

MIL-M-38510/30A
27 December 1974
SUPERSEDING
MIL-M-38510/30
21 December 1972

MILITARY SPECIFICATION

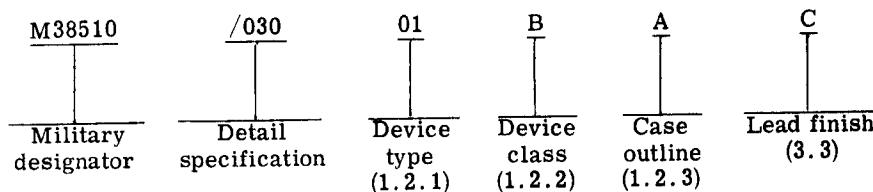
MICROCIRCUITS, DIGITAL, DTL,
NAND GATES, MONOLITHIC SILICON

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, DTL, positive logic NAND gating microcircuits. Three product assurance classes and a choice of case outline/lead finish are provided for each type and are reflected in the complete part number.

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



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

<u>Device type</u>	<u>Circuit</u>
01	Dual, 4-input expandable NAND gate
02	Extendable hex inverter
03	Hex inverter
04	Quadruple, 2-input positive NAND gate
05	Triple, 3-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:

<u>Letter</u>	<u>Case outline, MIL-M-38510, appendix C</u>
A	F-1 (14-lead, 1/4" x 1/4", flat-pack)
B	F-3 (14-lead, 1/8" x 1/4", flat-pack)
C	D-1 (14-lead, 1/4" x 3/4", dual-in-line pack)
D	F-2 (14-lead, 1/4" x 3/8", flat-pack)

1.3 Absolute maximum ratings:

Supply voltage range	- - - - -	-0.5 Vdc to 8.0 Vdc
Input voltage range	- - - - -	-1.5 Vdc to 5.5 Vdc
Storage temperature range	- - - - -	-65°C to 150°C
Maximum power dissipation, PD	- - - - -	23 mWdc per gate
Lead temperature (soldering 10 seconds)	- - - - -	300°C
Thermal resistance, junction to case	- - - - -	$\theta_{JC} = \begin{cases} 0.09^\circ\text{C}/\text{mW} & \text{for flat-pack} \\ 0.08^\circ\text{C}/\text{mW} & \text{for dual-in-line pack} \end{cases}$
Junction temperature	- - - - -	$T_J = 175^\circ\text{C}$

1.4 Recommended operating conditions:

Supply voltage	- - - - -	4.5 Vdc minimum to 5.5 Vdc maximum
Minimum high level input voltage	- - - - -	1.9 Vdc @ 25°C
Maximum low level input voltage	- - - - -	1.1 Vdc @ 25°C
Normalized fanout (each output)	- - - - -	8 maximum
Ambient operating temperature range	- - - - -	-55°C to 125°C

2. APPLICABLE DOCUMENT

2.1 The following document, of the issue in effect on date of invitation for bids or request for proposal, forms a part of this specification to the extent specified herein.

SPECIFICATION

MILITARY

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

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

3. REQUIREMENTS

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

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

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

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

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

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

3.3 Lead material and finish. Lead material and finish shall be in accordance with MIL-M-38510.

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

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

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/	Device types	Limits		Units
				Min	Max	
High-level output voltage	V _{OH}	V _{CC} = 4.5 V, I _{OH} = -0.12 mA	All	2.85		Volts
Low-level output voltage	V _{OL}	V _{CC} = 4.5 V, I _{OL} = 12 mA	All		0.45	Volts
Low-level input current	I _{IL}	V _{CC} = 5.5 V	All	-0.6	-1.50	mA
High-level input current	I _{IH}	V _{CC} = 5.5 V	01, 03, 04, 05	0	5.0	μA
Short circuit output current	I _{OS}	V _{CC} = 5.5 V, V _{OUT} = 0 V, V _{IN} = GND 2/	All	-0.59	-1.34	mA
High-level supply current per gate	I _{CCH1}	V _{CC} = 5.0 V, V _{IN} = GND	All		1.47	mA
High-level supply current per gate	I _{CCH2}	V _{CC} = 8.0 V, V _{IN} = GND	All		2.75	mA
Low-level supply current per gate	I _{CCL}	V _{CC} = 4.5 V, V _{IN} = OPEN	All		3.25	mA
Collector cutoff current	I _{CEX}	V _{CC} = 4.5 V	All		100	μA
Propagation delay time low-to-high level output	t _{PLH}	V _{CC} = 5.0 V, C _L = 30 pF R _L = 3.9 kΩ	All	25	112	ns
Propagation delay time high-to-low level output	t _{PHL}	V _{CC} = 5.0 V, C _L = 50 pF R _L = 390Ω	01, 03, 04, 05	10	40	ns
			02	10	45	ns

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

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

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

3.7 Marking. Marking shall be in accordance with MIL-M-38510 and 1.2 herein. At the option of the manufacturer, the following marking may be omitted from the body of the microcircuit, but shall be retained on the initial container:

- (a) Country of origin.

TABLE II. Electrical test requirements.

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

* PDA applies to subgroup 1 (see 4.3(h)).

4. PRODUCT ASSURANCE PROVISIONS

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

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified herein for groups A, B, and C inspections (see 4.4.1, 4.4.2, and 4.4.3). After qualification of one or more electrically and structurally similar types with a single lead finish, other lead finishes of the same case outline may be qualified by submitting a single type in the qualified case outline to the group B, subgroup 3 test and the group C, subgroups 1, 3, and 4 tests.

4.3 Screening. Screening shall be in accordance with Method 5004 of MIL-STD-883, and shall be conducted on all devices prior to qualification and quality conformance inspection. The following additional criteria shall apply:

- (a) Test samples for the group B bond strength test specified in Method 5005 of MIL-STD-883 may, at the manufacturer's option, be randomly selected immediately following the internal visual (precap) inspection and prior to sealing (see 4.4.2(b)).
- (b) Temperature cycling (Method 1010 of MIL-STD-883).
 - (1) Omit seal test as post-test measurement.

- (c) Thermal shock (Method 1011 of MIL-STD-883), when substituted for temperature cycling.
 - (1) Omit seal test as post-test measurement.
- (d) Burn-in test (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.
- (e) Reverse bias burn-in and interim electrical test in accordance with 3.1.10 of Method 5004 of MIL-STD-883 may be omitted.
- (f) 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.
- (g) External visual inspection shall not include measurement of case and lead dimensions.
- (h) Percent defective allowable (PDA) - The PDA is specified as 5 percent for class A devices and 10 percent for class B devices based on failures from group A, subgroup 1 test after cooldown as final electrical test in accordance with Method 5004 of MIL-STD-883, and with no intervening electrical measurements. If interim electrical parameter tests are performed prior to burn-in, failures resulting from pre burn-in screening may be excluded from the PDA. If interim electrical parameter tests prior to burn-in are omitted, then all screening failures shall be included in the PDA. The verified failures of group A, subgroup 1 after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent defective for that lot, and the lot shall be accepted or rejected based on the PDA for the applicable device class.

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

4.4.1 Group A inspection. Group A inspection shall consist of the test subgroups and LTPD values shown in table I of Method 5005 of MIL-STD-883 and as follows:

- (a) Tests shall be as specified in table II.
- (b) Subgroups 4, 5, 6, 7, and 8 of table I of Method 5005 of MIL-STD-883 shall be omitted.

4.4.2 Group B inspection. Group B inspection shall consist of the test subgroups and LTPD values shown in table II of Method 5005 of MIL-STD-883 and as follows:

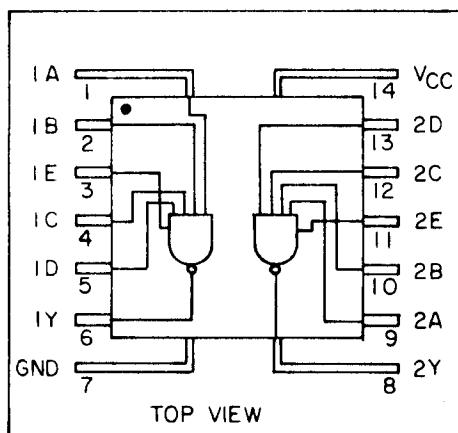
- (a) Bond strength test may be conducted on samples collected prior to sealing (see 4.3(a)).

4.4.3 Group C inspection. Group C inspection shall consist of the test subgroups and LTPD values shown in table III of Method 5005 of MIL-STD-883 and as follows:

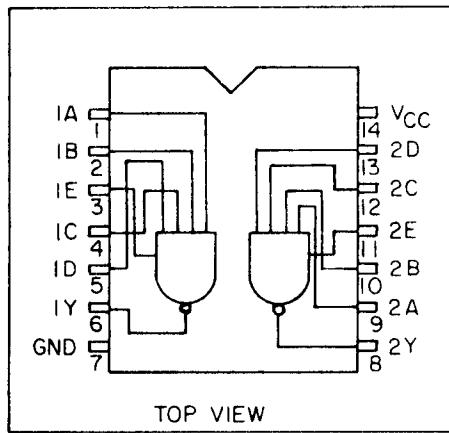
- (a) End point electrical parameters shall be as specified in table II.
- (b) Subgroups 7 and 8 shall be added to the group C inspection requirements for class B devices and shall consist of the tests, conditions and limits specified for subgroups 10 and 11 of group A.
- (c) Lead bend in only one direction is required for initial conditioning prior to moisture resistance and salt atmosphere tests.
- (d) High temperature storage test (Method 1008 of MIL-STD-883) conditions:
 - (1) Temperature: $150^\circ \pm 10^\circ\text{C}$.
 - (2) Duration: 1,000 hours, except as otherwise permitted by Appendix B of MIL-M-38510.
- (e) Operating 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 or MIL-M-38510.
- (f) Omit steady state reverse bias test.

Device type 01

Cases A, B, and D

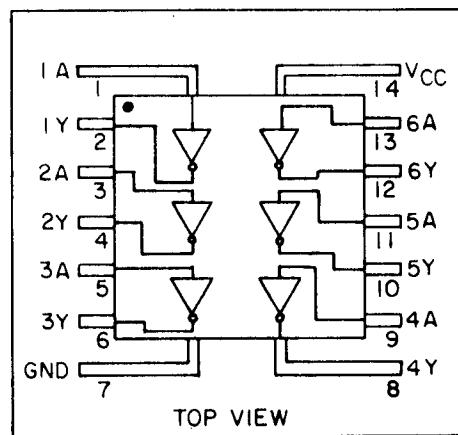


Case C

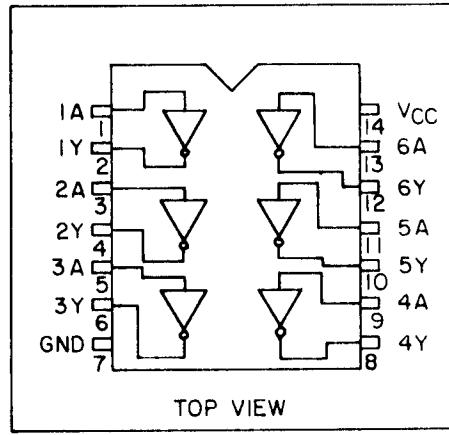


Device types 02 and 03

Cases A, B, and D

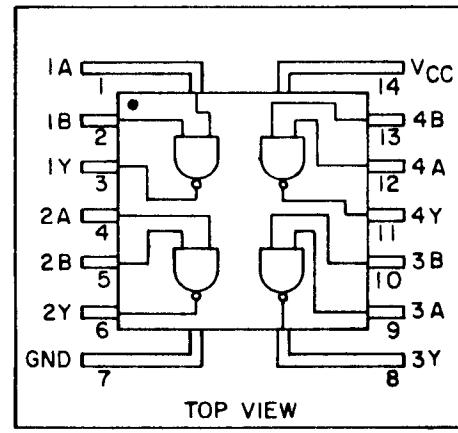


Case C



Device type 04

Cases A, B, and D



Case C

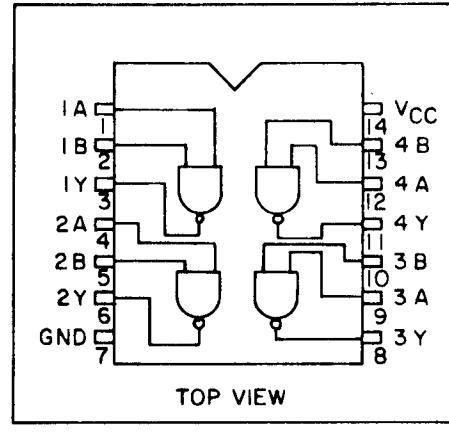


FIGURE 1. Logic diagram and terminal connections.

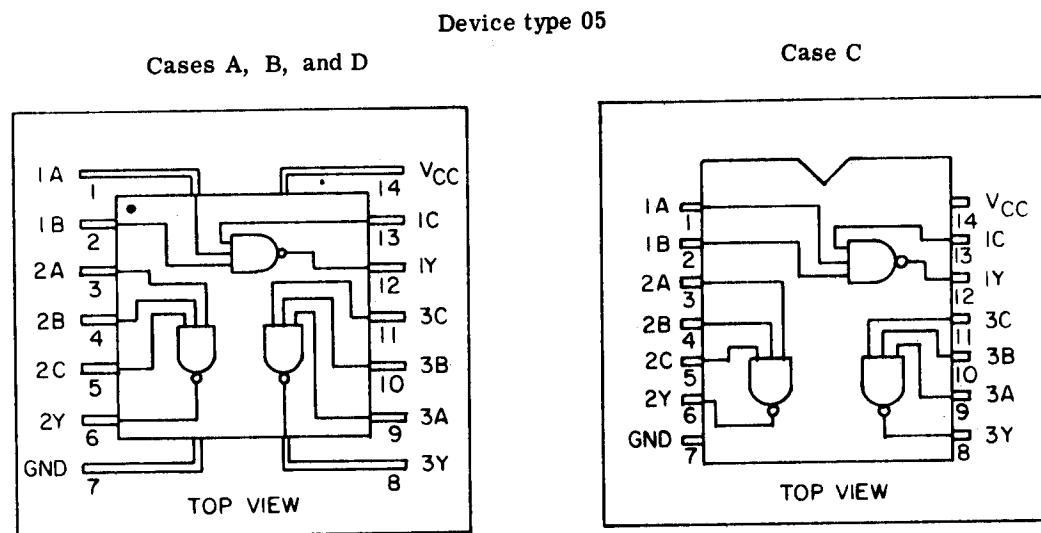


FIGURE 1. Logic diagram and terminal connections (Continued)

DEVICE TYPE 01

TRUTH TABLE EACH GATE					
INPUT					OUTPUT
A	B	C	D	E	Y
H	H	H	H	H	L
L	H	H	H	H	H
H	L	H	H	H	H
H	H	L	H	H	H
H	H	H	L	H	H
H	H	H	H	L	H
L	L	L	L	L	H

Positive Logic: $Y = \overline{A \cdot B \cdot C \cdot D \cdot E}$

DEVICE TYPES 02 and 03

TRUTH TABLE EACH GATE	
INPUT	OUTPUT
A	Y
L	H
H	L

Positive Logic: $Y = \overline{A}$

FIGURE 2. Truth tables.

DEVICE TYPE 04

TRUTH TABLE EACH GATE		
INPUT		OUTPUT
A	B	Y
L	L	H
H	L	H
L	H	H
H	H	L

$$\text{Positive Logic: } Y = \overline{AB}$$

DEVICE TYPE 05

TRUTH TABLE EACH GATE			
INPUT		OUTPUT	
A	B	C	
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

$$\text{Positive logic: } Y = \overline{ABC}$$

FIGURE 2. Truth tables (continued)

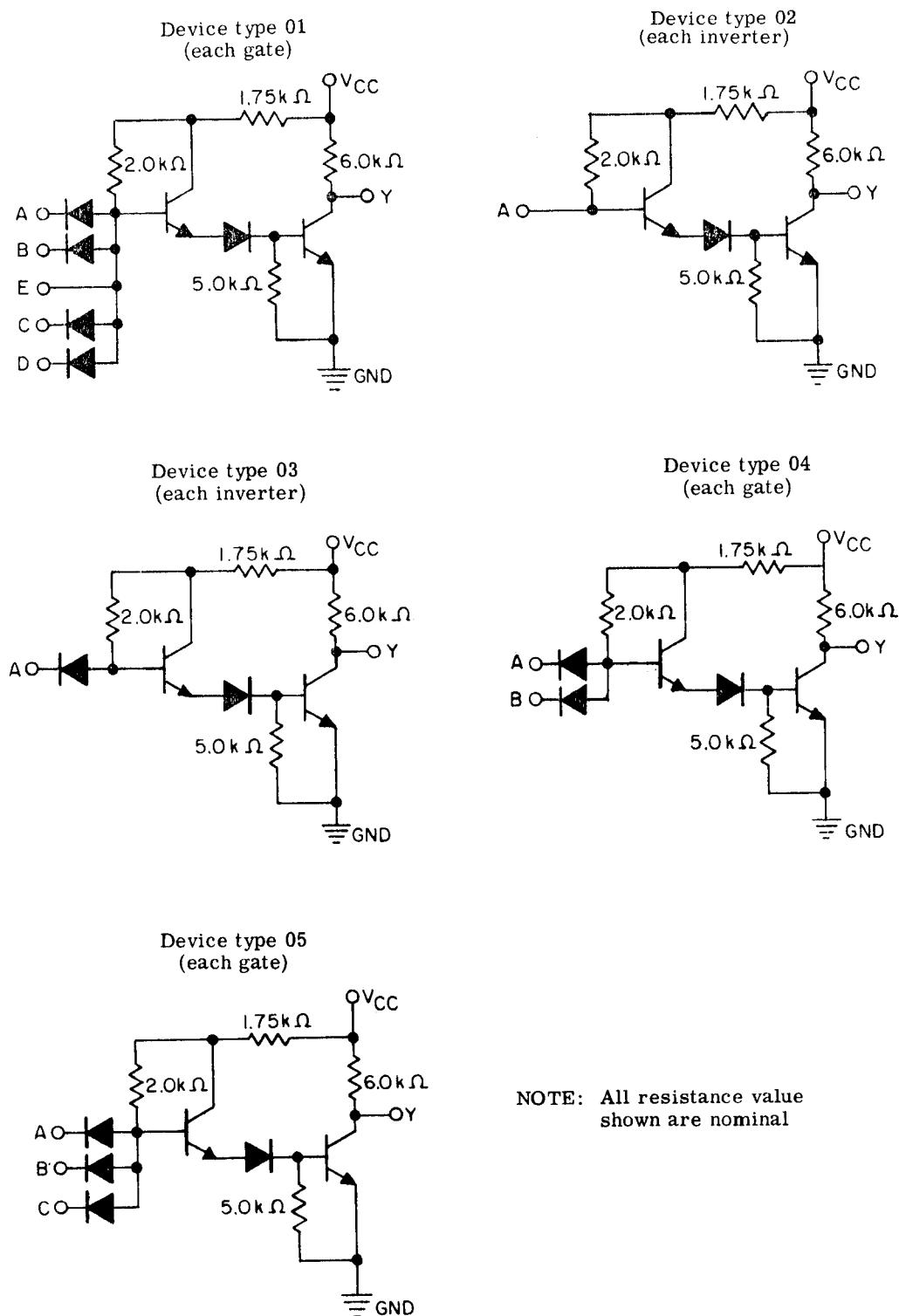
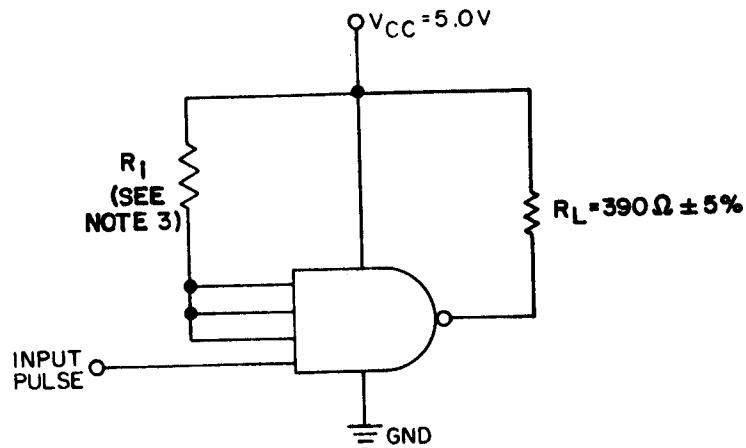


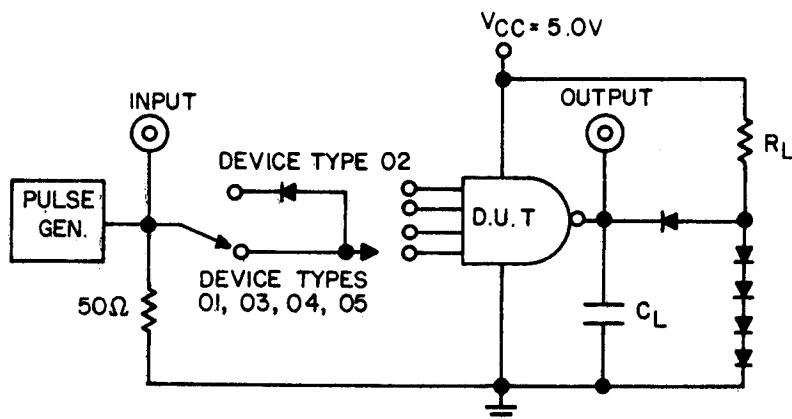
FIGURE 3. Schematic circuits.



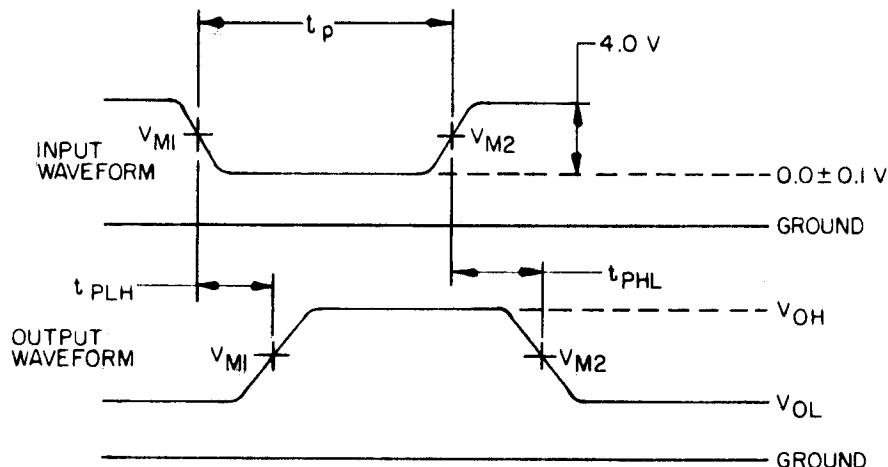
NOTES:

1. The input pulse characteristics are: $V_{gen} = 4.0$ V; $PRR = 100$ kHz; duty cycle = 50%; $t_{TLH} = 100$ ns; $t_{THL} = 100$ ns.
2. All input adjustments are $\pm 5\%$.
3. All undriven inputs are connected to V_{CC} thru appropriate current limiting resistors.
4. For parallel excitation: Clock pulse shall be 1 MHz and undriven inputs shall be connected to V_{CC} thru appropriate current limiting resistors.
5. External input diodes shall be used with device type 02.

FIGURE 4. Burn-in and life test circuit.



	t_{PLH}	t_{PHL}
R_L	$3.9k\ \Omega$	$390\Omega \pm 5\%$
C_L	30 pF min	50 pF min



TEMP (°C)	V_{M1} (volts)	V_{M2} (volts)
25	1.5	1.5
125	1.2	1.2
-55	1.7	1.7

NOTES:

1. The generator has the following characteristics: $V_{gen} = 4.0\text{ V}$; $t_{TLH} = 10\text{ ns} \pm 90\%$; $t_{THL} = 10\text{ ns} \pm 90\%$; $PRR = 500\text{ kHz}$, $t_p = 1\ \mu\text{s}$.
2. All diodes are 1N4150 or equivalent.
3. C_L includes all jig and probe capacitance.

FIGURE 5. Switching time test circuit.

TABLE III. Group A inspection for device type 01. 1/

See footnote at end of table.

TABLE III. Group A inspection for device type 01 - Continued

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D, Test No.	Test limits												Max.	Unit
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
2 TA = 125°C	I _H	3010	48	4.0 v GND	4.0 v GND	1E	1B	1C	1D	1Y	GND	GND	5.5 v	1A	-1.50	mA	
			49	4.0 v GND	4.0 v GND						GND	GND		1B	5.0	μA	
			50	4.0 v GND	4.0 v GND						GND	GND		1C			
			51	4.0 v GND	4.0 v GND						GND	GND		1D			
			52	4.0 v GND	4.0 v GND						4.0 v GND	4.0 v GND		2A			
			53	4.0 v GND	4.0 v GND						4.0 v GND	4.0 v GND		2B			
			54	4.0 v GND	4.0 v GND						4.0 v GND	4.0 v GND		2C			
			55	4.0 v GND	4.0 v GND						4.0 v GND	4.0 v GND		2D			
	II _L	3009	56	0.4 v 4.0 v	4.0 v 4.0 v									1A	-1.50	mA	
			57	0.4 v 4.0 v	0.4 v 4.0 v									1B			
3 TA = -55°C	IC _{EX}		58	0.4 v 4.0 v	0.4 v 4.0 v									1C			
			59	0.4 v 4.0 v	0.4 v 4.0 v									1D			
			60	0.4 v 4.0 v	0.4 v 4.0 v									2A			
			61	0.4 v 4.0 v	0.4 v 4.0 v									2B			
			62	0.4 v 4.0 v	0.4 v 4.0 v									2C			
			63	0.8 v 4.0 v	0.8 v 4.0 v									2D			
			64	0.8 v 4.0 v	0.8 v 4.0 v									100 μA			
			65	0.8 v 4.0 v	0.8 v 4.0 v									100 μA			
	IC _{CL}	3006	66	0.8 v 4.0 v	0.8 v 4.0 v									100 μA			
	IC _{CHI}		67	0.8 v 4.0 v	0.8 v 4.0 v									100 μA			
4 TA = 125°C	IC _{CD}		68	0.8 v 4.0 v	0.8 v 4.0 v									100 μA			
			69	0.8 v 4.0 v	0.8 v 4.0 v									100 μA			
			70	0.8 v 4.0 v	0.8 v 4.0 v									100 μA			
			71	2.1 v 2.1 v	2.1 v 2.1 v									100 μA			
	V _O _L	3007	72	2.1 v 2.1 v	2.1 v 2.1 v									100 μA			
			73	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			74	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			75	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			76	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			77	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
5 TA = -55°C	V _O _H	3006	78	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			79	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			80	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			81	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			82	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			83	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			84	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			85	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			86	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			87	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
6 TA = 125°C	IC _{OS}	3011	88	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			89	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			90	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			91	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			92	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			93	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			94	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			95	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			96	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
			97	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			
7 TA = -55°C	II _L	3009	98	1.4 v 2.1 v	1.4 v 2.1 v									100 μA			

See footnotes at end of †

TABLE III. Group A inspection for device type 01 - Continued

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D Test No.	Test Limits																	
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	Means, terminal	Min	Max	Unit
3 TA = -55°C	ICEX	99	1.4 v														4.5 v	1Y	50	μA	
	ICEX	100															4.5 v	2Y	50	μA	
	LGCL	101															5.0 v	VCC	6.5	mA	
	LCCH1	102	GND														GND	5.0 v	VCC	2.94	mA
	LCCH2	103	GND														GND	8.0 v	VCC	5.5	mA
	VOHE	104															4.5 v	1Y	3.3	Vdc	
9 TA = 25°C	VOHL	3006	105														4.5 v	2Y	3.3	Vdc	
	TPHL	3003	106	IN													5.0 v	IA to 1Y	10	30	ns
	TPHL	(Fig. 5)	107	IN														2A to 2Y	10	30	
	TPLH		108	IN														1A to 1Y	25	80	
	TPLH		109															2A to 2Y	25	80	
	TPHL		110	IN														1A to 1Y	10	35	
10 TA = 125°C	TPHL		111	IN														2A to 2Y	10	35	
	TPHL		112	IN														1A to 1Y	25	112	
	TPLH		113															2A to 2Y	25	112	
11 TA = -55°C	TPHL		114	IN														1A to 1Y	10	40	
	TPHL		115	IN														2A to 2Y	10	40	
	TPLH		116															1A to 1Y	25	80	
			117															2A to 2Y	25	80	

1/ Pins not designated may be HIGH level logic, LOW level logic or open.

TABLE III. Group A inspection for device type 02. 1/

See footnote at end of table.

TABLE III. Group A inspection for device type 02 - Continued.

See footnote at end of table.

TABLE III. Group A inspection for device type 02 - Continued.

1/ Pins not designated may be HIGH level logic, 10W never logic 0. Spec...

TABLE III. Group A inspection for device type 03. 1/

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D				1				2				3				4				5				6				7				8				9				10				11				12				13				14				Test limits	
			Test No.	1A	1Y	2A	2Y	3A	3Y	GND	4Y	4A	5Y	5A	6Y	6A	VCC	Meas. terminal	Min.	Max.	Unit																																											
1 $T_A = 25^\circ C$	VOL	3007	1	1.9 v	1.2 mA	1.9 v	12 mA	1.9 v	12 mA	GND							4.5 v	1Y		0.4	Vdc																																											
	V _{OH}	3006	2														2Y																																															
	V _{OH}	3006	3														3Y																																															
			4														4Y																																															
			5														5Y																																															
			6														6Y																																															
			7	1.1 v	-0.12mA	1.1 v	-0.12mA	1.1 v	-0.12mA		1.1 v	-0.12mA	1.1 v	-0.12mA	1.1 v	-0.12mA	1.1 v	1Y	3.4																																													
			8														2Y																																															
			9														3Y																																															
			10														4Y																																															
2 $T_A = 125^\circ C$	I _{OS}	3011	11														5Y																																															
	I _{OS}	3011	12														6Y																																															
	I _H	3010	13																																																													
	I _H	3010	14																																																													
	I _H	3010	15																																																													
	I _H	3010	16																																																													
	I _H	3010	17																																																													
	I _H	3010	18																																																													
	I _L	3009	19	4.0 v		4.0 v		4.0 v																																																								
	I _L	3009	20																																																													
2 $T_A = 125^\circ C$	I _{CCL}	32	21																																																													
	I _{CCH1}	33	22																																																													
	I _{CCH2}	34	23																																																													
	I _{CCL}	35	24																																																													
	I _{CCH1}	36	25	0.4 v		0.4 v		0.4 v																																																								
	I _{CCH2}	37	26																																																													
	I _{CCL}	38	27																																																													
	I _{CCH1}	39	28																																																													
	I _{CCH2}	40	29																																																													
	I _{CCL}	41	30	1.1 v	4.5 v	1.1 v	4.5 v	1.1 v	4.5 v																																																							
2 $T_A = 125^\circ C$	I _{CCH1}	42	31																																																													
	I _{CCH2}	43	32																																																													
	I _{CCL}	44	33																																																													
	I _{CCH1}	45	34																																																													
	I _{CCH2}	46	35																																																													
	I _{CCL}	47	36																																																													
	I _{CCH1}	48	37																																																													
	I _{CCH2}	49	38																																																													
	I _{CCL}	50	39																																																													
	I _{CCH1}	51	40																																																													
2 $T_A = 125^\circ C$	VOL	41	45	0.8 v	-0.12mA	0.8 v	-0.12mA	0.8 v	-0.12mA																																																							
	V _{OH}	42	46	0.8 v	1.2 mA	1.7 v	12 mA	1.7 v	12 mA																																																							
	V _{OH}	43	47	0.8 v	-0.12mA	0.8 v	-0.12mA	0.8 v	-0.12mA																																																							
	V _{OH}	44	48	0.8 v	1.2 mA	1.7 v	12 mA	1.7 v	12 mA																																																							
	V _{OH}	45	49	0.8 v	-0.12mA	0.8 v	-0.12mA	0.8 v	-0.12mA																																																							
	V _{OH}	46	50	0.8 v	1.2 mA	1.7 v	12 mA	1.7 v	12 mA																																																							
	V _{OH}	47	51	0.8 v	-0.12mA	0.8 v	-0.12mA	0.8 v	-0.12mA																																																							
	V _{OH}	48	52	0.8 v	1.2 mA	1.7 v	12 mA	1.7 v	12 mA																																																							
	V _{OH}	49	53	0.8 v	-0.12mA	0.8 v	-0.12mA	0.8 v	-0.12mA																																																							
	V _{OH}	50	54	0.8 v	1.2 mA	1.7 v	12 mA	1.7 v	12 mA																																																							

See footnote at end of table.

TABLE III. Group A inspection for device type 03 - Continued.

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D		1	2	3	4	5	6	7	8	9	10	11	12	13	14	Test limits	
			Test No.	1A	1Y	2A	2Y	3A	3Y	GND	4Y	4A	5Y	5A	6Y	6A	VCC	Meas. terminal	Max	Min
2 TA = 125 °C	I _{OS}	3011	52	GND	GND					GND						5.5 v	1Y 2Y 3Y 4Y 5Y	.59	-1.3	mA
			53																	
			54																	
			55																	
			56																	
			57																	
	I _H	3010	58	4.0 v		4.0 v														
			59																	
			60																	
			61																	
3 TA = -55 °C	I _L	3009	62																	
			63																	
			64	0.4 v		0.4 v														
			65																	
			66																	
			67																	
			68																	
			69																	
	I _{CEx}	70	0.8 v	4.5 v		0.8 v	4.5 v													
			71																	
4 TA = 125 °C	I _{CCL}	3005	72																	
			73																	
			74																	
			75																	
	I _{CCH1}	76																		
			77	GND	GND															
	I _{CCH2}	78																		
			79	2.1 v	12 mA															
	V _{OL}	3007	80																	
			81																	
5 TA = -55 °C	V _{OH}	3006	82																	
			83																	
			84																	
			85	1.4 v	-0.12mA		1.4 v	-0.12mA												
			86																	
			87																	
			88																	
			89																	
			90																	
			91	GND	GND															
6 TA = 125 °C	I _{OS}	3011	92																	
			93																	
			94																	
			95																	
			96																	
			97	4.0 v		4.0 v														
	I _H	3010	98																	
			99																	
			100																	
			101																	
			102																	

See footnote at end of table.

TABLE III. Group A inspection for device type 03 - Continued.

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D												Test Limits					
			1A	1Y	2A	2Y	3A	3Y	GND	4Y	4A	5Y	5A	6Y	6A	V _{CC}	Meas. terminal	Min	Max	Unit
3 T _A = -55°C	IIL	3009	103	0.4 v												5.5 v	1A	-6	-1.50	mA
			104													2A				
			105													3A				
			106													4A				
			107													5A				
			108													6A				
	ICEX																			
			109	1.4 v	4.5 v											4.5 v	1Y			
			110													2Y				
			111													3Y				
9 T _A = 25°C	ICCL	3005	110	1.4 v	4.5 v	1.4 v	4.5 v									4Y				
			111													5Y				
			112													6Y				
			113																	
			114																	
	ICCH1															5.0 v	VCC			
			115																	
			116																	
			117																	
	tPHL	3003 (Fig. 5)	118	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	GND	5.0 v	VCC		
10 T _A = 125°C	tPLH		119														1A to 1Y	10	30	ns
			120														2A to 2Y			
			121														3A to 3Y			
			122														4A to 4Y			
			123														5A to 5Y			
			124														6A to 6Y			
			125																	
			126																	
			127																	
			128																	
11 T _A = -55°C	tPLH		129																	
			130																	
			131	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	GND	8.0 v	VCC		
			132																	
			133																	
			134																	
			135																	
			136																	
			137																	
			138																	
12 T _A = 125°C	tPLH		139																	
			140																	
			141																	
			142																	
			143																	
			144																	
			145																	
			146																	
			147																	
			148																	
13 T _A = 25°C	tPLH	3003	149	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	GND	5.0 v	VCC		
			150																	
			151																	
			152																	
			153																	

1/ Pins not designated may be HIGH level logic, LOW level logic or open.

TABLE III. Group A inspection for device type 04. 1/

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D				GND	3Y	3A	4Y	4A	4B	VCC	Meas. terminal	Min	Max	Unit	Test limits		
			1	2	3	4														
TA=25°C	VOL	3007	1	1.9 v	1Y	2Y	3Y	4Y	0.4 Vdc											
	VOH	3006	2	3	4	5	6	7	8	9	10	11	12	13	14	1Y	2Y	3Y	4Y	3.4
	LOS	3011	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	-0.12mA
	IHL	3010	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	-0.12mA
	IL	3009	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	-0.12mA
	ICEX	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	-0.12mA
	ICCL	3005	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51			-0.12mA
	ICCH1																			-0.12mA
	ICCH2																			-0.12mA
TA=125°C	VOL	3007	40	41	42	43	44	45	46	47	48	49	50	51	4.5 v	4.5 v	4.5 v	4.5 v	4.5 v	
	VOH	3006	41	42	43	44	45	46	47	48	49	50	51		4.5 v	4.5 v	4.5 v	4.5 v	4.5 v	

See footnote at end of table.

TABLE III. Group A inspection for device type 04 - Continued.

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D		Test limits																
			Test No.	1A	1B	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	VCC	Meas. terminal	Min	Max	Unit	
2 $T_A = 25^\circ C$	I _{OS}	3011	52	GND												5.5 v	1Y	- .59	-1.3	mA	
	I _{HH}	3010	56	4.0 v GND	4.0 v GND				GND							2Y					
			57						GND							3Y					
			58													4Y					
			59														1A	1B	5.0	μA	
			60														2A	2B			
			61														3A	3B			
			62														4A	4B			
			63																		
	I _L	3009	64	0.4 v 4.0 v	0.4 v 4.0 v												1A	- .6	-1.50	mA	
3 $T_A = -55^\circ C$			65														1B	2A			
			66														2B	3A			
			67														3B	4A			
			68																		
			69																		
			70																		
			71																		
	I _{CEX}		72	0.8 v		4.5 v		0.8 v		4.5 v		0.8 v		4.5 v		0.8 v		4.5 v		100	μA
			73																		
			74																		
4 $T_A = 125^\circ C$	I _{CCL}	3005	76														5.0 v	VCC	13	mA	
	I _{CCH1}		77	GND					GND								5.0 v	VCC	5.88	mA	
	I _{CCH2}		78	GND					GND								8.0 v	VCC	11	mA	
	V _{OL}	3007	79	2.1 v	2.1 v	12 mA											4.5 v	1Y	0.4	Vdc	
			80																		
			81																		
			82																		
	V _{OH}	3006	83	1.4 v	1.4 v	-0.2mA	-0.2mA	1.4 v	1.4 v	-0.2mA	-0.2mA	1.4 v	-0.12mA	1.4 v	1.4 v	0.12mA	1.4 v	1.4 v	5.5 v		
			84																		
			85																		
5 $T_A = 150^\circ C$	I _{OS}	3011	91	GND					GND												
	I _{HH}	3010	95	4.0 v GND	4.0 v GND				GND												
			96																		
			97																		
			98																		
			99																		
			100																		
			101																		
			102																		

See footnote at end of table.

TABLE III. Group A inspection for device type 04 - Continued.

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D				Test No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Test limits		
			GND	3Y	3A	3B																Meas. terminal	Min	Max
3 TA= -55°C	IIL	3009	103 104 105 106 107 108 109 110	0.4 v 4.0 v 0.4 v 0.4 v 0.4 v 0.4 v 0.4 v 1.4 v	4.0 v 0.4 v 4.0 v 0.4 v 4.0 v 0.4 v 4.0 v 4.5 v	0.4 v 4.0 v 0.4 v 0.4 v 0.4 v 0.4 v 0.4 v 1.4 v	1A 1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	VCC	5.5 v	1A 1B 2A 3A 3B 4A 4B	- .6 - 1.50	mA	
	ICEX																					50	μA	
	ICCL	3005	115	GND																				
	ICCH1		116	GND																				
	ICCH2	3003 (Fig. 5)	117 118 119 120	GND IN IN 120																				
	tPHL		121																					
	tPLH		122	IN																				
	tPHL		123																					
	tPLH		124																					
	tPHL		125	IN																				
9 TA= 25°C	tPHL		126	IN	OUT	IN																		
	tPLH		127																					
	tPHL		128																					
	tPLH		129	IN	OUT	IN																		
	tPHL		130																					
	tPLH		131																					
	tPHL		132																					
	tPLH		133																					
	tPHL		134	IN	OUT	IN																		
	tPLH		135																					
11 TA= -55°C	tPHL		136																					
	tPLH		137																					
	tPHL		138	IN	OUT	IN																		
	tPLH		139																					
			140																					
			141																					

1/ Pins not designated may be HIGH level logic, LOW level logic or open.

TABLE III. Group A inspection for device type 05. 1/

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D				Test No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Meas. terminal	Min	Max	Unit	Test limits	
			1A	1B	2A	2B																					
1 TA=25°C	VOL	3007	1	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	1.9 v	0.4 Vdc	
	VOH	3006	4	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	1.1 v	3.4 v	
	IOS	3011	13																								
	I _H	3010	15																								
	I _L	3009	25	0.4 v	4.0 v	GND	4.0 v	GND	4.0 v	GND	4.0 v	GND	4.0 v	GND	4.0 v	GND	4.0 v	GND	4.0 v	GND	4.0 v	GND	4.0 v	GND	4.0 v	4.0 v	
		26	4.0 v	0.4 v	4.0 v	4.0 v	0.4 v	4.0 v	0.4 v	4.0 v	0.4 v	4.0 v	0.4 v	4.0 v	0.4 v	4.0 v	0.4 v	4.0 v	0.4 v	4.0 v	0.4 v	4.0 v	0.4 v	4.0 v	0.4 v	-6.150 mA	
		27	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	4.0 v	
		28																									
		29																									
		30																									
		31																									
		32																									
		33																									
	I _{CEx}	34	1.1 v																								
		35																									
		36																									
	ICCL	3005	37																								
	ICCH1		38																								
	ICCH2		39																								
2 TA=125°C	VOL	3007	40	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	1.7 v	
	VOH	3006	42	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	0.8 v	
		43																									
		44																									
		45																									
		46																									
		47																									
		48																									
		49																									
		50																									
		51																									

TABLE I... Group A inspection for device type 05 - Continued.

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, and D				Test No.	1				2				3				4				Test limits		
			1A	1B	2A	2B		2Y	GND	GND	GND	3Y	3A	3B	3C	1Y	1C	VCC	GND	GND	GND	GND	Meas. terminal	Min	Max	Unit
TA=125°C	I _{OS}	3011	52																					-59	-1.3	mA
	I _H	3010	53																					5	5	μA
			54																							
			55																							
			56																							
			57																							
			58																							
			59																							
			60																							
			61																							
TA=70°C	I _L	3009	62																							
	I _{LH}	3009	63																							
			64																							
			65																							
			66																							
			67																							
			68																							
			69																							
			70																							
			71																							
TA=-55°C	I _{CEx}	72																								
	I _{CCL}	73																								
	I _{CCII}	74																								
	V _O L	75																								
	I _{CCII}	76																								
	V _O H	77																								
	I _{CCII}	78																								
	V _O L	79																								
	I _{CCII}	80																								
	V _O H	81																								
TA=-55°C	I _{OS}	82																								
	I _H	83																								
		84																								
		85																								
		86																								
		87																								
		88																								
		89																								
		90																								
		91																								
TA=-55°C	I _{OS}	92																								
	I _H	93																								
		94																								
		95																								
		96																								
		97																								
		98																								
		99																								
		100																								
		101																								
TA=-55°C	I _{OS}	102																								
	I _H																									

See footnote at end of table.

TABLE III. Group A inspection for device type 05 - Continued.

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C and D	Test No.												Test limits				
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	Meas. terminal	Min.	Max.
$T_A = -55^\circ C$	IIL	3009	103 104 105 106 107 108 109 110 111	0.4 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 1.4 v	0.4 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 1.4 v	0.4 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.5 v	0.4 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.5 v	GND GND GND GND GND GND GND GND GND	3Y 3A 3B 3C	1Y 1Y 1Y 1Y 1Y 1Y 1Y 1Y 1Y	1A 1A 1A 1A 1A 1A 1A 1A 1A	5.6 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.0 v 4.5 v	1A 1B 1C 2A 2B 2C 3A 3B 3C	-6 -1.50	mA					
	ICEX																			μA
	ICCL	3005	114 115 116 117	1.4 v 1.4 v GND GND	1.4 v 1.4 v GND GND	1.4 v 1.4 v GND GND	1.4 v 1.4 v GND GND													
	ICCH1																			
	ICCH2																			
	tPHL	3003	118 (Fig. 5)	119	N	N	IN	OUT	OUT	OUT	IN	OUT	OUT	OUT	OUT	OUT	OUT	5.0 v	1A to 1Y 1A to 2Y 1A to 3Y	10 30 ns
	tPLH																			
	tPHL																			
	tPLH																			
	tPHL																			
$T_A = 25^\circ C$	tPLH																			
	tPHL																			
	tPLH																			
	tPHL																			
$T_A = 125^\circ C$	tPLH																			
	tPHL																			
	tPLH																			
	tPHL																			
$T_A = -55^\circ C$	tPLH																			
	tPHL																			
	tPLH																			
	tPHL																			

1/ Pins not designated may be HIGH level logic, LOW level logic or open.

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

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

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

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

5. PREPARATION FOR DELIVERY

5.1 Preservation-packaging and packing. Microcircuits shall be prepared for delivery in accordance with MIL-M-38510.

6. NOTES

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

6.2 Intended use. Microcircuits conforming to this specification are intended for use for Government microcircuit applications (original equipment) and logistic purposes.

6.3 Ordering data. The contract or 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) Requirement for certificate of compliance, if applicable.
- (d) Requirements for notification of change of product or process to procuring activity in addition to notification to qualifying activity, if applicable.
- (e) Requirements for packaging and packing.
- (f) Requirements for failure analysis (including required test condition of Method 5003), corrective action and reporting of results, if applicable.
- (g) Requirements for product assurance options.
- (h) Requirements for carriers, special lead lengths or lead forming, if applicable. These requirements shall not affect the part number. Unless otherwise specified, these requirements will not apply to direct purchases by or direct shipment to the Government.

6.4 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-STD-1313, MIL-STD-1331, and as follows:

GND	- - - - -	Electrical ground (common terminal)
ICEX	- - - - -	Collector cutoff current
VIN	- - - - -	Voltage level at an input terminal

6.5 Logistic support. Lead materials and finishes (see 3.3) are interchangeable. Unless otherwise specified, microcircuits procured to Government logistic support will be procured 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.

6.6 Substitutability. Microcircuits covered by this specification are substitutable for the following commercial device types:

<u>Device type</u>	<u>Commercial type</u>
01	930
02	MIC935 and MC940
03	936
04	946
05	962

Custodians:

Army - EL

Navy - EC

Air Force - 17

Preparing activity:

Air Force - 17

Review activities:

Army - MI

Air Force - 11, 17, 80

DSA - ES

Agent:

DSA - ES

(Project 5962-0078)

User activities:

Army - WC, MU

Navy - OS, AS, SH, CG

Air Force - 19