MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, BIPOLAR, SCHOTTKY TTL, EXCLUSIVE-OR 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, Schottky TTL, quadruple 2-input exclusive-OR gates microcircuits. Qualification requirements are removed for device type 02. These device types are inactive for new design after the date of this revision. Two product assurance classes and a choice of case outlines and lead finishes are provided and are reflected in the complete part number.

1.2 Part number. The complete part number shall be in accordance with MIL-M-38510, with the exception that the "JAN" or "J" certification mark shall not be used on device 02.

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

Device type	Circuit
01	Quad, 2-input exclusive-OR gate
02 1/	Quad, exclusive OR/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:

Outline 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
E	D-2 (16-lead, 1/4" x 7/8") dual-in-line package
F	F-5 (16-lead, 1/4" x 3/8") flat package

1.3 Absolute maximum ratings.

Supply voltage range	-0.5 V dc to +7.0 V dc
Input voltage range	-1.2 V dc at -18 mA to +5.5 V dc
Storage temperature range	-65°C to +150°C
Maximum power dissipation per gate, (P_D)	104.0 mW for type 01 137.0 mW for type 02 1/ 2/
Lead temperature (soldering, 10 seconds)	300°C
Thermal resistance, junction-to-case (θ_{JC}): Cases A, B, C, D, E and F	(See MIL-M-38510, appendix C)
Junction temperature (T_J) 3/	+175°C

1/ Qualification requirements removed for this device type.
2/ Must withstand the added P_D due to short circuit condition (e.g., I_{OS}) at one output for 5 seconds duration.
3/ Maximum junction temperature shall not be exceeded except for allowable short duration burn-in screening condition per method 5004 of MIL-STD-883.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Rome Air Development Center (RBE-2), Griffiss AFB, NY 13441, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

1.4 Recommended operating conditions.

Supply voltage (V_{CC}) - - - - - - - - - - - - -	4.5 V dc minimum to 5.5 V dc maximum
Minimum high-level input voltage (V_{IH}) - -	2.0 V dc
Maximum low-level input voltage (V_{IL}) 4/ -	0.8 V dc
Case operating temperature range (T_C) - -	-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATION

MILITARY

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

STANDARD

MILITARY

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

(Copies of the specification and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

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

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

3.2.1 Logic diagram and terminal connections. The 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 circuits. Schematic circuits shall be submitted to the preparing activity prior to inclusion of a manufacturer's device in the specification and shall be submitted to the qualifying activity and agent activity (DESC-ECS) as a prerequisite for qualification. All qualified manufacturers' schematics shall be maintained by the agent activity and 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 6.4).

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

4/ V_{IL} = 0.7 V at 125°C

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \leq T_C \leq +125°C$	Device type	Limits Min	Limits Max	Units
High-level output voltage	V_{OH}	V_{CC} = 4.5 V; V_{IN} = 0.8 V I_{OH} = -1 mA	All 1/	2.5		V
		@ T_C = 125°C, V_{IN} = 0.7 V				
Low-level output voltage	V_{OL}	V_{CC} = 4.5 V I_{OL} = 20 mA	All 1/		0.5	V
		T_C = 125°C			0.45	V
Input clamp voltage	V_{IC}	V_{CC} = 4.5 V I_{IN} = -18 mA, T_A = 25°C	All 1/		-1.2	V
Collector cutoff current	I_{CEX}	V_{CC} = 5.5 V; V_{IN} = GND V_{IH} = 5.5 V	All 1/		250	µA
High-level input current	I_{IH1}	V_{CC} = 5.5 V V_{IN} = 2.7 V	All 1/		50	µA
High-level input current	I_{IH2}	V_{CC} = 5.5 V V_{IN} = 5.5 V	All 1/		1.0	mA
Low-level input current	I_{IL}	V_{CC} = 5.5 V V_{IN} = .5 V	All 1/	-1.0	-2.0	mA
Short circuit output current	I_{OS}	V_{CC} = 5.5 V 2/	All 1/	-40	-100	mA
Supply current	I_{CC}	V_{CC} = 5.5 V	01 02 1/		75 99	mA
Propagation delay low-to-high level	t_{PLH1}	V_{CC} = 5.0 V C_L = 50 pF, R_L = 280Ω other input low	01	2.0	16.5	ns
Propagation delay high-to-low level	t_{PHL1}	V_{CC} = 5.0 V C_L = 50 pF, R_L = 280Ω other input low	01	2.0	15.5	ns
Propagation delay low-to-high level	t_{PLH2}	V_{CC} = 5.0 V C_L = 50 pF, R_L = 280Ω other input high	01	2.0	16.5	ns
Propagation delay high-to-low level	t_{PHL2}	V_{CC} = 5.0 V C_L = 50 pF, R_L = 280Ω other input high	01	2.0	15.5	ns

See footnote at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$		Device type	Limits Min	Limits Max	Units
Propagation delay low-to-high level	t_{PLH1}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From A or B, B or A = L, C = L	02 1/	2.0	19.5	ns
Propagation delay high-to-low level	t_{PHL1}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From A or B, B or A = L, C = L	02 1/	2.0	22.0	ns
Propagation delay low-to-high level	t_{PLH2}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From A or B, B or A = H, C = L	02 1/	2.0	18.5	ns
Propagation delay high-to-low level	t_{PHL2}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From A or B, B or A = H, C = L	02 1/	2.0	20.0	ns
Propagation delay low-to-high level	t_{PLH3}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From A or B, B or A = L C = H	02 1/	2.0	22.0	ns
Propagation delay high-to-low level	t_{PHL3}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From A or B, B or A = L, C = H	02 1/	2.0	15.5	ns
Propagation delay low-to-high level	t_{PLH4}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From A or B, B or A = H, C = H	02 1/	2.0	18.5	ns
Propagation delay high-to-low level	t_{PHL4}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From A or B, B or A = H, C = H	02 1/	2.0	17.0	ns
Propagation delay low-to-high level	t_{PLH5}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From C to A = B	02 1/	2.0	18.0	ns
Propagation delay high-to-low level	t_{PHL5}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From C to A = B	02 1/	2.0	21.5	ns
Propagation delay low-to-high level	t_{PLH6}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From C to A ≠ B	02 1/	2.0	17.5	ns
Propagation delay high-to-low level	t_{PHL6}	V_{CC} = 5.0 V C_L = 50 pF R_L = 280Ω	From C to A ≠ B	02 1/	2.0	18.0	ns

1/ Qualification requirements removed for device type 02.
2/ Not more than one output should be shorted at one time.

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 and 1.2 herein. 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. The "JAN" or "J" certification marking shall not be used, for device type 02.

3.7 Microcircuit group assignment. The microcircuit device type 01, covered by the specification shall be in microcircuit group number 8 (see MIL-M-38510, appendix E).

3.8 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. This shall apply only for device type 02.

3.9 Certification. Certification in accordance with MIL-M-38510 is not required for device type 02.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (see table III)	
	Class S devices 1/	Class B devices
Interim electrical parameters (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

* PDA applies to subgroup 1 (see 4.2c).
1/ Class S product assurance level not applicable for device type 02.

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 device type 01 prior to qualification and quality conformance inspection and on device type 02 prior to 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) shall be as specified in MIL-M-38510.

4.3 Qualification inspection. Qualification inspection is not required. This applies only for device type 02. Qualification inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified in method 5004 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4).

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510 and as specified herein. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, 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 Group 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. Electrical tests requirements shall be as specified in table II.

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 test requirements for device type 01 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.

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

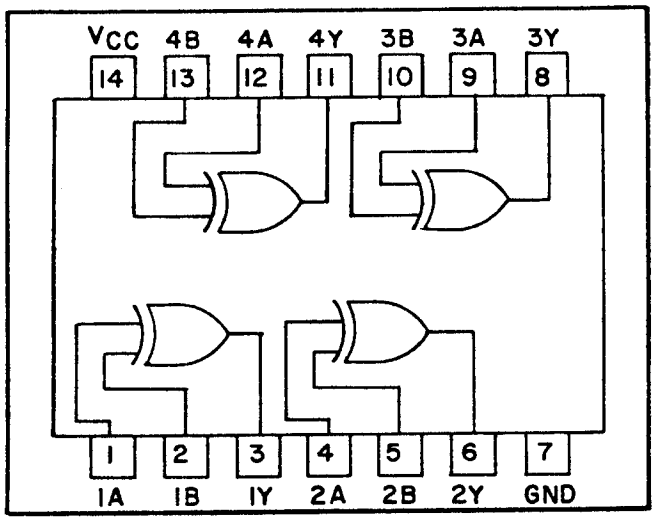
(1) Test condition D or E, using the circuit shown on figure 3, or equivalent.

(2) T_A = +125°C, minimum.

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

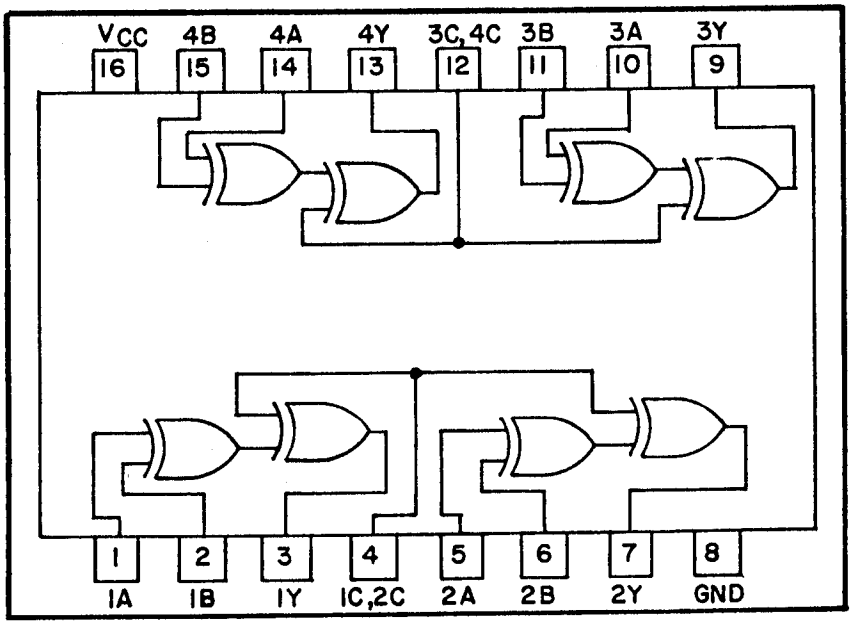
4.4.4 Group D inspection. Group D inspection shall be in accordance with table IV of method 5005 of MIL-STD-883. End-point electrical parameters shall be as specified in table II herein.

Device type 01



Cases A,B,C, and D

Device type 02 1/



Cases E and F

1/ Qualification requirements removed for device type 02.

FIGURE 1. Logic diagram and terminal connections.

Device type 01

INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

$Y = \overline{A}B + A\overline{B}$

Device type 02 1/

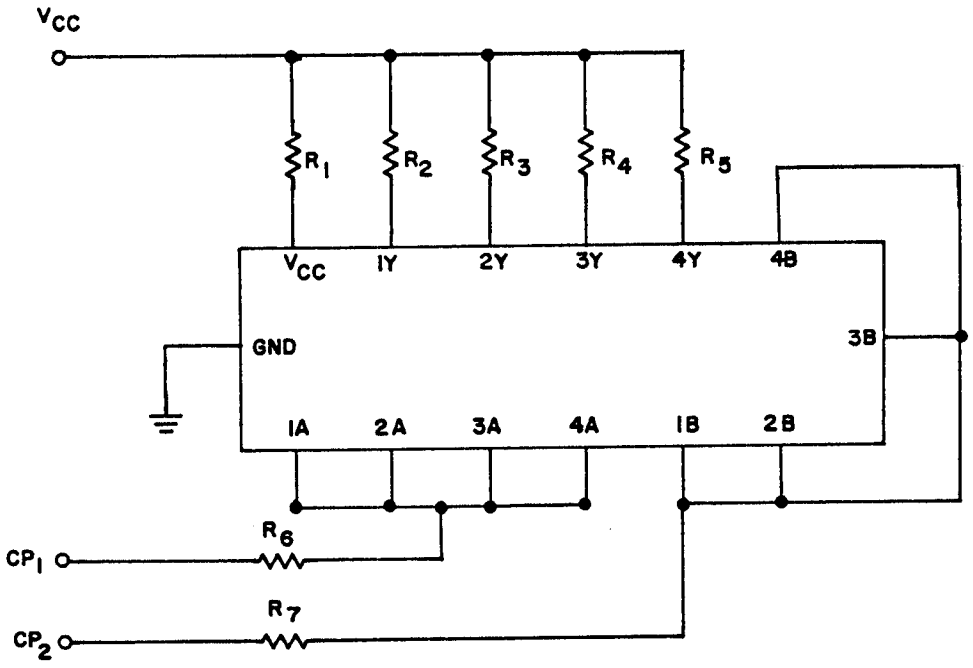
INPUTS			OUTPUT
A	B	C	Y
L	L	L	L
L	H	L	H
H	L	L	H
H	H	L	L
L	L	H	H
L	H	H	L
H	L	H	L
H	H	H	H

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

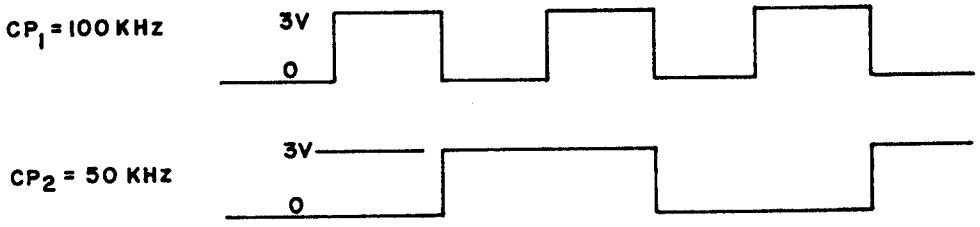
1/ Qualification requirements removed for device type 02.

FIGURE 2. Truth tables and logic equations.

Device type 01



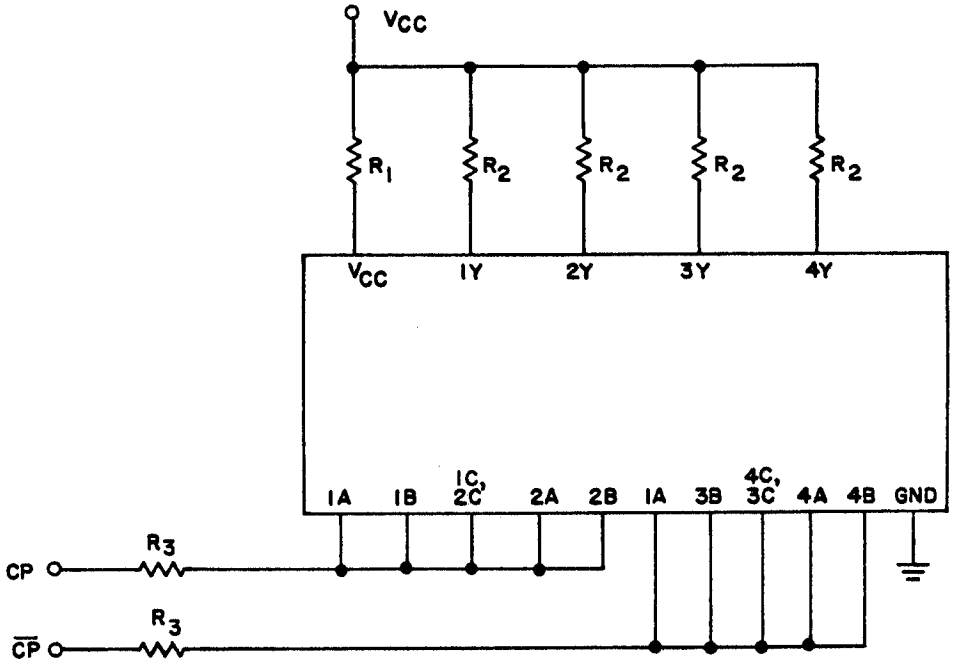
WAVEFORMS:



NOTES:
1. R_2 through R_5 = 220Ω ±5%; R_6, R_7 = 27Ω ±5%.
2. CP1 = 100 kHz ±50% square wave and CP2 = 50 kHz ±50% square wave; duty cycle = 50 ±15%; V_{IL} = 0.5 minimum to 0.8 V maximum; V_{IH} = 2.0 V minimum to 5.5 V maximum.
3. V_{CC} and R_1 shall be chosen to insure a 5.5 V miminum of device V_{CC} terminal.

FIGURE 3. Burn-in and life test circuit.

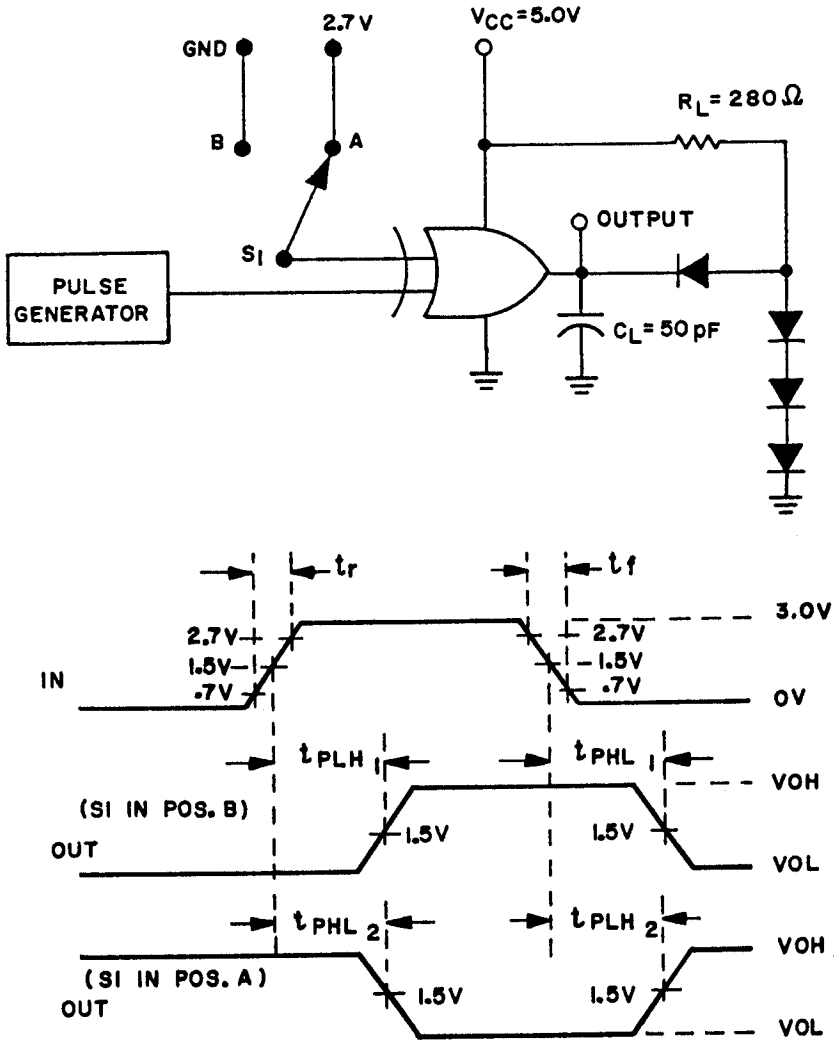
Device type 02



NOTES:
1. R_2 = 220Ω ±5%.
   R_3 = 27Ω ±5%.
2. CP = $\overline{CP}$ = 100 kHz ±50% square wave; duty cycle = 50 ±15%;
   V_{IL} = -0.5 V minimum to 0.8 V maximum; V_{IH} = 2.0 V minimum to 5.5 V maximum.
3. V_{CC} and R_1 shall be chosen to insure a 5.5 V minimum is present at device V_{CC} terminal.
4. Qualification requirements removed for this device type.

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

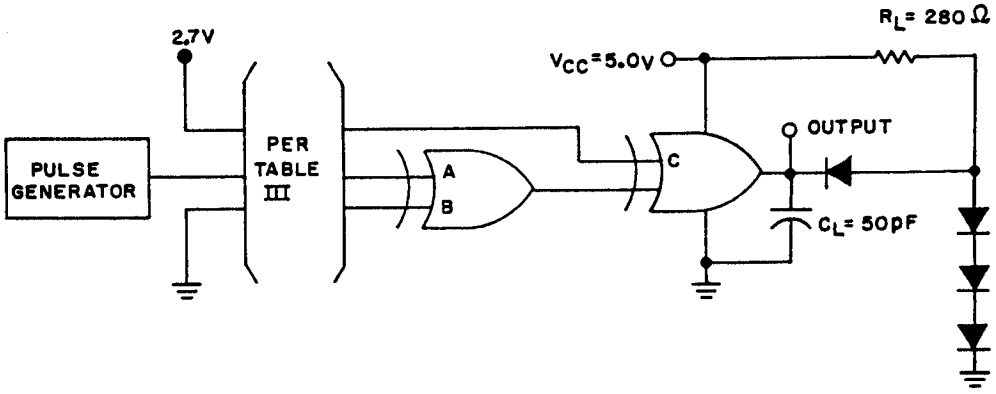
Device type 01

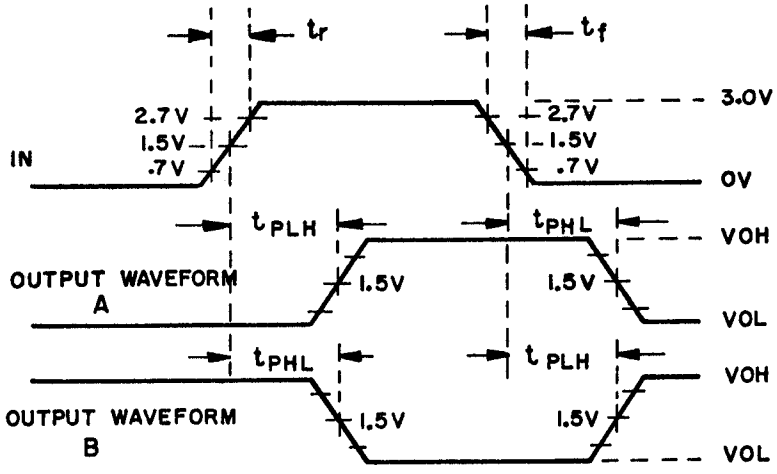


NOTES:
1. Pulse generator has the following characteristics: $t_1 = t_0 < 2.5$ ns, and $Z_{OUT} \approx 50\Omega$.
2. C_L = 50 pF minimum, including scope probe, wiring, and stray capacitance, without package in test fixture.
3. Voltage measurements are to be made with respect to network ground terminal.
4. All diodes are 1N3064, or equivalent.

FIGURE 4. Switching time test circuit and waveforms.

Device type 02





NOTES:
1. Pulse generator has the following characteristics: $t_1 = t_0 < 2.5$ ns, and $Z_{OUT} \approx 50\Omega$.
2. C_L = 50 pF minimum, including scope probe, wiring, and stray capacitance, without package in test fixture.
3. Voltage measurements are to be made with respect to network ground terminal.
4. All diodes are 1N3064, or equivalent.
5. Qualification requirements removed for this device type.

FIGURE 4. Switching time test circuit and waveforms - Continued.

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	Cases A, B, C, D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits		Unit
			Test no.	1A	1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	V_{CC}		Min	Max	
1 T_C = +25°C	V_{OH}	3006	1	2.0 V	0.8 V	-1 mA				GND							4.5 V	1Y	2.5		V
		"	2	0.8 V	2.0 V	-1 mA				"							"	1Y	"		"
		"	3				2.0 V	0.8 V	-1 mA	"							"	2Y	"		"
		"	4				0.8 V	2.0 V	-1 mA	"							"	2Y	"		"
		"	5							"	-1 mA	2.0 V	0.8 V				"	3Y	"		"
		"	6							"	-1 mA	0.8 V	2.0 V				"	3Y	"		"
		"	7							"				-1 mA	2.0 V	0.8 V	"	4Y	"		"
		"	8							"				-1 mA	0.8 V	2.0 V	"	4Y	"		"
	V_{OL}	3007	9	2.0 V	0.8 V	20 mA				"							"	1Y		0.5	"
		"	10	0.8 V	2.0 V	20 mA				"							"	1Y		"	"
		"	11				2.0 V	0.8 V	20 mA	"							"	2Y		"	"
		"	12				0.8 V	2.0 V	20 mA	"							"	2Y		"	"
		"	13							"	20 mA	2.0 V	2.0 V				"	3Y		"	"
		"	14							"	20 mA	0.8 V	0.8 V				"	3Y		"	"
		"	15							"				20 mA	2.0 V	2.0 V	"	4Y		"	"
		"	16							"				20 mA	0.8 V	0.8 V	"	4Y		"	"
	V_{IC}		17	-18 mA						"							"	1A		-1.2	"
			18		-18 mA					"							"	1B		"	"
			19				-18 mA			"							"	2A		"	"
			20					-18 mA		"							"	2B		"	"
			21							"		-18 mA					"	3A		"	"
			22							"			-18 mA				"	3B		"	"
			23							"					-18 mA		"	4A		"	"
			24							"						-18 mA	"	4B		"	"
	I_{IH1}	3010	25	2.7 V	GND					"							5.5 V	1A		50	μA
		"	26	GND	2.7 V					"							"	1B		"	"
		"	27				2.7 V	GND		"							"	2A		"	"
		"	28				GND	2.7 V		"							"	2B		"	"
		"	29							"		2.7 V	GND				"	3A		"	"
		"	30							"			2.7 V				"	3B		"	"
		"	31							"					2.7 V	GND	"	4A		"	"
		"	32							"						2.7 V	"	4B		"	"
	I_{IH2}	"	33	5.5 V	GND					"							"	1A		1.0	mA
		"	34	GND	5.5 V					"							"	1B		"	"
		"	35				5.5 V	GND		"							"	2A		"	"
		"	36				GND	5.5 V		"							"	2B		"	"
		"	37							"		5.5 V	GND				"	3A		"	"
		"	38							"			5.5 V				"	3B		"	"
		"	39							"					5.5 V	GND	"	4A		"	"
		"	40							"						5.5 V	"	4B		"	"
	I_{IL} 1/	3009	41	0.5 V	5.5 V					"							"	1A	-1	-2	"
		"	42	5.5 V	0.5 V					"							"	1B	"	"	"
		"	43				0.5 V	5.5 V		"							"	2A	"	"	"
		"	44				5.5 V	0.5 V		"							"	2B	"	"	"
		"	45							"		0.5 V	5.5 V				"	3A	"	"	"
		"	46							"			0.5 V				"	3B	"	"	"
		"	47							"					0.5 V	5.5 V	"	4A	"	"	"
		"	48							"						0.5 V	"	4B	"	"	"

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	Cases A, B, C, D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits		Unit
			Test no.	1A	1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	V_{CC}		Min	Max	
1 T_C = +25°C	I_{OS}	3011	49	5.5 V	GND	GND	5.5 V	GND	GND	GND	GND	5.5 V	GND	GND	5.5 V	GND	5.5 V	1Y	-40	-100	mA
		"	50							"							"	2Y	"	"	"
		"	51							"							"	3Y	"	"	"
		"	52							"							"	4Y	"	"	"
	I_{CC}	3005	53	GND	GND		GND	GND		"		GND	GND		GND	GND	"	V_{CC}		75	"
	I_{CEX}	"	54	5.5 V	GND	5.5 V	5.5 V	GND	5.5 V	"	5.5 V	5.5 V	GND	5.5 V	5.5 V	GND	"	1Y		250	μA
		"	55							"							"	2Y		"	"
		"	56							"							"	3Y		"	"
		"	57							"							"	4Y		"	"
2	Same tests, terminal conditions and limits as for subgroup 1, except T_C = +125°C and V_{IC} tests are omitted, V_{IL} = 0.7 V and V_{OL} (max) = 0.45 V.																				
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_{PLH1}	3003 (Fig 4)	58	IN	GND	OUT	IN	GND	OUT	GND	OUT	IN	GND	OUT	IN	GND	5.0 V	1Y	2	12.5	ns
		"	59							"							"	2Y	"	"	"
		"	60							"							"	3Y	"	"	"
		"	61							"							"	4Y	"	"	"
	t_{PLH2}	"	62	IN	2.7 V	OUT	IN	2.7 V	OUT	"	OUT	IN	2.7 V	OUT	IN	2.7 V	"	1Y	"	"	"
		"	63							"							"	2Y	"	"	"
		"	64							"							"	3Y	"	"	"
		"	65							"							"	4Y	"	"	"
	t_{PHL1}	"	66	IN	GND	OUT	IN	GND	OUT	"	OUT	IN	GND	OUT	IN	GND	"	1Y	"	12.0	"
		"	67							"							"	2Y	"	"	"
		"	68							"							"	3Y	"	"	"
		"	69							"							"	4Y	"	"	"
	t_{PHL2}	"	70	IN	2.7 V	OUT	IN	2.7 V	OUT	"	OUT	IN	2.7 V	OUT	IN	2.7 V	"	1Y	"	"	"
		"	71							"							"	2Y	"	"	"
		"	72							"							"	3Y	"	"	"
		"	73							"							"	4Y	"	"	"
10 T_C = +125°C	t_{PLH1}	"	74	IN	GND	OUT	IN	GND	OUT	"	OUT	IN	GND	OUT	IN	GND	"	1Y	"	16.5	"
		"	75							"							"	2Y	"	"	"
		"	76							"							"	3Y	"	"	"
		"	77							"							"	4Y	"	"	"
	t_{PLH2}	"	78	IN	2.7 V	OUT	IN	2.7 V	OUT	"	OUT	IN	2.7 V	OUT	IN	2.7 V	"	1Y	"	"	"
		"	79							"							"	2Y	"	"	"
		"	80							"							"	3Y	"	"	"
		"	81							"							"	4Y	"	"	"

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	Cases A, B, C, D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits		Unit
			Test no.	1A	1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	V_{CC}		Min	Max	
10 T_C = +125°C	t_{PHL1}	3003 (Fig 4)	82	IN	GND	OUT	IN	GND	OUT	"	OUT	IN	GND	OUT	IN	GND	5.0 V	1Y	2	15.5	ns
		"	83							"							"	2Y	"	"	"
		"	84							"							"	3Y	"	"	"
		"	85							"							"	4Y	"	"	"
	t_{PHL2}	"	86	IN	2.7 V	OUT	IN	2.7 V	OUT	"	OUT	IN	2.7 V	OUT	IN	2.7 V	"	1Y	"	"	"
		"	87							"							"	2Y	"	"	"
		"	88							"							"	3Y	"	"	"
		"	89							"							"	4Y	"	"	"
11	Same tests, terminal conditions and limits as for subgroup 10, except T_C = -55°C.																				

1/ I_{IL} limits for device type 01, circuit B, are -50 µA minimum and -750 µA maximum."

TABLE III. Group A inspection for device type 02. 1/
Terminal conditions (pins not designated may be high ≥ 2.0 V or low ≤ 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	Measured terminal	Test limits		Unit
			Test no.	1A	1B	1Y	1C 2C	2A	2B	2Y	GND	3Y	3A	3B	3C 4C	4Y	4A	4B	V_{CC}		Min	Max	
1 T_C = +25°C	V_{OH}	3006	1	2.0 V	0.8 V	-1 mA	0.8 V				GND								4.5 V	1Y	2.5		V
		"	2	0.8 V	2.0 V	"	0.8 V				"								"	1Y	"		"
		"	3	0.8 V	0.8 V	"	2.0 V				"								"	1Y	"		"
		"	4	2.0 V	2.0 V	"	2.0 V				"								"	1Y	"		"
		"	5				0.8 V	2.0 V	0.8 V	-1 mA	"								"	2Y	"		"
		"	6				0.8 V	0.8 V	2.0 V	"	"								"	2Y	"		"
		"	7				2.0 V	0.8 V	0.8 V	"	"								"	2Y	"		"
		"	8				2.0 V	2.0 V	2.0 V	"	"								"	2Y	"		"
		"	9								"	-1 mA	2.0 V	0.8 V	0.8 V				"	3Y	"		"
		"	10								"	"	0.8 V	2.0 V	0.8 V				"	3Y	"		"
		"	11								"	"	0.8 V	0.8 V	0.8 V				"	3Y	"		"
		"	12								"	"	2.0 V	2.0 V	2.0 V				"	3Y	"		"
		"	13								"				0.3 V	-1 mA	2.0 V	0.8 V	"	4Y	"		"
		"	14								"				0.8 V	"	0.8 V	2.0 V	"	4Y	"		"
		"	15								"				2.0 V	"	0.8 V	0.8 V	"	4Y	"		"
		"	16								"				2.0 V	"	2.0 V	2.0 V	"	4Y	"		"
	V_{OL}	3007	17	0.8 V	0.8 V	20 mA	0.8 V				"								"	1Y		0.5	"
		"	18	2.0 V	0.8 V	"	2.0 V				"								"	1Y		"	"
		"	19	0.8 V	2.0 V	"	2.0 V				"								"	1Y		"	"
		"	20	2.0 V	2.0 V	"	0.8 V				"								"	1Y		"	"
		"	21				0.8 V	0.8 V	0.8 V	20 mA	"								"	2Y		"	"
		"	22				2.0 V	2.0 V	0.8 V	"	"								"	2Y		"	"
		"	23				2.0 V	0.8 V	2.0 V	"	"								"	2Y		"	"
		"	24				0.8 V	2.0 V	2.0 V	"	"								"	2Y		"	"
		"	25								"	20 mA	0.8 V	0.8 V	0.8 V				"	3Y		"	"
		"	26								"	"	2.0 V	0.8 V	2.0 V				"	3Y		"	"
		"	27								"	"	0.8 V	2.0 V	2.0 V				"	3Y		"	"
		"	28								"	"	2.0 V	2.0 V	0.8 V				"	3Y		"	"
		"	29								"				0.8 V	20 mA	0.8 V	0.8 V	"	4Y		"	"
		"	30								"				2.0 V	"	2.0 V	0.8 V	"	4Y		"	"
		"	31								"				2.0 V	"	0.8 V	2.0 V	"	4Y		"	"
		"	32								"				0.8 V	"	2.0 V	2.0 V	"	4Y		"	"
	V_{IC}		33	-18 mA							"								"	1A		-1.2	"
			34		-18 mA						"								"	1B		"	"
			35				-18 mA				"								"	1C, 2C		"	"
			36					-18 mA			"								"	2A		"	"
			37						-18 mA		"								"	2B		"	"
			38								"		-18 mA						"	3A		"	"
			39								"			-18 mA					"	3B		"	"
			40								"				-18 mA				"	3C, 4C		"	"
			41								"						-18 mA		"	4A		"	"
			42								"							-18 mA	"	4B		"	"
	I_{IH1}	3010	43	2.7 V	GND						"								5.5 V	1A		50	μA
		"	44	GND	2.7 V						"								"	1B		"	"
		"	45	GND	GND						"								"	1C, 2C		"	"
		"	46				2.7 V	GND	GND		"								"	2A		"	"
		"	47					2.7 V	GND		"								"	2B		"	"
		"	48					GND	2.7 V		"								"	3A		"	"
		"	49								"		2.7 V	GND					"	3B		"	"
		"	50								"		GND	2.7 V					"	3C, 4C		"	"
		"	51								"		GND	GND	2.7 V				"	4A		"	"
		"	52								"								"	4B		"	"

See footnote at end of table.

TABLE III. Group A inspection for device type 02 - Continued. 1/
Terminal conditions (pins not designated may be high ≥ 2.0 V or low ≤ 0.8 V, or open).

Subgroup	Symbol	MIL-STD-883 method	Cases E, F Test no.	1 1A	2 1B	3 1Y	4 1C 2C	5 2A	6 2B	7 2Y	8 GND	9 3Y	10 3A	11 3B	12 3C 4C	13 4Y	14 4A	15 4B	16 V_{CC}	Measured terminal	Test limits Min	Test limits Max	Unit
1 T_C = +25°C	I_{IH2}	3010	53	5.5 V	GND		5.5 V	GND	GND		GND		5.5 V	GND			GND	GND	5.5 V	1A		1.0	mA
		"	54	GND	5.5 V			5.5 V	GND		"		GND	5.5 V			5.5 V	GND	"	1B		"	"
		"	55	GND	GND			GND	5.5 V		"		GND	GND			GND	5.5 V	"	1C, 2C		"	"
		"	56								"								"	2A		"	"
		"	57								"								"	2B		"	"
		"	58								"								"	3A		"	"
		"	59								"								"	3B		"	"
		"	60								"								"	3C, 4C		"	"
		"	61								"								"	4A		"	"
		"	62								"								"	4B		"	"
	I_{IL}	3009	63	0.5 V	5.5 V			5.5 V	GND		"		0.5 V	5.5 V			5.5 V	GND	"	1A	-1.0	-2	"
		"	64	5.5 V	0.5 V			0.5 V	5.5 V		"		5.5 V	0.5 V			0.5 V	5.5 V	"	1B	"	"	"
		"	65	5.5 V	GND			5.5 V	0.5 V		"		5.5 V	GND			5.5 V	0.5 V	"	1C, 2C	"	"	"
		"	66								"								"	2A	"	"	"
		"	67								"								"	2B	"	"	"
		"	68								"								"	3A	"	"	"
		"	69								"								"	3B	"	"	"
		"	70								"								"	3C, 4C	"	"	"
		"	71								"								"	4A	"	"	"
		"	72								"								"	4B	"	"	"
	I_{OS}	3011	73	5.5 V	GND	GND	GND	5.5 V	GND	GND	"	GND	5.5 V	GND	GND	GND	5.5 V	GND	"	1Y	-40	-100	"
		"	74				GND				"				GND				"	2Y	"	"	"
		"	75								"								"	3Y	"	"	"
		"	76								"								"	4Y	"	"	"
	I_{CC}	3005	77	GND	GND		GND	GND	GND		"		GND	GND	GND		GND	GND	"	V_{CC}		99	"
	I_{CEX}		78	5.5 V	GND	5.5 V	GND	5.5 V	GND	5.5 V	"	5.5 V	5.5 V	GND	GND	5.5 V	5.5 V	GND	"	1Y		250	µA
			79				GND				"				GND				"	2Y		"	"
			80								"								"	3Y		"	"
			81								"								"	4Y		"	"
2	Same tests, terminal conditions and limits as for subgroup 1, except T_C = +125°C and V_{IC} tests are omitted, V_{IL} = 0.7 V and V_{OL} (max) = 0.45 V.																						
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_{PLH1}	3003 (Fig 4)	82	IN	GND	OUT A	GND	IN	GND	OUT A	GND	OUT A	IN	GND	GND	OUT A	IN	GND	5.0 V	1Y	2	15	ns
		"	83				GND				"				GND				"	2Y	"	"	"
		"	84								"								"	3Y	"	"	"
		"	85								"								"	4Y	"	"	"
	t_{PLH2}	"	85	IN	2.7 V	OUT B	GND	IN	2.7 V	OUT B	"	OUT B	IN	2.7 V	GND	OUT B	IN	2.7 V	"	1Y	"	14	"
		"	87				GND				"				GND				"	2Y	"	"	"
		"	88								"								"	3Y	"	"	"
		"	89								"								"	4Y	"	"	"
	t_{PLH3}	"	90	IN	GND	OUT B	2.7 V	IN	GND	OUT B	"	OUT B	IN	GND	2.7 V	OUT B	IN	GND	"	1Y	"	17	"
		"	91				2.7 V				"				2.7 V				"	2Y	"	"	"
		"	92								"								"	3Y	"	"	"
		"	93								"								"	4Y	"	"	"

See footnote at end of table.

TABLE III. Group A inspection for device type 02 - Continued. 1/
Terminal conditions (pins not designated may be high ≥ 2.7 V or low ≤ 0.5 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	Measured terminal	Test limits		Unit
			Test no.	1A	1B	1Y	1C 2C	2A	2B	2Y	GND	3Y	3A	3B	3C 4C	4Y	4A	4B	V_{CC}		Min	Max	
9 T_C = +25°C	t_{PLH4}	3003 (Fig 4) " "	94 95 96 97	IN	2.7 V	OUT A	2.7 V 2.7 V	IN	2.7 V	OUT A	GND " " "	OUT A	IN	2.7 V	2.7 V 2.7 V	OUT A	IN	2.7 V	5.0 V " " "	1Y 2Y 3Y 4Y	2 " " "	14 " " "	ns " " "
	t_{PHL1}	" " " "	98 99 100 101	IN	GND	OUT A	GND GND	IN	GND	OUT A	" " " "	OUT A	IN	GND	GND GND	OUT A	IN	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	17 " " "	" " " "
	t_{PHL2}	" " " "	102 103 104 105	IN	2.7 V	OUT B	GND GND	IN	2.7 V	OUT B	" " " "	OUT B	IN	2.7 V	GND GND	OUT B	IN	2.7 V	" " " "	1Y 2Y 3Y 4Y	" " " "	15.5 " " "	" " " "
	t_{PHL3}	" " " "	106 107 108 109	IN	GND	OUT B	2.7 V 2.7 V	IN	GND	OUT B	" " " "	OUT B	IN	GND	2.7 V 2.7 V	OUT B	IN	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	12 " " "	" " " "
	t_{PHL4}	" " " "	110 111 112 113	IN	2.7 V	OUT A	2.7 V 2.7 V	IN	2.7 V	OUT A	" " " "	OUT A	IN	2.7 V	2.7 V 2.7 V	OUT A	IN	2.7 V	" " " "	1Y 2Y 3Y 4Y	" " " "	13 " " "	" " " "
	t_{PLH5}	" " " "	114 115 116 117	GND	GND	OUT A	IN IN	GND	GND	OUT A	" " " "	OUT A	GND	GND	IN IN	OUT A	GND	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	14 " " "	" " " "
	t_{PLH6}	" " " "	118 119 120 121	2.7 V	GND	OUT B	IN IN	2.7 V	GND	OUT B	" " " "	OUT B	2.7 V	GND	IN IN	OUT B	2.7 V	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	13.5 " " "	" " " "
	t_{PHL5}	" " " "	122 123 124 125	GND	GND	OUT A	IN IN	GND	GND	OUT A	" " " "	OUT A	GND	GND	IN IN	OUT A	GND	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	16.5 " " "	" " " "
	t_{PHL6}	" " " "	126 127 128 129	2.7 V	GND	OUT B	IN IN	2.7 V	GND	OUT B	" " " "	OUT B	2.7 V	GND	IN IN	OUT B	2.7 V	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	14 " " "	" " " "
10 T_C = +125°C	t_{PLH1}	" " " "	130 131 132 133	IN	GND	OUT A	GND GND	IN	GND	OUT A	" " " "	OUT A	IN	GND	GND GND	OUT A	IN	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	19.5 " " "	" " " "

See footnote at end of table.

TABLE III. Group A inspection for device type 02 - Continued. 1/
Terminal conditions (pins not designated may be high ≥ 2.0 V or low ≤ 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	Measured terminal	Test limits		Unit
			Test no.	1A	1B	1Y	1C 2C	2A	2B	2Y	GND	3Y	3A	3B	3C 4C	4Y	4A	4B	V_{CC}		Min	Max	
10 T_C = +125°C	t_{PLH2}	3003 (Fig 4) " "	134 135 136 137	IN	2.7 V	OUT B	GND GND	IN	2.7 V	OUT B	GND " " "	OUT B	IN	2.7 V	GND GND	OUT B	IN	2.7 V	5.0 V " " "	1Y 2Y 3Y 4Y	2 " " "	18.5 " " "	ns " " "
	t_{PLH3}	" " " "	138 139 140 141	IN	GND	OUT B	2.7 V 2.7 V	IN	GND	OUT B	" " " "	OUT B	IN	GND	2.7 V 2.7 V	OUT B	IN	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	22 " " "	" " " "
	t_{PLH4}	" " " "	142 143 144 145	IN	2.7 V	OUT A	2.7 V 2.7 V	IN	2.7 V	OUT A	" " " "	OUT A	IN	2.7 V	2.7 V 2.7 V	OUT A	IN	2.7 V	" " " "	1Y 2Y 3Y 4Y	" " " "	18.5 " " "	" " " "
	t_{PHL1}	" " " "	146 147 148 149	IN	GND	OUT A	GND GND	IN	GND	OUT A	" " " "	OUT A	IN	GND	GND GND	OUT A	IN	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	22 " " "	" " " "
	t_{PHL2}	" " " "	150 151 152 153	IN	2.7 V	OUT B	GND GND	IN	2.7 V	OUT B	" " " "	OUT B	IN	2.7 V	GND GND	OUT B	IN	2.7 V	" " " "	1Y 2Y 3Y 4Y	" " " "	20 " " "	" " " "
	t_{PHL3}	" " " "	154 155 156 157	IN	GND	OUT B	2.7 V 2.7 V	IN	GND	OUT B	" " " "	OUT B	IN	GND	2.7 V 2.7 V	OUT B	IN	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	15.5 " " "	" " " "
	t_{PHL4}	" " " "	158 159 160 161	IN	2.7 V	OUT A	2.7 V 2.7 V	IN	2.7 V	OUT A	" " " "	OUT A	IN	2.7 V	2.7 V 2.7 V	OUT A	IN	2.7 V	" " " "	1Y 2Y 3Y 4Y	" " " "	17 " " "	" " " "
	t_{PLH5}	" " " "	162 163 164 165	GND	GND	OUT A	IN IN	GND	GND	OUT A	" " " "	OUT A	GND	GND	IN IN	OUT A	GND	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	18 " " "	" " " "
	t_{PLH6}	" " " "	166 167 168 169	2.7 V	GND	OUT B	IN IN	2.7 V	GND	OUT B	" " " "	OUT B	2.7 V	GND	IN IN	OUT B	2.7 V	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	17.5 " " "	" " " "
	t_{PHL5}	" " " "	170 171 172 173	GND	GND	OUT A	IN IN	GND	GND	OUT A	" " " "	OUT A	GND	GND	IN IN	OUT A	GND	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	21.5 " " "	" " " "
	t_{PHL6}	" " " "	174 175 176 177	2.7 V	GND	OUT B	IN IN	2.7 V	GND	OUT B	" " " "	OUT B	2.7 V	GND	IN IN	OUT B	2.7 V	GND	" " " "	1Y 2Y 3Y 4Y	" " " "	18 " " "	" " " "
11	Same tests, terminal conditions and limits as for subgroup 10, except T_C = -55°C.																						

1/ Qualification requirements removed for this device type.

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

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

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

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

6.2 Ordering data. The acquisition document should specify the following:

a. Complete part number (see 1.2).

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

c. Requirements for certificate of compliance, if applicable.

d. Requirements for notification of change of product or process to the contracting activity for device type 01. In addition to that, notification to the qualifying activity for device type 02, if applicable.

e. For non-qualification removed device type 01, 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 packaging and packing, device type 02. Requirement for product assurance options, device type 01.

g. Requirements for special carriers, lead lengths, or lead forming. If applicable, these requirements shall not affect the part number. Unless otherwise specified, these requirements shall not apply to direct purchase by or direct shipment to the Government.

h. For device type 01; requirements for "JAN" marking.

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

GND	Ground zero voltage potential.
I_{IN}	Current flowing into an input terminal.
V_{IN}	Voltage level at an input terminal.

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

6.5 Generic test data. This shall apply only for device type 02. 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) 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.

6.6 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-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.

Military device type	Generic-industry type
01	54S86
02 5/	54S135

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' designation.

Device type	Manufacturer		
	Circuit A	Circuit B	Circuit C
	Texas instruments	Signetics	Fairchild
01	X	X	X

6.8 Ordering guidance. Since the qualification and certification requirements have been removed from the specification for device type 02, 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.

5/ Qualification requirements removed for this device type.

Custodians:
Army - ER
Navy - EC
Air Force - 17

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

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

Preparing activity:
Air Force - 17

Agent:
DLA - ES

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