

MIL-M-38510/4C  
25 February 1977  
SUPERSEDING  
MIL-M-38510/4A  
23 December 1971

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, TTL, MULTIPLE NOR 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, positive NOR logic gating microcircuits. Three product assurance classes and a choice of case outline/lead finish are provided for each type and are reflected in the complete part number (see 6.2).

1.2 Part number. The part number shall be in accordance with MIL-M-38510.

1.2.1 Device type. The device type shall be as shown in the following:

<u>Device type</u>	<u>Circuit</u>
01	Quadruple 2-input positive NOR gate
02	Dual 4-input positive NOR gate with strobe and expandable input
03	Dual 4-input positive NOR gate with strobe
04	Triple 3-input positive NOR gate

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

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

<u>Case outline letter</u>	<u>MIL-M-38510, appendix C, case outline</u>
A	F-1 (14-pin, 1/4" x 1/4", flat-pack)
B	F-3 (14-pin, 1/4" x 3/16", flat-pack)
C	D-1 (14-pin, 1/4" x 3/4", dual-in-line pack)
D	F-2 (14-pin, 1/4" x 3/8", flat-pack)
E	D-2 (16-pin, 1/4" x 7/8", dual-in-line pack)
F	F-5 (16-pin, 1/4" x 3/8", flat-pack)

1.2.4 Absolute maximum ratings.

Supply voltage range	- - - - -	-0.5 Vdc to 7.0 Vdc
Input voltage range	- - - - -	-1.5 Vdc at -12 mA to 5.5 Vdc
Storage temperature range	- - - - -	-65° to 150°C
Maximum power dissipation per gate, $P_D$	- - -	60 mWdc 1/
Lead temperature (soldering 10 seconds)	- - -	300°C
Thermal resistance, junction to case	- - -	$\theta_{JC} = \begin{cases} 0.09^\circ\text{C}/\text{mW} & \text{for flat pack} \\ 0.08^\circ\text{C}/\text{mW} & \text{for dual-in-line pack} \end{cases}$
Junction temperature	- - - - -	$T_J = 175^\circ\text{C}$

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

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, RADC (RBRD), 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.

1.2.5 Recommended operating conditions.

Supply voltage	- - - - -	4.5 Vdc minimum to 5.5 Vdc maximum
Minimum high level input voltage	- - - - -	2.0 Vdc
Maximum low level input voltage	- - - - -	0.8 Vdc
Normalized fanout (each output)	- - - - -	10 maximum
Ambient operating temperature range	- - - - -	-55° to 125°C

2. APPLICABLE DOCUMENT

2.1 Issues of documents. The following document, of the issue in effect on date of invitation for bids or request for proposal, forms 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, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Detail specifications. 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 logic diagram and terminal connections shall be as specified on figure 1.

3.2.2 Truth tables and logic equations. The truth tables and logic equations shall be as specified on figure 2.

3.2.3 Schematic circuit. The schematic circuit shall be as specified on figure 3.

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

3.3 Lead material and finish. Lead material and finish shall be in accordance with MIL-M-38510 (see 6.5).

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

3.5 Rebonding. Rebonding shall be in accordance with MIL-M-38510.

TABl .. Electrical performance characteristics.

Test	Symbol	Conditions	Device type	Limits		
				Min	Max	Unit
High-level output voltage	$V_{OH}$	$V_{CC} = 4.5V, V_{IN} = 0.8V$ $I_{OH} = -800 \mu A$	03, 04	2.4	---	V
		$V_{CC} = 4.5V, V_{IN} = 0.8V$ $I_{OH} = -400 \mu A$	01	2.4	---	V
		$V_{CC} = 4.5V, V_{IN} = 0.8V$ $I_{OH} = -800 \mu A$	02	2.4	---	V
		$V_{CC} = 4.5V, I_X = 0.15 mA,$ $I_X = 0.15 mA, I_{OH} = -400 \mu A$ 1/				
Low-level output voltage	$V_{OL}$	$V_{CC} = 4.5V, I_{OL} = 16 mA$ $V_{IN} = 2.0V$ 2/	01, 03, 04	---	0.4	V
		$V_{CC} = 4.5V, V_{IN} = 2.0V$ $I_{OL} = 16 mA$ 2/			0.4	V
		$V_{CC} = 4.5V, I_X = 0.3 mA$ $R_X = 138\Omega, I_{OL} = 16 mA$ 3/	02	---		
Expander current	$I_X$	$V_{CC} = 5.0V, I_{OL} = 16 mA$ $V_X = 0.4V, T_A = -55^\circ C$ 4/	02	---	3.5	mA
Base-emitter voltage	$V_{BE}$	$V_{CC} = 5.0V, I_X = 0.41 mA, I_{OL} = 16 mA$ $T_A = -55^\circ C$ 5/	02	---	1.1	V
High-level input current	$I_{IH1}$	$V_{CC} = 5.5V, \text{Data input} = 2.4V$	All	---	40	$\mu A$
		$V_{CC} = 5.5V, \text{Strobe input} = 2.4V$	02, 03	---	160	$\mu A$
High-level input current	$I_{IH2}$	$V_{CC} = 5.5V, \text{Data input} = 5.5V$	All	---	100	$\mu A$
		$V_{CC} = 5.5V, \text{Strobe input} = 5.5V$	02, 03	---	400	$\mu A$
Low-level input current	$I_{IL1}$	$V_{CC} = 5.5V, \text{Data input} = 0.4V$ 6/	01	- .55	-1.6	mA
			02, 03, 04	-1.7	-1.6	mA
Low-level input current	$I_{IL2}$	$V_{CC} = 5.5V, \text{Strobe input} = 0.4V$ 6/	02, 03	-2.8	-6.4	mA
Short-circuit output current	$I_{OS}$	$V_{CC} = 5.5V, V_{IN} = 0V$ 7/	All	-20	-55	mA
High-level supply current per gate	$I_{CCH}$	$V_{CC} = 5.5V, V_{IN} = 0V$	01		4	mA
			02, 03		8	mA
			04		5.2	mA
Low-level supply current per gate	$I_{CCL}$	$V_{CC} = 5.5V, V_{IN} = 5V$	01		6.5	mA
			02, 03		9.5	mA
			04		8.5	mA
Input clamp voltage	$V_{IC}$	$V_{CC} = 4.5V, I_{IN} = -12 mA$ $T_A = 25^\circ C$	All		-1.5	V
Propagation delay time high-to-low-level	$t_{PHL}$	$C_L = 50 pF \text{ minimum}$ $R_L = 390\Omega \pm 5 \text{ percent}$	All	3	24	ns
Propagation delay time low-to-high-level	$t_{PLH}$	$C_L = 50 pF \text{ minimum}$ $R_L = 390\Omega \pm 5 \text{ percent}$	01, 03, 04	3	27	ns
			02	3	30	ns

1/ See test figure 8.

2/ All unspecified inputs grounded.

3/ See test figure 7.

4/ See test figure 10.

5/ See test figure 9.

6/ All unspecified inputs at 5.5V.

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

3.6 Electrical test requirements. Electrical test requirements shall be as specified in table III for the applicable device type and device class. The subgroups of table III which constitute the minimum electrical test requirements for screening, qualification, and quality conformance by device class are specified in table II.

TABLE II. Electrical test requirements.

MIL-STD-883 Test requirement	Subgroups (see table III)		
	Class A Devices	Class B Devices	Class C Devices
Interim electrical parameters (Pre Burn-In) (method 5004)	1	1	Not required
Final electrical test parameters (method 5004)	1*, 2, 3, 7, 9, 10, 11	1*, 2, 3, 7, 9	1, 7
Group A test requirements (Method 5005)	1, 2, 3, 7, 8, 9, 10, 11	1, 2, 3, 7, 9	1, 2, 3, 7, 9
Groups C and D end point electrical parameters (method 5005)	1, 2, 3	1, 2, 3	1
Additional electrical subgroups for Group C periodic inspections	None	10, 11	None

\* PDA applies to subgroup 1 (see 4.3 c.).

3.7 Marking. Marking shall be in accordance with MIL-M-38510. At the option of the manufacturer, the following marking may be omitted from the body of the microcircuit, but shall be retained on the initial container:

- a. Country of origin.

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

#### 4. PRODUCT ASSURANCE PROVISIONS

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

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified herein for groups A, B, C, and D inspections (see 4.4.1, 4.4.2, and 4.4.3).

4.3 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 test (method 1015 of MIL-STD-883).
  - (1) Test condition D or E, using the circuit shown on figure four, or equivalent.

- b. Interim and final electrical test 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.
- c. Percent defective allowable (PDA). The PDA for class A devices shall be as specified in MIL-M-38510 (see 4.6.1.2). The PDA is specified as 10 percent for class B devices based on failures from group A, subgroup 1 test after cooldown as 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, subgroup 1 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, and the lot shall be accepted or rejected based on the PDA for the applicable device class.

**4.4 Quality conformance inspection.** Quality conformance inspection shall be in accordance with MIL-M-38510.

**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. Tests shall be as specified in table II.
- 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.

**4.4.3 Groups C and D inspections.** Groups C and D inspections shall be in accordance with table III and IV of method 5005 of MIL-STD-883 and as follows:

- a. End point electrical parameters shall be as specified in table II.
- b. 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 specified for subgroups 10 and 11 of group A.
- c. Operating life test (method 1005 of MIL-STD-883) conditions:
  - (1) Test condition D or E, using the circuit shown on figure four, or equivalent.
  - (2)  $T_A = 125^\circ\text{C}$ , minimum.
  - (3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510.

**4.5 Methods of examination and test.** Methods of examination and test shall be as specified in the appropriate tables and as follows:

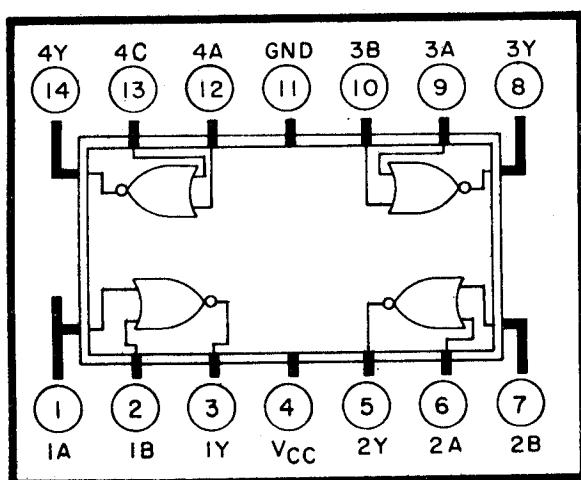
**4.5.1 Voltage and current.** All voltages given are referenced to the microcircuit ground terminal. Currents given are conventional current and positive when flowing into the referenced terminal.

**4.5.2 Life test cooldown procedure.** When devices are measured at  $25^\circ\text{C}$  following application of the operating life or burn-in test condition, they shall be cooled to room temperature prior to removal of the bias. Alternately, the bias may be removed during cooling if the case temperature is reduced to room temperature within 30 minutes after removal of the test condition.

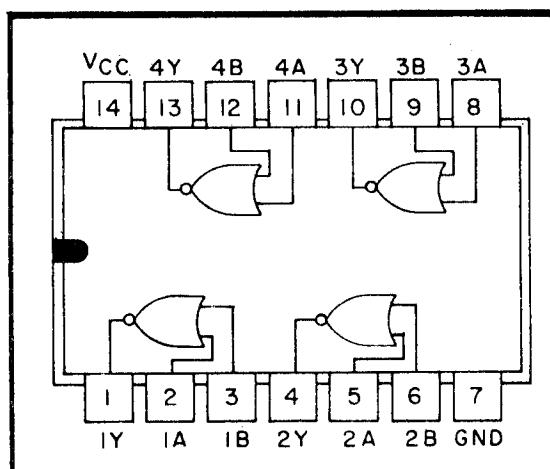
**4.6 Inspection of preparation for delivery.** The requirements for packaging shall be in accordance with MIL-M-38510, except that the rough handling test shall not apply.

## Device Type 01

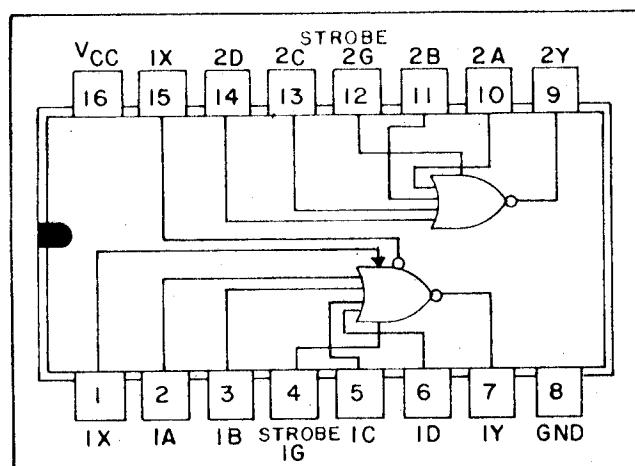
## CASES A,B,D



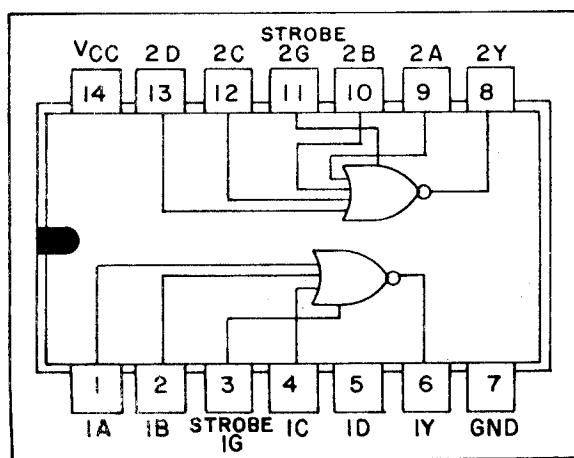
## CASE C



## Device Type 02, CASES E,F



## Device Type 03, CASES A,B,C,D



## Device Type 04, CASES A,B,C,D

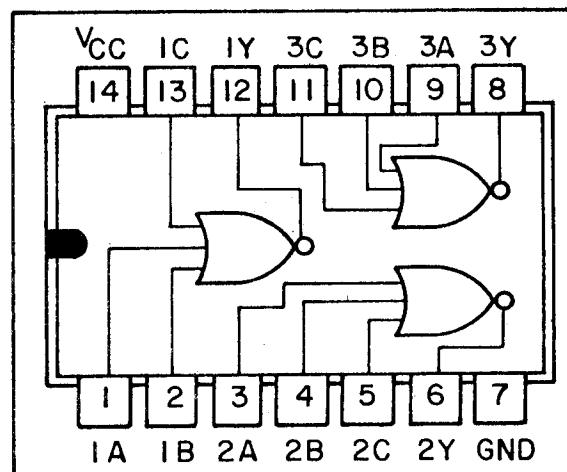


FIGURE 1. Logic diagram and terminal connections (top view).

## Device type 01

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

X = Irrelevant

Positive logic:  $Y = \overline{A} + B$ 

## Device type 02

Truth table gate 1						
Input						Output
1A	1B	1C	1D	1X	1G	1Y
H	X	X	X	X	H	L
X	H	X	X	X	H	L
X	X	H	X	X	H	L
X	X	X	H	X	H	L
X	X	X	X	ON	X	L
L	L	L	L	OFF	X	H
X	X	X	X	OFF	L	H

X = Irrelevant

1X = Expander Input

Positive logic:  $1Y = \overline{1G}(1A+1B+1C+1D+1X)$ 

Truth table gate 2					
Input					Output
2A	2B	2C	2D	2G	2Y
H	X	X	X	H	L
X	H	X	X	H	L
X	X	H	X	H	L
X	X	X	H	H	L
L	L	L	L	X	H
X	X	X	X	L	H

X = Irrelevant

Positive logic:  $2Y = \overline{2G}(2A+2B+2C+2D)$ 

FIGURE 2. Truth tables and logic equations.

## Device type 03

Truth table each gate					
Input					Output
A	B	C	D	G	Y
H	X	X	X	H	L
X	H	X	X	H	L
X	X	H	X	H	L
X	X	X	H	H	L
L	L	L	L	X	H
X	X	X	X	L	H

 $X = \text{Irrelevant}$ 

Positive logic:  $Y = \overline{G(A+B+C+D)}$

## Device type 04

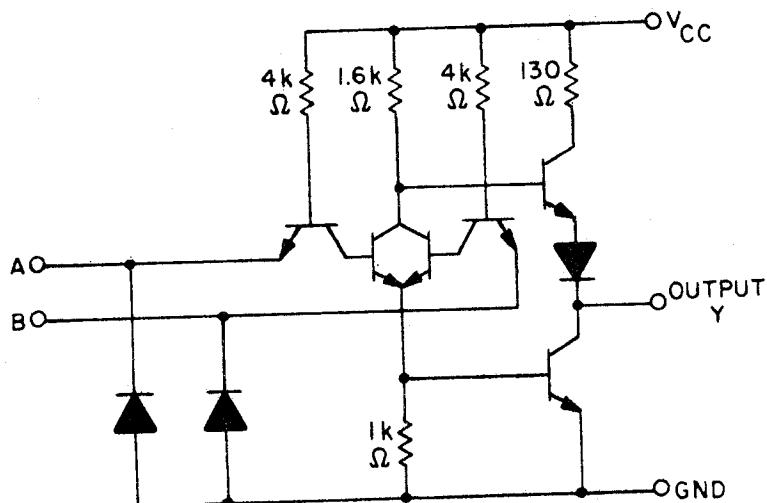
Truth table each gate			
Input			Output
A	B	C	Y
H	X	X	L
X	H	X	L
X	X	H	L
L	L	L	H

 $X = \text{Irrelevant}$ 

Positive logic:  $Y = \overline{A+B+C}$

FIGURE 2. Truth tables and logic equations - Continued.

Device type 01, circuit A  
(Each Gate)



NOTE: Component values shown are nominal.

Device type 01, circuit B  
(Each Gate)

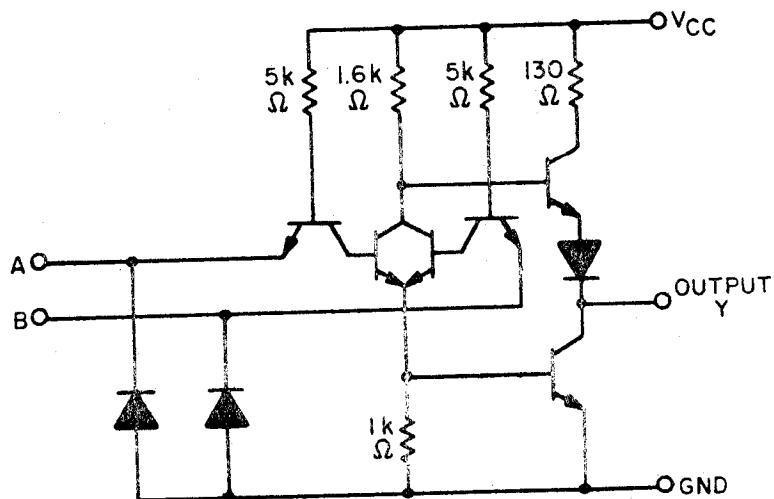
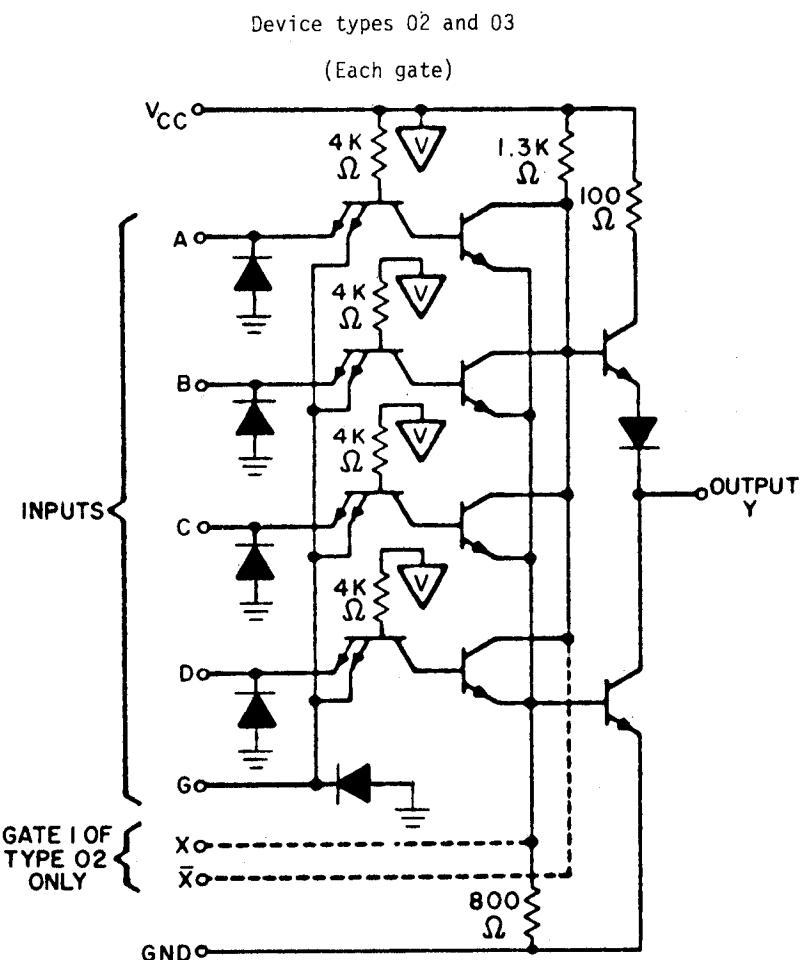


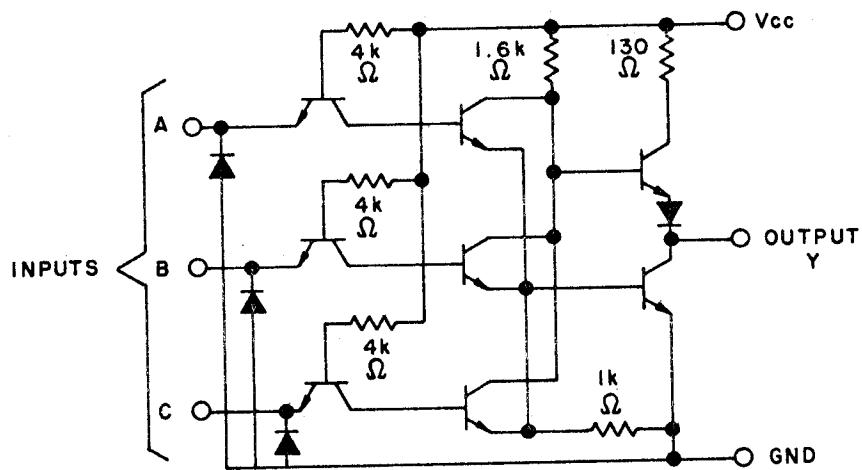
FIGURE 3. Schematic circuits.



- NOTES:**
- Component values shown are nominal.
  - Both expander inputs are used simultaneously for expanding.
  - If expander is not used leave **X** and  **$\bar{X}$**  open.
  - A total of four expander gates can be connected to the expander inputs.
  - Input **G** is strobe input.

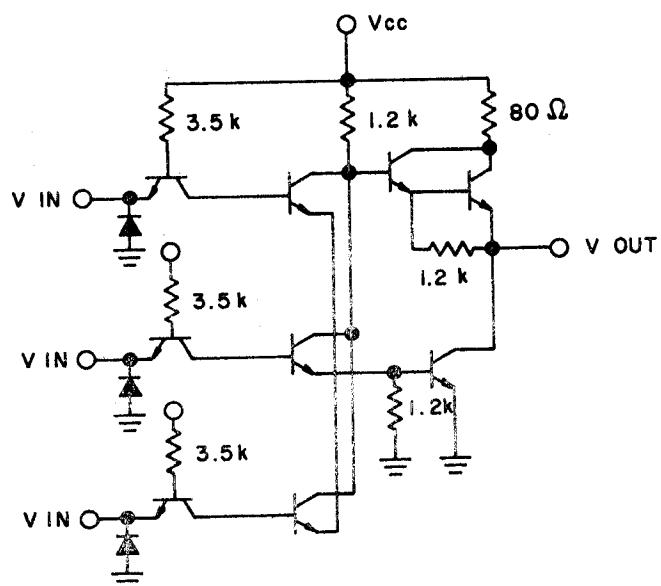
FIGURE 3. Schematic circuits - Continued.

Device type 04, circuit A  
(Each gate)



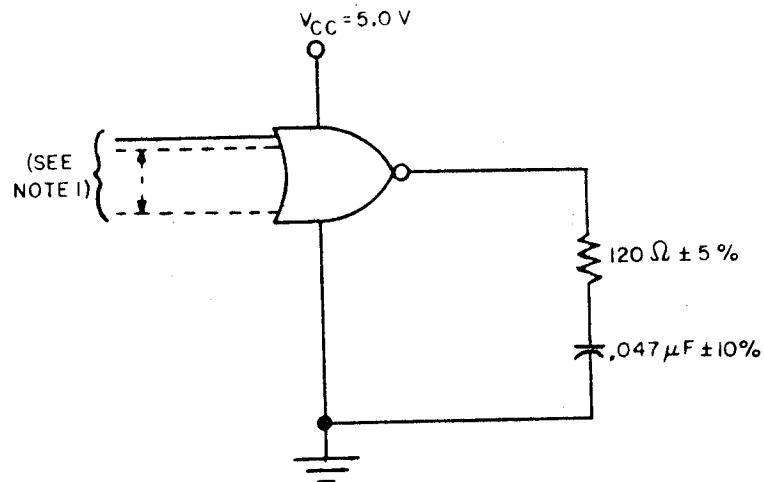
NOTE: Component values shown are nominal.

Device type 04, circuit B



NOTE: Component values shown are nominal.

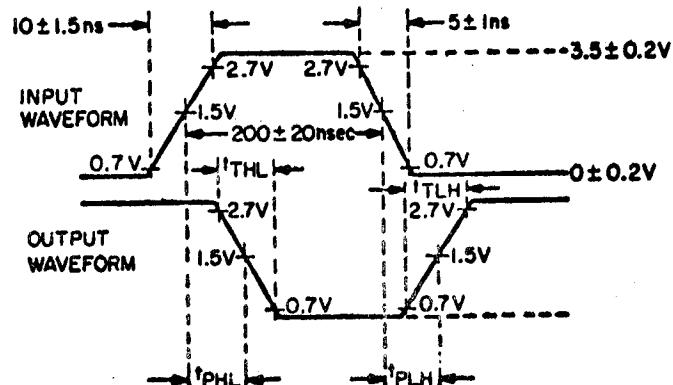
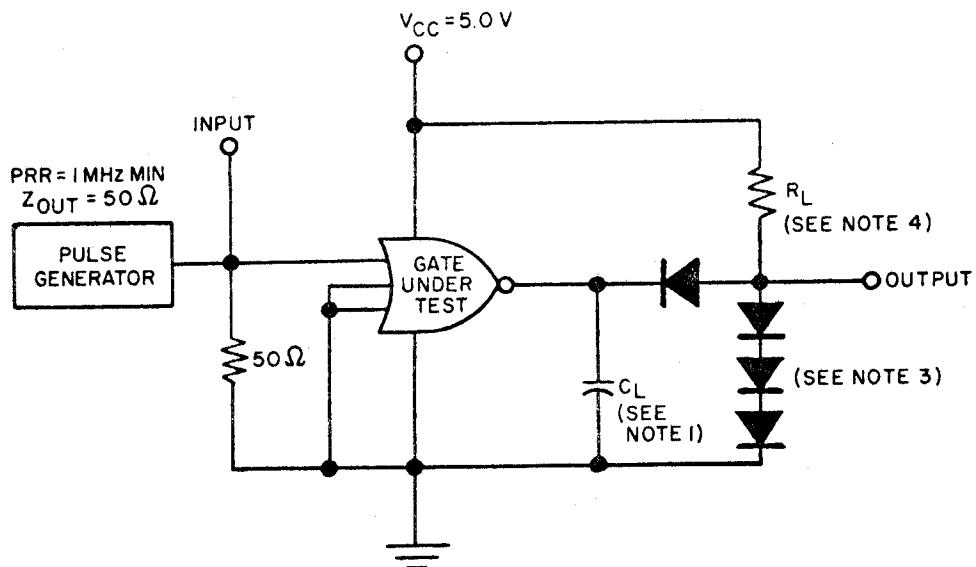
FIGURE 3. Schematic circuits - Continued.



NOTES:

1. One input of each gate shall be driven. Remaining gate inputs shall be connected to GND.
2.  $V_{CC} = 5.0\text{V}$ .
3. If parallel excitation is used, clock frequency shall be 100KHz with minimum  $V_{IN} = 3\text{V}$  and minimum duty cycle of 50%.

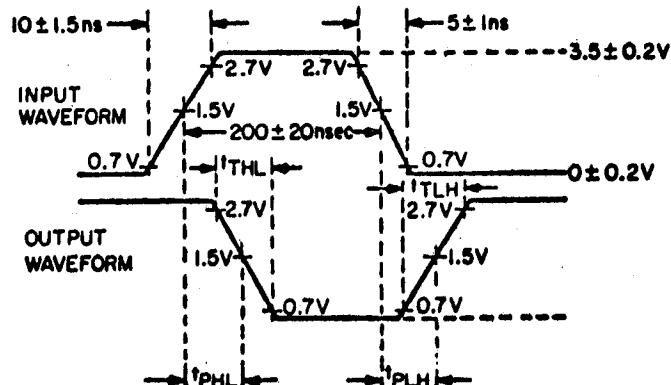
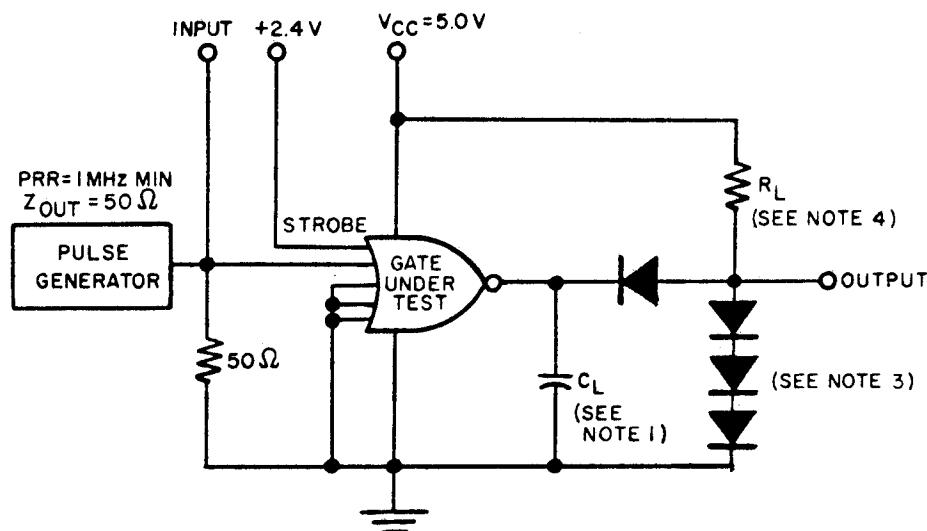
FIGURE 4. Burn-in and life test circuit.



## NOTES:

1.  $C_L = 50\text{pF}$  minimum including scope probe, wiring, and stray capacitance, without package in test fixture.
2. Voltage measurements are to be made with respect to network ground terminal.
3. All diodes are 1N3064 or equivalent.
4.  $R_L = 390\Omega \pm 5\%$ .

FIGURE 5. Switching time test circuit for device types 01 and 04.



NOTES:

1.  $C_L = 50\text{pF}$  minimum including scope probe, wiring, and stray capacitance, without package in test fixture.
2. Voltage measurements are to be made with respect to network ground terminal.
3. All diodes are 1N3064 or equivalent.
4.  $R_L = 390\Omega \pm 5\%$ .

FIGURE 6. Switching time test circuit for device types 02 and 03.

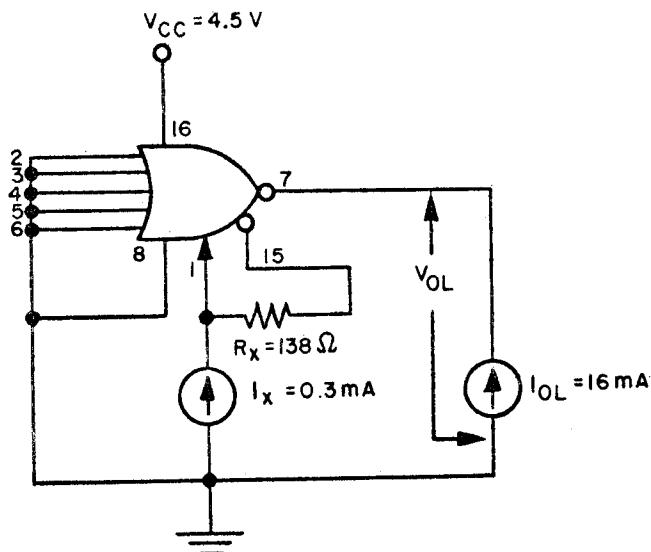
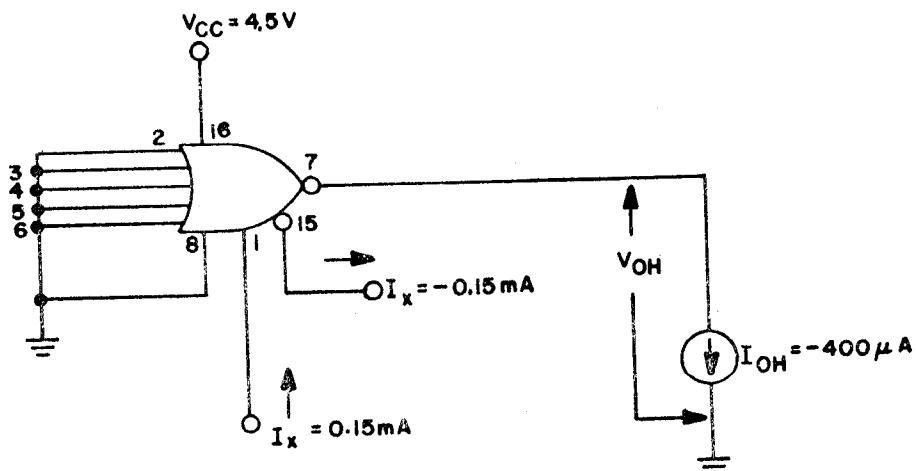
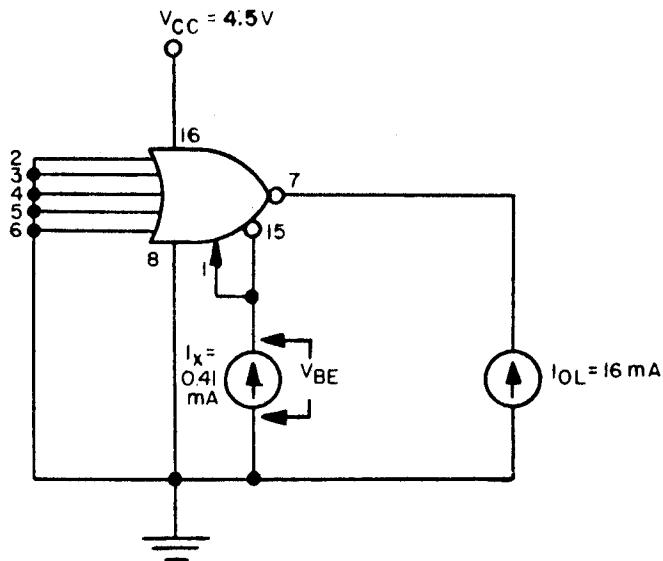
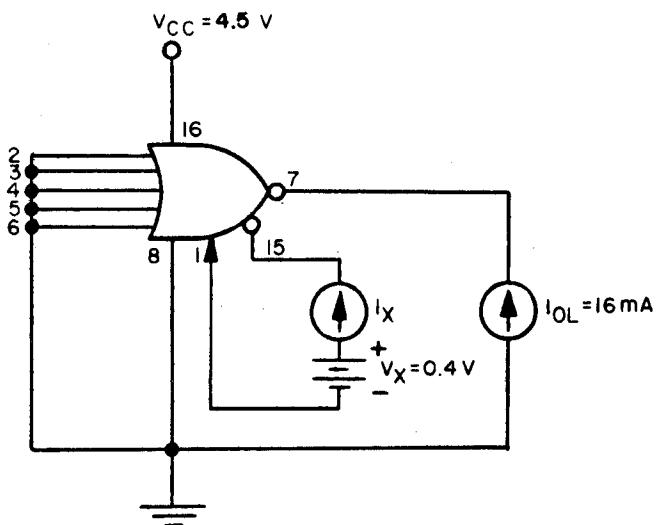


FIGURE 7. Low level output voltage test circuit for device type 02.



NOTE: At the manufacturer's option, the high level output voltage for the expanded inputs may be verified by an alternate equivalent procedure. The procedure is to omit the  $-400 \mu\text{A}$  current source on pin 7 (Y) and to connect a  $6 \text{ k}\Omega \pm 1\%$  resistor in parallel with a voltmeter between the output pin and ground. The  $V_{OH}$  minimum limit is met if the resultant voltage drop across the resistor is greater than 2.4 V.

FIGURE 8. High level output voltage test circuit for device type 02.

FIGURE 9. Base emitter voltage test circuit for device type 02.

NOTE: At the manufacturer's option, the expander test current limit may be verified by the use of an alternate equivalent procedure. The  $V_x$  voltage source and the  $I_x$  meter may be replaced with a  $11\Omega \pm 1\%$  resistor in parallel with a voltmeter between pins 1 and 15 (X to X). When the applicable conditions are applied, the resultant voltage drop across the resistor is measured. The  $I_x$  limit of 3.5 mA is met if the resultant voltage does not exceed 0.4 V.

FIGURE 10. Expander current test circuit for device type 02.

TABLE III. Group A inspection for device type 01.  
Terminal conditions (pins not designated may be H  $\geq$  2.0 V or L  $\leq$  0.8 V or open).

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Meas. terminal	Test limits
			Case C	2	3	1	14	4	5	6	10	8	9	7	11	12	13		
1	V <sub>OL</sub>	3007	1	2.0 v GND	16 mA 2.0 v GND	4.5 v 16 mA	GND	GND	GND	GND	GND	GND	GND	1Y	1Y	1Y	0.4 v		
			2	3	4	5	6	16 mA 16 mA	16 mA	2.0 v GND	2.0 v GND	16 mA 16 mA	2.0 v GND	2.0 v GND					
			3	4	5	6	7											2Y	
			4	5	6	7	8											3Y	
			5	6	7	8												3Y	
			6	7	8													4Y	
			7															4Y	
			8																
	V <sub>OH</sub>	3006	9	0.8 v 5.5 v	0.8 v 5.5 v	-400 $\mu$ A		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	2.4	
			10	11	12													2Y	
																		3Y	
																		4Y	
	I <sub>OS</sub>	3011	13	GND	GND	5.5 v		GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	1Y	-20
			14	15	16													2Y	
																		3Y	
																		4Y	
	I <sub>H1</sub>	3010	17	2.4 v GND	2.4 v GND			GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	1A	40 $\mu$ A
			18	19	20													1B	
																		2A	
																		2B	
																		3A	
																		3B	
																		4A	
	I <sub>H2</sub>	3010	25	26				5.5 v GND	5.5 v									4B	100 $\mu$ A
																		1A	
																		1B	
																		100 $\mu$ A	

TABLE III. Group A inspection for device type 01. - Continued  
Terminal conditions (pins not designated may be H > 2.0 V or L < 0.8 V or open).

same tests, terminal conditions and limits as for subgroup 1, except  $T_A = 125^\circ\text{C}$  and VIC tests are omitted.

Same tests, terminal conditions and limits as for subgroup 1, except  $T_A = -55^{\circ}\text{C}$  and VIC tests are omitted.

TABLE III. Group A inspection for device type 01. - Continued  
Terminal conditions (pins not designated may be  $H \geq 2.0\text{ V}$  or  $L \leq 0.8\text{ V}$  or open).

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,D Case C	Test No.	Test limits										Meas. terminal	Min	Max	Unit
					1	2	3	4	5	6	7	8	9	10				
9 $T_A = 25^\circ\text{C}$	tPHL	3003 (Fig. 5)	51 52 53 54	in GND out 5.0 v	out in GND out	1A to 1Y 2A to 2Y 3A to 3Y 4A to 4Y	3	20	ns									
	tPLH		55 56 57 58	in GND out in	out in GND out	1A to 1Y 2A to 2Y 3A to 3Y 4A to 4Y	3	25										
10 $T_A = 125^\circ\text{C}$	tPHL		59 60 61 62	in GND out in	out in GND out	1A to 1Y 2A to 2Y 3A to 3Y 4A to 4Y	3	24										
	tPLH		63 64 65 66	in GND out in	out in GND out	1A to 1Y 2A to 2Y 3A to 3Y 4A to 4Y	3	27										

11 Same tests, terminal conditions and limits as for subgroup 10, except  $T_A = -55^\circ\text{C}$ .

TABLE III. Group A inspection for device type 02.  
Terminal conditions (pins not designated may be H > 2.0 V or L < 0.8 V or open).

Subgroup	Symbol	MIL-STD-883 method	Cases E, F		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal		Test limits										
			Cases	No.																													
1 $T_A = 25^\circ C$	$V_{OL}$	3007	1	2	1X	1A	1B	1G	1C	1D	GND	2.0 v	GND	2.0 v	GND	2.0 v	GND	16 mA	GND	1Y	2Y	2A	2B	2G	2C	2D	1X	V <sub>cc</sub>	4.5 v	0.4 v			
			2	3																													
			3	4																													
			4	5	1/																												
			5	6																													
			6	7																													
			7	8																													
			8	9																													
			9	10																													
			10	11																													
			11	12	2/																												
			12	13																													
			13	14																													
			14	15																													
			15	16																													
			16	17	2/																												
			17	18																													
			18	19																													
			19	20																													
			20	21																													
			21	22																													
			22	23																													
			23	24																													
			24	25																													
			25	26																													
			26	27	5.5 v																												
			27	28																													
			28	29																													
			29	30																													
			30	31																													
			31	32																													
			32	33																													
			33	34																													
			34	35																													
			35	36																													
			36																														

See footnotes at end of device type 02.

TABLE III. Group A inspection for device type 02. - Continued  
Terminal conditions (pins not designated may be H  $\geq$  2.0 V or L  $\leq$  0.8 V or open).

Subgroup	Symbol	MIL-STD-883 method	Cases E, F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Test limits
		Test No.	1X	1A	1B	1G	1C	1D	1Y	GND	2Y	2A	2B	2G	2C	2D	$1\bar{X}$	Vcc	Meas. terminal	Max. Unit
1	$T_A = 25^\circ C$	I <sub>IL1</sub>	3009	37	0.4 v	5.5 v	5.5 v	5.5 v	5.5 v	GND							5.5 v	1A	-7	-1.6 mA
				38	5.5 v	0.4 v	5.5 v	5.5 v	5.5 v									1B		
				39		5.5 v	0.4 v	5.5 v	5.5 v									1C		
				40			5.5 v	0.4 v	5.5 v									1D		
				41				5.5 v	0.4 v									2A		
				42					5.5 v									2B		
				43														2C		
				44														2D		
		III.2	3009	45	5.5 v	5.5 v	0.4 v	5.5 v	5.5 v									1G	-2.8	-6.4 mA
		III.2	3009	46														2G	-2.8	-6.4 mA
		ICCL	3005	47		5.0 v	5.0 v	5.0 v	5.0 v									Vcc	19	mA
		ICCH	3005	48		GND	GND	GND	GND									Vcc	16	mA
		VIC		49				-12 mA										4.5 v	1A	-1.5 V
				50					-12 mA									1B		
				51						-12 mA								1G		
				52							-12 mA							1C		
				53								-12 mA						1D		
				54									-12 mA					2A		
				55										-12 mA				2B		
				56											-12 mA			2C		
				57												-12 mA		2D		
				58																

2 Same tests, terminal conditions and limits as for subgroup 1, except  $T_A = 125^\circ C$  and VIC tests are omitted.

$T_A = -55^\circ C$	I <sub>X</sub> V <sub>BE</sub>	59	$\frac{3}{4}$	GND	GND	GND	GND	GND	GND	GND	OUT	IN	GND	2.4 v	GND	GND	GND	5.0 v	1A to 1Y 2A to 2Y 1A to 1Y 2A to 2Y 1A to 1Y 2A to 2Y	3.5 mA 20 ns 20 ns 1.1 V	
9	t <sub>PHL</sub> Fig 6	3003	61		IN	GND	2.4 v	GND	GND	OUT									1A to 1Y 2A to 2Y 1A to 1Y 2A to 2Y 1A to 1Y 2A to 2Y	3 20 ns 20 ns 1.1 V	
	t <sub>PLH</sub>	62			IN	GND	2.4 v	GND	GND	OUT											
10	t <sub>PHL</sub>	63																			
		64																			
		65																			
		66																			

Remainder of subgroup consists of the same tests, terminal conditions and limits as for subgroup 1, except  $T_A = -55^\circ C$  and VIC tests are omitted.

See footnotes at end of device type 02.

TABLE III. Group A inspection for device type 02. ~ Continued  
Terminal conditions (pins not designated may be H  $\geq$  2.0 V or L  $\leq$  0.8 V or open).

Subgroup	Symbol	ML- STD-883 method	Cases E, F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Test limits	
			Test No.	1X	1A	1B	1G	1C	1D	1Y	GND	2Y	2A	2B	2G	2C	2D	1X	Vcc	Meas. terminal	
10 $T_A = 125^\circ C$	tPLH	3003 Fig. 6	67 68		IN	GND	2.4 v		GND	OUT	GND	OUT	GND	OUT	GND	IN	GND	2.4 v	GND	5.0 v 5.0 v	1A to 1Y 2A to 2Y
11	Same tests, terminal conditions and limits as for subgroup 10, except $T_A = -55^\circ C$ .																				

1/ See test figure 7.

2/ See test figure 8.

3/ See test figure 9.

4/ See test figure 10.

TABLE III. Group A inspection for device type 03.  
Terminal conditions (pins not designated may be H  $\geq$  2.0 V or L  $\leq$  0.8 V or open).

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,D				Cases C				Test No.				Test limits				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	Meas. terminal	Min	Max
1 $T_A = 25^\circ\text{C}$	$V_{OL}$	3007	1	2.0 v	GND	2.0 v	GND	16 mA	GND	GND	GND	GND	GND	4.5 v	1Y	1Y	0.4 v		
			2	GND	2.0 v	GND	2.0 v	GND	2.0 v	GND	2.0 v	GND	2.0 v	GND	2.0 v	GND	1Y	1Y	
			3														1Y	1Y	
			4														2Y	2Y	
			5														2Y	2Y	
			6														2Y	2Y	
			7														2Y	2Y	
			8														2Y	2Y	
	$V_{OH}$	3006	9	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	-800 $\mu\text{A}$	-800 $\mu\text{A}$	-800 $\mu\text{A}$	-800 $\mu\text{A}$	5.5 v	5.5 v	5.5 v	1Y	2.4	
			10	5.5 v	5.5 v	5.5 v	5.5 v	5.5 v	5.5 v	-800 $\mu\text{A}$	-800 $\mu\text{A}$	-800 $\mu\text{A}$	-800 $\mu\text{A}$	5.5 v	5.5 v	5.5 v	1Y	2.4	
			11														2Y	2Y	
			12														2Y	2Y	
	$I_{OS}$	3011	13	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	5.5 v	5.5 v	5.5 v	2Y	2Y	
			14														2Y	2Y	
	$I_{IH1}$	3010	15	2.4 v	GND	2.4 v	GND	2.4 v	GND	2.4 v	GND	2.4 v	GND	2.4 v	GND	2.4 v	1A	1B	40 $\mu\text{A}$
			16														1G	1G	160 $\mu\text{A}$
			17														1C	1C	40 $\mu\text{A}$
			18														1D	1D	40 $\mu\text{A}$
			19														2A	2A	40 $\mu\text{A}$
			20														2B	2B	40 $\mu\text{A}$
			21														2G	2G	160 $\mu\text{A}$
			22														2C	2C	40 $\mu\text{A}$
			23														2D	2D	40 $\mu\text{A}$
			24														1A	1B	100 $\mu\text{A}$
	$I_{IH2}$	2010	25	5.5 v	GND	5.5 v	GND	GND	GND	GND	GND	GND	GND	2.4 v	GND	2.4 v	1A	1B	100 $\mu\text{A}$
			26														1B	1B	100 $\mu\text{A}$

TABLE III. Group A inspection for device type 03. - Continued  
Terminal conditions (pins not designated may be  $H \geq 2.0$  V or  $L \leq 0.8$  V or open).

TABLE III. Group A inspection for device type 03. - Continued  
 Terminal conditions (pins not designated may be  $H \geq 2.0\text{ V}$  or  $L \leq 0.8\text{ V}$  or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Meas. terminal	Test limits	
		Case C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	VCC	Min	Max	Unit
		Test No.	1A	1B	1G	1C	1D	1Y	GND	2Y	2A	2B	2G	2C	2D	VCC				
1	VIC			53																
				54																
				55																
				56																
<b>2</b> Same tests, terminal conditions and limits as for subgroup 1, except $T_A = 125^\circ\text{C}$ and VIC tests are omitted.																				
<b>3</b> Same tests, terminal conditions and limits as for subgroup 1, except $T_A = -55^\circ\text{C}$ and VIC tests are omitted.																				
$T_A = 25^\circ\text{C}$		$t_{PHL}$	3003	57	in	GND	2.4 v	GND	GND	out	GND						5.0 v	1A to 1Y	3	20 ns
		$t_{PHL}$ (Fig. 6)	58	in	GND	2.4 v	GND	GND	out	in	GND	2.4 v	GND	GND	GND	GND	2A to 2Y	3	20 ns	
		$t_{PLH}$	59	in	GND	2.4 v	GND	GND	out	in	GND	2.4 v	GND	GND	GND	GND	1A to 1Y	3	25 ns	
		$t_{PLH}$	60	in	GND	2.4 v	GND	GND	out	in	GND	2.4 v	GND	GND	GND	GND	2A to 2Y	3	25 ns	
$T_A = 125^\circ\text{C}$		$t_{PHL}$	61	in	GND	2.4 v	GND	GND	out	in	GND	2.4 v	GND	GND	GND	GND	1A to 1Y	3	24 ns	
		$t_{PHL}$	62	in	GND	2.4 v	GND	GND	out	in	GND	2.4 v	GND	GND	GND	GND	2A to 2Y	3	24 ns	
		$t_{PLH}$	63	in	GND	2.4 v	GND	GND	out	in	GND	2.4 v	GND	GND	GND	GND	1A to 1Y	3	27 ns	
		$t_{PLH}$	64	in	GND	2.4 v	GND	GND	out	in	GND	2.4 v	GND	GND	GND	GND	2A to 2Y	3	27 ns	
<b>11</b> Same tests, terminal conditions and limits as for subgroup 10, except $T_A = -55^\circ\text{C}$ .																				

TABLE III. Group A inspection for device type Q4.  
Terminal conditions (pins not designated may be H  $\geq$  2.0 V or L  $\leq$  0.8 V or open).

Subgroup	Symbol	MLL- STD-883 method	Cases A,B,D Case C	Test limits												Meas. terminal	Min	Max	Unit
				1	2	3	4	5	6	7	8	9	10	11	12	13	14		
$T_A = 25^\circ C$	V <sub>OL</sub>	3007	1	2.0 v GND	GND	4.5 v	1Y	1Y	.4 v										
	V <sub>OH</sub>	3006	10	0.8 v 5.5 v	-800 $\mu$ A	0.8 v	0.8 v	0.8 v											
	I <sub>OS</sub>	3011	13	GND	5.5 v	5.5 v	5.5 v	5.5 v											
	I <sub>H1</sub>	3010	16	2.4 v GND	-800 $\mu$ A	0.8 v	0.8 v	0.8 v											
	I <sub>H2</sub>	3010	25	5.5 v GND	-800 $\mu$ A	0.8 v	0.8 v	0.8 v											
			11	5.5 v GND															
			12																
			14																
			15																
			17																
			18																
			19																
			20																
			21																
			22																
			23																
			24																
			26																

TABLE III. Group A inspection for device type 04. - Continued  
Terminal conditions (pins not designated may be H > 2.0 V or L < 0.8 V or open).

TABLE III. Group A inspection for device type 04. - Continued  
Terminal conditions (pins not designated may be  $H \geq 2.0\text{ V}$  or  $L \leq 0.8\text{ V}$  or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Meas. terminal	Test limits	
		Test No.	Case C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Min	Max	Unit
1			1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	VCC				
$T_A = 25^\circ\text{C}$	VIC																	-12 mA	4.5 v	1C
2			Same tests, terminal conditions and limits as for subgroup 1, except $T_A = 125^\circ\text{C}$ and VIC tests are omitted.																	
3			Same tests, terminal conditions and limits as for subgroup 1, except $T_A = -55^\circ\text{C}$ and VIC tests are omitted.																	
9			$t_{PHL}$ ↓	3003 (Fig. 5)	54	in	GND	in	GND	out	GND	out	GND	out	GND	out	GND	5.0 v	1A to 1Y	3
			$t_{PLH}$ ↓		55													2A to 2Y	ns	
					56													3A to 3Y	↓	
					57	in	GND	in	GND	out	GND	out	GND	out	GND	out	GND	1A to 1Y	3	
					58													2A to 2Y	ns	
					59													3A to 3Y	↓	
10			$t_{PHL}$ ↓		60	in	GND	in	GND	out	GND	out	GND	out	GND	out	GND	1A to 1Y	3	
			$t_{PLH}$ ↓		61													2A to 2Y	ns	
					62													3A to 3Y	↓	
					63	in	GND	in	GND	out	GND	out	GND	out	GND	out	GND	1A to 1Y	3	
					64													2A to 2Y	ns	
					65													3A to 3Y	↓	

11 Same tests, terminal conditions and limits as for subgroup 10, except  $T_A = -55^\circ\text{C}$ .

## 5. PACKAGING

5.1 Packaging requirements. Microcircuits shall be prepared for delivery in accordance with MIL-M-38510.

## 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 use for Government microcircuit applications (original equipment) and logistic purposes.

6.3 Ordering data. The contract 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 procuring activity in addition to notification to the qualifying activity, if applicable.
- e. Requirements for packaging and packing.
- f. Requirements for failure analysis (including required test condition of method 5003), corrective action and reporting of results, if applicable.
- g. Requirements for product assurance options.
- h. Requirements for carriers, special 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-STD-1313, MIL-STD-1331, and as follows:

GND	- - - - -	Electrical ground (common terminal)
V <sub>IN</sub>	- - - - -	Voltage level at an input terminal
V <sub>IC</sub>	- - - - -	Input clamp voltage
I <sub>IN</sub>	- - - - -	Current-flowing into an input terminal

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

6.6 Substitutability. Microcircuits covered by this specification will replace the following commercial device types:

<u>Device type</u>	<u>Commercial type</u>
01	5402
02	5423
03	5425
04	5427

Custodians:

Army - EL  
Navy - EC  
Air Force - 17

Review activities:

Army - MI, MU  
Air Force - 11, 19, 85, 99  
DLA - ES

User activities:

Army - EL, SM  
Navy - CG, MC, AS, OS

Preparing activity:

Air Force - 17

Agent:

DLA - ES

(Project 5962-0164)