

Qualification requirements are removed for device types 02, 04. See Scope.

MIL-M-38510/80D
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SUPERSEDING
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MILITARY SPECIFICATION
MICROCIRCUITS, DIGITAL, BIPOLAR, SCHOTTKY TTL, AND 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, positive AND logic gating microcircuits. Qualification requirements are removed for device types 02, 04. These device types are inactive for new design after the date of this revision. For the remaining device types 01, 03, two product assurance class and a choice of case outlines and lead finishes are provided and are reflected in the complete part number.

1.2 Part number. The part number shall be in accordance with MIL-M-38510, with the exception that the "JAN" or "J" certification mark shall not be used for device types 02, 04.

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

<u>Device type</u>	<u>Circuit</u>
01	Triple 3-input positive AND gate
02 1/	Triple 3-input positive AND gate (open-collector outputs)
03	Quad 2-input positive AND gate
04 1/	Quad 2-input positive AND gate (open-collector outputs)

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>
A	F-1 (14-lead, 1/4" x 1/4"), flat package
B	F-3 (14-lead, 3/16" x 1/4"), flat package
C	D-1 (14-lead, 1/4" x 3/4"), dual-in-line package
D	F-2 (14-lead, 1/4" x 3/8"), flat package
X	C-2A (20-terminal, .350" x .350"), square chip carrier package
2	C-2 (20-terminal, .350" x .350"), square chip carrier 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) 2/-	77 mW
Lead temperature (soldering, 10 seconds) - -	300°C
Thermal resistance, junction-to-case (θ _{JC}):	
Cases A, B, C, D, X, and 2 - - - - -	(See MIL-M-38510, appendix C).
Junction temperature (T _J) 3/- - - - - -	+175°C

- 1/ Qualification requirements removed for these device types.
2/ Must withstand the added P_D due to short circuit test (e.g., I_{OS}).
3/ Maximum junction temperature shall not be exceeded except for short duration burn-in screening conditions 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})	- -	0.8 V dc 4/
Case operating temperature range (T_C)	- -	-55°C to +125°C

2 APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. 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 contractors 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 (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 Terminal connections. The 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 will be available upon request.

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

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

4/ 0.7 V at 125°C.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_C \leq +125^{\circ}\text{C}$	Device type	Limits		Unit
				Min	Max	
High-level output voltage	V_{OH}	$V_{CC} = 4.5\text{ V}$ $I_{OH} = -1\text{ mA}$	01, 03	2.5		V
Low-level output voltage	V_{OL}	$V_{CC} = 4.5\text{ V}$ $I_{OL} = 20\text{ mA}$ $V_{IL} = 0.7\text{ V}$	01,02, 03,04 <u>3/</u>		.5	V
		@ $T_C = +125^{\circ}\text{C}$ <u>1/</u>	01,02, 03,04 <u>3/</u>		0.45	V
Input clamp voltage	V_{IC}	$V_{CC} = 4.5\text{ V}$ $I_{IN} = -18\text{ mA}$	01, 02, 03, 04 <u>3/</u>		-1.2	V
High-level output current	I_{CEX}	$V_{CC} = 5.5\text{ V}$ $V_{IN} = 2.0\text{ V}$ $V_{OH} = 5.5\text{ V}$	01, 03		1.0	mA
High-level output current	I_{CEX}	$V_{CC} = 4.5\text{ V}$ $V_{IH} = 2.0\text{ V}$ $V_{OH} = 5.5\text{ V}$	02, 04 <u>3/</u>		250	μA
High-level input current	I_{IH1}	$V_{CC} = 5.5\text{ V}$ $V_{IN} = 2.7\text{ V}$	01, 02, 03, 04 <u>3/</u>		50	μA
High-level input current	I_{IH2}	$V_{CC} = 5.5\text{ V}$ $V_{IN} = 5.5\text{ V}$	01, 02, 03, 04 <u>3/</u>		1.0	mA
Low-level input current	I_{IL}	$V_{CC} = 5.5\text{ V}$ $V_{IN} = 0.5\text{ V}$	01, 02, 03, 04 <u>3/</u>	-1.0	-2.0	mA
Short circuit output current	I_{OS}	$V_{CC} = 5.5\text{ V}$ <u>2/</u>	01, 03	-40	-100	mA
Supply current	I_{CCH}	$V_{CC} = 5.5\text{ V}$	01		24	mA
			02 <u>3/</u>		19.5	
			03		32	
			04 <u>3/</u>		32	
Supply current	I_{CCL}	$V_{CC} = 5.5\text{ V}$	01,02 <u>3/</u>		42	mA
			03,04 <u>3/</u>		57	
Propagation delay low-to-high-level	t_{PLH}	$V_{CC} = 5.0\text{ V}$ $C_L = 50\text{ pF} \pm 10\%$ $R_L = 280\Omega$	01	2.0	12.0	ns
			02 <u>3/</u>	2.0	16.0	
			03	2.0	12.0	
			04 <u>3/</u>	2.0	17.0	
Propagation delay high-to-low-level	t_{PHL}	$V_{CC} = 5.0\text{ V}$ $C_L = 50\text{ pF} \pm 10\%$ $R_L = 280\Omega$	01	2.0	14.0	ns
			02 <u>3/</u>	2.0	15.0	
			03	2.0	14.0	
			04 <u>3/</u>	2.0	16.0	

1/ $V_{IL} = 0.7\text{ V}$ at 125°C

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

3/ Qualification requirements have been removed for device types 02, 04.

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 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.

3.7 Microcircuit group assignment. The devices covered by this 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 types 02, 04.

3.9 Certification. Certification in accordance with MIL-M-38510 is not required for device types 02, 04, but shall be retained for the remaining device types.

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, 9,10,11
Group B test requirements (method 5005) subgroup 5 2/	1,2,3, 9,10,11	N/A
Group C end-point electrical parameters (method 5005)	N/A	1,2,3
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 class is not applicable for device types 02, 04.

2/ Group B test requirements shall apply to device types 01, 03, only.

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 types 01, 03, prior to qualification and quality conformance inspection, and on device types 02, 04, 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 3, 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) shall be as specified in MIL-M-38510.

4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4). Qualification inspection is not required for device types 02 and 04.

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 4.4.5).

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 test requirements shall be as specified in table II herein.
- b. Subgroups 4, 5, 6, 7, and 8 of table I of method 5005 of MIL-STD-883 shall be omitted.

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of method 5005 of MIL-STD-883. Electrical test requirements for device types 01 and 03 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. Steady-state life test (method 1005 of MIL-STD-883) conditions, or equivalent.
 - (1) Test condition D or E, using the circuit shown on figure 3, or equivalent.
 - (2) $T_A = +125^{\circ}\text{C}$ minimum.
 - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

Pin number		Device type 01		Device type 02		Device type 03		Device type 04	
				Cases					
2, X	A, B, C and D	2, X	A, B, C and D	2, X	A, B, C and D	2, X	A, B, C and D	2, X	A, B, C and D
1	1	NC	1A		1A	NC	1A		1A
2	2	1A	1B		1B	1A	1B		1B
3	3	1B	2A		2A	1B	1Y		1Y
4	4	2A	2B		2B	1Y	2A		2A
5	5	NC	2C		2C	NC	2B		2B
6	6	2B	2Y		2Y	2A	2Y		2Y
7	7	NC	GND		GND	NC	GND		GND
8	8	2C	3Y		3Y	2B	3Y		3Y
9	9	2Y	3A		3A	2Y	3A		3A
10	10	GND	3B		3B	GND	3B		3B
11	11	NC	3C		3C	NC	4Y		4Y
12	12	3Y	1Y		1Y	3Y	4A		4A
13	13	3A	1C		1C	3A	4B		4B
14	14	3B	V _{CC}		V _{CC}	3B	V _{CC}		V _{CC}
15	15	NC				NC			
16	16	3C				4Y			
17	17	NC				NC			
18	18	1Y				4A			
19	19	1C				4B			
20	20	V _{CC}				V _{CC}			

FIGURE 1. Terminal connections.

Device types 01 and 02
(See note)

Truth table (each gate)			
Inputs			Output
A	B	C	Y
L	L	L	L
H	L	L	L
H	H	L	L
H	H	H	H

Positive logic $Y = ABC$

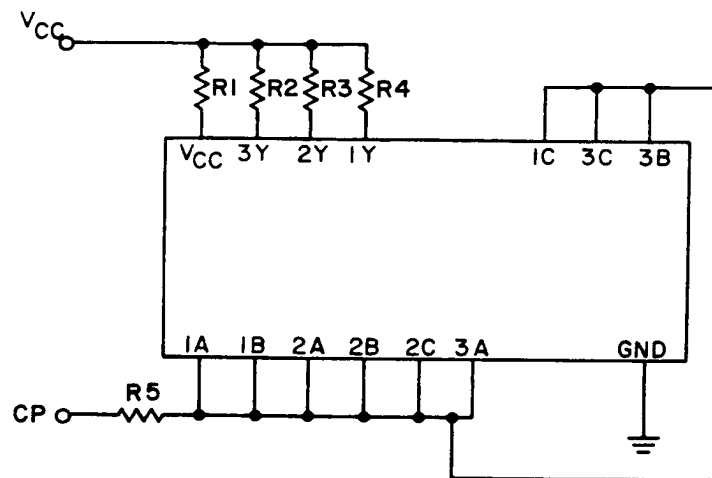
Device types 03 and 04
(See note)

Truth table (each gate)		
Inputs		Output
A	B	Y
L	L	L
H	L	L
L	H	L
H	H	H

Positive logic $Y = AB$

Note:
Qualification requirements removed for device types 02 and 04.

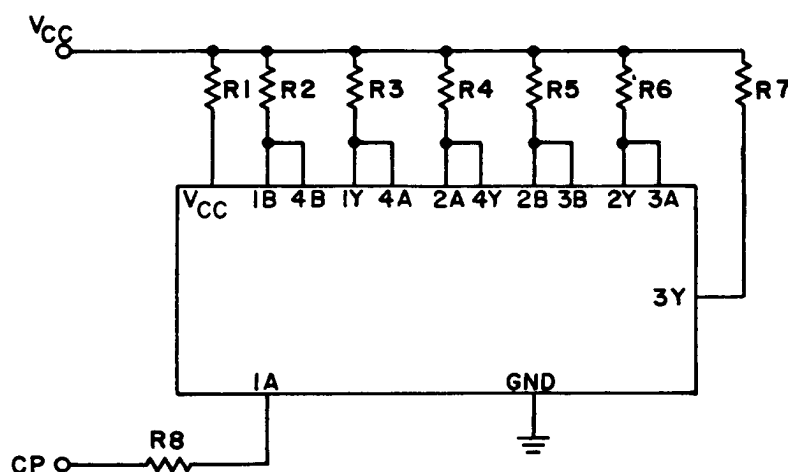
FIGURE 2. Truth tables and logic equations.

Device type 01

NOTES:

1. $R2, R3, R4 = 220\Omega \pm 5 \text{ percent}$; $R5 = 27\Omega \pm 5 \text{ percent}$.
2. $CP = 100 \text{ kHz} \pm 50 \text{ percent square wave}$; duty cycle = $50 \pm 15 \text{ percent}$;
 $V_{IH} = 2.0 \text{ V minimum to } 5.0 \text{ V maximum}$; $V_{IL} = -0.5 \text{ V minimum to } 0.8 \text{ V maximum}$.
3. V_{CC} and $R1$ shall be chosen to insure 5.0 V minimum is present at device V_{CC} terminal.

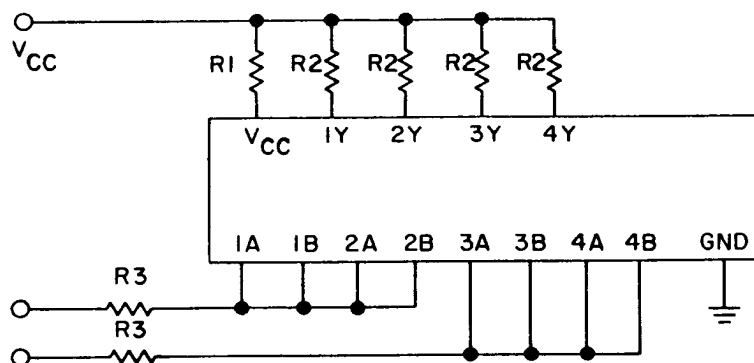
FIGURE 3. Burn-in and life test circuit.

Device type 02

NOTES:

1. R2 through R7 = $200\Omega \pm 5$ percent; R8 = $27\Omega \pm 5$ percent.
2. CP = 100 kHz ± 50 percent square wave; duty cycle = 50 ± 15 percent; V_{IH} = 2.0 V minimum to 5.0 V maximum; V_{IL} = -0.5 V minimum to 0.8 V maximum.
3. VCC and R1 shall be chosen to insure 5.0 V minimum is present at device VCC terminal.
4. Qualification requirements removed for this device type.

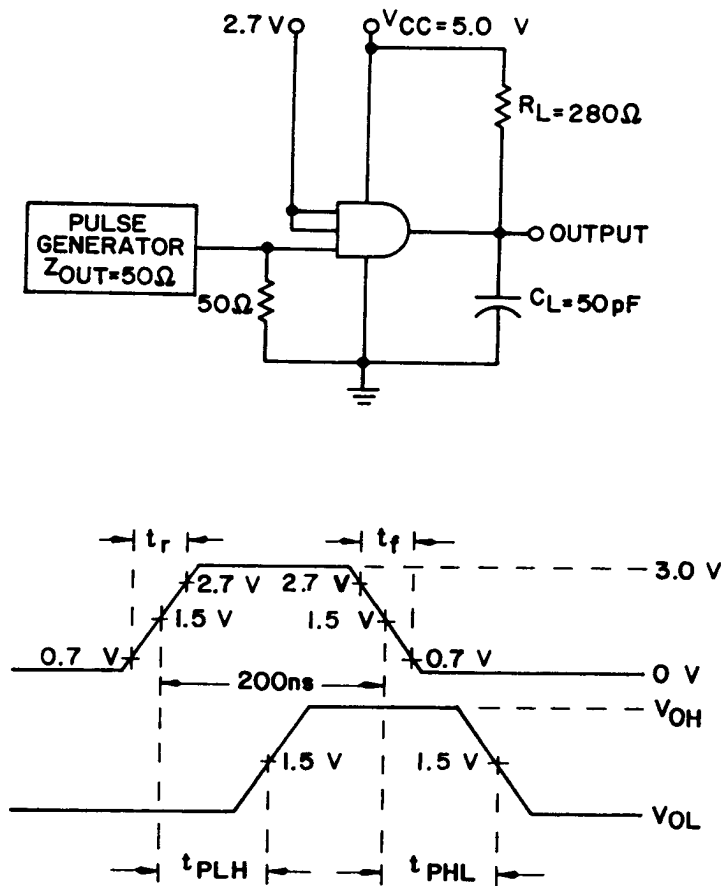
FIGURE 3. Burn-in and life test circuit - Continued.

Device type 03 and 04

NOTES:

1. CP and $\overline{CP}$ = 100 kHz $\pm$ 50 percent square wave; duty cycle = 50 $\pm$ 15 percent; V_{IH} = 2.0 V minimum to 5.0 V maximum; V_{IL} = -0.5 V minimum to +0.8 V maximum.
2. R2 = 220 Ω $\pm$ 5 percent; R3 = 27 Ω $\pm$ 5 percent.
3. VCC and R1 shall be chosen to insure 5.0 V minimum is present at device VCC terminal.
4. Qualification requirements removed for device type 04.

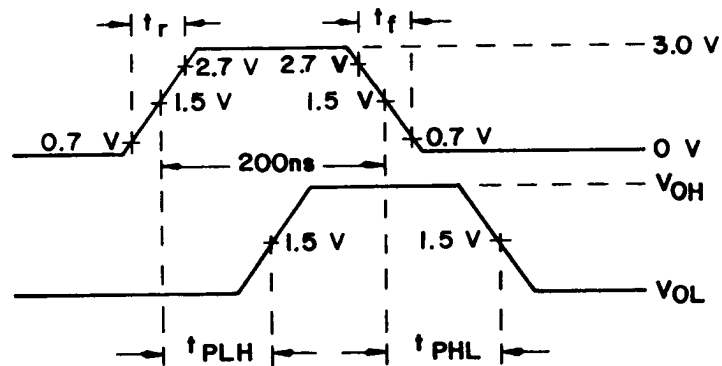
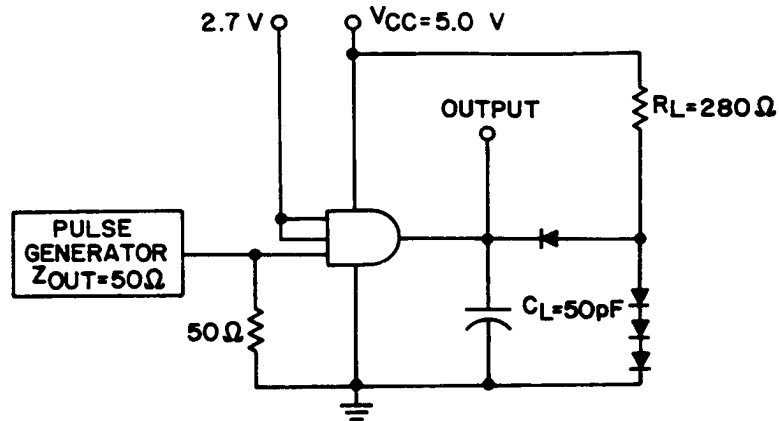
FIGURE 3. Burn-in and life test circuit - Continued.



NOTES:

1. $t_r = t_f < 2.5 ns$, $PRR < 1 MHz$.
2. $C_L = 50 pF$ minimum including jig and probe capacitance.
3. $R_L = 280\Omega \pm 5$ percent.
4. Qualification requirements removed for these device types.

FIGURE 4. Switching time waveform and circuit for device types 02 and 04.



NOTES:

1. $t_r = t_f < 2.5 \text{ ns}$, $\text{PRR} < 1 \text{ MHz}$.
2. $C_L = 50 \text{ pF}$ minimum including jig and probe capacitance.
3. $R_L = 280\Omega \pm 5 \text{ percent}$.
4. All diodes are 1N3064 or equivalent.

FIGURE 4. Switching time waveform and circuit for device types 01 and 03.

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		
				Cases E, F, G, H	1	2	3	4	5	6	7	8	9	10	11	12	13		14	Min		Max	
TC = 25°C	VOL	3007	Cases 2, X 1/	Test no.	1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	VCC					
				1	0.8 V	2.0 V	2.0 V	2.0 V	2.0 V		GND		2.0 V	2.0 V	2.0 V	2.0 V	2.0 V	2.0 V	2.0 V	4.5 V	1Y	0.5	V
				2	2.0 V	0.8 V															1Y		
				3	2.0 V																1Y		
				4		0.8 V															2Y		
				5		2.0 V															2Y		
				6				0.8 V													2Y		
				7				2.0 V													2Y		
				8																	3Y		
9																	3Y						

See footnote at the 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	Cases A, B, C, D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits		Unit			
				2	3	4	6	8	9	10	12	13	14	16	18	19	20		Min	Max				
1 $T_C = 25^\circ\text{C}$	V_{IC}		Cases 45 46 47 48 49 50 51 52 53	1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	3Y	1C	V_{CC}							
				-18 mA	-18 mA	-18 mA	-18 mA	-18 mA		GND									4.5 V	1A	-1.2	V		
																					1B			
																						2A		
																						2B		
																						2C		
																						3A		
																						3B		
																						3C		
																						1C		
2	I_{CEX}		54	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V									5.5 V	1Y	1.0	mA			
			55	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V										2Y					
			56	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V										3Y					
Same tests, terminal conditions and limits as for subgroup 1, except $T_C = 125^\circ\text{C}$ and V_{IC} tests are omitted. $V_{IL} = 0.7$ V and $V_{OL} (\text{max}) = 0.45$.																								
3																								
9 $T_C = 25^\circ\text{C}$	t_{PHL}	3003 (Fig. 4)	57	IN	2.7 V	IN	2.7 V	2.7 V	OUT	GND					OUT			5.0 V	1Y	2.0	11.0	ns		
			58																2Y					
			59											IN	2.7 V	2.7 V				3Y				
	t_{PLH}		60	IN	2.7 V	IN	2.7 V	2.7 V	OUT						OUT				1Y		9.0			
			61																2Y					
			62											IN	2.7 V	2.7 V				3Y				
10 $T_C = 125^\circ\text{C}$	t_{PHL}		63	IN	2.7 V	IN	2.7 V	2.7 V	OUT						OUT				1Y		14.0			
			64																2Y					
			65											IN	2.7 V	2.7 V				3Y				
	t_{PLH}		66	IN	2.7 V	IN	2.7 V	2.7 V	OUT						OUT				1Y		12.0			
			67																2Y					
			68											IN	2.7 V	2.7 V				3Y				
Same tests, terminal conditions, and limits as for subgroup 10, except $T_C = -55^\circ\text{C}$.																								

1/ Case 2 and X pins not referenced are NC.

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 A,B,C,D	Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Limits		Measured terminal	Unit
																			Min	Max		
1 $T_C = 25^\circ\text{C}$	V_{OL}	3007		1	0.8 V	2.0 V	2.0 V	2.0 V	2.0 V				2.0 V	2.0 V	2.0 V	20 mA	2.0 V	4.5 V		0.5	1V	V
				2	2.0 V	0.8 V											0.8 V				1V	V
				3		2.0 V				20 mA							0.8 V				1V	V
				4		0.8 V											2.0 V				2V	V
				5		2.0 V															2V	V
				6				0.8 V	0.8 V												2V	V
				7				2.0 V	2.0 V			20 mA									3V	V
				8									0.8 V	0.8 V							3V	V
				9									2.0 V	2.0 V	0.8 V						3V	V
I_{CEX}				10																	1V	μA
				11						5.5 V						5.5 V					2V	V
				12								5.5 V	2.0 V	2.0 V							3V	V
I_{IH1}		3010		13	2.7 V																1A	
				14		2.7 V															1B	
				15			2.7 V														2A	
				16				2.7 V													2B	
				17					2.7 V												2C	
				18									2.7 V								3A	
				19										2.7 V							3B	
				20											2.7 V						3C	
				21													2.7 V				1C	
I_{IH2}				22	5.5 V																1A	mA
				23		5.5 V															1B	
				24			5.5 V														2A	
				25				5.5 V													2B	
				26					5.5 V												2C	
				27						5.5 V											3A	
				28									5.5 V								3B	
				29										5.5 V							3C	
				30													5.5 V				1C	
I_{IIL}		3009		31	0.5 V	5.5 V	5.5 V	5.5 V	5.5 V				5.5 V	5.5 V	5.5 V						1A	
				32	5.5 V	0.5 V	5.5 V														1B	
				33		5.5 V	0.5 V														2A	
				34			5.5 V	0.5 V	0.5 V												2B	
				35				5.5 V	5.5 V				0.5 V								2C	
				36					5.5 V				5.5 V	0.5 V							3A	
				37									5.5 V	5.5 V	0.5 V						3B	
				38										5.5 V	5.5 V						3C	
				39													0.5 V				1C	
I_{CCH}		3005		40											5.5 V		5.5 V				VCC	V
				41																	VCC	V
I_{CCL}		3005																				

See footnote at end of device type 02.

TABLE 111. Group A inspection for device type 02 - Continued. 1/
Terminal conditions (pins not designated may be high ≥ 2.0 V or low ≤ 0.6 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	2A	2B	2C	2Y	3Y	3A	3B	3C	1Y	1C	V _{CC}		Min	Max	
1 T _C = 25°C	V _{IC}			42	-18 mA	-18 mA	-18 mA	-18 mA		GND							4.5 V	1A	-1.2	V	
				43														1B			
				44															2A		
				45															2B		
				46															2C		
				47															3A		
				48															3B		
				49															3C		
				50															1C		
2	Same tests, terminal conditions and limits as for subgroup 1, except T _C = 125°C and V _{IC} tests are omitted. V _{OL} (max) = 0.45 V, V _{IL} = 0.7 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 _{pHL}	3003 (Fig. 4)	51	IN	2.7 V	IN	2.7 V	2.7 V	OUT	GND							2.7 V	1Y	2.0	12.0	ns
			52															2Y			
			53								OUT								3Y		
	t _{pLH}		54	IN	2.7 V	IN	2.7 V	2.7 V	OUT								2.7 V	1Y		13.0	
		55															2Y				
		56							OUT			IN	2.7 V	2.7 V				3Y			
10 T _C = 125°C	t _{pHL}		57	IN	2.7 V	IN	2.7 V	2.7 V	OUT								2.7 V	1Y		15.0	
			58															2Y			
			59								OUT			IN	2.7 V	2.7 V			3Y		
	t _{pLH}		60	IN	2.7 V	IN	2.7 V	2.7 V	OUT								2.7 V	1Y		16.0	
		61															2Y				
		62										IN	2.7 V	2.7 V				3Y			
11	Same tests, terminal conditions, and limits as for subgroup 10, except T _C = -55°C.																				

1/ This device type has had qualification requirements removed.

TABLE III. Group A Inspection for device type 03.
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	Cases														Measured terminal	Limits		Unit
				2,X 1/															Min	Max	
				1	2	3	4	5	6	7	8	9	10	11	12	13	14				
1 T _C = 25°C	V _{OH}	3006	1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	V _{CC}	1Y 2Y 3Y 4Y	2.5 - - -	V - - -		
				2.0 V	2.0 V	-1 mA	5.5 V	5.5 V	-1 mA	GND		5.5 V	5.5 V	4.5 V							
				5.5 V	5.5 V		2.0 V	2.0 V				5.5 V	5.5 V								
							5.5 V	5.5 V			-1 mA	5.5 V	5.5 V								
	V _{OL}	3007	5A	5B	5C	5D	5E	5F	5G	5H	5I	5J	5K	5L	5M	5N	5O	1Y 1Y 2Y 3Y 3Y 4Y 4Y	0.5 - - - - - -	V - - - - - -	
				0.8 V	0.8 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V				5.5 V
				5.5 V	5.5 V		0.8 V	0.8 V													
							5.5 V	5.5 V													
	V _{IC}	3010	13A	13B	13C	13D	13E	13F	13G	13H	13I	13J	13K	13L	13M	13N	13O	1A 1A 2A 2A 3A 3A 3A 4A 4A 4A	-1.2 - - - - - - - - -	V - - - - - - - - -	
				-18 mA	-18 mA	-18 mA	-18 mA	-18 mA	-18 mA	-18 mA	-18 mA	-18 mA	-18 mA	-18 mA	-18 mA	-18 mA	-18 mA				-18 mA
2	I _{IH1}	3010	21A	21B	21C	21D	21E	21F	21G	21H	21I	21J	21K	21L	21M	21N	1A 1A 2A 2A 3A 3A 3A 4A 4A 4A	50 - - - - - - - - -	μA - - - - - - - - -		
				2.7 V	2.7 V	2.7 V	2.7 V	2.7 V	2.7 V	2.7 V	2.7 V	2.7 V	2.7 V	2.7 V	2.7 V	2.7 V				2.7 V	
				GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND				GND	
	I _{IH2}	3010	29A	29B	29C	29D	29E	29F	29G	29H	29I	29J	29K	29L	29M	29N	1A 1A 2A 2A 3A 3A 3A 4A 4A 4A	1.0 - - - - - - - -	mA - - - - - - - -		
				5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V				5.5 V	
				GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND				GND	
	I _{IL}	3009	37A	37B	37C	37D	37E	37F	37G	37H	37I	37J	37K	37L	37M	37N	1A 1A 2A 2A 3A 3A 3A 4A 4A 4A	-1.0 - - - - - - -	V - - - - - - -		
				0.5 V	0.5 V	0.5 V	0.5 V	0.5 V	0.5 V	0.5 V	0.5 V	0.5 V	0.5 V	0.5 V	0.5 V	0.5 V				0.5 V	
				5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V				5.5 V	
3	I _{OS}	3011	45A	45B	45C	45D	45E	45F	45G	45H	45I	45J	45K	45L	45M	1Y 2Y 3Y 4Y	-40 - - - - - - -	V - - - - - - -			
				GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND				GND	GND	
	I _{CCH}	3005	49A	49B	49C	49D	49E	49F	49G	49H	49I	49J	49K	49L	49M	V _{CC}	32	mA			
				5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V				5.5 V	5.5 V	
	I _{CCL}	3005	50A	50B	50C	50D	50E	50F	50G	50H	50I	50J	50K	50L	50M	V _{CC}	57	mA			
				GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND				GND	GND	

TABLE III. Group A inspection for device type 03 - 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		
				Cases 2, X, 1/	2	3	4	6	8	9	10	12	13	14	16	18	19		20	Min		Max	
1 $T_C = 25^\circ\text{C}$	tCEX			Test no.	1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	VCC					
				51	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	GND		5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	1Y	1.0 mA			
				52	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V			5.5 V	5.5 V	5.5 V					2Y				
				53			5.5 V	5.5 V	5.5 V		5.5 V								3Y				
				54			5.5 V	5.5 V	5.5 V			5.5 V	5.5 V	5.5 V	5.5 V	5.5 V		4Y					
2	Same tests, terminal conditions and limits as for subgroup 1, except $T_C = +125^\circ\text{C}$, and V_{IC} tests are omitted. $V_{IL} = 0.7\text{ V}$ and $V_{OL}(\text{max}) = 0.45\text{ V}$.																						
3	Same tests, terminal conditions and limits as for subgroup 1, except $T_C = -55^\circ\text{C}$ and V_{IC} tests are omitted.																						
9 $T_C = 25^\circ\text{C}$	tPHL	3003 (Fig. 4)	55	IN	2.7 V	OUT				GND								5.0 V	1A to 1Y	2.0	111.0	ns	
			56	2.7 V	IN	OUT	2.7 V	OUT	OUT											1B to 1Y			
			57			OUT														2A to 2Y			
			58			OUT														2B to 2Y			
			59																	3A to 3Y			
			60																	3A to 3Y			
10 $T_C = 125^\circ\text{C}$	tPHL		63	IN	2.7 V	OUT													1A to 1Y		9.0		
			64	2.7 V	IN	OUT														1B to 1Y			
			65			OUT	2.7 V	OUT	OUT											2A to 2Y			
			66			OUT														2B to 2Y			
			67																	3A to 3Y			
			68																	3A to 3Y			
11	tPLH		71	IN	2.7 V	OUT													1A to 1Y		14.0		
			72	2.7 V	IN	OUT														1B to 1Y			
			73			OUT	2.7 V	OUT	OUT											2A to 2Y			
			74			OUT														2B to 2Y			
			75																	3A to 3Y			
			76																	3A to 3Y			

1/ Case 2 and X pins not referenced are NC.

TABLE III. Group A inspection for device type 04. 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 A, B, C, D	Test no.														Measured terminal	Limits		Unit
				1	2	3	4	5	6	7	8	9	10	11	12	13	14		Min	Max	
1 $T_C = 25^\circ\text{C}$	I_{CEX}		Test no.	1A	1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	V_{CC}				
				1	2.0 V	2.0 V	5.5 V	5.5 V	5.5 V	GND		5.5 V	5.5 V		5.5 V	5.5 V	4.5 V	1Y			250 μA
				2	5.5 V	5.5 V	2.0 V	2.0 V	5.5 V		5.5 V	2.0 V	5.5 V					2Y			
				3			5.5 V	5.5 V			5.5 V	2.0 V	5.5 V					3Y			
	V_{OL}	3007	Test no.	4										5.5 V	2.0 V	2.0 V		4Y			
				5	0.8 V	20 mA												1Y			0.5 V
				6	5.5 V	0.8 V												1Y			
				7	5.5 V	5.5 V	0.8 V		20 mA									2Y			
	V_{IC}		Test no.	8			5.5 V	0.8 V	20 mA									2Y			
				9			5.5 V	5.5 V										3Y			
				10							20 mA	0.8 V	0.8 V					3Y			
				11							20 mA	5.5 V	5.5 V	20 mA	0.8 V			4Y			
V_{IC}		Test no.	12											5.5 V	0.8 V		4Y				
			13	-18 mA	-18 mA												1A			-1.2	
			14														1B				
			15														2A				
2	I_{IH1}	3010	Test no.	16														2B			
				17														3A			
				18														3B			
				19														3B			
	I_{IH2}		Test no.	20														4A			
				21	2.7 V	GND												1A			50 μA
				22	GND	2.7 V												1B			
				23		GND												2A			
	I_{IL}		Test no.	24														2B			
				25														3A			
				26														3A			
				27														3B			
I_{CCH}		Test no.	28														4A				
			29	5.5 V	5.5 V												1A			1.0 mA	
			30	GND	5.5 V												1B				
			31		GND												2A				
I_{CCL}		Test no.	32														2B				
			33														3A				
			34														3A				
			35														3B				
I_{CCH}	3009	Test no.	36														4A				
			37	0.5 V	5.5 V												1A			-1.0	
			38	5.5 V	0.5 V												1B			2.0	
			39		5.5 V												2A				
I_{CCL}		Test no.	40														2B				
			41														3A				
			42														3A				
			43														3B				
I_{CCH}	3005	Test no.	44														4A				
			45														4A				
			46														4B				
			47														4B				
3	I_{CCH}	3005	Test no.	48														V_{CC}			
				49														V_{CC}			
				50														V_{CC}			
				51														V_{CC}			
	I_{CCL}		Test no.	52														V_{CC}			
				53														V_{CC}			
				54														V_{CC}			
				55														V_{CC}			
	I_{CCH}	3005	Test no.	56														V_{CC}			
				57														V_{CC}			
				58														V_{CC}			
				59														V_{CC}			
I_{CCL}		Test no.	60														V_{CC}				
			61														V_{CC}				
			62														V_{CC}				
			63														V_{CC}				
2	I_{CCH}	3005	Test no.	64														V_{CC}			
				65														V_{CC}			
				66														V_{CC}			
				67														V_{CC}			
	I_{CCL}		Test no.	68														V_{CC}			
				69														V_{CC}			
				70														V_{CC}			
				71														V_{CC}			
	I_{CCH}	3005	Test no.	72														V_{CC}			
				73														V_{CC}			
				74														V_{CC}			
				75														V_{CC}			
I_{CCL}		Test no.	76														V_{CC}				
			77														V_{CC}				
			78														V_{CC}				
			79														V_{CC}				
2	I_{CCH}	3005	Test no.	80														V_{CC}			
				81														V_{CC}			
				82														V_{CC}			
				83														V_{CC}			
	I_{CCL}		Test no.	84														V_{CC}			
				85														V_{CC}			
				86														V_{CC}			
				87														V_{CC}			
	I_{CCH}	3005	Test no.	88														V_{CC}			
				89														V_{CC}			
				90														V_{CC}			
				91														V_{CC}			
2	I_{CCH}	3005	Test no.	92														V_{CC}			
				93														V_{CC}			
				94														V_{CC}			
				95														V_{CC}			
	I_{CCL}		Test no.	96														V_{CC}			
				97														V_{CC}			
				98														V_{CC}			
				99														V_{CC}			
	I_{CCH}	3005	Test no.	100														V_{CC}			
				101														V_{CC}			
				102														V_{CC}			
				103														V_{CC}			
2	I_{CCH}	3005	Test no.	104														V_{CC}			
				105														V_{CC}			
				106														V_{CC}			
				107														V_{CC}			
	I_{CCL}		Test no.	108														V_{CC}			
				109														V_{CC}			
				110														V_{CC}			
				111														V_{CC}			
	I_{CCH}	3005	Test no.	112														V_{CC}			
				113														V_{CC}			
				114														V_{CC}			
				115														V_{CC}			
2	I_{CCH}	3005	Test no.	116														V_{CC}			
				117														V_{CC}			
				118														V_{CC}			
				119														V_{CC}			
	I_{CCL}		Test no.	120														V_{CC}			
				121														V_{CC}			
				122														V_{CC}			
				123														V_{CC}			
	I_{CCH}	3005	Test no.	124														V_{CC}			
				125																	

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

4.5 Methods of inspection. Methods of inspection shall be as 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 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. Device types 02, 04, are intended on for use for logistics 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 types 02, 04. In addition to that, notification to the qualifying activity for device types 01, 03, if applicable.
- e. For device types 01, 03 requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), corrective action and reporting of results, if applicable.
- f. Requirements for product assurance options, device types 01, 03 only.
- 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. Requirements for "JAN" marking. This shall apply to device types 01, 03 only.

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), 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 to device types 02, 04. 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.

6.6 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.

<u>Military device type</u>	<u>Generic-industry type</u>
01	54S11
02 <u>1/</u>	54S15 <u>1/</u>
03	54S08
04 <u>1/</u>	54S09 <u>1/</u>

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

TABLE IV. Manufacturers' designations.

Device type	Manufacturer			
	Circuit A	Circuit B	Circuit C	Circuit D
	Texas Instruments	Signetics Corp.	Fairchild Semiconductor	National Semiconductor Corp.
01	X	X	X	X
03	X	X	X	X

6.8 Ordering guidance. Since the qualification and certification requirements have been removed from the specification for device types 02, 04, 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.

1/ This device has had qualification requirements removed.

Custodians:

Army - ER
Navy - EC
Air Force - 17

Review activities:

Army - AR, MI
Navy - OS, SH, 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

(Project 5962-1070)