The documentation and process conversion measures necessary to comply with this document shall be completed by 25 December 2016.

INCH-POUND
MIL-PRF-19500/323P
25 September 2016
SUPERSEDING
MIL-PRF-19500/323N
24 May 2013

# PERFORMANCE SPECIFICATION SHEET

## * TRANSISTOR, PNP, SILICON, SWITCHING, TYPES 2N3250A, 2N3251A, JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

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

The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-PRF-19500.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for PNP silicon switching transistors. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500. Two levels of product assurance are provided for die. RHA level designators “M”, “D”, “P”, “L”, “R”, “F”, “G”, and “H” are appended to the device prefix to identify devices which have passed RHA requirements.

* 1.2 Physical dimensions. See (similar to TO-18) in accordance with figure 1, (UB, surface mount) in accordance with figure 2. The dimensions and topography for JANHC and JANKC unencapsulated die is as follows: The A version die in accordance with figure 3.

* 1.3 Maximum ratings, unless otherwise specified, $T_C$ = + 25°C.

| Type | $P_T$ (1) $T_{PCB}$ = +25°C | $P_T$ (1) $T_C$ = +25°C | $P_T$ (1) $T_{SP}$ = +25°C | $R_{\theta J(PCB)}$ (2) | $R_{\theta JC}$ (2) | $R_{\theta JSP}$ (2) | $V_{CBO}$ | $V_{CEO}$ | $V_{EBO}$ | $I_C$ | $T_J$ and $T_{STG}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | mW | mW | mW | °C/W | °C/W | °C/W | V dc | V dc | V dc | mA dc | °C |
| 2N3250A | 360 | 360 | N/A | 325 | 150 | N/A | -60 | -60 | -5.0 | -200 | -65 to +200 |
| 2N3251A | 360 | 360 | N/A | 325 | 150 | N/A | -60 | -60 | -5.0 | -200 | |
| 2N3250AUB | 360 | N/A | 360 | 325 | N/A | 95 | -60 | -60 | -5.0 | -200 | |
| 2N3251AUB | 360 | N/A | 360 | 325 | N/A | 95 | -60 | -60 | -5.0 | -200 | |

(1) For derating, see figure 4, figure 5, and figure 6.
(2) For thermal impedance curves, see figure 7, figure 8, and figure 9.

Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, Columbus, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

* 1.4 Primary electrical characteristics.

| Limits | $h_{FE1}$ $V_{CE}$ = -1.0 V dc $I_C$ = -0.1 mA dc | | $h_{FE3}$ (1) $V_{CE}$ = -1.0 V dc $I_C$ = -10 mA dc | | $h_{FE4}$ (1) $V_{CE}$ = -1.0 V dc $I_C$ = -50 mA dc | | $\|h_{fe}\|$ f = 100 MHz $V_{CE}$ = -20 V dc; $I_C$ = -10 mA dc | |
|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Max | Min | Max | Min | Max |
| 2N3250A, AUB | 40 | | 50 | 150 | 15 | | 2.5 | 9.0 |
| 2N3251A, AUB | 80 | | 100 | 300 | 30 | | 3.0 | 9.0 |

| Limits | $r_b'C_C$ $V_{CE}$ = -20 V dc $I_C$ = -10 mA dc f = 31.8 MHz | $V_{CE(SAT)1}$ $I_C$ = -10 mA dc $I_B$ = -1.0 mA dc | $C_{obo}$ $V_{CB}$ = -10 V dc $I_E$ = 0 100 kHz ≤ f ≤ 1 MHz | $t_{on}$ $I_C$ = -10 mA dc $I_B$ = -1.0 mA dc | $t_{off}$ $I_C$ = -10 mA dc $I_B$ = -1.0 mA dc | | $N_F$ $V_{CE}$ = -5 V dc $I_C$ = -.1 mA dc Rg = 1kΩ f = 100 Hz |
|---|---|---|---|---|---|---|---|
| | | | | | 2N3250A, 2N3250AUB | 2N3251A, 2N3251AUB | |
| | ps | V dc | pF | ns | ns | ns | dB |
| Min | 5 | | | | | | |
| Max | 250 | 0.25 | 6 | 70 | 250 | 300 | 6 |

(1) Pulsed (see 4.5.1).

* 1.5 Part or Identifying Number (PIN). The PIN is in accordance with MIL-PRF-19500, and as specified herein. See 6.5 for PIN construction example and 6.6 for a list of available PINs.

* 1.5.1 JAN certification mark and quality level.

* 1.5.1.1 Quality level designators for encapsulated devices. The quality level designators for encapsulated devices that are applicable for this specification sheet from the lowest to the highest level are as follows: "JAN", "JANTX", "JANTXV", and "JANS".

* 1.5.1.2 Quality level designators for unencapsulated devices (die). The quality level designators for unencapsulated devices (die) that are applicable for this specification sheet from the lowest to the highest level are as follows: "JANHC" and "JANKC".

* 1.5.2 Radiation hardness assurance (RHA) designator. The RHA levels that are applicable for this specification sheet from lowest to highest are as follows: "M", "D", "P", "L", "R", "F", "G", and "H".

* 1.5.3 Device type. The designation system for the device types of transistors covered by this specification sheet are as follows.

* 1.5.3.1 First number and first letter symbols. The transistors of this specification sheet use the first number and letter symbols "2N".

* 1.5.3.2 Second number symbols. The second number symbols for the transistors covered by this specification sheet are as follow: "3250".

* 1.5.4 Suffix symbols. The following suffix symbol are incorporated in the PIN as applicable.

* 1.5.4.1 First suffix symbol. The first suffix letter "A" indicates that the semiconductor is a modified version of the device type.

* 1.5.4.2 Following suffix symbols. The following suffix symbols are incorporated in the PIN for this specification sheet:

| | |
|---|---|
| | A blank second suffix symbol indicates a through-hole mount package similar to a TO-18 metal can (see figure 1) TO-18 |
| UB | Indicates a 4 pad surface mount package. The metal lid is connected to pad 4 (see figure 2) |

* 1.5.5 Lead finish. The lead finishes applicable to this specification sheet are listed on QML-19500.

* 1.5.6 Die identifiers for unencapsulated devices (manufacturers and critical interface identifiers). The manufacturer die identifiers that are applicable for this specification sheet is "A".

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 of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 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 cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

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

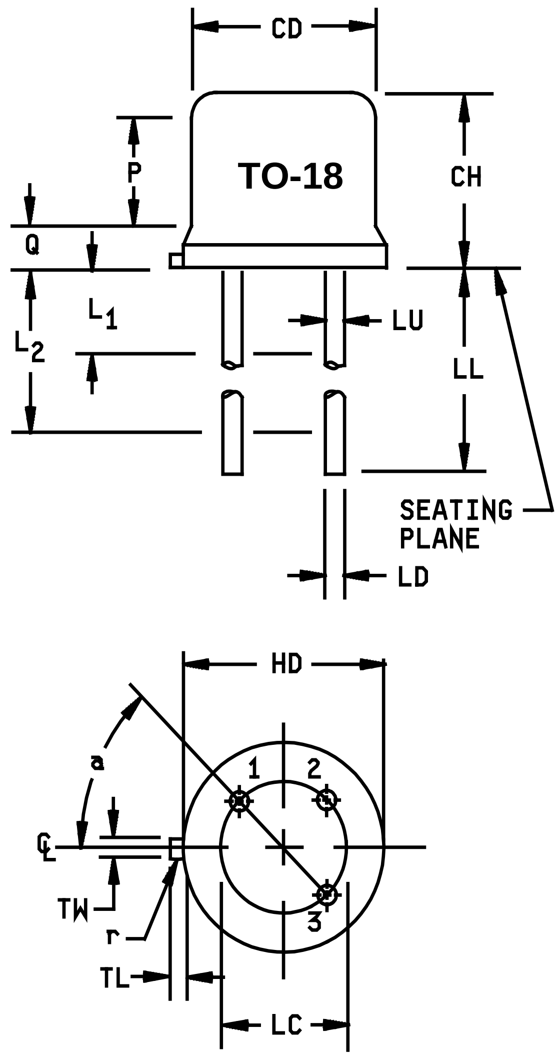
DEPARTMENT OF DEFENSE STANDARDS

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

* (Copies of these documents are available online at http://quicksearch.dla.mil.

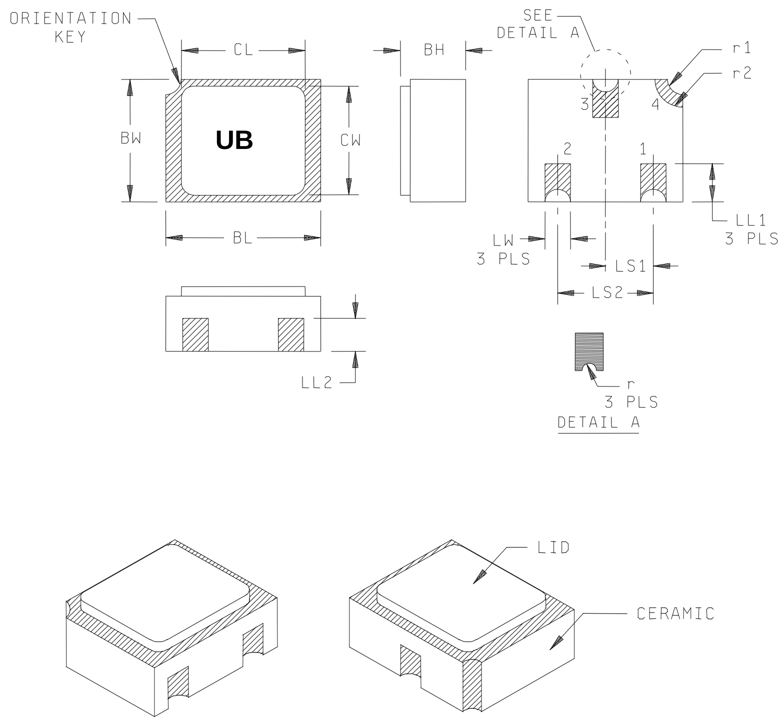
2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

| Symbol | Dimensions | | | | Note |
|---|---|---|---|---|---|
| | Inches | | Millimeters | | |
| | Min | Max | Min | Max | |
| CD | .178 | .195 | 4.52 | 4.95 | |
| CH | .170 | .210 | 4.32 | 5.33 | |
| HD | .209 | .230 | 5.31 | 5.84 | |
| LC | .100 TP | | 2.54 TP | | 6 |
| LD | .016 | .021 | 0.41 | 0.53 | 7,8 |
| LL | .500 | .750 | 12.70 | 19.05 | 7,8 |
| LU | .016 | .019 | 0.41 | 0.48 | 7,8 |
| $L_1$ | | .050 | | 1.27 | 7,8 |
| $L_2$ | .250 | | 6.35 | | 7,8 |
| P | .100 | | 2.54 | | |
| Q | | .040 | | 1.02 | 5 |
| TL | .028 | .048 | 0.71 | 1.22 | 3,4 |
| TW | .036 | .046 | 0.91 | 1.17 | 3 |
| r | | .010 | | 0.25 | 10 |
| $\alpha$ | 45° TP | | 45° TP | | 6 |
| 1, 2, 9, 11, 12 | | | | | |




NOTES:
1. Dimension are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TH shall be held for a minimum length of .011 inch (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 -.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 ASME Y14.5M, diameters are equivalent to $\phi$x symbology.
12. Lead 1 = emitter, lead 2 = base, lead 3 = collector.

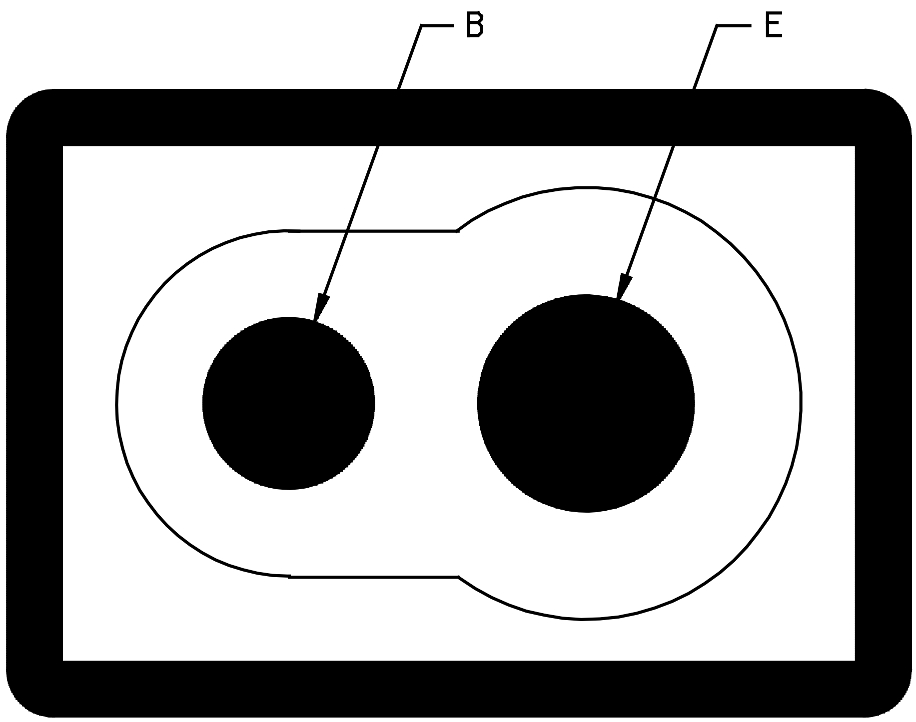
FIGURE 1. Physical dimensions (similar to TO-18).




| Symbol | Dimensions | | | | Note | Symbol | Dimensions | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inches | | Millimeters | | | | Inches | | Millimeters | | |
| | Min | Max | Min | Max | | | Min | Max | Min | Max | |
| BH | .046 | .056 | 1.17 | 1.42 | | LS1 | .035 | .039 | 0.89 | 0.99 | |
| BL | .115 | .128 | 2.92 | 3.25 | | LS2 | .071 | .079 | 1.80 | 2.01 | |
| BW | .085 | .108 | 2.16 | 2.74 | | LW | .016 | .024 | 0.41 | 0.61 | |
| CL | | .128 | | 3.25 | | r | | .008 | | 0.20 | |
| CW | | .108 | | 2.74 | | r1 | | .012 | | 0.31 | |
| LL1 | .022 | .038 | 0.56 | 0.96 | | r2 | | .022 | | 0.56 | |
| LL2 | .017 | .035 | 0.43 | 0.89 | | | | | | | |

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Hatched areas on package denote metallized areas
4. Pad 1 = Base, Pad 2 = Emitter, Pad 3 = Collector, Pad 4 = Shielding connected to the lid.
5. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 2. Physical dimensions, surface mount (UB version).




NOTES:
1. Chip size.................................................. 15 x 19 mils ±1 mil.
2. Chip thickness........................................ 10 ±1.5 mil.
3. Top metal ................................................ Aluminum 15,000Å minimum, 18,000Å nominal.
4. Back metal............................................... A. Gold 2,500Å minimum, 3,000Å nominal.
   B. Eutectic Mount – No Gold.
5. Backside.................................................. Collector.
6. Bonding pad ........................................... B = 3 mils, E = 4 mils diameter.
7. Passivation............................................. $Si_3N_4$ (Silicon Nitride) 2 kÅ min, 2.2 kÅ nom.

FIGURE 3. Physical dimensions, JANHCA and JANKCA die.

3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturers list before contract award (see 4.2 and 6.3).

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

$I_{BEX}$ - - - Base cutoff current (dc) with specified circuit between the collector and emitter.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1 (TO-18), figure 2 (UB surface mount), and figure 3 (die) herein. No lead (Pb) shall be used in the construction of the die bonds.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.5 Radiation hardness assurance (RHA). Radiation hardness assurance requirements, PIN designators, and test levels shall be as defined in MIL-PRF-19500.

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

3.7 Electrical test requirements. The electrical test requirements shall be as specified in table I, 4.4.2, and 4.4.3 herein.

3.8 Marking. Devices shall be marked in accordance with MIL-PRF-19500, except for the UB suffix package. Marking on the UB package shall consist of an abbreviated part number, the date code, and the manufacturer's symbol or logo. The prefixes JAN, JANTX, JANTXV, and JANS can be abbreviated as J, JX, JV, and JS respectively. The "2N" prefix and the "UB" suffix can also be omitted. The radiation hardened designator M, D, P, L, R, F, G, or H shall immediately precede (or replace) the device “2N” identifier (depending upon degree of abbreviation required).

3.9 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

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

a. Qualification inspection (see 4.2).

b. Screening (see 4.3).

c. Conformance inspection (see 4.4, and table I, table II, and table III).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.2.1 JANHC and JANKC qualification. JANHC and JANKC qualification inspection shall be in accordance with MIL-PRF-19500.

4.2.2 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of table III tests, the tests specified in table III herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

4.2.2.1 Group E thermal response. With extremely small junction devices such as this one, a true thermal impedance cannot be measure, only calculated. While “thermal response” has been substituted for “thermal impedance” herein, the terms, units and procedure as essentially unchanged. Each supplier shall submit a thermal response ($Z_{\theta JX}$) histogram of the entire qualification lot. The histogram data shall be taken prior to the removal of devices that are atypical for thermal response. Thermal response curves (from $Z_{\theta JX}$ test pulse time to $R_{\theta JX}$ minimum steady-state time) of the best device in the qual lot and the worst device in the qual lot (that meets the supplier proposed screening limit), or from the thermal grouping, shall be submitted. The optimal test conditions and proposed initial thermal response screening limit shall be provided in the qualification report. Data indicating how the optimal test conditions were derived for $Z_{\theta JX}$ shall also be submitted. The proposed maximum thermal response $Z_{\theta JX}$ screening limit shall be submitted. The qualifying activity may approve a different $Z_{\theta JX}$ limit for conformance inspection end-point measurements as applicable. Equivalent data, procedures, or statistical process control plans may be used for part, or all, of the above requirements. The approved thermal response conditions and limit for $Z_{\theta JX}$ shall be used by the supplier in screening and table I, subgroup 2. The approved thermal resistance conditions for $R_{\theta JX}$ shall be used by the supplier for conformance inspection. For product families with similar thermal characteristics based on the same physical and thermal die, package, and construction combination (thermal grouping), the supplier may use the same thermal response curves

4.3 Screening (JANS, JANTX and JANTXV levels only). Screening shall be in accordance with table E-IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

| Screen | Measurement | |
|---|---|---|
| | JANS level | JANTX and JANTXV levels |
| (1) 3c | Thermal response, method 3131 of MIL-STD-750, see 4.3.3 | Thermal response, method 3131 of MIL-STD-750, see 4.3.3 |
| 9 | $h_{FE3}$, $I_{CBO2}$ | Not applicable |
| 11 | $I_{CBO2}$; $h_{FE3}$;<br>$\Delta I_{CBO2}$ = 100 percent of initial value or 5 nA dc, whichever is greater,<br>$\Delta h_{FE3}$ = 25 percent change from initial value | $I_{CBO2}$ and $h_{FE3}$ |
| 12 | See 4.3.1 | See 4.3.1 |
| 13 | Subgroups 2 and 3 of table I herein;<br>$\Delta I_{CBO2}$ = 100 percent of initial value or 5 nA dc, whichever is greater;<br>$\Delta h_{FE3}$ = 25 percent change from initial value | Subgroup 2 of table I herein;<br>$\Delta I_{CBO2}$ = 100 percent of initial value or 5 nA dc, whichever is greater;<br>$\Delta h_{FE3}$ = 25 percent change from initial value |

(1) Shall be performed anytime after temperature cycling, screen 3a; JANTX and JANTXV levels do not need to be repeated in screening requirements.

* 4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: $T_A$ = room ambient as defined in 4.5 of MIL-STD-750; $V_{CB}$ = -10 - -30 V dc (-10 V dc for JANS); $P_T$ = 360 mW. NOTE: No heat sink or forced air-cooling on the devices shall be permitted.

4.3.2 Screening JANC. Screening of JANHC and JANKC die shall be in accordance with MIL-PRF-19500, "Discrete Semiconductor Die/Chip Lot Acceptance". Burn-in duration for the JANKC level follows JANS requirements; the JANHC follows JANTX requirements.

4.3.3 Thermal response. For very small junction devices such as this, the term thermal response shall be used in lieu of "thermal impedance" although measurements shall be performed the same way as thermal impedance in accordance with method 3131 of MIL-STD-750 using the guidelines in that method for determining $I_M$, $I_H$, $t_H$, $t_{SW}$ ($V_C$ and $V_H$ where appropriate). See table II, group E, subgroup 4 herein.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as specified herein. If alternate screening is being performed in accordance with MIL-PRF-19500, a sample of screened devices shall be submitted to and pass the requirements of groups A1 and A2 inspection only (table E-VIb, group B, subgroup 1 is not required to be performed again if group B has already been satisfied in accordance with 4.4.2).

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table E-V of MIL-PRF-19500 and table I herein.

* 4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing in table E-VIa (JANS) of MIL-PRF-19500 and 4.4.2.1 herein (See 4.4.2.2 for JAN, JANTX, and JANTXV group B testing). Delta requirements shall be in accordance with table IV herein.

* 4.4.2.1 Group B inspection, table E-VIa (JANS) of MIL-PRF-19500.

| | Subgroup | Method | Conditions |
|---|---|---|---|
| * | B4 | 1037 | $V_{CB}$ = -10 V dc. |
| * | B5 | 1027 | NOTE: If a failure occurs, resubmission shall be at the test conditions of the original sample. $V_{CB}$ = -10 - -30 V dc, $P_D \geq$ 100 percent of maximum rated $P_T$ (see 1.3). |
| * | | | Option 1: 96 hours minimum, sample size in accordance with table E-VIa of MIL-PRF-19500, adjust $T_A$ to achieve $T_J$ = +275°C minimum. |
| * | | | Option 2: 216 hours minimum, sample size = 45, c = 0; adjust $T_A$ to achieve $T_J$ = +225°C minimum. |
| | B6 | 3131 | $R_{\theta JA}$ and $R_{\theta JC}$ only, as applicable (see 1.3). |

* 4.4.2.2 Group B inspection, (JAN, JANTX, and JANTXV). Separate samples may be used for each step. In the event of a lot failure, the resubmission requirements of MIL-PRF-19500 shall apply. In addition, all catastrophic failures during CI shall be analyzed to the extent possible to identify root cause and corrective action.

| | Step | Method | Condition |
|---|---|---|---|
| * | 1 | 1026 | Steady-state life: 1,000 hours minimum, $V_{CB}$ = -10 - -30 V dc, power shall be applied and ambient temperature adjusted to achieve $T_J$ = +150°C minimum using a minimum of $P_D$ = 100 percent of maximum rated $P_T$ as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. |
| | 2 | 1048 | Blocking life: $T_A$ = +150°C, $V_{CB}$ = 80 percent rated voltage, 48 hours minimum. n = 45 devices, c = 0. |
| | 3 | 1032 | High-temperature life (non-operating), t = 340 hours, $T_A$ = +200°C. n = 22, c = 0. |

4.4.2.3 Group B sample selection. Samples selected from group B inspection shall meet all of the following requirements:

a. For JAN, JANTX, and JANTXV samples shall be selected randomly from a minimum of three wafers (or from each wafer in the lot) from each wafer lot. For JANS, samples shall be selected from each inspection lot. See MIL-PRF-19500.

b. Shall be chosen from an inspection lot that has been submitted to and passed group A, subgroup 2 conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for life test (subgroups B4 and B5 for JANS, and group B for JAN, JANTX, and JANTXV) may be pulled prior to the application of final lead finish.

* 4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of MIL-PRF-19500, and as follows. Delta requirements shall be in accordance with the steps of table IV herein.

* 4.4.3.1 Group C inspection (JANS), table E-VII of MIL-PRF-19500.

| | Subgroup | Method | Condition |
|---|---|---|---|
| | C2 | 2036 | Test condition E; (not applicable for UB devices). |
| * | C6 | 1026 | 1,000 hours at $V_{CB}$ = -10 - -30 V dc; power shall be applied and ambient temperature shall be adjusted to achieve $T_J$ = +150°C minimum and a minimum of $P_D$ = 100 percent of maximum rated $P_T$ as defined in 1.3 n = 45, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. |

4.4.3.2 Group C inspection (JAN, JANTX, and JANTXV), table E-VII of MIL-PRF-19500.

| Subgroup | Method | Condition |
|---|---|---|
| C2 | 2036 | Test condition E; not applicable for UB devices. |
| C5 | 3131 | $R_{\theta JA}$ and $R_{\theta JC}$ only, as applicable (see 1.3). |
| C6 | | Not applicable. |

4.4.3.3 Group C sample selection. Samples for subgroups in group C shall be chosen at random from any inspection lot containing the intended package type and lead finish procured to the same specification which is submitted to and passes table I tests herein for conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for C6 life test may be pulled prior to the application of final lead finish. Testing of a subgroup using a single device type enclosed in the intended package type shall be considered as complying with the requirements for that subgroup.

* 4.4.4 Group D inspection. Conformance inspection for hardness assured JANS and JANTXV types shall include the group D tests specified in table II herein. These tests shall be performed as required in accordance with MIL-PRF-19500 and method 1019 of MIL-STD-750 for total ionizing dose, or method 1017 of MIL-STD-750 for neutron fluence, as applicable (see 6.2 herein), except group D, subgroup 2 may be performed separate from other subgroups. Alternate package options may also be substituted for the testing provided there is no adverse effect to the fluence profile.

* 4.4.5 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-IX of MIL-PRF-19500 and as specified in table III herein. Delta requirements shall be in accordance with table IV herein.

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

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

4.5.2 Collector-base time constant. This parameter may be determined by applying an rf signal voltage of 1.0 volt (rms) across the collector-base terminals, and measuring the ac voltage drop ($V_{eb}$) with a high impedance rf voltmeter across the emitter-base terminals. With f = 31.8 MHz used for the 1.0 V signal, the following computation applies; $r_b'C_c$ (ps) = 5 x $V_{eb}$ (millivolts), see figure 10.

* TABLE I. Group A inspection.

| Inspection 1/ | MIL-STD-750 | | Symbol | Limit | | Unit |
|---|---|---|---|---|---|---|
| | Method | Conditions | | Min | Max | |
| Subgroup 1 2/ | | | | | | |
| Visual and mechanical examination | 2071 | | | | | |
| Solderability 3/ 4/ | 2026 | n = 15 leads, c = 0 | | | | |
| Resistance to solvents 3/ 4/ 5/ | 1022 | n = 15 devices, c = 0 | | | | |
| * Salt atmosphere 4/ | 1041 | (Laser marked devices only) n = 6 devices, c = 0. | | | | |
| Temp cycling 3/ 4/ | 1051 | Test condition C, 25 cycles, n = 22 devices, c = 0 | | | | |
| Hermetic seal 4/ 6/ Fine leak Gross leak | 1071 | n = 22 devices, c = 0 | | | | |
| Electrical measurements 4/ | | Table I, subgroup 2 | | | | |
| Bond strength 3/ 4/ | 2037 | Precondition $T_A$ = +250°C at t = 24 hrs or $T_A$ = +300°C at t = 2 hrs n = 11 wires, c = 0 | | | | |
| Decap internal visual (design verification) 4/ | 2075 | n = 4 devices, c = 0 | | | | |
| Subgroup 2 | | | | | | |
| Thermal response 7/ | 3131 | See 4.3.3 | $Z_{\theta JX}$ | | | °C/W |
| Collector to base cutoff current | 3036 | Bias condition D; $V_{CB}$ = -60 V dc | $I_{CBO1}$ | | -10 | µA dc |
| Emitter to base cutoff current | 3061 | Bias condition D; $V_{EB}$ = -5 V dc | $I_{EBO1}$ | | -10 | µA dc |
| Breakdown voltage collector - emitter | 3011 | Bias condition D; $I_C$ = -10 mA dc; pulsed (see 4.5.1) | $V_{(BR)CEO}$ | -60 | | V dc |
| Collector - base cutoff current | 3036 | Bias condition D; $V_{CB}$ = -40 V dc | $I_{CBO2}$ | | -20 | nA dc |
| Collector - emitter cutoff current | 3041 | Bias condition A; $V_{BE}$ = 3-.0 V dc, $V_{CE}$ = -40 V dc | $I_{CEX1}$ | | -20 | nA dc |
| Base cutoff current | 3041 | Bias condition A; $V_{BE}$ = -3.0 V dc; $V_{CE}$ = -40 V dc | $I_{BEX}$ | | -50 | nA dc |

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

| Inspection 1/ | MIL-STD-750 | | Symbol | Limit | | Unit |
|---|---|---|---|---|---|---|
| | Method | Conditions | | Min | Max | |
| Subgroup 2 - Continued | | | | | | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -0.1 mA dc | $h_{FE1}$ | | | |
| 2N3250A, 2N3250AUB | | | | 40 | | |
| 2N3251A, 2N3251AUB | | | | 80 | | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -1.0 mA dc | $h_{FE2}$ | | | |
| 2N3250A, 2N3250AUB | | | | 45 | | |
| 2N3251A, 2N3251AUB | | | | 90 | | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -10 mA dc, pulsed (see 4.5.1) | $h_{FE3}$ | | | |
| 2N3250A, 2N3250AUB | | | | 50 | 150 | |
| 2N3251A, 2N3251AUB | | | | 100 | 300 | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -50 mA dc, pulsed (see 4.5.1) | $h_{FE4}$ | | | |
| 2N3250A, 2N3250AUB | | | | 15 | | |
| 2N3251A, 2N3251AUB | | | | 30 | | |
| Current gain linearity | | $\frac{\lvert h_{FE3} - h_{FE1} \rvert}{h_{FE3}} \; x \; 100$ | $h_{FE}$ | | | |
| 2N3250A, 2N3250AUB | | | | | 40 | % |
| 2N3251A, 2N3251AUB | | | | | 30 | % |
| Collector - emitter saturated voltage | 3071 | $I_C$ = -10 mA dc; $I_B$ = -1.0 mA dc | $V_{CE(SAT)1}$ | | -0.25 | V dc |
| Collector - emitter saturated voltage | 3071 | $I_C$ = -50 mA dc; $I_B$ = -5.0 mA dc; pulsed (see 4.5.1) | $V_{CE(SAT)2}$ | | -0.50 | V dc |
| Base - emitter saturated voltage | 3066 | Test condition A; $I_C$ = -10 mA dc; $I_B$ = -1.0 mA dc | $V_{BE(SAT)1}$ | -0.60 | -0.90 | V dc |
| Base - emitter saturated voltage | 3066 | Test condition A; $I_C$ = -50 mA dc; $I_B$ = -5.0 mA dc; pulsed (see 4.5.1) | $V_{BE(SAT)2}$ | | -1.20 | V dc |

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

| Inspection 1/ | MIL-STD-750 | | Symbol | Limit | | Unit |
|---|---|---|---|---|---|---|
| | Method | Conditions | | Min | Max | |
| Subgroup 3 | | | | | | |
| High-temperature operation: | | $T_A$ = +150°C | | | | |
| Collector - emitter cutoff current | 3041 | Bias condition A; $V_{CE}$ = -40 V dc; $V_{BE}$ = -3.0 V dc | $I_{CEX2}$ | | -20 | µA dc |
| Low-temperature operation: | | $T_A$ = -55°C | | | | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -1.0 mA dc | $h_{FE5}$ | | | |
| 2N3250A, 2N3250AUB | | | | 20 | | |
| 2N3251A, 2N3251AUB | | | | 40 | | |
| Subgroup 4 | | | | | | |
| Small-signal short-circuit forward-current transfer ratio | 3206 | $V_{CE}$ = -10 V dc; $I_C$ = -1 mA dc; f = 1 kHz | $h_{fe}$ | | | |
| 2N3250A, | | | | 50 | 200 | |
| 2N3250AUB, | | | | 50 | 200 | |
| 2N3251A, | | | | 100 | 400 | |
| 2N3251AUB | | | | 100 | 400 | |
| Magnitude of common emitter small-signal short-circuit forward-current transfer ratio | 3306 | $V_{CE}$ = -20 V dc; $I_C$ = -10 mA dc; f = 100 MHz | $\|h_{fe}\|$ | | | |
| 2N3250A, 2N3250AUB | | | | 2.5 | 9.0 | |
| 2N3251A, 2N3251AUB | | | | 3.0 | 9.0 | |
| Open circuit output capacitance | 3236 | $V_{CB}$ = -10 V dc; $I_E$ = 0; 100 kHz ≤ f ≤ 1 MHz | $C_{obo}$ | | 6 | pF |
| Input capacitance (output open-circuited) | 3240 | $V_{EB}$ = -1.0 V dc; $I_C$ = 0; 100 kHz ≤ f ≤ 1 MHz | $C_{ibo}$ | | 8 | pF |
| Collector-base time constant | | $V_{CE}$ = -20 V dc; $I_C$ = -10 mA dc; f = 31.8 MHz; (see 4.5.2 and figure 10) | $r_b'C_c$ | 5 | 250 | ps |
| Noise figure | 3246 | $V_{CE}$ = -5.0 V dc; $I_C$ = -100 µA dc; Rg = 1 kΩ; f = 100 Hz | NF | | 6 | dB |

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

| Inspection 1/ | MIL-STD-750 | | Symbol | Limit | | Unit |
|---|---|---|---|---|---|---|
| | Method | Conditions | | Min | Max | |
| Subgroup 4 – Continued | | | | | | |
| Pulse response: | | | | | | |
| On-time | 3251 | Test condition A; $I_C$ = -10 mA dc; $I_{B1}$ = -1.0 mA dc; (see figure 11) | $t_{on}$ | | 70 | ns |
| Off time | 3251 | Test condition A; $I_C$ = -10 mA dc; $I_{B1}$ = $I_{B2}$ = -1.0 mA dc (see figure 12) | $t_{off}$ | | | |
| 2N3250A, 2N3250AUB | | | | | 250 | ns |
| 2N3251A, 2N3251AUB | | | | | 300 | ns |
| Small-signal open circuit reverse-voltage transfer ratio | 3211 | $V_{CE}$ = -10 V dc; $I_C$ = -1.0 mA dc; f = 1 kHz | $h_{re}$ | | | |
| 2N3250A, 2N3250AUB | | | | | 10 | x $10^{-4}$ |
| 2N3251A, 2N3251AUB | | | | | 20 | x $10^{-4}$ |
| Small-signal short circuit input impedance | 3201 | $V_{CE}$ = -10 V dc; $I_C$ = -1.0 mA dc; f = 1 kHz | $h_{ie}$ | | | |
| 2N3250A, 2N3250AUB | | | | 1 | 6 | kΩ |
| 2N3251A, 2N3251AUB | | | | 2 | 12 | kΩ |
| Small-signal open circuit output admittance | 3216 | $V_{CE}$ = -10 V dc; $I_C$ = -1.0 mA dc; f = 1 kHz | $h_{oe}$ | | | |
| 2N3250A, 2N3250AUB | | | | 4 | 40 | μmhos |
| 2N3251A, 2N3251AUB | | | | 0 | 60 | μmhos |

1/ For sampling plan see MIL-PRF-19500.
2/ For resubmission of failed test in subgroup 1 of table I, double the sample size of the failed test or sequence of tests. A failure in table I, subgroup 1 shall not require retest of the entire subgroup. Only the failed test shall be rerun upon submission.
3/ Separate samples may be used.
4/ Not required for JANS devices.
5/ Not required for laser marked devices.
6/ This hermetic seal test is an end-point to temp-cycling in addition to electrical measurements.
7/ This test required for the following end-point measurements only:
Group B, step 1 of 4.4.2.2 herein (JAN, JANTX, and JANTXV).
Group B, subgroups 3, 4, and 5 (JANS).
Group C, subgroup 2 and 6.
Group E, subgroup 1 and 2.

* TABLE II. Group D inspection.

| Inspection 1/ 2/ 3/ | MIL-STD-750 | | Symbol | Limit | | Unit |
|---|---|---|---|---|---|---|
| | Method | Conditions | | Min | Max | |
| Subgroup 1 4/ | | | | | | |
| Neutron Irradiation | 1017 | Neutron exposure $V_{CES}$ 0 V | | | | |
| Collector to base cutoff current | 3036 | Bias condition D; $V_{CB}$ = -60 V dc | $I_{CBO1}$ | | -20 | µA dc |
| Emitter to base cutoff current | 3061 | Bias condition D; $V_{EB}$ = -5 V dc | $I_{EBO1}$ | | -20 | µA dc |
| Breakdown voltage collector - emitter | 3011 | Bias condition D; $I_C$ = -10 mA dc; pulsed (see 4.5.1) | $V_{(BR)CEO}$ | 60 | | V dc |
| Collector - base cutoff current | 3036 | Bias condition D; $V_{CB}$ = -40 V dc | $I_{CBO2}$ | | -40 | nA dc |
| Collector - emitter cutoff current | 3041 | Bias condition A; $V_{BE}$ = -3.0 V dc, $V_{CE}$ = -40 V dc | $I_{CEX1}$ | | -40 | nA dc |
| Base cutoff current | 3041 | Bias condition A; $V_{BE}$ = -3.0 V dc; $V_{CE}$ = -40 V dc | $I_{BEX}$ | | -100 | nA dc |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -0.1 mA dc | [$h_{FE1}$] | | | |
| 2N3250A, 2N3250AUB | | | | [20] | | |
| 2N3251A, 2N3251AUB | | | | [40] | | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -1.0 mA dc | [$h_{FE2}$] | | | |
| 2N3250A, 2N3250AUB | | | | [22.5] | | |
| 2N3251A, 2N3251AUB | | | | [45] | | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -10 mA dc, pulsed (see 4.5.1) | [$h_{FE3}$] | | | |
| 2N3250A, 2N3250AUB | | | | [25] | 150 | |
| 2N3251A, 2N3251AUB | | | | [50] | 300 | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -50 mA dc, pulsed (see 4.5.1) | [$h_{FE4}$] | | | |
| 2N3250A, 2N3250AUB | | | | [7.5] | | |
| 2N3251A, 2N3251AUB | | | | [15] | | |

See footnotes at end of table.

* TABLE II. Group D inspection Continued.

| Inspection 1/ 2/ 3/ | MIL-STD-750 | | Symbol | Limit | | Unit |
|---|---|---|---|---|---|---|
| | Method | Conditions | | Min | Max | |
| Subgroup 1 - Continued | | | | | | |
| Current gain linearity | | $\frac{\lvert h_{FE3} - h_{FE1} \rvert}{h_{FE3}} \times 100$ | $h_{FE}$ | | | |
| 2N3250A, 2N3250AUB | | | | | 50 | % |
| 2N3251A, 2N3251AUB | | | | | 37.5 | % |
| Collector - emitter saturated voltage | 3071 | $I_C$ = -10 mA dc; $I_B$ = -1.0 mA dc | $V_{CE(SAT)1}$ | | -0.29 | V dc |
| Collector - emitter saturated voltage | 3071 | $I_C$ = -50 mA dc; $I_B$ = -5.0 mA dc; pulsed (see 4.5.1) | $V_{CE(SAT)2}$ | | -0.58 | V dc |
| Base - emitter saturated voltage | 3066 | Test condition A; $I_C$ = -10 mA dc; $I_B$ = -1.0 mA dc | $V_{BE(SAT)1}$ | -0.60 | -1.04 | V dc |
| Base - emitter saturated voltage | 3066 | Test condition A; $I_C$ = -50 mA dc; $I_B$ = -5.0 mA dc; pulsed (see 4.5.1) | $V_{BE(SAT)2}$ | | -1.38 | V dc |
| Subgroup 2 | | | | | | |
| Steady-state total dose irradiation | 1019 | Gamma exposure $V_{CES}$ = -48 V | | | | |
| Collector to base cutoff current | 3036 | Bias condition D; $V_{CB}$ = -60 V dc | $I_{CBO1}$ | | -20 | µA dc |
| * Emitter to base cutoff current | 3061 | Bias condition D; $V_{EB}$ = -5 V dc | $I_{EBO1}$ | | -20 | µA dc |
| Breakdown voltage collector - emitter | 3011 | Bias condition D; $I_C$ = -10 mA dc; pulsed (see 4.5.1) | $V_{(BR)CEO}$ | -60 | | V dc |
| Collector - base cutoff current | 3036 | Bias condition D; $V_{CB}$ = -40 V dc | $I_{CBO2}$ | | -40 | nA dc |
| Collector - emitter cutoff current | 3041 | Bias condition A; $V_{BE}$ = -3.0 V dc, $V_{CE}$ = -40 V dc | $I_{CEX1}$ | | -40 | nA dc |
| Base cutoff current | 3041 | Bias condition A; $V_{BE}$ = -3.0 V dc; $V_{CE}$ = -40 V dc | $I_{BEX}$ | | -100 | nA dc |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -0.1 mA dc | [$h_{FE1}$] | | | |
| 2N3250A, 2N3250AUB | | | | [20] | | |
| 2N3251A, 2N3251AUB | | | | [40] | | |

See footnotes at end of table.

* TABLE II. Group D inspection Continued.

| Inspection 1/ 2/ 3/ | MIL-STD-750 | | Symbol | Limit | | Unit |
|---|---|---|---|---|---|---|
| | Method | Conditions | | Min | Max | |
| Subgroup 2 - Continued | | | | | | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -1.0 mA dc | [$h_{FE2}$] | | | |
| 2N3250A, 2N3250AUB | | | | [22.5] | | |
| 2N3251A, 2N3251AUB | | | | [45] | | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -10 mA dc, pulsed (see 4.5.1) | [$h_{FE3}$] | | | |
| 2N3250A, 2N3250AUB | | | | [25] | 150 | |
| 2N3251A, 2N3251AUB | | | | [50] | 300 | |
| Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -50 mA dc, pulsed (see 4.5.1) | [$h_{FE4}$] | | | |
| 2N3250A, 2N3250AUB | | | | [7.5] | | |
| 2N3251A, 2N3251AUB | | | | [15] | | |
| Current gain linearity | | $\frac{\lvert h_{FE3} - h_{FE1} \rvert}{h_{FE3}}$ x 100 | $h_{FE}$ | | | |
| 2N3250A, 2N3250AUB | | | | | 50 | % |
| 2N3251A, 2N3251AUB | | | | | 37.5 | % |
| Collector - emitter saturated voltage | 3071 | $I_C$ = -10 mA dc; $I_B$ = -1.0 mA dc | $V_{CE(SAT)1}$ | | -0.29 | V dc |
| Collector - emitter saturated voltage | 3071 | $I_C$ = -50 mA dc; $I_B$ = -5.0 mA dc; pulsed (see 4.5.1) | $V_{CE(SAT)2}$ | | -0.58 | V dc |
| Base - emitter saturated voltage | 3066 | Test condition A; $I_C$ = -10 mA dc; $I_B$ = -1.0 mA dc | $V_{BE(SAT)1}$ | -0.60 | -1.04 | V dc |
| Base - emitter saturated voltage | 3066 | Test condition A; $I_C$ = -50 mA dc; $I_B$ = -5.0 mA dc; pulsed (see 4.5.1) | $V_{BE(SAT)2}$ | | -1.38 | V dc |

1/ Tests to be performed on all devices receiving radiation exposure.
2/ For sampling plan, see MIL-PRF-19500.
3/ Electrical characteristics apply to all device types unless otherwise noted.
4/ See 6.2.e herein.
5/ See method 1019 of MIL-STD-750, for how to determine [$h_{FE}$] by first calculating the delta($1/h_{FE}$) from the pre- and post-radiation $h_{FE}$. Notice that [$h_{FE}$] is not the same as $h_{FE}$ and cannot be measured directly. The [$h_{FE}$] value can never exceed the pre-radiation minimum $h_{FE}$ that it is based upon.

* TABLE III. Group E inspection (all quality levels) - for qualification only.

| Inspection | MIL-STD-750 | | Qualification |
|---|---|---|---|
| | Method | Conditions | |
| Subgroup 1 | | | |
| Temperature cycling (air to air) | 1051 | Test condition C, 500 cycles. | 45 devices c = 0 |
| Hermetic seal | 1071 | | |
| Fine leak<br>Gross leak | | | |
| Electrical measurements | | See table I, subgroup 2 herein. | |
| Subgroup 2 | | | |
| Intermittent life | 1037 | $V_{CB}$ = -10 V dc, 6,000 cycles, forced air cooling allowed on cooling cycle only. | 45 devices c = 0 |
| Electrical measurements | | See table I, subgroup 2 herein. | |
| Subgroup 4 | | | |
| Thermal resistance | 3131 | The following applies for qualification for $R_{\theta JSP(AM)}$ and $R_{JSP(IS)}$ can be calculated but shall be measured once in the same package with a similar die size to confirm calculations (can apply to multiple specification sheets). | 15 devices, c = 0 |
| Thermal impedance curves | | See 4.2.2.1. | |
| Subgroup 5 | | | |
| Not applicable | | | |
| Subgroup 6 | | | |
| ESD | 1020 | | 11 devices |
| Subgroup 8 | | | |
| Reverse stability | 1033 | Condition B. | 45 devices c = 0 |

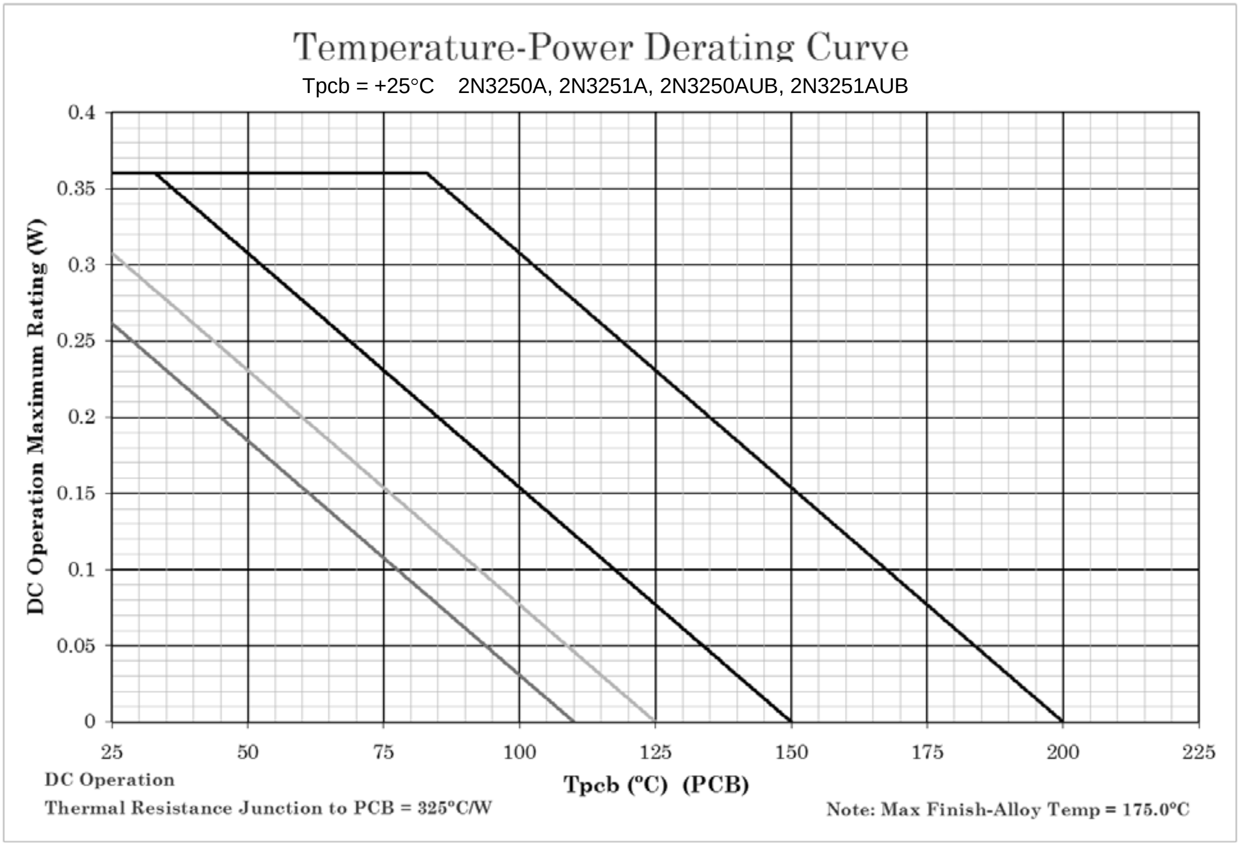
* TABLE IV. Group B and C delta measurements. 1/ 2/ 3/

| Step | Inspection | MIL-STD-750 | | Symbol | Limits | | Unit |
|---|---|---|---|---|---|---|---|
| | | Method | Conditions | | Min | Max | |
| 1. | Forward-current transfer ratio | 3076 | $V_{CE}$ = -1.0 V dc; $I_C$ = -10 mA dc; pulsed (see 4.5.1) | $\Delta h_{FE3}$ | ±25 percent change from initial value. | | |
| 2. | Collector - base cutoff current | 3036 | Bias condition D; $V_{CB}$ = -40 V dc | $\Delta I_{CBO2}$ | 100 percent of initial value or -5 nA dc, whichever is greater. | | |
| 3. | Collector - emitter voltage (saturated) | 3071 | $I_C$ = -50 mA dc; $I_B$ = -5.0 mA dc | $\Delta V_{CE(Sat)2}$ | -50 mV dc change from initial value. | | |

1/ The delta measurements for table E-VIa (JANS) of MIL-PRF-19500 are as follows:
a. Subgroup 4, see table IV herein, step 3.
b. Subgroup 5, see table IV herein, steps 1, 2, and 3.

2/ The delta measurements for 4.4.2.2 (JAN, JANTX, and JANTXV) are as follows: Following all steps in 4.4.2.2 herein, steps 1, 2, and 3 of table IV herein.

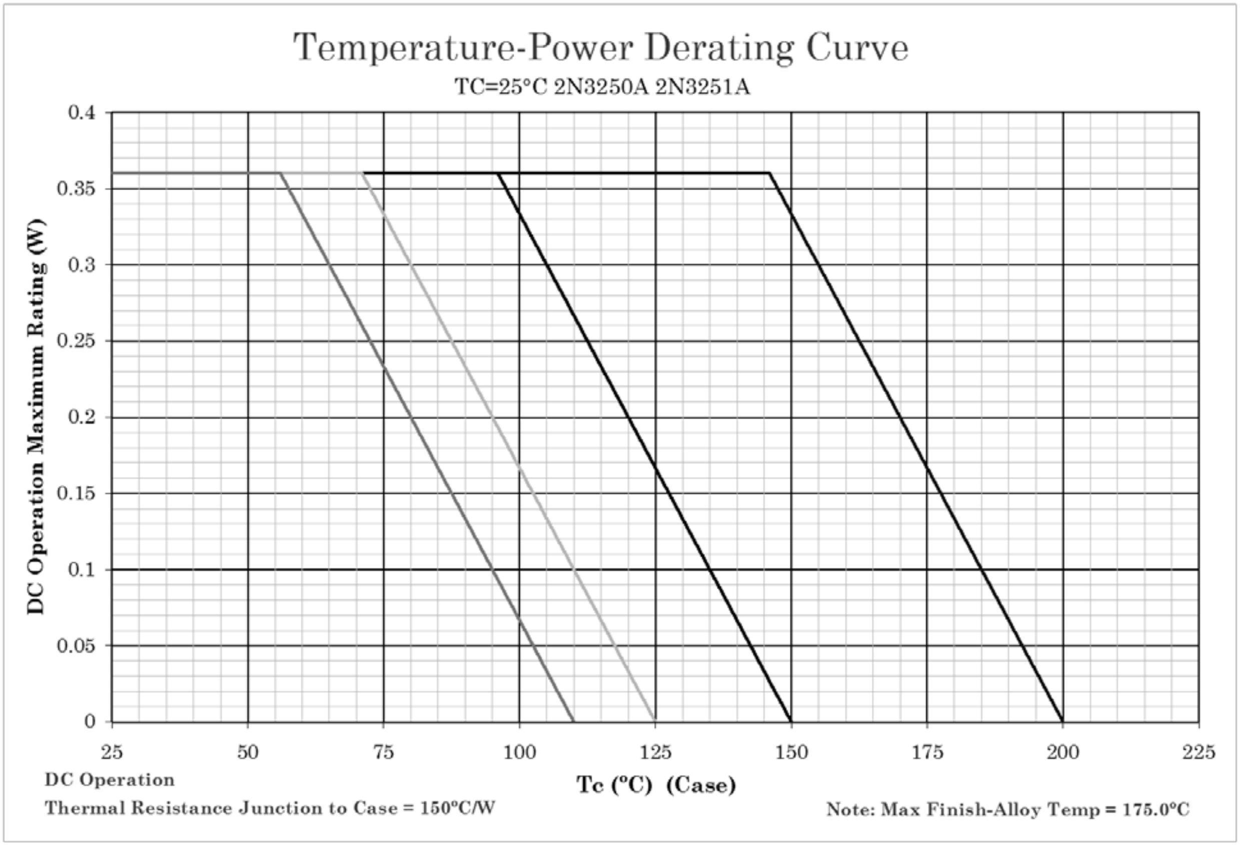
3/ The delta measurements for table E-VII of MIL-PRF-19500 are as follows: Subgroup 6, see table IV herein, steps 1 and 2 (for JANS).




NOTES:

1. This is the true inverse of the worst case thermal resistance value. All devices are capable of operating at ≤ $T_J$ specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum $T_J$ allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J$ ≤ 200°C) and power rating specified. (See 1.3 herein.)
3. Derate design curves chosen at $T_J$ ≤ 125°C, and 110°C to show power rating where most users want to limit $T_J$ in their application.

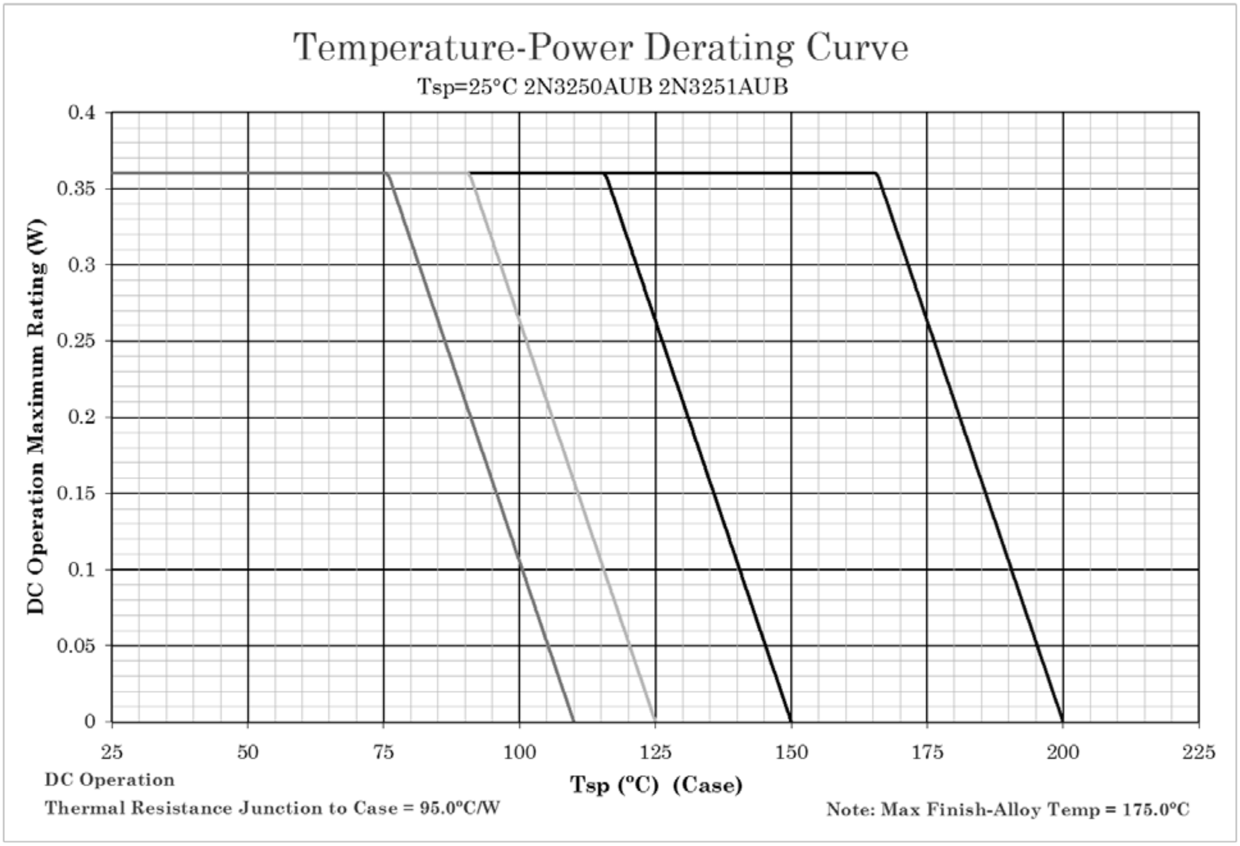
FIGURE 4. Derating for all devices ($R_{\theta JPCB}$) for all parts.




NOTES:

1. This is the true inverse of the worst case thermal resistance value. All devices are capable of operating at ≤ $T_J$ specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum $T_J$ allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J$ ≤ 200°C) and power rating specified. (See 1.3 herein.)
3. Derate design curves chosen at $T_J$ ≤ 125°C, and 110°C to show power rating where most users want to limit $T_J$ in their application.

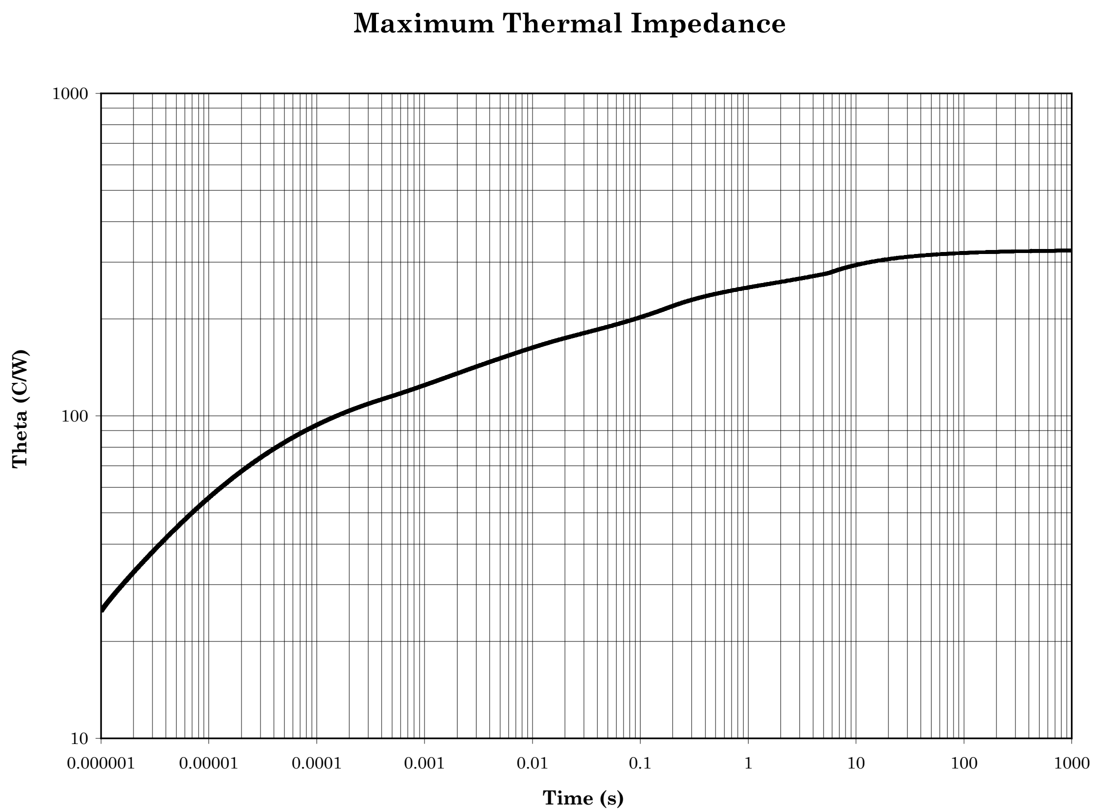
FIGURE 5. Derating for all devices ($R_{\theta JC}$) for all parts.




NOTES:

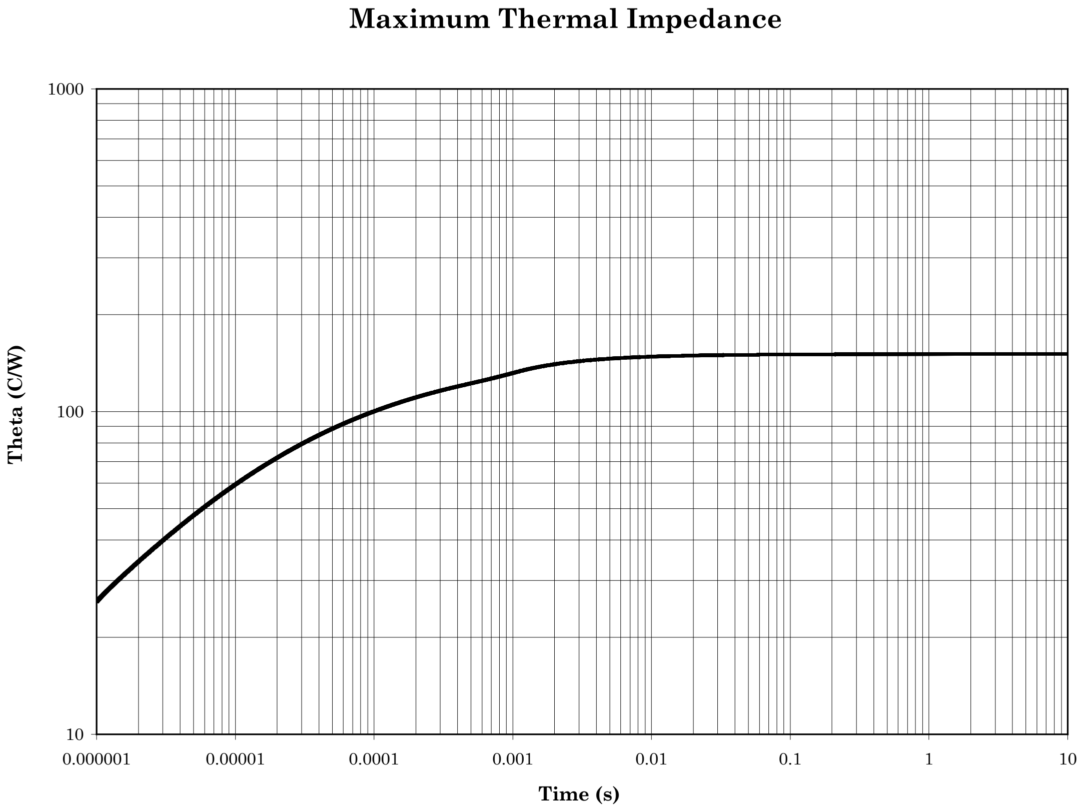
1. This is the true inverse of the worst case thermal resistance value. All devices are capable of operating at ≤ $T_J$ specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum $T_J$ allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J$ ≤ 200°C) and power rating specified. (See 1.3 herein.)
3. Derate design curves chosen at $T_J$ ≤ 125°C, and 110°C to show power rating where most users want to limit $T_J$ in their application.

FIGURE 6. Derating for all devices ($R_{\theta JSP}$) for all parts.



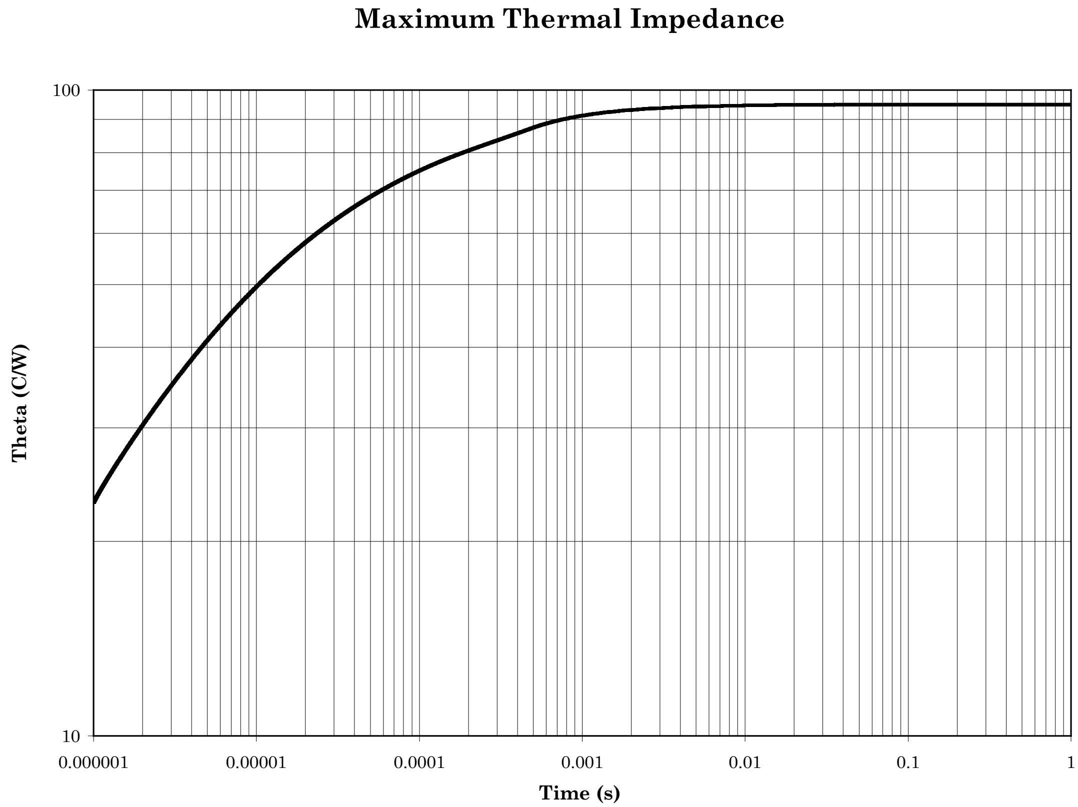

Resistance $R_{\theta JA}$ = 325°C/W.

FIGURE 7. Thermal impedance graph ($R_{\theta JA}$) for 2N3250A and 2N3251A.



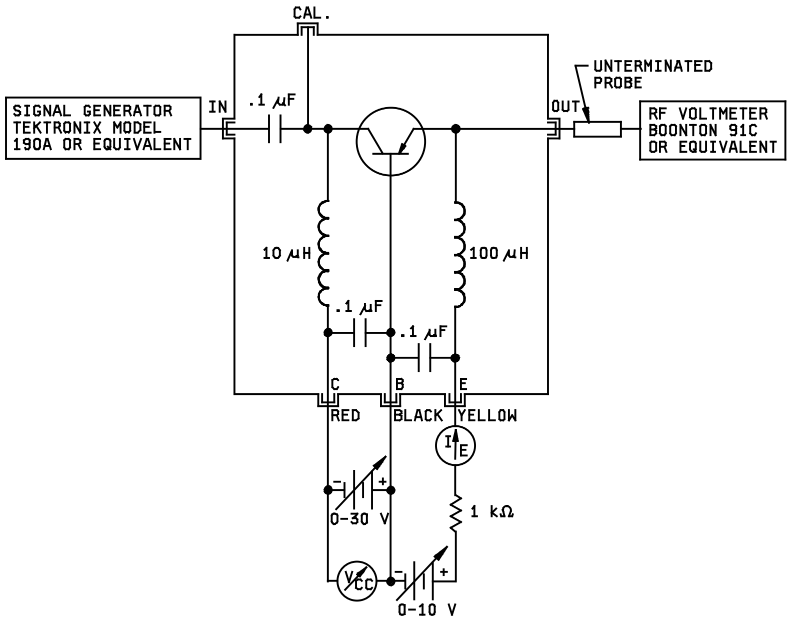

Resistance $R_{\theta JC}$ = 150°C/W.

FIGURE 8. Thermal impedance graph ($R_{\theta JC}$) for 2N3250A and 2N3251A.




Resistance $R_{\theta JSP}$ = 95°C/W.

FIGURE 9. Thermal impedance graph ($R_{\theta JSP}$) for 2N3250AUB and 2N3251AUB.



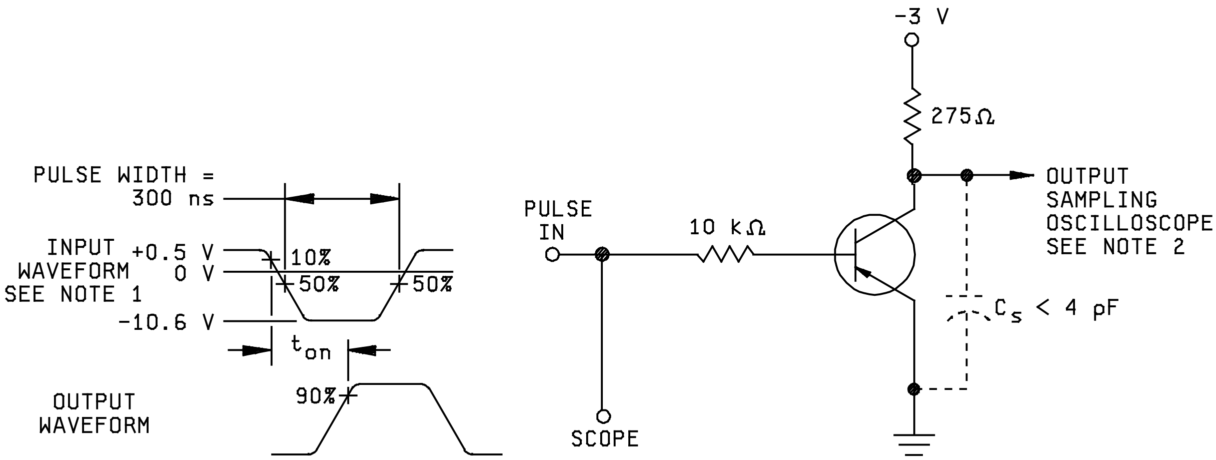

Procedure:

1. Set signal generator to 31.8 MHz and connect to "IN" connector on test jig.
2. Connect low voltage dc power supplies as shown. A 1 K ohm resistor should be placed in series with the emitter power supply to prevent damage to transistors being tested.
3. Set collector supply for $V_{CE}$ = -20 V dc, and emitter supply for $I_C$ = -10 mA.
4. Connect RF voltmeter with unterminated probe adapter to "CAL" connector on test jig. Adjust signal generator until RF voltage is 1 volt. (NOTE: Decade switching of voltmeter should be accurate from 1 mV to 3 volts. If not, input voltage may be set using voltage dividers, utilizing lower scales of the RF voltmeter. If this is done, the voltage dividers should be left in place when the voltmeter is removed, as they constitute a load on the input of the circuit.)
5. Remove RF voltmeter from "CAL" connector and connect to "OUT" connector. Meter will now read $r_b'C_c$ as follows:

Meter range full scale

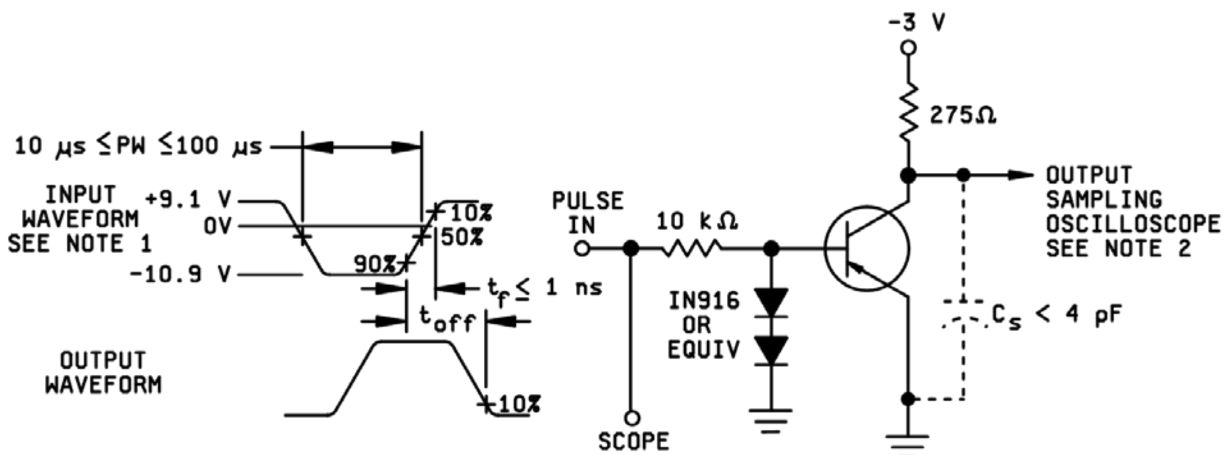
3 mV
10 mV
30 mV
.1 volt

FIGURE 10. Collector-base time constant test circuit (an equivalent circuit may be used).




NOTES:
1. The rise time ($t_r$) of the applied pulse shall be ≤ 1.0 ns, duty cycle ≤ 2 percent, and the generator source Z shall be 50Ω.
2. Sampling oscilloscope: $Z_{IN}$ ≥ 100 kΩ; rise time($t_r$) ≤ .1 ns.

FIGURE 11. Delay and rise time, test circuit.




NOTES:
1. The rise time ($t_r$) of the applied pulse shall be ≤ 1.0 ns, duty cycle ≤ 2 percent, and the generator source Z shall be 50Ω.
2. Sampling oscilloscope: $Z_{IN}$ ≥ 100 kΩ; rise time ($t_r$) ≤ .1 ns.

FIGURE 12. Storage and fall time, test circuit.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. 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.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory. The notes specified in MIL-PRF-19500 are applicable to this specification.)

6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Packaging requirements (see 5.1).

c. Lead finish (see 3.4.1).

* d. Product assurance level and type designator. The complete Part or Identifying Number (PIN), see 1.5.

e. For acquisition of RHA designed devices, table II, subgroup 1 testing of group D is optional. If subgroup 1 testing is desired, it should be specified in the contract.

6.3 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 Manufacturers List (QML 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 orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, Columbus, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil.

6.4 Suppliers of JANHC and JANKC die. The qualified JANHC/JANKC suppliers with the applicable letter version (example, JANHCA2N3250A) will be identified on the QML.

| JANC ordering information | | |
|---|---|---|
| PIN | Manufacturer | |
| | 43611 | 34156 |
| 2N3250A, AUB<br>2N3251A, AUB | JANHCA2N3250A<br>JANHCA2N3251A | JANHCB2N3250A<br>JANHCB2N3251A |
| 2N3250A, AUB<br>2N3251A, AUB | JANKCA2N3250A<br>JANKCA2N3251A | JANKCB2N3250A<br>JANKCB2N3251A |

* 6.5 PIN construction example.

* 6.5.1 Encapsulated devices The PINs for encapsulated devices are constructed using the following form.

JAN M 2N 3250 AUB

- JAN certification mark and quality level (see 1.5.1.1)
- RHA designator (see 1.5.2)
- First number and first letter symbols (see 1.5.3.1)
- Second number symbols (see 1.5.3.2)
- Suffix symbol (see 1.5.4)

* 6.5.2 Unencapsulated devices. The PINs for un-encapsulated devices are constructed using the following form.

JANHC A M 2N 3250 A

- JAN certification mark and quality level (see 1.5.1.2)
- Die identifier for unencapsulated devices (see 1.5.6)
- RHA designator (see 1.5.2)
- First number and first letter symbols (see 1.5.3.1)
- Second number symbols (see 1.5.3.2)
- Suffix symbol (see 1.5.4)

* 6.6 List of PINs. The following is a list of possible PINs available on this specification sheet.

| Encapsulated PINs for type 2N3250A and 2N3251A | | | |
|---|---|---|---|
| JAN2N3250A | JANTX2N3250A | JANTXV2N3250A | JANS#2N3250A |
| JAN2N3250AUB | JANTX2N3250AUB | JANTXV2N3250AUB | JANS#2N3250AUB |
| JAN2N3251A | JANTX2N3251A | JANTXV2N3251A | JANS#2N3251A |
| JAN2N3251AUB | JANTX2N3251AUB | JANTXV2N3251AUB | JANS#2N3251AUB |

| Unencapsulated PINs for type 2N3250A and 2N3251A | | | |
|---|---|---|---|
| JANHCA#2N3250A | JANKCA#2N3250A | | |
| JANHCA#2N3251A | JANKCA#2N3251A | | |

* (1) The number sign (#) represent one of eight RHA designators available (M, D, P, L, R, F, G, or H). The PIN is also available without a RHA designator.

6.7 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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

Preparing activity:
DLA - CC

(Project 5961-2016-080)

Review activities:
Army - AR, MI, SM
Navy - AS, MC
Air Force – 19, 99

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil.