL-TRANSISTOR, PNP, SILICON TYPES 2N3810, 2N3810L, 3N3811 AND 2N3811L, JAN, JANTX, JANTXV, AND JANS

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)

7. DATE SUBMITTED
(YYMMDD)

- (1) Commercial
- (2) AUTOVON
(If applicable)

8. PREPARING ACTIVITY

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