MIL-S-19500/68A
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SUPERSEDING
MIL-T-19500/68 (Sig C)
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MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE; TRANSISTOR, PNP, GERMANIUM, SWITCHING TYPE 2N1120

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 high-power, PNP, switching, germanium transistor.

1.2 Physical dimensions. See figure 1 (TO-41).

1.3 Maximum ratings.

P_C 1/ T_C = 25° C	V_{CBO}	V_{CEO}	V_{EBO}	I_E	I_B	T_{stg}	T_J
W	Vdc	Vdc	Vdc	Adc	Adc	°C	°C
90	-80	-40	-40	-15	-5	-65 to +100	100

1/ Derate linearly 1.25 W/° C for $T_C > 25°$ C.

1.4 Primary electrical characteristics.

	h_{FE} V_{CE} = -2 Vdc I_C = -5.0 Adc	h_{FE} V_{CE} = -2 Vdc I_C = -10 Adc	$V_{CE}(sat)$ I_C = -10 Adc I_B = -1 Adc	$V_{BE}(sat)$ I_C = -10 Adc I_B = -1 Adc	f_{hfe} V_{CE} = -2 Vdc I_C = -5 Adc
			Vdc	Vdc	kc
Min	---	20	---	---	3
Max	100	50	-0.7	-1.0	---

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.

SPECIFICATION

MILITARY

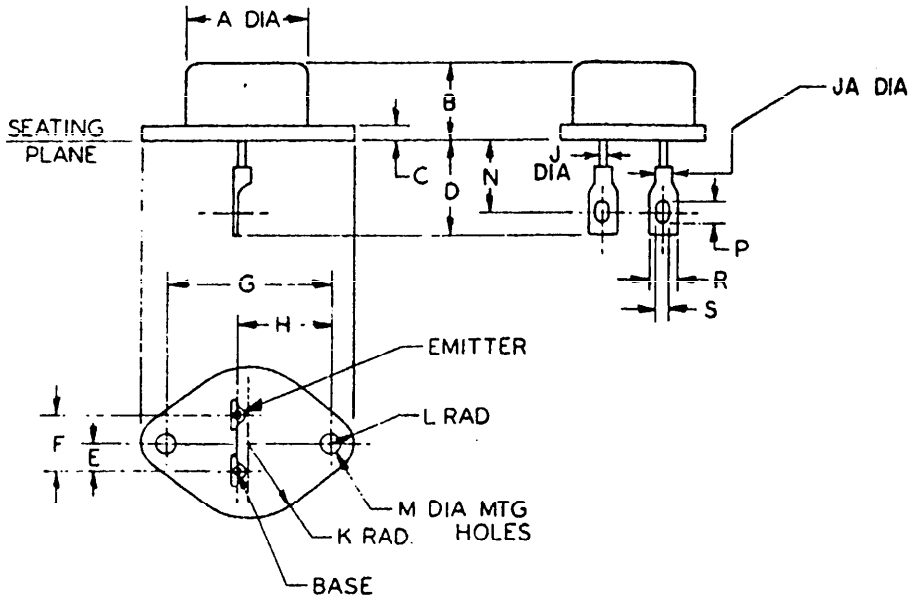
MIL-S-19500 - Semiconductor Devices, General Specification for.

STANDARDS

MILITARY

MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
MIL-STD-750 - Test Methods for Semiconductor Devices.

FSC 5961



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. This dimension should be measured at points .050 (1.27 mm) to .055 (1.40 mm) below seating plane. When gage is not used, measurement will be made at seating plane.
3. Two leads.
4. Collector shall be electrically connected to the case.
5. Two holes.

Ltr	Dimensions in inches with metric equivalents (mm) in parentheses (see note 1)		Notes
	Minimum	Maximum	
A	— — —	.875 (22.23)	
B	.250 (6.35)	.450 (11.43)	
C	— — —	.135 (3.43)	
D	.560 (14.22)	.680 (17.27)	2,3
E	.205 (5.21)	.225 (5.72)	
F	.420 (10.67)	.440 (11.18)	
G	1.177 (29.90)	1.197 (30.40)	
H	.655 (16.64)	.675 (17.15)	2
J	.038 (.97)	.052 (1.32)	3
JA	.078 (1.98)	.095 (2.41)	3
K	— — —	.525 (13.34)	
L	— — —	.188 (4.78)	
M	.151 (3.84)	.161 (4.09)	5
N	.500 (12.70)	.581 (14.76)	
P	.072 (1.83)	.170 (4.32)	
R	.125 (3.18)	.210 (5.33)	
S	.072 (1.83)	.120 (3.05)	

FIGURE 1. Physical dimensions of transistor type 2N1120 (TO-41).

(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 and construction. Transistor shall be of the design, construction, and physical dimensions shown on figure 1.

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

3.5 Marking. The following markings 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.

4.3 Quality conformance inspection. Quality conformance inspection shall consist of groups 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.

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

4.4.1 Inspection conditions. All measurements are to be made at T_C = 25° C unless otherwise specified.

TABLE I. Group A inspection

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		
	Method	Details			Min	Max	Unit
Subgroup 1			10				
Visual and mechanical examination	2071			---	---	---	---

TABLE I. Group A inspection - Continued

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		
	Method	Details			Min	Max	Unit
Subgroup 2			5				
Breakdown voltage, collector to emitter	3011	Bias cond. D; I_C = -300 mAdc		BV_{CEO}	-40	---	Vdc
Breakdown voltage, collector to emitter	3011	Bias cond. C; I_C = -300 mAdc		BV_{CES}	-70	---	Vdc
Floating potential	3020	V_{CB} = -80 Vdc; voltmeter input resistance $\geq$ 10 megohms		V_{EBF}	---	-0.5	Vdc
Collector to base cutoff current	3036	Bias cond. D; V_{CB} = -2 Vdc		I_{CBO}	---	-0.25	mAdc
Collector to base cutoff current	3036	Bias cond. D; V_{CB} = -80 Vdc		I_{CBO}	---	-10	mAdc
Emitter to base cutoff current	3061	Bias cond. D; V_{EB} = -40 Vdc		I_{EBO}	---	-3.0	mAdc
Subgroup 3			5				
Forward-current transfer ratio	3076	V_{CE} = -2 Vdc; I_C = -5 Adc		h_{FE}	---	100	---
Forward-current transfer ratio	3076	V_{CE} = -2 Vdc; I_C = -10 Adc; pulsed; tp = 1 sec. max; duty cycle 1 to 2%		h_{FE}	20	50	---
Collector to emitter voltage (saturated)	3071	I_C = -10 Adc; I_B = -1 Adc		$V_{CE(sat)}$	---	-0.7	Vdc
Base emitter voltage (saturated)	3066	Test cond. A; I_C = -10 Adc; I_B = -1 Adc		$V_{BE(sat)}$	---	-1.0	Vdc
Subgroup 4			10				
Small-signal short-circuit forward-current transfer-ratio cutoff frequency	3301	V_{CE} = -2 Vdc; I_C = -5 Adc		f_{hfe}	3	---	kc
High-temperature operation:	---	T_C = +90° C		---	---	---	---
Collector to base cutoff current	3036	Bias cond. D; V_{CB} = -30 Vdc		I_{CBO}	---	-20	mAdc
Low-temperature operation:	---	T_C = -55 ± 3° C		---	---	---	---
Forward-current transfer ratio	3076	V_{CE} = -2 Vdc; I_C = -10 Adc; pulsed; tp = 1 sec. max; duty cycle 1 to 2%		h_{FE}	15	---	---

TABLE II. Group B inspection

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		
	Method	Details			Min	Max	Unit
Subgroup 1			15				
Physical dimensions	2066	(See figure 1)		---	---	---	---
Subgroup 2			15				
Solderability	2026	Dwell time = 10 ± 1 sec; omit aging		---	---	---	---
Thermal shock (temperature cycling)	1051	Test cond. B, except T(high) = +100° C		---	---	---	---
Thermal shock (glass strain)	1056	Test cond. B		---	---	---	---
Moisture resistance	1021	Omit initial conditioning		---	---	---	---
End points:							
Collector to base cutoff current	3036	Bias cond. D; V_{CB} = -80 Vdc		I_{CBO}	---	-10	mAdc
Forward-current transfer ratio	3076	V_{CE} = -2 Vdc; I_C = -10 Adc; pulsed; t_p = 1 sec. max; duty cycle 1 to 2%		h_{FE}	20	50	---
Subgroup 3			15				
Shock	2016	Nonoperating; 500 G; approx. 1.0 msec; 5 blows in each orientation: X_1, Y_1, Y_2, and Z_1		---	---	---	---
Vibration fatigue	2046	10 G		---	---	---	---
Vibration, variable frequency	2056	10 G		---	---	---	---
Constant acceleration	2006	5000 G; in each orientation: X_1, Y_1, Y_2, and Z_1.		---	---	---	---
End points:							
(Same as subgroup 2)							
Subgroup 4			15				
Terminal strength: (tension)	2036	Test cond. A; weight = 10 lbs; time = 15 ± 3 sec. each lead		---	---	---	---
Terminal strength: (lead torque)	2036	Test cond. D_1; torque = 6 in-oz; time = 15 ± 3 sec. each lead		---	---	---	---

TABLE II. Group B inspection - Continued

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		
	Method	Details			Min	Max	Unit
Subgroup 4 - Continued							
End points:							
Seal (leak-rate)	---	Method 112 of MIL-STD-202, test cond. C, procedure III; test cond. B for gross leaks		---	---	$5x10^{-7}$	atm cc/sec
Subgroup 5			15				
Salt atmosphere (corrosion)	1041			---	---	---	---
End points:							
(Same as subgroup 2)							
Subgroup 6			λ = 10				
High-temperature life (nonoperating)	1031	T_{stg} = +100° C		---	---	---	---
End points:							
Collector to base cutoff current	3036	Bias cond. D; V_{CB} = -80 Vdc		I_{CBO}	---	-15	mAdc
Forward-current transfer ratio	3076	V_{CE} = -2 Vdc; I_C = -10 Adc; pulsed; tp = 1 sec. max; duty cycle 1 to 2%		h_{FE}	15	62	---
Subgroup 7			λ = 15				
Steady state operation life	1026	V_{CB} = -15 Vdc; P_C = 20 W; T_C = 80° C		---	---	---	---
End points:							
(Same as subgroup 6)							

TABLE III. Group C inspection

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		
	Method	Details			Min	Max	Unit
Subgroup 1			15				
Thermal resistance	3151			θ_{J-C}	---	0.8	° C/W

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 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 - SH
Air Force - 11

Review activities:
Army - EL, MU, MI
Navy - SH
Air Force - 11, 17, 85

User activities:
Army - EL, SM
Navy - CG, MC, WP
Air Force - 14, 19

Preparing activity:
Army - EL

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