

The documentation and process conversion measures necessary to comply with this revision shall be completed by 15 May 2002.

INCH-POUND

MIL-PRF-19500/376F
 15 February 2002
 SUPERSEDING
 MIL-PRF-19500/376E
 31 August 2000

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, LOW-POWER
 TYPES 2N2484, 2N2484UA, 2N2484UB, 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 NPN, silicon, low-power transistors. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500. Two levels of product assurance are provided for die.

1.2 Physical dimensions. See figure 1 (similar to T0-18), figures 2 and 3 (surface mount case outlines UA and UB), and figures 4 and 5 (die).

1.3 Maximum ratings.

Types	P _T (1)	V _{CB0}	V _{EBO}	V _{CEO}	I _C	T _J and T _{STG}	R _{θJA}
	T _A = +25°C						
	<u>mW</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>mA dc</u>	<u>°C</u>	<u>°C/W</u>
2N2484	360	60	6	60	50	-65 to +200	325
2N2484UA	360	60	6	60	50	-65 to +200	325
2N2484UB	360	60	6	60	50	-65 to +200	325

(1) Derate linearly at 2.06 mW/°C above T_A = +25°C.

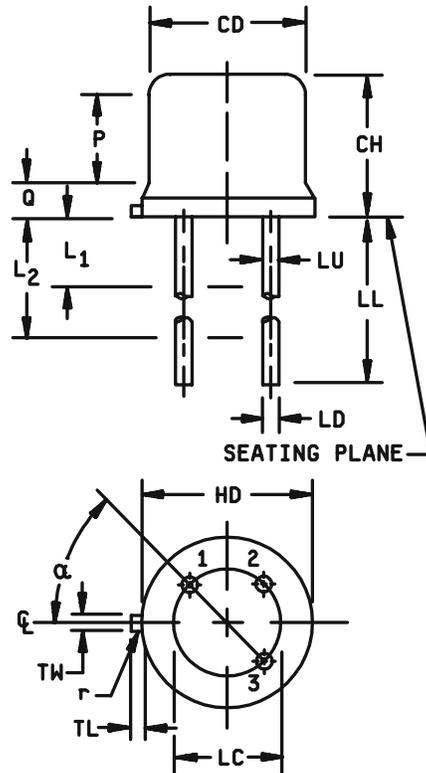
1.4 Primary electrical characteristics.

Limits	h _{fe}	C _{obo}	h _{fe} ²	V _{CE(sat)} (1)
	V _{CE} = 5 V dc I _C = 1 mA dc f = 1 kHz	I _E = 0 V _{CB} = 5 V dc 100 kHz ≤ f ≤ 1 MHz	I _C = 500 μA dc V _{CE} = 5 V dc f = 30 MHz	I _C = 1.0 mA dc I _B = 0.1 mA dc
		<u>pF</u>		<u>V dc</u>
Min	250		2.0	
Max	900	5.0	7.0	0.3

(1) Pulsed (see 4.5.1).

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, P.O. 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.

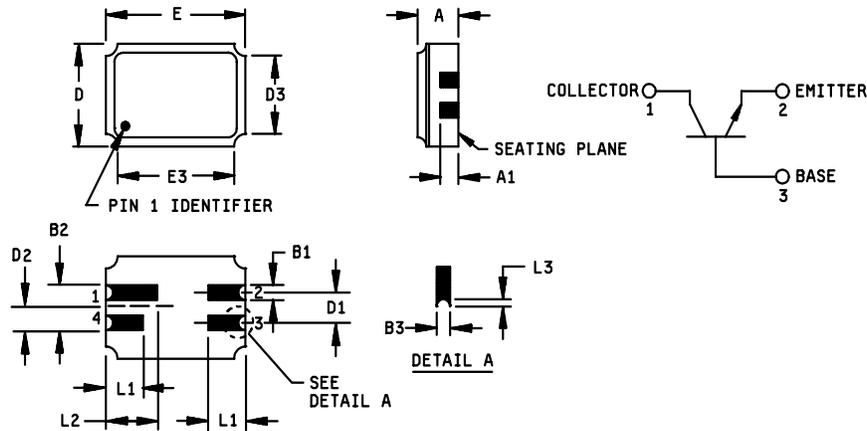
Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.178	.195	4.52	4.95	
CH	.170	.210	4.32	5.33	
HD	.209	.230	5.31	5.84	
LC	.100 TP		2.54 TP		6
LD	.016	.021	0.41	0.53	7,8
LL	.500	.750	12.7	19.05	7,8
LU	.016	.019	0.41	0.48	7,8
L1		.050		1.27	7,8
L2	.250		6.35		7,8
P	.100		2.54		
Q		.040		0.86	5
TL	.028	.048	0.71	1.22	3,4
TW	.036	.046	0.91	1.17	3
r		.010		0.25	10
α	45° TP		45° TP		6



NOTES:

1. Dimension are in inches.
2. Metric equivalents are given for general information only.
3. Beyond r (radius) maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
4. Dimension TL measured from maximum HD.
5. Body contour optional within zone defined by HD, CD, and Q.
6. Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
7. Dimension LU applies between L₁ and L₂. Dimension LD applies between L₂ and LL minimum. Diameter is uncontrolled in L₁ and beyond LL minimum.
8. All three leads.
9. The collector shall be internally connected to the case.
10. Dimension r (radius) applies to both inside corners of tab.
11. In accordance with ANSI Y14.5M, diameters are equivalent to ϕx symbology.
12. Lead 1 = emitter, lead 2 = base, lead 3 = collector.

FIGURE 1. Physical dimensions (similar to TO-18).

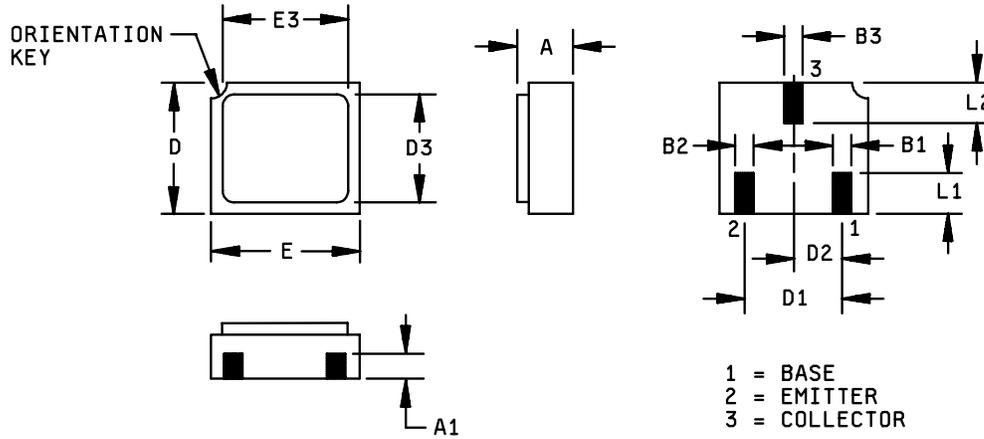


Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
A	.061	.075	1.55	1.90	3
A1	.029	.041	0.74	1.04	
B1	.022	.028	0.56	0.71	
B2	.075 REF		1.91 REF		
B3	.006	.022	0.15	0.56	5
D	.145	.155	3.68	3.93	
D1	.045	.055	1.14	1.39	
D2	.0375 BSC		.952 BSC		
D3		.155		3.93	
E	.215	.225	5.46	5.71	
E3		.225		5.71	
L1	.032	.048	0.81	1.22	
L2	.072	.088	1.83	2.23	
L3	.003	.007	0.08	0.18	5

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimension "A" controls the overall package thickness. When a window lid is used, dimension "A" must increase by a minimum of .010 inch (0.254 mm) and a maximum of .040 inch (1.020 mm).
4. The corner shape (square, notch, radius, etc.) may vary at the manufacturer's option, from that shown on the drawing.
5. Dimensions "B3" minimum and "L3" minimum and the appropriately castellation length define an unobstructed three-dimensional space traversing all of the ceramic layers in which a castellation was designed. (Castellations are required on bottom two layers, optional on top ceramic layer.) Dimension "B3" maximum and "L3" maximum define the maximum width and depth of the castellation at any point on its surface. Measurement of these dimensions may be made prior to solder dipping.
6. Lead 4 = no connection.

FIGURE 2. Physical dimensions, surface mount (2N2484UA).

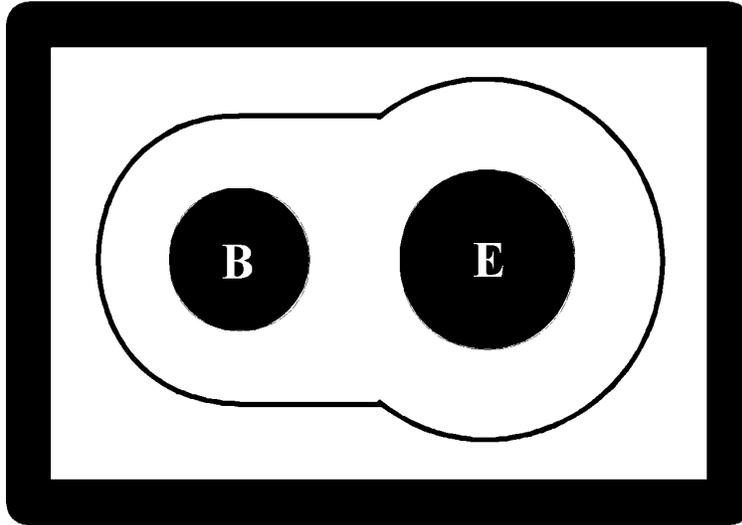


Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min.	Max.	Min.	Max.	
A	.046	.056	0.97	1.42	
A1	.017	.035	0.43	0.89	
B1	.016	.024	0.41	0.61	3
B2	.016	.024	0.41	0.61	3
B3	.016	.024	0.41	0.61	3
D	.085	.108	2.41	2.74	
D1	.071	.079	1.81	2.01	
D2	.035	.039	0.89	0.99	
D3	.085	.108	2.41	2.74	
E	.115	.128	2.82	3.25	
E3		.128		3.25	
L1	.022	.038	0.56	0.96	4
L2	.022	.038	0.56	0.96	4

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimensions B2 and B3 are identical to B1
4. Dimension L2 is identical to L1.

FIGURE 3. Physical dimensions, surface mount (2N2484UB).

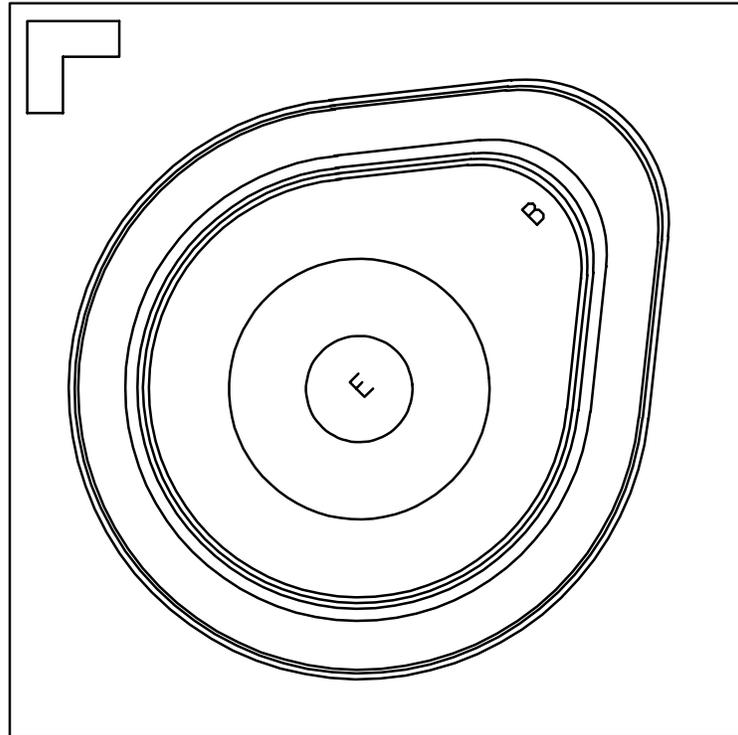


A- version

NOTES:

1. Die size: .015 (0.381 mm) x .019 inch (0.421 mm) \pm .001 inch (0.025 mm).
2. Die thickness: .010 (0.254 mm) \pm .0015 inch (0.038 mm).
3. Top metal: Aluminum 15,000 Å minimum, 18,000 Å nominal.
4. Back metal:
A. Gold 2,500 Å minimum, 3,000 Å nominal.
B. Eutectic Mount – No Gold.
5. Backside: Collector.
6. Bonding pad: B = .003 inch (0.076 mm), E = .004 inch (0.102 mm) diameter.
7. Passivation: Si₃N₄ (Silicon Nitride) 2,000 Å min, 2200 Å nom.
8. Metric equivalents are given for general information only.

FIGURE 4. Physical dimensions, JANHC and JANKC die, A - version.



B - version

NOTES:

1. Die size: .018 (0.056 mm) x .018 inch (0.056 mm).
2. Die thickness: .008 (0.203 mm) \pm .0016 inch (0.401 mm).
3. Base pad: .0025 inch (0.064 mm) diameter.
4. Emitter pad: .003 inch (0.076 mm) diameter.
5. Back metal: Gold, $6,500 \pm 1950 \text{ \AA}$.
6. Top metal: Aluminum, $19,500 \pm 2500 \text{ \AA}$.
7. Back side: Collector.
8. Glassivation: SiO_2 , $7,500 \pm 1,500 \text{ \AA}$.
9. Metric equivalents are given for general information only.

FIGURE 5. Physical dimensions, JANHC and JANKC die, B - version.

1.4 Primary electrical characteristics.

	NF $I_C = 10 \mu\text{A dc}$, $V_{CE} = 5 \text{ V dc}$ $R_g = 10 \text{ k}\Omega$			h_{FE2}	h_{FE5}
	$f = 100 \text{ Hz}$	$f = 1000 \text{ Hz}$	$f = 10 \text{ kHz}$	$V_{CE} = 5 \text{ V dc}$ $I_C = 10 \mu\text{A dc}$	$V_{CE} = 5 \text{ V dc}$ $I_C = 1 \text{ mA dc}$
	<u>dB</u>	<u>dB</u>	<u>dB</u>		
Min				200	250
Max	7.5	3	2	500	800

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.

3. REQUIREMENTS

3.1 General. The requirements for acquiring the product described herein shall consist of this document and MIL-PRF-19500.

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.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500 and figures 1, 2, 3, 4, and 5 herein.

3.4.1 Lead finish. Unless otherwise specified, lead finish shall be solderable in accordance with MIL-PRF-19500, and herein.

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500, except for the UB suffix package. Marking on the UB package shall consist of an abbreviated part number, the date code, and the manufacturers symbol or logo. The prefixes JAN, JANTX, JANTXV, and JANS can be abbreviated as J, JX, JV, and JS respectively. The "2N" prefix can also be omitted.

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 table I herein.

3.8 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 as specified herein.

4.2.1. JANHC and JANKC qualification. JANHC and JANKC qualification inspection shall be in accordance with MIL-PRF-19500.

* 4.2.4 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 II tests, the tests specified in table II herein must 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 table IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
3c	Thermal impedance, method 3131 of MIL-STD-750.	Thermal impedance, method 3131 of MIL-STD-750.
9	I_{CBO2} , h_{FE4}	Not applicable
10	48 hours minimum	48 hours minimum
11	I_{CBO2} ; h_{FE4} ; ΔI_{CBO2} = 100 percent of initial value or 2 nA dc, whichever is greater. Δh_{FE4} = ± 15 percent	I_{CBO2} , h_{FE4}
12	See 4.3.2 240 hours minimum	See 4.3.2 80 hours minimum
13	Subgroups 2 and 3 of table I herein; ΔI_{CBO2} = 100 percent of initial value or 2 nA dc, whichever is greater; Δh_{FE4} = ± 15 percent	Subgroup 2 of table I herein; ΔI_{CBO2} = 100 percent of initial value or 2 nA dc, whichever is greater; Δh_{FE4} = ± 25 percent

* 4.3.1 Screening (JANHNC and JANKC). Screening for JANHC and JANKC die shall be in accordance with MIL-PRF-19500 "Discrete Semiconductor Die/Chip Lot Acceptance". Burn-in duration for the JANKC level follows JANS requirements; the JANHC follows JANTX requirements.

* 4.3.2 Power burn-in conditions. Power burn-in conditions are as follows: V_{CB} = 10 to 30 V dc, P_D = 360 mW, 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. If alternate screening is being performed in accordance with MIL-PRF-19500, a sample of screened devices shall be submitted to and pass the requirements of group A1 and A2 inspection only (table VIb, group B, subgroup 1 is not required to be performed again if group B has already been satisfied in accordance with 4.4.2).

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 table VIa (JANS) of MIL-PRF-19500 and 4.4.2.1. Electrical measurements (end-points) shall be in accordance with group A, subgroup 2 herein. Delta requirements shall be in accordance with table III herein. See 4.4.2.2 for JAN, JANTX, and JANTXV group B testing. Electrical measurements (end-points) and delta requirements for JAN, JANTX, and JANTXV shall be after each step in 4.4.2.2 and shall be in accordance with group A, subgroup 2 herein. Delta requirements shall be after each step and shall be in accordance with table III herein.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B4	1037	$V_{CB} = 10 \text{ V dc.}$
B5	1027	$V_{CB} = 10 \text{ V dc; } P_D \geq 100 \text{ percent of maximum rated } P_T \text{ (see 1.3). (NOTE: If a failure occurs, resubmission shall be at the test conditions of the original sample.)}$ Option 1: 96 hours minimum sample size in accordance with MIL-PRF-19500, table VIa, adjust T_A or P_D to achieve $T_J = +275^\circ\text{C}$ minimum. Option 2: 216 hours minimum, sample size = 45, $c = 0$; adjusted T_A or P_D to achieve a $T_J = +225^\circ\text{C}$ minimum.

4.4.2.2 Group B inspection, (JAN, JANTX, and JANTXV). Separate samples may be used for each step. In the event of a group B failure, the manufacturer may pull a new sample at double size from either the failed assembly lot or from another assembly lot from the same wafer lot. If the new "assembly lot" option is exercised, the failed assembly lot shall be scrapped.

<u>Step</u>	<u>Method</u>	<u>Condition</u>
1	1039	Steady-state life: Test condition B, 340 hours, $V_{CB} = 10 - 30 \text{ V dc}$, $T_J = 150^\circ\text{C min.}$, external heating of the device under test to achieve $T_J = +150^\circ\text{C}$ minimum is allowed provided that a minimum of 75 percent of rated power is dissipated. No heat sink or forced-air cooling on the devices shall be permitted. $n = 45$ devices, $c = 0$.
2	1039	The steady-state life test of step 1 shall be extended to 1,000 hours for each die design. Samples shall be selected from a wafer lot every twelve months of wafer production. Group B, step 2 shall not be required more than once for any single wafer lot. $n = 45$, $c = 0$.
3	1032	High-temperature life (non-operating), $t = 340$ hours, $T_A = +200^\circ\text{C}$. $n = 22$, $c = 0$.

4.4.2.3 Group B sample selection. Samples selected from group B inspection shall meet all of the following requirements:

- a. For JAN, JANTX, and JANTXV, samples shall be selected randomly from a minimum of three wafers (or from each wafer in the lot) from each wafer lot. For JANS, samples shall be selected from each inspection lot. See MIL-PRF-19500.
- b. Must be chosen from an inspection lot that has been submitted to and passed group A, subgroup 2 conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for life test (subgroups B4 and B5 for JANS, and group B for JAN, JANTX, and JANTXV) may be pulled prior to the application of final lead finish.

4.4.3 Group C inspection, Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500, and in 4.4.3.1 (JANS) and 4.4.3.2 (JAN, JANTX, and JANTXV) herein for group C testing. Electrical measurements (end-points) shall be in accordance with group A, subgroup 2 herein. Delta requirements shall be in accordance with table III herein.

4.4.3.1 Group C inspection, table VII (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Test condition E (not applicable to UA and UB suffix devices).
C6	1026	1,000 hours at $V_{CB} = 10 - 30$ V dc; power shall be applied to achieve $T_J = +150^\circ\text{C}$ minimum and a minimum power dissipation $P_D = 75$ percent of maximum rated P_T as defined in 1.3 herein.

4.4.3.2 Group C inspection, table VII (JAN, JANTX, and JANTXV) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Test condition E (not applicable to UA and UB suffix devices).
C5	3131	See 1.3.
C6		Not applicable.

4.4.3.3 Group C sample selection. Samples for subgroups in group C shall be chosen at random from any inspection lot containing the intended package type and lead finish procured to the same specification which is submitted to and passes group A tests for conformance inspection. Testing of a subgroup using a single device type enclosed in the intended package type shall be considered as complying with the requirements for that subgroup.

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

4.5 Method 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.

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TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u> <u>2/</u>						
Visual and mechanical examination <u>3/</u>	2071	n = 45 devices, c = 0				
Solderability <u>3/ 4/</u>	2026	n = 15 leads, c = 0				
Resistance to solvents <u>3/ 4/ 5/</u>	1022	n = 15 devices, c = 0				
Temperature cycling <u>3/ 4/</u>	1051	Test condition C, 25 cycles. n = 22 devices, c = 0				
Hermetic seal <u>4/</u> Fine leak Gross leak	1071	n = 22 devices, c = 0				
Electrical measurements <u>4/</u>		Group A, subgroup 2				
Bond strength <u>3/ 4/</u>	2037	Precondition T _A = +250°C at t = 24 hrs or T _A = 300°C at t = 2 hrs; n = 11 wires, c = 0				
<u>Subgroup 2</u>						
Collector to emitter breakdown voltage	3011	Bias condition D; I _C = 10 mA dc pulsed (see 4.5.1)	V _{(BR)CEO}	60		V dc
Collector to base cutoff current	3036	Bias condition D; V _{CB} = 60 V dc	I _{CBO1}		10	μA dc
Emitter to base cutoff current	3061	Bias condition D; V _{EB} = 6 V dc	I _{EBO1}		10	μA dc
Collector to base cutoff current	3036	Bias condition D; V _{CB} = 45 V dc	I _{CBO2}		5	nA dc
Collector to emitter cutoff current	3041	Bias condition D; V _{CE} = 5 V dc	I _{CEO}		2	nA dc
Emitter to base cutoff current	3061	Bias condition D; V _{EB} = 5 V dc	I _{EBO2}		2	nA dc
Collector to emitter cutoff current	3041	Bias condition C; V _{CE} = 45 V dc	I _{CES}		5	nA dc
Forward-current transfer ratio	3076	V _{CE} = 5 V dc; I _C = 1 μA dc	h _{FE1}	45		

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2 - continued.</u>						
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 10 \mu\text{A dc}$	h_{FE2}	200	500	
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 100 \mu\text{A dc}$	h_{FE3}	225	675	
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 500 \mu\text{A dc}$	h_{FE4}	250	800	
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 1 \text{ mA dc}$	h_{FE5}	250	800	
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 10 \text{ mA dc}$ pulsed (see 4.5.1)	h_{FE6}	225	800	
Collector to emitter voltage (saturated)	3071	$I_C = 1.0 \text{ mA dc}; I_B = 100 \mu\text{A dc}$	$V_{CE(sat)}$		0.3	V dc
Base emitter voltage (nonsaturated)	3066	Test condition B; $V_{CE} = 5 \text{ V dc};$ $I_C = 100 \mu\text{A dc}$	$V_{BE(ON)}$	0.5	0.7	V dc
<u>Subgroup 3</u>						
High-temperature operation		$T_A = +150^\circ\text{C}$				
Collector to base cutoff current	3036	Bias condition D; $V_{CB} = 45 \text{ V dc}$	I_{CBO3}		10	$\mu\text{A dc}$
Low-temperature operation		$T_A = -55^\circ\text{C}$				
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 10 \mu\text{A dc}$	h_{FE7}	35		
<u>Subgroup 4</u>						
Magnitude of common emitter small-signal short-circuit forward-current transfer ratio	3306	$V_{CE} = 5 \text{ V dc}; I_C = 50 \mu\text{A dc};$ $f = 5 \text{ MHz}$	$ h_{fe} 1$	3.0		
Magnitude of common emitter 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} 2$	2.0	7.0	
Small-signal open-circuit output admittance	3216	$V_{CE} = 5 \text{ V dc}; I_C = 1.0 \text{ mA dc};$ $f = 1 \text{ kHz}$	h_{oe}		40	μmhos
Small-signal open- circuit reverse-voltage transfer ratio	3211	$V_{CE} = 5 \text{ V dc}; I_C = 1.0 \text{ mA dc};$ $f = 1 \text{ kHz}$	h_{re}		8.0×10^{-4}	
Small-signal short- circuit input impedance	3201	$V_{CE} = 5 \text{ V dc}; I_C = 1 \text{ mA dc};$ $f = 1 \text{ kHz}$	h_{ie}	3.5	24	$\text{k}\Omega$

See footnote at end of table.

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TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4 - continued.</u>						
Small-signal short-circuit forward current transfer ratio	3206	$V_{CE} = 5 \text{ V dc}; I_C = 1 \text{ mA dc}; f = 1 \text{ kHz}$	h_{fe}	250	900	
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}		5.0	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}		6.0	pF
Noise figure	3246	$f = 100 \text{ Hz}; V_{CE} = 5 \text{ V dc}; I_C = 10 \mu\text{A dc}; R_g = 10 \text{ k}\Omega;$	NF1		7.5	dB
Noise figure	3246	$f = 1 \text{ kHz}; V_{CE} = 5 \text{ V dc}; I_C = 10 \mu\text{A dc}; R_g = 10 \text{ k}\Omega;$	NF2		3	dB
Noise figure	3246	$f = 10 \text{ kHz}; V_{CE} = 5 \text{ V dc}; I_C = 10 \mu\text{A dc}; R_g = 10 \text{ k}\Omega;$	NF3		2	dB
Noise figure (wideband)	3246	Noise bandwidth = 10 Hz to 15.7 kHz; $V_{CE} = 5 \text{ V dc}; I_C = 10 \mu\text{A dc}; R_g = 10 \text{ k}\Omega;$	NF4		3	dB
<u>Subgroups 5 and 6</u>						
Not applicable						
<u>Subgroup 7 <u>4/</u></u>						
Decap internal visual (design verification)	2075	$n = 1 \text{ device}, c = 0$				

1/ For sampling plan see MIL-PRF-19500.

2/ For resubmission of failed subgroup A1, double the sample size of the failed test or sequence of tests. A failure in group A, subgroup 1 shall not require retest of the entire subgroup. Only the failed test shall be rerun upon submission.

3/ Separate samples may be used.

4/ Not required for JANS devices.

5/ Not required for laser marked devices.

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* TABLE II. Group E inspection (all quality levels) - for qualification only.

Inspection	MIL-STD-750		Qualification
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Temperature cycling (air to air)	1051	Test condition C, 500 cycles	
Hermetic seal	1071		
Fine leak			
Gross leak			
Electrical measurements		See group A, subgroup 2 and table III herein.	
<u>Subgroup 2</u>			45 devices c = 0
Intermittent life		V _{CB} = 10 V dc, 6,000 cycles.	
Electrical measurements		See group A, subgroup 2 and table III herein.	
<u>Subgroups 3 through 7</u>			
Not applicable			
<u>Subgroup 8</u>			45 devices c = 0
Reverse stability	1033	Condition A for devices ≥ 400 V Condition B for devices ≤ 400 V	

* TABLE III. Groups B and C delta measurements. 1/ 2/ 3/ 4/

Step	Inspection	MIL-STD-750		Symbol	Limit	Unit
		Method	Conditions			
1	Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 500 \mu\text{A dc};$ pulsed see 4.5.1	<u>5/</u> Δh_{FE4}	± 25 percent change from initial recorded reading	
2.	Collector to emitter voltage (saturated)	3071	$I_C = 1.0 \text{ mA dc}; I_B = 100 \mu\text{A dc}$	$\Delta V_{CE(sat)}$ <u>5/</u>	± 50 mV dc change from previously measured value.	
3.	Collector to emitter cutoff current	3041	Bias condition C; $V_{CE} = 45 \text{ V dc}$	ΔI_{CES} <u>5/</u>	100 percent of initial value or 2 nA dc, whichever is greater.	

- 1/ The delta measurements for group B, table VIa (JANS) of MIL-PRF-19500 are as follows:
- a. Subgroup 4, see table III herein, step 2.
 - b. Subgroup 5, see table III herein, steps 1 and 3.
- 2/ The delta measurements for 4.4.2.2 herein (group B, JAN, JANTX, and JANTXV) are as follows: All steps of table III shall be performed after each step in 4.4.2.2 herein.
- 3/ The delta measurements for group C, table VII of MIL-PRF-19500 are as follows: Subgroup 6, see table III herein, steps 1 and 3 for JANS, step 1 for JAN, JANTX, and JANTXV.
- 4/ The delta measurements for group E, table IX of MIL-PRF-19500 are as follows: Subgroups 1 and 2, see table III herein, all steps.
- 5/ Devices which exceed the group A limits for this test shall not be accepted.

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 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.

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. Lead formation and finish may be specified (see 3.4.1).
- d. Type designation and product assurance level.
- e. Packaging requirements (see 5.1).

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-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 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 Suppliers of JANHC die. The qualified JANHC suppliers with the applicable letter version (example JANHCA2N2484) will be identified on the QML.

JANC ordering information		
PIN	Manufacturer	
	43611	34156
2N2484	JANHCA2N2484 JANKCA2N2484	JANHCB2N2484 JANKCB2N2484

* 6.5 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

Preparing activity:

DLA - CC

(Project 5961-2497)

Review activities:

Army - AR, MI, SM
Navy - AS, MC, SH
Air Force - 19

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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.
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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-19500/376F	2. DOCUMENT DATE 15 February 2002
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3. **DOCUMENT TITLE**
SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, LOW-POWER TYPES 2N2484, 2N2484UA, 2N2484UB, 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 DSN FAX EMAIL 614-692-0510 850-0510 614-692-6939 alan.barone@dscclia.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		