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Defense Electronics Supply Center Dayton, Ohio Original date of drawing: 26 February 1987 AMSC N/A	PREPARED BY <i>Greg A. Pitz</i>	<h3 style="margin: 0;">MILITARY DRAWING</h3> <p style="margin: 0; font-size: small;">This drawing is available for use by all Departments and Agencies of the Department of Defense</p> <p style="margin: 0; font-size: small;">TITLE: MICROCIRCUITS, DIGITAL HIGH-SPEED CMOS QUAD 2-INPUT NAND GATE MONOLITHIC SILICON</p> <p style="margin: 0; font-size: small;">DWG NO. 5962-86831</p> <p style="margin: 0; font-size: small;">PAGE 1 OF 9</p>
	CHECKED BY <i>DA Di Cruz</i>	
	APPROVED BY <i>M. Houch</i>	
	SIZE A	
REV		5962-E126

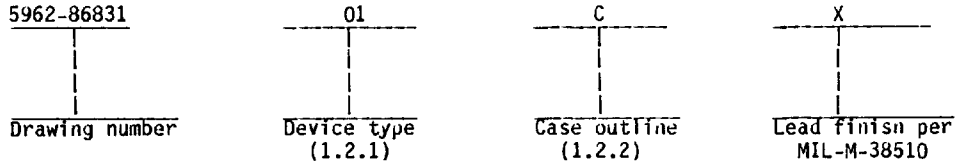
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1. SCOPE

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:



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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	54HCT00	Quad 2-input nand gate with TTL compatible inputs

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

<u>Outline letter</u>	<u>Case outline</u>
C	D-1 (14-lead, 1/4" x 3/4"), dual-in-line package

1.3 Absolute maximum ratings. 1/

Supply voltage	-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)	500 mW 2/
Lead temperature (soldering 10 seconds)	260°C
Thermal resistance, junction-to-case (θ_{JC})	see MIL-M-38510 appendix C
Junction temperature (T_j)	+175°C

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

2/ For $T_C = +100^\circ\text{C}$ to $+125^\circ\text{C}$, derate linearly at 12 mW/°C.

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1.4 Recommended operating conditions.

Supply voltage (V_{CC})	4.5 V dc to 5.5 V dc
Input rise or fall time: ($V_{CC} = 4.5V$)	0 to 500 ns
Case operating temperature (T_C)	-55°C to +125°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 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.

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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ -55°C ≤ T _C ≤ +125°C	Group A subgroups	Limits		Unit
				Min	Max	
High-level output voltage	V _{OH}	V _{CC} = 4.5 V; V _{IN} = V _{IH} or V _{IL} ; I _O = 20 μA	1,2,3	4.4		V
		V _{CC} = 4.5 V; V _{IN} = V _{IH} or V _{IL} ; I _O = 4.0 mA		3.7		V
Low-level output voltage	V _{OL}	V _{CC} = 4.5 V; V _{IN} = V _{IH} or V _{IL} ; I _O = 20 μA	1,2,3		0.1	V
		V _{CC} = 4.5 V; V _{IN} = V _{IH} or V _{IL} ; I _O = 4.0 mA			0.4	V
High-level input voltage	V _{IH}	V _{CC} = 4.5 V	1,2,3	2.0		V
Low-level input voltage	V _{IL}	V _{CC} = 4.5 V	1,2,3		0.8	V
Input capacitance	C _{IN}	V _{IN} = 0 V; T _C = 25°C See 4.3.1(c)	4		10	pF
Quiescent current	I _{CC}	V _{IN} = V _{CC} or GND; I _{OUT} = 0	1,2,3		40	μA
Additional quiescent supply current	ΔI _{CC}	V _{IN} = 2.4 V or 0.5 V, any 1 input V _{IN} = V _{CC} or GND, other inputs V _{CC} = 5.5 V I _{OUT} = 0 μA	1,2,3		490	μA
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND; V _{IN} = V _{IH} or V _{IL}	1,2,3		±1	μA
Functional tests		See 4.3.1(d)	7			
Propagation delay time, high-to-low low-to-high	t _{PHL} t _{PLH}	T _C = +25°C; V _{CC} = 4.5 V; C _L = 50 pF ±10% See figure 3	9		22	ns
		T _C = -55°C and +125°C; V _{CC} = 4.5 V; C _L = 50 pF ±10%, See figure 3	10,11		33	ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C	Group A subgroups	Limits		Unit
				Min	Max	
Transition time 2/ high-to-low Low-to-high	t _{THL} t _{TLH}	T _C = -55°C and +125°C; V _{CC} = 4.5 V; C _L = 50 pF ±10%, See figure 3	10,11		22	ns

1/ For a power supply of 5 V ±10%, the worst case output voltages (V_{OH} and V_{OL}) occur for HCT 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.) Power dissipation capacitance (C_{PD}), typically 20 pF, determines the no load dynamic power consumption, P_D = C_{PD} V_{CC}² f + I_{CC} V_{CC}, and the no load dynamic current consumption, I_S = C_{PD} V_{CC} f + I_{CC}.

2/ Transition time (t_{THL}, t_{TLH}), if not tested shall be guaranteed to the specified parameters.

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-EC3 shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.8 Verification and review. DESC's agent and the acquiring activity reserve the right to retain the option to review the manufacturer's facility and applicable required documentation. Off-shore documentation shall be made available on-shore 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).

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.
- d. 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.

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Case C

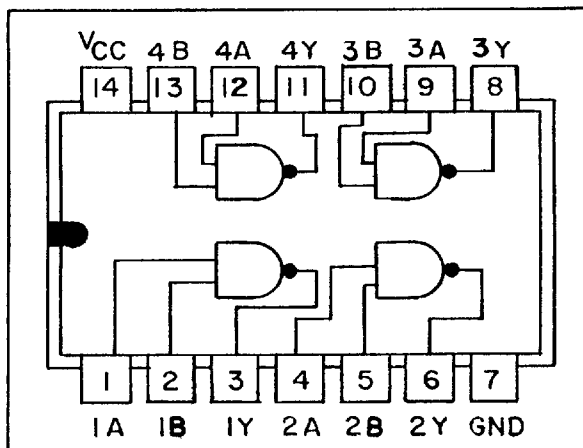


FIGURE 1. Terminal connections (top view).

Device type 01

Truth table each gate		
Input		Output
A	B	Y
L	L	H
H	L	H
L	H	H
H	H	L

Positive logic $Y = \overline{AB}$

FIGURE 2. Truth table.

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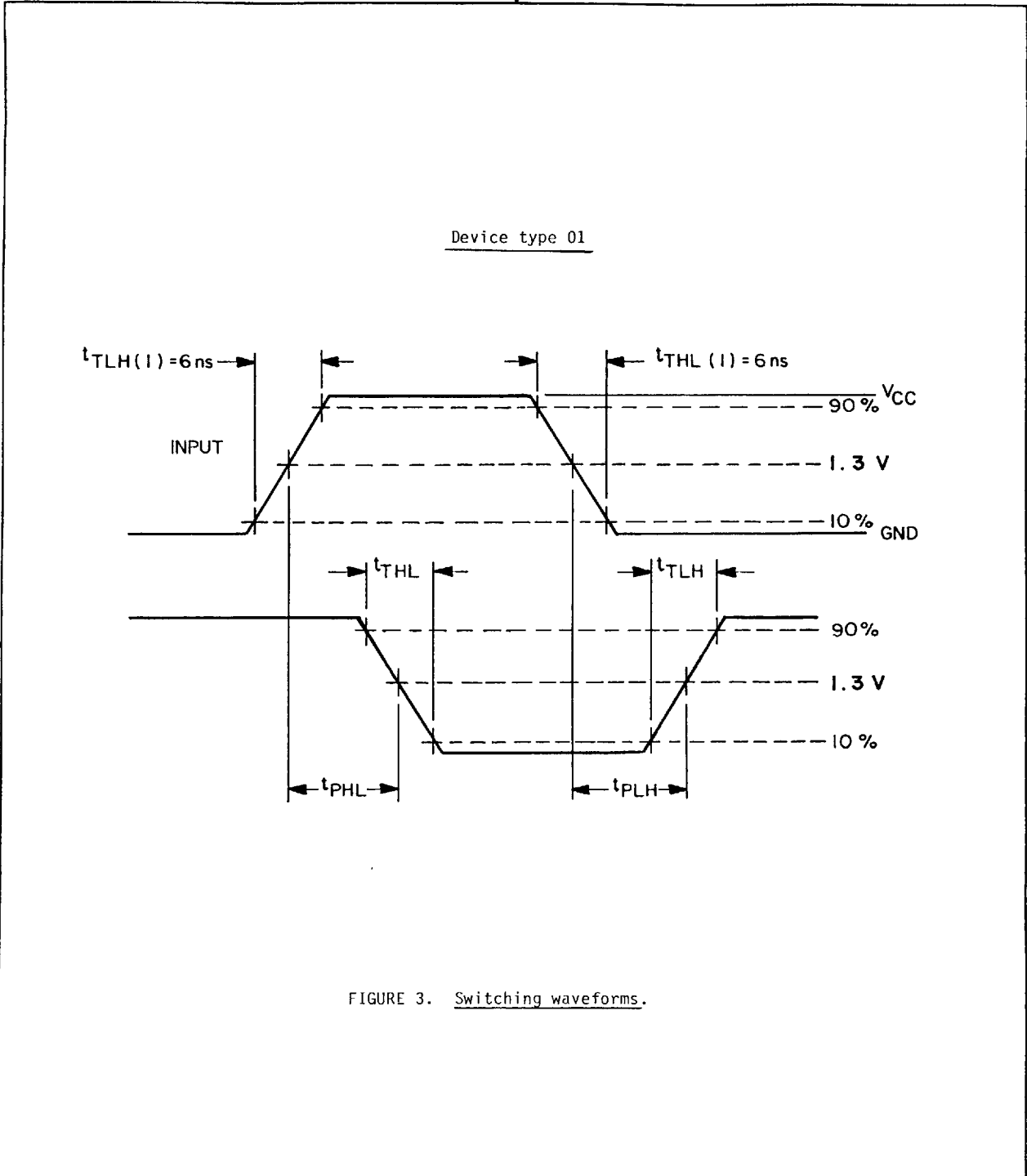


FIGURE 3. Switching waveforms.

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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.
- d. Subgroup 7 shall be tested sufficiently to verify the 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) $T_A = +125^\circ C$, 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)	1,2,3,4,7,9, 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.

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5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-3851J.

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

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/
5962-8683101CX	18714 27014	CD54HCT00F/3A MM54HCT00J/883

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

<u>Vendor CAGE number</u>	<u>Vendor name and address</u>
18714	RCA Corporation Solid State Division Route 202 Somerville, NJ 08876
27014	National Semiconductor 2300 Semiconductor Dr. Santa Clara, CA 95052

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