MILITARY SPECIFICATION

TRANSISTOR, PNP, GERMANIUM
TYPES 2N502A AND 2N502B

1. SCOPE

1.1 Scope.-- This specification covers the detail requirements for germanium, PNP, transistors for particular use as 200-MHz amplifier devices having a minimum power gain of 10 db, in compatible equipment circuits. (See 3.4 and 6.2 herein.)

1.2 Outline and dimensions.-- See Figures 1A and 1B, and 3.3 herein.

1.3 Maximum ratings.--

<table>
<thead>
<tr>
<th>$P_T$</th>
<th>$V_{CBO}$</th>
<th>$V_{CES}$</th>
<th>$V_{EBO}$</th>
<th>$T_{stg}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>mW</td>
<td>Vdc</td>
<td>Vdc</td>
<td>Vdc</td>
<td>°C</td>
</tr>
<tr>
<td>0.75</td>
<td>-30</td>
<td>-30</td>
<td>-0.5</td>
<td>-65 to +100</td>
</tr>
</tbody>
</table>

$P_T$ -- This power dissipation is for 1,000 hours expected life at $T_A = +25°C$. For power dissipation at $T_A > +25°C$, derate at 1.0 mW/°C.

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

<table>
<thead>
<tr>
<th>$h_{fe}$</th>
<th>$P.G.$</th>
<th>$NF$</th>
<th>$F_b$</th>
<th>$C_{obo}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>at: $f = 1$ KHz</td>
<td>at: $f = 200$ MHz</td>
<td>at: $f = 200$ MHz</td>
<td>at: $f = 6$ MHz</td>
<td>at: $f = 1$ MHz</td>
</tr>
<tr>
<td>$V_{CEO} = 10$ Vdc</td>
<td>$V_{CEO} = 10$ Vdc</td>
<td>$V_{CEO} = 10$ Vdc</td>
<td>$V_{CEO} = 10$ Vdc</td>
<td>$V_{CEO} = 10$ Vdc</td>
</tr>
<tr>
<td>$I_E = 2$ mAdc</td>
<td>$I_E = 2$ mAdc</td>
<td>$I_E = 2$ mAdc</td>
<td>$I_E = 2$ mAdc</td>
<td>$I_E = 0$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2N502A</th>
<th>2N502B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>25</td>
<td>80</td>
</tr>
<tr>
<td>1.6</td>
<td>1.6</td>
</tr>
</tbody>
</table>

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FER-5981
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-202

Test Methods For Electronic and Electrical Component Parts

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 agency or as directed by the contracting officer. Both the title and number or symbol should be stipulated when requesting copies.)

3. REQUIREMENTS

3.1 Requirements. - 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, and as follows:

\[ f_b \times C_c \] extrinsic base-resistance collector-capacitance product

3.3 Design and construction. - The transistor shall be of the design, construction, and physical dimensions specified in either Fig.1A or Fig.1B herein. (See 3.3.2 herein.)

3.3.1 Terminal arrangement. - The terminal arrangement on the transistor shall be as indicated in Figures 1A or 1B.

3.3.2 Terminal-lead length. - Terminal-lead length(s) other than that specified in Figures 1A or 1B may be furnished under contract or order (see 6.3 herein) where the devices covered herein are required directly for particular equipment-circuit installation. 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 JAE marking.
1.3.3 Operating position - The transistor 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 each transistor type (see 1.3, 1.4 and Tables I, II, and III herein), the performance requirements, including characteristics, ratings, and test conditions, apply equally to both 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. The "manufacturer's identification" and "country of origin" may, at option of the manufacturer, be omitted from being marked directly on the semiconductor device covered 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.

4.2 Qualification and acceptance 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 Table 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 Tables I, II, and III herein shall apply for all of the tests, combined, in the subgroup.

4.2.2 Group B-Group C life test samples - Samples that have been subjected to Group B, 540-hour life test may be continued on test for 1000 hours in order to satisfy Group C life test requirements. These samples shall be predesignated, and shall remain subject to the Group C, 1000-hour acceptance evaluation after they have passed the Group B, 540-hour acceptance criteria; hereto, the cumulative total of failures found during 540-hour test and during the subsequent interval up to 1000 hours on these samples shall be computed for 1000-hour acceptance criteria.

4.2.3 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 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 consecutive lots, to be performed for required Group C tests.
4.2.4 Disposition of sample units. - Sample units that have been subjected to Group B, Subgroup 2, 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, 3, 6, 7 and 8 and Group C tests (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, these 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 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

4.3.2 Mechanical damage resulting from test. Except for intentionally deforming, mutilating, 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, or C tests.
<table>
<thead>
<tr>
<th>Test Method per MIL-STD-750</th>
<th>Examination or test Conditions</th>
<th>LTPD Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2071 Subgroup 1</td>
<td>Visual and mechanical examination</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3036 Subgroup 2</td>
<td>Collector-base cutoff current</td>
<td>$I_{CB0}$</td>
<td>$-$4</td>
<td>µA dc</td>
</tr>
<tr>
<td></td>
<td>Collector-base cutoff current</td>
<td>$I_{CB0}$</td>
<td>$-$10</td>
<td>µA dc</td>
</tr>
<tr>
<td></td>
<td>Collector-emitter cutoff current</td>
<td>$I_{CES}$</td>
<td>$-$10</td>
<td>µA dc</td>
</tr>
<tr>
<td></td>
<td>Emitter-base cutoff current</td>
<td>$I_{EBO}$</td>
<td>$-$100</td>
<td>µA dc</td>
</tr>
<tr>
<td></td>
<td>Collector-emitter breakdown voltage</td>
<td>$BV_{CEO}$</td>
<td>15</td>
<td>V dc</td>
</tr>
<tr>
<td>3206 Subgroup 3</td>
<td>Small-signal short-circuit forward-current transfer ratio:</td>
<td>---</td>
<td>15</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>$V_{CE}$ = -10 Vdc</td>
<td>$h_{fe}$</td>
<td>25</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>$I_{E}$ = 2 mA dc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$f$ = 1 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2N502A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2N502B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3306 Magnitude of common emitter small-signal short-circuit transfer ratio</td>
<td>$V_{CE}$ = -10 Vdc</td>
<td>$</td>
<td>h_{fe}</td>
<td>$</td>
</tr>
<tr>
<td></td>
<td>$I_{E}$ = 2 mA dc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$f$ = 100 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5
Table I. Group A inspection – (Cont'd).

<table>
<thead>
<tr>
<th>Test Method per MIL-STD-750</th>
<th>Examination or test Conditions</th>
<th>LTPD</th>
<th>Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
</tbody>
</table>

**Subgroup 3-(Cont'd)**

3236  
Output capacitance  

\[ V_{CB} = -10 \text{ Vdc} \]  
\[ I_E = 0 \]  
\[ f = 1 \text{ MHz} \]  

Cobo  
---  
1.6  
pr

3246  
Noise figure  

\[ V_{CB} = -10 \text{ Vdc} \]  
\[ I_E = 2 \text{ mAdc} \]  
\[ f = 200 \text{ MHz} \]  

NF  
---  
7  
db

---  
Extrinsic  
base-resistance  
collector-capacitance product  

\[ V_{CB} = -10 \text{ Vdc} \]  
\[ I_E = 2 \text{ mAdc} \]  
\[ f = 46 \text{ MHz} \]  

Test circuit per Fig. 2 herein  

\[ r_b' c_c \]  
5  
25  
psec

3256  
Small-signal power gain  

\[ V_{CB} = -10 \text{ Vdc} \]  
\[ I_E = 2 \text{ mAdc} \]  
\[ f = 200 \text{ MHz} \]  

Test circuit per Fig. 3 herein  

P.G.  
10  
20  
db

---

1/  
See 3.4 herein.
### Table II. Group B inspection.

<table>
<thead>
<tr>
<th>Test Method per MIL-STD-750</th>
<th>Examination or test</th>
<th>Conditions</th>
<th>LTPD</th>
<th>Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subgroup 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2066</td>
<td>Physical dimensions</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subgroup 2</strong></td>
<td></td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>Solderability</td>
<td>Omit aging</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1051</td>
<td>Temperature cycling</td>
<td>Test Cond. B except T(high) = +100°C</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1056</td>
<td>Thermal shock</td>
<td>Test Cond. A</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>(glass strain)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/</td>
<td>Seal (leak rate)</td>
<td>Test Cond. C, procedure III; Test Cond. A or B for gross leaks</td>
<td>---</td>
<td>---</td>
<td>10⁻⁷ atm cc/sec</td>
<td></td>
</tr>
<tr>
<td>1021</td>
<td>Moisture resistance</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>End-Point tests:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3036</td>
<td>Collector-base cut-off current</td>
<td>Bias Cond. D V&lt;sub&gt;CB&lt;/sub&gt; = -10 Vdc</td>
<td>I&lt;sub&gt;CB0&lt;/sub&gt;</td>
<td>---</td>
<td>4 uA dc</td>
<td></td>
</tr>
<tr>
<td>3206</td>
<td>Small-signal short-circuit forward-current transfer ratio:</td>
<td>V&lt;sub&gt;CE&lt;/sub&gt; = -10 Vdc I&lt;sub&gt;E&lt;/sub&gt; = 2 mA dc f = 1 kHz</td>
<td>b&lt;sub&gt;fe&lt;/sub&gt;</td>
<td>15 200</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Subgroup 3</strong></td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>Shock</td>
<td>3/ Non-operating 500G 5 blows of 1.0 msec ea. in orientations X1, Y1, Y2, Z1 (total = 20 blows)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Test Method per MIL-STD-750</td>
<td>Examination or test</td>
<td>Conditions</td>
<td>LTPD Symbol</td>
<td>Limits</td>
<td>Unit</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------</td>
<td>-------------</td>
<td>-------------</td>
<td>--------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>2046</td>
<td><strong>Subgroup 3-(Cont'd)</strong></td>
<td>Vibration fatigue</td>
<td>Non-oper.; 10G</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2056</td>
<td>Vibration, variable frequency</td>
<td>1G</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2006</td>
<td>Constant acceleration</td>
<td>10,000G; Orientations X1, Y1, Y2, Z1</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**End-Point tests:**
Same as for subgroup 2, above

<table>
<thead>
<tr>
<th>Test Method per MIL-STD-750</th>
<th>Examination or test</th>
<th>Conditions</th>
<th>LTPD Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2036</td>
<td><strong>Subgroup 4</strong></td>
<td>Terminal strength (lead fatigue)</td>
<td>Test Cond. E</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**Subgroup 5**

<table>
<thead>
<tr>
<th>Test Method per MIL-STD-750</th>
<th>Examination or test</th>
<th>Conditions</th>
<th>LTPD Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1041</td>
<td>Salt atmosphere (corrosion)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**End-Point tests:**
Same as for Subgroup 2, above

**Subgroup 6**

<table>
<thead>
<tr>
<th>Test Method per MIL-STD-750</th>
<th>Examination or test</th>
<th>Conditions</th>
<th>LTPD Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2036</td>
<td><strong>High-temperature operation:</strong></td>
<td>$T_A = +55^\circ C$</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3036</td>
<td>Collector-base cutoff current</td>
<td>Bias Cond. D; $V_{CB} = -10$ Vdc</td>
<td>$I_{CB}$</td>
<td>---</td>
<td>$-40$ uAdc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Method per MIL-STD-750</th>
<th>Examination or test</th>
<th>Conditions</th>
<th>LTPD Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2036</td>
<td><strong>Low-temperature operation:</strong></td>
<td>$T_A = -55^\circ C$</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3206</td>
<td>Small-signal short-circuit forward-current transfer ratio:</td>
<td>$V_C = -10$ Vdc; $I_E = 2$ mA; $f = 1$ kHz</td>
<td>$h_{fe}$</td>
<td>7</td>
<td>200</td>
</tr>
<tr>
<td>2N502A</td>
<td>$h_{fe}$</td>
<td>12</td>
<td>.80</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2N502B</td>
<td>$h_{fe}$</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
Table II. Group B inspection - (Cont'd).

<table>
<thead>
<tr>
<th>Test Method per</th>
<th>Examination or test</th>
<th>Conditions</th>
<th>LTPD</th>
<th>Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL-STD-750</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td>Subgroup 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1031</td>
<td>High-temperature life</td>
<td>$T_{stg} = +100^\circ C$</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td></td>
<td>(non-operating)</td>
<td>$t = 340$ hours</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>End-Point tests:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3036</td>
<td>Collector-base cut-off current</td>
<td>Bias Cond. D</td>
<td>I_{CBO}</td>
<td>-20 μAdc</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CB} = -30$ Vdc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3206</td>
<td>Small-signal short-circuit forward-current transfer ratio:</td>
<td>$V_{CE} = -10$ Vdc</td>
<td>$I_E = 2$ mAdc</td>
<td>$f = 1$ kHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2N502A</td>
<td>$h_r: 10$ 250 ___</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2N502B</td>
<td>$h_{fe} 20$ 95 ___</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subgroup 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1026</td>
<td>Steady state opera-tion life:</td>
<td>$T_A = +25^\circ C$</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CB} = -10$ Vdc</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 7.5$ mAdc</td>
<td>___</td>
<td>___</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>$t = 340$ hours</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td></td>
<td>End-point tests:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Same as for</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subgroup 7, above</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1/ See 3.4 and 4.3.1 herein.
3/ Per 4.3.4 herein.
4/ For this Subgroup, the sample units subjected to the High-Temperature Operation test shall be permitted to return to and be stabilized at room ambient temperature prior to their being subjected to the Low-Temperature Operation test.
5/ Measurement(s) shall be made after thermal equilibrium has been reached at the temperature specified.
6/ See 4.2.2 herein.
<table>
<thead>
<tr>
<th>Test Method per MIL-STD-750</th>
<th>Examination or test Conditions</th>
<th>LTPD Symbol</th>
<th>Limits</th>
<th>Unit</th>
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<tbody>
<tr>
<td>Subgroup 1</td>
<td></td>
<td>λ=10</td>
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<td></td>
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<tr>
<td>1031</td>
<td>High-temperature life</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(non-operating)</td>
<td>$T_{A} = +100\degree$C</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$t = 1000$ hrs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>End-Point tests:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-base cut-off current:</td>
<td>Bias Cond. D</td>
<td>$I_{CBO}$</td>
<td>---</td>
<td>-20</td>
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<tr>
<td></td>
<td>$V_{CB} = -30$ Vdc</td>
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<td></td>
<td>uAdc</td>
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<tr>
<td>3206</td>
<td>Small-signal short-circuit</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>forward-current transfer ratio:</td>
<td>$V_{CE} = -10$ Vdc</td>
<td>$I_{C} = 2$ mA</td>
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<tr>
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<td>$f = 1$ kHz</td>
<td>$h_{fe}$</td>
<td>10</td>
<td>250</td>
</tr>
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<td></td>
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<td>$h_{fe}$</td>
<td>20</td>
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<tr>
<td>1026</td>
<td>Steady state operation life:</td>
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</tr>
<tr>
<td></td>
<td>$T_{A} = +25\degree$C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CE} = -10$ Vdc</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>$I_{C} = 7.5$ mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$t = 1000$ hrs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>End-Point tests:</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Same as for</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subgroup 1, above</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1/ Periodicity: See 4.2.3 herein.

2/ See 3.4 and 4.3.1 herein.

3/ See 4.2.2 herein.
Figure 1A. Outline and dimensions.
MIL-S-19500/112Q(EL)

**SEATING PLANE**

**BASE**

**COLLECTOR** (NOTE 7)

**EMITTER**

![Diagram of a transistor with dimensions](image)

**DIMENSIONS**

<table>
<thead>
<tr>
<th>LTR</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.335</td>
<td>8.51</td>
</tr>
<tr>
<td>B</td>
<td>0.305</td>
<td>7.75</td>
</tr>
<tr>
<td>C</td>
<td>0.240</td>
<td>6.10</td>
</tr>
<tr>
<td>D</td>
<td>1.500</td>
<td>3.81</td>
</tr>
<tr>
<td>E</td>
<td>0.016</td>
<td>0.41</td>
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<tr>
<td>F</td>
<td>0.016</td>
<td>0.41</td>
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<tr>
<td>G</td>
<td>0.100</td>
<td>2.54</td>
</tr>
<tr>
<td>H</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>J</td>
<td>0.029</td>
<td>0.74</td>
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<tr>
<td>K</td>
<td>0.028</td>
<td>0.71</td>
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<tr>
<td>L</td>
<td>0.009</td>
<td>0.23</td>
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<tr>
<td>M</td>
<td>0.1414</td>
<td>3.59 Nom</td>
</tr>
<tr>
<td>N</td>
<td>0.0707</td>
<td>1.80 Nom</td>
</tr>
</tbody>
</table>

**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 of 0.050 (1.27 mm) and .250 (6.35 mm) from the seating plane.
4. Variations on Dim B in this zone shall not exceed .010 (0.25 mm).
5. Outline in this zone is not controlled.
6. When measured in a gaging plane of the transistor max dia leads shall be within .007 (.18 mm) of their true location relative to a maximum width 10%.
7. All leads electrically isolated from case.
8. Measured from the maximum diameter of the actual device.
9. All 3 leads.

*Figure 18. Outline and dimensions.*
PROCEDURAL NOTES:

1. Connect 46-mHz source to Input jack.
2. Connect RFVM to "Sample" jack **.
3. Adjust 46-mHz level so that 0.35 V is read on RFVM.
4. Connect RFVM to Output jack; peak the emitter tuning-capacitor on fixture.
5. Return RFVM to "Sample" jack.
6. Insert T.U.T. into socket, apply bias, and set 46-mHz level for a 0.346-volt reading on RFVM.
7. Connect RFVM to "Output" jack. $r_{cC}$ is read with 1 mV = 10 psec, 3 mV = 30 psec, etc. (the 0.346 V in should be checked regularly during successive test measurements).

** RFVM = Boonton Type 91CA or equiv.;
(high impedance); unterminated probe,
Boonton type 91-6C adapter or equiv,
to be used.

** Adapter ENC UC-491A/U, or equiv.,
to be used for connections to Input, "Sample", and Output jacks.

Figure 2. $r_{bC}$ Test circuit.
Notes:

11: 5-1/2 turns #16 silver-plated copper wire tapped at 2-1/4 turns.
    Coil = 3/8 I.D., and approximately 3/4 long.

12: 6-1/2 turns #16 silver-plated copper wire tapped at 2-1/2 and 3-1/2 turns.
    Coil = 3/8 I.D., and approximately 7/8 long.

Figure 3. 200-mc Power Amplifier test circuit.
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 additions or exceptions, are applicable to this specification.

6.2 Application guidance. The transistors conforming to requirements of this document issue are recommended as ready replacements (having superior-controlled characteristics) for the transistors covered by previous issue(s) of this document.

6.3 Ordering data. -

a. Terminal-lead length. (If other than as shown in Fig. 1A or 1B herein): 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.

6.5 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.

Custodian: Army-EL

Preparing activity: Army-EL

Project No. 5961-A099