The documentation and process conversion measures necessary to comply with this revision shall be completed by 19 April 1998

INCH-POUND

MIL-PRF-19500/270F
19 January 1998
SUPERSEDING
MIL-S-19500/270E
14 August 1992

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, UNITIZED, DUAL-TRANSISTOR, NPN, SILICON, TYPES 2N2060 AND 2N2060L
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 NPN, 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 - 77).

1.3 Maximum ratings.

P_{T1} T_A = +25°C		P_{T2} T_C = +25°C		I_C	V_{CBO}	V_{CEO}	V_{EBO}	T_{STG} and T_J
One section 1/	Both sections 2/	One section 1/	Both sections 2/					
mW	mW	W	W	mA dc	V dc	V dc	V dc	°C
540	600	1.5	2.12	500	100	60	7	-65 to +200

1/ For T_A > +25°C, derate linearly 3.08 mW/°C one section, 3.48 mW/°C both sections.

2/ For T_C > +25°C, derate linearly 8.6 mW/°C one section, 12.1 mW/°C both sections.

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

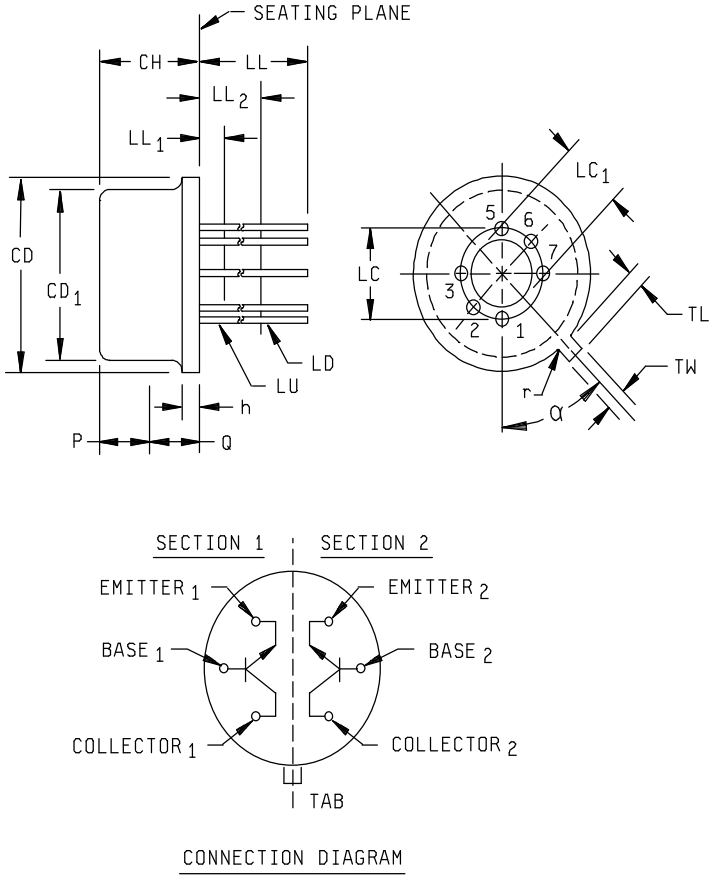
Limit	h_{FE1}	h_{FE2}	h_{FE3}	h_{FE4} 1/	$\lvert h_{fe} \rvert$	$V_{CE(sat)}$	$V_{BE(sat)}$
	V_{CE}= 5 V dc I_C = 10 μA dc	V_{CE}= 5 V dc I_C = 100 μA dc	V_{CE}= 5 V dc I_C = 1 mA dc	V_{CE}= 5 V dc I_C = 10 mA dc	V_{CE}= 10 V dc I_C = 50 mA dc f = 20 MHz	I_C = 50 mA dc I_B = 5 mA dc	I_C = 50 mA dc I_B = 5 mA dc
						V dc	V dc
Min	25	30	40	50	3	0.3	0.9
Max	75	90	120	150	25		

1/ Pulsed (see 4.5.1).0

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, 3990 East Broad Street, 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.



Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.335	.370	8.51	9.40	
CD_1	.305	.335	7.75	8.51	
CH	.150	.260	3.81	7.60	
LC	.200 TP		5.08 TP		9
LC_1	.140	.160	3.56	4.06	
LD	.016	.021	0.41	0.53	10
LL	See notes 10, 12, and 13				
LL_1	- - -	.050	- - -	1.27	10
LL_2	.250	- - -	6.35	- - -	10
LU	.016	.019	0.41	0.48	10
P	.100	- - -	2.54	- - -	8
Q	- - -	.050	- - -	1.27	7
TL	.029	.045	0.74	1.14	5, 6
TW	.028	.034	0.71	0.86	4, 5
h	.009	.041	0.23	1.04	
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, TW must be held to a minimum length of .021 inch (.53 mm).
6. TL measured from maximum CD.
7. Details of outline in this zone optional.
8. CD_1 shall not vary more than .010 inch (.25 mm) 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 inch (.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. LU applies between LL_1 and LL_2 LD applies between LL_2 and LL minimum. Diameter is uncontrolled in LL_1 and beyond minimum.
11. r (radius) applies to both inside corners of tab.
12. For transistor types 2N2060, LL is .500 inch (12.70 mm) minimum, and .750 inch (19.50 mm) maximum. (TO-99)
13. For transistor types 2N2060L, LL is 1.500 inches (38.10 mm) minimum, and 1.750 inches (44.45 mm) maximum.

FIGURE 1. Physical dimensions.

1.5 Primary electrical matching characteristics of each individual section.

Limit	$\frac{h_{FE2-1}}{h_{FE2-2}}$ 1/	$\lvert V_{BE1} - V_{BE2} \rvert$	$\lvert \Delta(V_{BE1} - V_{BE2}) \Delta T_A \rvert 1$	$\lvert \Delta(V_{BE1} - V_{BE2}) \Delta T_A \rvert 2$
	V_{CE} = 5 V dc; I_C = 100 µA dc 1/	V_{CE} = 5 V dc; I_C = 100 µA dc	V_{CE} = 5 V dc; I_C = 100 µA dc T_A = +25°C and -55°C	V_{CE} = 5 V dc; I_C = 100 µA dc T_A = +125°C and +25°C
		mV dc	mV dc	mV
Min	0.9	- - -	- - -	- - -
Max	1.0	5	0.8	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.

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

$\frac{n_{FE-1}}{h_{FE-2}}$ ..... 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 Interface requiements and physical dimensions. The interface requiements and physical dimensions shall be as specified in MIL-PRF-19500 and on figure 1 herein.

3.3.1 Lead finish. Lead finish shall be gold, silver, tin, or solder plated. Lead finish shall be solderable as defined in MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition requirements (see 6.2).

3.4 Marking. Devices shall be marked as specified in MIL-PRF-19500.

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

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

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).

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 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)	Measurement	
	JANS level	JANTX and JANTXV levels
9	I_{CBO1}, $\frac{h_{FE2-1}}{h_{FE2-2}}$, and h_{FE3}	Not applicable
11	I_{CBO1}, $\frac{h_{FE2-1}}{h_{FE2-2}}$, and h_{FE3} I_{CBO1} = 100 percent of initial value or 2 nA dc, whichever is greater. Δh_{FE3} = ± 15 percent	I_{CBO1} and h_{FE3}
12	See 4.3.1	See 4.3.1
13 (a)	Subgroups 2 and 3 of table I herein; ΔI_{CBO1} = 100 percent of initial value or 2 nA dc, whichever is greater. Δh_{FE3} = ±15 percent	Subgroup 2 of table I herein; ΔI_{CBO1} = 100 percent of initial value or 2 nA dc, whichever is greater. Δh_{FE3} = ±15 percent
13 (b)	MIL-STD-750, method 1016, test condition A (collector to collector) R_{C1-C2} = 10^9 ohms minimum.	Not applicable

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°C ± 3°C.
V_{CB} = 10 V dc, P_T = 600 mW (both sections) at T_A = +25°C ± 3°C.

JANTX and JANTXV levels
(all device types)..... V_{CB} = 40 V dc, P_T = 300 mW (each section) at T_A = +25°C ± 3°C.
V_{CB} = 40 V dc, P_T = 600 mW (both sections) at T_A = +25°C ± 3°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, and as specified herein. Alternate flow is allowed for quality conformance inspection in accordance with appendix E of 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. 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 appendix E, table VIa (JANS) and table VIb (JANTX and JANTXV) of MIL-PRF-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, appendix E, table VIa (JANS) of MIL-PRF-19500.

a. 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°C ± 3°C. $t_{on} = t_{off}$ = 3 minutes minimum for 2,000 cycles. No heat sink or forced-air cooling on devices shall be permitted.

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 = +100°C ± 3°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 an average T_J = +275°C.

4.4.2.2 Group B inspection, appendix E, table VIb (JANTX and JANTXV of MIL-PRF-19500. Condition for Steady-state operation life (accelerated) are as follows:

V_{CB} = 30 V dc; P_T = 300 mW (each section); P_T = 600 mW (both sections) at T_A = +25°C ± 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 appendix E, table VII of MIL-PRF-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.

4.4.3.1 Group C inspection, appendix E, table VII of MIL-PRF-19500. Condition for steady-state operation life (accelerated) are as follows:

1000 hours at V_{CB} = 30 V dc; P_T = 300 mW (each section); P_T = 600 mW (both section) at T_A = +25°C ± 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 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

4.5.2 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.

4.5.3 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 4.5.5 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/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical inspection	2071					
Subgroup 2						
Breakdown voltage, collector to base	3001	Bias condition D, , I_C = 100 μA dc	$V_{(BR)CBO}$	100		V dc
Breakdown voltage, collector to emitter	3011	Bias condition B, I_C = 10 mA dc R_{BE} ≤ 10 ohms, pulsed (see 4.5.1)	$V_{(BR)CER}$	80		V dc
Breakdown voltage, collector to emitter	3011	Bias condition D, I_C = 30 mA dc pulsed (see 4.5.1)	$V_{(BR)CEO}$	60		V dc
Breakdown voltage, emitter to base	3026	Bias condition D, I_E = 100 μA dc	$V_{(BR)EBO}$	7		V dc
Collector to base cutoff current	3036	Bias condition D, V_{CB} = 80 V dc	I_{CBO1}		2	nA dc
Emitter to base cutoff current	3061	Bias condition D, V_{EB} = 5 V dc	I_{EBO}		2	nA dc
Saturation voltage and resistance (collector to emitter)	3071	I_C = 50 mA dc; I_B = 5 mA dc	$V_{CE(sat)}$		0.3	V dc
Base emitter voltage (saturated)	3066	Test condition A, I_C = 50 mA dc; I_B = 5 mA dc	$V_{BE(sat)}$		0.9	V dc
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 μA dc	h_{FE1}	25	75	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 100 μA dc	h_{FE2}	30	90	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc	h_{FE3}	40	120	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 mA dc pulsed (see 4.5.1)	h_{FE4}	50	150	
Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 100 μA dc pulsed (see 4.5.4)	$\frac{h_{FE2-1}}{h_{FE2-2}}$ 2/	0.9	1.0	

See footnotes 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 (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 1 mA dc pulsed (see 4.5.4)	$\frac{h_{FE3-1}}{h_{FE3-2}}$ 2/	0.9	1.0	
Absolute value of base emitter-voltage differential	3066	Test condition B; V_{CE} = 5 V dc; I_C = 100 :A dc (see 4.5.5)	$\lvert V_{BE} - V_{BE2} \rvert$ 1		5	mV dc
Absolute value of base emitter-voltage differential	3066	Test condition B; V_{CE} = 5 V dc; I_C = 1 mA dc (see 4.5.5)	$\lvert V_{BE} - V_{BE2} \rvert$ 2		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°C and -55°C (see 4.5.6)	$\lvert \Delta(V_{BE1} - V_{BE2}) / \Delta T_A \rvert 1$		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 = +25°C and +125°C (see 4.5.6)	$\lvert \Delta(V_{BE1} - V_{BE2}) / \Delta T_A \rvert 2$		1	mV dc
Subgroup 3						
High temperature operation:						
Collector to base cutoff current	3036	T_A = +150°C Bias condition D, V_{CB} = 80 V dc	I_{CBO2}		10	µA dc
Low temperature operation:						
Forward-current transfer ratio	3076	T_A = -55°C V_{CE} = 5 V dc; I_C = 100 µA dc	h_{FE5}	10		

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 4						
Small-signal short-circuit forward-current transfer ratio	3206	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{fe}	50	150	
Common emitter small-signal short-circuit forward-current transfer ratio	3306	V_{CE} = 10 V dc; I_C = 50 mA dc; f = 20 MHz	$\|h_{fe}\|$	3	25	
Small-signal short-circuit input impedance	3201	V_{CB} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{ib}	20	30	Ω
Small-signal short circuit input impedance	3201	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{ie}	1,000	4,000	Ω
Small-signal open-circuit output admittance	3216	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{oe}	0	16	μmhos
Output capacitance (input open circuited)	3236	V_{CB} = 10 V dc; I_E = 0; 100 kHz ≤ f ≤ 1 MHz	C_{obo}		15	pF
Input capacitance (output open circuited)	3240	V_{EB} = 0.5 V dc; I_C = 0; 100 kHz ≤ f ≤ 1 MHz	C_{ibo}		85	pF
Noise figure	3246	V_{CE} = 10 V dc; I_C = 300 μA dc; Rg = 510 Ω; f = 1 kHz (see 4.5.7)	F1		8	dB
Noise figure	3246	V_{CE} = 10 V dc; I_C = 300 μA dc; Rg = 1 k Ω; f = 10 kHz (see 4.5.7)	F2		8	dB
Collector to collector leakage		Test condition (see 4.5.3) $V_{(collector\ 1\ to\ collector\ 2)}$ = 100 V dc	$I_{(collector\ 1\ to\ collector2)}$		100	nA dc

1/ For sampling plan, see MIL-PRF-19500.
2/ The larger number will be placed in the denominator.

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} = 80 V dc	I_{CBO1}		2	nA dc
2.	Collector to base cutoff current	3036	Bias condition D; V_{CB} = 80 V dc	I_{CBO1}		4	nA dc
3.	Emitter to base cutoff current	3061	Bias condition D; V_{EB} = 5 V dc	I_{EBO}		2	nA dc
4.	Base emitter voltage (absolute value of differential)	3066	Test condition B; V_{CE} = 5 V dc, I_C = 100 μA dc, (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert$ [3]		8	mV dc
5.	Saturation voltage and resistance (collector to emitter voltage)	3071	I_C = 50 mA dc; I_B = 5 V dc	$V_{CE(sat)}$		0.3	V dc
6.	Base to emitter voltage (saturated)	3066	Test condition A; I_C = 50 mA dc, I_B = 5 mA dc	$V_{BE(sat)}$		0.9	V dc
7.	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 μA dc	h_{FE1}	25	75	
8.	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc	h_{FE3}	40	120	
9.	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 mA dc, pulsed (see 4.5.1)	h_{FE4}	50	150	
10.	Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 100 μA dc, (see 4.5.4)	$\frac{h_{FE2-1}}{h_{FE2-2}}$ 1/	0.9	1.0	
11.	Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 1 mA dc, (see 4.5.4)	$\frac{h_{FE3-1}}{h_{FE2-2}}$ 1/	0.85	1.0	

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	
12.	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°C and -55°C (see 4.5.6)	$\lvert\Delta(V_{BE1} - V_{BE2})/\Delta T_A\rvert$2		0.80	mV dc
13.	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°C and +125°C (see 4.5.6)	$\lvert\Delta(V_{BE1} - V_{BE2})/\Delta T_A\rvert$2		1.0	mV dc
14.	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc	Δh_{FE3} 2/	± 25 percent change from initial reading.		
15.	Forward-current transfer ratio	3076	V_{CE} = 5 V dc, I_C = 10 mA dc, (see 4.5.2)	Δh_{FE4} 2/	± 25 percent change from initial reading.		
16.	Collector to base cutoff current	3036	Bias condition D; V_{CB} = 80 V dc	ΔI_{CBO1} 2/	100 percent or 2 nA dc, whichever is greater.		
17.	Saturation voltage and resistance (collector to emitter voltage)	3071	I_C = 50 mA dc, I_B = 5 mA dc	$\Delta V_{CE(sat)}$ 2/	± 50 percent mV dc from initial reading.		

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 VIa (JANS) of MIL-PRF-19500 are as follows:

a. Subgroup 3, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, and 11.

b. Subgroup 4, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, and 17.

c. Subgroup 5, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15, and 16.

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

4/ The electrical measurements for appendix E, table VIb (JANTX and JANTXV) of MIL-PRF-19500 are as follows:

a. Subgroup 2, see table II herein, steps 1, 5, and 6.

b. Subgroup 3, see table II herein, steps 2, 4, 11, and 15.

c. Subgroup 6, see table II herein, steps 2, 4, 11, and 15.

5/ The electrical measurements for appendix E, table VII of MIL-PRF-19500 are as follows:

a. Subgroup 2 and 3, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, and 11 for JANS and steps 1, 5, and 6 for JANTX and JANTXV.

b. Subgroup 6, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15, and 16 for JANS and steps 2, 4, 11, and 15 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, ATTN: DSCC-VQE, 3990 East Broad Street, Columbus, OH 43216-5000.

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 extensiveness of the changes.

Custodians:
Army - CR
Navy - EC
Air Force - 17

Review activities:
Army - AR, AV, MI, SM
Air Force - 13, 19, 85, 99
Navy - AS, CG, MC, OS, SH

Preparing activity:
DLA - CC

(Project 5961-1945)

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-19500/270F	**2. DOCUMENT DATE (YYMMDD)** 980119

3. DOCUMENT TITLE
SEMICONDUCTOR DEVICE, UNITIZED, DUAL-TRANSISTORS, NPN, SILICON, TYPES 2N2060 AND 2N2060L 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) Commercial DSN FAX EMAIL	7. DATE SUBMITTED (YYMMDD)

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@dscc.dla.mil
c. ADDRESS Defense Supply Center Columbus, ATTN: DSCC-VAT, 3990 East Broad Street, Columbus, OH 43216-5000	**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