MIL-S-19500/143B(EL)
22 JUNE 1966
SUPERSEDING
MIL-S-19500/143A(EL)
30 December 1963

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, TRANSISTOR, PNP, GERMANIUM TYPES 2N1183, 2N1183A, 2N1183B, and 2N1184, 2N1184A, 2N1184B

1. SCOPE

1.1 Scope.- This specification covers the detail requirements for germanium, PNP, transistors for use in medium-power circuit applications. (See 6.2 herein.)

1.2 Outline and dimensions.- (See Figure 1 herein.)

1.3 Maximum ratings.- (At T_A = + 25°C, unless otherwise specified.):

	P_C 1/	V_{CBO}	V_{CEO}	V_{CES}	V_{EBF}	T_{stg}	Altitude
	W	Vdc	Vdc	Vdc	Vdc	°C	ft.
2N1183	7.5	45	20	35	-1.2	-65 to +100	85,000
2N1184	7.5	45	20	35	-1.2	-65 to +100	85,000
2N1183A	7.5	60	30	50	-1.2	-65 to +100	85,000
2N1184A	7.5	60	30	50	-1.2	-65 to +100	85,000
2N1183B	7.5	80	40	60	-1.2	-65 to +100	85,000
2N1184B	7.5	80	40	60	-1.2	-65 to +100	85,000

1/ For power dissipation at ambient temperatures over + 25°C and up to + 100°C, derate at rate of 0.1 W/°C.

1.4 Particular electrical characteristics.- (At T_A = + 25°C.):

	h_{FE} at: V_{CE} = -2Vdc, I_C = -400 mAdc		V_{BE} at: V_{CE} = -2Vdc, I_C = -400mAdc	$V_{CE(sat)}$ at: I_C = -400mAdc, I_B = -40mAdc	f_{hfb} at: V_{CB} = -6Vdc, I_E = .1mAdc	θ_{J-C}
	2N1183,A,B	2N1184,A,B				
	---	---	Vdc	Vdc	Mc/s	°C/W
Min	20	40	---	---	0.5	---
Max	60	120	-1.5	-0.3	---	10

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 this specification to the extent specified herein:

SPECIFICATIONS

MILITARY

MIL-S-19500 Semiconductor Devices, General Specification For

STANDARDS

MILITARY

MIL-STD-750 Test Methods For Semiconductor Devices

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer. Both the title and number or symbol should be stipulated when requesting copies.)

3. REQUIREMENTS

3.1 General.- Requirements for the transistors shall be in accordance with Specification MIL-S-19500, and as otherwise specified herein.

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

3.3 Design and construction.- The transistors shall be of the design, construction, and physical dimensions specified in Figure 1 herein.

3.3.1 Terminal arrangement.- The terminal arrangement on the transistor shall be as indicated in Figure 1 herein.

3.3.2 Terminal-lead length.- Terminal-lead length(s) other than that specified in Figure 1 may be furnished under contract or order (see 6.3 herein); however, where such other lead lengths are required and provided, it shall not be construed as affecting adversely the Qualified-product status of the device, or applicable JAN marking.

3.3.3 Operating position.- The transistors shall be capable of proper operation in any position.

3.4 Performance characteristics.- The transistor performance characteristics shall be as specified in Tables I, II, and III herein. Except where specifically differentiated for respective transistor types (see 1.3, 1.4, and Tables I, II, and III), the performance requirements, including operating characteristics, ratings, test conditions, and test limits shall apply equally to all transistor types covered herein.

3.5 Marking.- Except as otherwise specified herein, marking shall be in accordance with Specification MIL-S-19500. If any specification-requirements waiver has been granted, the product-identification marking shall consist of the 'classification' type designation only.. (See 4.3.5 herein.)

4. QUALITY ASSURANCE PROVISIONS

4.1 General.- Except as otherwise specified herein, the responsibility for inspection, general procedures for acceptance, classification of inspection, and inspection conditions and methods of test shall be in accordance with Specification MIL-S-19500, Quality Assurance Provisions.

4.1.1 Inspection lot.- Applicable to the semiconductor devices covered herein, the term "inspection lot" shall be as defined in paragraph 4.3.2.1 of Specification MIL-S-19500 except that the 6-week-period time limitation stipulated therein shall be considered as not compulsory.

4.1.2 Procedure for lots held more than 1 year.- The requirements in Specification MIL-S-19500, paragraph 4.2, applicable to "lots held more than 6 months" shall apply, herewith, only to lots held more than 1 year.

4.2 Qualification and Quality Conformance inspection.- Qualification and Quality Conformance inspection shall be in accordance with Specification MIL-S-19500, Quality Assurance Provisions, and as otherwise specified herein (see 4.2.2 herein). Groups A, B, and C inspection shall consist of the examinations and tests specified in Tables I, II and III, respectively, herein. Quality Conformance inspection shall include inspection of Preparation for Delivery (see 5.1 herein).

4.2.1 Specified LTPD for subgroups.- The LTPD specified for a subgroup in Table I, II, and III herein shall apply for all of the tests, combined, in the subgroup.

4.2.2 Group C testing.- Unless otherwise specified, Group C tests shall be performed on the initial lot and thereafter on a lot every 6 months. (See Table III herein.) The contractor shall, throughout the course of a contract or order, permit the Government representative to scrutinize all test data and findings covering manufacturer's test program on Group C characteristics and parameters for the product(s) concerned. Upon determination by the Government inspector (in advance of Group C, 6-month, test results) that Group C parameters are not being adequately met, the Government inspector may require lot-by-lot inspection (normally for a minimum of 3 consective lots) to be performed for required Group C tests.

4.2.3 Disposition of sample units.- Sample units that have been subjected to Group B, Subgroup 4 and 5 tests shall not be delivered on the contract or order. Sample units that have been subjected to and have passed Group B, Subgroups 1, 2, 3, 6, and 7 tests, and Group C Subgroup 1 test, these tests to be considered non-destructive, may be delivered on the contract or order provided that, after Group B and C inspection is terminated, those sample units are subjected to and pass Group A inspection. Defective units from any sample group that may have passed group inspection shall not be delivered on the contract or order until the defect(s) has been remedied to the satisfaction of the Government.

4.3 Particular examination and test requirements.-

4.3.1 Test temperature.- All electrical performance characteristics shall be measured at an ambient temperature of + 25° ± 3°C, unless otherwise specified.

4.3.2 Interval for End-Point test measurements.- All applicable End-Point Test measurements shall be performed, after sample units have been subjected to required physical-mechanical or environmental test(s), in accordance with the following time-delay limitations:

(a) For Qualification inspection: within 24 hours.

(b) For Quality Conformance inspection: within 96 hours.

4.3.3 Shock.- The shock testing apparatus shall be capable of providing shock pulses of the specified peak acceleration, waveform, and pulse duration to the body of the device. The acceleration pulse, as determined from the unfiltered output of a transducer with a natural frequency greater than 10,000 cycles per second, shall be a half-sine waveform with an allowable distortion not greater than ± 20 percent of the specified peak acceleration. The pulse duration shall be measured between the points at 10 percent of the peak acceleration during rise, and at 10 percent of the peak acceleration during decay. Absolute tolerance of the pulse duration shall be ± 30 percent of the specified duration.

4.3.4 Mechanical Damage Resulting from Tests.- Except for intentionally deforming, mutiloting, or dismembering mechanical-stress tests to which samples are subjected, there shall be no evidence of mechanical damage to any sample unit as a result of any of the Groups A, B, and C tests.

4.3.5 Marking legibility.- Marking shall be legible before and after all tests.

Table I. Group A inspection.

Test Method per MIL-STD-750	Examination or test 1/	Conditions 2/	LTPD	Symbol	Limits Min	Limits Max	Unit
	Subgroup 1		10				
2071	Visual and mechanical examination	---		---	---	---	---
	Subgroup 2		5				
3020	Floating potential:	I_E = 0 Voltmeter input resistance = 10 Meg, min					
	2N1183, 2N1184	V_{CB} = -45 Vdc		V_{EBF}	---	-1.2	Vdc
	2N1183A, 2N1184A	V_{CB} = -60 Vdc		V_{EBF}	---	-1.2	Vdc
	2N1183B, 2N1184B	V_{CB} = -80 Vdc		V_{EBF}	---	-1.2	Vdc
3036	Collector-to-base cutoff current:	Bias Cond. D I_E = 0					
	2N1183, 2N1184	V_{CB} = -45 Vdc		I_{CBO}	---	-0.25	mAdc
	2N1183A, 2N1184A	V_{CB} = -60 Vdc		I_{CBO}	---	-0.25	mAdc
	2N1183B, 2N1184B	V_{CB} = -80 Vdc		I_{CBO}	---	-0.25	mAdc
3076	Static forward-current transfer ratio:	V_{CE} = -2 Vdc I_C = -400 mAdc					
	2N1183, A, B			h_{FE}	20	60	---
	2N1184, A, B			h_{FE}	40	120	---
3066	Base-to-emitter voltage	Test Cond. B V_{CE} = -2 Vdc I_C = -400 mAdc		V_{BE}	---	1.5	Vdc
	Subgroup 3		5				
3071	Collector-to-emitter saturation voltage	I_C = -400 mAdc I_B = -40 mAdc		$V_{CE}(sat)$	---	-0.3	Vdc

Table I. Group A inspection-(Cont'd).

Test Method per MIL-STD-750	Examination or test 1/	Conditions 2/	LTPD	Symbol	Limits Min	Limits Max	Unit
	Subgroup 3-(cont'd)						
3011	Collector-to-emitter breakdown voltage:	Bias Cond. D I_C = -50 mAdc I_B = 0					
	2N1183, 2N1184			BV_{CEO}	-20	---	Vdc
	2N1183A, 2N1184A			BV_{CEO}	-30	---	Vdc
	2N1183B, 2N1184B			BV_{CEO}	-40	---	Vdc
3011	Collector-to-emitter breakdown voltage:	Bias Cond. C I_C = -50 mAdc I_E = 0					
	2N1183, 2N1184			BV_{CES}	-35	---	Vdc
	2N1183A, 2N1184A			BV_{CES}	-50	---	Vdc
	2N1183B, 2N1184B			BV_{CES}	-60	---	Vdc
	Subgroup 4		10				
3036	Collector-to-base cutoff current	Bias Cond. D V_{CB} = -1.5 Vdc I_E = 0		I_{CBO}	---	-0.03	mAdc
3061	Emitter-to-base cutoff current	Bias Cond. D V_{EB} = -20 Vdc I_C = 0		I_{EBO}	---	0.10	mAdc
3301	Small-signal short-circuit forward-current transfer ratio cutoff frequency	V_{CB} = -6 Vdc I_E = 1 mAdc		f_{hfb}	0.5	---	Mc/s

1/ See 3.4 herein.

2/ See 4.3.1 herein.

Table II. Group B inspection.

Test Method per MIL-STD-750	Examination or test 1/	Conditions 2/	LTPD	Symbol	Limits Min	Limits Max	Unit
	Subgroup 1		20				
2066	Physical dimensions	---		---	---	---	---
	Subgroup 2		10				
2031	Soldering heat	---		---	---	---	---
1051	Temperature cycling	Test Cond.B except $T_{(high)}$=+100°C min		---	---	---	---
1056	Thermal shock (glass strain)	Test Cond. A		---	---	---	---
1021	Moisture resistance	No initial conditioning		---	---	---	---
	End-point tests:						
3036	Collector-to-base cutoff current:	Bias Cond. D I_E = 0					
	2N1183,2N1184	V_{CB} = -45 Vdc		I_{CBO}	---	-0.375	mAdc
	2N1183A,2N1184A	V_{CB} = -60 Vdc		I_{CBO}	---	-0.375	mAdc
	2N1183B,2N1184B	V_{CB} = -80 Vdc		I_{CBO}	---	-0.375	mAdc
3076	Static forward-current transfer ratio:	V_{CE} = -2 Vdc I_C = -400 mAdc					
	2N1183, A, B			h_{FE}	13	---	---
	2N1184, A, B			h_{FE}	26	---	---
	Subgroup 3		10				
2016	Shock	3/ Non-operating G = 500 5 blows of 1.0 msec ea. in orientations X1, Y1, Z1 (total = 15 blows)		---	---	---	---

Table II. Group B inspection-(Cont'd).

Test Method per MIL-STD-750	Examination or test 1/	Conditions 2/	LTPD	Symbol	Limits Min	Limits Max	Unit
	Subgroup 3-(cont'd)						
2046	Vibration fatigue	Non-operating G = 20	---	---	---	---	---
2056	Vibration, variable frequency	---	---	---	---	---	---
2006	Constant acceleration (centrifuge)	G = 10,000 Orientations X1, Y1, Z1	---	---	---	---	---
	End-point tests: Same as listed under Subgroup 2 above						
	Subgroup 4		15				
2036	Lead fatigue	Test Cond.E	---	---	---	---	---
	End-point tests: Same as listed under Subgroup 2 above						
	Subgroup 5		15				
1046	Salt spray (corrosion)	---	---	---	---	---	---
	End-point tests: Same as listed under Subgroup 2 above						
	Subgroup 6		λ=10				
1031	High-temperature life (non-operating)	T_{stg} = + 100°C min	---	---	---	---	---
	End-point tests: Same as listed under Subgroup 2 above						

Table II. Group B inspection-(Cont'd).

Test Method per MIL-STD-750	Examination or test 1/	Conditions 2/	LTPD Symbol	Limits Min	Limits Max	Unit
	Subgroup 7		λ=10			
1026	Steady state operation life	T_C = +75°C, min P_C = 2.5W, max V_{CB} = -12 Vdc I_C = -0.12 Adc	---	---	---	---
	End-point tests: Same as listed under Subgroup 2 above					

1/ See 3 4 herein.

2/ See 4.3.1 herein.

3/ See 4.3.3 herein.

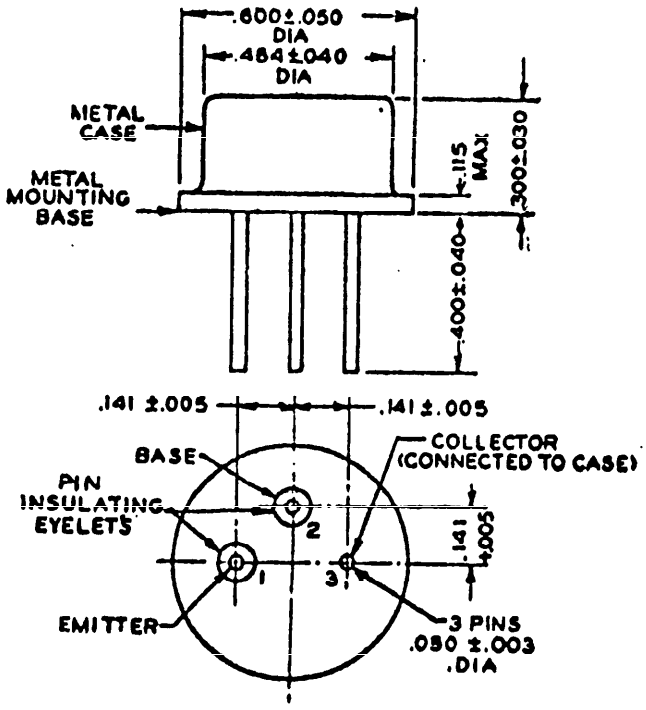
Table III. Group C inspection. 1/

Test Method per MIL-STD-750	Examination or test 2/	Conditions 3/	LTPD	Symbol	Limits Min	Limits Max	Unit
	Subgroup 1		10				
1001	Barometric pressure, reduced (altitude operation):	Pressure = 15.0 mmHg Normal mounting t = 1 minute, minimum		---	---	---	---
	Measurement during test:						
3036	Collector-to-base cutoff current:	Bias Cond. D $I_E = 0$					
	2N1183, 2N1184	V_{CB} = -45 Vdc		I_{CBO}	---	-0.375	mAdc
	2N1183A, 2N1184A	V_{CB} = -60 Vdc		I_{CBO}	---	-0.375	mAdc
	2N1183B, 2N1184B	V_{CB} = -80 Vdc		I_{CBO}	---	-0.375	mAdc
3151	Thermal resistance (junction-to-case)	T_J = +95°C		θ_{J-C}	---	10	°C/W

1/ Periodicity: See 4.2.2 herein.

2/ See 3.4 herein.

3/ See 4.3.1 herein.



NOTES:

1. All dimensions in inches.

Figure 1. Outline and dimensions.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery.- Preparation for delivery shall be in accordance with Specification MIL-S-19500.

6. NOTES

6.1 Notes.- The notes included in Specification MIL-S-19500, with the following exceptions, are applicable to this specification.

6.2 Application guidance.- To insure proper circuit application, particular attention should be given to the differential voltage-and-current requirements, ratings, and performance characteristics pertinent to the individual transistor types covered herein.

6.3 Ordering data.- See 3.3.2 herein.

6.4 Qualification.- With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List (QPL)-19500, whether or not such products have actually been so listed by that date. Information pertaining to qualification of products covered by this specification should be requested from the Commanding General, U. S. Army Electronics Command, Fort Monmouth, New Jersey 07703, Attention: AMSEL-PP-EM-2.

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