

QUALIFICATION
REQUIREMENTS
REMOVED

MIL-M-38510/158A
23 April 1984
SUPERSEDING
MIL-M-38510/158(USAF)
8 December 1975

MILITARY SPECIFICATION
MICROCIRCUITS, DIGITAL, TTL, DECODERS,
MONOLITHIC SILICON

INACTIVE FOR NEW DESIGN AFTER DATE OF THIS REVISION

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, decoder microcircuits. One product assurance class 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 complete part number shall be as specified in MIL-M-38510, with the exception that the "JAN" or "J" certification shall not be used.

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

<u>Device type</u>	<u>Circuit</u>
01	1 of 4 decoder
02	7 segment decoder/driver

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

1.2.4 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/	
Device type 01- - - - -	275 mWdc
Device type 02- - - - -	400 mWdc
Lead temperature (soldering, 10 seconds)- -	+300°C
Thermal resistance, junction-to-case (θ _{JC}):	
Case E- - - - -	50°C/W
Case F- - - - -	70°C/W
Junction temperature (T _J) - - - - -	+175°C

1/ Must withstand the added P_D due to short circuit test (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 (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.

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1.2.5 Recommended operating conditions.

Supply voltage (V_{CC})	- - - - -	4.5 V dc minimum to 5.5 V dc maximum
Minimum high-level input voltage (V_{IH})	- - -	2.0 V dc
Maximum low-level input voltage (V_{IL})	- - -	0.8 V dc
Sink-current capability by device type		
01	- - - - -	16 mA
02, outputs a - g	- - - - -	20 mA
02, RBO node	- - - - -	2.4 mA
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. The terminal connections shall be as specified on figure 2.

3.2.2 Logic diagrams. The logic diagrams shall be as specified on figure 1.

3.2.3 Truth tables. The truth tables shall be as specified on figure 3.

3.2.4 Case outlines. The case outlines shall be as specified in MIL-M-38510 and in 1.2.3 herein.

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510 and 6.5 herein.

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

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

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TABLE I. Electrical performance characteristics.

Tests	Symbol	Conditions ^{1/}	Device type	Limits		Unit
				Min	Max	
High-level output voltage	V _{OH}	V _{CC} = 4.5 V, I _{OH} = -0.8 mA V _{IN} = 0.8 V and 2.0 V	01	2.4		V
Low-level output voltage	V _{OL}	V _{CC} = 4.5 V, I _{OL} = 16 mA V _{IN} = 0.8 and 2.0 V	01		0.4	V
Low-level output voltage	V _{OL1}	V _{CC} = 4.5 V, I _{OL} = 2.4 mA ^{4/} V _{IN} = 0.8 and 2.0 V	02		0.4	V
Low-level output voltage	V _{OL2}	V _{CC} = 5.5 V, I _{OL} = 3.1 mA ^{4/} V _{IN} = 0.8 and 2.0 V	02		0.4	V
Low-level output voltage	V _{OL3}	V _{CC} = 4.5 V, I _{OL} = 20 mA LT = 0 V	02		0.4	V
High-level output voltage (RBO output only)	V _{OH}	V _{CC} = 4.5 V, I _{OH} = -70 μ A V _{IN} = 0.8 V and 2.0 V	02	3.0		V
Input clamp voltage	V _{IC}	V _{CC} = 4.5 V, I _{IN} = -12 mA	01		-1.5	V
Low-level input current	I _{IL}	V _{CC} = 5.5 V, V _{IN} = 0.4 V	01	-0.7	-1.6	mA
Low-level input current (data inputs)	I _{IL1}	V _{CC} = 5.5 V, V _{IN} = 0.4 V	02	-0.5	-1.4	mA
Low-level input current (LT input)	I _{IL2}	V _{CC} = 5.5 V, V _{IN} = 0.4 V	02	-2.8	-6.4	mA
Low-level input current (RBI input)	I _{IL3}	V _{CC} = 5.5 V, V _{IN} = 0.4 V	02	-0.3	-0.75	mA
High-level input current	I _{IH1}	V _{CC} = 5.5 V, V _{IN} = 2.4 V ^{2/} (except LT input on 02)	01, 02	0	40	μ A
High-level input current	I _{IH2}	V _{CC} = 5.5 V, V _{IN} = 5.5 V ^{2/} (except LT input on 02)	01, 02	0	100	μ A
High-level input current	I _{IH3}	V _{CC} = 5.5 V, V _{IN} = 2.4 V ^{2/} (at LT only)	02	0	200	μ A
High-level input current	I _{IH4}	V _{CC} = 5.5 V, V _{IN} = 5.5 V ^{2/} (at LT only)	02	0	500	μ A

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Tests	Symbol	Conditions <u>1/</u>	Device type	Limits		Unit
				Min	Max	
Short circuit output current	I_{OS}	$V_{CC} = 5.5 \text{ V } \underline{2/} \underline{3/}$	01	-20	-70	mA
Short circuit output current (RBO output only)	I_{OS}	$V_{CC} = 4.5 \text{ V } \underline{4/}$	02	-0.64		mA
Short circuit output current (RBO output only)	I_{OS}	$V_{CC} = 5.5 \text{ V } \underline{4/}$	02		-6.8	mA
Supply current	I_{CC}	$V_{CC} = 5.5 \text{ V}, V_{IN} = 0 \text{ V}$	01		50	mA
Supply current	I_{CC}	$V_{CC} = 5.0 \text{ V}$	02		66	mA
Output latching voltage	B_{VO}	$V_{CC} = 5.0 \text{ V}, I_{OUT} = 10 \text{ mA}$	02	30		V
High-level input current	I_{IH2}	$V_{CC} = 5.5 \text{ V } \underline{2/}$ (except LT input on 02)	01, 02	0	100	μA
High-level input current	I_{IH2}	$V_{CC} = 5.5 \text{ V}, V_{IN} = 5.5 \text{ V } \underline{2/}$ (at LT only)	02	0	500	μA
Propagation delay time from E to $\bar{O}$, I, 2, 3	t_{PLH}	$V_{CC} = 5.0 \text{ V}$ $R_L = 390\Omega \pm 5\%$ $C_L = 50 \text{ pF}$ minimum See figure 6	01	6	39	ns
	t_{PHL}		01	12	35	ns
Propagation delay time from A0 to $\bar{O}$, 2 A1 to $\bar{O}$, I	t_{PLH}		01	6	39	ns
	t_{PHL}		01	6	35	ns
Propagation delay time from A0 to I, 3 A1 to 2, 3	t_{PLH}		01	9	50	ns
	t_{PHL}		01	9	41	ns
Propagation delay time from A0, A1, A2, A3, LT to $\bar{a}$, $\bar{b}$, $\bar{c}$, $\bar{d}$, $\bar{e}$, $\bar{f}$, $\bar{g}$	t_{PLH}	$V_{CC} = 5.0 \text{ V}$ $R_L = 240\Omega \pm 5\%$ $C_L = 50 \text{ pF}$ minimum $R_L = 2,000\Omega \pm 5\%$ See figure 7	02	30	1,100	ns
	t_{PHL}		02	50	1,200	ns
Propagation delay time from A0, A1, A2, A3 to RBO	t_{PLH}		02	60	1,100	ns
	t_{PHL}		02	10	500	ns
Propagation delay time from RBT to $\bar{a}$, $\bar{b}$, $\bar{c}$, $\bar{d}$, $\bar{e}$, $\bar{f}$, $\bar{g}$	t_{PLH}		02	30	1,200	ns
	t_{PHL}		02	30	1,300	ns

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Tests	Symbol	Conditions <u>1/</u>	Device type	Limits		Unit
				Min	Max	
Propagation delay time from $\overline{RBI}$ to $\overline{RBO}$	t_{PLH}	$V_{CC} = 5.0 \text{ V}$ $R_L = 240\Omega \pm 5\%$ $C_L = 50 \text{ pF}$ minimum $R_L = 2,000\Omega \pm 5\%$ See figure 7	02	40	700	ns
	t_{PHL}		02	10	400	ns
Propagation delay time from $\overline{LT}$ to $\overline{RBO}$	t_{PLH}		02	30	700	ns
	t_{PHL}		02	10	80	ns
Propagation delay time from $\overline{RBO}$ to $\overline{a}$, $\overline{b}$, $\overline{c}$, $\overline{d}$, $\overline{e}$, $\overline{f}$, $\overline{g}$	t_{PLH}		02	30	700	ns
	t_{PHL}		02	30	600	ns

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

2/ All unspecified inputs grounded.

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

4/ $\overline{RBO}$ node only.

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3.6 Marking. Marking shall be in accordance with MIL-M-38510 and 1.2 herein. The "JAN" or "J" certification mark shall not be used.

3.7 Manufacturer eligibility. To be eligible to supply microcircuits to this specification, a manufacturer shall have a manufacturer certification in accordance with MIL-M-38510 for at least one line; not necessarily the line producing the device type described herein.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (see table III)
	Class B devices
Interim electrical parameters (pre burn-in) (method 5004)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 7, 9
Group A test requirements (method 5005)	1, 2, 3, 7, 9, 10, 11
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3
Additional electrical subgroups for group C periodic inspections	None

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

3.8 Certification. Certification in accordance with MIL-M-38510 is not required for this device.

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 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 4, or equivalent.
 - (2) $T_A = +125^{\circ}\text{C}$ 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 B devices shall be 10 percent 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.

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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 is not required.

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, and D inspections (see 4.4.1 through 4.4.4). Generic test data (see 6.6) may be used to satisfy the requirements for groups C and D inspections. Quality conformance inspection shall be completed on the specific devices covered by this specification before they are shipped.

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, and 6, 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 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 4, 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.

4.4.4 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

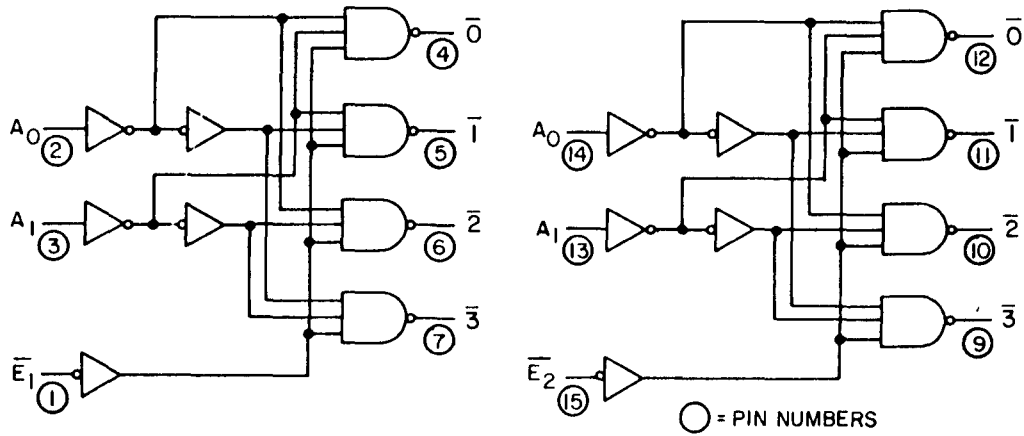
5.1 Packaging requirements. The requirements for packaging of microcircuits shall be as specified in MIL-M-38510.

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 logistic support of existing equipment.

Device type 01



Device type 02

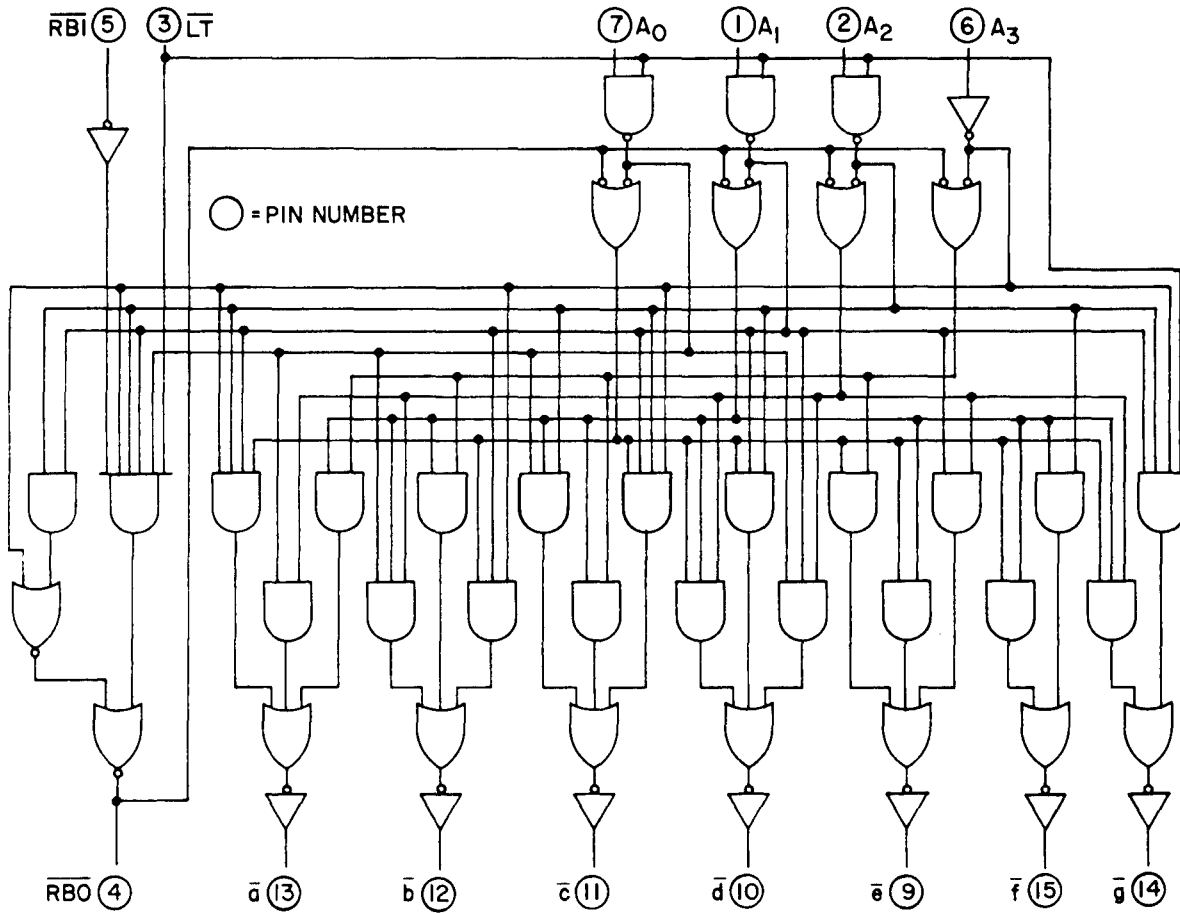
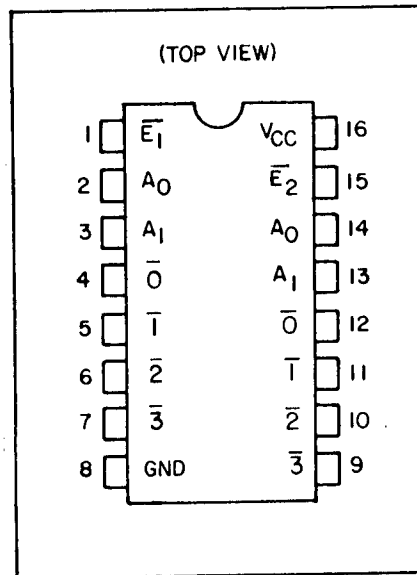


FIGURE 1. Logic diagrams.

Device type 01

CASES E AND F



Device type 02

CASES E AND F

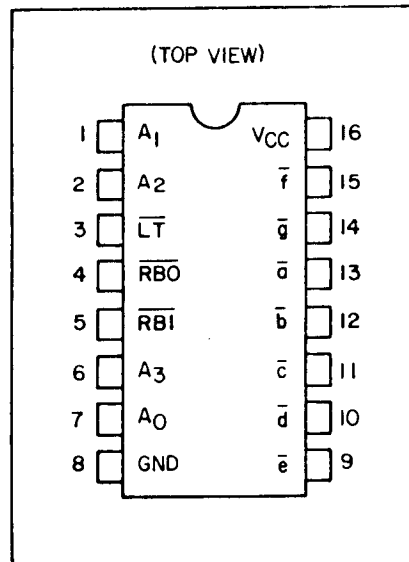


FIGURE 2. Terminal connections.

Device type 01

DECODER 1 & 2

$\overline{E}$	A ₀	A ₁	$\overline{0}$	$\overline{1}$	$\overline{2}$	$\overline{3}$
L	L	L	L	H	H	H
L	H	L	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L
H	X	X	H	H	H	H

H = HIGH voltage level
 L = LOW voltage level
 X = Irrelevant

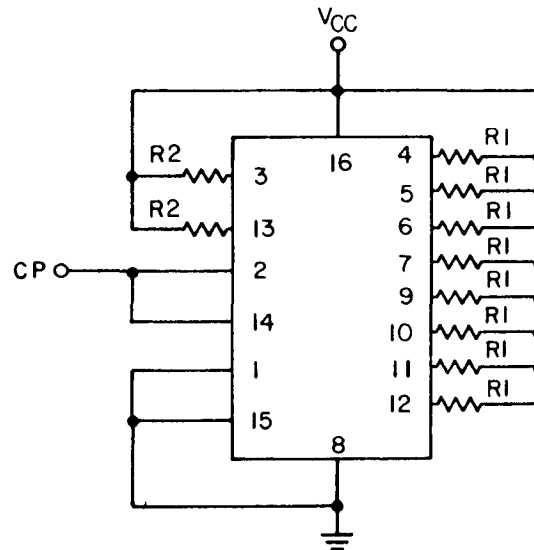
Device type 02

$\overline{LT}$	$\overline{RB1}$	A ₀	A ₁	A ₂	A ₃	$\overline{a}$	$\overline{b}$	$\overline{c}$	$\overline{d}$	$\overline{e}$	$\overline{f}$	$\overline{g}$	$\overline{RBO}$	DECIMAL OR FUNCTION
L	X	X	X	X	X	L	L	L	L	L	L	L	H	
H	L	L	L	L	L	H	H	H	H	H	H	H	L	0
H	H	L	L	L	L	L	L	L	L	L	L	H	H	0
	X	H	L	L	L	H	H	H	H	L	L	H	H	1
		L	H	L	L	L	L	H	L	L	H	L	H	2
		H	H	L	L	L	L	L	L	H	H	L	H	3
		L	L	H	L	H	L	L	H	H	L	L	H	4
		H	L	H	L	L	H	L	L	H	L	L	H	5
		L	H	H	L	H	H	L	L	L	L	L	H	6
		H	H	H	L	L	L	L	H	H	H	H	H	7
		L	L	L	H	L	L	L	L	L	L	L	H	8
		H	L	L	H	L	L	L	H	H	L	L	H	9
		L	H	L	H	H	H	H	H	H	H	H	L	10
		H	H	L	H	H	H	H	H	H	H	H	L	11
		L	L	H	H	H	H	H	H	H	H	H	L	12
		H	L	H	H	H	H	H	H	H	H	H	L	13
		L	H	H	H	H	H	H	H	H	H	H	L	14
H	X	H	H	H	H	H	H	H	H	H	H	H	L	15

H = HIGH voltage level
 L = LOW voltage level
 X = Irrelevant

FIGURE 3. Truth tables.

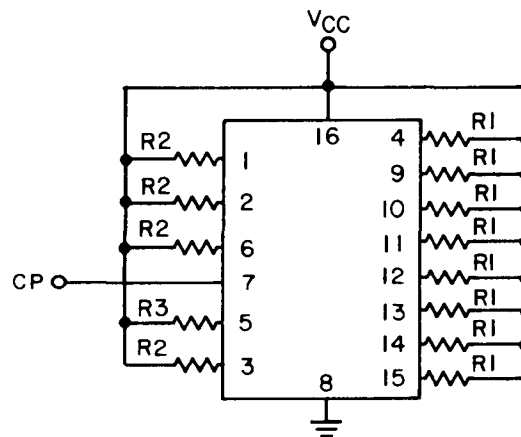
Device type 01



NOTES:

1. CP = 3 volts, frequency = 1 MHz, and 50% duty cycle.
2. VCC = 5.5 V.
3. R1 = 318Ω, R2 = 4 kΩ.

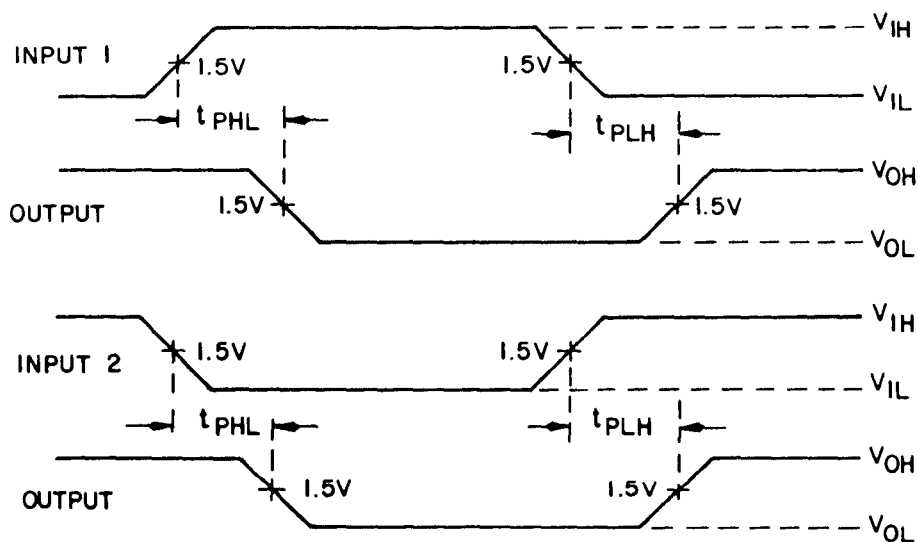
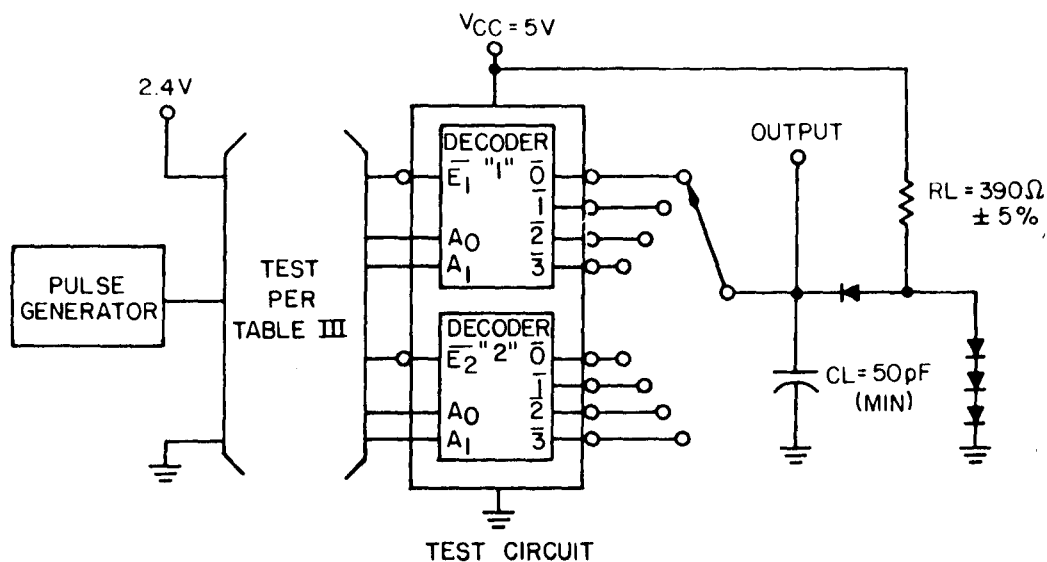
Device type 02



NOTES:

1. CP = 3 volts, frequency = 1 MHz, and 50% duty cycle.
2. VCC = 5.5 V.
3. R1 = 255Ω, R2 = 2.6 kΩ, R3 = 5.2 kΩ.

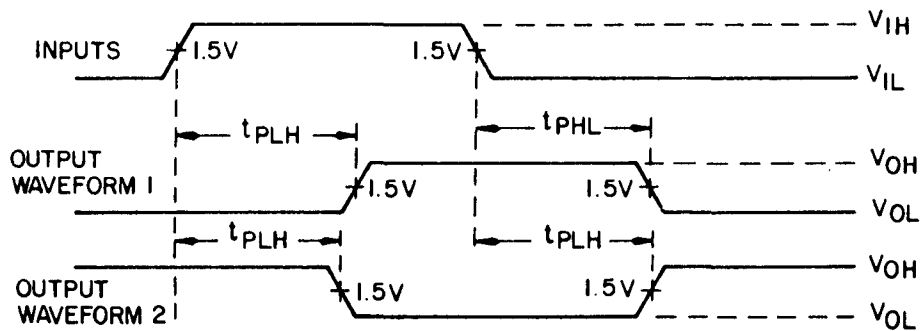
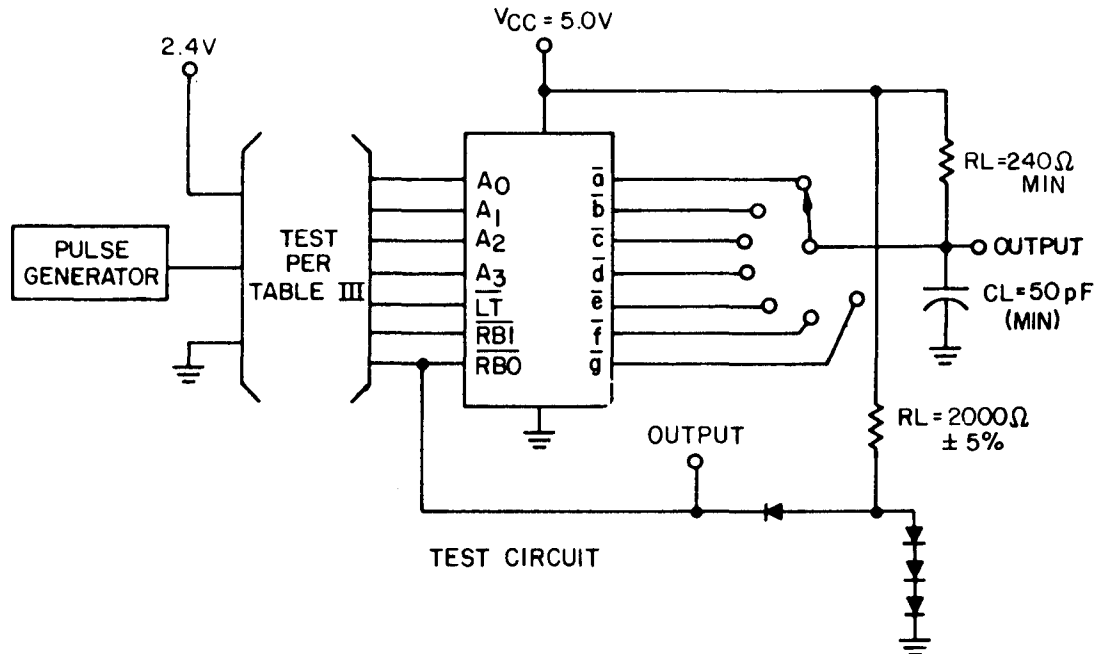
FIGURE 4. Burn-in and life test circuit.



NOTES:

1. The pulse generator has the following characteristics: $V_{gen} = 3.0 \text{ V min.}$ t_{TLH} (0.7 V to 2.7 V) and t_{THL} (2.7 V to 0.7 V) 10 ns, PRR = 1 MHz, and min. duty cycle 50%.
2. CL includes probe and jig capacitance.
3. All diodes are 1N3064 or equivalent.
4. Input 1 and input 2 are used to test each output with each A input. Input 2 is used to test each output with each E input.

FIGURE 5. Switching time for device type 01.



NOTES:

1. The pulse generator has the following characteristics: $V_{gen} = 3.0 \text{ V min.}$ t_{TLH} (0.7 V to 2.7 V) and t_{THL} (2.7 V to 0.7 V) 10 ns, PRR = 1 MHz, and min. duty cycle 50%.
2. C_L includes probe and jig capacitance.
3. Input - output waveform combination in accordance with the truth tables.
4. All diodes are 1N3064 or equivalent.

FIGURE 5. Switching time for device type 02.

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

Subgroup	Symbol	MIL-STD-883 method	Case E, F Test No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits		
				$\overline{E1}$	A0	A1	$\overline{0}$	$\overline{1}$	$\overline{2}$	$\overline{3}$	GND	$\overline{3}$	$\overline{2}$	$\overline{1}$	$\overline{0}$	A1	A0	$\overline{E2}$	VCC		Min	Max	Unit
1 $T_C = 25^\circ\text{C}$	VOH ↓	3007 ↓	1	2.0 V	GND	GND	- .8 mA				GND								4.5 V	0	2.4		V
			2	↓	4.5 V	GND		- .8 mA												1			
			3		GND	4.5 V			- .8 mA											2			
			4		4.5 V	4.5 V				- .8 mA										3			
			5																	0			
			6																	1			
			7											- .8 mA		GND	GND	2.0 V		2			
			8									- .8 mA	- .8 mA			4.5 V	4.5 V	↓		3			
	VOL ↓	3006 ↓	9	0.8 V	0.8 V	0.8 V	16 mA													0		0.4	
			10	GND	2.0 V	GND		16 mA												1			
			11	GND	GND	2.0 V			16 mA											2			
			12	GND	4.5 V	4.5 V				16 mA										3			
			13													0.8 V	0.8 V	0.8 V		0			
			14											16 mA	16 mA	GND	2.0 V	GND		1			
			15									16 mA				4.5 V	4.5 V	GND		2			
			16															GND		3			
	VIC ↓		17	-12 mA																E1		-1.5	
			18		-12 mA															A0			
			19			-12 mA														A1			
			20																	A0			
			21																	A1			
			22													-12 mA	-12 mA	-12 mA		A1			
	IIH1 ↓	3010 ↓	23	2.4 V																E1	0	40	μA
			24		2.4 V															A0			
			25			2.4 V														A1			
			26																	E2			
			27													2.4 V	2.4 V	2.4 V		A0			
			28																	A1			
	IIH2 ↓		29	5.5 V																E1		100	
			30		5.5 V															A0			
			31			5.5 V														A1			
			32																	E2			
			33																	A0			
			34													5.5 V	5.5 V	5.5 V		A1			
	IIL ↓	3009 ↓	35	0.4 V																E1	-0.7	-1.6	mA
			36		0.4 V															A0			
			37			0.4 V														A1			
			38																	E2			
			39																	A0			
			40													0.4 V	0.4 V	0.4 V		A1			
	IOS ↓	3011 ↓	41	GND	4.5 V	GND	GND													0	-20	-70	
			42	↓	GND	↓		GND												1			
			43		GND				GND											2			
			44		4.5 V					GND										3			
			45																	0			
			46																	1			
			47																	2			
			48									GND					4.5 V	GND		3			
	ICC ↓	3005 ↓	49	GND	GND	GND														VCC		50	

See notes at end of device type 01.

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

Subgroup	Symbol	MIL-STD-883 method	Case E, F Test No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits					
				$\overline{E1}$	A0	A1	$\overline{0}$	$\overline{1}$	$\overline{2}$	$\overline{3}$	GND	$\overline{3}$	$\overline{2}$	$\overline{1}$	$\overline{0}$	A1	A0	$\overline{E2}$	V _{CC}		Min	Max	Unit			
2	Same tests, terminal conditions, and limits as for subgroup 1, except T _A = 125°C and V _{IC} tests are omitted.																									
3	Same tests, terminal conditions, and limits as for subgroup 1, except T _A = -55°C and V _{IC} tests are omitted.																									
7 T _C = 25°C ↓	Truth table test ↓		50 51 52 53 54	GND ↓ 5.0 V	GND 5.0 V GND 5.0 V X	GND GND 5.0 V X	L H ↓	H L H H	H H L H	H H L H	GND ↓	H H L H	H H L H	H L H H	L H ↓	GND GND 5.0 V 5.0 V X	GND 5.0 V GND 5.0 V X	GND ↓ 5.0 V	5.0 V ↓	}	See notes 1 and 2					
8 ↓	Truth table test	55 thru 59	Same tests as subgroup 7 except T _C = 125°C.																							
	Truth table test	60 thru 64	Same tests as subgroup 7 except T _C = -55°C.																							
9 T _C = 25°C ↓	t _{PHL} ↓	3003 (Fig 5)	65 66 67 68	IN ↓	GND 5.0 V GND 5.0 V	GND GND 5.0 V 5.0 V	OUT	OUT	OUT	OUT	GND								5.0 V	$\overline{E1} - \overline{0}$ $\overline{E1} - 1$ $\overline{E1} - 2$ $\overline{E1} - 3$	6 ↓	28 ↓	ns			
	t _{PLH} ↓		69 70 71 72	↓	GND 5.0 V GND 5.0 V	GND GND 5.0 V 5.0 V	OUT	OUT	OUT	OUT										$\overline{E1} - 0$ $\overline{E1} - 1$ $\overline{E1} - 2$ $\overline{E1} - 3$	↓	25 ↓				
	t _{PHL} t _{PHL}		73 74	GND ↓	IN ↓	GND 5.0 V		OUT	OUT	OUT										A0 - 1 A0 - 2	9 6	33 28				
	t _{PLH} t _{PLH}		75 76	↓	GND 5.0 V		OUT	OUT	OUT	OUT										A0 - 1 A0 - 2	9 6	33 25				
	t _{PHL} t _{PHL}		77 78	↓	GND 5.0 V	IN ↓	OUT			OUT										A1 - 0 A1 - 3	6 9	28 33				
	t _{PLH} t _{PLH}		79 80	↓	GND 5.0 V	↓	OUT			OUT										A1 - 0 A1 - 3	6 9	25 33				
	t _{PHL} ↓		81 82 83 84									OUT	OUT	OUT	OUT	GND GND 5.0 V 5.0 V	GND 5.0 V GND 5.0 V	IN ↓		E2 - 0 E2 - 1 E2 - 2 E2 - 3	6 ↓	28 ↓				
	t _{PLH} ↓		85 86 87 88									OUT	OUT	OUT	OUT	GND GND 5.0 V 5.0 V	GND 5.0 V GND 5.0 V	↓		E2 - 0 E2 - 1 E2 - 2 E2 - 3	↓	25 ↓				
	t _{PHL} t _{PHL}		89 90										OUT	OUT	OUT		GND 5.0 V	IN ↓	GND		A0 - 1 A0 - 2	9 6	33 28			
	t _{PLH} t _{PLH}		91 92											OUT	OUT		GND 5.0 V	↓	↓		A0 - 1 A0 - 2	9 6	33 25			
	t _{PHL} t _{PHL}		93 94									OUT			OUT	IN 5.0 V	GND	↓	↓		A1 - 0 A1 - 3	6 9	28 33			
	t _{PLH} t _{PLH}		95 96									OUT			OUT	↓	GND 5.0 V	↓	↓	↓	A1 - 0 A1 - 3	6 9	25 33	↓		

See notes at end of device type 01.

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

Subgroup	Symbol	MIL-STD-883 method	Case E, F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits		
			Test No.	$\overline{E}1$	A0	A1	$\overline{0}$	$\overline{1}$	$\overline{2}$	$\overline{3}$	GND	$\overline{3}$	$\overline{2}$	$\overline{1}$	$\overline{0}$	A1	A0	E2	V _{CC}		Min	Max	Unit
10 T _C = 125°C	t _{PHL}	3003 (Fig 5)	97	IN	GND	GND	OUT	OUT			GND								5.0 V	E1 - 0	12	35	ns
	98		↓	5.0 V	GND		OUT												E1 - 1				
	99			GND	5.0 V			OUT												E1 - 2			
	100			5.0 V	5.0 V			OUT												E1 - 3	↓	↓	
	t _{PLH}		101	↓	GND	GND	OUT	OUT												E1 - 0	6	39	
	102		5.0 V	GND		OUT														E1 - 1	↓	↓	
	103		GND	5.0 V		OUT														E1 - 2			
	104		5.0 V	5.0 V		OUT														E1 - 3	↓	↓	
	t _{PHL}		105	GND	IN	GND		OUT												A0 - 1	9	41	
	t _{PHL}		106			5.0 V		OUT												A0 - 2	6	35	
	t _{PLH}		107	↓		GND		OUT												A0 - 1	9	50	
	t _{PLH}		108		↓	5.0 V		OUT												A0 - 2	6	39	
	t _{PHL}		109		GND	IN	OUT													A1 - 0	6	35	
	t _{PHL}		110	↓	5.0 V	↓			OUT											A1 - 3	9	41	
	t _{PLH}		111		GND		OUT													A1 - 0	6	39	
	t _{PLH}		112	↓	5.0 V	↓			OUT											A1 - 3	9	50	
	t _{PHL}		113																	E2 - 0	12	35	
	↓		114																	E2 - 1	↓	↓	
	115																			E2 - 2			
	116																			E2 - 3	↓	↓	
	t _{PLH}		117																	E2 - 0	6	39	
	↓		118																	E2 - 1			
	119																			E2 - 2	↓	↓	
	120																			E2 - 3			
	t _{PHL}		121																	A0 - 1	9	41	
	t _{PHL}		122																	A0 - 2	6	35	
	t _{PLH}		123																	A0 - 1	9	50	
	t _{PLH}		124																	A0 - 2	6	39	
t _{PHL}		125																	A1 - 0	6	35		
t _{PHL}		126																	A1 - 3	9	41		
t _{PLH}		127																	A1 - 0	6	39		
t _{PLH}		128																	A1 - 3	9	50		
11	Same tests, terminal conditions and limits as subgroup 10, except T _C = -55°C.																						

NOTES:

1. X = Input may be high or low.
2. Output voltages shall be either:
 - (a) H = 2.4 volts minimum and L = 0.4 volts maximum when using a high speed checker double comparator, or
 - (b) H ≥ 1.5 volts and L < 1.5 volts when using a high speed checker single comparator.

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

Subgroup	Symbol	MIL-STD-883 method	Case E, F Test No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits		
				A1	A2	LT	RBO	RBI	A3	A0	GND	e	d	c	b	a	g	f	V _{CC}		Min	Max	Unit
1 $T_C = 25^\circ\text{C}$	V _{OH}	3007	1	0.8 V	0.8 V	2.0 V	-70 μA	2.0 V	0.8 V	0.8 V	GND								4.5 V	RBO	3.0		V
	V _{OH}	3007	2	2.0 V	2.0 V	0.8 V	-70 μA	2.0 V	2.0 V	2.0 V									4.5 V	RBO	3.0		
	V _{OL1}	3006	3	0.8 V	0.8 V	2.0 V	2.4 mA	0.8 V	0.8 V	0.8 V									4.5 V	RBO		0.4	
	V _{OL2}	3006	4	0.8 V	0.8 V	2.0 V	3.1 mA	0.8 V	0.8 V	0.8 V									5.5 V	RBO			
	V _{OL3}	3006	5			0.8 V						20 mA	20 mA	20 mA	20 mA	20 mA	20 mA		4.5 V	e			
			6																	d			
			7																	c			
			8																	b			
			9																	a			
			10																	g			
			11																	f			
	BVO		12	4.5 V	4.5 V	4.5 V			4.5 V	4.5 V		10 mA	10 mA	10 mA	10 mA	10 mA	10 mA		5.0 V	e	30		
			13																	d			
			14																	c			
			15																	b			
			16																	a			
			17																	g			
			18																	f			
	I _{IH1}	3010	19	2.4 V		GND													5.5 V	A1	0	40	μA
	I _{IH1}		20		2.4 V	GND		5.5 V	GND	GND										A2		40	
	I _{IH3}		21	GND	GND	2.4 V		2.4 V												LT		200	
	I _{IH1}		22																	RBI		40	
			23			GND			2.4 V	2.4 V										A3		40	
			24																	A0		40	
	I _{IH2}		25	5.5 V																A1		100	
	I _{IH2}		26		5.5 V			5.5 V	GND	GND										A2		100	
	I _{IH4}		27	GND	GND	5.5 V		5.5 V												LT		500	
	I _{IH2}		28					5.5 V												RBI		100	
			29			GND			5.5 V											A3		100	
			30			GND				5.5 V										A0		100	
	I _{IL1}	3009	31	0.4 V		4.5 V														A1	-0.5	-1.4	mA
			32		0.4 V															A2			
			33						0.4 V											A3			
			34																	A0			
	I _{IL2}		35	4.5 V	4.5 V	0.4 V		GND	GND	4.5 V										LT	-2.8	-6.4	
	I _{IL3}		36					0.4 V												RBI	-0.3	-0.75	
	I _{OS}	3011	37	4.5 V	4.5 V	4.5 V	GND	4.5 V	GND	4.5 V									4.5 V	RBO	-0.64		
	I _{OS}	3011	38	GND	GND	GND	GND	4.5 V	4.5 V	4.5 V									5.5 V	RBO		-6.8	
	I _{CC}	3005	39																5.0 V	V _{CC}		66	
2	Same tests, terminal conditions, and limits as for subgroup 1, except $T_C = 125^\circ\text{C}$.																						
3	Same tests, terminal conditions, and limits as for subgroup 1, except $T_C = -55^\circ\text{C}$.																						

See notes at end of device type 02.

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

Subgroup	Symbol	MIL-STD-883 method	Case E, F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits			
			Test No.	A1	A2	LT	RBO	RBI	A3	A0	GND	e	d	c	b	a	g	f	VCC		Min	Max	Unit	
7 T _C = 25°C	Truth table test		40	X	X	GND	H	X	X	X	GND	L	L	L	L	L	L	L	5.0 V	See notes 1 and 2				
			41	GND	GND	5.0 V	L	GND	GND	GND		H	H	H	H	H	H	H						
			42	GND			H	5.0 V				L	L	L	L	L	L	L						
			43	GND				X				L	H	H	H	H	H	H						
			44	5.0 V								L	L	L	L	L	L	L						
			45	5.0 V								L	L	L	L	L	L	L						
			46	GND	5.0 V							H	H	H	L	L	L	L						
			47	GND								H	H	H	L	L	L	L						
			48	5.0 V								L	L	L	L	L	L	L						
			49	5.0 V								L	H	L	L	L	L	L						
			50	GND	GND				5.0 V			L	L	L	L	L	L	L						
			51	GND								L	L	L	L	L	L	L						
			52	5.0 V			L							H	H	H	H	H						
			53	5.0 V																				
			54	GND	5.0 V																			
			55	GND																				
			56	5.0 V																				
			57	5.0 V																				
8	Truth table test		58 thru 75	Same tests as subgroup 7, except T _C = 125°C.																				
	Truth table test		76 thru 93	Same tests as subgroup 7, except T _C = -55°C.																				
9 T _C = 25°C	t _{PHL}	3003 (Fig 5)	94	GND	GND	5.0 V		5.0 V	GND	IN	GND				OUT	OUT	OUT	OUT	5.0 V	A0 - a	50	700	ns	
			95		5.0 V															A0 - b				
			96		GND																A0 - c			
			97		GND																A0 - d			
			98		GND																A0 - e			
			99	5.0 V	5.0 V																A0 - f			
			100	5.0 V	5.0 V																A0 - g			
	101	GND	GND		OUT	GND											OUT		A0 - RBO	10	400			
	t _{PLH}		102		GND				5.0 V										OUT		A0 - a	30	500	
			103		5.0 V																A0 - b			
			104		GND																A0 - c			
			105		GND																A0 - d			
			106		GND																A0 - e			
			107	5.0 V	5.0 V														OUT		A0 - f			
			108	5.0 V	5.0 V																A0 - g			
	109	GND	GND		OUT	GND											OUT		A0 - RBO	60	700			
	t _{PHL}		110	IN	GND				5.0 V		5.0 V										A1 - a	50		
			111		5.0 V						GND										A1 - b			
112				GND						GND										A1 - c				
113				5.0 V						5.0 V										A1 - d				
114				GND						5.0 V										A1 - e				
115				GND						GND								OUT		A1 - f				
116				GND			OUT		5.0 V	GND										A1 - RBO	10	400		

See notes at end of device type 02.

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

Subgroup	Symbol	MIL-STD-883 method	Case E, F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits			
			Test No.	A1	A2	LT	RBO	RBI	A3	A0	GND	e	d	c	b	a	g	f	VCC		Min	Max	Unit	
9 T _C = 25 °C	t _{PLH} ↓	3003 (Fig 5)	117	IN	GND	5.0 V		5.0 V	GND	5.0 V	GND				OUT	OUT			5.0 V	A1 - a	30	500	ns	
			118	↓	5.0 V			↓	↓	GND										A1 - b				
			119	↓	GND			↓	↓	GND										A1 - c				
	120		↓	5.0 V			↓	↓	5.0 V											A1 - d				
	121		↓	GND			↓	↓	5.0 V				OUT	OUT						A1 - e				
	122		↓	GND			↓	↓	GND									OUT		A1 - f				
	123		↓	GND				OUT		5.0 V	GND									A1 - RBO	60	700		
	t _{PHL} ↓		124	GND	IN					GND	GND							OUT			A2 - a	50		
			125	↓	↓					↓	5.0 V										A2 - c			
			126	↓	↓					↓	GND			OUT	OUT						A2 - d			
	127		↓	↓					↓	5.0 V										A2 - e				
	t _{PLH} ↓		128	↓	↓					↓	GND							OUT			A2 - a	30	500	
			129	↓	↓					↓	5.0 V										A2 - c			
			130	↓	↓					↓	GND				OUT	OUT					A2 - d			
	131		↓	↓					↓	5.0 V										A2 - e				
	t _{PHL}		132	↓	GND					IN	5.0 V						OUT				A3 - b	50	700	
	t _{PHL}		133	5.0 V	5.0 V			OUT			GND										A3 - RBO	10	400	
	t _{PLH}		134	GND	GND						5.0 V						OUT				A3 - b	30	500	
t _{PLH}	135	5.0 V	5.0 V			OUT	↓	↓	GND										A3 - RBO	60	700			
t _{PHL}	136	GND	GND					IN	GND							OUT			RBI - a	30	750			
t _{PHL}	137	↓	↓			OUT	↓												RBI - RBO	10	175			
t _{PLH}	138	↓	↓					↓											RBI - a	30	500			
t _{PLH}	139	↓	↓			↓	OUT	↓								OUT			RBI - RBO	40	450			
t _{PHL}	140	↓	↓			IN		GND							OUT				LT - b	50	700			
t _{PHL}	141	↓	↓														OUT		LT - g	50	700			
t _{PHL}	142	↓	↓				OUT												LT - RBO	10	350			
t _{PLH}	143	↓	↓			↓													LT - b	30	500			
t _{PLH}	144	↓	↓																LT - g		500			
t _{PLH}	145	↓	↓			↓	OUT	↓									OUT		LT - RBO		350			
t _{PHL}	146	↓	↓			5.0 V	IN	5.0 V							OUT				RBO - c		400			
t _{PLH}	147	↓	↓			5.0 V	IN	5.0 V	↓	↓	↓				OUT				RBO - c	↓	300			
10 T _C = 125 °C	t _{PHL} ↓	3003 (Fig 5)	148		GND	5.0 V		5.0 V	GND	IN	GND					OUT	OUT		5.0 V	A0 - a	50	1,200		
			149	↓	5.0 V			↓	↓											A0 - b				
			150	↓	GND			↓	↓											A0 - c				
	151		↓	GND			↓	↓												A0 - d				
	152		↓	GND			↓	↓	5.0 V											A0 - e				
	153		5.0 V	5.0 V			↓		GND											A0 - f				
	154		5.0 V	5.0 V			↓											OUT		A0 - g				
	155		GND	GND				OUT	GND											A0 - RBO	10	500		
	t _{PLH} ↓		156	↓	GND				5.0 V	↓											A0 - a	30	1,100	
			157	↓	5.0 V				↓	↓											A0 - b			
			158	↓	GND				↓	↓											A0 - c			
	159		↓	GND				↓	↓											A0 - d				
	160		↓	GND				↓	↓	5.0 V											A0 - e			
	161		5.0 V	5.0 V			↓		GND				OUT	OUT							A0 - f			
	162		5.0 V	5.0 V			↓		GND										OUT		A0 - g			
	163		GND	GND			↓	OUT	GND	GND	↓	↓									A0 - RBO	60	1,100	

See notes at end of device type 02.

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

Subgroup	Symbol	MIL-STD-883 method	Case E, F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits				
			Test No.	A1	A2	LT	RBO	RBI	A3	A0	GND	e	d	c	b	a	g	f	VCC		Min	Max	Unit		
10 T _C = 125°C	t _{PHL}	3003 (Fig 5)	164 165 166 167 168 169 170	IN	GND 5.0 V GND 5.0 V GND	5.0 V		5.0 V	GND	5.0 V GND GND 5.0 V 5.0 V GND GND	GND			OUT	OUT	OUT			5.0 V	A1 - a A1 - b A1 - c A1 - d A1 - e A1 - f A1 - RBO	50	1,200	ns		
	t _{PLH}		171 172 173 174 175 176 177		5.0 V GND 5.0 V GND GND GND		OUT		GND	5.0 V GND GND 5.0 V GND GND			OUT	OUT	OUT			OUT		A1 - a A1 - b A1 - c A1 - d A1 - e A1 - f A1 - RBO	10 30	500 1,100			
	t _{PHL}		178 179 180 181	GND	IN				GND	GND 5.0 V GND 5.0 V			OUT	OUT		OUT					A2 - a A2 - c A2 - d A2 - e	50	1,200		
	t _{PLH}		182 183 184 185							GND 5.0 V GND 5.0 V			OUT	OUT		OUT					A2 - a A2 - c A2 - d A2 - e	30	1,100		
	t _{PHL}		186 187	5.0 V	GND 5.0 V		OUT		IN	5.0 V GND					OUT							A3 - b A3 - RBO	50 10	1,200 500	
	t _{PLH}		188 189	GND 5.0 V	GND 5.0 V		OUT			5.0 V GND					OUT							A3 - b A3 - RBO	30 60	1,100 1,100	
	t _{PHL}		190 191	GND	GND		OUT	IN	GND							OUT						RBI - a RBI - RBO	30 10	1,300 400	
	t _{PLH}		192 193				OUT									OUT						RBI - a RBI - RBO	30 40	1,200 700	
	t _{PHL}		194 195 196			IN		GND								OUT		OUT				LT - b LT - g LT - RBO	50 50 10	1,200 1,200 80	
	t _{PLH}		197 198 199				OUT									OUT		OUT				LT - b LT - g LT - RBO	30	1,100 1,100 700	
	t _{PHL}		200			5.0 V	IN	5.0 V							OUT							RBO - c		600	
	t _{PLH}		201			5.0 V	IN	5.0 V							OUT							RBO - c		700	
	11	Same tests, terminal conditions and limits as subgroup 10, except T _C = -55°C.																							

NOTES:

- 1 X = Input may be high or low.
- 2 Output voltages shall be either:
 - (a) H = 2.4 volts minimum and L = 0.4 volts maximum when using a high speed checker double comparator, or
 - (b) H ≥ 1.5 volts and L ≤ 1.5 volts when using a high speed checker single comparator.

6.3 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, if applicable.
- e. Requirements for packaging and packing.
- f. 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.

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).
I _{IN}	- - - - -	Current flowing into an input terminal.
T _C	- - - - -	Case temperature.
V _{IN}	- - - - -	Voltage level at 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), lead material and finish C (see 3.3). Longer length leads and lead forming shall not affect the part number.

6.6 Generic test data. Generic test data may be used to satisfy the requirements of 4.4.3. Group C generic test data shall be on date codes no more than one year old and on a die in the same microcircuit group (see appendix E of MIL-M-38510) with the same material, design and process and from the same plant as the die represented. Group D (see 4.4.4) generic data shall be on date codes no more than one year old and on the same package type (see terms, definitions, and symbols of MIL-M-38510) and from the same plant as the package represented. The vendor is required to retain the generic data for a period of not less than 36 months from the date of shipment.

6.7 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>Military device type</u>	<u>Generic-industry type</u>
01	9321
02	9317

6.8 Ordering guidance. Since the qualification and certification requirements have been removed from the specification, orders may be placed immediately.

6.9 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

(Project 5962-0674-3)

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