| REVISIONS | | | |
|---|---|---|---|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | Add vendor device type to case outline.<br>Editorial changes in table I. | 1 Apr. 87 | |
| B | Changed code ident. no. to 67268.<br>Add case outline 3 with terminal connections update. | 17 NOV 87 | |

**CURRENT CAGE CODE 67268**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REV | | | | | | | | | | | | | |
| PAGE | | | | | | | | | | | | | |
| REV STATUS OF PAGES | REV | B | B | A | A | A | B | A | A | A | A | B | |
| | PAGES | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |

Defense Electronics Supply Center
Dayton, Ohio

Original date of drawing:
30 September 1986

AMSC N/A

PREPARED BY
Jeffery Lunstad

CHECKED BY
DA DiCenzo

APPROVED BY

SIZE A | CODE IDENT. NO. 14933

REV B

# MILITARY DRAWING

This drawing is available for use by all Departments and Agencies of the Department of Defense

TITLE: MICROCIRCUITS, HIGH SPEED CMOS 1 OF 16 DECODER/DEMULTIPLEXER MONOLITHIC SILICON

DWG NO. 5962-86822

PAGE 1 OF 11

5962-E622

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

DESC FORM 193
MAY 86

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

| 5962-86822 | 01 | J | X |
|---|---|---|---|
| Drawing number | Device type (1.2.1) | Case outline (1.2.2) | Lead finish per MIL-M-38510 |

1.2.1 Device type. The device type shall identify the circuit function as follows:

| Device type | Generic number | Circuit function |
|---|---|---|
| 01 | 54HC154 | Decoder, 4-to-16 line |

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

| Outline letter | Case outline |
|---|---|
| J | D-3 (24-lead, 1/2" x 1-1/4"), dual-in-line package |
| L | D-9 (24-lead, 1/4" x 1-1/4"), dual-in-line package |
| 3 | C-4 (28-terminal .450" x .450"), square chip carrier package |

1.3 Absolute maximum ratings. 1/

| | |
|---|---|
| Supply voltage range | -0.5 V dc to +7.0 V dc |
| DC input voltage | -0.5 V dc to $V_{CC}$ + 0.5 V dc |
| DC output voltage | -0.5 V dc to $V_{CC}$ + 0.5 V dc |
| Clamp diode current | ±20 mA |
| DC output current (per pin) | ±25 mA |
| DC $V_{CC}$ or GND current (per pin) | ±50 mA |
| Storage temperature range | -65°C to +150°C |
| Maximum power dissipation ($P_D$) 2/ | 500 mW |
| Lead temperature (soldering, 10 seconds) | +260°C |
| Thermal resistance, junction-to-case ($\theta_{JC}$): | |
| Cases J, L, and 3 | See MIL-M-38510, appendix C |
| Junction temperature ($T_J$) | +175°C |

1.4 Recommended operating conditions.

| | |
|---|---|
| Supply voltage ($V_{CC}$) | +2.0 V dc to +6.0 V dc |
| Case operating temperature range ($T_C$) | -55°C to +125°C |
| Input rise or fall time : | |
| $V_{CC}$ = 2.0 V | 0 to 1000 ns |
| $V_{CC}$ = 4.5 V | 0 to 500 ns |
| $V_{CC}$ = 6.0 V | 0 to 400 ns |

1/ Unless otherwise specified, all voltages are referenced to ground.

2/ For $T_C$ = +100°C to +125°C, derate linearly at 12 mW/°C.

2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, 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 drawing 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 the specification and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

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

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" 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 Truth table. The truth table shall be as specified on figure 2.

3.2.3 Logic diagram. The logic diagram shall be as specified on figure 3.

3.2.4 Case outline. The case outline shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full recommended case operating temperature range.

3.4 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in 6.4 herein.

TABLE I. Electrical performance characteristics.

| Test | Symbol | Conditions $-55°C \le T_C \le +125°C$ 1/ | | Group A subgroups | Limits Min | Limits Max | Unit |
|---|---|---|---|---|---|---|---|
| High level output voltage | $V_{OH}$ | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$\|I_O\| \le 20$ µA | $V_{CC} = 2.0$ V<br>$V_{CC} = 4.5$ V<br>$V_{CC} = 6.0$ V | 1,2,3 | 1.9<br>4.4<br>5.9 | | V |
| | | $\|I_O\| \le 4.0$ mA | $V_{CC} = 4.5$ V | | 3.7 | | |
| | | $\|I_O\| \le 5.2$ mA | $V_{CC} = 6.0$ V | | 5.2 | | |
| Low level output voltage | $V_{OL}$ | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$\|I_O\| \le 20$ µA | $V_{CC} = 2.0$ V<br>$V_{CC} = 4.5$ V<br>$V_{CC} = 6.0$ V | 1,2,3 | | 0.1<br>0.1<br>0.1 | V |
| | | $\|I_O\| \le 4.0$ mA | $V_{CC} = 4.5$ V | | | 0.4 | |
| | | $\|I_O\| \le 5.2$ mA | $V_{CC} = 6.0$ V | | | 0.4 | |
| High level input voltage | $V_{IH}$ | 2/ | $V_{CC} = 2.0$ V<br>$V_{CC} = 4.5$ V<br>$V_{CC} = 6.0$ V | 1,2,3 | 1.5<br>3.15<br>4.2 | | V |
| Low level input voltage | $V_{IL}$ | 2/ | $V_{CC} = 2.0$ V<br>$V_{CC} = 4.5$ V<br>$V_{CC} = 6.0$ V | 1,2,3 | | 0.3<br>0.9<br>1.2 | V |
| Input capacitance | $C_{IN}$ | $V_{IN} = 0$ V ; $T_C = +25°C$<br>see 4.3.1c | | 4 | | 10 | pF |
| Quiescent current | $I_{CC}$ | $V_{CC} = 6.0$ V ; $V_{IN} = V_{CC}$ or GND | | 1,2,3 | | 160 | µA |
| Input leakage current | $I_{IN}$ | $V_{CC} = 6.0$ V ; $V_{IN} = V_{CC}$ or GND | | 1,2,3 | | ±1 | µA |
| Functional tests | | See 4.3.1d | | 7 | | | |
| Propagation delay, Address to outputs 3/ | $t_{PHL1}$, $t_{PLH1}$ | $T_C = +25°C$,<br>$C_L = 50$ pF ±10%<br>See figure 4 | $V_{CC} = 2.0$ V<br>$V_{CC} = 4.5$ V<br>$V_{CC} = 6.0$ V | 9 | | 190<br>38<br>32 | ns |
| | | $T_C = -55°C$, $+125°C$<br>$C_L = 50$ pF ±10%<br>See figure 4 | $V_{CC} = 2.0$ V<br>$V_{CC} = 4.5$ V<br>$V_{CC} = 6.0$ V | 10,11 | | 285<br>57<br>48 | ns |

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

| Test | Symbol | Conditions $-55°C \le T_C \le +125°C$ | | Group A subgroups | Limits Min | Limits Max | Unit |
|---|---|---|---|---|---|---|---|
| Propagation delay, Chip select to outputs 3/ | $t_{PHL2}$, $t_{PLH2}$ | $T_C$ = +25°C, $C_L$ = 50 pF ±10% See figure 4 | $V_{CC}$ = 2.0 V | 9 | | 180 | ns |
| | | | $V_{CC}$ = 4.5 V | | | 36 | |
| | | | $V_{CC}$ = 6.0 V | | | 31 | |
| | | $T_C$ = -55°C, +125°C $C_L$ = 50 pF ±10% See figure 4 | $V_{CC}$ = 2.0 V | 10,11 | | 270 | ns |
| | | | $V_{CC}$ = 4.5 V | | | 54 | |
| | | | $V_{CC}$ = 6.0 V | | | 46 | |
| Transition time 4/ | $t_{TLH}$, $t_{THL}$ | $T_C$ = +25°C, $C_L$ = 50 pF ±10% See figure 4 | $V_{CC}$ = 2.0 V | 9 | | 75 | ns |
| | | | $V_{CC}$ = 4.5 V | | | 15 | |
| | | | $V_{CC}$ = 6.0 V | | | 13 | |
| | | $T_C$ = -55°C, +125°C $C_L$ = 50 pF ±10% See figure 4 | $V_{CC}$ = 2.0 V | 10,11 | | 110 | ns |
| | | | $V_{CC}$ = 4.5 V | | | 22 | |
| | | | $V_{CC}$ = 6.0 V | | | 19 | |

1/ For a power supply of 5 V ±10% the worst case output voltage ($V_{OH}$ and $V_{OL}$) occur for HC at 4.5 V. Thus the 4.5 V values should be used when designing with this supply. Worst case $V_{IH}$ and $V_{IL}$ occur at $V_{CC}$ = 5.5 V and 4.5 V respectively. (The $V_{IH}$ value at 5.5 V is 3.85 V). The worst case leakage current ($I_{IN}$, $I_{CC}$, and $I_{OZ}$) occur for CMOS at the higher voltage and so the 6.0 V values should be used. Power dissipation capacitance (CPD), typically 40 pF, determines the no load dynamic power consumption, $P_D = CPD\ V_{CC2}\ f + I_{CC}\ V_{CC}$, and the no load dynamic current consumption, $IS = CPD\ V_{CC}\ f + I_{CC}$.
2/ Test not required if applied as a forcing function for $V_{OH}$ or $V_{OL}$.
3/ AC testing at $V_{CC}$ = 2.0 V and $V_{CC}$ = 6.0 V shall be guaranteed, if not tested, to the specified parameters.
4/ Transition time, ($t_{TLH}$, $t_{THL}$), if not tested, shall be guaranteed to the specified parameters.

3.5 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in 6.4. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

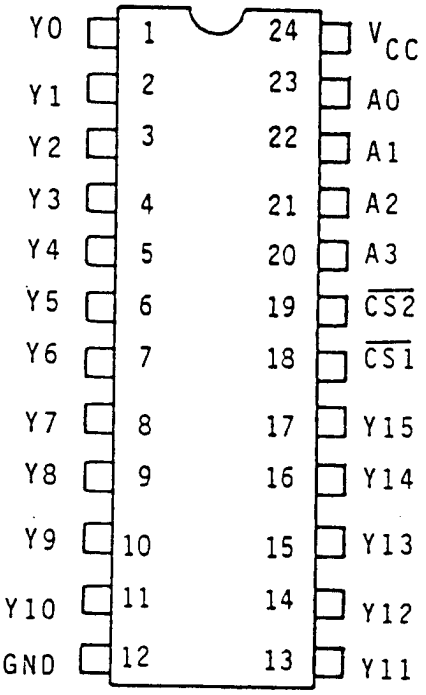
3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.8 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

Cases J and L




Case 3

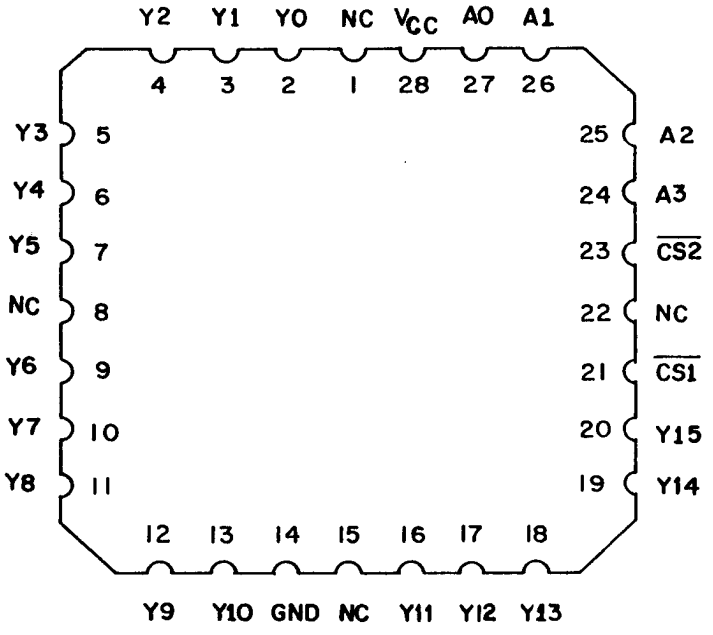



FIGURE 1. Terminal connections.

| MILITARY DRAWING<br>DEFENSE ELECTRONICS SUPPLY CENTER<br>DAYTON, OHIO | SIZE<br>A | | DWG NO.<br>5962-86822 |
|---|---|---|---|
| | | REV B | PAGE 6 |

DESC FORM 193A
FEB 86

| Inputs | | | | | | Low output* |
|---|---|---|---|---|---|---|
| CS1 | CS2 | A3 | A2 | A1 | A0 | |
| L | L | L | L | L | L | 0 |
| L | L | L | L | L | H | 1 |
| L | L | L | L | H | L | 2 |
| L | L | L | L | H | H | 3 |
| L | L | L | H | L | L | 4 |
| L | L | L | H | L | H | 5 |
| L | L | L | H | H | L | 6 |
| L | L | L | H | H | H | 7 |
| L | L | H | L | L | L | 8 |
| L | L | H | L | L | H | 9 |
| L | L | H | L | H | L | 10 |
| L | L | H | L | H | H | 11 |
| L | L | H | H | L | L | 12 |
| L | L | H | H | L | H | 13 |
| L | L | H | H | H | L | 14 |
| L | L | H | H | H | H | 15 |
| L | H | X | X | X | X | -- |
| H | L | X | X | X | X | -- |
| H | H | X | X | X | X | -- |

*All other high

FIGURE 2. Truth table.

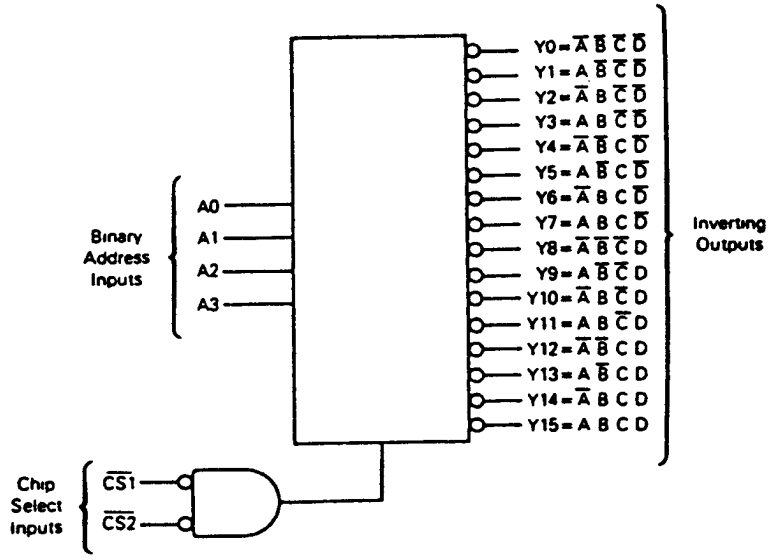



FIGURE 3. Logic diagram.

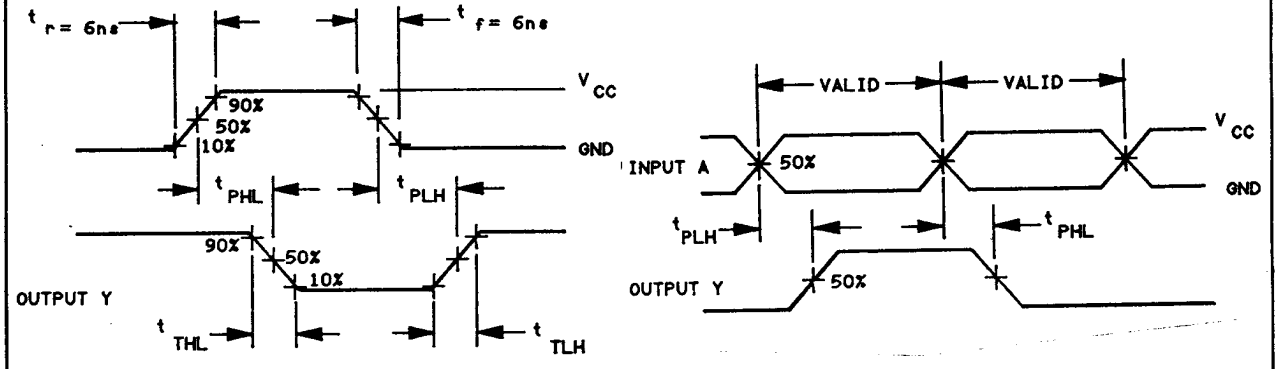



FIGURE 4. Switching waveforms.

| MILITARY DRAWING<br>DEFENSE ELECTRONICS SUPPLY CENTER<br>DAYTON, OHIO | SIZE<br>A | | DWG NO.<br>5962-86822 |
|---|---|---|---|
| | | REV A | PAGE 8 |

DESC FORM 193A
FEB 86

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 additional criteria shall apply:

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

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein)

(2) $T_A$ = +125°C, minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

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

b. Subgroups 5, 6, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroup 4 ($C_{IN}$ measurement) shall be measured only for the initial test and after process or design changes which may affect input capacitance. Generic test data may be used to satisfy the subgroup 4 requirements.

d. Subgroup 7 tests sufficient to verify truth table.

4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test (method 1005 of MIL-STD-883) conditions:

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) $T_A$ = +125°C, minimum.

(3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.

TABLE II. Electrical test requirements.

| MIL-STD-883 test requirements | Subgroups (per method 5005, table I) |
|---|---|
| Interim electrical parameters (method 5004) | --- |
| Final electrical test parameters (method 5004) | 1*,2,9 |
| Group A test requirements (method 5005) | 1,2,3,7,9, 10,11** |
| Groups C and D end-point electrical parameters (method 5005) | 1,2,3 |
| Additional electrical subgroups for group C periodic inspections | --- |

* PDA applies to subgroup 1.
** Subgroups 10 and 11, if not tested, shall be guaranteed to the specified limits in table I.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Replaceability is determined as follows:

a. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

b. When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/65804.

6.3 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone 513-296-5375.

6.4 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

| Military drawing part number | Vendor CAGE number | Vendor similar part number 1/ | Replacement military specification part number |
|---|---|---|---|
| 5962-8682201JX | 18714 | CD54HC154F/3A | M38510/65804BJX |
| 5962-8682201LX | 27014<br>04713 | MM54HC154J/883<br>54HC154/BLAJC | M38510/65804BLX |
| 5962-86822013X | 27014 | MM54HC154E/883 | M38510/65804B3X |

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

| Vendor CAGE number | Vendor name and address |
|---|---|
| 27014 | National Semiconductor Corp.<br>2900 Semiconductor Dr.<br>Santa Clara, CA 95051 |
| 18714 | RCA Corporation<br>Solid State Division<br>Route 202<br>Somerville, NJ 08876 |
| 04713 | Motorola, Incorporated<br>7402 South Price Road<br>Tempe, AZ 85283 |