

# MILITARY SPECIFICATION

## MICROCIRCUITS, DIGITAL, CMOS, MONOLITHIC N-BIT ONE OF EIGHT DECODER

INACTIVE FOR NEW DESIGN AFTER DATE OF THIS REVISION

This specification is approved for use by the George C. Marshall Space Flight Center, National Aeronautics and Space Administration, and is available for use by all Departments and Agencies of the Department of Defense.

### 1. SCOPE

1.1 Scope. This specification covers the detail requirements for a monolithic silicon, silicon gate CMOS microcircuit. One product assurance class and a choice of case outlines and lead finishes are provided and are reflected in the complete part number.

1.2 Part number. The complete part number shall be as specified in MIL-M-38510, except that "JAN" or "J" certification shall not be used.

1.2.1 Device type. The device type shall be as follows:

| <u>Device type</u> | <u>Circuit</u>             |
|--------------------|----------------------------|
| 01                 | N-bit one of eight decoder |

1.2.2 Case outline. The case outline shall be designated as follows:

| <u>Outline letter</u> | <u>Case outline, (see MIL-M-38510, appendix C</u> |
|-----------------------|---------------------------------------------------|
| E                     | D-2 (16-lead, 1/4" x 7/8"), dual-in-line package  |
| F                     | F-5 (16-lead, 1/4" x 3/8"), flat package          |

### 1.3 Absolute maximum ratings.

|                                                        |           |                                       |
|--------------------------------------------------------|-----------|---------------------------------------|
| Storage-temperature range ( $T_{stg}$ )                | - - - - - | -65°C to +150°C                       |
| Case operating temperature range ( $T_C$ )             | - - -     | -55°C to +125°C                       |
| Supply voltage range ( $V_{DD} - V_{SS}$ )             | - - - - - | -0.5 V to +13 V                       |
| Power dissipation per package ( $P_D$ )                |           |                                       |
| For $T_C = -55^\circ\text{C}$ to $+100^\circ\text{C}$  | - - - - - | 500 mW                                |
| For $T_C = +100^\circ\text{C}$ to $125^\circ\text{C}$  | - - - - - | Derate linearly at 12 mW/°C to 200 mW |
| Device dissipation per output transistor               |           |                                       |
| For $T_C = -55^\circ\text{C}$ to $+125^\circ\text{C}$  | - - - - - | 100 mW                                |
| Input voltage range (all inputs)                       | - - - - - | -0.5 V to $V_{DD} + 0.5$ V            |
| DC input current (any one input)                       | - - - - - | +10 mA                                |
| Lead temperature (during soldering)                    |           |                                       |
| At distance 1/16 +1/32 inch (1.59 +0.79 mm)            |           |                                       |
| from case for 10 s maximum                             | - - - - - | +265°C                                |
| Maximum junction temperature ( $T_J$ )                 | - - - - - | +150°C                                |
| Thermal resistance, junction to case ( $\theta_{JC}$ ) |           |                                       |
| Case E                                                 | - - - - - | 0.0833°C/mW                           |
| Case F                                                 | - - - - - | .15°C/mW                              |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: George C. Marshall Space Flight Center, National Aeronautics and Space Administration (ATTN: EG02), Marshall Space Flight Center, AL 35812 using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

#### 1.4 Recommended operating conditions. (At $T_C = -55^\circ\text{C}$ to $+125^\circ\text{C}$ .)

|                                            |           |                                |
|--------------------------------------------|-----------|--------------------------------|
| Supply voltage range ( $V_{DD} - V_{SS}$ ) | - - - - - | 4 to 11 V                      |
| Input low voltage range ( $V_{IL}$ )       | - - - - - | 0 to 1.5 V at $V_{DD} = 5$ V   |
|                                            |           | 0 to 3 V at $V_{DD} = 10$ V    |
| Input high voltage range ( $V_{IH}$ )      | - - - - - | 3.5 V to 5 V at $V_{DD} = 5$ V |
|                                            |           | 7 V to 10 V at $V_{DD} = 10$ V |

## 2. APPLICABLE DOCUMENTS

2.1 Government specifications and standards. Unless otherwise specified, the following specifications and standards, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this specification to the extent specified herein.

### SPECIFICATION

#### MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

### STANDARD

#### MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

## 3. REQUIREMENTS

3.1 Detail specification. The individual item requirements shall be in accordance with MIL-M-38510, and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510, and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Logic diagram. The logic diagram shall be as specified on figure 2.

3.2.3 Functional diagram. The functional description shall be as specified in the truth table and timing diagram on figure 3.

3.2.4 Case outline. The case outlines shall be as specified in MIL-M-38510 and in 1.2.3 herein.

3.3 Lead material and finish. Lead material and finish shall be in accordance with MIL-M-38510.

3.4 Electrical performance characteristics. The electrical performance characteristics are as specified in table I and apply over the full recommended case operating temperature range unless otherwise specified.

3.5 Electrical test requirements. Electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table III.

3.6 Marking. Marking shall be in accordance with MIL-M-38510. At the option of the manufacturer, the country of origin may be omitted from the body of the microcircuit, but shall be retained on the initial container. The "JAN" or "J" certification mark shall not be used.

TABLE I. Electrical performance characteristics.

| Test                                      | Symbol                   | Conditions 1/<br>$V_{SS} = 0 \text{ V}$<br>$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$<br>Unless otherwise specified | Device<br>type | Limits |      | Unit |
|-------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------|--------|------|------|
|                                           |                          |                                                                                                                              |                | Min    | Max  |      |
| Positive clamping input<br>to $V_{DD}$    | $V_{IC(pos)}$            | $T_A = 25^\circ\text{C}$ , $V_{DD} = 0 \text{ V}$ ,<br>$V_{SS}$ Open, Outputs Open,<br>$I_I = 1 \text{ mA}$                  | 01             |        | 1.5  | V    |
| Negative clamping input<br>to $V_{SS}$    | $V_{IC(neg)}$            | $T_A = 25^\circ\text{C}$ , $V_{DD}$ Open,<br>$V_{SS} = 0 \text{ V}$ , Outputs Open,<br>$I_I = -1 \text{ mA}$                 | 01             |        | -1.5 | V    |
| Quiescent supply current                  | $I_{SS}$                 | $V_{DD} = 13 \text{ V}$ , any combination<br>of inputs                                                                       | 01             |        | -10  | A    |
| High level output<br>voltage              | $V_{OH1}$                | $V_{DD} = 10 \text{ V}$ , $I_{OH} = 1 \text{ A}$<br>(see table III for $V_I$ )                                               | 01             | 9.95   |      |      |
| Low level output<br>voltage               | $V_{OL1}$                | $V_{DD} = 10 \text{ V}$ , $I_{OL} = 1 \text{ A}$<br>(see table III for $V_I$ )                                               | 01             |        | 0.05 | V    |
| Output high (source)<br>current           | $I_{OH1}$                | $V_{DD} = 5 \text{ V}$ , $V_{OH1} = 4.6 \text{ V}$                                                                           | 01             | -1.5   |      | mA   |
|                                           | $I_{OH2}$                | $V_{DD} = 10 \text{ V}$ , $V_{OH2} = 9.5 \text{ V}$                                                                          | 01             | -3.0   |      |      |
| Output low (sink)<br>current              | $I_{OL1}$                | $V_{DD} = 5 \text{ V}$ , $V_{OL1} = 0.4 \text{ V}$                                                                           | 01             | 2.0    |      | mA   |
|                                           | $I_{OL2}$                | $V_{CC} = 10 \text{ V}$ , $V_{OL2} = 0.5 \text{ V}$                                                                          | 01             | 5.0    |      |      |
| Input leakage current<br>(any input)      | $I_{IH}$                 | $V_{DD} = 13 \text{ V}$ , $V_I = 13 \text{ V}$                                                                               | 01             |        | 100  | nA   |
|                                           | $I_{IL}$                 | $V_{DD} = 13 \text{ V}$ , $V_I = 0 \text{ V}$                                                                                | 01             |        | -100 |      |
| Propagation delay<br>(CE to output)       | $t_{PLH1}$<br>$t_{PHL1}$ | $V_{DD} = 5 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                    | 01             | 34     | 256  | ns   |
|                                           | $t_{PLH4}$<br>$t_{PHL4}$ | $V_{DD} = 10 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                   | 01             | 16     | 114  |      |
| Propagation delay<br>(NO, 1,2, to output) | $t_{PLH2}$               | $V_{DD} = 5 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                    | 01             | 40     | 296  | ns   |
|                                           | $t_{PLH5}$               | $V_{DD} = 10 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                   | 01             | 18     | 138  |      |
| Propagation delay<br>(NO, 1,2, to output) | $t_{PHL2}$               | $V_{DD} = 5 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                    | 01             | 25     | 176  | ns   |
|                                           | $t_{PHL5}$               | $V_{DD} = 10 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                   | 01             | 12     | 80   |      |
| Propagation delay<br>(CLK A to output)    | $t_{PLH3}$<br>$t_{PHL3}$ | $V_{DD} = 5 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                    | 01             | 36     | 268  | ns   |
|                                           | $t_{PLH6}$<br>$t_{PHL6}$ | $V_{DD} = 10 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                   | 01             | 16     | 120  |      |
| Transition time                           | $t_{TLH1}$<br>$t_{THL1}$ | $V_{DD} = 5 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                    | 01             |        | 60   | ns   |
|                                           | $t_{TLH2}$<br>$t_{THL2}$ | $V_{DD} = 10 \text{ V}$ , $C_L = 50 \text{ pF}$ ,<br>$R_L = 200 \text{ k}$                                                   | 01             |        | 33   |      |

TABLE II. Electrical test requirements

| MIL-STD-883<br>method | MIL-STD-883<br>test requirement                                                 | Subgroups (see table<br>III unless otherwise<br>specified) |
|-----------------------|---------------------------------------------------------------------------------|------------------------------------------------------------|
|                       |                                                                                 | Class B devices                                            |
| 5004                  | Interim electrical parameters<br>(pre burn-in)                                  | 1                                                          |
|                       | Interim electrical parameters<br>(between state burn-in and<br>dynamic burn-in) | Not applicable                                             |
|                       | Final electrical test<br>parameters                                             | 1*, 2, 7*, 8                                               |
| 5005                  | Group A electrical tests                                                        | 1, 2, 7, 8, 9                                              |
|                       | Group B electrical tests                                                        | None                                                       |
|                       | VZAP                                                                            | See 4.5.3                                                  |
|                       | Group C end-point electrical<br>parameters                                      | 1, 2, 7, 8                                                 |
|                       | Additional electrical subgroups<br>for group C periodic inspection              | 10                                                         |
|                       | Group D end-point electrical<br>parameters                                      | 1, 2, 7, 8                                                 |

\* PDA applies to subgroups 1 and 7 (see 4.2b).

3.7 Manufacturer eligibility. To be eligible to supply microcircuits to this specification a manufacturer shall have a manufacturer certification in accordance with MIL-M-38510 for at least one line; not necessarily the line producing the device type described herein.

3.8 Certification. Certification in accordance with MIL-M-38510 is not required for this device.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-M-38510 and methods 5005 and 5007 of MIL-STD-883, as applicable, except as modified herein.

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following modifications and additional criteria shall apply:

a. Burn-in test (method 1015 of MIL-STD-883).

(1) The burn-in test as described in 3.1.10 of method 5004 shall be performed as indicated. (3.1.11 and 3.1.12 are not required; 3.1.9 is required for class B devices.)

(2) For class B devices, the circuit shown on figure 4 shall be used.

b. The percent defective allowable (PDA) is specified as 10 percent for class B devices based on failures from group A, subgroups 1 and 7 (after cooldown) of final electrical test in accordance with method 5004 of MIL-STD-883, and with no intervening electrical measurements. If interim electrical parameter tests are performed prior to burn-in, failures resulting from pre burn-in screening may be excluded from the PDA. If interim electrical parameter tests prior to burn-in are omitted, then all screening failures shall be included in the PDA. The verified failures of group A, subgroups 1 and 7 after burn-in, divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent defective for that lot. The lot shall be accepted or rejected based on the PDA for the applicable device class.

c. Interim and final electrical parameters shall be as specified in table II, except interim electrical parameters test prior to burn-in is optional at the discretion of the manufacturer.

4.3 Qualification inspection. Qualification inspection is not required.

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510 and as specified herein. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4). Generic test data (see 6.6) may be used to satisfy the requirements for groups C and D inspections. Quality conformance inspection shall be completed on the specific devices covered by this specification before they are shipped.

4.4.1 Group A inspection. Group A inspection shall consist of the test subgroups and LTPD values shown in table I of method 5005 of MIL-STD-883 and as follows:

a. Tests shall be as specified in table II herein.

b. Subgroups 5 and 6 shall be omitted.

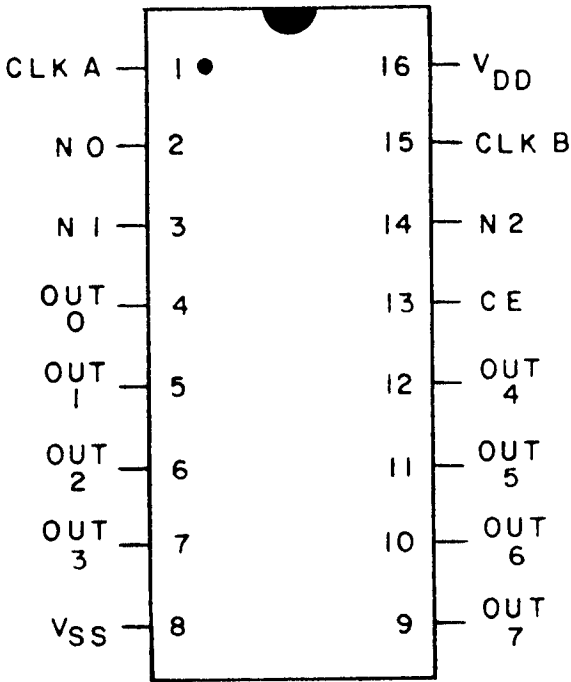


FIGURE 1. Terminal connections.

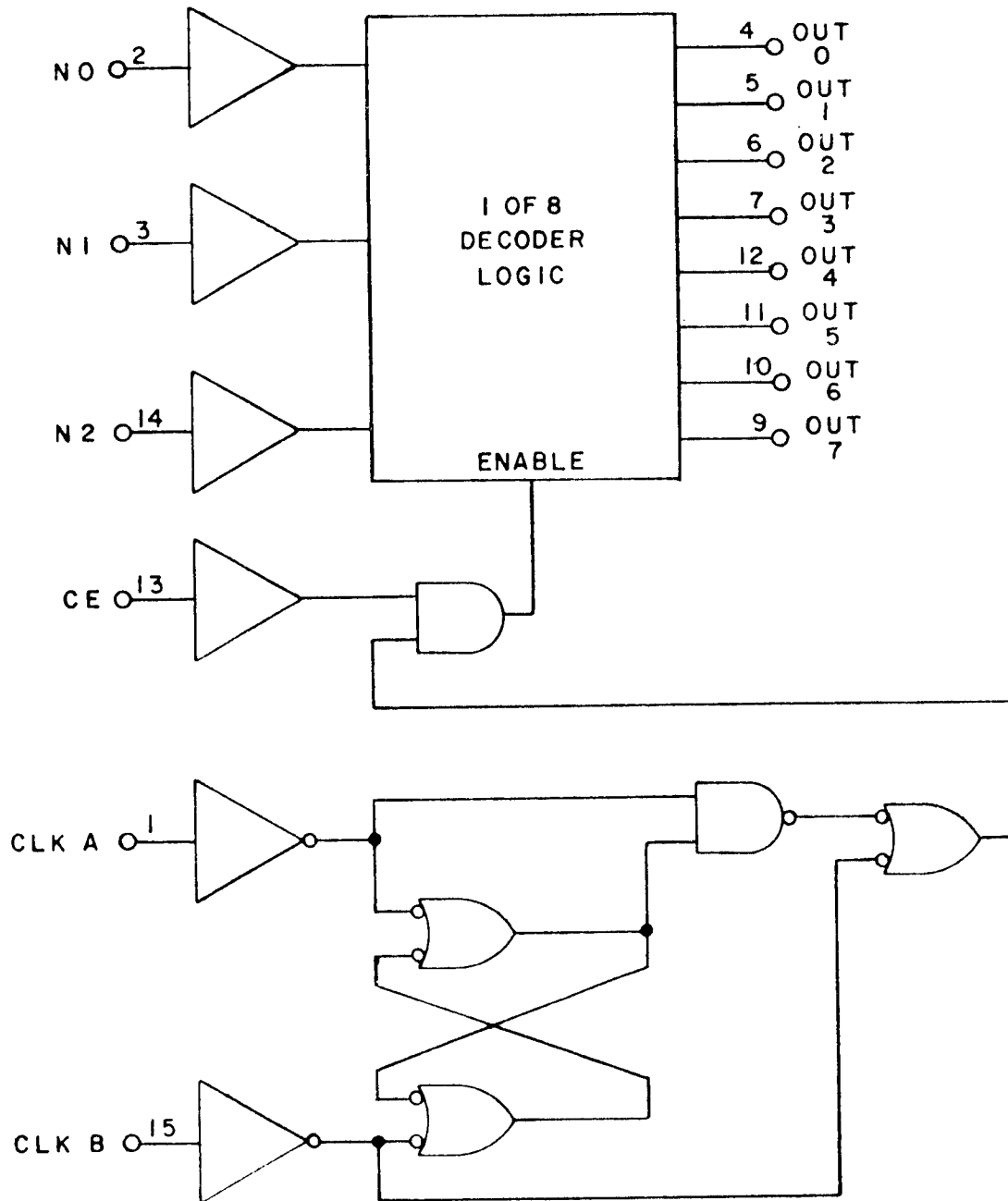


FIGURE 2. Logic diagram.

| CE | CLK A | CLK B | EN |
|----|-------|-------|----|
| 1  | 0     | 0     | #  |
| 1  | 0     | 1     | 1  |
| 1  | 1     | 0     | 0  |
| 1  | 1     | 1     | 1  |
| 0  | X     | X     | 0  |

1 = High level  
 0 = Low level  
 X = Don't care  
 EN = Internal enable signal - see timing diagram below and figure 2.  
 # = Dependent on previous state - see timing diagram below

| N2 | N1 | N0 | EN | Outputs |       |       |       |       |       |       |       |
|----|----|----|----|---------|-------|-------|-------|-------|-------|-------|-------|
|    |    |    |    | OUT 0   | OUT 1 | OUT 2 | OUT 3 | OUT 4 | OUT 5 | OUT 6 | OUT 7 |
| 0  | 0  | 0  | 1  | 1       | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 0  | 0  | 1  | 1  | 0       | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 0  | 1  | 0  | 1  | 0       | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 0  | 1  | 1  | 1  | 0       | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 1  | 0  | 0  | 1  | 0       | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 1  | 0  | 1  | 1  | 0       | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 1  | 1  | 0  | 1  | 0       | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 1  | 1  | 1  | 1  | 0       | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| X  | X  | X  | 0  | 0       | 0     | 0     | 0     | 0     | 0     | 0     | 0     |

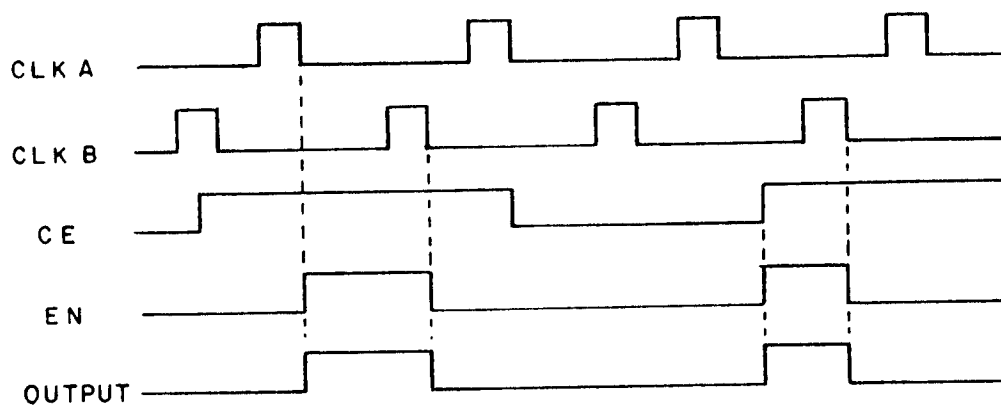
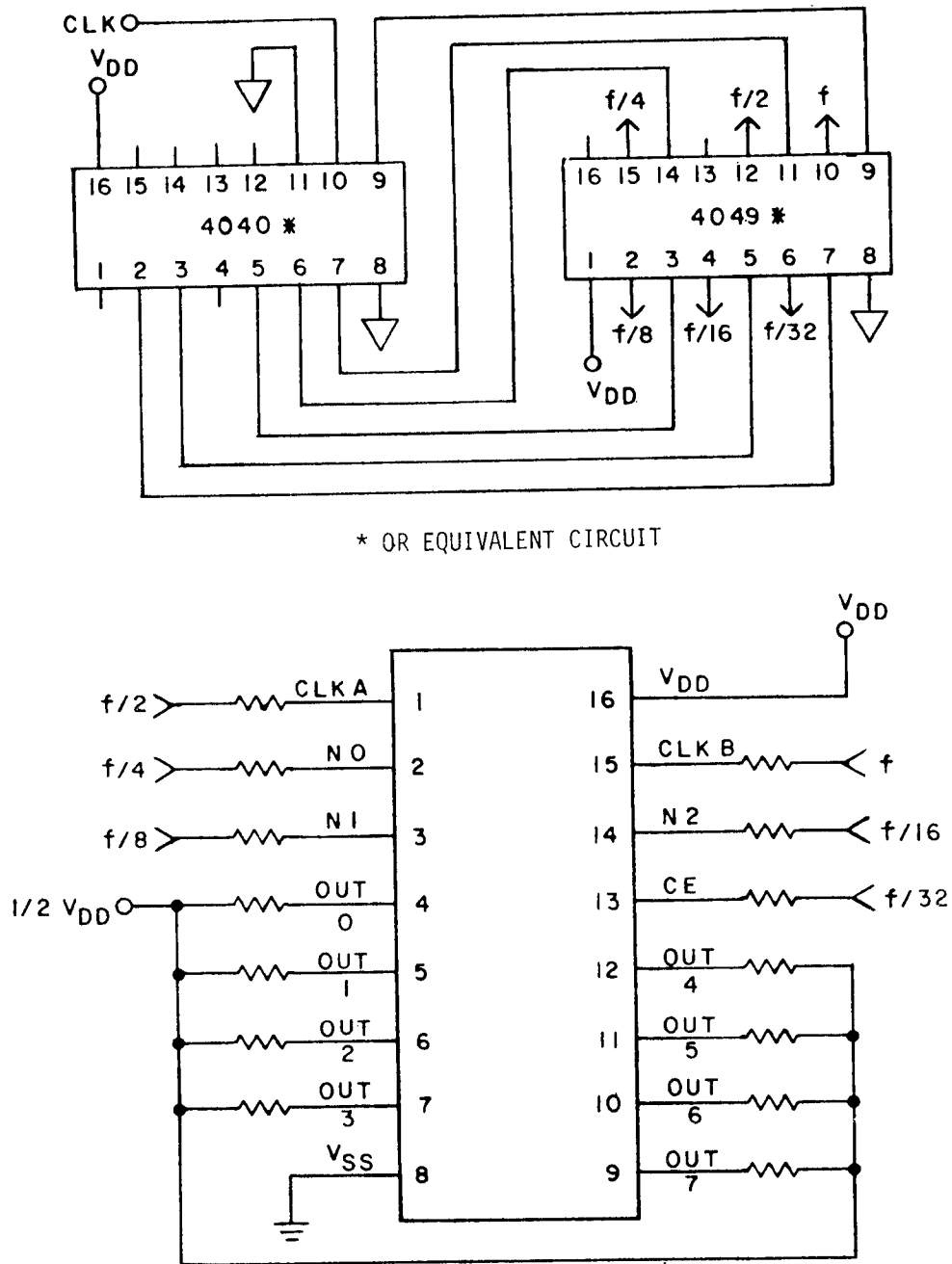


FIGURE 3. Truth table and timing diagram.



NOTES:

1. All resistors shall be  $47\text{ k}\Omega \pm 5\%$ .
2. CLOCK: 50 kHz square wave, amplitude =  $V_{DD}$ .
3.  $V_{DD} = 13\text{ V}$ .

FIGURE 4. Dynamic burn-in and steady state life test circuit.

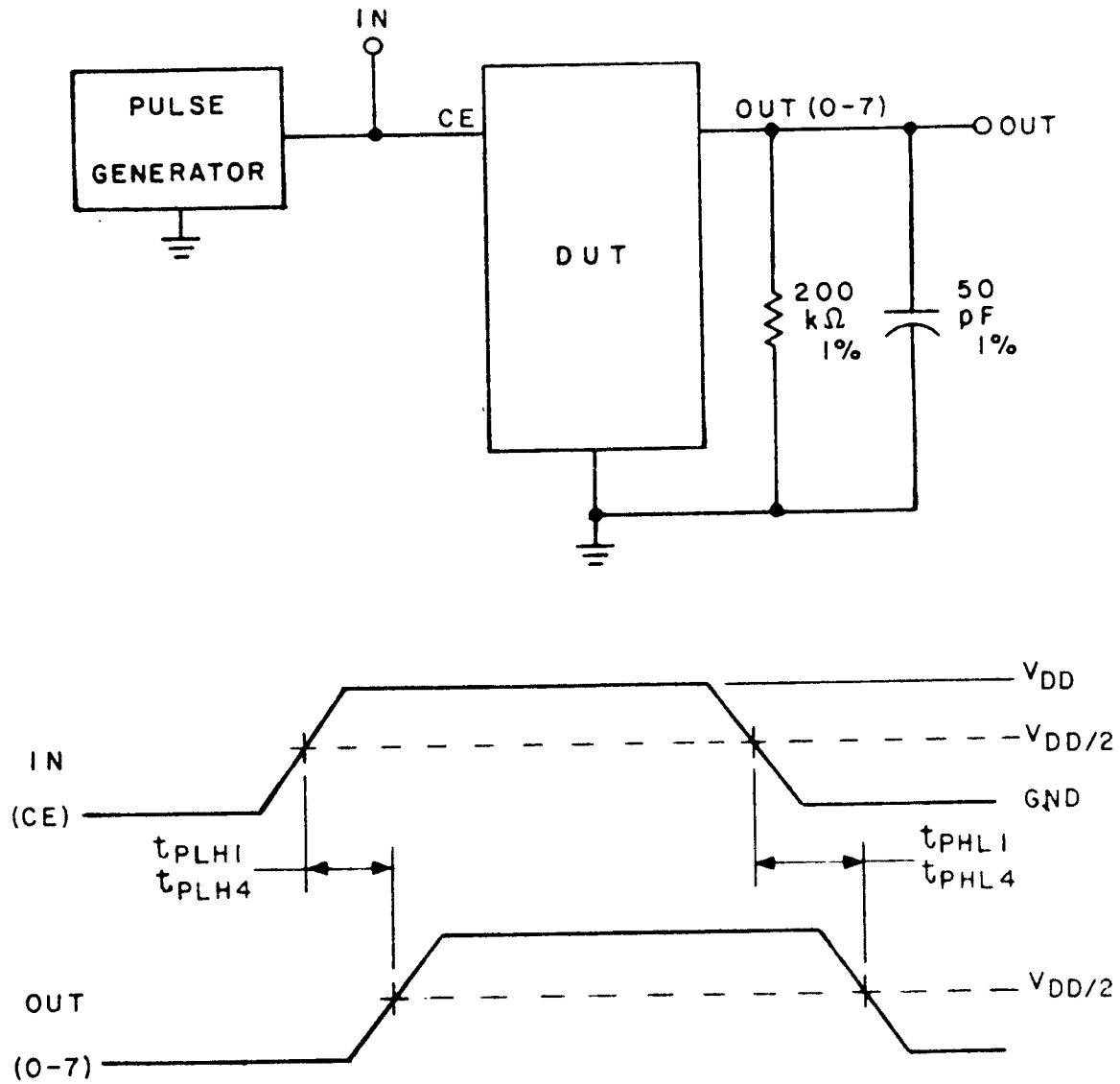


FIGURE 5a. Chip enable switching time test circuit and waveforms.

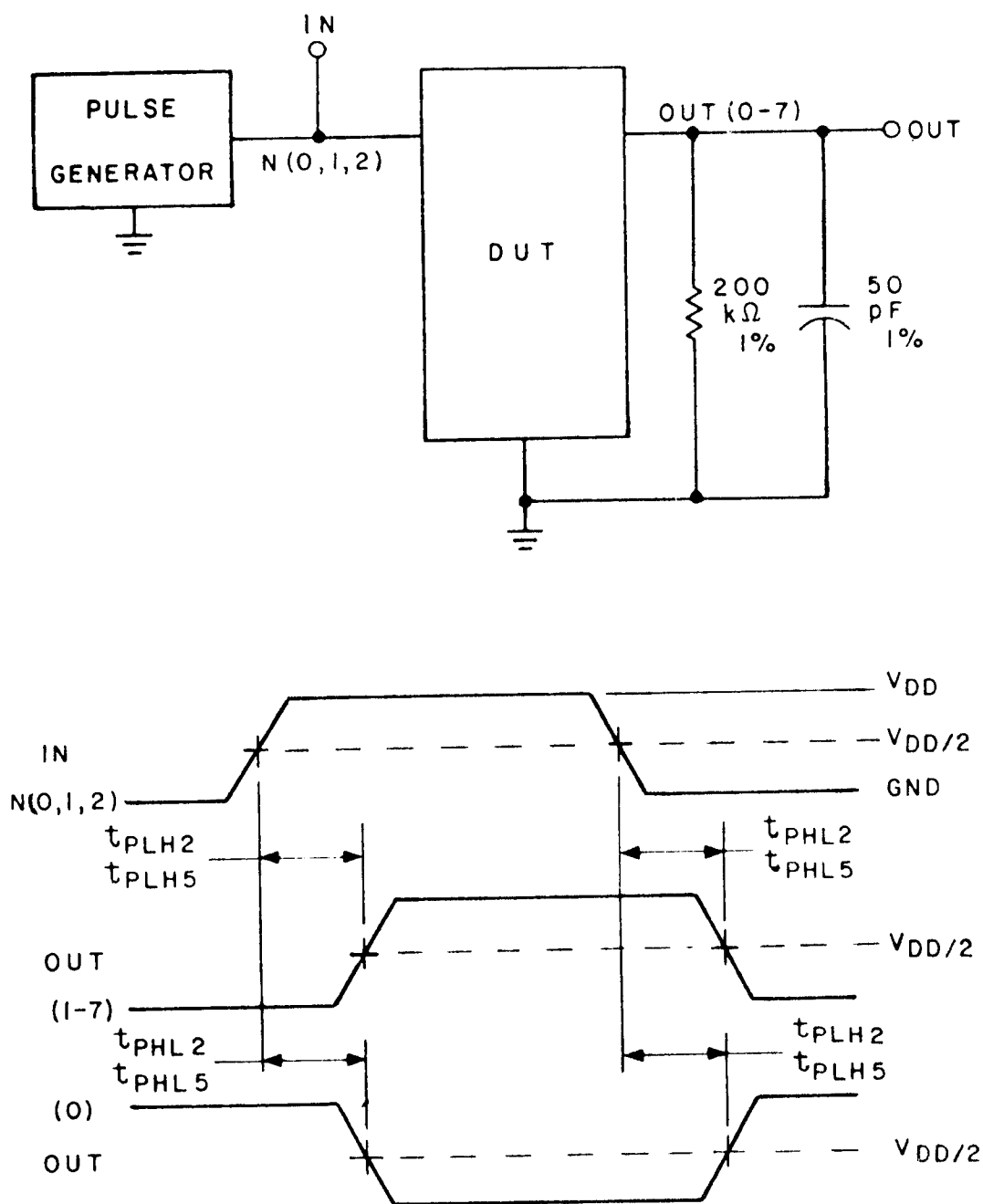
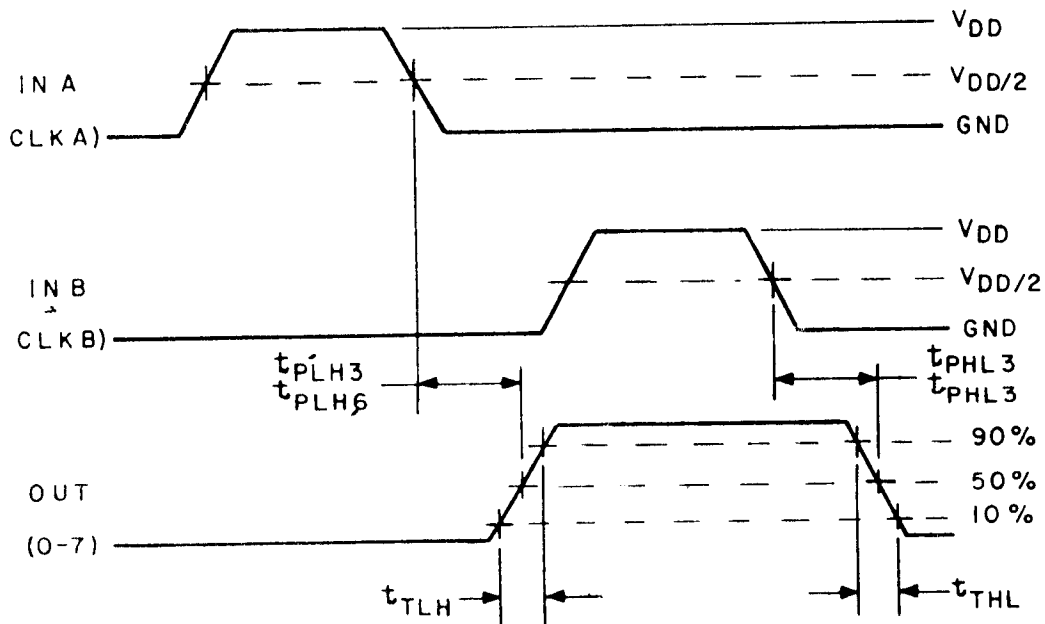
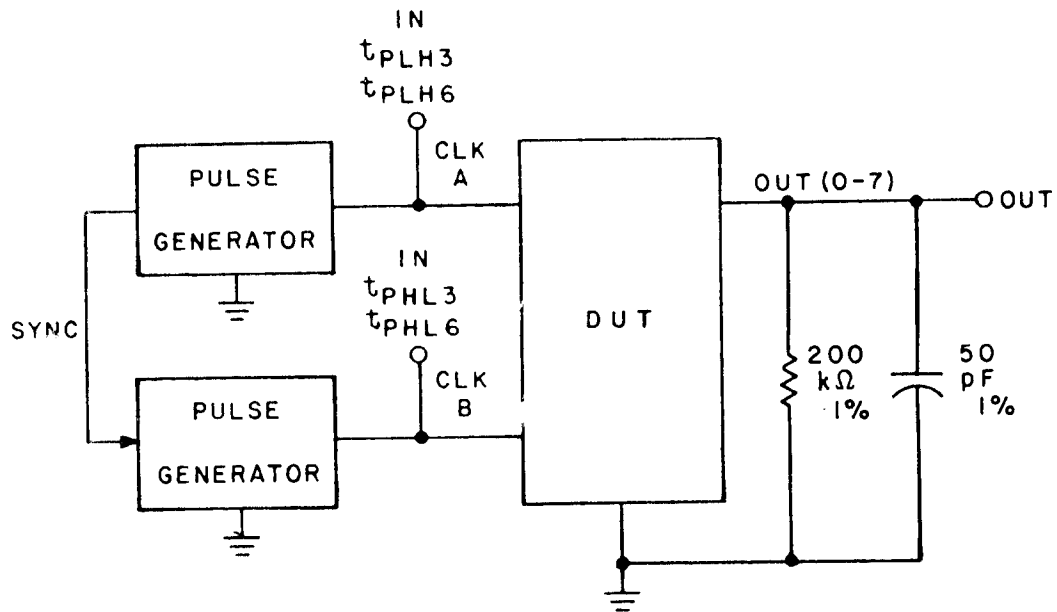


FIGURE 5b. Input (N) to output switching time test circuit and waveform.



NOTES FOR FIGURES 7a - 7c:

1. Pulse generator output: amplitude =  $V_{DD}$ ,  $t_{TLH}$  and  $t_{THL}$  =  $10 \pm 2$  ns.
2. See table III for complete terminal connections.
3. Load capacitance includes wiring and probe capacitance.

FIGURE 5c. Clock A and clock B to output switching time test circuit and waveform.

TABLE III. Group A inspection for device type 01.

| Symbol                | MIL-STD-883 method | Cases | Terminal conditions 1/ |    |    |     |     |     |     |     |     |     |    |    |     |     | Test limits       |            |        |            |        |            | Unit   |        |        |
|-----------------------|--------------------|-------|------------------------|----|----|-----|-----|-----|-----|-----|-----|-----|----|----|-----|-----|-------------------|------------|--------|------------|--------|------------|--------|--------|--------|
|                       |                    |       | CLK                    | NO | N1 | OUT | OUT | OUT | OUT | OUT | OUT | VSS | N2 | CE | CLK | VDD | Measured terminal | Subgroup 1 |        | Subgroup 2 |        | Subgroup 3 |        |        |        |
|                       |                    |       |                        |    |    |     |     |     |     |     |     |     |    |    |     |     |                   | Min        | Max    | Min        | Max    | Min        |        | Max    | Min    |
| V <sub>IC</sub> (pos) |                    |       | 1                      | 2  | 3  | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7  | 8  | 9   | 10  | 11                | 12         | 13     | 14         | 15     | 16         |        |        |        |
|                       |                    |       |                        |    |    |     |     |     |     |     |     |     |    |    |     |     |                   |            | 1 mA   | 1 mA       |        |            |        |        |        |
| V <sub>IC</sub> (neg) |                    |       | 7                      | 8  | 9  | 10  | 11  | 12  | 13  | 14  | 15  | 16  |    |    |     |     |                   |            |        |            |        |            |        |        |        |
|                       |                    |       |                        |    |    |     |     |     |     |     |     |     |    |    |     |     |                   |            | -1 mA  | -1 mA      |        |            |        |        |        |
| I <sub>SS</sub> 2/    |                    |       | 13                     | 14 | 15 | 16  | 17  | 18  | 19  | 20  | 21  | 22  |    |    |     |     |                   |            |        |            |        |            |        |        |        |
|                       |                    |       |                        |    |    |     |     |     |     |     |     |     |    |    |     |     |                   |            | 13.0 V | 13.0 V     | 13.0 V | 13.0 V     | 13.0 V | 13.0 V | 13.0 V |
| I <sub>OH1</sub>      |                    |       | 23                     | 24 | 25 | 26  | 27  | 28  | 29  | 30  |     |     |    |    |     |     |                   |            | VDD    | VDD        | VDD    | VDD        | VDD    | VDD    | VDD    |
|                       |                    |       |                        |    |    |     |     |     |     |     |     |     |    |    |     |     |                   |            | GND    | GND        | GND    | GND        | GND    | GND    | GND    |
| I <sub>OH2</sub>      |                    |       | 31                     | 32 | 33 | 34  | 35  | 36  | 37  | 38  |     |     |    |    |     |     |                   |            |        |            |        |            |        |        |        |
|                       |                    |       |                        |    |    |     |     |     |     |     |     |     |    |    |     |     |                   |            | VDD    | VDD        | VDD    | VDD        | VDD    | VDD    | VDD    |
| V <sub>OH1</sub>      |                    |       | 39                     | 40 | 41 | 42  | 43  | 44  | 45  | 46  |     |     |    |    |     |     |                   |            | 10 V   | 10 V       | 10 V   | 10 V       | 10 V   | 10 V   | 10 V   |
|                       |                    |       |                        |    |    |     |     |     |     |     |     |     |    |    |     |     |                   |            |        |            |        |            |        |        |        |
| I <sub>OL1</sub>      |                    |       | 47                     | 48 | 49 | 50  | 51  | 52  | 53  | 54  |     |     |    |    |     |     |                   |            |        |            |        |            |        |        |        |
|                       |                    |       |                        |    |    |     |     |     |     |     |     |     |    |    |     |     |                   |            |        |            |        |            |        |        |        |

[illegible]

TABLE III. Group A inspection for device type 01 - Continued.

| Symbol            | ML-STD-883 method | Cases E,F | Terminal conditions 1/ |         |         |          |          |          |          |          |          |          |          |          |          |             |             |             | Test limits |                                           |                                    |     |                                      |     | Unit |                                     |     |
|-------------------|-------------------|-----------|------------------------|---------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|-------------|-------------|-------------|-------------------------------------------|------------------------------------|-----|--------------------------------------|-----|------|-------------------------------------|-----|
|                   |                   |           | CLK<br>A               | NO<br>2 | NI<br>3 | OUT<br>0 | OUT<br>1 | OUT<br>2 | OUT<br>3 | VSS<br>8 | OUT<br>7 | OUT<br>6 | OUT<br>5 | OUT<br>4 | CE<br>13 | N2<br>14    | CLK<br>B    | VDD<br>15   | VDD<br>16   | Measured terminal<br>T <sub>A</sub> =25°C | Subgroup 9<br>T <sub>A</sub> =25°C |     | Subgroup 10<br>T <sub>A</sub> =125°C |     |      | Subgroup 11<br>T <sub>A</sub> =55°C |     |
|                   |                   |           |                        |         |         |          |          |          |          |          |          |          |          |          |          |             |             |             |             |                                           | Min                                | Max | Min                                  | Max |      | Min                                 | Max |
| t <sub>PHL1</sub> | 3003 Fig. 5a      | 88        | VDD                    | VDD     | VDD     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | IN       | GND      | VDD         | 5.0 V       | CE to OUT 3 | CE to OUT 3 | 47                                        | 188                                | 64  | 256                                  | 34  | 136  | ns                                  |     |
|                   |                   | 89        | GND                    | GND     | GND     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD      | OUT         | CE to OUT 4 | CE to OUT 4 |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 90        | VDD                    | VDD     | VDD     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD         | OUT         | CE to OUT 5 | CE to OUT 5 |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 91        | GND                    | GND     | GND     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD         | OUT         | CE to OUT 6 | CE to OUT 6 |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 92        | VDD                    | VDD     | VDD     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD         | OUT         | CE to OUT 7 | CE to OUT 7 |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 93        | GND                    | GND     | GND     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD         | OUT         | CE to OUT 0 | CE to OUT 0 |                                           |                                    |     |                                      |     |      |                                     |     |
| t <sub>PHL2</sub> | 3003 Fig. 5b      | 101       | IN                     | IN      | IN      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD      | GND      | VDD         | 5.0 V       | NO to OUT 1 | NO to OUT 1 | 55                                        | 220                                | 74  | 256                                  | 40  | 160  |                                     |     |
|                   |                   | 102       | VDD                    | VDD     | VDD     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | GND      | OUT         | NO to OUT 3 | NO to OUT 3 |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 103       | GND                    | GND     | GND     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD      | OUT         | NO to OUT 5 | NO to OUT 5 |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 104       | VDD                    | VDD     | VDD     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD      | OUT         | NO to OUT 7 | NO to OUT 7 |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 105       | IN                     | IN      | IN      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | GND      | OUT         | N1 to OUT 2 | N1 to OUT 2 |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 106       | IN                     | IN      | IN      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD      | OUT         | N1 to OUT 6 | N1 to OUT 6 |             |                                           |                                    |     |                                      |     |      |                                     |     |
| t <sub>PHL2</sub> | 3003 Fig. 5b      | 107       | GND                    | GND     | GND     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | IN       | IN       | IN          | OUT         | N2 to OUT 4 | N2 to OUT 4 |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 108       | IN                     | IN      | IN      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | IN       | IN       | IN          | OUT         | N2 to OUT 0 | N2 to OUT 0 |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 109       | IN                     | IN      | IN      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | GND      | OUT         | NO to OUT 1 | NO to OUT 1 | 34          | 136                                       | 44                                 | 176 | 25                                   | 100 |      |                                     |     |
|                   |                   | 110       | VDD                    | VDD     | VDD     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | GND      | OUT         | NO to OUT 3 | NO to OUT 3 |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 111       | GND                    | GND     | GND     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD      | OUT         | NO to OUT 5 | NO to OUT 5 |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 112       | VDD                    | VDD     | VDD     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD      | OUT         | NO to OUT 7 | NO to OUT 7 |             |                                           |                                    |     |                                      |     |      |                                     |     |
| t <sub>PHL2</sub> | 3003 Fig. 5b      | 113       | IN                     | IN      | IN      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | GND      | OUT      | N1 to OUT 2 | N1 to OUT 2 |             |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 114       | IN                     | IN      | IN      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | VDD      | OUT      | N1 to OUT 6 | N1 to OUT 6 |             |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 115       | GND                    | GND     | GND     | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | IN       | IN       | IN          | N2 to OUT 4 | N2 to OUT 4 |             |                                           |                                    |     |                                      |     |      |                                     |     |
|                   |                   | 116       | IN                     | IN      | IN      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | OUT      | IN       | IN       | IN          | N2 to OUT 0 | N2 to OUT 0 |             |                                           |                                    |     |                                      |     |      |                                     |     |

TABLE III. Group A inspection for device type 01 - Continued.

| Symbol | ML-STD-883 method | Cases E, F Test no. | Terminal conditions 1/ |     |     |       |       |       |       |     |       |       |        |        |        |    |    |       | Measured terminal I <sub>A</sub> =25°C | Test limits    |                                 |     |                                   |     |                                   | Unit |     |
|--------|-------------------|---------------------|------------------------|-----|-----|-------|-------|-------|-------|-----|-------|-------|--------|--------|--------|----|----|-------|----------------------------------------|----------------|---------------------------------|-----|-----------------------------------|-----|-----------------------------------|------|-----|
|        |                   |                     | CLK A                  | NO  | N1  | OUT 0 | OUT 1 | OUT 2 | OUT 3 | VSS | OUT 7 | OUT 9 | OUT 10 | OUT 11 | OUT 12 | CE | N2 | CLK B |                                        | VDD            | Subgroup 9 I <sub>A</sub> =25°C |     | Subgroup 10 I <sub>A</sub> =125°C |     | Subgroup 11 I <sub>A</sub> =-55°C |      |     |
|        |                   |                     |                        |     |     |       |       |       |       |     |       |       |        |        |        |    |    |       |                                        |                | Min                             | Max | Min                               | Max | Min                               |      | Max |
| tPLH3  | 3003 Fig. 5c      | 117                 | IN A                   | GND | GND | OUT   |       |       |       | GND |       |       |        |        | VDD    |    |    | IN B  | 5.0 V                                  | CLK A to OUT 0 | 50                              | 200 | 67                                | 268 | 36                                | 146  | ns  |
|        |                   | 118                 |                        | VDD | GND |       | OUT   |       |       |     |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 1 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 119                 |                        | GND | VDD |       |       | OUT   |       |     |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 2 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 120                 |                        | VDD | VDD |       |       |       | OUT   |     |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 3 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 121                 |                        | GND | GND |       |       |       |       |     |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 4 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 122                 |                        | VDD | VDD |       |       |       |       |     |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 5 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 123                 |                        | GND | VDD |       |       |       |       |     |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 6 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 124                 |                        | VDD | VDD |       |       |       |       | OUT |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 7 |                                 |     |                                   |     |                                   |      |     |
| tPHL3  |                   | 125                 |                        | GND | GND |       | OUT   |       |       |     |       |       |        |        |        |    |    |       |                                        | CLK B to OUT 0 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 126                 |                        | VDD | GND |       |       | OUT   |       |     |       |       |        |        |        |    |    |       |                                        | CLK B to OUT 1 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 127                 |                        | GND | VDD |       |       |       | OUT   |     |       |       |        |        |        |    |    |       |                                        | CLK B to OUT 2 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 128                 |                        | VDD | VDD |       |       |       |       | OUT |       |       |        |        |        |    |    |       |                                        | CLK B to OUT 3 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 129                 |                        | GND | GND |       |       |       |       |     | OUT   |       |        |        |        |    |    |       |                                        | CLK B to OUT 4 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 130                 |                        | VDD | VDD |       |       |       |       |     |       | OUT   |        |        |        |    |    |       |                                        | CLK B to OUT 5 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 131                 |                        | GND | VDD |       |       |       |       |     |       |       | OUT    |        |        |    |    |       |                                        | CLK B to OUT 6 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 132                 |                        | VDD | VDD |       |       |       |       |     |       |       |        | OUT    |        |    |    |       |                                        | CLK B to OUT 7 |                                 |     |                                   |     |                                   |      |     |
| tTLH1  |                   | 133                 |                        | GND | GND |       | OUT   |       |       |     |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 0 | 42                              |     | 60                                |     | 32                                |      |     |
|        |                   | 134                 |                        | VDD | GND |       |       | OUT   |       |     |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 1 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 135                 |                        | GND | VDD |       |       |       | OUT   |     |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 2 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 136                 |                        | VDD | VDD |       |       |       |       | OUT |       |       |        |        |        |    |    |       |                                        | CLK A to OUT 3 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 137                 |                        | GND | GND |       |       |       |       |     | OUT   |       |        |        |        |    |    |       |                                        | CLK A to OUT 4 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 138                 |                        | VDD | VDD |       |       |       |       |     |       | OUT   |        |        |        |    |    |       |                                        | CLK A to OUT 5 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 139                 |                        | GND | VDD |       |       |       |       |     |       |       | OUT    |        |        |    |    |       |                                        | CLK A to OUT 6 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 140                 |                        | VDD | VDD |       |       |       |       |     |       |       |        | OUT    |        |    |    |       |                                        | CLK A to OUT 7 |                                 |     |                                   |     |                                   |      |     |
| tTL1   |                   | 141                 |                        | GND | GND |       | OUT   |       |       |     |       |       |        |        |        |    |    |       |                                        | CLK B to OUT 0 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 142                 |                        | VDD | GND |       |       | OUT   |       |     |       |       |        |        |        |    |    |       |                                        | CLK B to OUT 1 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 143                 |                        | GND | VDD |       |       |       | OUT   |     |       |       |        |        |        |    |    |       |                                        | CLK B to OUT 2 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 144                 |                        | VDD | VDD |       |       |       |       | OUT |       |       |        |        |        |    |    |       |                                        | CLK B to OUT 3 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 145                 |                        | GND | GND |       |       |       |       |     | OUT   |       |        |        |        |    |    |       |                                        | CLK B to OUT 4 |                                 |     |                                   |     |                                   |      |     |
|        |                   | 146                 |                        | VDD | VDD |       |       |       |       |     |       | OUT   |        |        |        |    |    |       |                                        | CLK B to OUT 5 |                                 |     |                                   |     |                                   |      |     |

TABLE III. Group A inspection for device type 01 - Continued.

| Symbol            | MIL-STD-883 method | Cases E, F | Terminal conditions 1/ |                 |                 |          |          |          |          |                      |          |          |           |           |                 |                 |                 |          | Test limits           |                                    |     |                                      |     |                                     |     |  | Unit |
|-------------------|--------------------|------------|------------------------|-----------------|-----------------|----------|----------|----------|----------|----------------------|----------|----------|-----------|-----------|-----------------|-----------------|-----------------|----------|-----------------------|------------------------------------|-----|--------------------------------------|-----|-------------------------------------|-----|--|------|
|                   |                    |            | CLK<br>A               | NO<br>2         | NI<br>3         | OUT<br>0 | OUT<br>1 | OUT<br>2 | OUT<br>3 | V <sub>SS</sub><br>8 | OUT<br>7 | OUT<br>9 | OUT<br>10 | OUT<br>11 | OUT<br>12       | CE<br>13        | N2<br>14        | CLK<br>B | V <sub>DD</sub><br>16 | Subgroup 9<br>T <sub>A</sub> =25°C |     | Subgroup 10<br>T <sub>A</sub> =125°C |     | Subgroup 11<br>T <sub>A</sub> =55°C |     |  |      |
|                   |                    |            |                        |                 |                 |          |          |          |          |                      |          |          |           |           |                 |                 |                 |          |                       | Min                                | Max | Min                                  | Max | Min                                 | Max |  |      |
| t <sub>PHL1</sub> | 3003 Fig. 5c       | 147        | IN A                   | GND             | V <sub>DD</sub> | OUT      |          |          | GND      |                      | OUT      |          | OUT       |           | V <sub>DD</sub> | V <sub>DD</sub> | IN B            | 5.0 V    | CLK B to OUT 6        | 42                                 | 60  | 32                                   | ns  |                                     |     |  |      |
| t <sub>PHL1</sub> | 3003 Fig. 5c       | 148        | IN A                   | V <sub>DD</sub> | V <sub>DD</sub> | OUT      |          |          | OUT      |                      | OUT      |          |           |           | V <sub>DD</sub> | V <sub>DD</sub> | IN B            | 5.0 V    | CLK B to OUT 7        | 42                                 | 60  | 32                                   |     |                                     |     |  |      |
| t <sub>PHL4</sub> | 3003 Fig. 5a       | 149        | V <sub>DD</sub>        | GND             | GND             | OUT      |          |          |          |                      |          |          |           |           | IN              |                 | V <sub>DD</sub> | 10.0 V   | CE to OUT 0           | 22                                 | 86  | 16                                   | 64  |                                     |     |  |      |
|                   |                    | 150        |                        | V <sub>DD</sub> | GND             | OUT      |          | OUT      |          |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 1           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 151        |                        | GND             | V <sub>DD</sub> |          | OUT      |          |          |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 2           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 152        |                        | V <sub>DD</sub> | V <sub>DD</sub> |          |          | OUT      |          |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 3           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 153        |                        | GND             | GND             |          |          |          |          |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 4           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 154        |                        | V <sub>DD</sub> | GND             |          |          |          |          |                      | OUT      |          |           |           |                 |                 |                 |          | CE to OUT 5           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 155        |                        | GND             | V <sub>DD</sub> |          |          |          |          |                      | OUT      |          |           |           |                 |                 |                 |          | CE to OUT 6           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 156        |                        | V <sub>DD</sub> | V <sub>DD</sub> |          |          |          |          | OUT                  |          |          |           |           |                 |                 |                 |          | CE to OUT 7           |                                    |     |                                      |     |                                     |     |  |      |
| t <sub>PLH4</sub> |                    | 157        |                        | GND             | GND             | OUT      |          |          |          |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 0           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 158        |                        | V <sub>DD</sub> | GND             |          | OUT      |          |          |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 1           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 159        |                        | GND             | V <sub>DD</sub> |          |          | OUT      |          |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 2           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 160        |                        | V <sub>DD</sub> | V <sub>DD</sub> |          |          |          | OUT      |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 3           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 161        |                        | GND             | GND             |          |          |          |          |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 4           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 162        |                        | V <sub>DD</sub> | GND             |          |          |          |          |                      | OUT      |          |           |           |                 |                 |                 |          | CE to OUT 5           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 163        |                        | GND             | V <sub>DD</sub> |          |          |          |          |                      |          |          |           |           |                 |                 |                 |          | CE to OUT 6           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 164        |                        | V <sub>DD</sub> | V <sub>DD</sub> |          |          |          |          | OUT                  |          |          |           |           |                 |                 |                 |          | CE to OUT 7           |                                    |     |                                      |     |                                     |     |  |      |
| t <sub>PHL5</sub> | 3003 Fig. 5b       | 165        | IN                     | IN              | GND             |          | OUT      |          |          |                      |          |          |           |           | V <sub>DD</sub> |                 | GND             |          | NO to OUT 1           | 25                                 | 100 | 34                                   | 138 | 18                                  | 74  |  |      |
|                   |                    | 166        |                        | V <sub>DD</sub> | V <sub>DD</sub> |          |          | OUT      |          |                      |          |          |           |           |                 |                 |                 |          | NO to OUT 3           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 167        |                        | GND             | GND             |          |          |          | OUT      |                      |          |          |           |           |                 |                 |                 |          | NO to OUT 5           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 168        |                        | V <sub>DD</sub> | V <sub>DD</sub> |          |          |          |          | OUT                  |          |          |           |           |                 |                 |                 |          | NO to OUT 7           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 169        |                        | GND             | IN              |          |          | OUT      |          |                      |          |          |           |           |                 |                 |                 |          | NI to OUT 2           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 170        |                        | IN              | IN              |          |          |          |          |                      | OUT      |          |           |           |                 |                 |                 |          | NI to OUT 6           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 171        |                        | GND             | GND             |          |          |          |          |                      |          |          |           |           |                 |                 |                 |          | N2 to OUT 4           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 172        |                        | IN              | GND             |          |          |          |          |                      |          |          |           |           |                 |                 |                 |          | N2 to OUT 0           |                                    |     |                                      |     |                                     |     |  |      |
| t <sub>PHL5</sub> |                    | 173        | IN                     | IN              | GND             |          | OUT      |          |          |                      |          |          |           |           |                 |                 |                 |          | NO to OUT 1           | 15                                 | 60  | 20                                   | 80  | 12                                  | 50  |  |      |
|                   |                    | 174        |                        | IN              | V <sub>DD</sub> |          |          | OUT      |          |                      |          |          |           |           |                 |                 |                 |          | NO to OUT 3           |                                    |     |                                      |     |                                     |     |  |      |
|                   |                    | 175        |                        | IN              | GND             |          |          |          |          |                      | OUT      |          |           |           |                 |                 |                 |          | NO to OUT 5           |                                    |     |                                      |     |                                     |     |  |      |

TABLE III. Group A inspection for device type 01 - Continued.

| Symbol            | MIL-STD-883 method | Cases E, F | Terminal conditions 1/ |                 |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | Test limits                                 |     |                                      |     |                                      |     | Unit |
|-------------------|--------------------|------------|------------------------|-----------------|-----------------|----------|----------|----------|----------|----------------------|----------|----------|----------|----------|-----------------|-----------------|-----------------|-----------------------|---------------------------------------------|-----|--------------------------------------|-----|--------------------------------------|-----|------|
|                   |                    |            | CLK<br>A               | NO<br>2         | NI<br>3         | OUT<br>0 | OUT<br>1 | OUT<br>2 | OUT<br>3 | V <sub>SS</sub><br>8 | OUT<br>7 | OUT<br>6 | OUT<br>5 | OUT<br>4 | CE<br>13        | N2<br>14        | CLK<br>B        | V <sub>DD</sub><br>16 | Measured Subgroup 9<br>T <sub>A</sub> =25°C |     | Subgroup 10<br>T <sub>A</sub> =125°C |     | Subgroup 11<br>T <sub>A</sub> =-55°C |     |      |
|                   |                    |            |                        |                 |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | Min                                         | Max | Min                                  | Max | Min                                  | Max |      |
| t <sub>PHL5</sub> | 3003               | 176        | V <sub>DD</sub>        | IN              | V <sub>DD</sub> |          |          |          | GND      | OUT                  |          |          |          |          | V <sub>DD</sub> | V <sub>DD</sub> | 10.0 V          | N0 to<br>OUT 7        | 15                                          | 60  | 20                                   | 80  | 12                                   | 50  | ns   |
|                   | Fig. 5b            | 177        |                        | GND             | IN              |          |          |          |          |                      | OUT      |          |          |          |                 | GND             |                 |                       | NI to<br>OUT 2                              |     |                                      |     |                                      |     |      |
|                   |                    | 178        |                        |                 | IN              |          |          |          |          |                      |          |          |          |          |                 | V <sub>DD</sub> |                 |                       | NI to<br>OUT 6                              |     |                                      |     |                                      |     |      |
|                   |                    | 179        |                        |                 | GND             |          |          |          |          |                      |          |          |          | OUT      |                 | IN              |                 |                       | N2 to<br>OUT 4                              |     |                                      |     |                                      |     |      |
|                   |                    | 180        |                        |                 | GND             | OUT      |          |          |          |                      |          |          |          |          |                 | IN              |                 |                       | N2 to<br>OUT 0                              |     |                                      |     |                                      |     |      |
| t <sub>PLH6</sub> | 3003               | 181        | IN A                   |                 | OUT             |          |          |          |          |                      |          |          |          |          |                 | GND             | IN B            |                       | CLK A to<br>OUT 0                           | 22  | 89                                   | 30  | 120                                  | 16  | 66   |
|                   | Fig. 5c            | 182        |                        | V <sub>DD</sub> |                 |          |          | OUT      |          |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 1                           |     |                                      |     |                                      |     |      |
|                   |                    | 183        |                        | GND             |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 2                           |     |                                      |     |                                      |     |      |
|                   |                    | 184        |                        | V <sub>DD</sub> |                 |          |          |          | OUT      |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 3                           |     |                                      |     |                                      |     |      |
|                   |                    | 185        |                        | GND             |                 |          |          |          |          |                      |          |          |          |          |                 |                 | V <sub>DD</sub> |                       | CLK A to<br>OUT 4                           |     |                                      |     |                                      |     |      |
|                   |                    | 186        |                        | V <sub>DD</sub> |                 |          |          |          |          |                      |          | OUT      |          |          |                 |                 |                 |                       | CLK A to<br>OUT 5                           |     |                                      |     |                                      |     |      |
|                   |                    | 187        |                        | GND             |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 6                           |     |                                      |     |                                      |     |      |
|                   |                    | 188        |                        | V <sub>DD</sub> |                 |          |          |          |          | OUT                  |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 7                           |     |                                      |     |                                      |     |      |
| t <sub>PHL6</sub> | 189                |            | GND                    |                 | OUT             |          |          |          |          |                      |          |          |          |          |                 | GND             |                 |                       | CLK B to<br>OUT 0                           |     |                                      |     |                                      |     |      |
|                   |                    | 190        |                        | V <sub>DD</sub> |                 |          |          | OUT      |          |                      |          |          |          |          |                 |                 |                 |                       | CLK B to<br>OUT 1                           |     |                                      |     |                                      |     |      |
|                   |                    | 191        |                        | GND             |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | CLK B to<br>OUT 2                           |     |                                      |     |                                      |     |      |
|                   |                    | 192        |                        | V <sub>DD</sub> |                 |          |          |          |          | OUT                  |          |          |          |          |                 |                 |                 |                       | CLK B to<br>OUT 3                           |     |                                      |     |                                      |     |      |
|                   |                    | 193        |                        | GND             |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | CLK B to<br>OUT 4                           |     |                                      |     |                                      |     |      |
|                   |                    | 194        |                        | V <sub>DD</sub> |                 |          |          |          |          |                      |          | OUT      |          |          |                 |                 |                 |                       | CLK B to<br>OUT 5                           |     |                                      |     |                                      |     |      |
|                   |                    | 195        |                        | GND             |                 |          |          |          |          |                      |          |          | OUT      |          |                 |                 |                 |                       | CLK B to<br>OUT 6                           |     |                                      |     |                                      |     |      |
|                   |                    | 196        |                        | V <sub>DD</sub> |                 |          |          |          |          |                      | OUT      |          |          |          |                 |                 |                 |                       | CLK B to<br>OUT 7                           |     |                                      |     |                                      |     |      |
| t <sub>TLH2</sub> | 197                |            | GND                    |                 | OUT             |          |          |          |          |                      |          |          |          |          |                 | GND             |                 |                       | CLK A to<br>OUT 0                           |     | 26                                   |     | 33                                   | 20  |      |
|                   |                    | 198        |                        | V <sub>DD</sub> |                 |          |          | OUT      |          |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 1                           |     |                                      |     |                                      |     |      |
|                   |                    | 199        |                        | GND             |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 2                           |     |                                      |     |                                      |     |      |
|                   |                    | 200        |                        | V <sub>DD</sub> |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 3                           |     |                                      |     |                                      |     |      |
|                   |                    | 201        |                        | GND             |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 4                           |     |                                      |     |                                      |     |      |
|                   |                    | 202        |                        | V <sub>DD</sub> |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 5                           |     |                                      |     |                                      |     |      |
|                   |                    | 203        |                        | GND             |                 |          |          |          |          |                      |          |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 6                           |     |                                      |     |                                      |     |      |
|                   |                    | 204        |                        | V <sub>DD</sub> |                 |          |          |          |          |                      | OUT      |          |          |          |                 |                 |                 |                       | CLK A to<br>OUT 7                           |     |                                      |     |                                      |     |      |

TABLE III. Group A inspection for device type 01 - Continued.

| Symbol            | MIL-STD-883 method | Cases E, F | Terminal conditions 1/ |     |     |     |     |     |     |     |     |     |     |    |    |       | Test limits |                   |            |     |             |         | Unit |             |     |     |
|-------------------|--------------------|------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|-------|-------------|-------------------|------------|-----|-------------|---------|------|-------------|-----|-----|
|                   |                    |            | CLK                    | NO  | N1  | OUT | OUT | OUT | OUT | OUT | VSS | OUT | OUT | CE | N2 | CLK B | VDD         | Measured terminal | Subgroup 9 |     | Subgroup 10 |         |      | Subgroup 11 |     |     |
|                   |                    |            |                        |     |     |     |     |     |     |     |     |     |     |    |    |       |             |                   | TA=25°C    | Min | Max         | TA=25°C |      |             | Min | Max |
| t <sub>THL2</sub> | 3003               | 205        | IN A                   | GND | GND | OUT |     |     |     |     |     |     |     |    |    |       |             |                   |            |     |             |         |      |             |     | ns  |
|                   | Fig. 5c            | 206        |                        | VDD | GND |     | OUT |     |     |     |     |     |     |    |    |       |             |                   |            |     |             |         |      |             |     |     |
|                   |                    | 207        |                        | GND | VDD |     |     | OUT |     |     |     |     |     |    |    |       |             |                   |            |     |             |         |      |             |     |     |
|                   |                    | 208        |                        | VDD | VDD |     |     |     | OUT |     |     |     |     |    |    |       |             |                   |            |     |             |         |      |             |     |     |
|                   |                    | 209        |                        | GND | GND |     |     |     |     | OUT |     |     |     |    |    |       |             |                   |            |     |             |         |      |             |     |     |
|                   |                    | 210        |                        | VDD | GND |     |     |     |     |     | OUT |     |     |    |    |       |             |                   |            |     |             |         |      |             |     |     |
|                   |                    | 211        |                        | GND | VDD |     |     |     |     |     |     | OUT |     |    |    |       |             |                   |            |     |             |         |      |             |     |     |
|                   |                    | 212        |                        | VDD | VDD |     |     |     |     |     |     |     | OUT |    |    |       |             |                   |            |     |             |         |      |             |     |     |

1/ Pins not designated may be "HIGH" level logic, "LOW" level logic or open. Exceptions are as follows: V<sub>IC</sub>(pos) tests, the V<sub>SS</sub> terminals shall be open; V<sub>IC</sub>(neg) tests, the V<sub>DD</sub> terminal shall be open; ISS tests, the output terminals shall be open.

2/ Leakage currents (ISS, I<sub>IH</sub>, I<sub>IL</sub>), subgroup 3, shall be performed using the sample size and acceptance number per the LTPD specified in method 5005 of MIL-STD-883.

3/ Perform the functional test using the test pattern and expected outputs shown in the following table. Input levels shall be 0 = V<sub>SS</sub> and 1 = V<sub>DD</sub>. Output levels shall be 0 ≤ .5 V and 1 ≥ V<sub>DD</sub> - .5 V.

Functional test pattern

| Name  | Pin | TIME SLOTS |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |
|-------|-----|------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
|       |     | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| CLK A | 1   | 1          | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 0  | 0  | 0  | 1  | 0  |
| CLK B | 15  | 1          | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 0  | 0  | 1  | 0  | 0  | 0  |
| CE    | 13  | 1          | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| NO    | 2   | 0          | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0  | 0  | 0  | 0  | 0  | 1  | 1  |
| NI    | 3   | 0          | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0  | 0  | 0  | 0  | 1  | 1  | 1  |
| N2    | 14  | 0          | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0  | 0  | 0  | 0  | 1  | 1  | 1  |
| OUT 0 | 4   | 1          | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 1  | 1  | 0  | 0  | 0  | 0  |
| OUT 1 | 5   | 0          | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| OUT 2 | 6   | 0          | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| OUT 3 | 7   | 0          | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| OUT 4 | 12  | 0          | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| OUT 5 | 11  | 0          | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| OUT 6 | 10  | 0          | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| OUT 7 | 9   | 0          | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0  | 0  | 0  | 0  | 0  | 0  | 1  |

4.4.2 Group B inspection. Group B inspection shall consist of the test subgroups and LTPD values shown in table II of method 5005 of MIL-STD-883 and as follows:

- a. A special subgroup shall be added to the group B inspection requirements for class B devices and shall consist of the tests, conditions and limits specified in 4.5.2. The LTPD for this subgroup shall be 15.

4.4.3 Group C inspection. Group C inspection shall consist of the test subgroups and LTPD values shown in table III of method 5005 of MIL-STD-883 and as follows:

- a. End-point electrical parameters shall be as specified in table II.
- b. Steady-state life test (method 1005 of MIL-STD-883) conditions:
  - (1) Test condition D or E, as specified in 4.5.2, and as shown on figure 4, or equivalent.
  - (2)  $T_A = 125^\circ\text{C}$  minimum.
- c. Additional electrical subgroups as specified in table II shall be added to the group C inspection requirements for class B devices.

4.4.4 Group D inspection. Group D inspection shall be in accordance with table IV of method 5005 of MIL-STD-883; end-point electrical parameters shall be as specified in table II.

4.5 Methods of inspection. Methods of inspection shall be specified as follows:

4.5.1 Voltage and current. All voltages given are referenced to the microcircuit  $V_{SS}$  terminal. Currents given are conventional and positive when flowing into the referenced terminal.

4.5.2 High voltage ( $V_{ZAP}$ ) test of input protection circuits. Unless otherwise specified, all input terminals (up to a maximum of four) of the device under test (DUT) shall be subjected to a voltage pulse from a 100 pF source charged to 400 V (see figure 6). This destructive test shall be conducted in the following sequence:

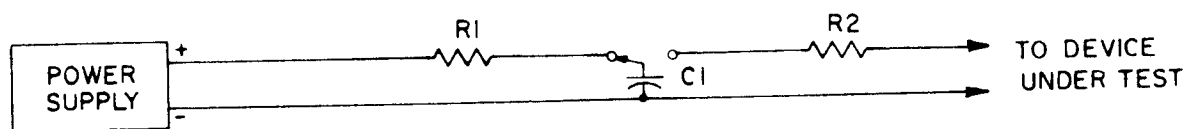
- a. Measure  $I_{IH}$  and  $I_{IL}$  at inputs selected, as stated above, at  $25^\circ\text{C}$  and  $V_{DD} = 13\text{ V}$ . Also measure  $I_{SS}$  at  $25^\circ\text{C}$  and  $V_{DD} = 13\text{ V}$ . These measurements shall be made in accordance with table III herein. The test limits for a single terminal measurement of  $I_{IH}$  and  $I_{IL}$  shall be 100 nA maximum.
- b. With  $S_1$  in position 1, charge  $C_1$  to 400 V. With  $S_1$  in position 2, apply the test voltage ( $V_{ZAP}$ ) to the same terminal selected for leakage current measurements. Apply  $V_{ZAP}$  in a 3 pulse sequence as follows:
  - (1) Input (-) to  $V_{DD}$ .
  - (2) Input (+) to  $V_{SS}$ .
  - (3) Input (+) to Output.

In each case,  $V_{ZAP}$  shall be applied by charging  $C_1$  to 400 V with  $S_1$  in position 1 and then switching to position 2.

- c. Within 24 hours, repeat the  $I_{SS}$  measurement and the  $I_{IH}$  and the  $I_{IL}$  measurements on the same terminals as performed above. At this time a DUT exhibiting leakage currents in excess of the specified limits is defective.

4.6 Data reporting. When specified in the contract, a copy of the following data, as applicable, shall be supplied:

- a. Attributes data for all screening tests (see 4.2) and variables data for all dynamic burn-in, and operating life tests (see 3.5).



$R1 = 10 \text{ M}\Omega \leq R1 \leq 50 \text{ M}\Omega$ .  
 $R2 = 1.5 \text{ k}\Omega$ .  
 $C1 = 100 \text{ pF}$ .  
 $V_{ZAP} = 400 \text{ V}$  charge on  $C1$ .  
 $S1 = \text{Hg-wetted "bounceless" relay}$ .

FIGURE 6. High voltage ( $V_{ZAP}$ ) test circuit.

- b. The quality conformance inspection data (see 4.4).
- c. Final electrical parameters data (see 4.2c).

## 5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510. These devices require electrostatic protection.

## 6. NOTES

6.1 Notes. The notes specified in MIL-M-38510 are applicable to this specification.

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

6.3 Ordering data. The contract or purchase order should specify the following:

- a. Complete part number (see 1.2).
- b. Requirements for delivery of one copy of the quality conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.
- c. Requirement for certificate of compliance, if applicable.
- d. Requirements for notification of change of product or process to contracting activity if applicable.
- e. Requirements for failure analysis (including required test condition of method 5003), corrective action and reporting of results, if applicable.
- f. Requirements for product assurance options.
- g. Requirements for special carriers, lead lengths or lead forming, if applicable. These requirements shall not affect the part number. Unless otherwise specified, these requirements will not apply to direct purchase by or direct shipment to the Government.

6.4 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-M-38510, MIL-STD-1331, table I, and as follows:

|                  |           |                                                                                                                                                                                   |
|------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GND              | - - - - - | Ground. Zero voltage potential.                                                                                                                                                   |
| TA               | - - - - - | Free air temperature.                                                                                                                                                             |
| t <sub>THL</sub> | - - - - - | Fall time. Time duration during which the amplitude of the trailing edge of the input forcing condition or waveform is decreasing from 90 to 10 percent of the maximum amplitude. |
| t <sub>TLH</sub> | - - - - - | Rise time. Time duration during which the amplitude of the leading edge of the input forcing condition or waveform is increasing from 10 to 90 percent of the maximum amplitude.  |
| V <sub>DD</sub>  | - - - - - | Positive supply voltage.                                                                                                                                                          |
| V <sub>SS</sub>  | - - - - - | Negative supply voltage.                                                                                                                                                          |
| I <sub>SS</sub>  | - - - - - | Quiescent supply current.                                                                                                                                                         |

6.5 Logistic support. Lead materials and finishes (see 3.3), are interchangeable. Unless otherwise specified, microcircuits acquired for Government logistic support will be acquired to device class B (see 1.2.2) and lead material and finish C (see 3.3). Longer length leads and lead forming shall not affect the part number.

6.6 Generic test data. Generic test data may be used to satisfy the requirements of 4.4.3. Group C generic test data shall be on date codes no more than one year old and on a die in the same microcircuit group (see appendix E of MIL-M-38510) with the same material, design and process and from the same plant as the die represented. Group D (see 4.4.4) generic data shall be on date codes no more than one year old and on the same package type (see terms, definitions, and symbols of MIL-M-38510) and from the same plant as the package represented. The vendor is required to retain the generic data for a period of not less than 36 months from the date of shipment.

6.7 Substitutability. The cross-reference information below is presented for the convenience of users. Microcircuits covered by this specification will functionally replace the listed generic-industry type. Generic-industry microcircuit types may not have equivalent operational performance characteristics across military temperature ranges or reliability factors equivalent to MIL-M-38510 device types and may have slight physical variations in relation to case size. The presence of this information shall not be deemed as permitting substitution of generic-industry types for MIL-M-38510 types or as a waiver of any of the provisions of MIL-M-38510.

| <u>Military device<br/>type</u> | <u>Generic-industry<br/>type</u> |
|---------------------------------|----------------------------------|
| 01                              | 1853                             |

6.8 Handling. MOS devices must be handled with certain precautions to avoid damage due to accumulation to static charge. Input protective devices have been designed in the chip to minimize the effect of this static buildup. However, the following handling practices are recommended:

- a. Devices should be handled on benches with conductive and grounded surface.
- b. Ground test equipment and tools.
- c. Do not handle devices by the leads.
- d. Store devices in conductive foam or carriers.
- e. Avoid use of plastic, rubber, or silk in MOS areas.
- f. Maintain relative humidity above 50 percent, if practical.

6.9 Ordering guidance. Since the qualification and certification requirements have been removed from the specification, orders may be placed immediately.

6.10 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:  
NASA - NA

Review activity:  
DLA - ES

Agent:  
DLA - ES

Preparing activity:  
NASA - NA

(Project 5962-K646-4)