MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, ADVANCED SCHOTTKY TTL, 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, Advanced Schottky TTL, positive NAND logic gate microcircuits. Two product assurance classes and a choice of case outlines and lead finishes are provided for each type and are reflected in the complete part number.

1.2 Part number. The part number shall be in accordance with MIL-M-38510, and as specified herein.

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

Device type	Circuit
01	Quadruple, 2-input positive NAND gate
02	Hex, 1-input inverter gate
03	Triple, 3-input positive NAND gate
04	Dual, 4-input positive NAND 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:

Letter	Case outline (see MIL-M-38510, appendix C)
A	F-1 (14-lead, 1/4" x 1/4"), flat package
B	F-3 (14-lead, 3/16" x 1/4"), flat package
C	D-1 (14-lead, 1/4" x 3/4"), dual-in-line package
D	F-2 (14-lead, 1/4" x 3/8"), flat package
X	C-2 (20-terminal, .350" x .350"), square chip carrier package, option A
Y	C-2 (20-terminal, .350" x .350"), square chip carrier package, option B

1.3 Absolute maximum ratings.

Supply voltage range	-0.5 V to +7.0 V
Input voltage range	-1.2 V at -18 mA to +7.0 V
Storage temperature range	-65°C to +150°C
Maximum power dissipation per device (P_D)1/:	
Device type 01	56 mW
Device type 02	84 mW
Device type 03	42 mW
Device type 04	28 mW
Lead temperature (soldering, 10 seconds)	300°C
Thermal resistance, junction to case (θ_{JC}):	
Cases A, B, and D	70°C/W
Case C	50°C/W
Cases X and Y	60°C/W
Junction temperature (T_J)	175°C

1/ Must withstand the added P_D due to short-circuit test (e.g., I_{OS}).

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.

FSC 5962

1.4 Recommended operating conditions.

Supply voltage	4.5 V minimum to 5.5 V maximum
Minimum high level input voltage (V_{IH})	2.0 V
Maximum low level input voltage (V_{IL})	0.8 V
Normalized fanout (each output) 2/:	
Low logic level	33 maximum
High logic level	50 maximum
Case operating temperature range (T_C)	-55°C to +125°C

2. APPLICABLE DOCUMENTS

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

SPECIFICATION

MILITARY

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

STANDARD

MILITARY

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

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

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

3. REQUIREMENTS

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

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

3.2.1 Terminal connections and logic diagrams. The terminal connections and logic diagrams 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 circuits. The 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 as a prerequisite for qualification. All manufacturers' schematics shall be maintained and 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 (see 6.5).

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

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

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$	Device type	Limits Min	Limits Max	Unit
High-level output voltage	V_{OH}	V_{CC} = 4.5 V, I_{OH} = -1.0 mA, V_{IL} = 0.8 V	All	2.5		V
Low-level output voltage	V_{OL}	V_{CC} = 4.5 V, I_{OL} = 20 mA, V_{IH} = 2.0 V	All		0.5	V
Input clamp voltage	V_{IC}	V_{CC} = 4.5 V, I_{IN} = -18 mA T_C = 25°C	All		-1.2	V
High-level input current	I_{IH1}	V_{CC} = 5.5 V, V_{IN} = 2.7 V	All		20	µA
	I_{IH2}	V_{CC} = 5.5 V, V_{IN} = 7.0 V	All		100	µA
Low-level input current	I_{IL}	V_{CC} = 5.5 V, V_{IN} = 0.5 V	All	-.03	-.60	mA
Short-circuit output current 1/	I_{OS}	V_{CC} = 5.5 V	All	-60	-150	mA
Output drive	I_{OD}	V_{CC} = 4.5 V, V_{IN} = 5.5 V, V_{OUT} = 2.5 V	All	60		mA
High-level supply current	I_{CCH}	V_{CC} = 5.5 V	01		2.8	mA
			02		4.2	mA
			03		2.1	mA
			04		1.4	mA
Low-level supply current	I_{CCL}	V_{CC} = 5.5 V	01		10.2	mA
			02		15.3	mA
			03		7.7	mA
			04		5.1	mA
Propagation delay time, high-to-low level	t_{PHL}	V_{CC} = 5.0 V, C_L = 50 pF ±10%, R_L = 500Ω ±5%	All	1.5	6.5	ns
Propagation delay time, low-to-high level	t_{PLH}	V_{CC} = 5.0 V, C_L = 50 pF ±10%, R_L = 500Ω ±5%	All	2.0	7.0	ns

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

TABLE II. Electrical test requirements.

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

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

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.

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

3.7 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 8 (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 test (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°C minimum.

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. The percent defective allowable (PDA) for class S devices shall be as specified in MIL-M-38510. The PDA for class B devices shall be 10 percent based on failures from group A, subgroup 1 test after cooldown as the 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.

4.3 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 n 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. 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).

4.4.1 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 herein.

b. Subgroups 4, 5, 6, 7, and 8 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 parameters 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. 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 inspection.

c. Steady state life test (method 1005 of MIL-STD-883) conditions, or equivalent.

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

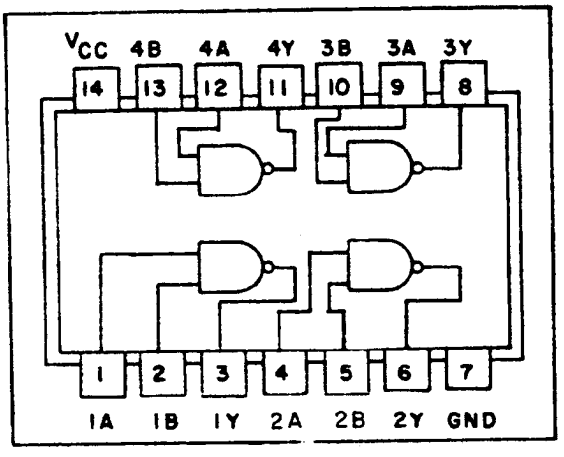
(2) T_A = +125°C minimum.

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

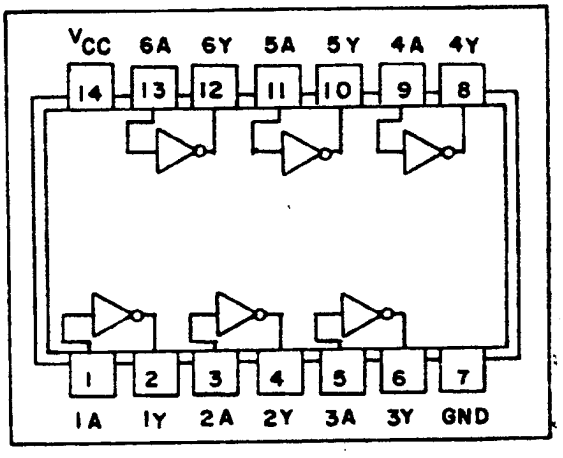
4.4.4 Group D inspection. Group D inspection shall be in accordance with table IV of method 5005 of MIL-STD-883. End-point electrical parameters shall be as specified in table II herein.

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

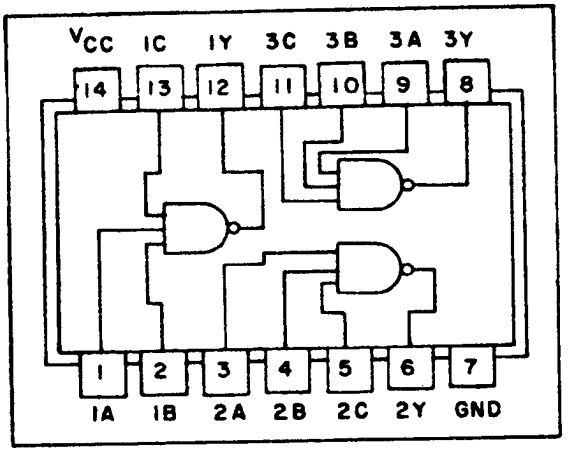
Device type 01
Cases A, B, C, and D



Device type 02
Cases A, B, C, and D



Device type 03
Cases A, B, C, and D



Device type 04
Cases A, B, C, and D

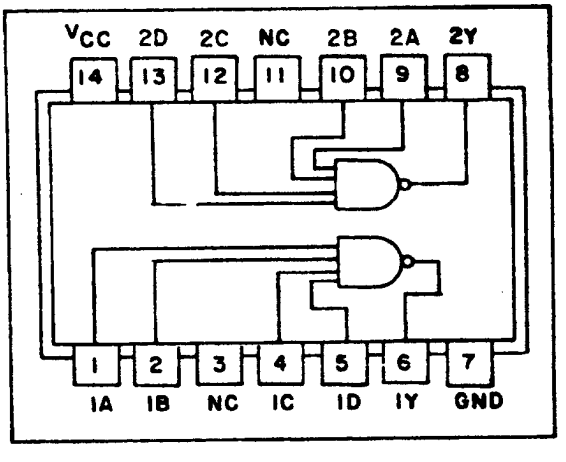


FIGURE 1. Terminal connections (top view).

Device type 01
Case X, Y

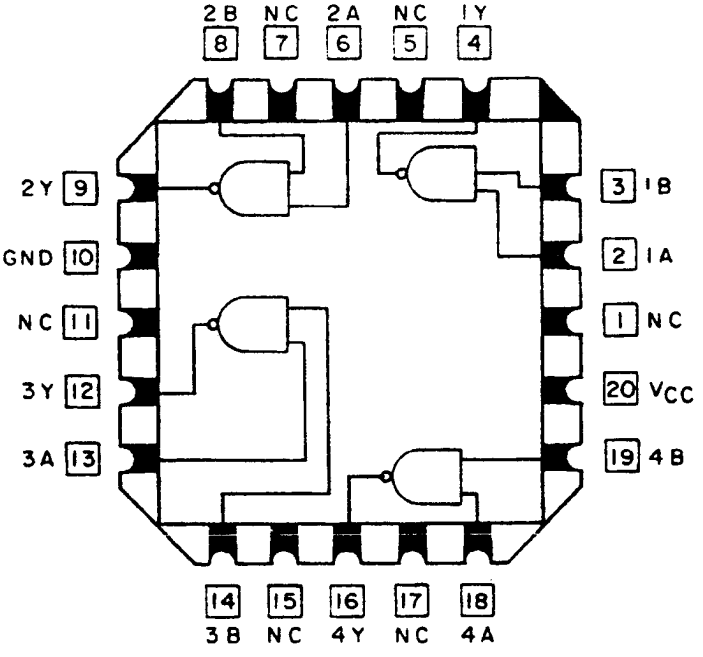


FIGURE 1. Terminal connections (top view) - Continued.

Device type 02
Case X, Y

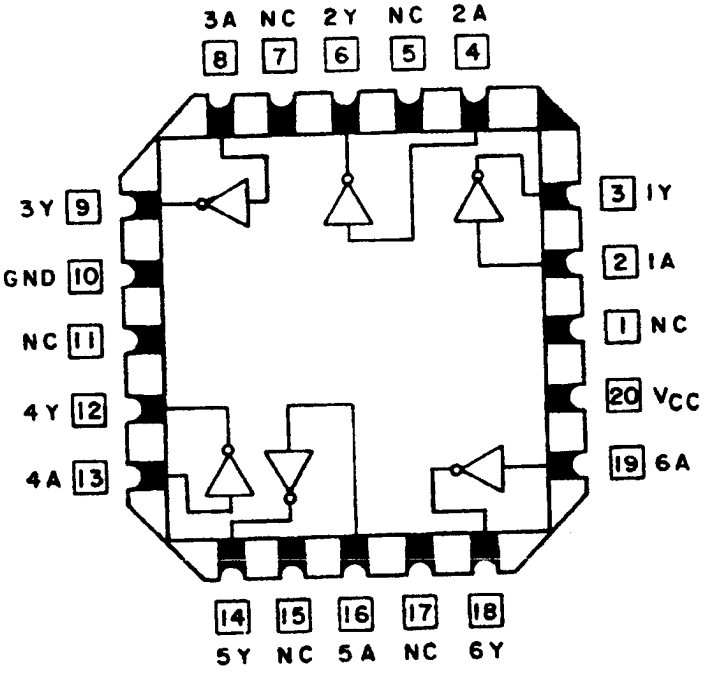


FIGURE 1. Terminal connections (top view) - Continued.

Device type 03
Case X, Y

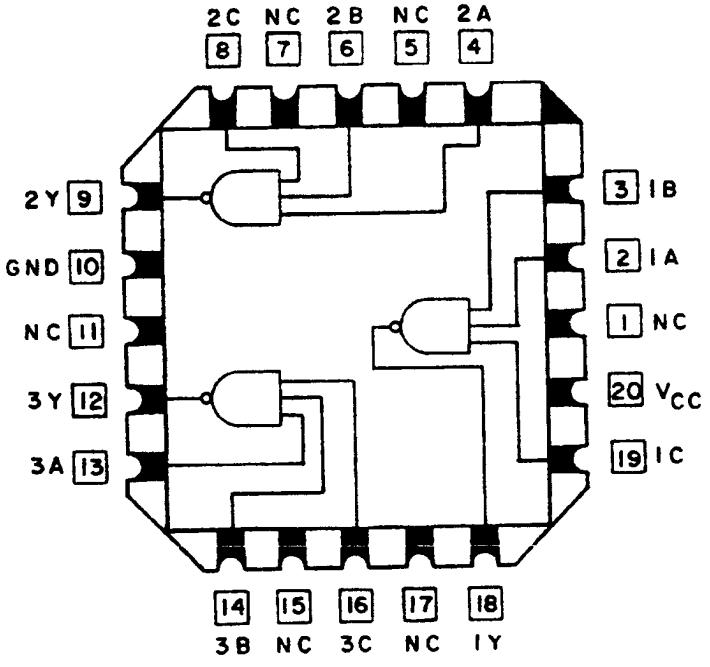


FIGURE 1. Terminal connections (top view) - Continued.

Device type 04
Case X, Y

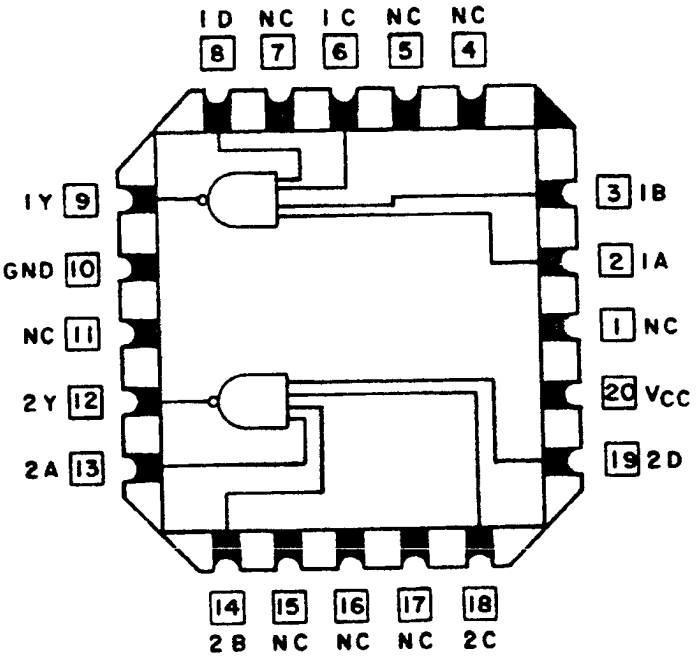


FIGURE 1. Terminal connections (top view) - Continued.

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 $Y = \overline{AB}$

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	C	Y
L	L	L	H
H	L	L	H
L	H	L	H
H	H	L	H
L	L	H	H
H	L	H	H
L	H	H	H
H	H	H	L

Positive logic $Y = \overline{ABC}$

Device type 04

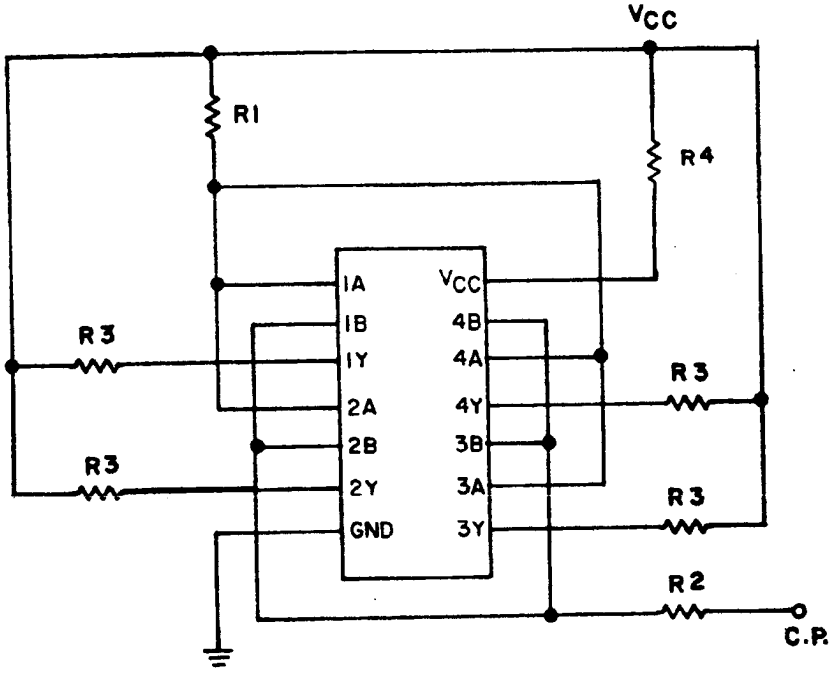
Truth table each gate				
Input				Output
A	B	C	D	Y
L	L	L	L	H
H	L	L	L	H
L	H	L	L	H
H	H	L	L	H
L	L	H	L	H
H	L	H	L	H
L	H	H	L	H
H	H	H	L	H
L	L	L	H	H
H	L	L	H	H
L	H	L	H	H
H	H	L	H	H
L	L	H	H	H
H	L	H	H	H
L	H	H	H	H
H	H	H	H	L

Positive logic $Y = \overline{ABCD}$

FIGURE 2. Truth tables and logic equations.

Device type 01

Cases A, B, C, D, X, and Y
(Pins not shown for cases X and Y are N/C)

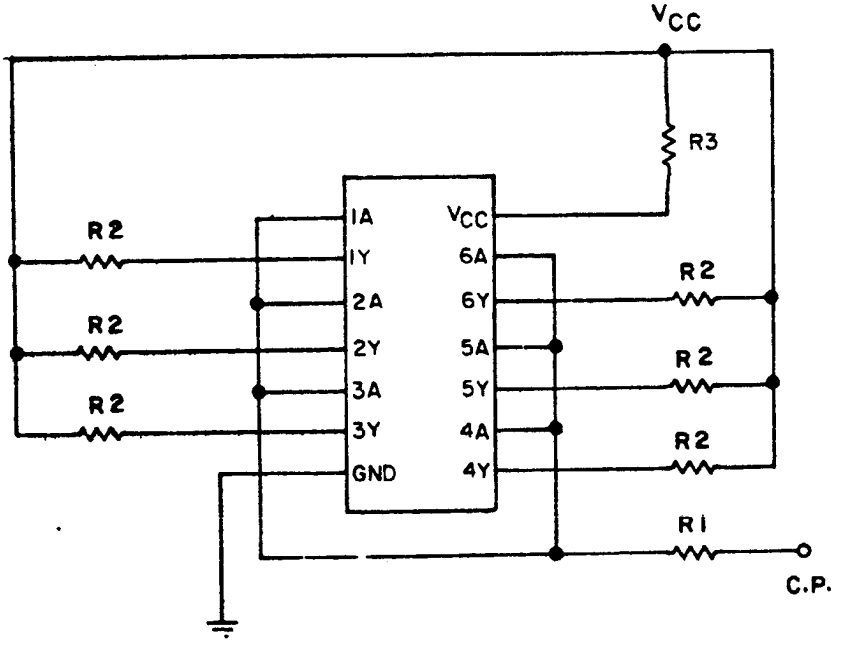


1. R1 = 1 kΩ ±5%.
   R2 = 160Ω ±5%.
   R3 = 270Ω ±5%.
2. V_{CC} and R_4 shall be chosen to insure a 5.5 V minimum is present at device V_{CC} terminal.
3. C.P. = 100 kHz ±50% square wave; duty cycle = 50 ±15%; V_{IL} = -0.5 V min to 0.8 V max; V_{IH} = 2.0 V min to 5.5 V max.

FIGURE 3. Burn-in and life test circuit.

Device type 02

Cases A, B, C, D, X, and Y
(Pins not shown for cases X and Y are N/C)

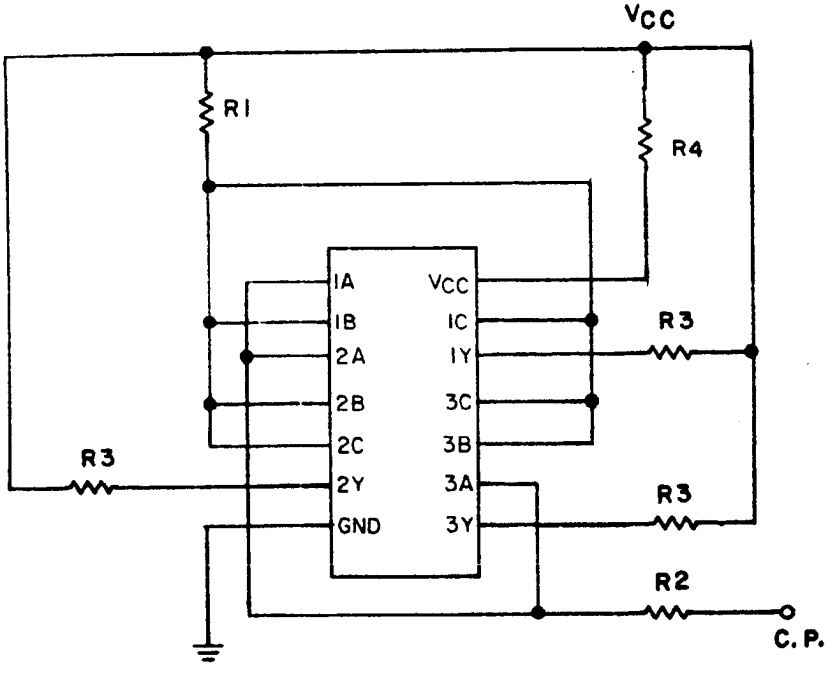


NOTES:
1. R1 ≤ 110Ω.
   R2 = 270Ω ±5%.
2. V_{CC} and R_3 shall be chosen to insure a 5.5 V minmum is present at device V_{CC} terminal.
3. C.P. = 100 kHz square wave ±50%; duty cycle = 50 ±15%; V_{IL} = -0.5 V min to 0.8 V max; V_{IH} = 2.0 V min to 5.5 V max.

FIGURE 3. Burn-in and life test circuit - Continued.

Device type 03

Cases A, B, C, D, X, and Y
(Pins not shown for cases X and Y are N/C

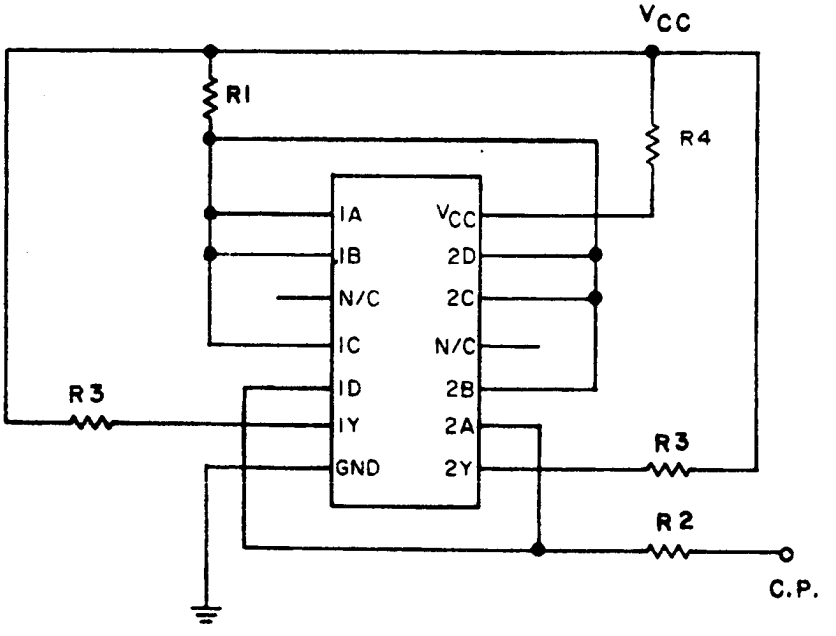


NOTES:
1. R1 = 1 kΩ ±5%.
   R2 = 220Ω ±5%.
   R3 = 270Ω ±5%.
2. V_{CC} and R_4 shall be chosen to insure a 5.5 V minimum is present at device V_{CC} terminal.
3. C.P. = 100 kHz ±50% square wave; duty cycle = 50 ±15%; V_{IL} = -0.5 V min to 0.8 V max; V_{IH} = 2.0 V min to 5.5 V max.

FIGURE 3. Burn-in and life test circuit - Continued.

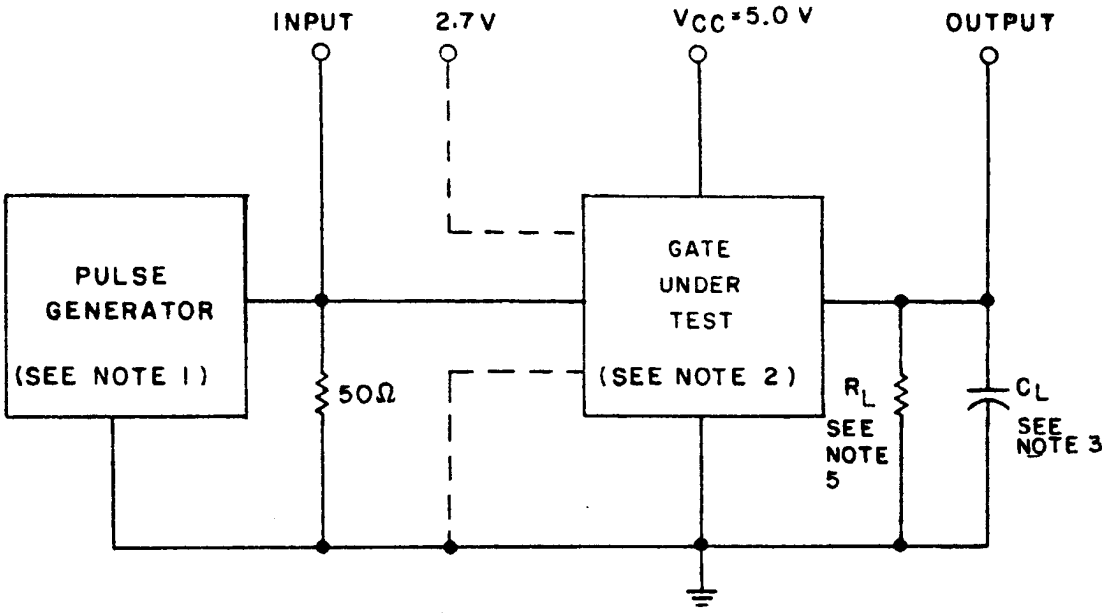
Device type 04

Cases A, B, C, D, X, and Y
(Pins not shown for cases X and Y are N/C

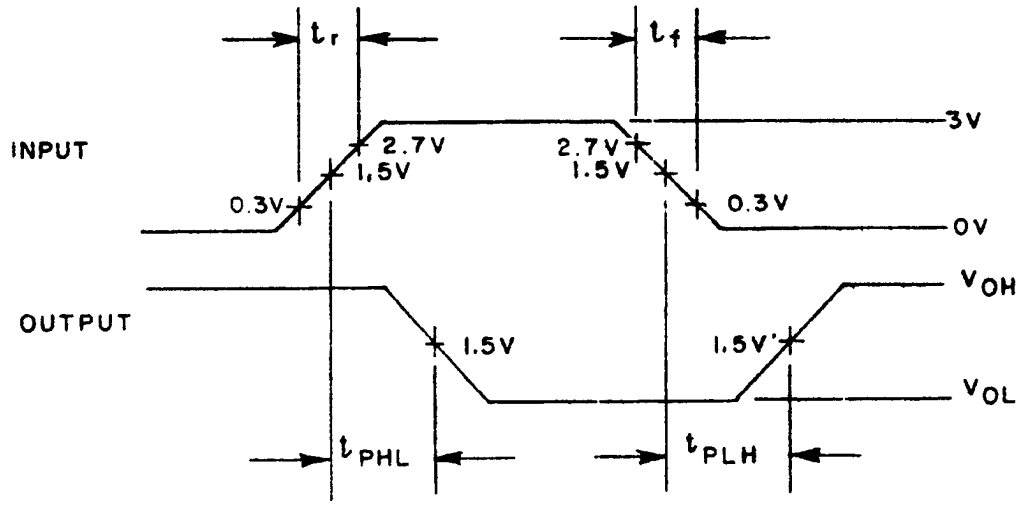


NOTES:
1. R1 = 1 kΩ ±5%.
   R2 = 330Ω ±5%.
   R3 = 270Ω ±5%.
2. V_{CC} and R_4 shall be chosen to insure a 5.5 V minimum is present at device V_{CC} terminal.
3. C.P. = 100 kHz ±50% square wave; duty cycle = 50 ±15%; V_{IL} = -0.5 V min to 0.8 V max; V_{IH} = 2.0 V min to 5.5 V max.

FIGURE 3. Burn-in and life test circuit - Continued.



TEST CIRCUIT



NOTES:

1. Pulse generator has following characteristics: $t_r = t_f \leq 2.5$ ns, PRR = 1 MHz and $Z_{OUT} \approx 50\Omega$.
2. Inputs not under test are at 2.7 V or GND as specified in table III.
3. C_L = 50 pF ±10% including scope, probe, wiring, and stray capacitance, without package in test fixture.
4. Voltage measurements are to be made with respect to network ground terminal.
5. R_L = 500Ω ±5%.

FIGURE 4. Switching time test circuit (all device types).

TABLE III. Group A inspection for device type 01.
Terminal conditions (pins not designated may be high ≥2.0 V, low ≤0.8 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, D / Cases X, Y / Test no.	1 / 2 / 1A	2 / 3 / 1B	3 / 4 / 1Y	4 / 6 / 2A	5 / 8 / 2B	6 / 9 / 2Y	7 / 10 / GND	8 / 12 / 3Y	9 / 13 / 3A	10 / 14 / 3B	11 / 16 / 4Y	12 / 18 / 4A	13 / 19 / 4B	14 / 20 / V_{CC}	Measured terminal	Limits Min	Limits Max	Unit
1 T_C = 25°C	V_{OH}	3006	1	5.5 V	0.8 V	-1 mA				GND							4.5 V	1Y	2.5		V
	"	"	2	0.8 V	5.5 V	-1 mA				"							"	1Y	"		"
	"	"	3				5.5 V	0.8 V	-1 mA	"							"	2Y	"		"
	"	"	4				0.8 V	5.5 V	-1 mA	"							"	2Y	"		"
	"	"	5							"	-1 mA	5.5 V	0.8 V				"	3Y	"		"
	"	"	6							"	-1 mA	0.8 V	5.5 V				"	3Y	"		"
	"	"	7							"				-1 mA	5.5 V	0.8 V	"	4Y	"		"
	"	"	8							"				-1 mA	0.8 V	5.5 V	"	4Y	"		"
	V_{OL}	3007	9	2.0 V	2.0 V	20 mA				"							"	1Y		0.5	"
	"	"	10				2.0 V	2.0 V	20 mA	"							"	2Y		"	"
	"	"	11							"	20 mA	2.0 V	2.0 V				"	3Y		"	"
	"	"	12							"				20 mA	2.0 V	2.0 V	"	4Y		"	"
	V_{IC}		13	-18 mA						"							"	1A		-1.2	"
	"		14		-18 mA					"							"	1B		"	"
	"		15				-18 mA			"							"	2A		"	"
	"		16					-18 mA		"							"	2B		"	"
	"		17							"		-18 mA					"	3A		"	"
	"		18							"			-18 mA				"	3B		"	"
	"		19							"				-18 mA			"	4A		"	"
	"		20							"					-18 mA		"	4B		"	"
	I_{IH1}	3010	21	2.7 V	GND					"							5.5 V	1A		20	µA
	"	"	22	GND	2.7 V					"							"	1B		"	"
	"	"	23				2.7 V	GND		"							"	2A		"	"
	"	"	24				GND	2.7 V		"							"	2B		"	"
	"	"	25							"		2.7 V	GND				"	3A		"	"
	"	"	26							"		GND	2.7 V				"	3B		"	"
	"	"	27							"				2.7 V	GND		"	4A		"	"
	"	"	28							"				GND	2.7 V		"	4B		"	"
	I_{IH2}	"	29	7.0 V	GND					"							"	1A		100	"
	"	"	30	GND	7.0 V					"							"	1B		"	"
	"	"	31				7.0 V	GND		"							"	2A		"	"
	"	"	32				GND	7.0 V		"							"	2B		"	"
	"	"	33							"		7.0 V	GND				"	3A		"	"
	"	"	34							"		GND	7.0 V				"	3B		"	"
	"	"	35							"				7.0 V	GND		"	4A		"	"
	"	"	36							"				GND	7.0 V		"	4B		"	"
	I_{IL}	3009	37	0.5 V	5.5 V					"							"	1A	27	27	mA
	"	"	38	5.5 V	0.5 V					"							"	1B	"	"	"
	"	"	39				0.5 V	5.5 V		"							"	2A	"	"	"
	"	"	40				5.5 V	0.5 V		"							"	2B	"	"	"
	"	"	41							"		0.5 V	5.5 V				"	3A	"	"	"
	"	"	42							"		5.5 V	0.5 V				"	3B	"	"	"
	"	"	43							"				0.5 V	5.5 V		"	4A	"	"	"
	"	"	44							"				5.5 V	0.5 V		"	4B	"	"	"
	I_{OS}	3011	45	GND	GND	0.0 V				"							"	1Y	-60	-150	"
	"	"	46				GND	GND	0.0 V	"							"	2Y	"	"	"
	"	"	47							"	0.0 V	GND	GND				"	3Y	"	"	"
	"	"	48							"				0.0 V	GND	GND	"	4Y	"	"	"

See footnotes at end of table.

TABLE III. Group A inspection for device type 01 - Continued.
Terminal conditions (pins not designated may be high ≥2.0 V, low ≤0.8 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, D Cases X, Y 1/ Test no.	1 2 1A	2 3 1B	3 4 1Y	4 6 2A	5 8 2B	6 9 2Y	7 10 GND	8 12 3Y	9 13 3A	10 14 3B	11 16 4Y	12 18 4A	13 19 4B	14 20 V_{CC}	Measured terminal	Limits Min	Limits Max	Unit
1 T_C = 25°C	I_{OD}		49 50 51 52	5.5 V	5.5 V	2.5 V	5.5 V	5.5 V	2.5 V	GND • •	2.5 V	5.5 V	5.5 V	2.5 V	5.5 V	5.5 V	4.5 V • •	1Y 2Y 3Y 4Y	60 • •		mA • •
	I_{CCH}	3005	53	GND	GND		GND	GND		"		GND	GND		GND	GND	5.5 V	V_{CC}		2.8	"
	I_{CCL}	3005	54	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	V_{CC}		10.2	"
2	Same tests, terminal conditions, and limits as for subgroup 1, except T_C = 125°C and V_{IC} tests are omitted.																				
3	Same tests, terminal conditions, and limits as for subgroup 1, except T_C = -55°C and V_{IC} tests are omitted.																				
9 T_C = 25°C	t_{PHL}	3003 Fig. 4 • • • •	55 56 57 58 59 60 61 62	IN 2.7 V	2.7 V IN	OUT OUT	IN 2.7 V	2.7 V IN	OUT OUT	GND • • • • • • •	OUT OUT	IN 2.7 V	2.7 V IN	OUT OUT	IN 2.7 V	2.7 V IN	5.0 V • • • • • •	1A → 1Y 1B → 1Y 2A → 2Y 2B → 2Y 3A → 3Y 3B → 3Y 4A → 4Y 4B → 4Y	2.0 • • • • • • •	4.3 • • • • • • •	ns • • • • • • •
	t_{PLH}	• • • • • •	63 64 65 66 67 68 69 70	IN 2.7 V	2.7 V IN	OUT OUT	IN 2.7 V	2.7 V IN	OUT OUT	• • • • • • •	OUT OUT	IN 2.7 V	2.7 V IN	OUT OUT	IN 2.7 V	2.7 V IN	• • • • • • •	1A → 1Y 1B → 1Y 2A → 2Y 2B → 2Y 3A → 3Y 3B → 3Y 4A → 4Y 4B → 4Y	2.4 • • • • • • •	5.0 • • • • • • •	• • • • • • • •
10	t_{PHL}	"	71 - 78	Same tests and terminal conditions as for subgroup 9, except T_C = 125°C															1.5	6.5	"
	t_{PLH}	"	79 - 86																2.0	7.0	"
11	Same tests, terminal conditions, and limits as for subgroup 10, except T_C = -55°C.																				

1/ Pins not referenced (i.e., 1, 5, 7, 11, 15, and 17) are N/C.

2/ I_{IL} limits shall be as follows:

Test	MIN/MAX limits in mA		
	Circuits		
	A	B	C
I_{IL}	-.25/-.80	-.03/-.80	-.03/-.80

TABLE III. Group A inspection for device type 02.
Terminal conditions (pins not designated may be high ≥2.0 V, low ≤0.8 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, D / Cases X, Y 1/ / Test no.	1 / 2 / 1A	2 / 3 / 1Y	3 / 4 / 2A	4 / 6 / 2Y	5 / 8 / 3A	6 / 9 / 3Y	7 / 10 / GND	8 / 12 / 4Y	9 / 13 / 4A	10 / 14 / 5Y	11 / 16 / 5A	12 / 18 / 6Y	13 / 19 / 6A	14 / 20 / V_{CC}	Measured terminal	Limits Min	Limits Max	Unit
1 T_C = 25°C	V_{OH}	3006	1 2 3 4 5 6	0.8 V	-1 mA	0.8 V	-1 mA	0.8 V	-1 mA	GND	-1 mA	0.8 V	-1 mA	0.8 V	-1 mA	0.8 V	4.5 V	1Y 2Y 3Y 4Y 5Y 6Y	2.5		V
	V_{OL}	3007	7 8 9 10 11 12	2.0 V	20 mA	2.0 V	20 mA	2.0 V	20 mA		20 mA	2.0 V	20 mA	2.0 V	20 mA	2.0 V		1Y 2Y 3Y 4Y 5Y 6Y		0.5	
	V_{IC}		13 14 15 16 17 18	-18 mA		-18 mA		-18 mA				-18 mA		-18 mA		-18 mA		1A 2A 3A 4A 5A 6A		-1.2	
	I_{IH1}	3010	19 20 21 22 23 24	2.7 V		2.7 V		2.7 V				2.7 V		2.7 V		2.7 V	5.5 V	1A 2A 3A 4A 5A 6A		20	µA
	I_{IH2}		25 26 27 28 29 30	7.0 V		7.0 V		7.0 V				7.0 V		7.0 V		7.0 V		1A 2A 3A 4A 5A 6A		100	
	I_{IL}	3009	31 32 33 34 35 36	0.5 V		0.5 V		0.5 V				0.5 V		0.5 V		0.5 V		1A 2A 3A 4A 5A 6A	-27	-27	mA
	I_{OS}	3011	37 38 39 40 41 42	GND	0.0 V	GND	0.0 V	GND	0.0 V		0.0 V	GND	0.0 V	GND	0.0 V	GND		1Y 2Y 3Y 4Y 5Y 6Y	-60	-150	

1/ See footnotes at end of table.

TABLE III. Group A inspection for device type 02 - Continued.
Terminal conditions (pins not designated may be high ≥2.0 V, low ≤0.8 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, D Cases X, Y 1/ Test no.	1 2 1A	2 3 1Y	3 4 2A	4 6 2Y	5 8 3A	6 9 3Y	7 10 GND	8 12 4Y	9 13 4A	10 14 5Y	11 16 5A	12 18 6Y	13 19 6A	14 20 V_{CC}	Measured terminal	Limits Min	Limits Max	Unit
1 T_C = 25°C	I_{OD}		43 44 45 46 47 48	5.5 V	2.5 V	5.5 V	2.5 V	5.5 V	2.5 V	GND " " " " "	2.5 V	5.5 V	2.5 V	5.5 V	2.5 V	5.5 V	4.5 V " " " " "	1Y 2Y 3Y 4Y 5Y 6Y	60 " " " " "		mA " " " " "
	I_{CCH}	3005	49	GND		GND		GND		"		GND		GND		GND	5.5 V	V_{CC}		4.2	mA
	I_{CCL}	3005	50	5.5 V		5.5 V		5.5 V		"		5.5 V		5.5 V		5.5 V	5.5 V	V_{CC}		15.3	mA
2	Same tests, terminal conditions, and limits as for subgroup 1, except T_C = 125°C and V_{IC} tests are omitted.																				
3	Same tests, terminal conditions, and limits as for subgroup 1, except T_C = -55°C and V_{IC} tests are omitted.																				
9 T_C = 25°C	t_{PHL}	3003 Fig. 4 " " " "	51 52 53 54 55 56	IN	OUT	IN	OUT	IN	OUT	GND " " " " "	OUT	IN	OUT	IN	OUT	IN	5.0 V " " " " "	1A → 1Y 2A → 2Y 3A → 3Y 4A → 4Y 5A → 5Y 6A → 6Y	2.0 " " " " "	4.3 " " " " "	ns " " " " "
	t_{PLH}	" " " " " "	57 58 59 60 61 62	IN	OUT	IN	OUT	IN	OUT	" " " " " "	OUT	IN	OUT	IN	OUT	IN	" " " " " "	1A → 1Y 2A → 2Y 3A → 3Y 4A → 4Y 5A → 5Y 6A → 6Y	2.4 " " " " "	5.0 " " " " "	" " " " " "
10	t_{PHL}	"	63 - 68	Same tests and terminal conditions as for subgroup 9, except T_C = 125°C															1.5	6.5	"
	t_{PLH}	"	69 - 74																2.0	7.0	"
11	Same tests, terminal conditions, and limits as for subgroup 10, except T_C = -55°C.																				

1/ Pins not referenced (i.e., 1, 5, 7, 11, 15, and 17) are N/C.

2/ I_{IL} limits shall be as follows:

Test	Min/Max limits in mA Circuits A	B	C
I_{IL}	-.25/-.80	-.09/-.80	-.03/-.80

TABLE III. Group A inspection for device type 03.
Terminal conditions (pins not designated may be high ≥2.0 V, low ≤0.8 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, D Cases X,Y 1/ Test no.	1 2 1A	2 3 1B	3 4 2A	4 6 2B	5 8 2C	6 9 2Y	7 10 GND	8 12 3Y	9 13 3A	10 14 3B	11 16 3C	12 18 1Y	13 19 1C	14 20 V_{CC}	Measured terminal	Limits Min	Limits Max	Unit
1 T_C = 25°C	V_{OH}	3006	1	0.8 V	5.5 V				-1 mA	GND					-1 mA	5.5 V	4.5 V	1Y	2.5		V
			2	5.5 V	0.8 V											5.5 V		1Y			
			3	5.5 V	5.5 V											0.8 V		1Y			
			4			0.8 V	5.5 V	5.5 V										2Y			
			5			5.5 V	0.8 V	5.5 V										2Y			
			6			5.5 V	5.5 V	0.8 V										2Y			
			7								-1 mA	0.8 V	5.5 V	5.5 V				3Y			
			8									5.5 V	0.8 V	5.5 V				3Y			
			9									5.5 V	5.5 V	0.8 V				3Y			
	V_{OL}	3007	10	2.0 V	2.0 V										20 mA	2.0 V		1Y		0.5	
			11			2.0 V	2.0 V	2.0 V	20 mA									2Y			
			12								20 mA	2.0 V	2.0 V	2.0 V				3Y			
	V_{IC}		13	-18 mA														1A		-1.2	
			14		-18 mA													1B			
			15			-18 mA												2A			
			16				-18 mA											2B			
			17					-18 mA										2C			
			18									-18 mA						3A			
			19										-18 mA					3B			
			20											-18 mA				3C			
			21													-18 mA		1C			
	I_{IH1}	3010	22	2.7 V	GND											GND	5.5 V	1A		20	µA
			23	GND	2.7 V											GND		1B			
			24	GND	GND											2.7 V		1C			
			25			2.7 V	GND	GND										2A			
			26			GND	2.7 V	GND										2B			
			27			GND	GND	2.7 V										2C			
			28								2.7 V	GND	GND	GND				3A			
			29								GND	2.7 V	GND	GND				3B			
			30								GND	GND	2.7 V	2.7 V				3C			
	I_{IH2}		31	7.0 V	GND											GND		1A		100	
			32	GND	7.0 V											GND		1B			
			33	GND	GND											7.0 V		1C			
			34			7.0 V	GND	GND										2A			
			35			GND	7.0 V	GND										2B			
			36			GND	GND	7.0 V										2C			
			37								7.0 V	GND	GND	GND				3A			
			38								GND	7.0 V	GND	GND				3B			
			39								GND	GND	7.0 V	7.0 V				3C			
	I_{IL}	3009	40	0.5 V	5.5 V											5.5 V		1A	2/	2/	mA
			41	5.5 V	0.5 V											5.5 V		1B			
			42	5.5 V	5.5 V											0.5 V		1C			
			43			0.5 V	5.5 V	5.5 V										2A			
			44			5.5 V	0.5 V	5.5 V										2B			
			45			5.5 V	5.5 V	0.5 V										2C			
			46								0.5 V	5.5 V	5.5 V	5.5 V				3A			
			47								5.5 V	0.5 V	5.5 V	5.5 V				3B			
			48								5.5 V	5.5 V	0.5 V	0.5 V				3C			
	I_{OS}	3011	49	GND	GND										0.0 V	GND		1Y	-60	-150	
			50			GND	GND	GND	0.0 V									2Y			
			51								0.0 V	GND	GND	GND				3Y			

See footnotes at end of table.

TABLE III. Group A inspection for device type 03 - Continued.
Terminal conditions (pins not designated may be high ≥2.0 V, low ≤0.8 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, D Cases X, Y 1/ Test no.	1 2 1A	2 3 1B	3 4 2A	4 6 2B	5 8 2C	6 9 2Y	7 10 GND	8 12 3Y	9 13 3A	10 14 3B	11 16 3C	12 18 1Y	13 19 1C	14 20 V_{CC}	Measured terminal	Limits Min	Limits Max	Unit
1 T_C = 25°C	I_{OD}		52	5.5 V	5.5 V					GND					2.5 V	5.5 V	4.5 V	1Y	60		mA
			53			5.5 V	5.5 V	5.5 V	2.5 V	"							"	2Y	"		"
			54							"	2.5 V	5.5 V	5.5 V	5.5 V			"	3Y	"		"
	I_{CCH}	3005	55	GND	GND	GND	GND	GND		GND		GND	GND	GND		GND	5.5 V	V_{CC}		2.1	mA
	I_{CCL}	3005	56	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V		GND		5.5 V	5.5 V	5.5 V		5.5 V	5.5 V	V_{CC}		7.7	mA
2	Same tests, terminal conditions, and limits as for subgroup 1, except T_C = 125°C and V_{IC} tests are omitted.																				
3	Same tests, terminal conditions, and limits as for subgroup 1, except T_C = -55°C and V_{IC} tests are omitted.																				
9 T_C = 25°C	t_{PHL}	3003 Fig. 4	57	IN	2.7 V					GND					OUT	2.7 V	5.0 V	1A → 1Y	2.0	4.3	ns
		"	58	2.7 V	IN					"					"	2.7 V	"	1B → 1Y	"	"	"
		"	59	2.7 V	2.7 V					"					"	IN	"	1C → 1Y	"	"	"
		"	60			IN	2.7 V	2.7 V	OUT	"							"	2A → 2Y	"	"	"
		"	61			2.7 V	IN	2.7 V	"	"							"	2B → 2Y	"	"	"
		"	62			2.7 V	2.7 V	IN	"	"							"	2C → 2Y	"	"	"
		"	63							"	OUT	IN	2.7 V	2.7 V			"	3A → 3Y	"	"	"
		"	64							"	"	2.7 V	IN	2.7 V			"	3B → 3Y	"	"	"
		"	65							"	"	2.7 V	2.7 V	IN			"	3C → 3Y	"	"	"
	t_{PLH}	"	66	IN	2.7 V					"					OUT	2.7 V	"	1A → 1Y	2.4	5.0	"
		"	67	2.7 V	IN					"					"	2.7 V	"	1B → 1Y	"	"	"
		"	68	2.7 V	2.7 V					"					"	IN	"	1C → 1Y	"	"	"
		"	69			IN	2.7 V	2.7 V	OUT	"							"	2A → 2Y	"	"	"
		"	70			2.7 V	IN	2.7 V	"	"							"	2B → 2Y	"	"	"
		"	71			2.7 V	2.7 V	IN	"	"							"	2C → 2Y	"	"	"
		"	72							"	OUT	IN	2.7 V	2.7 V			"	3A → 3Y	"	"	"
		"	73							"	"	2.7 V	IN	2.7 V			"	3B → 3Y	"	"	"
		"	74							"	"	2.7 V	2.7 V	IN			"	3C → 3Y	"	"	"
10	t_{PHL}	"	75 - 83	Same tests and terminal conditions as for subgroup 9, except T_C = 125°C															1.5	6.5	"
	t_{PLH}	"	84 - 92																2.0	7.0	"
11	Same tests, terminal conditions, and limits as for subgroup 10, except T_C = -55°C.																				

1/ Pins not referenced (i.e., 1, 5, 7, 11, 15, and 17) are N/C.

2/ I_{IL} limits shall be as follows:

Test	Min/Max limits in mA, Circuits A	B	C
I_{IL}	-.25/-.60	-.03/-.60	-.03/-.60

TABLE III. Group A inspection for device type 04.
Terminal conditions (pins not designated may be high ≥2.0 V, low ≤0.8 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, D Cases X, Y 1/ Test no.	1 2 1A	2 3 1B	3 4 NC	4 6 1C	5 8 1D	6 9 1Y	7 10 GND	8 12 2Y	9 13 2A	10 14 2B	11 16 NC	12 18 2C	13 19 2D	14 20 V_{CC}	Measured terminal	Limits Min	Limits Max	Unit
1 T_C = 25°C	V_{OH}	3006	1	0.8 V	5.5 V		5.5 V	5.5 V	-1 mA	GND		0.8 V	5.5 V		5.5 V	5.5 V	4.5 V	1Y	2.5		V
		"	2	5.5 V	0.8 V		5.5 V	"	"	"		5.5 V	0.8 V		5.5 V	"	"	1Y	"		"
		"	3	"	5.5 V		0.8 V	"	"	"		0.8 V	5.5 V		0.8 V	"	"	1Y	"		"
		"	4	"	5.5 V		5.5 V	0.8 V	"	"	-1 mA	5.5 V	0.8 V		5.5 V	0.8 V	"	1Y	"		"
		"	5							"	"	"	"		"	"	"	2Y	"		"
		"	6							"	"	"	"		"	"	"	2Y	"		"
		"	7							"	"	"	"		"	"	"	2Y	"		"
		"	8							"	"	"	"		"	"	"	2Y	"		"
	V_{OL}	3007	9	2.0 V	2.0 V		2.0 V	2.0 V	20 mA	"	20 mA	2.0 V	2.0 V		2.0 V	2.0 V	"	1Y		0.5	"
	V_{OL}	3007	10															2Y		0.5	
	V_{IC}		11	-18 mA						"							"	1A		-1.2	"
			12		-18 mA					"							"	1B		"	"
			13				-18 mA			"							"	1C		"	"
			14					-18 mA		"							"	1D		"	"
			15							"		-18 mA					"	2A		"	"
			16							"			-18 mA				"	2B		"	"
			17							"					-18 mA		"	2C		"	"
			18							"						-18 mA	"	2D		"	"
	I_{IH1}	3010	19	2.7 V	GND		GND	GND		"							5.5 V	1A		20	μA
		"	20	GND	2.7 V		GND	"		"							"	1B		"	"
		"	21	"	GND		2.7 V	"		"							"	1C		"	"
		"	22	"	GND		GND	2.7 V		"							"	1D		"	"
		"	23							"		2.7 V	GND		GND	GND	"	2A		"	"
		"	24							"		GND	2.7 V		GND	"	"	2B		"	"
		"	25							"		"	GND		2.7 V	2.7 V	"	2C		"	"
		"	26							"		"	GND		GND	"	"	2D		"	"
	I_{IH2}	"	27	7.0 V	GND		GND	GND		"							"	1A		100	μA
		"	28	GND	7.0 V		GND	"		"							"	1B		"	"
		"	29	"	GND		7.0 V	"		"							"	1C		"	"
		"	30	"	GND		GND	7.0 V		"							"	1D		"	"
		"	31							"		7.0 V	GND		GND	GND	"	2A		"	"
		"	32							"		GND	7.0 V		GND	"	"	2B		"	"
		"	33							"		"	GND		7.0 V	7.0 V	"	2C		"	"
		"	34							"		"	GND		GND	"	"	2D		"	"
	I_{IL}	3009	35	0.5 V	5.5 V		5.5 V	5.5 V		"							"	1A	27	27	mA
		"	36	5.5 V	0.5 V		5.5 V	"		"							"	1B	"	"	"
		"	37	"	5.5 V		0.5 V	"		"							"	1C	"	"	"
		"	38	"	5.5 V		5.5 V	0.5 V		"							"	1D	"	"	"
		"	39							"		0.5 V	5.5 V		5.5 V	5.5 V	"	2A	"	"	"
		"	40							"		5.5 V	0.5 V		5.5 V	"	"	2B	"	"	"
		"	41							"		"	5.5 V		0.5 V	0.5 V	"	2C	"	"	"
		"	42							"		"	5.5 V		5.5 V	"	"	2D	"	"	"
	I_{OS}	3011	43	GND	GND		GND	GND	0.0 V	"	0.0 V	GND	GND		GND	GND	"	1Y	-60	-150	"
	I_{OS}	3011	44															2Y	-60	-150	

See footnotes at end of table.

TABLE III. Group A inspection for device type 04 - Continued.
Terminal conditions (pins not designated may be high ≥2.0 V, low ≤0.8 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, D Cases E, Y 1/ Test no.	1 2 1A	2 3 1B	3 4 NC	4 6 1C	5 8 1D	6 9 1Y	7 10 GND	8 12 2Y	9 13 2A	10 14 2B	11 16 NC	12 18 2C	13 19 2D	14 20 V_{CC}	Measured terminal	Limits Min	Limits Max	Unit
1 T_C = 25°C	I_{OD}		45 46	5.5 V	5.5 V		5.5 V	5.5 V	2.5 V	GND GND	2.5 V	5.5 V	5.5 V		5.5 V	5.5 V	4.5 V 4.5 V	1Y 2Y	60 60		mA mA
	I_{CCH}	3005	47	GND	GND		GND	GND		GND		GND	GND		GND	GND	5.5 V	V_{CC}		1.4	mA
	I_{CCL}	3005	48	5.5 V	5.5 V		5.5 V	5.5 V		GND		5.5 V	5.5 V		5.5 V	5.5 V	5.5 V	V_{CC}		5.1	mA
2	Same tests, terminal conditions, and limits as for subgroup 1, except T_C = 125°C and V_{IC} tests are omitted.																				
3	Same tests, terminal conditions, and limits as for subgroup 1, except T_C = -55°C and V_{IC} tests are omitted.																				
9 T_C = 25°C	t_{PHL}	3003 Fig. 4	49 50 51 52 53 54 55 56	IN 2.7 V " " " " " "	2.7 V IN 2.7 V 2.7 V " " " "		2.7 V 2.7 V IN 2.7 V " " " "	2.7 V " " IN " " " "	OUT " " " " " " "	GND " " " " " " "	OUT " " "	IN 2.7 V " "	2.7 V IN 2.7 V 2.7 V		2.7 V 2.7 V IN 2.7 V	2.7 V " " IN	5.0 V " " " " " " "	1A → 1Y 1B → 1Y 1C → 1Y 1D → 1Y 2A → 2Y 2B → 2Y 2C → 2Y 2D → 2Y	2.0 " " " " " " "	4.3 " " " " " " "	ns " " " " " " "
	t_{PLH}	" " " " " " " "	57 58 59 60 61 62 63 64	IN 2.7 V " " " " " "	2.7 V IN 2.7 V 2.7 V " " " "		2.7 V 2.7 V IN 2.7 V " " " "	2.7 V " " IN " " " "	OUT " " " " " " "	" " " " " " " "	OUT " " "	IN 2.7 V " "	2.7 V IN 2.7 V 2.7 V		2.7 V 2.7 V IN 2.7 V	2.7 V " " IN	" " " " " " " "	1A → 1Y 1B → 1Y 1C → 1Y 1D → 1Y 2A → 2Y 2B → 2Y 2C → 2Y 2D → 2Y	2.4 " " " " " " "	5.0 " " " " " " "	" " " " " " " "
10	t_{PHL}		65 - 72	Same tests and terminal conditions as for subgroup 9, except T_C = 125°C.															1.5	6.5	"
	t_{PLH}		73 - 80																2.0	7.0	"
11	Same tests, terminal conditions, and limits as for subgroup 10, except T_C = -55°C.																				

1/ Pins not referenced (i.e., 1, 5, 7, 11, 15, and 17) are N/C.

2/ I_{IL} limits shall be as follows:

Test	Min/Max limits in mA Circuits A	B	C
I_{IL}	-.25/-.60	-.03/-.60	-.03/-.60

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

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

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

a. Complete part number (see 1.2).

b. Requirements for delivery of one copy of the quality conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.

c. 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. Unless otherwise specified, these requirements will not apply to direct purchase by or direct shipment to the Government.

h. Requirements for "JAN" marking.

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

GND	Electrical ground (common terminal)
V_{IN}	Voltage level at an input terminal
I_{IN}	Current flowing into an input terminal

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

6.6 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-35810 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-35810 types or as a waiver of any of the provisions of MIL-M-38510.

Military device type	Generic-industry type
01	54F00
02	54F04
03	54F10
04	54F20

6.7 Manufacturers' designation. Manufacturers' circuits which form a part of this specification are designated with an 'X' as shown in table IV herein.

TABLE IV. Manufacturers' designations.

Device type	Manufacturer		
	Circuit A	Circuit B	Circuit C
	Fairchild Semiconductor	Motorola Inc.	Signetics Corp.
01	X	X	
02	X	X	
03	X	X	
04	X	X	

6.8 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

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

User activities:
Army - SM
Navy - AS, CG, MC

Agent:
DLA - ES

Preparing activity:
Air Force - 17

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