REQUIREMENTS:

1. GENERAL:
   A. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
   B. UNITS SHALL MEET THE REQUIREMENTS OF MIL-S-19500 EXCEPT AS, AND IN ADDITION TO, THE REQUIREMENTS SPECIFIED HEREIN.
   C. SUPPLIER SHALL CONFORM TO THE QUALITY ASSURANCE PROVISIONS CONTAINED IN ND 1015404, CLASS 2.
   D. MARKING: UNITS SHALL BE MARKED IN ACCORDANCE WITH ND 1002019 WITH THE MANUFACTURER'S IDENTIFICATION, DATE CODE, KEYING STRIPE AND THE NUMBER 321.
   E. PREPARATION FOR DELIVERY SHALL BE IN ACCORDANCE WITH ND 1002215, CLASS I, CODE 2.

2. ACCEPTANCE AND INSPECTION: QUALITY DEMONSTRATION PER TABLES I, II, AND III.
   A. DEFINITION: A LOT IS DEFINED AS A GROUP OF PARTS IN A SINGLE PROCUREMENT SELECTED FROM A SINGLE CONTINUOUS PRODUCTION RUN USING LIKE MATERIALS WHICH ARE CONTROLLED USING A PROCESS WHICH IS THE SAME FROM THE BEGINNING TO THE END OF THE RUN. MAXIMUM SHIPPED NUMBER OF UNITS IN ANY LOT SHALL BE 5000 UNITS.
   B. TEST CONDITIONS:
      (1) THE TESTS AS DEFINED IN TABLES I, II, AND III SHALL BE PERFORMED BY THE QUALITY CONTROL DEPARTMENT OF THE VENDOR.
      (2) UNLESS OTHERWISE SPECIFIED HEREIN ALL ELECTRICAL TESTS MUST BE REFERENCED TO AN AMBIENT TEMPERATURE OF PLUS 25 PLUS OR MINUS 1/2 DEGREE CENTIGRADE.
      (3) THE PRE-SEAL TEST PER TABLE I SHALL BE PERFORMED AFTER THE FINAL PRODUCTION INTERNAL VISUAL INSPECTION AND PRIOR TO SEALING.
   C. VENDOR SUPPLIED DATA:
      (1) DATA FROM TABLE I AND II SHALL ACCOMPANY THE LOT WHEN SHIPPED TO THE PURCHASER. UNITS USED IN QUALITY DEMONSTRATION TESTS OF TABLE III SHALL NOT BE SHIPPED AS PART OF THE DELIVERY BUT SHALL BE FURNISHED ALONG WITH THE TEST DATA FROM TABLE III UNDER SEPARATE COVER TO THE PURCHASER, ATTENTION: PURCHASING AGENT.
      (3) THE DATA SUPPLIED PER TABLE II SHALL INCLUDE THE NUMBER OF UNITS REJECTED PER THE TEST, THE CAUSE OF REJECTION, AND THE DATE CODE OF THE UNITS TESTED.
      (4) THE DATA SUPPLIED PER TABLE III SHALL INCLUDE THE NUMBER OF UNITS REJECTED PER THE TEST, THE CAUSE FOR REJECTION BY SERIAL NUMBER AND THE DATE CODE OF THE UNITS.
   D. SELECTION OF UNITS FOR TEST:
      (1) THE SAMPLE USED FOR TABLE II SHALL BE RANDOMLY SELECTED FROM THE ENTIRE GROUP OF UNITS WHICH CONSTITUTE A LOT.
      (2) A LOT MAY BE RESUBMITTED FOR TABLE II AND TABLE III ONCE. THE REQUIREMENT OF MIL-S-1900c FOR LOT RESUBMITTAL SHALL APPLY WITH THE TIGHTENED INSPECTION FOR THE CHARACTERISTICS WHICH FAILED.
      (3) UNITS USED IN TESTING SUBGROUP 2 OF TABLE III, SUBGROUPS 1 AND 5 MAY BE ELECTRICAL REJECTS FROM THE SAME LOT.
      (4) ACCEPTABLE UNITS USED IN TESTING SUBGROUP 2 OF TABLE II SHALL BE USED IN SUBGROUPS 2, 3, AND 4 OF TABLE III. IN TABLE III ACCEPTABLE UNITS FROM SUBGROUP 2 MAY BE USED IN SUBGROUP 5.
      (5) AFTER COMPLETION OF TESTS, UNITS USED IN SUBGROUP 3 OF TABLE III SHALL BE USED IN SUBGROUPS 6 OF TABLE III.

DIMENSIONS ARE IN INCHES -- INSTRUMENTATION LAB MANNED SPACECRAFT CENTER CAMBRIDGE, MASS.
CAPACITOR VALUES ARE IN MUF.
RESISTOR VALUES ARE IN OHMS.
TOLERANCES ON DIMENSIONS ARE IN CHIN.
FRACTIONS DECREAD AS NUMERALS.
DO NOT SCALE THIS DRAWING.

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E. DATE CODE:

(1) Units shall be date coded indicating the week sealing operation was performed. An additional letter may be added to the date code to separate lots for the purpose of traceability.

3. DESIGN:

A. Absolute maximum ratings at 25°C ambient:

(1) Voltage to pin 10: Plus 10.0 volts with respect to pin 5.
(2) Voltage applied to any input pin plus or minus 4 volts with respect to pin 5.
(4) Thermal resistance, junction-ambient, (θJA): 500°C/watt.

B. Temperature:

(1) Temperature range, junction, operating: -55°C to +125°C.
(2) Temperature range, junction, storage: -65°C to +150°C.
(3) Temperature, soldering leads: +250°C (1 minute max).

C. Construction:

(1) Semiconductor: Silicon, NPN.
(2) Enclosure: See figure, hermetically sealed and electrically isolated from power or ground.
(3) Leads:

   Lead material shall be in accordance with NASA document PS 1015402 with the following exceptions:

   Gold plate shall be a minimum of 100 and a maximum of 200 micro inches, the nickel strike under the gold shall be optional but if used shall be a minimum of 100 micro inches, and paragraph 3.4.2. shall not apply. Certificate of compliance for lead material shall accompany each lot shipped.

4. Test methods:

A. Lead fatigue: Leads shall be capable of withstanding the following lead bend test. The unit shall be held in a vertical position with a 2 ounce weight suspended from the lead to be tested. Two cycles of bending shall be performed, a cycle consisting of moving the body of the unit 45 degrees from the vertical in one direction, and back 45 degrees to the original position. No mechanical damage shall be evidenced after the test.

B. Lead tension: Each lead shall be capable of withstanding an axial pull of 1 pound minimum for 30 seconds. No mechanical damage shall be evidenced after the test.

C. Seal test:

The units shall be subjected to the leak tests as specified in ND 1002246. A leakage rate of 5 x 10^-4 cc/atm/sec or greater shall constitute a failure.

D. Average propagation delay (τp): Measurements shall be performed on each input using test circuit specified in figure 1 made up of acceptable units where τp = (τ1 + τ2)/2. Voltage 4V ± 10% during test all unused bases shall be grounded.
E. Operation life: An odd number of units (gates) shall be connected in series with the output of the last unit supplying the input to the first unit, thus forming a ring as shown in Figure 2 and Figure 3 with 5.5 or 10V DC applied to the power terminals of all units in the circuit ("Ring") connection must occur at the initiation of the test.

F. Visual and mechanical external examination:
- Markings shall be legible. The case finish shall have no flaking, spattering, chipping, or holes. The glass or ceramic shall have no seal impairing cracks. No foreign matter shall be in or on the seal interface. Leads shall be free from nicks and nicks shall maintain a uniform thickness within lead specifications. The units shall comply with the specified lead material requirements. Lead section (A) may be cut from the lead proper and shall not be subjected to physical examination. No body paint shall be on the leads or package seal area.

G. Pre-seal visual inspection: The pre-seal visual inspection shall be performed using the rejection criteria of No. 70257.

H. Emitter-base back bias test: All base inputs shall have minus 4 volts with respect to the common emitter connection. The DC current of Table 2 shall be performed before and after the emitter-base back bias test with a maximum tolerable change in Beta of ±10%.

---

**Table 2: Pre-seal Visual Inspection**

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Conditions</th>
<th>Sub Lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual internal inspection</td>
<td>See Note ZC(1) and 4G</td>
<td>LTPD = 7</td>
</tr>
</tbody>
</table>

**Dimensions to be measured:** Within ±0.01 of

Max body dimensions include all glassclimb body dim to be symmetrical about ±0.005 of C of L. Leads to be symmetrical within ±0.005 of pin 1. Lead dimensions to be measured within ±0.05 of package body.
### Table II

#### Acceptance Inspection

<table>
<thead>
<tr>
<th>Test</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Limits</th>
<th>Units</th>
<th>Lot</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUGROUP 1</strong>&lt;br&gt;Visual and Mechanical Examination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Voltage PIN 1, 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT. VOLT. PIN 1, 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Current PIN 1, 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COLLECTOR-EMITTER Threshold Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COLLECTOR Emitter Cutoff Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COLLECTOR Resistor Between Pins 10 and 1, 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.C. Current Gain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**<br>1. TPD PER MIL-S-19500C, TABLE IV<br>2. SAMPLE SIZE USED BY THE BUYER AND VENDOR SHALL BE THE SAME<br>3. AND SHALL CORRESPOND TO THE MAX ACC NUMBER SPECIFIED IN MIL-S-19500C, TABLE IV<br>4. MEASUREMENTS TO BE MADE ON GATE 1 AND GATE 2<br>5. TESTS TO BE PERFORMED IN SEQUENCE INDICATED

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**C REPLACED BY REV(D) WITH CHANGES**

**List of Materials**

- **DUAL NOR GATE**
  - **FLAT PACK**

**Specification Control Drawings**

- **NASA APPROVAL**
- **NASA DRAWING NO.**
- **NASA APPROVAL DATE**

---

**Master**

- **Heat Treatment**
- **APPLICATION**
- **FINISH**
- **NEXT ASSEMBLY**
- **USED ON**
- **FINAL FINISH**

---

**UNLESS OTHERWISE SPECIFIED**

- **DIMENSIONS ARE IN INCHES**
- **TOLERANCES ON**
- **FRACTIONS DECIMALS ANGLES**
- **DO NOT SCALE THIS DRAWING**
- **MATERIAL**

---

**MANNED SPACECRAFT CENTER**

- **DUAL NOR GATE**
  - **FLAT PACK**

**INSTRUMENTATION LAB**

- **CHECKED**
- **APPROVED**

**NASA APPROVAL**

- **CODE IDENT NO.**
- **SIZE**
- **NASA DRAWING NO.**
**Table III**

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Condition</th>
<th>Lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subgroup 1</td>
<td>Physical Dimension</td>
<td>Method 2066</td>
</tr>
<tr>
<td>Subgroup 2***</td>
<td>Thermal Shock</td>
<td>Method 1011, Condition B (150°C to -45°C, 3 cycles)</td>
</tr>
<tr>
<td>Subgroup 3***</td>
<td>Storage Life</td>
<td>Method 1031</td>
</tr>
<tr>
<td>Subgroup 4***</td>
<td>Operation Life</td>
<td>Method 1014, See Note 4 and Figure 2</td>
</tr>
<tr>
<td>Subgroup 5***</td>
<td>Lead Fatigue</td>
<td>Method 1041, See Note 4A</td>
</tr>
<tr>
<td>Subgroup 6***</td>
<td>Emitter-Base Back Bias</td>
<td>Method 1041, See Note 4B</td>
</tr>
</tbody>
</table>

**Figure 2**

Test Circuit - Power Burn In
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IM ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

B THIS SHEET ADDED

C REPLACED BY REV(D) WITH CHANGES

FIGURE I
AVERAGE PROPAGATION DELAY

GROUND ALL UNUSED INPUTS

+4V

3.6K

A

** B

UNIT UNDER TEST

NO CONNECTION TO PIN 10

GROUND ALL UNUSED INPUTS

+1V

0V

0.2 μSEC

INPUT PULSE

50%

50%

T1

T2

DUAL NOR GATE
(FLAT PACK)

SPECIFICATION CONTROL DRAWING

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

INSTRUMENTATION LAB

DRAWN
CHECKED
APPROVED
DATE

DO NOT SCALE THIS DRAWING

MATERIAL

DUAL NOR GATE

HEAT TREATMENT

SPECIFICATION

NASA APPROVAL

CODE BOOK NO.

INSTRUMENTATION LAB

NASA DRAWING NO.

1006321

NEXT ASSEMBLY

APPLICATION

FINISH

MT APPLICATION

MT FINISH

SHEET 6 OF 6