

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, HIGH-FREQUENCY, POWER
TYPES 2N3375, 2N3553, AND 2N4440
JAN, JANTX, AND JANTXV

This amendment forms a part of MIL-S-19500/341B, dated
29 March 1968, and is approved for use by all Depart-
ments and Agencies of the Department of Defense.

PAGE 1

TITLE: Delete and substitute as printed above.

1.1, delete and substitute:

"1.1 Scope. This specification covers the detail requirements for NPN, silicon, high-frequency, power-amplifier transistors. The prefix 'TX' is used on devices submitted to and passing the special process-conditioning, testing, and screening specified in 4.5 through 4.5.8.1. The prefix 'TXV' is used on devices submitted to and passing the internal visual inspection specified in 4.6."

PAGE 2

Add the following new paragraph:

"3.4.2 Internal visual (PRECAP) inspection and process-conditioning, testing, and screening of 'TXV' types. The 'TXV' device type shall, in addition to all performance requirements, be internally visually inspected and process-conditioned, tested, and screened in accordance with 4.6."

PAGE 3

FIGURE 1, Dimensions table:

Dimension E, Max columns: Under "Inches", delete ".045" and substitute ".048"; and under "Millimeters", delete "1.14" and substitute "1.22".

Dimension H, Min columns: Under "Inches", delete ".115" and substitute ".110"; and under "Millimeters", delete "2.92" and substitute "2.79".

PAGE 6

Add the following new paragraph:

"3.5.2 'TXV' marking. Devices in accordance with the 'TXV' requirements shall be marked with 'TXV' immediately following the JAN prefix."

4.2.1, delete and substitute:

"4.2.1 Qualification testing. The non-TX types shall be used for qualification testing. Upon request to the qualifying activity, qualification will be extended to include the 'TX' and 'TXV' types of the device."

PAGE 8

TABLE I, Group A inspection, Subgroup 3:

First Power output test, Details column: Delete "(see 4.4.4 and fig. 5)" and substitute "(see 4.4.4 and figures 5 and 7a)".

First Power output test, Min Limits column for type 2N4440: Delete "10" and substitute "9".

Second Power output test, Details column: Delete "(see 4.4.4 and fig. 6)" and substitute "(see 4.4.4 and figures 6 and 7a)".

Third Power output test, Details column: Delete "(see 4.4.4 and fig. 7)" and substitute "(see 4.4.4 and figures 7 and 7a)".

PAGE 9

TABLE II, Group B inspection, Subgroup 2, Seal (leak-rate) test: Under "Method" column, delete "---" and substitute "1071"; and under "Details" column, delete data and substitute "Test cond. G or H for fine leaks; test cond. A, B, C, D, or F for gross leaks."

TABLE II, Group B inspection, Subgroup 2, first Power output test, Min Limits column for type 2N4440: Delete "10" and substitute "9".

PAGE 10

TABLE II, Group B inspection, Subgroup 6, first Power output test, Min Limits column for type 2N4440: Delete "9.7" and substitute "8.7".

PAGE 11

- * TABLE III, Subgroup 1: Delete "Barometric pressure, reduced (altitude operation)" test and associated information in its entirety.

PAGE 12

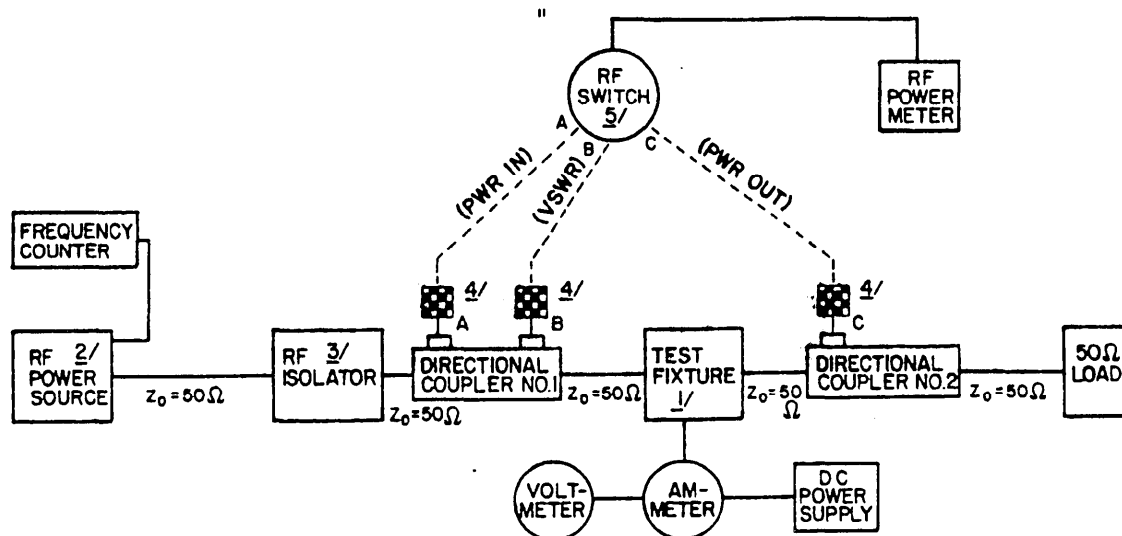
TABLE III, Group C inspection, Subgroup 3, first Power output test, Min Limits column for type 2N4440: Delete "9.7" and substitute "8.7".

PAGES 14 AND 15

FIGURES 5, 6, and 7, add the following:

"NOTE: Figure 7a is the required test procedure."

Add new figure 7a as follows:



NOTES:

- 1/ Test fixture is the circuit as described in appropriate figure 5, 6, or 7.
- 2/ RF power source may be any unit capable of generating desired power level at desired frequency with a harmonic and spurious content at least 20 dB below operating frequency level.
- 3/ The RF isolator may be any device (pad, circulator, etc.) capable of establishing at least 20 dB of isolation ($RL \geq 20$ dB) between RF source and test fixture.
- 4/ Variable attenuators (or fixed if calibrated): Attenuator on directional coupler No. 2 shall be calibrated against known working standard either by means of calibration chart or suitable adjustment if variable. Attenuation at position "A" of directional coupler No. 1 shall be calibrated or adjusted so that actual power at test fixture is known. Attenuation at position "B" shall be adjusted to establish sensitivity needed to measure VSWR.
- 5/ RF switch may be eliminated if additional power meters are used.

PROCEDURE:

1. Remove "test fixture" and install jumper between directional coupler No. 1 and directional coupler No. 2.
2. Set the RF switch to power output position "C".
3. Adjust frequency and power of RF source, as required by specification, and monitor frequency counter and RF power meter respectively (see note 4).
4. Set the RF switch to position "A" and adjust variable attenuator to obtain identical reading as power out in position "C" (see note 4).
5. Reconnect "test fixture" in test setup and insert device.
6. Adjust power supply to 28 Vdc.
7. Adjust circuit output tuning for maximum power gain and circuit input tuning for minimum VSWR. (Switch between power in, VSWR, and power out while tuning and repeat as many times as necessary to obtain minimum VSWR and maximum power out. Check power in level before taking final reading. Minimum VSWR is defined as minimum reading obtained on power meter with switch in position "B" and maintaining power in).

FIGURE 7a. RF power gain (G_{pe}) test procedure. "

PAGE 16

4.5.5, 4.5.5.1, and 4.5.5.2, delete and substitute:

"4.5.5 Hermetic seal tests. All devices shall be subjected to hermetic seal tests (~~fine leak followed by gross leak~~) with test conditions as specified in 4.5.5.1 and 4.5.5.2. Failed devices from either test shall be removed from the lot.

"4.5.5.1 Hermetic seal (fine-leak) test. All devices shall be fine-leak tested in accordance with MIL-STD-750, method 1071, test condition G or H. The leak-rate rejection criterion shall be 1×10^{-7} cubic centimeters of helium per second when measured at a differential pressure of one atmosphere.

"4.5.5.2 Hermetic seal (gross-leak) test. All devices shall be tested for gross-leaks in accordance with MIL-STD-750, method 1071, test condition A, B, C, D, or F."

PAGE 17

4.5.5.3, delete and substitute:

"4.5.5.3 Reverse bias. All devices shall be subjected to reverse bias with the following test sequence and end point measurements:

- (a) The collector to base junction shall be reverse-biased at $V_{CB} = 30$ V dc, $I_E = 0$, for 48 hours minimum at $T_A = +150^\circ\text{C}$.
- (b) At the end of the high-temperature test time, the case temperature shall be lowered until $T_C = +30^\circ\text{C} \pm 5^\circ\text{C}$ is attained. This case temperature shall be maintained prior to removal of reverse bias voltage.
- (c) No other voltages or temperatures shall be applied to the device before taking the end point measurement.
- (d) Within 24 hours following bias removal, measure I_{CEO} as specified in table IV. The manufacturer, at his option, may use a 72-hour maximum criteria if it is demonstrated (at 72 hours) for three consecutive lots to the qualifying activity that readings of 99 percent of all devices remain stable within ± 10 percent of the 24-hour reading."

PAGE 18

Add the following new paragraph:

"4.6 Internal visual (PRECAP) inspection and process-conditioning, testing, and screening of 'TXV' types. The internal visual inspection shall be performed in accordance with test method 2072 of MIL-STD-750 prior to encapsulation on a 100 percent basis and process-conditioning, testing, and screening shall be as specified in 4.5.1 through 4.5.8.1 and figure 9. The manufacturer shall permit the authorized Government representative to witness concurrent with time of manufacturer's performance of these tests, the process-conditioning, testing, and screening of the devices. Those conditioning and screening tests normally performed by a manufacturer as standard production tests, need not be repeated when these are predesignated and acceptable to the Government as being equal to or more severe than the test specified herein."

NOTE: The margins of this amendment are marked with asterisks to indicate where changes from the previous amendment 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 amendment.

CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 17

Review activities:

Army - AR, MI
Air Force - 11, 19, 80, 85
NASA - NA
DLA - ES

User activities:

Army - SM
Navy - AS, CG, MC, OS, SH
Air Force - 13, 15

Preparing activity:
Army - ER

Agent:
DLA - ES

(Project 5961-1097)