

INCH-POUND

MIL-M-38510/80F
15 February 2006
SUPERSEDING
MIL-M-38510/80E
10 August 2005

MILITARY SPECIFICATION
MICROCIRCUITS, DIGITAL, BIPOLAR, SCHOTTKY TTL, AND GATES,
MONOLITHIC SILICON

Inactive for new design after 23 August 1996.

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

The requirements for acquiring the product herein shall consist of this specification sheet and MIL-PRF 38535

1. SCOPE

1.1 Scope. This specification covers the detail requirements for monolithic silicon, Schottky TTL, positive AND logic gating microcircuits. Two product assurance classes and a choice of case outlines and lead finishes are provided for each type and are reflected in the complete part number. For this product, the requirements of MIL-M-38510 have been superseded by MIL-PRF-38535, (see 6.4).

1.2 Part or Identifying Number (PIN). The PIN is in accordance with MIL-PRF-38535.

1.2.1 Device types. The device types are as follows:

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

1.2.2 Device class. The device class is the product assurance level as defined in MIL-PRF-38535.

1.2.3 Case outlines. The case outlines are as designated in MIL-STD-1835 and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
A	GDFP5-F14 or CDFP6-F14	14	Flat pack
B	GDFP4-F14	14	Flat pack
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line
D	GDFP1-F14 or CDFP2-F14	14	Flat pack
X	CQCC2-N20	20	square chip carrier package
2	CQCC1-N20	20	square chip carrier package

Comments, suggestions, or questions on this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAS, P. O. Box 3990, Columbus, OH 43218-3990, or emailed to bipolar@dsccl.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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): <u>1/</u>	77 mW
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC}):	(See MIL-STD-1835)
Junction temperature (T_J) <u>2/</u>	+175°C

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 <u>3/</u>
Case operating temperature range (T_C)	-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-38535 - Integrated Circuits (Microcircuits) Manufacturing, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard for Microelectronics.
MIL-STD-1835 - Interface Standard Electronic Component Case Outlines

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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

2/ Maximum junction temperature shall not be exceeded except for allowable short duration burn-in screening conditions in accordance with MIL-PRF-38535.

3/ 0.7 V at +125°C.

3. REQUIREMENTS

3.1 Qualification. Microcircuits furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturers list before contract award (see 4.3 and 6.3).

3.2 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-38535 and as specified herein or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

3.3 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535 and herein.

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

3.3.2 Terminal connections. The terminal connections shall be as specified on figure 1.

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

3.3.4 Schematic circuits. The schematic circuits shall be maintained by the manufacturer and made available to the qualifying activity and the preparing activity upon request.

3.4 Lead material and finish. The lead material and finish shall be in accordance with MIL-PRF-38535 (see 6.6).

3.5 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.

3.6 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.

3.7 Marking. Marking shall be in accordance with MIL-PRF-38535.

3.8 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 8 (see MIL-PRF-38535, appendix A).

4. VERIFICATION

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38535 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not effect the form, fit, or function as described herein.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38535 and shall be conducted on all devices prior to qualification and conformance inspection. The following additional criteria shall apply:

- a. The burn-in test duration, test condition, and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document control by the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.
- 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. Additional screening for space level product shall be as specified in MIL-PRF-38535.

4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-38535.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C unless otherwise specified	Device type	Limits		Unit
				Min	Max	
High level output voltage	V _{OH}	V _{CC} = 4.5 V, I _{OH} = -1 mA	01, 03	2.5		V
Low level output voltage	V _{OL}	V _{CC} = 4.5 V, I _{OL} = 20 mA, V _{IL} = 0.7 V	01, 02, 03, 04		0.5	V
		@T _C = +125°C <u>1/</u>	01, 02, 03, 04		0.45	V
Input clamp voltage	V _{IC}	V _{CC} = 4.5 V, I _{IN} = -18 mA	01, 02, 03, 04		-1.2	V
High level output current	I _{CEX}	V _{CC} = 5.5 V, V _{IN} = 2.0 V, V _{OH} = 5.5 V	01, 03		1.0	mA
High level output current	I _{CEX}	V _{CC} = 4.5 V, V _{IH} = 2.0 V, V _{OH} = 5.5 V	02, 04		250	μA
High level input current	I _{IH1}	V _{CC} = 5.5 V, V _{IN} = 2.7 V	01, 02, 03, 04		50	μA
High level input current	I _{IH2}	V _{CC} = 5.5 V, V _{IN} = 5.5 V	01, 02, 03, 04		1.0	mA
Low level input current	I _{IL}	V _{CC} = 5.5 V, V _{IN} = 0.5 V	01, 02, 03, 04	-1.0	-2.0	mA
Short circuit output current	I _{OS}	V _{CC} = 5.5 V <u>2/</u>	01, 03	-40	-100	mA
Supply current	I _{CCH}	V _{CC} = 5.5 V	01		24	mA
			02		19.5	
			03		32	
			04		32	
Supply current	I _{CCL}	V _{CC} = 5.5 V	01, 02		42	mA
			03, 04		57	
Propagation delay low to high level	t _{PLH}	V _{CC} = 5.0 V, C _L = 50 pF ± 10%, R _L = 280 Ω	01	2	12	ns
			02	2	16	
			03	2	12	
			04	2	17	
Propagation delay high to low level	t _{PHL}	V _{CC} = 5.0 V, C _L = 50 pF ± 10%, R _L = 280 Ω	01	2	14	ns
			02	2	15	
			03	2	14	
			04	2	16	

1/ V_{IL} = 0.7 V at 125°C.2/ Not more than one output should be shorted at a time.

TABLE II. Electrical test requirements.

MIL-PRF-38535 test requirements	Subgroup (see table III)	
	Class S devices	Class B devices
Interim electrical parameters (Pre Burn-In) (Method 5004)	1	1
Final electrical test parameters	1*, 2, 3, 9, 10, 11	1*, 2, 3, 9
Group A test requirements	1, 2, 3, 9, 10, 11	1, 2, 3, 9, 10, 11
Group B electrical test parameters when using the method 5005 QCI option	1, 2, 3 9, 10, 11	N/A
Group C end-point electrical parameters	1, 2, 3, 9, 10, 11	1, 2, 3
Group D end-point electrical parameters	1, 2, 3	1, 2, 3

*PDA applies to subgroup 1.

4.4 Technology Conformance Inspection (TCI). Technology conformance inspection shall be in accordance with MIL-PRF-38535 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4).

4.4.1 Group A inspection. Group A inspection shall be in accordance with table III of MIL-PRF-38535 and as follows:

- a. Tests shall be as specified in table II herein.
- b. Subgroups 4, 5, 6, 7, and 8 shall be omitted.

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of MIL-PRF-38535.

4.4.3 Group C inspection. Group C inspection shall be in accordance with table IV of MIL-PRF-38535 and as follows:

- a. End-point electrical parameters shall be as specified in table II herein.
- b. The steady-state life test duration, test condition, and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document control by the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.

4.4.4 Group D inspection. Group D inspection shall be in accordance with table V of MIL-PRF-38535. End-point electrical parameters shall be as specified in table II herein.

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

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

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

FIGURE 1. Terminal connections.

Device types 01 and 02

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 $Y = ABC$

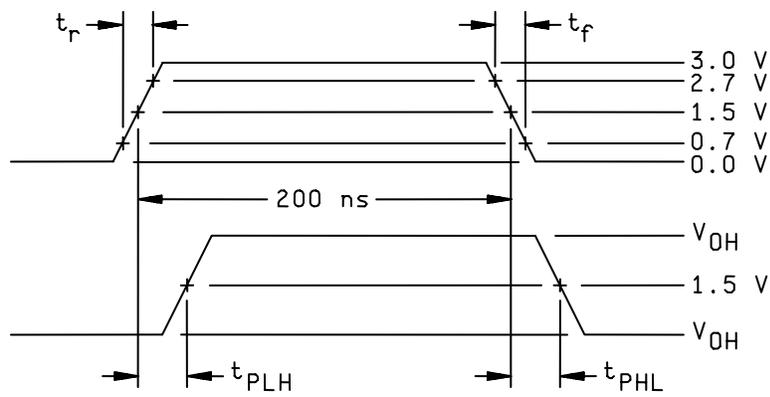
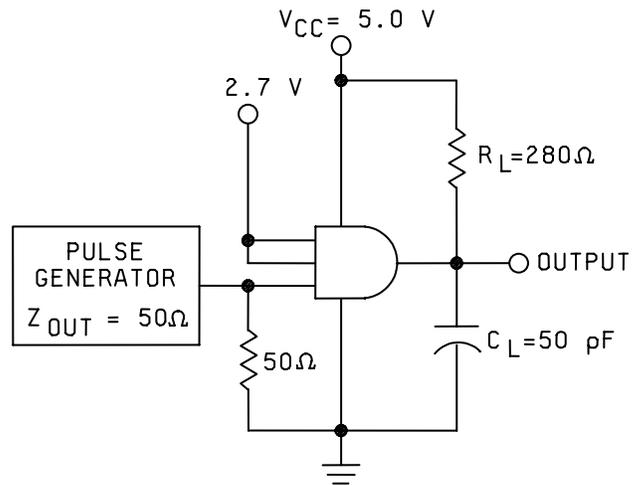
Device types 03 and 04

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

Positive logic $Y = AB$

FIGURE 2. Truth tables and logic equations.

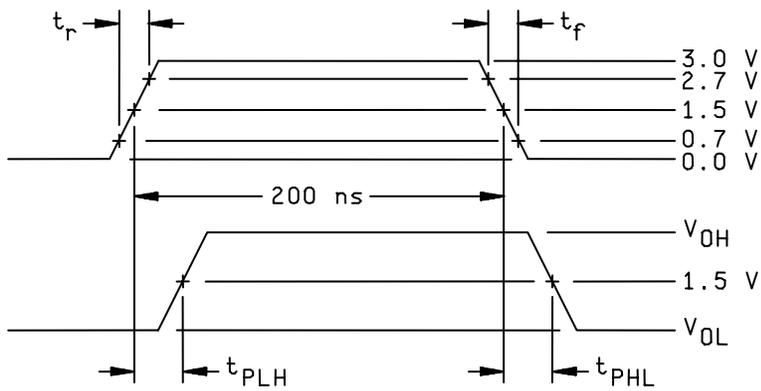
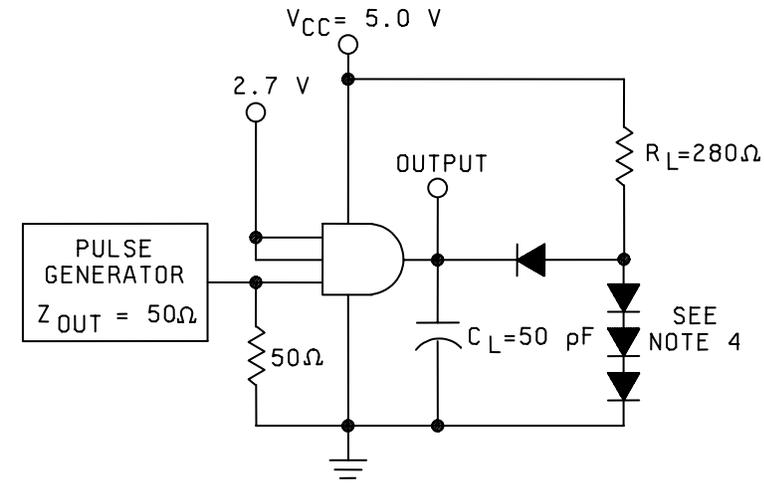
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NOTES:

1. $t_r = t_f \leq 2.5\text{ ns}$, $\text{PRR} \leq 1\text{ MHz}$.
2. $C_L = 50\text{ pF}$ minimum including jig and probe capacitance.
3. $R_L = 280\Omega \pm 5\%$.

FIGURE 3. Switching time waveform and circuit for device types 02 and 04.



NOTES:

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

FIGURE 3. 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 2, X 1/ Test no.	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					
				1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	V _{CC}								
1 T _c = 25°C	V _{OL}	3007	1	0.8 V	2.0 V	20 mA	GND	20 mA	2.0 V	2.0 V	2.0 V	20 mA	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	"	"	"		"		"	"	"	"	"	"	"	0.8 V	"	2Y		"	"
			5	"	"	2.0 V	0.8 V	"	"		"		"	"	"	"	"	"	"	2.0 V	"	2Y		"	"
			6	"	"	"	"	"	0.8 V		"		"	"	"	"	"	"	"	"	"	2Y		"	"
			7	"	"	"	"	"	2.0 V		0.8 V		"	"	"	"	"	"	"	"	"	3Y		"	"
			8	"	"	"	"	"	"		"		2.0 V	"	"	"	"	"	"	"	"	3Y		"	"
			9	"	"	"	"	"	"		"		"	"	"	"	"	"	"	"	"	3Y		"	"
	V _{OH}	3006	10	"	"	GND	GND	GND	GND	-1 mA	"	"	GND	GND	GND	-1 mA	"	"	1Y	2.5		"			
			11	GND	GND	2.0 V	2.0 V	2.0 V	2.0 V	"	"	"	-1 mA	GND	GND	GND	"	GND	2Y	"		"			
			12	GND	GND	GND	GND	GND	GND	"	"	"	"	2.0 V	2.0 V	2.0 V	"	GND	3Y	"		"			
	I _{OS}	3011	13	5.5 V	5.5 V	GND	GND	GND	GND	GND	"	"	GND	GND	GND	GND	5.5 V	5.5 V	1Y	-40	-100	mA			
			14	GND	GND	5.5 V	"	"	"	"	"	"	"	"	2Y	"	"	"							
			15	GND	"	GND	GND	GND	GND	GND	"	"	GND	5.5 V	5.5 V	5.5 V	"	"	3Y	"	"	"			
	I _{IH1}	3010	16	2.7 V	"	"	"	"	"	"	"	"	"	GND	GND	GND	"	"	1A		50	μA			
			17	GND	2.7 V	"	"	"	"	"	"	"	"	"	"	"	"	"	1B		"	"			
			18	"	GND	2.7 V	"	"	"	"	"	"	"	"	"	"	"	"	2A		"	"			
			19	"	"	2.7 V	"	"	"	"	"	"	"	"	"	"	"	"	2B		"	"			
			20	"	"	GND	2.7 V	"	"	"	"	"	"	"	"	"	"	"	2C		"	"			
			21	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3A		"	"			
			22	"	"	"	"	"	"	"	"	"	"	"	2.7 V	"	"	"	3B		"	"			
			23	"	"	"	"	"	"	"	"	"	"	"	GND	2.7 V	"	"	3C		"	"			
			24	"	"	"	"	"	"	"	"	"	"	"	"	"	2.7 V	"	1C		"	"			
	I _{IH2}	"	25	5.5 V	"	"	"	"	"	"	"	"	"	"	"	"	GND	"	1A		1.0	mA			
			26	GND	5.5 V	"	"	"	"	"	"	"	"	"	"	"	"	"	1B		"	"			
			27	"	GND	5.5 V	"	"	"	"	"	"	"	"	"	"	"	"	2A		"	"			
			28	"	"	"	5.5 V	"	"	"	"	"	"	"	"	"	"	"	2B		"	"			
			29	"	"	"	GND	5.5 V	"	"	"	"	"	"	"	"	"	"	2C		"	"			
			30	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3A		"	"			
			31	"	"	"	"	"	"	"	"	"	"	"	5.5 V	"	"	"	3B		"	"			
			32	"	"	"	"	"	"	"	"	"	"	"	GND	5.5 V	"	"	3C		"	"			
			33	"	"	"	"	"	"	"	"	"	"	"	"	"	5.5 V	"	1C		"	"			
	I _{IL}	3009	34	0.5 V	5.5 V	"	"	"	"	5.5 V	5.5 V	5.5 V	"	"	1A	-1.0	-2.0	"							
			35	5.5 V	0.5 V	5.5 V	"	"	"	"	"	"	"	"	1B	"	"	"							
			36	"	5.5 V	0.5 V	5.5 V	5.5 V	5.5 V	5.5 V	"	"	"	"	"	"	"	"	2A	"	"	"			
			37	"	"	5.5 V	0.5 V	5.5 V	5.5 V	5.5 V	"	"	"	"	"	"	"	"	2B	"	"	"			
			38	"	"	"	5.5 V	0.5 V	5.5 V	5.5 V	"	"	"	"	"	"	"	"	2C	"	"	"			
			39	"	"	"	"	5.5 V	0.5 V	5.5 V	"	"	"	"	"	"	"	"	3A	"	"	"			
			40	"	"	"	"	"	5.5 V	0.5 V	5.5 V	"	"	"	"	"	"	"	3B	"	"	"			
			41	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3C	"	"	"			
			42	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1C	"	"	"			
I _{CCH}	3005	43	"	"	"	"	"	"	"	"	"	"	"	5.5 V	"	5.5 V	V _{CC}		24	"					
I _{CCL}	3005	44	GND	GND	GND	GND	GND	GND	"	"	"	"	GND	GND	GND	GND	V _{CC}		42	"					

See footnotes at end of device type 01.

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

Subgroup	Symbol	MIL-STD-883 method	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					
			Test no.	1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	V _{CC}								
1 T _C = 25°C	V _{IC}		45	-18 mA														4.5 V	1A		-1.2	V			
			46		-18 mA															1B					
			47																		2A				
			48			-18 mA															2B				
			49				-18 mA														2C				
			50					-18 mA													3A				
	I _{CEX}		51					-18 mA						-18 mA						3B					
			52																		3C				
			53															-18 mA			1C				
			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	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	5.5 V	5.5 V	5.5 V	3Y											
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.																								
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. 3)	57	IN	2.7 V					GND															
			58				IN	2.7 V	2.7 V	OUT						OUT	2.7 V	5.0 V		1Y	2.0	11.0	ns		
			59										OUT	IN	2.7 V	2.7 V				2Y					
	t _{PLH}		60	IN	2.7 V																				
			61				IN	2.7 V	2.7 V	OUT						OUT	2.7 V			1Y		9.0			
			62										OUT	IN	2.7 V	2.7 V				2Y					
10 T _C = 125°C	t _{PHL}		63	IN	2.7 V																				
			64				IN	2.7 V	2.7 V	OUT						OUT	2.7 V			1Y		14.0			
	t _{PLH}		65												OUT	2.7 V			2Y						
			66	IN	2.7 V											OUT	2.7 V			3Y					
			67	IN	2.7 V														1Y		12.0				
			68				IN	2.7 V	2.7 V	OUT				OUT	2.7 V				2Y						
											OUT	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/ Case 2 and X pins not referenced are NC.

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

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,C,D Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits		Unit			
				1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	V _{CC}		Min	Max				
1 T _c = 25°C	V _{OL}	3007	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	20 mA	2.0 V	4.5 V	1Y		0.5	V		
			2	2.0 V	0.8 V													2.0 V		1Y				
			3		2.0 V													0.8 V		1Y				
			4			0.8 V					20 mA							2.0 V		2Y				
			5			2.0 V			0.8 V											2Y				
			6						2.0 V	0.8 V										2Y				
			7							2.0 V	0.8 V			20 mA	0.8 V					3Y				
			8												2.0 V	0.8 V				3Y				
			9												2.0 V	2.0 V	0.8 V			3Y				
	I _{CEX}			10			GND	GND	GND	5.5 V			GND	GND	GND	5.5 V			1Y		250	μA		
				11	GND	GND	2.0 V	2.0 V	2.0 V					GND	GND	GND		GND		2Y				
				12	GND		GND	GND	GND			5.5 V		5.5 V	2.0 V	2.0 V	2.0 V			3Y				
	I _{IH1}	3010		13	2.7 V								GND	GND	GND			5.5 V	1A		50	μA		
				14	GND	2.7 V														1B				
				15		GND	2.7 V														2A			
				16				2.7 V													2B			
				17				GND	2.7 V												2C			
				18						2.7 V					2.7 V						3A			
				19											GND	2.7 V					3B			
	20												GND	2.7 V				3C						
	21															2.7 V		1C						
I _{IH2}			22	5.5 V												GND		1A		1.0	mA			
			23	GND	5.5 V														1B					
			24		GND	5.5 V														2A				
			25			5.5 V														2B				
			26				5.5 V													2C				
			27					5.5 V						5.5 V						3A				
			28											GND	5.5 V					3B				
			29												GND	5.5 V				3C				
			30													GND	5.5 V			1C				
			I _{IL}	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	-1.0	-2.0
32	5.5 V	0.5 V				5.5 V														1B				
33		5.5 V				0.5 V															2A			
34						5.5 V															2B			
35							5.5 V														2C			
36								5.5 V													3A			
37									5.5 V												3B			
38																					3C			
39																					1C			
I _{CCH}	3005	40												5.5 V		5.5 V		V _{CC}		19.5				
I _{CCL}	3005	41	GND	GND	GND	GND	GND					GND	GND	GND		GND		V _{CC}		42				

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

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,C,D Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits		Unit			
				1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	V _{CC}		Min	Max				
1 T _C = 25°C	V _{IC}		42	-18 mA							GND						4.5 V	1A		-1.2	V			
			43		-18 mA														1B					
			44				-18 mA													2A				
			45						-18 mA												2B			
			46								-18 mA										2C			
			47											-18 mA							3A			
			48												-18 mA						3B			
49													-18 mA					3C						
50																-18 mA		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. 3)	51	IN	2.7 V					GND					OUT	2.7 V	5.0 V	1Y	2.0	12.0	ns			
			52			IN	2.7 V	2.7 V	2.7 V	OUT										2Y				
			53									OUT	IN	2.7 V	2.7 V					3Y				
10 T _C = 125°C	t _{PHL}		54	IN	2.7 V										OUT	2.7 V			1Y		15.0			
			55			IN	2.7 V	2.7 V	2.7 V	OUT										2Y				
			56									OUT	IN	2.7 V	2.7 V					3Y				
10 T _C = 125°C	t _{PLH}		57	IN	2.7 V										OUT	2.7 V			1Y		16.0			
			58			IN	2.7 V	2.7 V	2.7 V	OUT										2Y				
			59									OUT	IN	2.7 V	2.7 V					3Y				
10 T _C = 125°C	t _{PLH}		60	IN	2.7 V										OUT	2.7 V			1Y		16.0			
			61			IN	2.7 V	2.7 V	2.7 V	OUT										2Y				
			62									OUT	IN	2.7 V	2.7 V					3Y				
11	Same tests, terminal conditions, and limits as for subgroup 10, except T _C = -55°C.																							

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 2, X 1/ Test no.	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			
				1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	V _{CC}						
1 T _c = 25°C	V _{OH}	3006	1	2.0 V	2.0 V	-1 mA	5.5 V	5.5 V											1Y	2.5		V	
			2	5.5 V	5.5 V		2.0 V	2.0 V	-1 mA											2Y			
			3				5.5 V	5.5 V					-1 mA							3Y			
			4																	4Y			
	V _{OL}	3007	5	0.8 V		20 mA													1Y		0.5		
			6	5.5 V	0.8 V	20 mA													1Y				
			7		5.5 V			0.8 V												2Y			
			8					5.5 V												2Y			
			9						0.8 V											3Y			
			10							0.8 V										3Y			
			11											20 mA						4Y			
			12																	4Y			
	V _{IC}		13	-18 mA															1A		-1.2		
			14		-18 mA														1B				
			15																2A				
			16																2B				
			17																3A				
			18																3B				
			19																4A				
			20																4B				
	I _{IH1}	3010	21	2.7 V	GND			GND	GND										1A		50	μA	
			22	GND	2.7 V			GND											1B				
			23		GND			2.7 V											2A				
			24					GND											2B				
			25						2.7 V										3A				
			26							GND									3B				
			27																4A				
			28																4B				
I _{IH2}		29	5.5 V															1A		1.0	mA		
		30	GND	5.5 V														1B					
		31		GND														2A					
		32																2B					
		33																3A					
		34																3B					
		35																4A					
		36																4B					
I _{IL}	3009	37	0.5 V	5.5 V			5.5 V	5.5 V										1A	-1.0	-2.0			
		38	5.5 V	0.5 V			5.5 V											1B					
		39		5.5 V			0.5 V											2A					
		40					5.5 V											2B					
		41						0.5 V										3A					
		42						5.5 V										3B					
		43																4A					
		44																4B					
I _{OS}	3011	45			GND		GND	GND										1Y	-40	-100			
		46	GND	GND			5.5 V	5.5 V	GND									2Y					
		47					GND	GND										3Y					
		48					GND	GND										4Y					
I _{CCH}	3005	49	5.5 V	5.5 V		5.5 V	5.5 V										V _{CC}		32	mA			
I _{CCL}	3005	50	GND	GND		GND	GND										V _{CC}		57	mA			

See footnotes at end of device type 03.

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			
			Test no.	1A	1B	2A	2B	2C	2Y	GND	3Y	3A	3B	3C	1Y	1C	V _{CC}						
1	I _{CEX}		51	5.5 V										1Y		1.0	mA						
			52	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							3Y					
			54	"			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°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 _{PHL}	3003 (Fig. 3)	55	IN	2.7 V	OUT				GND							5.0 V	1A to 1Y	2.0	11.0	ns		
			56	IN	2.7 V	IN					"							"	1B to 1Y	"	"	"	
			57								"							"	2A to 2Y	"	"	"	
			58				IN	2.7 V	OUT		"							"	2B to 2Y	"	"	"	
			59								"	OUT	IN	2.7 V	2.7 V	IN		"	3A to 3Y	"	"	"	
			60								"	OUT	OUT	IN	2.7 V	IN		"	3B to 3Y	"	"	"	
			61								"					OUT	IN	2.7 V	4A to 4Y	"	"	"	
	62								"					OUT	IN	2.7 V	4B to 4Y	"	"	"			
	t _{PLH}			63	IN	2.7 V	OUT				"							"	1A to 1Y	"	9.0	"	
				64	IN	2.7 V	IN					"							"	1B to 1Y	"	"	"
				65								"							"	2A to 2Y	"	"	"
				66				IN	2.7 V	OUT		"							"	2B to 2Y	"	"	"
				67								"	OUT	IN	2.7 V	2.7 V	IN		"	3A to 3Y	"	"	"
				68								"	OUT	OUT	IN	2.7 V	IN		"	3B to 3Y	"	"	"
69											"					OUT	IN	2.7 V	4A to 4Y	"	"	"	
70								"					OUT	IN	2.7 V	4B to 4Y	"	"	"				
10	t _{PHL}		71	IN	2.7 V	OUT				"							"	1A to 1Y	"	14.0	"		
			72	IN	2.7 V	IN					"							"	1B to 1Y	"	"	"	
			73								"							"	2A to 2Y	"	"	"	
			74				IN	2.7 V	OUT		"							"	2B to 2Y	"	"	"	
			75								"	OUT	IN	2.7 V	2.7 V	IN		"	3A to 3Y	"	"	"	
			76								"	OUT	OUT	IN	2.7 V	IN		"	3B to 3Y	"	"	"	
			77								"					OUT	IN	2.7 V	4A to 4Y	"	"	"	
	78								"					OUT	IN	2.7 V	4B to 4Y	"	"	"			
	t _{PLH}			79	IN	2.7 V	OUT				"							"	1A to 1Y	"	12.0	"	
				80	IN	2.7 V	IN					"							"	1B to 1Y	"	"	"
				81								"							"	2A to 2Y	"	"	"
				82								"							"	2B to 2Y	"	"	"
				83				IN	2.7 V	OUT		"							"	3A to 3Y	"	"	"
				84								"	OUT	IN	2.7 V	2.7 V	IN		"	3B to 3Y	"	"	"
85											"					OUT	IN	2.7 V	4A to 4Y	"	"	"	
86								"					OUT	IN	2.7 V	4B to 4Y	"	"	"				
11	Same tests, terminal conditions and limits as subgroup 10, except T _C = -55°C.																						

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

TABLE III. Group A inspection for device type 04.
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	Measured terminal	Limits		Unit				
				1A	1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	V _{CC}		Min	Max					
1 T _c = 25°C	I _{CEX}		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								2Y					
			3	"	"		5.5 V	5.5 V				"	5.5 V	2.0 V	2.0 V		"	"	"	3Y					
			4	"	"		"	"				"	"	5.5 V	5.5 V	5.5 V	5.5 V	2.0 V	2.0 V	"	4Y				
	V _{OL}	3007		5	0.8 V	"	20 mA	"	"			"		"	"		5.5 V	5.5 V	"	1Y		0.5	V		
				6	5.5 V	0.8 V	20 mA	"	"			"		"	"		"	"	"	"	1Y				
				7	"	5.5 V		0.8 V	"	20 mA			"		"	"		"	"	"	"	2Y			
				8	"	"		5.5 V	0.8 V	20 mA			"		"	"		"	"	"	"	2Y			
				9	"	"		"	5.5 V	"			"	20 mA	0.8 V	"		"	"	"	"	3Y			
				10	"	"		"	"	"			"	20 mA	5.5 V	0.8 V		"	"	"	"	3Y			
				11	"	"		"	"	"			"	"	5.5 V	5.5 V	20 mA	0.8 V	"	"	"	4Y			
				12	"	"		"	"	"			"	"	"	5.5 V	20 mA	0.8 V	0.8 V	"	"	4Y			
	V _{IC}			13	-18 mA						"							"	"	1A		-1.2	"		
				14		-18 mA					"								"	"	1B				
				15							"								"	"	2A				
				16							"								"	"	2B				
				17							"								"	"	3A				
				18							"								"	"	3B				
	I _{IH1}	3010		21	2.7 V	GND		GND	GND		"		GND	GND		GND	GND	5.5 V	"	1A		50	μA		
				22	GND	2.7 V		GND	"	"		"		"	"		"	"	"	"	1B				
				23	"	GND		2.7 V	"	"		"		"	"		"	"	"	"	"	2A			
				24	"	"		GND	2.7 V	"	"		"	"	"		"	"	"	"	"	2B			
				25	"	"		"	"	2.7 V	"		"	"	"		"	"	"	"	"	3A			
				26	"	"		"	"	"	GND		"	"	2.7 V	"	"	"	"	"	"	3B			
				27	"	"		"	"	"	"		"	"	GND	2.7 V	"	"	"	"	"	4A			
				28	"	"		"	"	"	"		"	"	"	GND	"	2.7 V	"	"	"	4B			
	I _{IH2}			29	5.5 V			"	"		"		"	"		"	GND	"	"	1A		1.0	mA		
				30	GND	5.5 V		"	"		"		"	"	"		"	"	"	"	1B				
31				"	GND		"	"		"		"	"	"		"	"	"	"	"	2A				
32				"	"		5.5 V	"	"		"		"	"		"	"	"	"	"	2B				
33				"	"		GND	5.5 V	"	"		"	"	5.5 V	"		"	"	"	"	3A				
34				"	"		"	"	"	"		"	"	GND	5.5 V	"	"	"	"	"	3B				
35				"	"		"	"	"	"		"	"	GND	GND	5.5 V	"	"	"	"	4A				
36				"	"		"	"	"	"		"	"	GND	GND	GND	5.5 V	5.5 V	"	"	4B				
I _{IL}	3009		37	0.5 V	5.5 V		5.5 V	5.5 V		"		5.5 V	5.5 V		5.5 V	"	"	"	1A	-1.0	-2.0	"			
			38	5.5 V	0.5 V		5.5 V	"	"		"		"	"		"	"	"	"	1B					
			39	"	5.5 V		0.5 V	"	"		"		"	"		"	"	"	"	"	2A				
			40	"	"		5.5 V	"	"		"		"	"		"	"	"	"	"	2B				
			41	"	"		"	"	"	"		"	"	"		"	"	"	"	"	3A				
			42	"	"		"	"	"	0.5 V	"		"	"		"	"	"	"	"	3B				
			43	"	"		"	"	"	5.5 V	"		"	0.5 V	0.5 V		"	"	"	"	4A				
			44	"	"		"	"	"	"	"		"	5.5 V	5.5 V		0.5 V	0.5 V	"	"	4B				
I _{CCH}	3005	45	"	"		"	"		"		"	"		"	"	"	"	V _{CC}		32	"				
I _{CCL}	3005	46	GND	GND		GND	GND		"		GND	GND		GND	GND	"	"	V _{CC}		57	"				
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.																								

TABLE III. Group A inspection for device type 04 – 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 Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits		Unit			
				1A	1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	V _{CC}		Min	Max				
9 T _C = 25°C	t _{PHL}	3003 (Fig. 3)	47	IN	2.7 V	OUT	OUT			GND							5.0 V	1A to 1Y	2.0	13.0	ns			
			48	2.7 V	IN	OUT													1B to 1Y					
			49																	2A to 2Y				
			50					IN	2.7 V	2.7 V	IN	OUT	OUT							2B to 2Y				
			51										OUT	IN	2.7 V	2.7 V	IN			3A to 3Y				
			52													OUT	IN	2.7 V		3B to 3Y				
	53																	4A to 4Y						
	54																	4B to 4Y						
	t _{PLH}			55	IN	2.7 V	OUT	OUT												1A to 1Y		14.0		
				56	2.7 V	IN	OUT														1B to 1Y			
				57					IN	2.7 V	2.7 V	IN	OUT	OUT							2A to 2Y			
				58										OUT	IN	2.7 V	2.7 V	IN			2B to 2Y			
59																				3A to 3Y				
60													OUT	IN	2.7 V	2.7 V	IN			3B to 3Y				
61													OUT	IN	2.7 V		4A to 4Y							
62																	4B to 4Y							
10 T _C = 125°C	t _{PHL}		63	IN	2.7 V	OUT	OUT												1A to 1Y		16.0			
			64	2.7 V	IN	OUT														1B to 1Y				
			65					IN	2.7 V	2.7 V	IN	OUT	OUT							2A to 2Y				
			66																	2B to 2Y				
			67										OUT	IN	2.7 V	2.7 V	IN			3A to 3Y				
			68																	3B to 3Y				
	69													OUT	IN	2.7 V		4A to 4Y						
	70																	4B to 4Y						
	t _{PLH}			71	IN	2.7 V	OUT	OUT												1A to 1Y		17.0		
				72	2.7 V	IN	OUT														1B to 1Y			
				73					IN	2.7 V	2.7 V	IN	OUT	OUT							2A to 2Y			
				74																	2B to 2Y			
75													OUT	IN	2.7 V	2.7 V	IN			3A to 3Y				
76																				3B to 3Y				
77													OUT	IN	2.7 V		4A to 4Y							
78																	4B to 4Y							
11	Same tests, terminal conditions and limits as subgroup 10, except T _C = -55°C.																							

5. PACKAGING

5.1 Packaging requirements. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service or Defense Agency, or within the military service's system command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but it is not mandatory)

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

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. PIN and compliance identifier, if applicable (see 1.2).
- c. Requirements for delivery of one copy of the conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.
- d. Requirements for certificate of compliance, if applicable.
- e. Requirements for notification of change of product or process to contracting activity in addition to notification to the qualifying activity, if applicable.
- f. Requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), corrective action, and reporting of results, if applicable.
- g. Requirements for product assurance options.
- h. Requirements for special carriers, lead lengths, or lead forming, if applicable. These requirements should not affect the part number. Unless otherwise specified, these requirements will not apply to direct purchase by or direct shipment to the Government.
- i. Requirements for "JAN" marking.
- j. Packaging requirements (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List QML-38535 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DSCC-VQ, 3990 E. Broad Street, Columbus, Ohio 43123-1199.

6.4 Superseding information. The requirements of MIL-M-38510 have been superseded to take advantage of the available Qualified Manufacturer Listing (QML) system provided by MIL-PRF-38535. Previous references to MIL-M-38510 in this document have been replaced by appropriate references to MIL-PRF-38535. All technical requirements now consist of this specification and MIL-PRF-38535. The MIL-M-38510 specification sheet number and PIN have been retained to avoid adversely impacting existing government logistics systems and contractor's parts lists.

6.5 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535, MIL-HDBK-1331, and as follows:

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

6.6 Logistic support. Lead materials and finishes (see 3.4) 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 A (see 3.4). Longer length leads and lead forming should not affect the part number.

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6.7 Substitutability. The cross-reference information below is presented for the convenience of users. Microcircuits covered by this specification will functionally replace the listed generic-industry type. Generic-industry microcircuit types may not have equivalent operational performance characteristics across military temperature ranges or reliability factors equivalent to MIL-M-38510 device types and may have slight physical variations in relation to case size. The presence of this information should 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-PRF-38535.

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

6.8 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
01	X	X	X	X
02				
03	X	X	X	X
04				

6.9 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship; to the last previous issue.

Custodians:
 Army - CR
 Navy - EC
 Air Force - 11
 DLA - CC

Preparing activity:
 DLA - CC
 (Project 5962-2006-005)

Review activities:
 Army - MI, SM
 Navy - AS, CG, MC, SH, TD
 Air Force - 03, 19, 99

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.