

The documentation and process conversion measures necessary to comply with this revision shall be completed by 13 November 2015.

INCH-POUND

MIL-PRF-19500/312F
12 August 2015
SUPERSEDING
MIL-PRF-19500/312E
30 March 2006

PERFORMANCE SPECIFICATION SHEET

TRANSISTOR, NPN, SILICON, SWITCHING,
THROUGH-HOLE PACKAGE AND UNENCAPSULATED DIE,
TYPE 2N708, QUALITY LEVELS JAN, JANTX, AND JANHC

Inactive for new design after 7 June 1999.

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 NPN silicon switching transistors. Two levels of product assurance (JAN and JANTX) are provided for the device type as specified in [MIL-PRF-19500](#). One level of product assurance (JANHC) is provided for unencapsulated device type (die) as specified in [MIL-PRF-19500](#).

1.2 Physical dimensions. The device package styles are as follows: Three terminal metal-can package TO-206AA (formerly TO-18) in accordance with [figure 1](#) and unencapsulated die in accordance with [figure 2](#) for device type JANHC.

1.3 Maximum ratings. Unless otherwise specified $T_A = +25^\circ\text{C}$.

P_T (1) $T_A = +25^\circ\text{C}$	$R_{\theta JA}$	V_{CBO}	V_{CEO}	V_{EBO}	V_{CER} $R_{BE} \leq 10$ ohms	T_J and T_{STG}
<u>W</u>	<u>$^\circ\text{C/W}$</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>$^\circ\text{C}$</u>
0.5	325	40	15	5.0	20	-65 to +200

(1) Derate linearly 3.08 mW/ $^\circ\text{C}$ above $T_A = +37.5^\circ\text{C}$.

1.4 Primary electrical characteristics. Unless otherwise specified, $T_A = +25^\circ\text{C}$.

Limits	h_{FE2} (1) $V_{CE} = 1.0$ V dc $I_C = 10$ mA dc	$V_{CE(SAT)1}$ $I_C = 10$ mA dc $I_B = 1.0$ mA dc	$V_{BE(SAT)1}$ $I_C = 10$ mA dc $I_B = 1.0$ mA dc	t_{on} $I_C = 10$ mA dc $I_{B1} = 3$ mA dc $V_{BE} = 2$ V dc	t_{off} $I_C = 10$ mA dc $I_{B1} = 3$ mA dc $I_{B2} = 1$ mA dc	$ h_{fe} $ $V_{CE} = 10$ V dc $I_C = 10$ mA dc $f = 100$ MHz
		<u>V dc</u>	<u>V dc</u>	<u>ns</u>	<u>ns</u>	
Min	40		0.72			3.0
Max	120	0.4	0.80	40	75	9.0

(1) Pulsed (see [4.5.1](#)).

Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, 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>.

AMSC N/A

FSC 5961



1.5 Part or Identifying Number (PIN). The PIN is in accordance with [MIL-PRF-19500](#), and as specified herein. See [6.4](#) for PIN construction example and [6.5](#) 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" and "JANTX".

1.5.1.2 Quality level designators for unencapsulated devices (die). The quality level designator for unencapsulated devices (die) that are applicable for this specification sheet is "JANHC".

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

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

1.5.2.2 Second number symbols. The second number symbols for the transistors covered by this specification sheet is "708".

1.5.3 Suffix symbols. Suffix symbols are not applicable for this specification sheet.

1.5.4 Lead finish. The lead finishes applicable to this specification sheet are listed on [QML-19500](#).

1.5.5 Die identifiers for unencapsulated devices. The manufacturer die identifiers that are applicable for this specification sheet is "A" (see [figure 2](#) and [6.5](#)).

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.

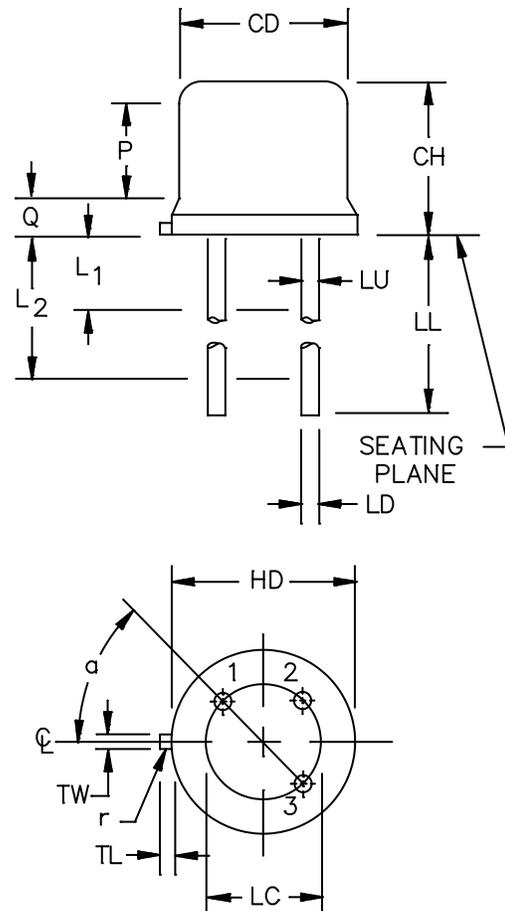
DEPARTMENT OF DEFENSE STANDARDS

[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.

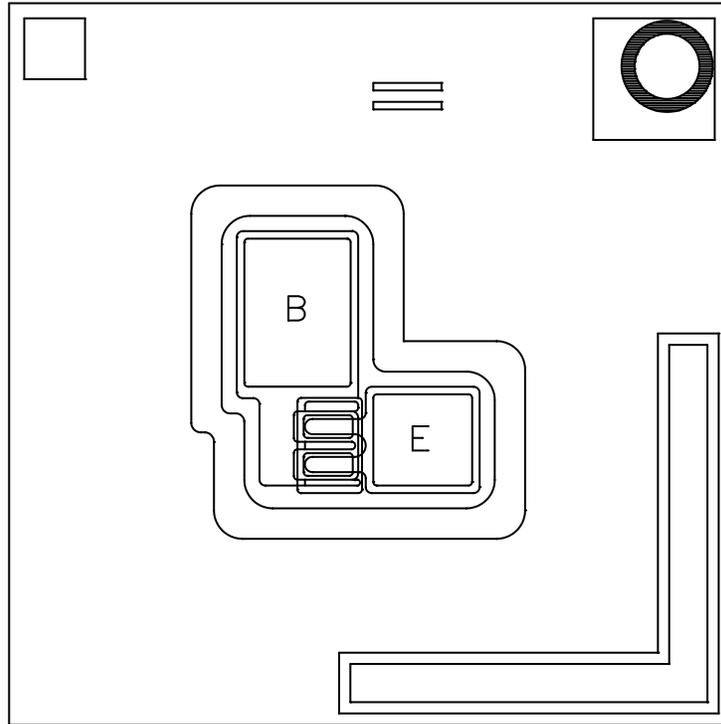
Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.178	.195	4.52	4.95	
CH	.170	.210	4.32	5.33	
HD	.209	.230	5.31	5.84	
LC	.100 TP		2.54 TP		3
LD		.021		0.53	4, 5
LL	.500		12.70		5, 6
LU	.016	.019	0.41	0.48	4, 5, 6
L1		.050		1.27	6
L2	.250		6.35		6
P	.100		2.54		
Q		.040		1.02	7
TL	.028	.048	0.71	1.22	8
TW	.036	.046	0.91	1.17	
r	45° TP		45° TP		



NOTES:

1. Dimensions are in inches. Millimeters equivalents are given for general information only.
2. Lead 1 = emitter, lead 2 = base, lead 3 = collector. The collector shall be internally connected to the case.
3. When measured in a gauging plane $.054 +.001 - .000$ inch ($1.37 +0.03 -0.00$ mm) below the seating plane of the transistor, maximum diameter leads shall be within $.007$ inch (0.18 mm) of their true location relative to a maximum width tab. Smaller diameter leads shall fall within the outline of the maximum diameter lead tolerance.
4. Measured in the zone beyond $.250$ inch (6.35 mm) from the seating plane.
5. All 3 leads.
6. Symbol LU applies between L1 and L2. Dimension LD applies between L2 and LL minimum. Lead diameter shall not exceed $.042$ inch (1.07 mm) within L1 and beyond LL minimum.
7. Details of outline in this zone are optional.
8. Measured from the maximum diameter of the actual device.
9. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions of TO-206AA (formerly TO-18) package.



NOTES:

- | | | |
|----|----------------|--|
| 1. | Die size: | .020 x .020 inch, ± 0.002 inch (0.51 x 0.51 mm, ± 0.05 mm). |
| 2. | Die thickness: | .010 inch ± 0.0015 inch (0.25 mm ± 0.038 mm) nominal. |
| 3. | Top metal: | Aluminum 10,000 Å min, 12,000 Å nominal. |
| 4. | Back metal: | a. Al/Ti/Ni/Ag 12 kÅ/ 3 kÅ/ 7 kÅ/ 7 kÅ min., 15 kÅ/ 5 kÅ/ 10 kÅ/ 10 kÅ.
b. Gold 2,500 Å minimum, 3,000 Å nominal.
c. Eutectic mount - no gold. |
| 5. | Backside: | Collector. |
| 6. | Bonding pads | B = .004 x .0045 inch (0.102 x 0.114 millimeters).
E = .0045 x .005 inch (0.114 x 0.127 millimeters). |

FIGURE 2. JANHC (A-version) die dimensions.

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 manufacturer's list (QML) 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.

$R_{\theta JA}$	Thermal resistance junction to ambient.
$R_{\theta JC}$	Thermal resistance junction to case.
$R_{\theta JSP(AM)}$	Thermal resistance junction to solder pads (adhesive mount to PCB).

3.4 Interface and physical dimensions. The interface requirements and physical dimensions shall be as specified in [MIL-PRF-19500](#) and on [figure 1](#) (TO-206AA) and [figure 2](#) (unencapsulated die) herein.

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

3.4.2 Pin out. The pin out of the device types shall be as shown on [figures 1](#) and [2](#).

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in [1.3](#), [1.4](#), and [table I](#) herein.

3.6 Marking. Marking shall be in accordance with [MIL-PRF-19500](#). At the option of the manufacturer, marking of the country of origin may be omitted from the body of the transistor, but shall be retained on the initial container.

3.7 Workmanship. 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 [tables I](#) and [II](#)).

4.2 Qualification inspection. Qualification inspection shall be in accordance with [MIL-PRF-19500](#), and as specified herein.

4.2.1 Unencapsulated die (JANHC). Qualification of unencapsulated die shall be as specified in [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 II](#) tests, the tests specified in [table II](#) herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

4.3 Screening.

4.3.1 Screening of packaged devices (quality level JANTX only). Screening of packaged devices 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
	JANTX level
3c (1)	Transient thermal impedance method 3131 of MIL-STD-750 (see 4.5.3)
7	Optional
11	I_{CB01} and h_{FE2}
12	See 4.3.1.1
13	Subgroup 2 of table I herein; ΔI_{CB01} = 100 percent of initial value or 10 nA dc, whichever is greater; Δh_{FE2} = ± 15 percent of initial value.
14	Required

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

4.3.1.1 Power burn-in conditions. The power burn-in conditions shall be as follows: V_{CB} equal to 10 to 30 V dc; power shall be applied to achieve T_J equal to +135°C minimum and a minimum power dissipation equal to 75 percent of maximum rated P_T (see 1.3). NOTE: No heat sink or forced air cooling on the devices shall be permitted.

4.3.2 Screening of unencapsulated die (JANHC). Screening of unencapsulated die shall be in accordance with appendix G of MIL-PRF-19500. The burn-in duration for the JANHC level shall follow the JANTX requirements of table E-IV of MIL-PRF-19500. As a minimum, unencapsulated die shall be 100 percent probed in accordance with table I, subgroup 2 herein.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein.

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. End-point electrical measurements shall be in accordance with table I, subgroup 2 herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified in table E-VIC (small die flow) of MIL-PRF-19500 and herein. Delta measurements shall be taken after each step and shall be in accordance with table I, subgroup 2 and 4.6 herein.

<u>Step</u>	<u>Method</u>	<u>Condition</u>
1	1026	Steady-state operation life: 1,000 hours minimum, $V_{CB} = 10$ V dc, power shall be applied to achieve $T_J = +150^\circ\text{C}$ minimum using a minimum of $P_D = 75$ 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, $T_A = +150^\circ\text{C}$, $V_{CB} = 80$ percent of rated voltage, 48 hours minimum. $n = 45$ devices, $c = 0$.
3	1032	High-temperature life (non-operating), $t = 340$ hours, $T_A = +200^\circ\text{C}$. $n = 22$, $c = 0$.

4.4.2.1 Sample selection. Samples selected for group B inspection shall meet all of the following:

- a. Samples shall be selected randomly from a minimum of three wafers (or from each wafer in the lot) from each wafer lot. See MIL-PRF-19500.
- b. Shall be chosen from an inspection lot that has been submitted to and passed table I, 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 may be pulled prior to the application of final lead finish.
- c. Separate samples may be used for each step.

4.4.2.2 Failures. 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.

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 herein. Delta measurements shall be in accordance with 4.6.

4.4.3.1 Subgroup details for quality levels JAN and JANTX.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
C2	2036	Test condition E.
C5	3131	R _{θJA} only, as applicable (see 1.3).
C6		Not applicable.

4.4.3.2 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 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 herein. Delta measurements shall be in accordance with 4.6.

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

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

4.5.2 Real part of small-signal short-circuit input impedance. Test shall be conducted in accordance with method 3266 of MIL-STD-750 except that capacitor "c" as shown in the test circuit shall be removed and connected directly across the collector-emitter output.

4.5.3 Transient thermal impedance. The transient thermal impedance measurements shall be performed 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). The transient thermal impedance limit used in screen 3c and table I, subgroup 2 shall be set statistically by the supplier over several die lots and submitted to the qualifying activity for approval. See table II, subgroup 4 herein.

4.6 Delta measurements. The delta measurements for groups B, C, and E shall be as specified below.

Step	Inspection (1) (2) (3) (4)	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)	Δh_{FE2}	±25 percent change from initial value		

- (1) Devices which exceed the table I limits for this test shall not be accepted.
- (2) The delta measurements for group B inspection (see 4.4.2 herein and table E-VIC of MIL-PRF-19500), all quality levels, shall be as follows: The step listed above shall be performed after each step in 4.4.2.
- (3) The delta measurements for group C inspection (see 4.4.3 herein), all quality levels, shall be as follows: In addition to the measurements specified for subgroup 6 of table E-VII of MIL-PRF-19500, the measurements of step 1 shall also be taken.
- (4) The delta measurements for group E inspection (see 4.4.4 herein), all quality levels, shall be as follows: In addition to the measurements specified for subgroups 1 and 2 of table E-IX of MIL-PRF-19500, the measurements of step 1 shall also be taken.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u> 2/						
Visual and mechanical examination 3/	2071	n = 45 devices, c = 0				
Solderability 3/	2026	n = 15 leads, c = 0				
Resistance to solvents 3/ 4/	1022	n = 15 devices, c = 0				
Salt atmosphere	1041	N = 6 devices, c = 0 (for laser marked devices only)				
Temp cycling 3/	1051	Test condition C, 25 cycles; n = 22 devices, c = 0				
End-point electrical measurements		Table I , subgroup 2				
Hermetic seal 5/ Fine leak Gross leak	1071	n = 22 devices, c = 0				
Bond strength 3/	2037	Precondition T _A = +250°C at t = 24 hours or T _A = +300°C at t = 2 hours n = 11 wires, c = 0				
Decap internal visual (design verification)	2075	n = 4 devices, c = 0				
<u>Subgroup 2</u>						
Transient thermal impedance	3131	See 4.5.3	Z _{θJX}			°C/W
Breakdown voltage collector to base	3001	Bias condition D; I _C = 1.0 μA dc	V _{(BR)CBO}	40		V dc
Breakdown to voltage emitter to base	3026	Bias condition D; I _E = 10 μA dc	V _{(BR)EBO}	5.0		V dc
Breakdown voltage, collector to emitter	3011	Bias condition D; I _C = 10 mA dc; pulsed (see 4.5.1)	V _{(BR)CEO}	15		V dc
Breakdown voltage, collector to emitter	3011	Bias condition B; I _C = 10 mA dc; R _{BE} ≤ 10 ohms; pulsed (see 4.5.1)	V _{(BR)CER}	20		V dc
Collector to base cutoff current	3036	Bias condition D; V _{CB} = 20 V dc	I _{CB01}		25	nA dc
Emitter to base cutoff current	3061	Bias condition D; V _{EB} = 4 V dc	I _{EBO}		80	nA dc

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u> - Continued						
Forward-current transfer ratio	3076	$V_{CE} = 1 \text{ V dc}; I_C = 0.5 \text{ mA dc}$	h_{FE1}	15		
Forward-current transfer ratio	3076	$V_{CE} = 1 \text{ V dc}; I_C = 10 \text{ mA dc};$ pulsed (see 4.5.1)	h_{FE2}	40	120	
Saturation voltage (collector to emitter)	3071	$I_C = 10 \text{ mA dc}; I_B = 1 \text{ mA dc}$	$V_{CE(SAT)1}$.40	V dc
Base emitter voltage (saturated)	3066	Test condition A; $I_C = 10 \text{ mA dc}; I_B = 1 \text{ mA dc}$	$V_{BE(SAT)1}$.72	.80	V dc
Base emitter voltage (saturated)	3066	Test condition A; $I_C = 1 \text{ mA dc}; I_B = 0.1 \text{ mA dc}$	$V_{BE(SAT)2}$.72	V dc
<u>Subgroup 3</u>						
High-temperature operation:		$T_A = +150^\circ\text{C}$				
Collector to base cutoff current	3036	Bias condition D; $V_{CB} = 20 \text{ V dc}; T_A = +125^\circ\text{C}$	I_{CB02}		15	$\mu\text{A dc}$
Collector to emitter cutoff current	3041	Bias condition A; $V_{CE} = 20 \text{ V dc}; V_{BE} = 0.25 \text{ V dc}$	I_{CEX}		10	$\mu\text{A dc}$
Saturation voltage (collector to emitter)	3071	$I_C = 7 \text{ mA dc}; I_B = 0.7 \text{ mA dc}$	$V_{CE(SAT)2}$.40	V dc
Low-temperature operation:		$T_A = -55^\circ\text{C}$				
Forward-current transfer ratio	3076	$V_{CE} = 1.0 \text{ V dc}; I_C = 10 \text{ mA dc};$ pulsed (see 4.5.1)	h_{FE3}	15		
Base emitter voltage (saturated)	3066	Test condition A; $I_C = 7 \text{ mA dc}; I_B = 0.7 \text{ mA dc}$	$V_{BE(SAT)3}$.90	V dc
<u>Subgroup 4</u>						
Common emitter small-signal short-circuit forward-current transfer ratio	3306	$V_{CE} = 10 \text{ V dc}; I_C = 10 \text{ mA dc}; f = 100 \text{ MHz}$	$ h_{fe} $	3.0	9.0	
Open circuit output capacitance	3236	$V_{CB} = 10 \text{ V dc}; I_E = 0; f = 1 \text{ MHz}$	C_{obo}		6.0	pF
Input capacitance (output open-circuited)	3240	$V_{EB} = 0.5 \text{ V dc}; I_C = 0; f = 1 \text{ MHz}$	C_{ibo}		9.0	pF

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection ^{1/}	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u> - Continued						
Real part small-signal short-circuit input impedance	3266	$V_{CE} = 10 \text{ V dc};$ $I_C = 10 \text{ mA dc};$ $f = 300 \text{ MHz}$ (see 4.5.2)	RE_{nie}		50	Ω
Charge storage time		$I_C = I_{B1} = -I_{B21} = 10 \text{ mA dc}$ (see figure 3)	t_s		25	ns
Turn-on time		$I_C = 10 \text{ mA dc}; I_{B1} = 3 \text{ mA dc};$ $V_{BE(0)} = -2.0 \text{ V dc}$ (see figure 4)	t_{on}		40	ns
Turn-off time		$I_C = 10 \text{ mA dc}; I_{B1} = 3 \text{ mA dc};$ $I_{B2} = -1 \text{ mA dc};$ (see figure 4)	t_{off}		75	ns
<u>Subgroups 5, 6, and 7</u>						
Not applicable						

^{1/} For sampling plan, see MIL-PRF-19500.

^{2/} For resubmission of failed test in table I, subgroup 1, 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.

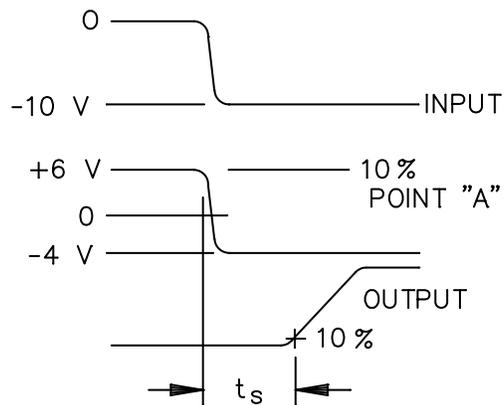
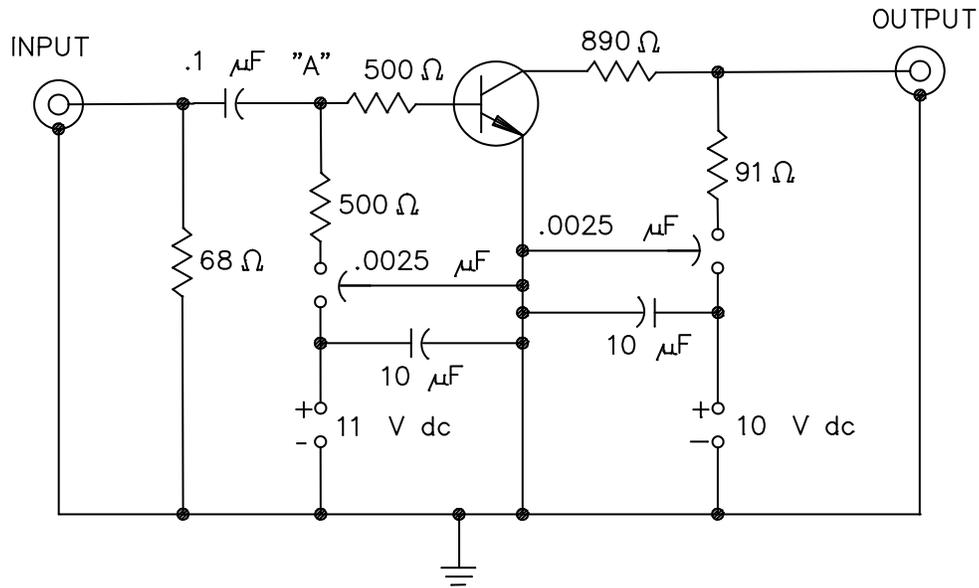
^{3/} Separate samples may be used.

^{4/} Not required for laser marked devices.

^{5/} This hermetic seal test is an end-point to temp-cycling in addition to electrical measurements.

TABLE II. Group E inspection (all quality levels) - for qualification or re-qualification only.

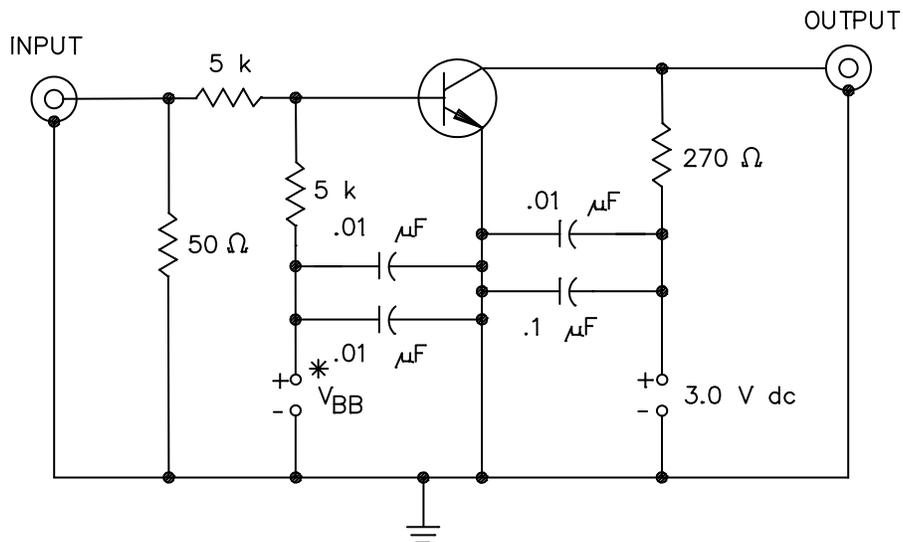
Inspection	MIL-STD-750		Qualification
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Temperature cycling (air to air)	1051	Test condition C, 500 cycles	
Hermetic seal Fine leak Gross leak	1071		
End-point electrical measurements		See table I , subgroup 2 and 4.6 herein.	
<u>Subgroup 2</u>			45 devices c = 0
Intermittent operation life	1037	$V_{CB} = 10$ V dc, 6,000 cycles. Adjust device current, or power, to achieve a minimum ΔT_J of +100°C.	
End-point electrical measurements		See table I , subgroup 2 and 4.6 herein.	
<u>Subgroup 4</u>			Sample size N/A
Thermal impedance curves		See MIL-PRF-19500 .	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 8</u>			45 devices c = 0
Reverse stability	1033	Condition B for devices < 400 V.	



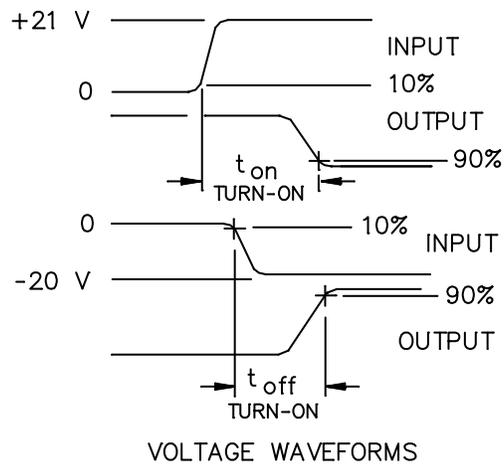
NOTES:

1. The input waveform is supplied by a pulse generator with the following characteristics:
 $Z_{out} = 50\Omega$, $t_r \leq 1 \text{ ns}$, $PW \geq 300 \text{ ns}$, duty cycle ≤ 2 percent.
2. Output waveforms are monitored on a sampling oscilloscope with the following characteristics:
 $Z_{in} \geq 100 \text{ k}\Omega$, $t_r \leq 1 \text{ ns}$.

FIGURE 3. Charge storage time.



* $V_{BB} = -4.0$ V dc FOR t_{ON} , $+17.0$ V dc FOR t_{off}



NOTES:

1. The input waveform is supplied by a pulse generator with the following characteristics: $Z_{out} = 50\Omega$, $t_r \leq 1$ ns, $PW \geq 300$ ns, duty cycle ≤ 2 percent.
2. Output waveforms are monitored on a sampling oscilloscope with the following characteristics: $Z_{in} \geq 100$ k Ω , $t_r \leq 1$ ns.

FIGURE 4. Turn-on and turn-off 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. Transistors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

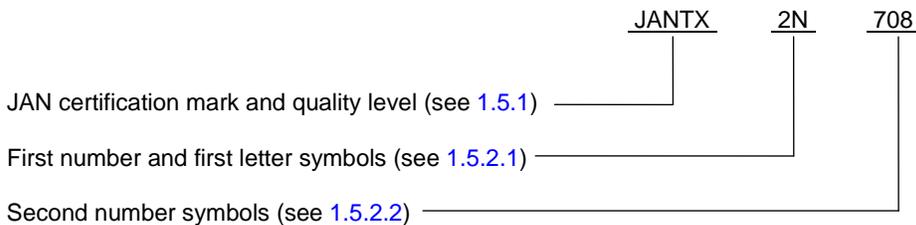
6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Lead finish (see 3.4.1).
- d. The complete PIN, see 1.5, 6.4 and 6.5.

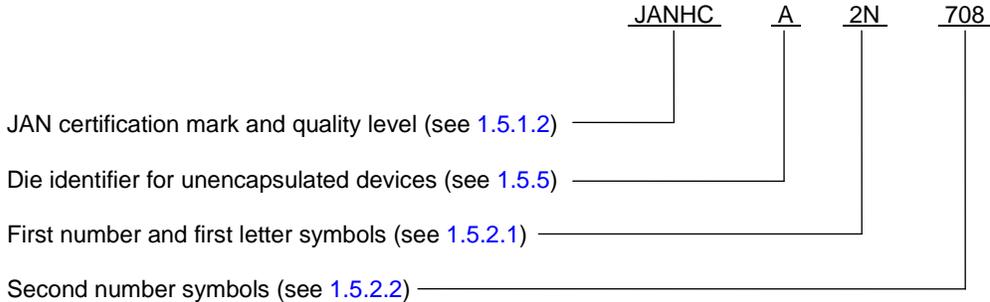
6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention 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, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil.

6.4 PIN construction examples.

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



6.4.2 Un-encapsulated devices. The PINs for un-encapsulated devices are constructed using the following form.



6.5 List of PINS.

6.5.1 Encapsulated devices. There is currently only two possible PINs for encapsulated devices on this specification sheet. They are JAN2N708 and JANTX2N708.

6.5.2 Un-encapsulated devices. There is currently only one possible PIN for unencapsulated devices available on this specification sheet. It is JANHCA2N708.

6.6 Suppliers of JANHC die. The qualified JANHC suppliers with the applicable letter version (example, JANHCA2N708) will be identified on the QML.

JANHC ordering information	
PIN	Manufacturer
	43611
2N708	JANHCA2N708

6.7 Supersession information and superseded PINs.

6.7.1 Lead finish. The original issue of this specification through MIL-S-19500/312A(USAF) with amendment 1 (3 March 1966) did not specify a lead finish. MIL-S-19500/312B (23 February 1967) specified that the lead finish as "gold-plated". That same revision also allowed for "tin coated" as an option. Tin is no longer acceptable as a lead finish.

6.7.2 Lead material. Because of the performance format of this document, lead material is no longer specified.

6.8 Request for new types and configurations. Requests for new device types or configurations for inclusions in this specification sheet should be submitted to: DLA Land and Maritime, ATTN: VAC, Post Office Box 3990, Columbus, OH 43218-3990 or by electronic mail at "Semiconductor@dla.mil" or by facsimile (614) 693-1642 or DSN 850-6939.

6.9 Changes from previous issue. The margins of this specification are marked with vertical lines 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
DLA – CC

Preparing activity:
DLA – CC
(Project 5961-2015-053)

Review activities:
Army – AR, MI, SM
Navy – AS, MC, OS, SH
Air Force –19

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>.