

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, BIPOLAR, TTL, SCHMITT-TRIGGER
NAND GATES, MONOLITHIC SILICON

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for monolithic, silicon, TTL, Schmitt-Trigger, positive NAND logic gating microcircuits. Two product assurance classes 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 in accordance with MIL-M-38510.

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

<u>Device type</u>	<u>Circuit</u>
01	Dual, 4-input positive NAND gate, Schmitt-Trigger
02	Hex, 1-input inverter gate, Schmitt-Trigger
03	Quadruple, 2-input positive NAND gate, Schmitt-Trigger

1.2.2 Device class. The device class shall be the product assurance level as defined in MIL-M-38510.

1.2.3 Case outlines. The case outlines shall be designated as follows:

<u>Outline letter</u>	<u>Case outline (see MIL-M-38510, appendix C)</u>
A	F-1 (14-pin, 1/4" x 1/4"), flat package
B	F-3 (14-pin, 3/16" x 1/4"), flat package
C	D-1 (14-pin, 1/4" x 3/4"), dual-in-line package
D	F-2 (14-pin, 1/4" x 3/8"), flat package

1.3 Absolute maximum ratings.

Supply voltage range - - - - -	-0.5 V dc to 7.0 V dc
Input voltage range - - - - -	-1.5 V dc at -12 mA to 5.5 V dc
Storage temperature range - - - - -	-65°C to 150°C
Maximum power dissipation (P_D) 1/ - - - -	176 mW dc
Lead temperature (soldering, 10 seconds)-	+300°C
Thermal resistance, junction to case (θ_{JC}):	(See MIL-M-38510, appendix C)
Cases A, B, C, D- - - - -	+175°C
Junction temperature (T_J) 2/- - - - -	

1/ Must withstand the added P_D due to short circuit conditions (e.g. I_{OS}) at one output for 5 seconds.

2/ Maximum junction temperature shall not be exceeded except for allowable short duration burn-in screening per method 5004 of MIL-STD-883.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Rome Air Development Center (RBE-2), Griffiss AFB, NY 13441, by 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.

Supply voltage(V_{CC}) - - - - -	4.5 V dc minimum to 5.5 V dc maximum
Positive-going threshold voltage- - - - -	1.5 V dc minimum to 2.0 V dc maximum
Negative-going threshold voltage- - - - -	0.6 V dc minimum to 1.1 V dc maximum
Normalized fanout (each output) 1/- - - -	10 maximum
Case operating temperature range (T_C) - - -	-55°C to +125°C

2. APPLICABLE DOCUMENTS**2.1 Government documents.**

2.1.1 Specification and standard. The following specification and standard, form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODIIS) and supplement thereto, cited in the solicitation.

SPECIFICATION**MILITARY**

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

STANDARD**MILITARY**

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

(Copies of specification and standard required by contractors 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 specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

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 Logic diagram and terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Truth tables. The truth table shall be as specified on figure 2.

3.2.3 Schematic circuits. Schematic circuits shall be submitted to the preparing activity prior to inclusion of a manufacturer's device in this specification and shall be submitted to the qualifying activity and agent activity (DESC-ECS) as a prerequisite for qualification. All qualified manufacturers schematics shall be maintained by the agent activity and will be available upon request.

3.2.4 Case outlines. The case outlines shall be as specified in 1.2.3.

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510 and 6.4 herein.

1/ The device shall fanout in both high and low levels to the specified number of inputs of the same device type as that being tested.

3.4 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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_C \leq +125^{\circ}\text{C}$	Group A		Limits		Unit
			subgroups	Min	Max		
Positive-going threshold voltage	V_{T+}	$V_{CC} = 5.0 \text{ V}$	A11	1.5	2.0		V
Negative-going threshold voltage	V_{T-}	$V_{CC} = 5.0 \text{ V}$	A11	0.6	1.1		V
Hysteresis	H	$V_{CC} = 5.0 \text{ V}$	A11	0.4	1.4		V
High-level output voltage	V_{OH1}	$V_{CC} = 4.5 \text{ V}, V_{IN} = 5/$ $I_{OH} = -.8 \text{ mA}$	A11			2.4	Volts
Low-level output voltage	V_{OL1}	$V_{CC} = 4.5 \text{ V}, I_{OL} = 16 \text{ mA}$ $V_{IN} = 2.0 \text{ V}$ for all inputs of gate under test	A11	0.4			Volts
High-level output voltage	V_{OH2}	$V_{CC} = 5.0 \text{ V}, V_{IN} = 3/$ $I_{OH} = -.8 \text{ mA}$	A11			2.4	Volts
Low-level output voltage	V_{OL2}	$V_{CC} = 5.0 \text{ V}, I_{OL} = 16 \text{ mA}$ $V_{IN} = 2/$ for all inputs of gate under test	A11	0.4			Volts
Input clamp voltage	V_{IC}	$V_{CC} = 4.5 \text{ V},$ $I_{IN} = -12 \text{ mA}, T_C = 25^{\circ}\text{C}$	A11			-1.5	Volts
High-level input current	I_{IH1}	$V_{CC} = 5.5 \text{ V}, V_{IN} = 2.4 \text{ V}$	A11			40	μA
High-level input current	I_{IH2}	$V_{CC} = 5.5 \text{ V}, V_{IN} = 5.5 \text{ V}$	A11			100	μA
Low-level input current	I_{IL}	$V_{CC} = 5.5 \text{ V}, V_{IN} = 0.4 \text{ V}$	01	-0.5	-1.6		mA
			02,03	-0.5	-1.2		mA
Short-circuit output current	I_{OS}	$V_{CC} = 5.5 \text{ V}$ 4/	A11	-18	-55		mA
High-level supply current (total)	I_{CCH}	$V_{CC} = 5.5 \text{ V}$ $V_{IN} = 0 \text{ V}$	01			23	mA
			02			36	mA
			03			24	mA
Low-level supply current (total)	I_{CCL}	$V_{CC} = 5.5 \text{ V}$ $V_{IN} = 5.5 \text{ V}$	01			32	mA
			02			60	mA
			03			40	mA

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ TC ≤ +125°C	Group A		Limits		Unit
			subgroups		Min	Max	
Propagation delay time, high-to-low level	t _{PHL}	C _L = 50 pF, R _L = 390Ω	01		5	32	ns
Propagation delay time, low-to-high level	t _{P LH}	C _L = 50 pF, R _L = 390Ω	01		5	37	ns
Propagation delay time, high-to-low level	t _{PHL}	C _L = 50 pF, R _L = 390Ω	02,03		5	35	ns
Propagation delay time, low-to-high level	t _{P LH}	C _L = 50 pF, R _L = 390Ω	02,03		5	40	ns

1/ Complete terminal conditions shall be as specified in table III.

2/ 2.0 V, then 1.1 V.

3/ 0.6 V, then 1.5 V.

4/ Not more than one output should be shorted at a time.

5/ At T_C = 25°C and T_C = -55°C, V_{IN} = 0.6 V. At T_C = 125°C, V_{IN} = 0.5 V.

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

TABLE II. Electrical test requirements.

MIL-STD-883 Test requirement	Subgroups (see table III)	
	Class S devices	Class B devices
Initial electrical parameters (pre burn-in) (method 5004)	1	1
Final electrical test parameters (method 5004)	1*, 2, 3, 9	1*, 2, 3, 9
Group A test requirements (method 5005)	1, 2, 3, 9, 10, 11	1, 2, 3, 9
Group B test requirements (method 5005) subgroup 5	1, 2, 3, 7, 8, 9, 10, 11	N/A
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3	1, 2, 3
Additional electrical subgroups for group C periodic inspections	N/A	10, 11

*PDA applies to subgroup 1 (see 4.2c).

3.6 Marking. Marking shall be in accordance with MIL-M-38510.

3.7 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 1 (see MIL-M-38510, appendix E).

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, as applicable, of MIL-STD-883, 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 qualification and quality conformance inspection. The following additional criteria shall apply:

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

(1) Test condition D or E, using the circuit shown on figure 3, or equivalent.

(2) $T_A = +125^{\circ}\text{C}$ minimum.

b. Initial and final electrical parameters shall be as specified in table II except initial electrical tests prior to burn-in are optional at the discretion of the manufacturer.

c. The percent defective allowable (PDA) shall be as specified in MIL-M-38510.

4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-M-38510. 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).

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, D, and E inspections (see 4.4.1 through 4.4.4).

4.4.1 Group A inspection. Group A inspection shall be in accordance with table I of method 5005 of MIL-STD-883 and as follows:

a. Electrical test requirements shall be as specified in table II herein.

b. Subgroups 4, 5, 6, 7, and 8 of table I of method 5005 of MIL-STD-883 shall be omitted.

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of method 5005 of MIL-STD-883. Electrical test requirements shall be as specified in table II herein.

4.4.3 Group C inspection. Group C inspection shall be in accordance with table III of method 5005 of MIL-STD-883 and as follows:

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 D or E using the circuit shown on figure 3, or equivalent.

(2) $T_A = +125^{\circ}\text{C}$ minimum.

(3) Test duration, 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

c. Subgroups 3 and 4 shall be added to the group C inspection requirements for class B devices, and shall consist of the tests, conditions, and limits as specified for subgroups 10 and 11 of group A.

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 herein.

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 ground terminal. Currents given are conventional and positive when flowing into the referenced terminal.

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 specification are intended for use for Government microcircuit applications (original equipment) and logistic purposes.

6.2 Ordering data. The acquisition document 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. Requirements for certificate of compliance, if applicable.
- d. Requirements for notification of change of product or process to the contracting activity in addition to notification to the qualifying activity, if applicable.
- e. Requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), 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 shall not apply to direct purchase by, or direct shipment to the Government.
- h. Requirements for "JAN" marking.

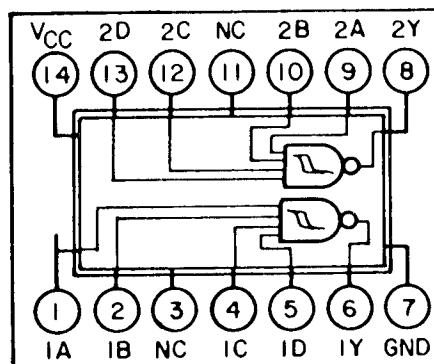
6.3 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-M-38510, MIL-STD-1331, and as follows:

GND-	- - - - -	Ground zero voltage potential.
V _{IN} -	- - - - -	Voltage level at an input terminal.
V _{IC} -	- - - - -	Input clamp voltage.
I _{IN} -	- - - - -	Current flowing into an input terminal.

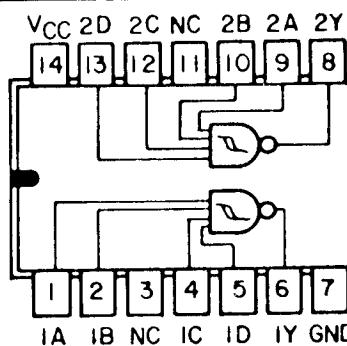
6.4 Logistic support. Lead materials and finishes (see 3.3) are interchangeable. Unless otherwise specified, microcircuits acquired for Government logistic support will be acquired to device class B (see 1.2.2) and lead material and finish C (see 3.3). Longer length leads and lead forming shall not affect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

Device types 01

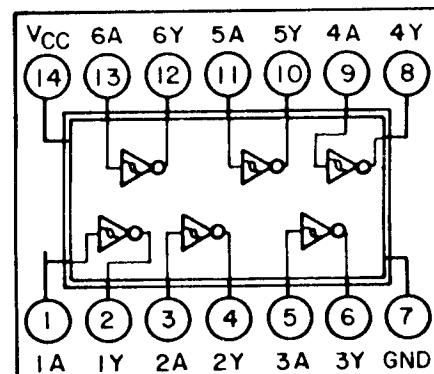
Cases A, B, and D



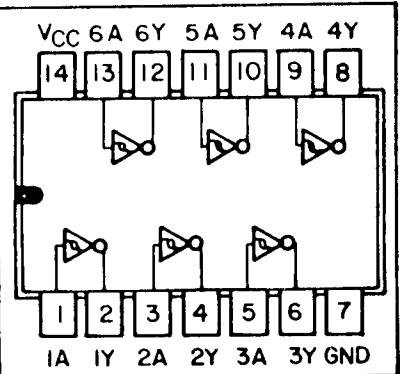
Case C

Device types 02

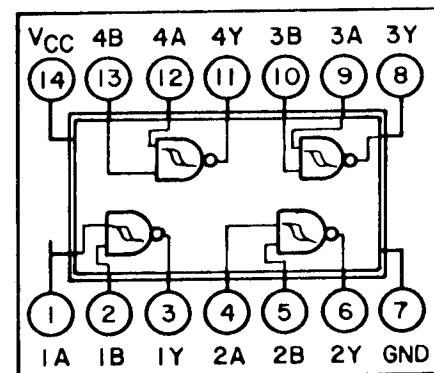
Cases A, B, and D



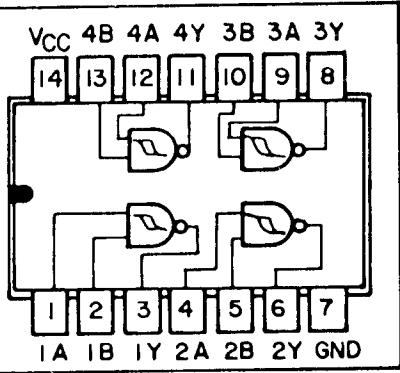
Case C

Device types 03

Cases A, B, and D



Case C

FIGURE 1. Logic diagram and terminal connections (top view).

Device type 01

Truth table				
Input				Output
A	B	C	D	Y
L	L	L	L	H
H	L	L	L	H
L	H	L	L	H
H	H	L	L	H
L	L	H	L	H
H	L	H	L	H
L	H	H	L	H
H	H	H	L	H
L	L	L	H	H
H	L	L	H	H
L	H	L	H	H
H	H	L	H	H
L	L	H	H	H
H	L	H	H	H
L	H	H	H	H
H	H	H	H	L

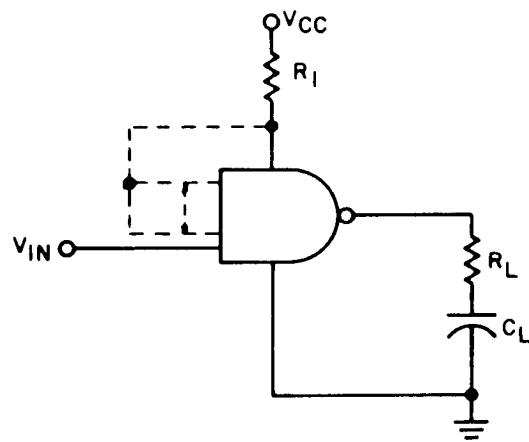
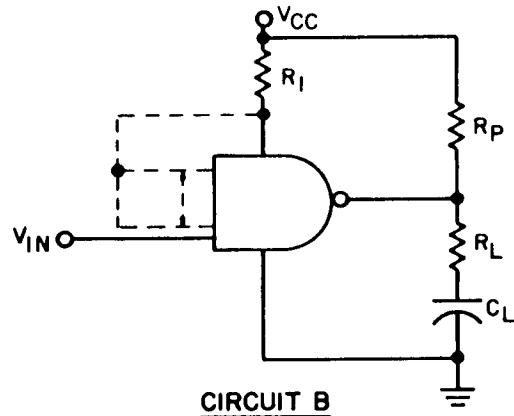
Positive logic $Y = \overline{ABCD}$ Device type 02

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

Positive logic $Y = \overline{A}$ Device type 03

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 tables and logic equations.

CIRCUIT ACIRCUIT B

NOTES:

1. One input of each gate shall be driven. The remaining inputs of each gate shall be connected to V_{CC} through the appropriate current limiting resistors.
2. V_{CC} and R_I are such that the minimum voltage at the device terminals is 5 volts.
3. If parallel excitation is used, the clock frequency shall be 100 kHz with V_{IN} = 3 volts minimum and minimum duty cycle of 50%.
4. R_L = 120Ω ±5%; C_L = .05 μF ±10%; R_P = 300Ω ±5%.
5. Circuit A shall be used for device type 01.
Circuit B shall be used for device types 02 and 03.

FIGURE 3. Burn-in and life test circuits.

TABLE III. Group A inspection for device type 01.

Substrand	Symbol	MIL-STO-1883	Cases		Test no.	1A	1B	NC	IC	1D	1Y	GND	2Y	2A	2B	NC	2C	2D	VCC	Measured	Limits	Unit	
			1	2																			
1	T _C = 25°C	V _{O1} 1 V _{O2}	3007 3007	1 2	2.0 V	2.0 V			2.0 V	2.0 V	16 mA	GND	2.0 V	2.0 V	4.5 V	1Y 2Y	0.4 V 0.4 V	"					
		V _{O1} 1	3005 "	3 4	0.6 V 2.0 V	2.0 V 0.6 V			2.0 V 2.0 V	2.0 V 2.0 V	-8 mA -8 mA	-8 mA	0.6 V 0.6 V	0.6 V 0.6 V	2.0 V 2.0 V	1Y 2Y	2.4 V 2.4 V	"					
		V _{O1} 1	" 6	5 7	2.0 V 2.0 V	2.0 V 2.0 V			2.0 V 2.0 V	2.0 V 2.0 V	-8 mA -8 mA	-8 mA	0.6 V 0.6 V	0.6 V 0.6 V	2.0 V 2.0 V	1Y 2Y	2.4 V 2.4 V	"					
		V _{O1} 1	" 9	8 10	2.0 V 2.0 V	2.0 V 2.0 V			2.0 V 2.0 V	2.0 V 2.0 V	-8 mA -8 mA	-8 mA	0.6 V 0.6 V	0.6 V 0.6 V	2.0 V 2.0 V	1Y 2Y	2.4 V 2.4 V	"					
		V _{O1} 2 V _{O2}	3007 3007	11 12	1/	1/			1/	1/	16 mA	"	1/	1/	1/	1/	1/	1/	5.0 V	1Y 2Y	0.4 V 0.4 V	"	
		V _{O2}	3006 "	13 14	2/	2.5 V 2.5 V			2.0 V 2.0 V	2.0 V 2.0 V	-8 mA -8 mA	-8 mA	2/	2/	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	1Y 2Y	2.4 V 2.4 V	"
		V _{O2}	" 15	16 17	2.0 V 2.0 V	2.0 V 2.0 V			2.0 V 2.0 V	2.0 V 2.0 V	-8 mA -8 mA	-8 mA	2/	2/	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	1Y 2Y	2.4 V 2.4 V	"
		V _{O2}	" 18	19 20	2.0 V 2.0 V	2.0 V 2.0 V			2.0 V 2.0 V	2.0 V 2.0 V	-8 mA -8 mA	-8 mA	2/	2/	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	2.0 V 2.0 V	1Y 2Y	2.4 V 2.4 V	"
		V _{I1C}		21 22 23 24 25 26 27 28	-12 mA	-12 mA			-12 mA	-12 mA	4.5 V	1A 1B 1C 1D 2A 2B 2C 2D	-1.5 V	"									
		V _{I1C}		29 30 31 32 33 34 35 36	2.4 V GND GND GND GND GND GND GND	GND GND GND GND GND GND GND GND			2.4 V GND GND GND GND GND GND GND	5.5 V GND GND GND GND GND GND GND	1A 1B 1C 1D 2A 2B 2C 2D	40 uA	"										
		V _{I1H1}	3010 "	37 38 39 40 41 42 43 44	5.5 V GND GND GND GND GND GND GND	GND GND GND GND GND GND GND GND			5.5 V GND GND GND GND GND GND GND	1A 1B 1C 1D 2A 2B 2C 2D	100 uA	"											
		V _{I1H2}	3009 "	45 46 47 48 49 50 51 52	0.4 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V	5.5 V 0.4 V 5.5 V 0.4 V 5.5 V 0.4 V 5.5 V 0.4 V			5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V	5.5 V 0.4 V 5.5 V 0.4 V 5.5 V 0.4 V 5.5 V 0.4 V	5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V	5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V	5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V	5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V	5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V	5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V	5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V 5.5 V	1A 1B 1C 1D 2A 2B 2C 2D	100 uA	"			
		V _{I1L}																					See 3/

See footnotes at end of device type 01.

TABLE III. Group A inspection for device type 01 - Continued.
Terminal conditions (pins not designated are open, high level or low level)

Subgroup	Symbol	MIL-STD-1883	Cases A,B,C,D	Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits Min	Limits Max	Unit
1	$T_C = 25^\circ C$	t_{PHL} t_{PLH}	10S 10S	3011 3011	53 54	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	5.5 V	1Y 2Y	-18 -18	-55 -55	mA	
	$T_C = 125^\circ C$	t_{PLH}		3005	55	GND	GND	GND	GND	"	GND	GND	GND	GND	GND	GND	"	VCC	23	mA		
	$T_C = 125^\circ C$	t_{PHL}		3005	56	5.5 V	5.5 V	5.5 V	5.5 V	"	5.5 V	"	VCC	32	mA							
2	Same tests, terminal conditions and limits as for subgroup 1, except $T_C = 125^\circ C$, V_{IC} tests are omitted, and $V_{IN} = 0.5$ V for V_{OH1} testing.																					
3	Same tests, terminal conditions and limits as for subgroup 1, except $T_C = -55^\circ C$, and V_{IC} tests are omitted.																					
9	$T_C = 25^\circ C$	t_{PHL} t_{PLH}	(Fig. 4)	57 58	IN	2.4 V	2.4 V	2.4 V	2.4 V	OUT	GND	OUT	IN	2.4 V	2.4 V	2.4 V	2.4 V	5.0 V	1A to 1Y 2A to 2Y	5	24	ns
	$T_C = 125^\circ C$	t_{PLH}		" 60	IN	2.4 V	2.4 V	2.4 V	2.4 V	OUT	GND	OUT	IN	2.4 V	2.4 V	2.4 V	2.4 V	"	1A to 1Y 2A to 2Y	5	28	"
10	$T_C = 125^\circ C$	t_{PHL} t_{PLH}		" 62	IN	2.4 V	2.4 V	2.4 V	2.4 V	OUT	GND	OUT	IN	2.4 V	2.4 V	2.4 V	2.4 V	"	1A to 1Y 2A to 2Y	5	32	"
	$T_C = 125^\circ C$	t_{PLH}		" 63	IN	2.4 V	2.4 V	2.4 V	2.4 V	OUT	GND	OUT	IN	2.4 V	2.4 V	2.4 V	2.4 V	"	1A to 1Y 2A to 2Y	5	32	"
11	Same tests, terminal conditions and limits as for subgroup 10, except $T_C = -55^\circ C$.																					
1/	2.0 V, then 1.1 V.																					
2/	0.6 V, then 1.5 V.																					
3/	For device type 01, with schematics incorporating a 4 k Ω base resistor, the minimum and maximum limits shall be -0.7 and -1.6 mA, respectively. For schematics incorporating a 6 k Ω base resistor, the minimum and maximum limits shall be -0.5 and -1.2 mA respectively.																					

TABLE III. Group A Inspection for device type 02.

Subgroup	Symbol	Cases A,B,C,D	MIL-STD- 883 Test no.	Terminal conditions (pins not designated are open, high level or low level)				Measured terminal	Min	Max
				1	2	3	4			
$T_C = 25^\circ C$	V0L1	3007	1	2.0 V	16 mA	2.0 V	16 mA	GND	4.5 V	0.4 V
		"	2	"	"	"	"	3Y	2Y	"
		"	3	"	"	"	"	4Y	3Y	"
		"	4	"	"	"	"	5A	4Y	"
		"	5	"	"	"	"	6Y	5Y	"
		"	6	"	"	"	"	"	6Y	"
	V0H1	3006	7	0.6 V	-8 mA	0.6 V	-8 mA	"	"	"
		"	8	"	"	"	"	"	"	"
		"	9	"	"	"	"	"	"	"
		"	10	"	"	"	"	"	"	"
		"	11	"	"	"	"	"	"	"
		"	12	"	"	"	"	"	"	"
	V0L2	3007	13	1/	16 mA	1/	16 mA	"	"	"
		"	14	"	"	"	"	"	"	"
		"	15	"	"	"	"	"	"	"
		"	16	"	"	"	"	"	"	"
		"	17	"	"	"	"	"	"	"
		"	18	"	"	"	"	"	"	"
	V0H2	3006	19	2/	-8 mA	2/	-8 mA	"	"	"
		"	20	"	"	"	"	"	"	"
		"	21	"	"	"	"	"	"	"
		"	22	"	"	"	"	"	"	"
		"	23	"	"	"	"	"	"	"
		"	24	"	"	"	"	"	"	"
	VIC	25	-12 mA	-12 mA	-12 mA	-12 mA	-12 mA	-12 mA	4.5 V	2.4 V
		"	26	"	"	"	"	"	1A	-1.5 V
		"	27	"	"	"	"	"	2A	"
		"	28	"	"	"	"	"	3A	"
		"	29	"	"	"	"	"	4A	"
		"	30	"	"	"	"	"	5A	"
		"	"	"	"	"	"	"	6A	"
	I1H1	3010	31	2.4 V	2.4 V	2.4 V	2.4 V	"	5.5 V	40 μA
		"	32	"	"	"	"	"	1A	"
		"	33	"	"	"	"	"	2A	"
		"	34	"	"	"	"	"	3A	"
		"	35	"	"	"	"	"	4A	"
		"	36	"	"	"	"	"	5A	"
	I1H2	"	37	5.5 V	5.5 V	5.5 V	5.5 V	"	1A	100 μA
		"	38	"	"	"	"	"	2A	"
		"	39	"	"	"	"	"	3A	"
		"	40	"	"	"	"	"	4A	"
		"	41	"	"	"	"	"	5A	"
		"	42	"	"	"	"	"	6A	"
	I1L	3009	43	0.4 V	0.4 V	0.4 V	0.4 V	"	1A	-0.5 V
		"	44	"	"	"	"	"	2A	"
		"	45	"	"	"	"	"	3A	"
		"	46	"	"	"	"	"	4A	"
		"	47	"	"	"	"	"	5A	"
		"	48	"	"	"	"	"	6A	"

See footnotes at end of device type 02.

TABLE III. Group A inspection for device type 02 - Continued.
Terminal conditions (pins not designated are open, high level or low level)

Same tests, terminal conditions and limits as for subgroup 10, except $|C| = -55$ L.

1/ 2.0 V, then 1.1 V.

2/ 0.6 V; then 1.5 V.

TABLE III. Group A Inspection for device type 03.
Terminal conditions (pins not designated are open, high level or low level)

Subgroup	Symbol	MIL-STD-1883	Cases A,B,C,D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits	Unit
		Test no.	Method	TA	TB	TY	ZA	ZB	2Y	GND	3Y	JA	JB	4Y	4A	4B	VCC	Min	Max	
$T_C = 25^\circ C$	V_{OL1}	3007	"	1	2.0 V	2.0 V	16 mA	2.0 V	2.0 V	16 mA	"	"	"	"	"	"	4.5 V	1Y 2Y 3Y 4Y	0.4 V	
		"	"	2	0.6 V	2.0 V	-.8 mA	0.6 V	2.0 V	16 mA	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	3	2.0 V	0.6 V	-.8 mA	2.0 V	0.6 V	-.8 mA	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	4	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
	V_{OH1}	3006	"	5	0.6 V	2.0 V	-.8 mA	0.6 V	2.0 V	16 mA	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	2.4 V	
		"	"	6	2.0 V	0.6 V	-.8 mA	2.0 V	0.6 V	16 mA	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	7	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	8	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	9	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	10	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	11	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	12	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
	V_{OL2}	3007	"	13	1Y	1Y	16 mA	1Y	1Y	16 mA	"	"	"	"	"	"	"	5.0 V	1Y 2Y 3Y 4Y	0.4 V
		"	"	14	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	15	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	16	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
	V_{OH2}	3006	"	17	2Y	2.0 V	-.8 mA	2.0 V	2.0 V	16 mA	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	2.4 V	
		"	"	18	2.0 V	2.0 V	-.8 mA	2.0 V	2.0 V	16 mA	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	19	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	20	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	21	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	22	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	23	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
		"	"	24	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y 2Y 3Y 4Y	"	
	V_{IC}	25	"	-12 mA	"	"	"	"	"	"	"	4.5 V	1A 1B 2A 2B 3A 3B 4A 4B	-1.5 V						
		26	"	-12 mA	"	"	"	"	"	"	"	5.5 V	1A 1B 2A 2B 3A 3B 4A 4B	"						
		27	"	-12 mA	"	"	"	"	"	"	"	5.5 V	1A 1B 2A 2B 3A 3B 4A 4B	"						
		28	"	-12 mA	"	"	"	"	"	"	"	5.5 V	1A 1B 2A 2B 3A 3B 4A 4B	"						
		29	"	-12 mA	"	"	"	"	"	"	"	5.5 V	1A 1B 2A 2B 3A 3B 4A 4B	"						
		30	"	-12 mA	"	"	"	"	"	"	"	5.5 V	1A 1B 2A 2B 3A 3B 4A 4B	"						
		31	"	-12 mA	"	"	"	"	"	"	"	5.5 V	1A 1B 2A 2B 3A 3B 4A 4B	"						
		32	"	-12 mA	"	"	"	"	"	"	"	5.5 V	1A 1B 2A 2B 3A 3B 4A 4B	"						
	I_{IH1}	3010	"	33	2.4 V	GND	2.4 V	2.4 V	GND	2.4 V	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	40 uA	
		"	"	34	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	35	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	36	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	37	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	38	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	39	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	40	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
	I_{IH2}	"	"	41	5.5 V	GND	5.5 V	5.5 V	GND	5.5 V	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	100 uA	
		"	"	42	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	43	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	44	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	45	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	46	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	47	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	
		"	"	48	"	"	"	"	"	"	"	"	"	"	"	"	"	1A 1B 2A 2B 3A 3B 4A 4B	"	

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 03 - (Continued.
Terminal conditions (pins not designated are open, high level or low level)

Subgroup	Symbol	MIL-STD-883	Cases A,B,C,D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits	Unit	
		Test no.	Method	1A	1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	V _{CC}	Min	Max		
1	T _C = 25°C	t _{PHL}	3009	49	0.4 V	5.5 V	0.4 V	5.5 V	0.4 V	GND							5.5 V	1A	-0.5 -1.2	mA	
		"	"	50	5.5 V	0.4 V				"								1B	"	"	
		"	"	51						"								2A	"	"	
		"	"	52						"								2B	"	"	
		"	"	53						"								3A	"	"	
		"	"	54						"								3B	"	"	
		"	"	55						"								4A	"	"	
		"	"	56						"								4B	"	"	
10S		3011		57	GND	GND	GND	GND	GND	"								1Y	-18 -55	"	
		"		58						"								2Y	"	"	
		"		59						"								3Y	"	"	
		"		60						"								4Y	"	"	
1CCH		3005		61	GND	GND	GND	GND	GND	"								V _{CC}	"	"	
1CCL		3005		62	5.5 V	"								V _{CC}	"	"					
																		40	"	"	
2																					
3																					
9	T _C = 25°C	t _{PHL} (Fig. 4)	3003	63	IN	2.4 V	OUT	IN	2.4 V	OUT	GND	"	OUT	IN	2.4 V	OUT	IN	2.4 V	5.0 V	1A to 1Y 2A to 2Y 3A to 3Y 4A to 4Y	ns
		"	"	64						"											
		"	"	65						"											
		"	"	66						"											
10	T _C = 125°C	t _{PHL}	"	67	IN	2.4 V	OUT	IN	2.4 V	OUT	"	OUT	IN	2.4 V	OUT	IN	2.4 V	5.0 V	1A to 1Y 2A to 2Y 3A to 3Y 4A to 4Y	ns	
		"	"	68						"											
		"	"	69						"											
		"	"	70						"											
11																					

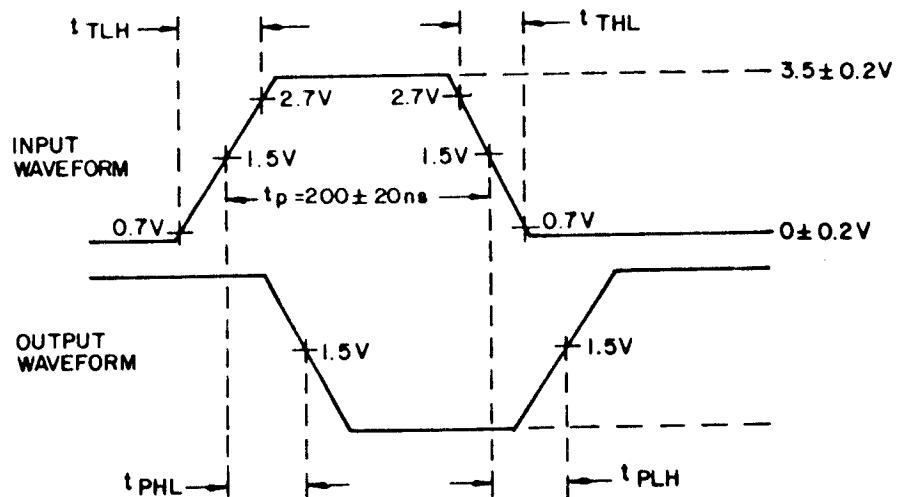
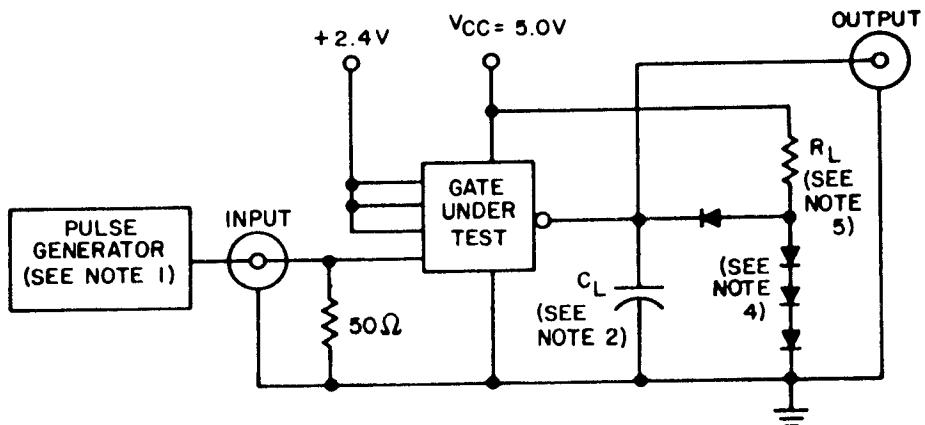
1 Same tests, terminal conditions and limits as for subgroup 1, except T_C = 125°C, VIC tests are omitted, and V_{IN} = 0.5 V for Y_{H1} testing.2 Same tests, terminal conditions and limits as for subgroup 1, except T_C = -55°C and VIC tests are omitted.

9	T _C = 25°C	t _{PHL}	3003	63	IN	2.4 V	OUT	IN	2.4 V	OUT	GND	"	OUT	IN	2.4 V	OUT	IN	2.4 V	5.0 V	1A to 1Y 2A to 2Y 3A to 3Y 4A to 4Y	ns
		"	"	64						"											
		"	"	65						"											
		"	"	66						"											
10	T _C = 125°C	t _{PHL}	"	67	IN	2.4 V	OUT	IN	2.4 V	OUT	"	OUT	IN	2.4 V	OUT	IN	2.4 V	5.0 V	1A to 1Y 2A to 2Y 3A to 3Y 4A to 4Y	ns	
		"	"	68						"											
		"	"	69						"											
		"	"	70						"											
11																					

1/ 2.0 V, then 1.1 V.

2/ 0.6 V, then 1.5 V.

11 Same tests, terminal conditions and limits as for subgroup 10, except T_C = -55°C.



NOTES:

1. The pulse generator has the following characteristics: $t_{TLH} = t_{THL} \leq 10 \text{ ns}$, PRR = 1 MHz, $Z_{out} = 50 \text{ ohms}$.
2. $C_L = 50 \text{ pF}$ minimum, including scope probe, wiring, and stray capacitance, without package in test fixture.
3. Voltage measurements are to be made with respect to network ground terminal.
4. All diodes are 1N3064 or equivalent.
5. $R_L = 390 \text{ ohms} \pm 5 \text{ percent}$.

FIGURE 4. Switching time test circuit.

6.5 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>Device type</u>	<u>Commercial type</u>
01	5413, 7413
02	5414, 7414
03	54132, 74132

6.6 Manufacturers' designations. Manufacturers' circuits included in this specification are designated with an "X" as shown in table IV herein.

TABLE IV. Manufacturers' designations.

Device type	Circuits		
	A	B	C
	National Semiconductor	Motorola	Signetics
01		X	X
02		X	X
03		X	X

6.7 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.

Custodians:

Army - ER
Navy - EC
Air Force - 17

Preparing activity:
Air Force - 17

Agent:
DLA - ES

(Project 5962-0843)

Review activities:

Army - AR, MI
Navy - SH, OS, TD
Air Force - 11, 19, 85, 99
DLA - ES

User activities:

Army - SM
Navy - AS, CG, MC