

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, TRANSISTOR, PNP, GERMANIUM, LOW-POWER
 TYPE 2N526

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for a PNP, germanium, low-power transistor.

1.2 Physical dimensions. See figure 1 (TO-5).

1.3 Maximum ratings.

P_T ^{1/}	V_{CBO}	V_{CER}	V_{EBO}	I_C	T_{stg}
<u>mW</u>	<u>Vdc</u>	<u>Vdc</u>	<u>Vdc</u>	<u>mAdc</u>	<u>°C</u>
225	-45	-30	-15	-500	-65 to +100

^{1/} Derate linearly 3 mW/°C for $T_A > 25^\circ C$.

1.4 Primary electrical characteristics.

Limits	f_{hfb} $V_{CB} = -5 Vdc$ $I_E = 1 mAdc$	h_{ob} $V_{CB} = -5 Vdc$ $I_E = 1 mAdc$	h_{rb} $V_{CB} = -5 Vdc$ $I_E = 1 mAdc$	h_{ib} $V_{CB} = -5 Vdc$ $I_E = 1 mAdc$	$V_{CE(sat)}$ $I_B = -1 mAdc$ $I_C = -20 mAdc$
	<u>MHz</u>	<u>μmho</u>	<u>$\times 10^{-4}$</u>	<u>ohms</u>	<u>mVdc</u>
Min	1	0.1	1	25	-55
Max	6.5	1	12	35	-130

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

~~REGISTRATION~~

MILITARY

MIL-S-19500 - Semiconductor Devices, General Specification for.

STANDARD

MILITARY

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

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 General. Requirements shall be in accordance with MIL-S-19500, and as specified herein.

3.2 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-S-19500.

3.3 Design, construction, and physical dimensions. Transistors shall be of the design, construction, and physical dimensions shown on figure 1.

3.3.1 Terminal-lead length. Terminal-lead length(s) other than that specified in figure 1 may be furnished when so stipulated under contract or order (see 6.2) where the devices covered herein are required directly for particular equipment-circuit installation or for automatic-assembly-technique programs. Where other lead lengths are required and provided, it shall not be construed as adversely affecting the qualified-product status of the device, or applicable JAN marking.

3.4 Performance characteristics. Performance characteristics shall be as specified in tables I, II, and III.

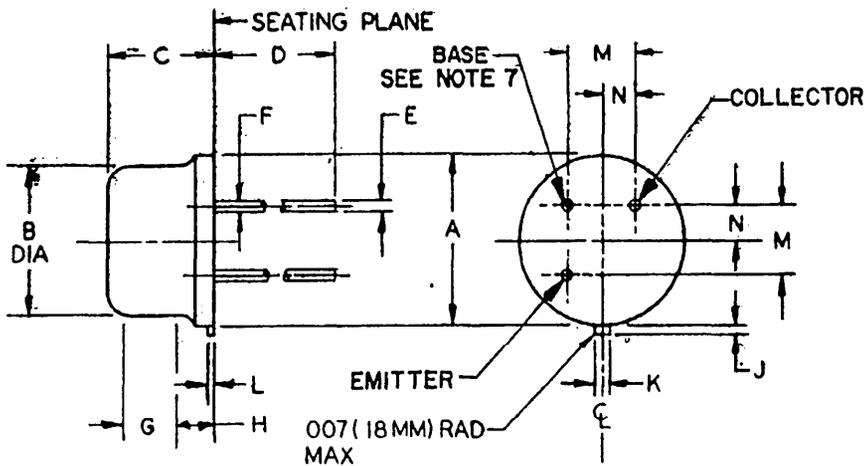
3.5 Marking. The following marking specified in MIL-S-19500 may be omitted from the body of the transistor at the option of the manufacturer:

- (a) Country of origin.
- (b) Manufacturer's identification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500, and as specified herein.

4.2 Qualification inspection. Qualification inspection shall consist of the examinations and tests specified in tables I, II, and III.

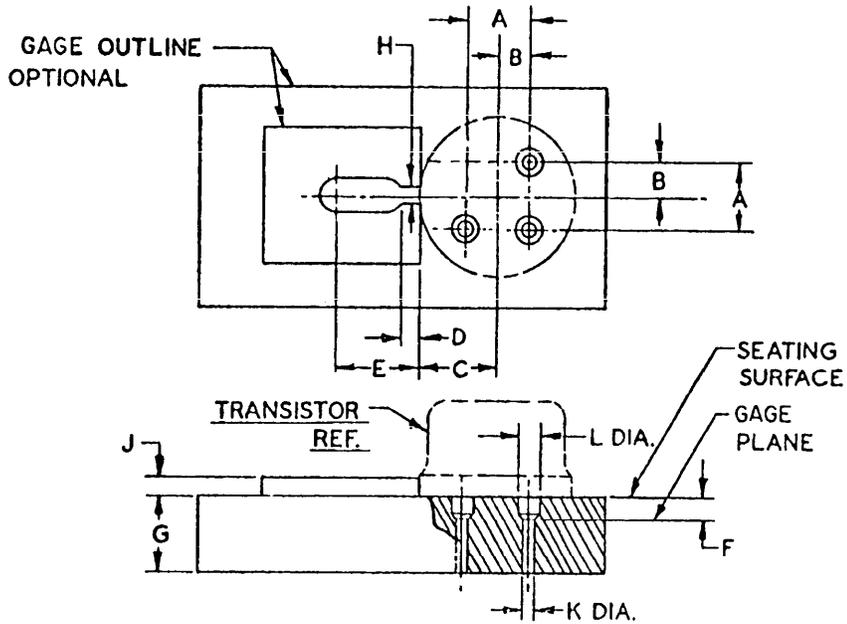


Dimensions					
Ltr	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.335	.370	8.51	9.40	--
B	.305	.335	7.75	8.51	--
C	.240	.260	6.10	6.60	--
D	1.500	1.750	38.10	44.45	9
E	.016	.021	.41	.53	2,9
F	.016	.019	.41	.48	3,9
G	.100	---	2.54	---	4
H	---	---	---	---	5
J	.029	.045	.74	1.14	8
K	.028	.034	.71	.86	--
L	.009	.125	.23	3.18	--
M	.1414 Nom		3.59 Nom		6
N	.0707 Nom		1.80 Nom		6

NOTES:

1. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
2. Measured in the zone beyond .250 (6.35 mm) from the seating plane.
3. Measured in the zone .050 (1.27 mm) and .250 (6.35 mm) from the seating plane.
4. Variations on dimension B in this zone shall not exceed .010 (.25 mm).
5. Outline in this zone is not controlled.
6. When measured in a gaging plane .054 + .001, -.000 (1.37 + .03, -.00 mm) below the seating plane of the transistor maximum diameter leads shall be within .007 (.18 mm) of their true location relative to a maximum width tab. Smaller diameter leads shall fall within the outline of the maximum diameter lead tolerance. Figure 2 preferred measured method.
7. The base shall be electrically connected to the case.
8. Measured from the maximum diameter of the actual device.
9. All 3 leads.

FIGURE 1. Physical dimensions of transistor type 2N526 (TO-5).



NOTES:

1. The following gaging procedure shall be used: The use of a pin straightener prior to insertion in the gage is permissible. The device being measured shall be inserted until its seating plane is $.125 \pm .010$ (3.18 \pm .25 mm) from the seating surface of the gage. A spacer may be used to obtain the .125 (3.18 mm) distance from the gage seat prior to force application. A force of 8 oz \pm 0.5 oz shall then be applied parallel and symmetrical to the device's cylindrical axis. When examined visually after the force application (the force need not be removed) the seating plane of the device shall be seated against the gage.
2. The location of the tab locator, within the limits of dim C, will be determined by the tab and flange dimension of the device being checked.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.1409	.1419	3.58	3.60
B	.0702	.0712	1.78	1.81
C	.182	.199	4.62	5.05
D	.009	.011	.23	.28
E	.125 Nom		3.18 Nom	
F	.054	.055	1.37	1.40
G	.372	.378	9.45	9.60
H	.0350	.0355	.89	.90
J	.150 Nom		3.81 Nom	
K	.0325	.0335	.83	.85
L	.0595	.0605	1.51	1.54

FIGURE 2. Gage for lead and tab location for transistor type 2N526.

4.3 Quality conformance inspection. Quality conformance inspection shall consist of group A, B, and C inspections.

4.3.1 Group A inspection. Group A inspection shall consist of the examinations and tests specified in table I.

4.3.2 Group B inspection. Group B inspection shall consist of the examinations and tests specified in table II.

4.3.3 Group C inspection. Group C inspection shall consist of the examinations and tests specified in table III. This inspection shall be conducted on the initial lot and thereafter every 6 months during production.

4.3.4 Group B and group C life-test samples. Samples that have been subjected to group B, 340-hours life-test, may be continued on test to 1,000 hours in order to satisfy group C life-test requirements. These samples shall be predesignated, and shall remain subjected to the group C 1,000-hour acceptance evaluation after they have passed the group B, 340-hour acceptance criteria. The cumulative total of failures found during 340-hour test and during the subsequent interval up to 1,000 hours shall be computed for 1,000-hour acceptance criteria.

4.4 Methods of examination and test. Methods of examination and test shall be as specified in tables I, II, and III.

TABLE I. Group A inspection

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 1</u>			10				
Visual and mechanical examination	2071			---	---	---	---
<u>Subgroup 2</u>			5				
Breakdown voltage, collector to emitter	3011	Bias cond. B; $I_C = -0.6 \text{ mAdc}$; $R_2 = 10 \text{ K}$		BVCER	-30	---	Vdc
Breakdown voltage, collector to base	3001	Bias cond. D; $I_C = -200 \text{ } \mu\text{Adc}$		BVCBO	-45	---	Vdc
Breakdown voltage, emitter to base	3026	Bias cond. D; $I_E = -10 \text{ } \mu\text{Adc}$		BVEBO	-15	---	Vdc
Collector to base cutoff current	3036	Bias cond. D; $V_{CB} = -30 \text{ Vdc}$		ICBO	---	-10	μAdc
Floating potential	3020	$V_{CB} = -31 \text{ Vdc}$; Voltmeter input resistance $\geq 10 \text{ megohms}$		VEBF	---	-1	Vdc

TABLE I. Group A inspection - Continued

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 3</u>			5				
Small-signal open-circuit output admittance	3216	V _{CB} = -5 Vdc; I _E = 1 mA _{dc}		h _{ob}	0.1	1	μmho
Small-signal open-circuit reverse-voltage transfer ratio	3211	V _{CB} = -5 Vdc; I _E = 1 mA _{dc}		h _{rb}	1	12	x10 ⁻⁴
Small-signal short-circuit input impedance	3201	V _{CB} = -5 Vdc; I _E = 1 mA _{dc}		h _{ib}	25	35	ohms
Small-signal short-circuit forward-current transfer ratio	3206	V _{CB} = -5 Vdc; I _E = 1 mA _{dc}		h _{fe}	44	88	---
<u>Subgroup 4</u>			10				
Open-circuit output capacitance	3236	V _{CB} = -5 Vdc; I _E = 0; 100 kHz ≤ f ≤ 1 MHz		C _{obo}	10	40	pf
Noise figure	3246	V _{CB} = -5 Vdc; I _E = 1 mA _{dc} ; R _g = 1,000 ohms		NF	---	10	db
Small-signal short-circuit forward-current transfer ratio cutoff frequency	3301	V _{CB} = -5 Vdc; I _E = 1 mA _{dc}		f _{hfb}	1	6.5	MHz
<u>Subgroup 5</u>			5				
Forward-current transfer ratio	3076	V _{CE} = -1 Vdc; I _C = -20 mA _{dc}		h _{FE}	53	90	---
Forward-current transfer ratio	3076	V _{CE} = -1 Vdc; I _C = -100 mA _{dc}		h _{FE}	47	---	---
Base emitter voltage (nonsaturated)	3066	Test cond. B; V _{CE} = -1 Vdc; I _C = -20 mA _{dc}		V _{BE}	-190	-320	mVdc
Collector to emitter voltage (saturated)	3071	I _C = -20 mA _{dc} ; I _B = -1 mA _{dc}		V _{CE(sat)}	-55	-130	mVdc
<u>Subgroup 6</u>			15				
High-temperature operation: TA = 70°C							
Collector to base cutoff current	3036	Bias cond. D; V _{CB} = -30 Vdc		I _{CBO}	---	-200	μA _{dc}
Low-temperature operation: TA = -55°C							
Forward-current transfer ratio	3076	V _{CE} = -1 Vdc; I _C = -20 mA _{dc}		h _{FE}	27	---	---

TABLE II. Group B inspection

MIL-S-19500/60E

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 1</u>			20				
Physical dimensions	2066	(See figure 1)		---	---	---	---
<u>Subgroup 2</u>			15				
Solderability	2026			---	---	---	---
Thermal shock (temperature cycling)	1051	Test cond. B, except step 3, T _A = +100°C		---	---	---	---
Thermal shock (glass strain)	1056	Test cond. A		---	---	---	---
Hermetic seal	1071	Test cond. G or H for fine leak tests; test cond. A, C, D or F for gross leaks		---	---	1x10 ⁻⁷	atm cc/sec
Moisture resistance	1021			---	---	---	---
End points:							
Collector to base cutoff current	3036	Bias cond. D; V _{CB} = -30 Vdc		I _{CBO}	---	-15	μAdc
Forward-current transfer ratio	3076	V _{CE} = -1 Vdc; I _C = -20 mAdc		h _{FE}	50	100	---
<u>Subgroup 3</u>			15				
Shock	2016	Nonoperating; 1,500 G, 0.5 msec, 5 blows in each orientation: X ₁ , Y ₁ , Y ₂ , and Z ₁		---	---	---	---
Vibration, variable frequency	2056			---	---	---	---
Constant acceleration	2006	10,000 G in each orientation: X ₁ , Y ₁ , Y ₂ , and Z ₁		---	---	---	---
End points: (Same as subgroup 2)							
<u>Subgroup 4</u>			20				
Terminal strength (lead fatigue)	2036	Test cond. E		---	---	---	---
End points:							
Hermetic seal	1071	Test cond. G or H for fine leaks; test cond. A, C, D, or F for gross leaks		---	---	1x10 ⁻⁷	atm cc/sec

TABLE II. Group B inspection - Continued

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 5</u> Salt atmosphere (corrosion) End points: (Same as subgroup 2)	1041		20	---	---	---	---
<u>Subgroup 6</u> High-temperature life (nonoperating) End points:	1032	T _{stg} = +100°C; time = 340 hours (see 4.3.4)	7	---	---	---	---
Collector to base cutoff current	3036	Bias cond. D; V _{CB} = -30 Vdc		I _{CBO}	---	-20	μAdc
Forward-current transfer ratio	3076	V _{CE} = -1 Vdc; I _C = -20 mAdc		h _{FE}	45	110	---
<u>Subgroup 7</u> Intermittent operation life End points: (Same as subgroup 6)	1037	V _{CB} = -20 Vdc; P _C = 225 mW; Cycle: ON, 50 ±2 minutes, OFF, 10 ±2 minutes; time = 340 hours (see 4.3.4)	7	---	---	---	---

TABLE III. Group C inspection

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 1</u> High-temperature life (nonoperating) End points: (Same as subgroup 6 of group B)	1031	T _{stg} = +100°C (see 4.3.4)	λ = 7	---	---	---	---
<u>Subgroup 2</u> Intermittent operation life End points: (Same as subgroup 6 of group B)	1036	V _{CB} = -20 Vdc; P _C = 225 mW; Cycle: ON, 50 ±2 minutes, OFF, 10 ±2 minutes (see 4.3.4)	λ = 7	---	---	---	---

5. PREPARATION FOR DELIVERY

5.1 See MIL-S-19500, section 5.

6. NOTES:

6.1 Notes. The notes specified in MIL-S-19500 are applicable to this specification.

6.2 Ordering data. Procurement documents should specify the following: Terminal-lead length if other than specified in figure 1 (see 3.3.1).

6.3 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 - EL
Navy - EC
Air Force - 85

Preparing activity:

Navy - EC

Agent:

DSA - ES

Review activities:

Army - MU, MI
Navy - SH
Air Force - 11, 17
DSA - ES

(Project 5961-0159)

User activities:

Army - SM
Navy - CG, MC, OS, AS
Air Force - 13, 15, 19, 70, 80

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).

SPECIFICATION

ORGANIZATION (Of submitter)

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

\$

MATERIAL PROCURED UNDER A

DIRECT GOVERNMENT CONTRACT

SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

 YES

 NO

IF "YES", IN WHAT WAY?

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)

SUBMITTED BY (Printed or typed name and activity)

DATE