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 101540, class 2.
   d. markings: units shall be marked in accordance with ND 100219 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 1, code 2.
      (1) marking of shipping containers shall conform to the marking of unit and intermediate packages and the method of marking as specified in ND 1002215.

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 referred 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 forwarded along with the test data from table III under separate cover to the purchaser, attention‘ purchasing agent.
      (2) the data supplied per table I shall include the number of sub-lots tested, the number of units that failed from each sub-lot, the cause of failure, and the number of times the sub-lot was re-submitted. the maximum size for any sub-lot shall be 1000 units.
      (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 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.
      (7) after completion of tests, units used in subgroup 5 of table III shall be used in subgroups 6 of table III.
**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 HEREBY 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 IN 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.

**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.
3. Thermal resistance, junction-case: \( (\theta_{jc}) \): 200°C/Watt.
4. Thermal resistance, junction-ambient: \( (\theta_{ja}) \): 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 107402 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 maximum 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: (REF. MIL-STD-750 WITH EXCEPTIONS NOTED BELOW).**

**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 leak rate of 5 x 10^-8 cc/atm/sec or greater shall constitute a failure.

**D. AVERAGE PROPAGATION DELAY \( (T_{PD}) \):** Measurements shall be performed on each input using test circuit specified in figure 1 made up of acceptable units where \( T_{PD} = (T_{1} + T_{2})/2 \). Voltage AV ± 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, with a 5% DC applied to the power terminals of all units in the circuit ("ring") oscillation 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. Re-entrance at the glass, ceramic or solder seal shall not extend over 5% of the seal width. No foreign matter shall be in or on the seal interface. Leads shall be free from kinks and nicks. The leads shall maintain a uniform thickness within lead specifications. The units shall comply with the specified lead material requirement. Lead section (S) may be cut from the lead preform and shall not be subjected to physical examination. No body paint shall be on the leads or package seal area.

G. Presenal Visual Inspection: The presenal visual inspection shall be performed using the rejection criteria of ND 100237.

H. Emitter-Base Back Bias Test: All base inputs shall have minus 180 volts with respect to the common emitter connection. The dc current of Table II shall be performed before and after the emitter-base back bias test with a maximum tolerable change in beta of 10%.

Table 1

<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 20(2)</td>
<td>TYP* &amp; 7</td>
</tr>
<tr>
<td></td>
<td>Max ACC No = 1</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE II

<table>
<thead>
<tr>
<th><strong>TEST</strong></th>
<th><strong>SYMBOL</strong></th>
<th><strong>TEST CONDITIONS</strong></th>
<th><strong>LIMITS</strong></th>
<th><strong>UNITS</strong></th>
<th><strong>LOT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VISUAL AND MECHANICAL EXAMINATION</strong></td>
<td>-</td>
<td>PIN 2, 6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>BASE CURRENT</strong></td>
<td>1</td>
<td>-</td>
<td>152 uA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>OUTPUT VOLT. PIN 1, 9</strong></td>
<td>7</td>
<td>OPEN</td>
<td>-</td>
<td>42.01V</td>
<td>-</td>
</tr>
<tr>
<td><strong>SAT. VOLT. PIN 1, 9</strong></td>
<td>5</td>
<td>OPEN</td>
<td>-</td>
<td>870 ± 2V</td>
<td>-</td>
</tr>
<tr>
<td><strong>OUTPUT CURRENT PIN 1, 9</strong></td>
<td>10</td>
<td>-</td>
<td>42.01V</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>COLLECTOR-EMITTER THRESHOLD CURRENT</strong></td>
<td>1</td>
<td>-</td>
<td>42.01V</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>COLLECTOR CUTOFF CURRENT</strong></td>
<td>4</td>
<td>-</td>
<td>42.01V</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>EMITTER CUTOFF CURRENT</strong></td>
<td>3</td>
<td>-</td>
<td>42.01V</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>INTERFACE TEST</strong></td>
<td>4</td>
<td>OPEN</td>
<td>-</td>
<td>400 mV</td>
<td>-</td>
</tr>
<tr>
<td><strong>AVG. PROPAGATION DELAY</strong></td>
<td>4</td>
<td>-</td>
<td>24 nsec</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>COLLECTOR RESISTANCE</strong></td>
<td>4</td>
<td>-</td>
<td>30 - 200</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* **LTPO PER MIL-S-19500C, TABLE IV**
* **SAMPLE SIZE USED BY THE BUYER AND VENDOR SHALL BE THE SAME AND SHALL CORRESPOND TO THE MAX ACC NUMBER SPECIFIED IN MIL-S-19500C, TABLE IV**
* **MEASUREMENTS TO BE MADE ON GATE 1 AND GATE 2**
* **TEXTURED SAMPLING PROBE P6032 WITH 50X ATTENUATOR**
* **TEST TO BE PERFORMED IN SEQUENCE INDICATED**

---

**NOTE:**
- **LTPO:** Limited Time Production Order.
- **MIL-S-19500C:** MIL-Standard-19500C.
- **MAX ACC NO.:** Maximum Acceptance Number.
- **LOT:** Lot number.

---

**DUAL NOR GATE (FLAT PACK)**

**SPECIFICATION CONTROL DRAWING**

**MANUFACTURED BY:**

**DATE APPROVED:**

**NASA APPROVAL:**

**NASA DRAWING NO.:**

**SIZE:**

**CUTS:**

**SPECIFICATION:**

**INSTRUMENTATION LAB:**

**MANNED SPACECRAFT CENTER:**

**HEAT TREATMENT CODE:**

**IDENTIFYING NO.**

**NOMENCLATURE OR DESCRIPTION:**

**FIND NO.:**

**LIST OF MATERIALS:**

**INCHES:**

**DEGREES:**

**ANGLES:**

**DO NOT SCALE THIS DRAWING:**

**NASA:**

**REVISIONS:**

**INITIAL RELEASE:**

**DATE:**

**APPROVAL:**

**DRAWN BY:**

**CHECKED BY:**

**APPRAVED BY:**

---

**NOTE:**
- **LTPO PER MIL-S-19500C, TABLE IV**
- **SAMPLE SIZE USED BY THE BUYER AND VENDOR SHALL BE THE SAME AND SHALL CORRESPOND TO THE MAX ACC NUMBER SPECIFIED IN MIL-S-19500C, TABLE IV**
- **MEASUREMENTS TO BE MADE ON GATE 1 AND GATE 2.**
- **TEXTURED SAMPLING PROBE P6032 WITH 50X ATTENUATOR.**
- **TEST TO BE PERFORMED IN SEQUENCE INDICATED.**
TABLE III

<table>
<thead>
<tr>
<th>TEST</th>
<th>TEST CONDITION</th>
<th>LOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBGROUP 1</td>
<td>SEE NOTE 2 (D)</td>
<td>LTDP* = 20</td>
</tr>
<tr>
<td>PHYSICAL DIMENSION</td>
<td>METHOD 2056</td>
<td>MAX. ACC. NO. = 1</td>
</tr>
<tr>
<td>SUBGROUP 2</td>
<td>SEE NOTE 2 (D)</td>
<td>LTDP* = 7</td>
</tr>
<tr>
<td>THERMAL SHOCK</td>
<td>METHOD 100A, CONDITION B</td>
<td>(150°C TO -65°C, 5 CYCLES)</td>
</tr>
<tr>
<td>SEAL TEST</td>
<td>SEE NOTE 4 C</td>
<td></td>
</tr>
<tr>
<td>SUBGROUP 3</td>
<td>SEE NOTE 2O(4)</td>
<td>LTDP* = 5</td>
</tr>
<tr>
<td>STORAGE LIFE</td>
<td>METHOD 1081</td>
<td>(COMBINED)</td>
</tr>
<tr>
<td>SHOCK</td>
<td>METHOD 206B, 4000 G, 0.1 SEC</td>
<td></td>
</tr>
<tr>
<td>VIBRATION VARIABLE FREQUENCY</td>
<td>METHOD 206B, 4000 G, 0.1 SEC</td>
<td></td>
</tr>
<tr>
<td>CONSTANT ACCELERATION</td>
<td>METHOD 206B, 4000 G, 0.1 SEC</td>
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</tr>
<tr>
<td>SUBGROUP 4</td>
<td>SEE NOTE 2 (D)</td>
<td>LTDP* = 3</td>
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<tr>
<td>OPERATION LIFE</td>
<td>METHOD 1066</td>
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</tr>
<tr>
<td>SUBGROUP 5</td>
<td>SEE NOTE 2O(3)</td>
<td>LTDP* = 20</td>
</tr>
<tr>
<td>LEAD TENSION</td>
<td>SEE NOTE 4B</td>
<td></td>
</tr>
<tr>
<td>SUBGROUP 6</td>
<td>SEE NOTE 2O(5)</td>
<td>LTDP* = 15</td>
</tr>
<tr>
<td>EMITTER-BASE BACK BIAS</td>
<td>METHODS 2076</td>
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</tr>
</tbody>
</table>

VIEW SHOWN FOR AXIS REFERENCE ONLY

TABLE III (CONTINUED)

<table>
<thead>
<tr>
<th>TEST</th>
<th>SYMBOL</th>
<th>CONDITIONS</th>
<th>LIMIT</th>
<th>MIN</th>
<th>MAX</th>
<th>UNITS</th>
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</thead>
<tbody>
<tr>
<td>END POINTS FOR SUBGROUPS 2, 3, 4 AND 5</td>
<td></td>
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<tr>
<td>OUTPUT VOLTAGE, PIN 1, Vq</td>
<td>SAME AS</td>
<td></td>
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<tr>
<td>OUTPUT VOLTAGE, PIN 1, Vq</td>
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</tr>
<tr>
<td>OUTPUT CURRENT, PIN 1, IQ</td>
<td>SPECIFIED IN TABLE II</td>
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</tr>
<tr>
<td>COLLECTOR Emitter THRESHOLD CURRENT</td>
<td>Iem</td>
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<td></td>
</tr>
<tr>
<td>BASE CURRENT, 1, Ic</td>
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<tr>
<td>BASE CURRENT, 2, Ic</td>
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<td></td>
<td></td>
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<tr>
<td>BASE CURRENT, 3, Ic</td>
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<td></td>
</tr>
</tbody>
</table>

MANNED SPACECRAFT CENTER
DUAL NOR GATE (FLAT PACK)
SPECIFICATION CONTROL DRAWINGS

C 1006321