

The documentation and process conversion measures necessary to comply with this revision shall be completed by 29 November 2002.

INCH-POUND

MIL-PRF-19500/357G
 29 August 2002
 SUPERSEDING
 MIL-PRF-19500/357F
 9 June 2000

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, TRANSISTOR, PNP, SILICON, AMPLIFIER
 TYPES 2N3634 THROUGH 2N3637, 2N3634L THROUGH 2N3637L
 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 PNP, silicon, low-power amplifier, and switching transistors. Four levels of product assurance are provided for each encapsulated device type as specified in MIL-PRF-19500 and two levels of product assurance are provided for unencapsulated devices.

1.2 Physical dimensions. See figure 1 (TO-5 and TO-39) and figure 2 (JANHC AND JANKC).

1.3 Maximum ratings.

Types	P _T 1/ T _A = +25°C	P _T 2/ T _C = +25°C	V _{CB0}	V _{CEO}	V _{EBO}	I _C	T _J and T _{STG}	R _{θJA}	R _{θJC}
	<u>W</u>	<u>W</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>A dc</u>	<u>°C</u>	<u>°C/W</u>	<u>°C/W</u>
2N3634, 2N3634L	1	5	140	140	5	1	-65 to +200	175	35
2N3635, 2N3635L	1	5	140	140	5	1			
2N3636, 2N3636L	1	5	175	175	5	1			
2N3637, 2N3637L	1	5	175	175	5	1			

1/ Derate linearly 5.71 mW/°C for T_A > +25°C.

2/ Derate linearly 28.6 mW/°C for T_C > +25°C.

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

Types	h _{FE} at V _{CE} = 10 V dc					h _{fe}		C _{obo}	
	h _{FE1} I _C = 0.1 mA dc 1/	h _{FE2} I _C = 1.0 mA dc 1/	h _{FE3} I _C = 10 mA dc 1/	h _{FE4} I _C = 50 mA dc 1/	h _{FE5} I _C = 150 mA dc 1/	V _{CE} = 30 V dc I _C = 30 mA dc f = 100 Mhz		V _{CB} = 20 V dc I _E = 0 100 Khz ≤ f ≤ 1 Mhz	
	<u>Min</u>	<u>Min</u>	<u>Min</u>	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>
2N3634	25	45	50	50	150	30		1.5	8.0
2N3635	55	90	100	100	300	60		2.0	8.5
2N3636	25	45	50	50	150	30		1.5	8.0
2N3637	55	90	100	100	300	60		2.0	8.5

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.

AMSC N/A

FSC 5961

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

1.4 Primary electrical characteristics at $T_A = +25^\circ\text{C}$ - Continued.

	$V_{CE(sat)1}$	$V_{CE(sat)2}$	$V_{BE(sat)1}$	$V_{BE(sat)2}$	Switching parameters (see figure 3)			
	$I_C = 10 \text{ mA dc}$ 1/ $I_B = 1 \text{ mA dc}$	$I_C = 50 \text{ mA dc}$ 1/ $I_B = 5 \text{ mA dc}$	$I_C = 10 \text{ mA dc}$ 1/ $I_B = 1 \text{ mA dc}$	$I_C = 50 \text{ mA dc}$ 1/ $I_B = 5 \text{ mA dc}$	t_d	t_r	t_s	t_f
	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>ns</u>	<u>ns</u>	<u>ns</u>	<u>ns</u>
Minimum				0.65	100	100	500	150
Maximum	0.3	0.6	0.8	0.90				

1/ Pulsed (see 4.5.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 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.

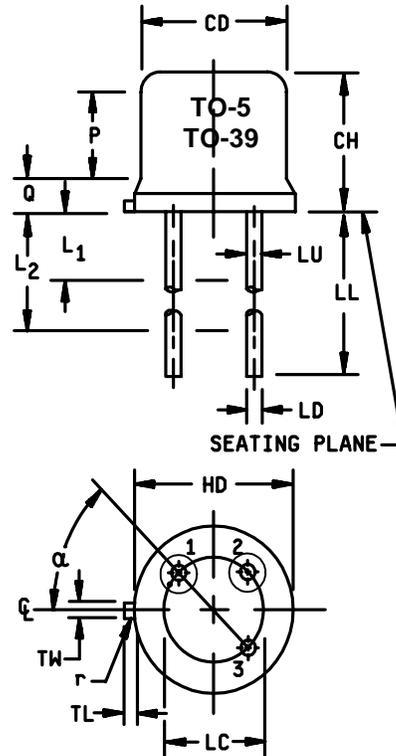
(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

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.

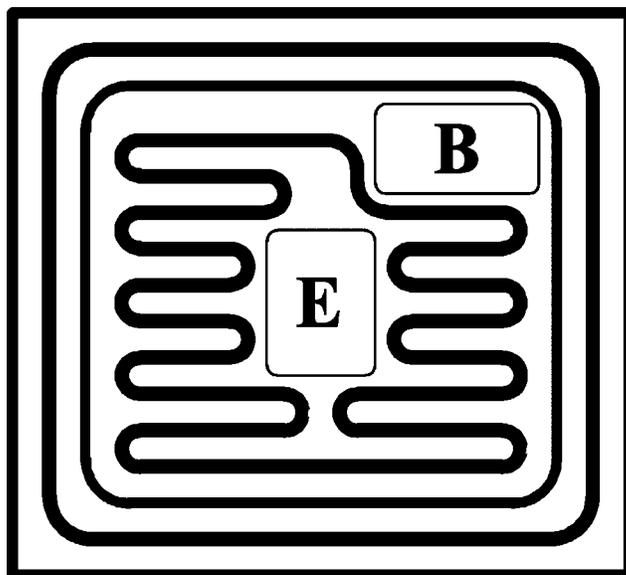
Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	
LC	.200 TYP		5.08 TYP		7
LD	.016	.021	0.41	0.53	6
LL	See notes 7, 9, and 10				
LU	.016	.019	0.41	0.48	7
L1		.050		1.27	7
L2	.250		6.35		7
P	.100		2.54		5
Q		.050		1.27	
r		.010		0.254	8
TL	.029	.045	0.74	1.14	4
TW	.028	.034	0.71	0.86	3
α	45° TP		45° TP		6
Term 1	Emitter				
Term 2	Base				
Term 3	Collector				



NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Beyond r maximum, TW must be held to a minimum length of .021 inch (0.53 mm).
4. TL measured from maximum HD.
5. CD shall not vary more than ± 0.010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane .054 - .055 inch (1.37 - 1.40 mm) below seating plane shall be within .007 inch (0.18 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 gauge and gauging procedure.
7. LU applies between L1 and L2. LD applies between L2 and L minimum. Diameter is uncontrolled in L1 and beyond LL minimum.
8. r (radius) applies to both inside corners of tab.
9. For transistor types 2N3634 through 2N3637, LL is .500 inch (12.70 mm) minimum, and .750 inch (19.50 mm) maximum (TO-39).
10. For transistor types 2N3634L through 2N3637L, LL is 1.500 inches (38.10 mm) minimum, and 1.750 inches (44.45 mm) maximum (TO-5).
11. In accordance with ANSI Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions (TO-5 and TO-39).



1. Chip size.....24 x 26 mils \pm 2 mils.
2. Chip thickness.....10 \pm 1.5mils nominal.
3. Top metal.....Aluminum 15,000 \AA minimum, 18,000 \AA nominal.
4. Back metal.....A. Al/Ti/Ni/Ag 12k \AA /3k \AA /7k \AA /7k \AA min., 15k \AA /5k \AA /10k \AA /10k \AA nominal.
B. Gold 2,500 \AA minimum, 3,000 \AA nominal.
C. Eutectic Mount – No Gold.
5. Backside.....Collector.
6. Bonding pad.....B = 4 x 6 mils, E = 4 x 5.5 mils.

FIGURE 2. JANHCA and JANKCA die dimensions.

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 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 figure 1 and 2 herein.

3.4.1 Lead finish. 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 document (see 6.2).

3.5 Electrical performance characteristics. Unless otherwise specified herein, 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.

3.7 Marking. Marking shall be in accordance with MIL-PRF-19500.

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).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and table II herein.

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

4.2.2 Group E qualification. Group E inspection shall be performed for qualification or requalification. In case qualification was awarded to a prior revision of the associated specification that did not require the performance of group E tests, the tests specified in the group E table herein shall be performed on the first inspection lot to this revision to maintain qualification.

4.3 Screening (JANTX, JANTXV, and JANS 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 (see 4.3.3)	Thermal impedance, method 3131 of MIL-STD-750 (see 4.3.3)
9	I_{CBO2} and h_{FE5}	Not applicable
10	24 hours minimum.	24 hours minimum.
11	I_{CBO2} and h_{FE5} $\Delta I_{CBO2} = 100$ percent of initial value or 10 nA dc, whichever is greater; $\Delta h_{FE5} = \pm 15$ percent of initial value.	I_{CBO2} and h_{FE5}
12	See 4.3.2, 240 hours minimum.	See 4.3.2, 80 hours minimum.
13	Subgroups 2 and 3 of table I herein; $\Delta I_{CBO2} = 100$ percent of initial value or 10 nA dc, whichever is greater. $\Delta h_{FE5} = \pm 15$ percent of initial value.	Subgroup 2 of table I herein; $\Delta I_{CBO2} = 100$ percent of initial value or 10 nA dc, whichever is greater. $\Delta h_{FE5} = \pm 15$ percent of initial value.

4.3.1 Screening (JANHNC and JANKC). Screening of 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: $V_{CB} = 10 - 30$ V dc: Power shall be applied to the device to achieve a junction temperature of $T_J = 135^\circ\text{C}$ minimum and a minimum power dissipation of $P_D = 75$ percent of maximum P_T shall be used (see 1.3).

4.3.3 Thermal impedance ($Z_{\theta JX}$ measurements). The $Z_{\theta JX}$ measurements shall be performed in accordance with MIL-STD-750, Method 3131.

- a. I_M measurement current 5 mA.
- b. I_H forward heating current 200 mA (minimum).
- c. t_H heating time 25 - 30 ms.
- d. t_{md} measurement delay time 60 μs maximum.
- e. V_{CE} collector-emitter voltage 10 V dc

The maximum limit for $Z_{\theta JX}$ under these test conditions are $Z_{\theta JX} (\text{max}) = 35^\circ\text{C/W}$.

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 table I, group A subgroup 1 and table I, group A subgroup 2 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 herein).

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table V of 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 herein. Electrical measurements (end-points) and delta requirements shall be in accordance with table I, group A, subgroup 2 and 4.5.4 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 table I, group A, subgroup 2 and 4.5.4 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	$V_{CB} = 10 - 30$ V dc; 2,000 cycles. No heat sink or forced-air cooling on devices shall be permitted.
B5	1027	(NOTE: If a failure occurs, resubmission shall be at the test conditions of the original sample.) $V_{CB} = 10$ V dc, $P_D = 100$ percent of maximum rated P_T (see 1.3). 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, $c = 0$; adjust T_A or P_D to achieve $T_J = 225^\circ\text{C}$ 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, $V_{CB} = 10 - 30$ V dc. $n = 45$, $c = 0$. Power shall be applied to the device to achieve $T_J \geq 150^\circ\text{C}$ and power dissipation of $P_D \geq 75$ percent of the rated P_T (see 1.3).
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), $T_A = +200^\circ\text{C}$, $t = 340$ hours, $n = 22$, $c = 0$.

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

- a. For JAN, JANJ, 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 table I, 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 tests and 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, JANJ, JANTX, and JANTXV) herein for group C testing. Electrical measurements (end-points) and delta requirements shall be in accordance with table I, group A, subgroup 2 and 4.5.4 herein; delta requirements only apply to subgroup C6.

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.
C6	1026	1,000 hours at $V_{CB} = 10 - 30$ V dc; power shall be applied to the device to achieve $T_J \geq 150^\circ\text{C}$ and a power dissipation of $P_D \geq 75$ percent of the rated P_T (see 1.3).

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.
C5	3131	$R_{\theta JC}$ (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 table I, group A tests for conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for C6 life test may be pulled prior to the application of final lead finish. 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.

4.4.4 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 herein. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein.

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.

4.5.2 Input capacitance. This test shall be conducted in accordance with method 3240 of MIL-STD-750, except the output capacitor shall be omitted.

4.5.3 Noise figure. Noise figure shall be measured using a model 310B Quan Tech Laboratories test set, or equivalent. Conditions shall be as specified in table I herein.

MIL-PRF-19500/357G

4.5.4 Delta requirements. Delta requirements shall be as specified below:

Step	Inspection	MIL-STD-750		Symbol	Limit	Unit
		Method	Conditions			
1	Collector-base cutoff current	3036	Bias condition D, $V_{CB} = 100 \text{ V dc}$	ΔI_{CB02} <u>1/</u>	100 percent of initial value or $\pm 20 \text{ nA dc}$, whichever is greater.	
2	Forward current transfer ratio	3076	$V_{CE} = 10 \text{ V dc}$; $I_C = 150 \text{ mA dc}$; pulsed see 4.5.1	Δh_{FE5} <u>1/</u>	± 25 percent change from initial reading.	

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

MIL-PRF-19500/357G

TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1 2/</u>						
Visual and mechanical inspection <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				
Temp 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				
Decap internal visual (design verification)	2075	n = 4 device, c = 0				
<u>Subgroup 2</u>						
Collector to base, cutoff current 2N3634, 2N3634L 2N3635, 2N3635L 2N3636, 2N3636L 2N3637, 2N3637L	3036	Bias condition D $V_{CB} = 140$ V dc $V_{CB} = 175$ V dc	I_{CB01}		100	μ A dc
Emitter to base, cutoff current	3061	Bias condition D, $V_{EB} = 5$ V dc	I_{EBO1}		10	μ A dc
Breakdown voltage, collector to emitter 2N3634, 2N3634L 2N3635, 2N3635L 2N3636, 2N3636L 2N3637, 2N3637L	3011	Bias condition D, $I_C = 10$ mA dc pulsed (see 4.5.1)	$V_{(BR)CEO}$		140 175	V dc V dc

See footnotes 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 2</u> - Continued						
Collector to base cutoff current	3036	Bias condition D, $V_{CB} = 100$ V dc	I_{CBO2}	100		nA dc
Emitter to base cutoff current	3061	Bias condition D, $V_{EB} = 3$ V dc	I_{EBO2}	50		nA dc
Collector to emitter cutoff current	3041	Bias condition D, $V_{CE} = 100$ V dc	I_{CEO}	10		μ A dc
Forward-current transfer ratio	3076	$V_{CE} = 10$ V dc, $I_C = 0.1$ mA dc pulsed (see 4.5.1)	h_{FE1}	25		
2N3634, 2N3634L 2N3636, 2N3636L						
2N3635, 2N3635L 2N3637, 2N3637L				55		
Forward-current transfer ratio	3076	$V_{CE} = 10$ V dc, $I_C = 1.0$ mA dc pulsed (see 4.5.1)	h_{FE2}	45		
2N3634, 2N3634L 2N3636, 2N3636L						
2N3635, 2N3635L 2N3637, 2N3637L				90		
Forward-current transfer ratio	3076	$V_{CE} = 10$ V dc, $I_C = 10$ mA dc pulsed (see 4.5.1)	h_{FE3}	50		
2N3634, 2N3634L 2N3636, 2N3636L						
2N3635, 2N3635L 2N3637, 2N3637L				100		
Forward-current transfer ratio	3076	$V_{CE} = 10$ V dc, $I_C = 50$ mA dc pulsed (see 4.5.1)	h_{FE4}	50	150	
2N3634, 2N3634L 2N3636, 2N3636L						
2N3635, 2N3635L 2N3637, 2N3637L				100	300	
Forward-current transfer ratio	3076	$V_{CE} = 10$ V dc, $I_C = 150$ mA dc pulsed (see 4.5.1)	h_{FE5}	30		
2N3634, 2N3634L 2N3636, 2N3636L						
2N3635, 2N3635L 2N3637, 2N3637L				60		

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u> - Continued						
Collector to emitter voltage (saturated)	3071	$I_C = 10 \text{ mA dc}$, $I_B = 1 \text{ mA dc}$ pulsed (see 4.5.1)	$V_{CE(sat)1}$		0.3	V dc
Collector to emitter voltage (saturated)	3071	$I_C = 50 \text{ mA dc}$, $I_B = 5 \text{ mA dc}$ pulsed (see 4.5.1)	$V_{CE(sat)2}$		0.6	V dc
Base-emitter voltage (saturated)	3066	Test condition A; $I_C = 10 \text{ mA dc}$, $I_B = 1.0 \text{ mA dc}$ pulsed (see 4.5.1)	$V_{BE(sat)1}$	0.65	0.8	V dc
Base-emitter voltage (saturated)	3066	Test condition A; $I_C = 50 \text{ mA dc}$, $I_B = 5 \text{ mA dc}$ pulsed (see 4.5.1)	$V_{BE(sat)2}$		0.90	V dc
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +150^\circ\text{C}$				
Collector to base cutoff current	3036	Bias condition D, $V_{CB} = -100 \text{ V dc}$	I_{CB03}		100	$\mu\text{A dc}$
Low-temperature operation:		$T_A = -55^\circ\text{C}$				
Forward-current transfer ratio	3076	$V_{CE} = 10 \text{ V dc}$, $I_C = 50 \text{ mA dc}$	h_{FE6}			
2N3634, 2N3634L 2N3636, 2N3636L				25		
2N3635, 2N3635L 2N3637, 2N3637L				50		
<u>Subgroup 4</u>						
Small-signal short-circuit forward-current transfer ratio	3306	$V_{CE} = 30 \text{ V dc}$, $I_C = 30 \text{ mA dc}$, $f = 100 \text{ MHz}$	$ h_{re} $			
2N3634, 2N3634L 2N3636, 2N3636L				1.5	8.0	
2N3635, 2N3635L 2N3637, 2N3637L				2.0	8.5	
Small-signal short-circuit forward current transfer ratio	3206	$V_{CE} = 10 \text{ V dc}$, $I_C = 10 \text{ mA dc}$, $f = 1 \text{ kHz}$	h_{re}			
2N3634, 2N3634L 2N3636, 2N3636L				40	160	
2N3635, 2N3635L 2N3637, 2N3637L				80	320	

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Small-signal short-circuit input impedance 2N3634, 2N3634L 2N3636, 2N3636L <u>Subgroup 4</u> - Continued 2N3635, 2N3635L 2N3637, 2N3637L	3201	$V_{CE} = 10 \text{ V dc}$, $I_C = 10 \text{ mA dc}$, $f = 1 \text{ kHz}$	h_{ie}	100	600	Ω
Small signal open circuit reverse voltage transfer ratio	3211	$V_{CE} = 10 \text{ V dc}$, $I_C = 10 \text{ mA dc}$, $f = 1 \text{ kHz}$	h_{re}		3×10^{-4}	
Small signal open circuit output admittance	3216	$V_{CE} = 10 \text{ V dc}$, $I_C = 10 \text{ mA dc}$, $f = 1 \text{ kHz}$	h_{oe}		200	μs
Open circuit output capacitance	3236	$V_{CB} = 20 \text{ V dc}$, $I_E = 0$, $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{obo}		10	pF
Input capacitance (output open circuited)	3240	$V_{EB} = 1 \text{ V dc}$, $I_C = 0$, $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{ibo}		75	pF
Noise figure	3246	$V_{CE} = 10 \text{ V dc}$, $I_C = 0.5 \text{ mA dc}$, $R_G = 1 \text{ k}\Omega$ (see 4.5.3) $f = 100 \text{ Hz}$ $f = 10 \text{ kHz}$ $f = 1 \text{ kHz}$	NF		5 3 3	dB dB dB
Pulse response		Test condition A				
Switching parameters	3251	See figure 3	t_d		100	ns
Pulse delay time		See figure 3	t_r		100	ns
Pulse rise time		See figure 3	t_s		500	ns
Pulse storage time		See figure 3	t_f		150	ns
Pulse fall time t_{off}		t_s & t_r	t_{off}		600	ns

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection ^{1/}	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 5</u> Safe operating area (continuous dc) <u>Test 1</u> 2N3634, 2N3634L 2N3635, 2N3635L 2N3636, 2N3636L 2N3637, 2N3637L <u>Test 2</u> <u>Test 3</u> End-point electrical measurements <u>Subgroup 6</u> Not applicable <u>Subgroups 7</u> Not applicable	3051	$T_C = + 25^\circ\text{C}$, $t = 1\text{s}$, 1 cycle (see figure 4) $V_{CE} = 100\text{ V dc}$, $I_C = 30\text{ mA dc}$ $V_{CE} = 130\text{ V dc}$, $I_C = 20\text{ mA dc}$ $V_{CE} = 50\text{ V dc}$, $I_C = 95\text{ mA dc}$ $V_{CE} = 5\text{ V dc}$, $I_C = 1\text{ A dc}$ Subgroup 2.				

^{1/} For sampling plan see MIL-PRF-19500.

^{2/} For resubmission of failed table I, group A subgroup 1, 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.

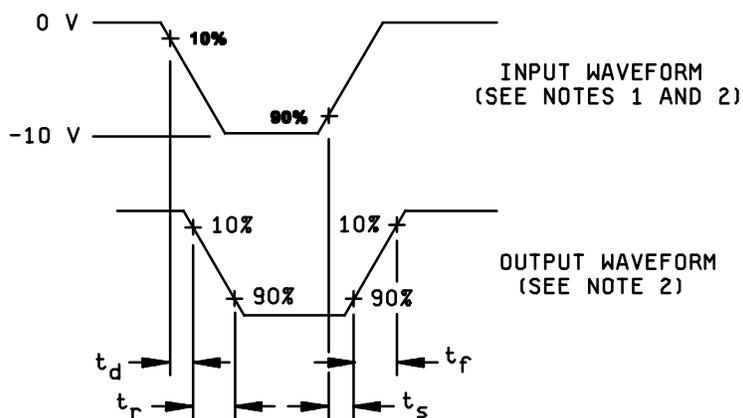
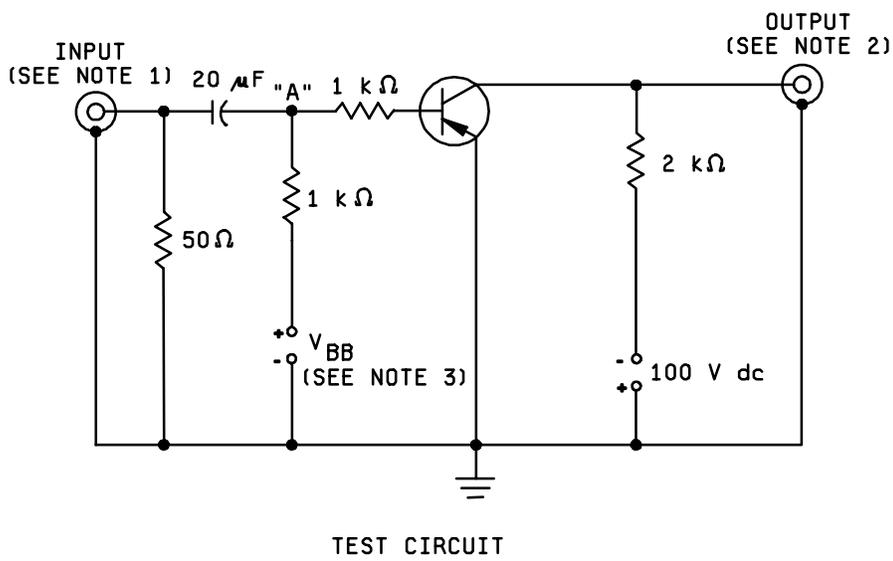
^{3/} Separate samples may be used.

^{4/} Not required for JANS devices.

^{5/} Not required for laser marked devices.

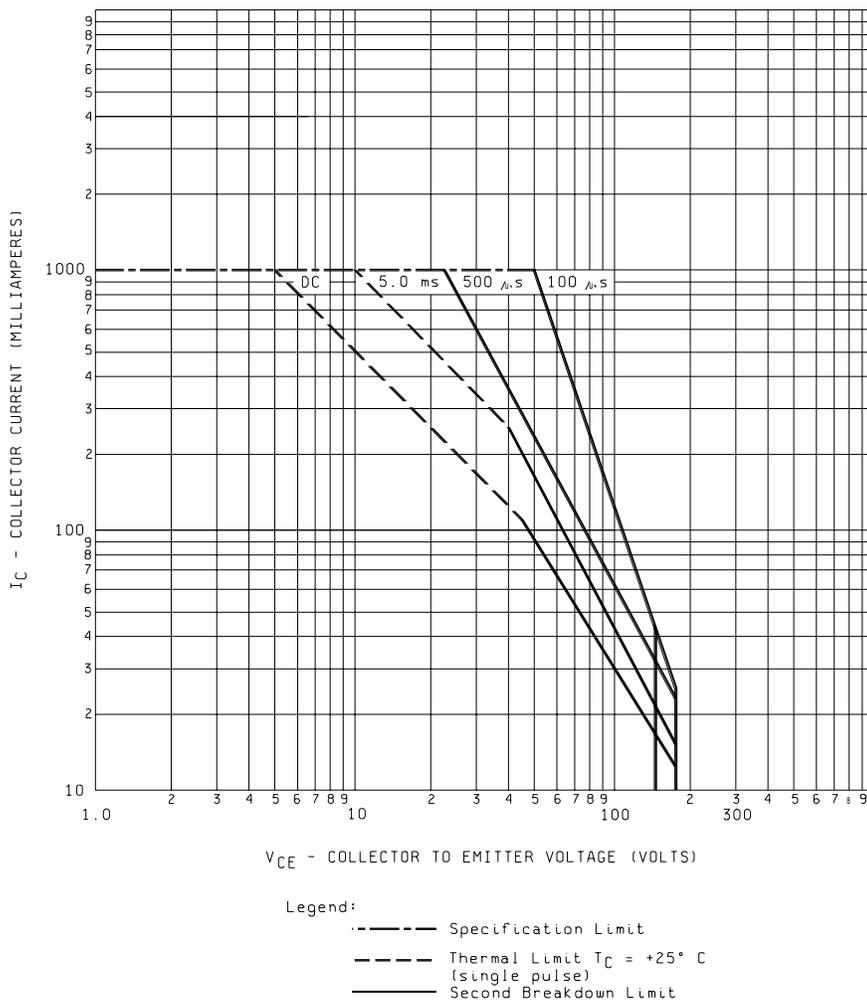
TABLE II. Group E inspection (all quality levels) - for qualification only.

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 table I, group A, subgroup 2 and 4.5.4 herein.	
<u>Subgroup 2</u>			45 devices c = 0
Intermittent life	1037	V _{CB} = 10 V dc, 6,000 cycles; forced air cooling allowed on cooling cycle only.	
Electrical measurements		See group A, subgroup 2 and 4.5.4 herein.	
<u>Subgroup 3, 4, 5, 6 and 7</u>			
Not applicable			
<u>Subgroup 8</u>			22 devices c = 0
Reverse stability	1033	Condition A for devices ≥ 400 volts Condition B for devices < 400 volts	

**NOTES:**

1. The input waveform is supplied by a pulse generator with the following characteristics:
 $t_r \leq 15 \text{ ns}$, $t_f \leq 15 \text{ ns}$, $Z_{OUT} = 50 \Omega$, $PW = 20 \mu\text{s}$, duty cycle ≤ 2 percent.
2. Output waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15 \text{ ns}$, $R_{in} \geq 10 \text{ M}\Omega$, $C_{in} \leq 11.5 \text{ pF}$.
3. $V_{BB} = 4.0 \text{ V dc}$ for t_{on} , 4.1 for t_{off} at point "A".
4. Resistors shall be noninductive types.
5. The dc power supplies may require additional by-passing in order to minimize ringing.

FIGURE 3. Pulse response test circuit.



NOTES:

1. $T_J = +200^\circ\text{C}$.
2. Curves are based on a 30 percent derating factor.

FIGURE 4. Maximum safe operating area graph (continuous dc).

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 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).
- c. Packaging requirements (see 5.1).
- d. Lead finish (see 3.4.1).
- e. Type designation and product assurance level.
- f. For die acquisition, the JANHC or JANKC letter version shall be specified (see figure 2).
- g. Surface mount designation if applicable.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers' List (QML) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43216-5000.

6.4 Supersession information. Devices covered by this specification supersede the manufacturers' and users' Part or Identifying Number (PIN). The term Part or Identifying Number (PIN) is equivalent to the term part number which was previously used in this specification. This information in no way implies that manufacturers' PIN's are suitable as a substitute for the military PIN.

6.5 Suppliers of JANHC and JANKC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example JANHCA2N3634) will be identified on the QML.

JANHC and JANKC ordering information	
PIN	Manufacturer
2N3634	JANHCA2N3634, JANKCA2N3634
2N3635	JANHCA2N3635, JANKCA2N3635
2N3636	JANHCA2N3636, JANKCA2N3636
2N3637	JANHCA2N3637, JANKCA2N3637

6.6 Changes from previous issue. Asterisks 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 - 11
 NASA - NA
 DLA - CC

Preparing activity:

DLA - CC

(Project 5961-2542)

Review activities:

Army - AR, MI, SM
 Navy - AS, MC, SH
 Air Force - 19, 71

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-19500/357G	2. DOCUMENT DATE 29 August 2002
3. DOCUMENT TITLE SEMICONDUCTOR DEVICE, TRANSISTOR, PNP, SILICON, AMPLIFIER, TYPES 2N3634 THROUGH 2N3637, 2N3634L THROUGH 2N3637L, 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@dscd.dla.mil	
c. ADDRESS Defense Supply Center Columbus ATTN: DSCC-VAC P.O. Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533, Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888	