

The documentation and process conversion measures necessary to comply with this revision shall be completed by 1 June 1999.

INCH-POUND

MIL-PRF-19500/6C  
 1 March 1999  
 SUPERSEDING  
 MIL-S-19500/6B  
 28 December 1971

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, TRANSISTOR, PNP,  
 GERMANIUM, LOW-POWER,  
 TYPES 2N43AZ1, 2N43AZ2, 2N44AZ1 AND 2N44AZ2

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, germanium, low-power transistor. One level of product assurance is provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (Z1 suffix) and figure 2 (Z2 suffix).

1.3 Maximum ratings.

$P_T$ <sup>1/</sup> $T_A = +25^\circ\text{C}$	$V_{CB}$	$V_{EB}$	$V_{CEO}$	$T_J$	$T_{STG}$
<u>mW</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>°C</u>	<u>°C</u>
150	-45	-5	-30	+85	-55 to +100

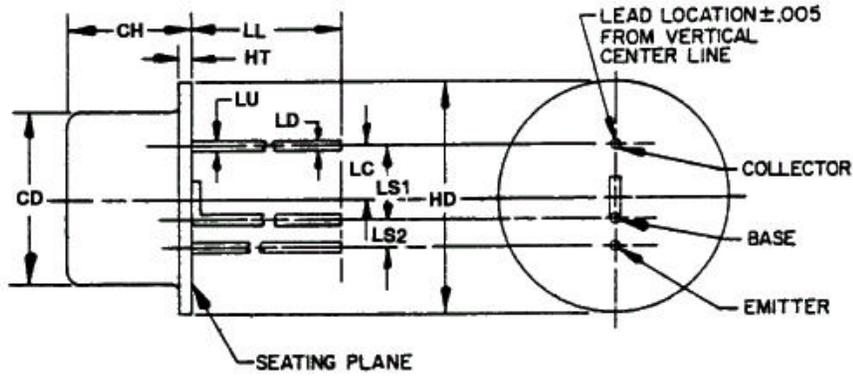
<sup>1/</sup> Derate linearly 2.50 mW/°C for  $T_A > +25^\circ\text{C}$ .

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

Limits	Types <sup>1/</sup>	$h_{fe}$ $V_{CE} = -5 \text{ V dc}$ $I_E = 1.0 \text{ mA dc}$	$h_{ib}$ $V_{CB} = -5 \text{ V dc}$ $I_E = 1.0 \text{ mA dc}$	$h_{ob}$ $V_{CB} = -5 \text{ V dc}$ $I_E = 1.0 \text{ mA dc}$	$f_{hib}$	$C_{obo}$ $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$ $V_{CB} = -5 \text{ V dc}$ $I_E = 0$	$C_{obo}$ $V_{CB} = -5 \text{ V dc}$ $I_E = 1.$ $f = 1 \text{ kHz}$
			<u><math>\Omega</math></u>	<u><math>\mu\text{mho}</math></u>	<u>MHz</u>	<u>pF</u>	<u>dB</u>
Min	2N43A 2N44A	30 16	25 27	0.1 0.1	0.5 0.5	20 20	- -
Max	2N43A 2N44A	66 38	35 38	1.5 1.5	3.5 3.0	60 60	20 15

<sup>1/</sup> Applies to both package configurations.

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 St., Columbus, OH 43216-5000, by using the addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.



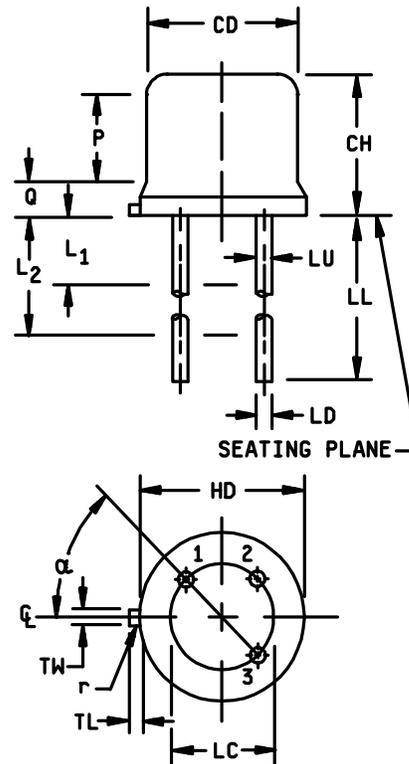
Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.322	.345	8.18	8.76	
CH	.185	.250	4.70	6.35	
HD	.430	.460	10.92	11.68	
HT	.020	.045	.51	1.14	
LC	.086	.106	2.18	2.69	
LD	.016	.026	0.41	0.66	4,6
LL	1.50	1.75	38.10	44.45	6
LS1	.137	.151	3.48	3.84	
LS2	.041	.055	1.04	1.40	
LU	.016	.019	0.41	0.48	3,6

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Measured in the zone .050 (1.27 mm) and .250 (6.35 mm) from the seating plane.
4. Measured in the zone beyond .250 (6.35 mm) from the seating plane.
5. The base shall be connected to the case.
6. All 3 leads.
7. In accordance with ANSI Y14.5M, diameters are equivalent to  $\phi x$  symbology.

FIGURE 1. Physical dimensions (suffix "Z1").

Symbol	Dimensions				Note
	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	.100 TP		2.54 TP		6
LD	.016	.021	0.41	0.53	7,8
LL	1.50	1.75	38.10	44.45	7,8
LU	.016	.019	0.41	0.48	7,8
L1	---	.050	---	1.27	7,8
L2	.250	---	6.35	---	7,8
Q	---	---	---	---	5
TL	.029	.045	0.74	1.14	3,4
TW	.028	.034	0.71	0.86	3
r	---	.007	---	0.18	10
$\alpha$	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, TL shall be held for a minimum length of .011 (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  $.054 +.001 -0.000$  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. The device may be measured by direct methods or by the gauge and gauging procedure shown in figure 2.
7. Dimension LU applies between  $L_1$  and  $L_2$ . Dimension LD applies between  $L_2$  and LL minimum. Diameter is uncontrolled in  $L_1$  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  $\phi x$  symbology.
12. Lead 1 = emitter, lead 2 = base, lead 3 = collector (base is connected to the case).

FIGURE 2. Physical dimensions (suffix "Z2").

## 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

#### 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 Associated specification. The individual item requirements shall be in accordance with MIL-PRF-19500, and as specified herein.

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

3.3 Interface requirements and physical dimensions. The Interface requirements and physical dimensions shall be as specified in MIL-PRF-19500, and figures 1 and 2 herein.

3.3.1 Lead finish. Lead finish shall be solderable as defined in MIL-PRF-19500.

3.3.2 Package outline. This specification contains two standard packages. Any user of this specification that has a specific package outline requirement shall specify their package suffix preference in the document purchase order. If package style is not specified, the manufacturer may supply either package (see 6.2).

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

3.4.1 Package identifiers. Devices shall be marked with a suffix to designate the package type: "Z1" suffix for packages conforming to figure 1, "Z2" suffix for devices conforming to figure 2 (See 6.3).

3.5 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 6.2).

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in paragraph 1.3, 1.4, and table 1.

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

## 4. VERIFICATION

4.1 Classification of Inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 Qualification inspection. Qualification inspection shall consist of groups A, B, and C inspections.

4.3 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein.

4.3.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500, and table I herein.

4.3.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIb (JAN) of MIL-PRF-19500. Electrical measurements (end-points) shall be in accordance with group A, subgroup 2 .

Subgroup	Method	Condition
B2	1051	Test condition B, except step 3, $T_A = +100^\circ$
B3	1037	$V_{CB} = -15$ V dc; $P_T = 150$ mW, $T_A = 25^\circ\text{C}$ , $t = 340$ hours, $t_{on} = t_{off} = 3$ minutes minimum for 2,000 cycles. No heat sink or forced-air cooling on devices shall be permitted.
B5	3151	$R_{\theta JA} = 0.40$ °C/mW

4.3.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII (JAN) of MIL-PRF-19500, and herein for group C testing. Electrical measurements (end points) shall be in accordance with group A, subgroup 2.

Subgroup	Method	Condition
C2	2036	Test condition E.
C6	1037	$V_{CB} = -15$ V dc; $P_T = 150$ mW, $T_A = 25^\circ\text{C}$ , $t = 340$ hours, $t_{on} = t_{off} = 3$ minutes minimum for 2,000 cycles. No heat sink or forced-air cooling on devices shall be permitted.

4.4 Method of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

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

TABLE I. Group A inspection.

Inspection <u>1/</u> , <u>2/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Collector to base cutoff current	3036	Bias condition D; $V_{CB} = -45$ V dc;	$I_{CBO}$		-16	$\mu$ A dc
Emitter to base cutoff current	3061	Bias condition D; $V_{EB} = -5.0$ V dc;	$I_{EBO}$		-10	$\mu$ A dc
Breakdown voltage, collector to emitter	3011	Bias condition B; $I_C = -0.6$ mA dc; $R_{BE} = 10$ k $\Omega$	$V_{(BR)CER}$	-30		V dc
Floating Potential	3020	$V_{CB} = -30$ V dc; voltmeter input resistance $\geq 1$ M $\Omega$	$V_{EBF}$		-1.0	V dc
Collector to emitter voltage (saturated)	3071	Bias condition C; $V_{CE} = 50$ V dc	$V_{CE}(\text{sat})$		-0.16	V dc
2N43A 2N44A		$I_C = -20$ mA dc, $I_B = -1.3$ mA dc $I_C = -20$ mA dc, $I_B = -2.0$ mA dc				
Base to emitter voltage (saturated)	3066	Test condition B; $I_C = -20$ mA dc, $V_{CE} = -1.0$ mA dc	$V_{BE}$		-0.32 -0.34	V dc V dc
2N43A 2N44A						
Forward-current transfer ratio	3076	$V_{CE} = -1.0$ V dc; $I_C = -20$ mA dc	$h_{FE}$	34 18	65 43	
2N43A 2N44A						
Forward-current transfer ratio	3076	$V_{CE} = -1.0$ V dc; $I_C = -100$ mA dc	$h_{FE}$	30 13		
2N43A 2N44A						
<u>Subgroup 3</u>						
High temperature operation		$T_A = +150^\circ\text{C}$				
Collector to base cutoff current	3036	Bias condition D; $V_{CB} = 60$ V dc	$I_{CBO}$		225	$\mu$ A dc
Low temperature operation		$T_A = -55^\circ\text{C}$				
Forward-current transfer ratio	3076	$V_{CE} = 10$ V dc; $I_C = 10$ mA dc	$h_{FE6}$		20 15	dB dB
2N43A 2N44A						

See footnotes at end of table.

TABLE I. Group A inspection - continued.

Inspection <u>1/</u> , <u>2/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u>						
Small-signal short-circuit forward current transfer ratio 2N43A 2N44A	3206	$V_{CE} = -5.0 \text{ V dc}; I_C = 1.0 \text{ mA dc}$	$h_{fe}$	30 16	66 38	
Small-signal short-circuit input impedance 2N43A 2N44A	3201	$V_{CB} = -5.0 \text{ V dc}; I_E = 1.0 \text{ mA dc}$	$h_{ib}$	25 27	35 38	$\Omega$ $\Omega$
Small-signal open-circuit output admittance	3216	$V_{CB} = -5.0 \text{ V dc}; I_E = 1.0 \text{ mA dc}$	$h_{ob}$	0.1	1.5	$\mu\text{mho}$
Small-signal open-circuit reverse-voltage transfer ratio 2N43A 2N44A	3211	$V_{CB} = -5.0 \text{ V dc}; I_E = 1.0 \text{ mA dc}$	$h_{rb}$	1 1	15 13	$\times 10^{-4}$ $\times 10^{-4}$
Small-signal short-circuit input forward-current transfer-ratio cutoff frequency 2N43A 2N44A	3301	$V_{CB} = -5.0 \text{ V dc}; I_E = 1.0 \text{ mA dc}$	$f_{hfb}$	0.5 0.5	3.5 3.0	MHz MHz
Open circuit output capacitance	3236	$V_{CB} = -5.0 \text{ V dc}; I_E = 0 \text{ mA};$ $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	$C_{obo}$	20	60	pF
Noise figure 2N43A 2N44A	3246	$V_{CB} = -5.0 \text{ V dc}; I_E = 1.0 \text{ mA dc}$	NF		20 15	dB dB
<u>Subgroups 5 and 6</u>						
Not required						

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

2/ Applies to both package configurations.

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 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 Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's 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. Acquisition documents should specify the following:

- a. Issue of DODISS to be cited in the solicitation and, if required, the specific issue of individual documents referenced (see 2.2.1).
- b. Lead finish (see 3.3.1).
- c. Type designation and product assurance level.
- d. Packaging requirements (see 5.1).

6.3 Substitution information. Devices previously covered by this specification, 2N43A and 2N44A, have been replaced by 2N43AZ1 and 2N44AZ1 respectively.

6.4 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-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-VQE, 3990 East Broad St., Columbus, OH 43216.

CONCLUDING MATERIAL

Custodians:  
Army - CR  
Navy - EC  
Air Force - 85  
NASA - NA

Preparing activity:  
DLA - CC

(Project 5961-2100)

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

## 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.

<b>I RECOMMEND A CHANGE :</b>		<b>1. DOCUMENT NUMBER</b> MIL-PRF-19500/6C	<b>2. DOCUMENT DATE</b> 1 March 1999
3. SEMICONDUCTOR DEVICE, TRANSISTOR, PNP, GERMANIUM, LOW-POWER, TYPES 2N43AZ1, 2N43AZ2, 2N44AZ1 AND 2N44AZ2			
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)			
5. REASON FOR RECOMMENDATION			
<b>6. SUBMITTER</b>			
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
<b>8. PREPARING ACTIVITY</b>			
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-VAT Columbus, OH 43216-5000		<b>IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:</b> Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340    DSN 289-2340	