INCH-POUND

MIL-M-38510/313B
23 May 2003
SUPERSEDING
MIL-M-38510/313A
22 July 1983

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, BIPOLAR LOW-POWER SCHOTTKY TTL, SCHMITT TRIGGER POSITIVE NAND GATES AND INVERTERS, MONOLITHIC SILICON

Inactive for new design after 18 April 1997.

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, low-power Schottky TTL, Schmitt trigger positive NAND gate and inverter 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 For this product, the requirements of MIL-M-38510 have been superseded by MIL-PRF-38535, (see 6.3).

1.2 Part number. The part number should be in accordance with MIL-PRF-38535, and as specified herein.

1.2.1 Device types. The device types should be as follows:

Device type	Circuit
01	Dual 4 input, Schmitt trigger positive NAND gate
02	Hex Schmitt trigger inverter
03	Quad 2 input Schmitt trigger positive NAND gate

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

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

Outline letter	Descriptive designator	Terminals	Package style
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 leadless chip carrier
2	CQCC1-N20	20	Square leadless chip carrier

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAS, P. O. Box 3990, Columbus, OH 43216-5000, by using the self addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5962

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

1.3 Absolute maximum ratings.

Supply voltage range .... -0.5 V dc to +7.0 V dc
Input voltage range .... -1.5 V dc at -18 mA to +5.5 V dc
Storage temperature range .... -65° to +150°C
Maximum power dissipation, (P_D) 1/
  Device type 01 .... 38.5 mW dc
  Device type 02 .... 115.5 mW dc
  Device type 03 .... 77 mW dc
Lead temperature (soldering, 10 seconds) .... +300°C
Thermal resistance, junction to case (θ_{JC}):
  Cases A, B, C, D, X, and 2 .... (See MIL-STD-1835)
Junction temperature (T_J) 2/ .... +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}) .... +1.4 V dc
Maximum low level input voltage (V_{IL}) .... +1.0 V dc
Normalized fanout (each output) 3/ .... 10 maximum
Case operating temperature range (T_C) .... -55° to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 shall be those listed in the issue of the Departments of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

DEPARTMENT OF DEFENSE

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

STANDARDS

DEPARTMENT OF DEFENSE

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

(Unless otherwise indicated, copies of the above specifications and standards are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

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1/ Must withstand the added P_D due to short-circuit test (e.g., I_{OS}).
2/ Maximum junction temperature shall not be exceeded except in accordance with allowable short duration burn-in screening condition in accordance with MIL-PRF-38535.
3/ The device shall fanout in both high and low levels to the specified number of inputs of the same device type as that being tested.

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 6.4).

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 Terminal connections and logic diagrams. The terminal connections and logic diagrams shall be as specified on figure 1.

3.3.2 Truth tables. The truth tables shall be as specified on figure 2.

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

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

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 quality 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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \leq T_C \leq +125°C$ unless otherwise specified	Device types	Limits		Unit
				Min	Max	
Positive going threshold voltage	V_{T+}	V_{CC} = +5.0 V	All	1.4	1.9	V
Negative going threshold voltage	V_{T-}	V_{CC} = +5.0 V	All	0.5	1.0	V
Hysteresis	H	V_{CC} = +5.0 V	All	0.4	1.4	V
High level output voltage	V_{OH1}	V_{CC} = +4.5 V, I_{OH} = -.4 mA, V_{IN} = +0.5 V	All	2.5		V
Low level output voltage	V_{OL1}	V_{CC} = +4.5 V, I_{OL} = +4 mA, V_{IN} = +1.9 V	All		0.4	V
High level output voltage	V_{OH2}	V_{CC} = +5.0 V, I_{OH} = -.4 mA, V_{IN} = +0.5 V, then +1.4 V	All	2.5		V
Low level output voltage	V_{OL2}	V_{CC} = +5.0 V, I_{OL} = +4 mA, V_{IN} = +1.9 V, then +1.0 V	All		0.4	V
Input clamp voltage	V_{IC}	V_{CC} = +4.5 V, I_{IN} = -18 mA, T_C = +25°C	All		-1.5	V
High level input current	I_{IH1}	V_{CC} = +5.5 V, V_{IN} = +2.7 V	All		20	μA
	I_{IH2}	V_{CC} = +5.5 V, V_{IH} = +5.5 V	All		100	μA
Low level input current 1/	I_{IL}	V_{CC} = +5.5 V, V_{IN} = +0.4 V	All	-.12	-.36	mA
Short circuit output current	I_{OS}	V_{CC} = +5.5 V, V_{IN} = GND 2/	All	-15	-100	mA
High level supply current (total)	I_{CCH}	V_{CC} = +5.5 V, V_{IN} = GND	01		6.0	mA
			02		16.0	
			03		11.0	
Low level supply current (total)	I_{CCL}	V_{CC} = +5.5 V, V_{IN} = 5.5 V	01		7.0	mA
			02		21.0	
			03		14.0	
Propagation delay time high to low level	t_{PHL}	V_{CC} = +5.0 V, R_L = 2 kΩ ±10% C_L = 50 pF ±10%,	All	5	52	ns
Propagation delay time low to high level	t_{PLH}		All	5	52	ns

1/ For CKT E, device type 03, I_{IL} limits are -.17 mA min and -.41 mA max.

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

TABLE II. Electrical test requirements.

MIL-PRF-38535 test requirements	Subgroups (see table III)	
	Class S devices	Class B devices
Interim electrical parameters	1	1
Final electrical test parameters	1*, 2, 3, 9	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.

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

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 and 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.

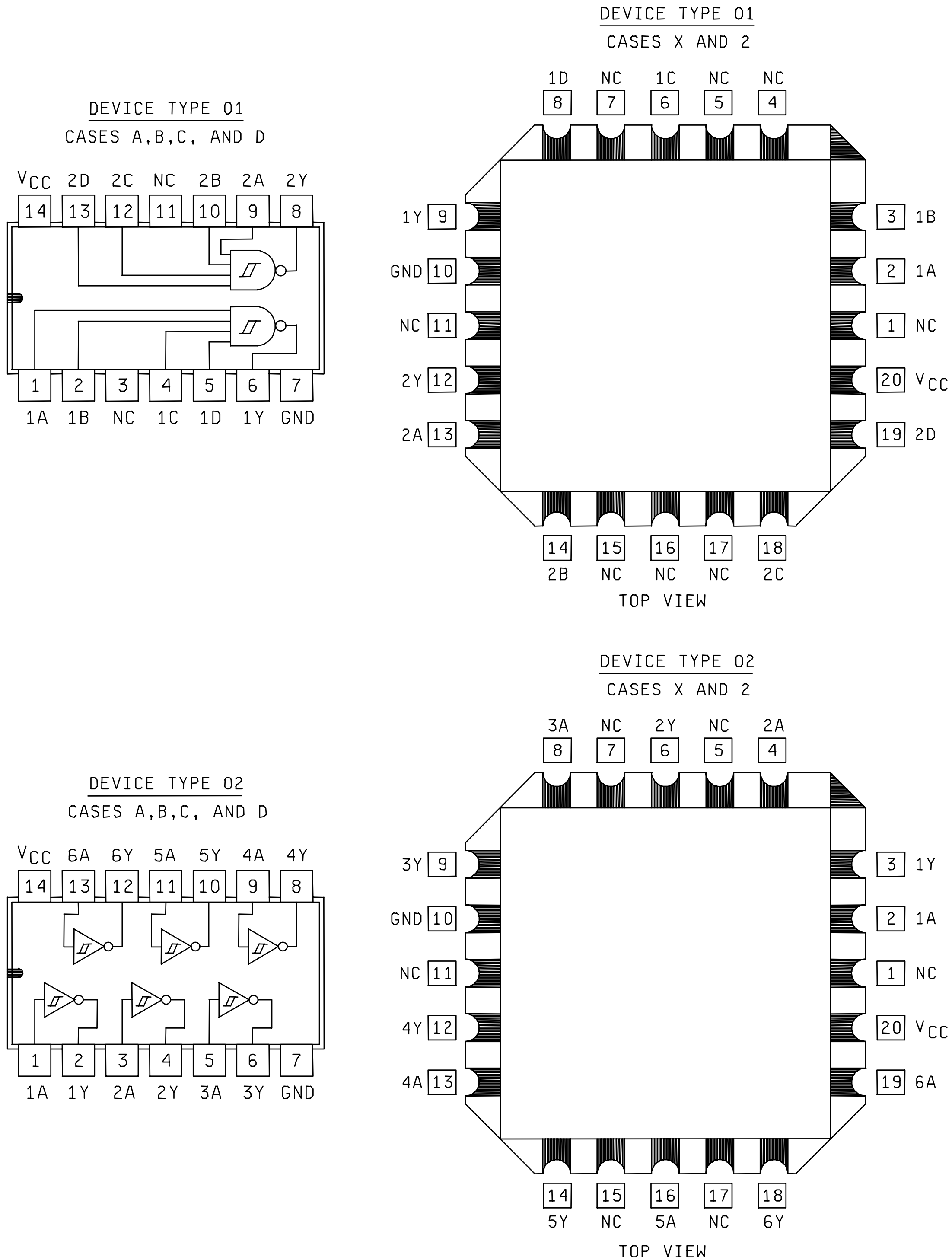


FIGURE 1. Terminal connections and logic diagrams.

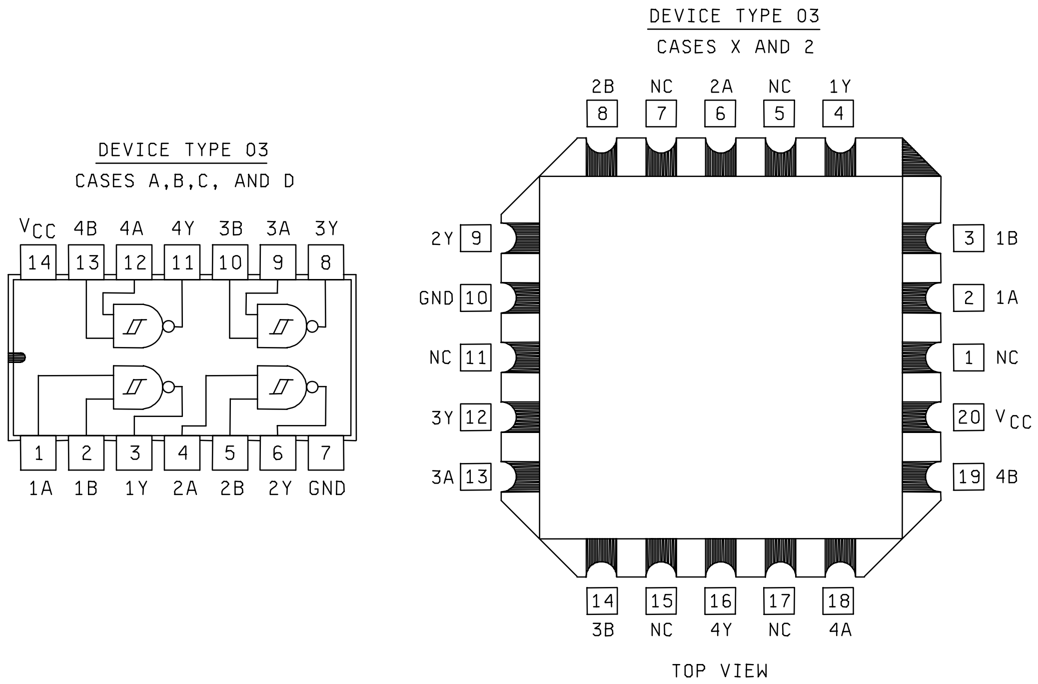


FIGURE 1. Terminal connections and logic diagrams - Continued.

Device type 01

Truth table				
Input				Output
A	B	C	D	Y
L	L	L	L	H
H	L	L	L	H
L	H	L	L	H
H	H	L	L	H
L	L	H	L	H
H	L	H	L	H
L	H	H	L	H
H	H	H	L	H
L	L	L	H	H
H	L	L	H	H
L	H	L	H	H
H	H	L	H	H
L	L	H	H	H
H	L	H	H	H
L	H	H	H	H
H	H	H	H	L

Positive logic $Y = \overline{ABCD}$

Device type 02

Truth table each gate	
Input	Output
A	Y
L	H
H	L

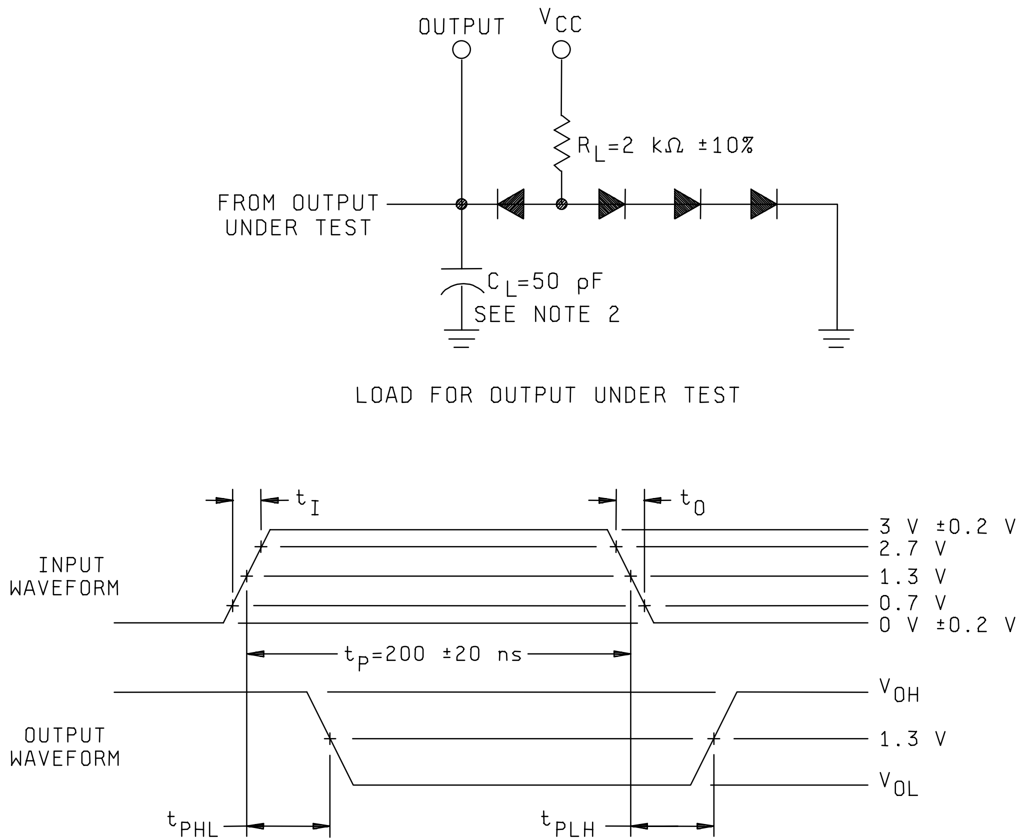
Positive logic $Y = \overline{A}$

Device type 03

Truth table each gate		
Input		Output
A	B	Y
L	L	H
H	L	H
L	H	H
H	H	L

Positive logic $Y = \overline{AB}$

FIGURE 2. Truth tables and logic equations.



NOTES:

1. Pulse generator characteristics: PRR ≤ 1 MHz, t_I ≤ 15 ns, t_O ≤ 6 ns, and $Z_{OUT} \approx 50\Omega$.
2. C_L = 50 pF ±10% including probe and jig capacitance. All diodes are 1N3064 or equivalent.

FIGURE 3. Switching time test circuit and waveforms.

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

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 X, 2 2/	2	3	4	6	8	9	10	12	13	14	16	18	19	20				
			Test no.	1A	1B	NC	1C	1D	1Y	GND	2Y	2A	2B	NC	2C	2D	V_{CC}		Min	Max	
1	V_{OH1}	3006	1	0.5 V	1.9 V		1.9 V	1.9 V	-.4 mA	GND							4.5 V	1Y	2.5		V
Tc = 25°C		"	2	1.9 V	0.5 V		1.9 V	"	"	“							"	1Y	"		"
		"	3	"	1.9 V		0.5 V	"	"	“							"	1Y	"		"
		"	4	"	1.9 V		1.9 V	0.5 V	"	“							"	1Y	"		"
		"	5							"	-.4 mA	0.5 V	1.9 V		1.9 V	1.9 V	"	2Y	"		"
		"	6							"	"	1.9 V	0.5 V		1.9 V	"	"	2Y	"		"
		"	7							“	"	"	1.9 V		0.5 V	"	"	2Y	"		"
		"	8							“	"	"	1.9 V		1.9 V	0.5 V	"	2Y	"		"
	V_{OL1}	3007	9	1.9 V	1.9 V		1.9 V	1.9 V	4 mA	“							"	1Y		0.4	"
		3007	10							“	4 mA	1.9 V	1.9 V		1.9 V	1.9 V	"	2Y		0.4	"
	V_{OH2}	3006	11	3/	1.9 V		1.9 V	1.9 V	-.4 mA	"							5.0 V	1Y	2.5		"
		"	12	1.9 V	3/		1.9 V	"	"	“							"	1Y	"		"
		"	13	"	1.9 V		3/	"	"	“							"	1Y	"		"
		"	14	"	1.9 V		1.9 V	3/	"	“							"	1Y	"		"
		"	15							"	-.4 mA	3/	1.9 V		1.9 V	1.9 V	"	2Y	"		"
		"	16							"	"	1.9 V	3/		1.9 V	"	"	2Y	"		"
		"	17							“	"	"	1.9 V		3/	"	"	2Y	"		"
		"	18							“	"	"	1.9 V		1.9 V	3/	"	2Y	"		"
	V_{OL2}	3007	19	4/	4/		4/	4/	4 mA	“							"	1Y		0.4	"
		3007	20							“	4 mA	4/	4/		4/	4/	"	2Y		0.4	"
	V_{IC}		21	-18 mA						“							4.5 V	1A		-1.5	"
			22		-18 mA					“							"	1B		"	"
			23				-18 mA			“							"	1C		"	"
			24					-18 mA		“							"	1D		"	"
			25							“		-18 mA					"	2A		"	"
			26							“			-18 mA				"	2B		"	"
			27							“					-18 mA		"	2C		"	"
			28							“						-18 mA	"	2D		"	"
	I_{IH1}	3010	29	2.7 V	GND		GND	GND		“							5.5 V	1A		20	μA
		"	30	GND	2.7 V		GND	"		“							"	1B		"	"
		"	31	"	GND		2.7 V	"		“							"	1C		"	"
		"	32	"	GND		GND	2.7 V		“							"	1D		"	"
		"	33							“		2.7 V	GND		GND	GND	"	2A		"	"
		"	34							“		GND	2.7 V		GND	"	"	2B		"	"
		"	35							“		"	GND		2.7 V	"	"	2C		"	"
		"	36							“		"	GND		GND	2.7 V	"	2D		"	"
	I_{IH2}	"	37	5.5 V	GND		GND	GND		“							"	1A		100	"
		"	38	GND	5.5 V		GND	"		“							"	1B		"	"
		"	39	"	GND		5.5 V	"		“							"	1C		"	"
		"	40	"	GND		GND	5.5 V		“							"	1D		"	"
		"	41							“		5.5 V	GND		GND	GND	"	2A		"	"
		"	42							“		GND	5.5 V		GND	"	"	2B		"	"
		"	43							“		"	GND		5.5 V	"	"	2C		"	"
		"	44							“		"	GND		GND	5.5 V	"	2D		"	"

See footnotes at end of table.

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

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 X, 2 2/	2	3	4	6	8	9	10	12	13	14	16	18	19	20				
			Test no.	1A	1B	NC	1C	1D	1Y	GND	2Y	2A	2B	NC	2C	2D	V_{CC}		Min	Max	
1 Tc = 25°C	I_{IL}	3009	45	0.4 V	5.5 V		5.5 V	5.5 V		GND							5.5 V	1A	-.12	-.36	mA
		"	46	5.5 V	0.4 V		5.5 V	"		“							"	1B	"	"	"
		"	47	"	5.5 V		0.4 V	"		"							"	1C	"	"	"
		"	48	"	5.5 V		5.5 V	0.4 V		"							"	1D	"	"	"
		"	49							"		0.4 V	5.5 V		5.5 V	5.5 V	"	2A	"	"	"
		"	50							"		5.5 V	0.4 V		5.5 V	"	"	2B	"	"	"
		"	51							"		"	5.5 V		0.4 V	"	"	2C	"	"	"
		"	52							"		"	5.5 V		5.5 V	0.4 V	"	2D	"	"	"
	I_{OS}	3011	53	GND	GND		GND	GND	GND	"							"	1Y	-15	-100	"
		3011	54							"	GND	GND	GND		GND	GND	"	2Y	-15	-100	
	I_{CCH}	3005	55	GND	GND		GND	GND		“		GND	GND		GND	GND	"	V_{CC}		6.0	"
	I_{CCL}	3005	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	"	V_{CC}		7.0	"
2	Same tests, terminal conditions and limits as for subgroup 1, except T_C = +125°C and V_{IC} tests are omitted.																				
3	Same tests, terminal conditions and limits as for subgroup 1, except T_C = -55°C and V_{IC} tests are omitted.																				
9 Tc = 25°C	t_{PHL}	3003	57	IN	5.0 V		5.0 V	5.0 V	OUT	GND							5.0 V	1A to 1Y	5	32	ns
		Fig. 3	58							“	OUT	IN	5.0 V		5.0 V	5.0 V	"	2A to 2Y	“	“	“
	t_{PLH}	"	59	IN	5.0 V		5.0 V	5.0 V	OUT	"							"	1A to1Y	"	"	"
		"	60							"	OUT	IN	5.0 V		5.0 V	5.0 V	"	2A to 2Y	"	"	"
10 Tc = 125°C	t_{PHL}	"	61	IN	5.0 V		5.0 V	5.0 V	OUT	"							"	1A to 1Y	"	52	"
		"	62							“	OUT	IN	5.0 V		5.0 V	5.0 V	"	2A to 2Y	“	“	“
	t_{PLH}	"	63	IN	5.0 V		5.0 V	5.0 V	OUT	"							"	1A to1Y	"	"	"
		"	64							"	OUT	IN	5.0 V		5.0 V	5.0 V	"	2A to 2Y	"	"	"
11	Same tests, terminal conditions, and limits as for subgroup 10, except T_C = -55°C.																				

1/ Terminal conditions (pins not designated may be H ≥ 1.4 V; L ≤ 1.0 V; or open).

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

3/ Momentary 0.5 V, then 1.4 V without overshoot during test.

4/ Momentary 1.9 V, then 1.0 V without undershoot during test.

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

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 X, 2 2/	2	3	4	6	8	9	10	12	13	14	16	18	19	20				
			Test no.	1A	1Y	2A	2Y	3A	3Y	GND	4Y	4A	5Y	5A	6Y	6A	V_{CC}		Min	Max	
1	V_{OH1}	3006	1	0.5 V	-.4 mA					GND							4.5 V	1Y	2.5		V
Tc = 25°C		"	2			0.5 V	-.4 mA			"							“	2Y	"		“
		"	3					0.5 V	-.4 mA	“							“	3Y	"		“
		"	4							"	-.4 mA	0.5 V					"	4Y	"		"
		"	5							“			-.4 mA	0.5 V			“	5Y	"		"
		"	6							“					-.4 mA	0.5 V	“	6Y	"		“
	V_{OL1}	3007	7							“					4 mA	1.9 V	“	6Y		0.4 V	“
		"	8							“			4 mA	1.9 V			“	5Y		"	“
		"	9							“	4 mA	1.9 V					“	4Y		"	“
		"	10					1.9 V	4 mA	“							“	3Y		"	“
		"	11			1.9 V	4 mA			“							“	2Y		"	"
		"	12	1.9 V	4 mA					“							“	1Y		"	“
	V_{OH2}	3006	13	3/	-.4 mA					"							5.0 V	1Y	2.5		V
		"	14			3/	-.4 mA			"							“	2Y	"		“
		"	15					3/	-.4 mA	“							“	3Y	"		“
		"	16							"	-.4 mA	3/					"	4Y	"		"
		"	17							“			-.4 mA	3/			“	5Y	"		"
		"	18							“					-.4 mA	3/	“	6Y	"		“
	V_{OL2}	3007	19							“					4 mA	4/	“	6Y		0.4 V	“
		"	20							“			4 mA	4/			“	5Y		"	“
		"	21							“	4 mA	4/					“	4Y		"	“
		"	22					4/	4 mA	“							“	3Y		"	“
		"	23			4/	4 mA			“							“	2Y		"	"
		"	24	4/	4 mA					“							“	1Y		"	“
	V_{IC}		25	-18 mA						“							4.5 V	1A		-1.5	“
			26			-18 mA				“							"	2A		"	"
			27					-18 mA		“							“	3A		"	"
			28							“		-18 mA					“	4A		“	“
			29							“				-18 mA			"	5A		"	"
			30							“						-18 mA	"	6A		"	"
	I_{IH1}	3010	31							“						2.7 V	5.5 V	6A		20	µA
		"	32							“				2.7 V			"	5A		“	“
		"	33							“		2.7 V					“	4A		“	“
		"	34					2.7 V		“							“	3A		"	“
		"	35			2.7 V				“							“	2A		"	“
		"	36	2.7 V						“							“	1A		“	“
	I_{IH2}	"	37	5.5 V						“							“	1A		100	“
		"	38			5.5 V				“							“	2A		“	“
		"	39					5.5 V		“							“	3A		"	“
		"	40							“		5.5 V					“	4A		“	“
		"	41							“				5.5 V			“	5A		“	“
		"	42							“						5.5 V	“	6A		“	“
	I_{IL}	3009	43							"						0.4 V	"	6A	-.12	-.36	mA
		"	44							“				0.4 V			“	5A	"	"	“
		"	45							“		0.4 V					“	4A	"	"	“
		"	46					0.4 V		“							“	3A	"	"	"
		"	47			0.4 V				“							“	2A	"	"	"
		"	48	0.4 V						“							“	1A	"	“	“

See footnotes at end of table.

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

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 X, 2 2/	2	3	4	6	8	9	10	12	13	14	16	18	19	20				
			Test no.	1A	1Y	2A	2Y	3A	3Y	GND	4Y	4A	5Y	5A	6Y	6A	V_{CC}		Min	Max	
1 Tc = 25°C	I_{OS}	3011	49	GND	GND					GND							5.5 V	1Y	-15	-100	mA
		"	50			GND	GND			"							"	2Y	"	"	"
		"	51					GND	GND	"							"	3Y	"	"	"
		"	52							"	GND	GND					"	4Y	"	"	"
		"	53							"			GND	GND			"	5Y	"	"	"
		"	54							"					GND	GND	"	6Y	"	"	"
	I_{CCH}	3005	55	GND		GND		GND		"		GND		GND		GND	"	V_{CC}		16	"
	I_{CCL}	3005	56	5.5 V		5.5 V		5.5 V		"		5.5 V		5.5 V		5.5 V	"	V_{CC}		21	"
2	Same tests, terminal conditions and limits as for subgroup 1, except T_C = +125° C, and V_{IC} tests are omitted.																				
3	Same tests, terminal conditions and limits as for subgroup 1, except T_C = -55° C, and V_{IC} tests are omitted.																				
9 Tc = 25°C	t_{PHL}	3003	57	IN	OUT					GND							5.0 V	1A to 1Y	5	32	ns
		Fig. 3	58			IN	OUT			“							“	2A to 2Y	“	“	“
		"	59					IN	OUT	“							“	3A to 3Y	“	“	“
		"	60							“	OUT	IN					“	4A to 4Y	“	“	“
		"	61							"			OUT	IN			"	5A to 5Y	"	"	"
		"	62							“					OUT	IN	“	6A to 6Y	“	“	“
	t_{PLH}	"	63	IN	OUT					“							“	1A to 1Y	“	“	“
		"	64			IN	OUT			“							“	2A to 2Y	“	“	“
		"	65					IN	OUT	"							"	3A to 3Y	"	"	"
		"	66							“	OUT	IN					“	4A to 4Y	“	“	“
		"	67							“			OUT	IN			“	5A to 5Y	“	“	“
		"	68							“					OUT	IN	“	6A to 6Y	“	“	“
10 Tc = 125°C	t_{PHL}	3003	57	IN	OUT					"							"	1A to 1Y	"	52	"
		Fig. 3	58			IN	OUT			“							“	2A to 2Y	“	“	“
		"	59					IN	OUT	“							“	3A to 3Y	“	“	“
		"	60							“	OUT	IN					“	4A to 4Y	“	“	“
		"	61							"			OUT	IN			"	5A to 5Y	"	"	"
		"	62							“					OUT	IN	“	6A to 6Y	“	“	“
	t_{PLH}	"	63	IN	OUT					“							“	1A to 1Y	“	“	“
		"	64			IN	OUT			“							“	2A to 2Y	“	“	“
		"	65					IN	OUT	"							"	3A to 3Y	"	"	"
		"	66							“	OUT	IN					“	4A to 4Y	“	“	“
		"	67							“			OUT	IN			“	5A to 5Y	“	“	“
		"	68							“					OUT	IN	“	6A to 6Y	“	“	“
11	Same tests, terminal conditions, and limits as for subgroup 10, except T_C = -55°C.																				

1/ Terminal conditions (pins not designated may be H ≥ 1.4 V; L ≤ 1.0 V; or open).

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

3/ Momentary 0.5 V, then 1.4 V without overshoot during test.

4/ Momentary 1.9 V, then 1.0 V without undershoot during test.

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

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 X, 2 2/	2	3	4	6	8	9	10	12	13	14	16	18	19	20				
			Test no.	1A	1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	V_{CC}		Min	Max	
1	V_{OH1}	3006	1	0.5 V	1.9 V	-.4 mA				GND							4.5 V	1Y	2.5		V
Tc = 25°C		"	2	1.9 V	0.5 V	-.4 mA				“							"	1Y	"		"
		"	3				0.5 V	1.9 V	-.4 mA	“							"	2Y	"		"
		"	4				1.9 V	0.5 V	-.4 mA	“							"	2Y	"		"
		"	5							"	-.4 mA	0.5 V	1.9 V				"	3Y	"		"
		"	6							"	-.4 mA	1.9 V	0.5 V				"	3Y	"		"
		"	7							“				-.4 mA	0.5 V	1.9 V	"	4Y	"		"
		"	8							“				-.4 mA	1.9 V	0.5 V	"	4Y	"		"
	V_{OL1}	3007	9							“				4 mA	1.9 V	1.9 V	"	4Y		0.4	"
		"	10							“	4 mA	1.9 V	1.9 V				"	3Y		"	"
		"	11				1.9 V	1.9 V	4 mA	"							"	2Y		"	"
		"	12	1.9 V	1.9 V	4 mA				"							"	1Y		"	"
	V_{OH2}	3006	13	3/	1.9 V	-.4 mA				"							5.0 V	1Y	2.5		"
		"	14	1.9 V	3/	-.4 mA				“							"	1Y	"		"
		"	15				3/	1.9 V	-.4 mA	“							"	2Y	"		"
		"	16				1.9 V	3/	-.4 mA	“							"	2Y	"		"
		"	17							"	-.4 mA	3/	1.9 V				"	3Y	"		"
		"	18							"	-.4 mA	1.9 V	3/				"	3Y	"		"
		"	19							“				-.4 mA	3/	1.9 V	"	4Y	"		"
		"	20							“				-.4 mA	1.9 V	3/	"	4Y	"		"
	V_{OL2}	3007	21							“				4 mA	4/	4/	"	4Y		0.4	"
		"	22							"	4 mA	4/	4/				"	3Y		"	"
		"	23				4/	4/	4 mA	"							"	2Y		"	"
		"	24	4/	4/	4 mA				“							"	1Y		"	"
	V_{IC}		25	-18 mA						“							4.5 V	1A		-1.5	"
			26		-18 mA					“							"	1B		"	"
			27				-18 mA			“							"	2A		"	"
			28					-18 mA		“							"	2B		"	"
			29							“		-18 mA					"	3A		"	"
			30							“			-18 mA				"	3B		"	"
			31							“					-18 mA		"	4A		"	"
			32							“						-18 mA	"	4B		"	"
	I_{IH1}	3010	33	2.7 V	GND					“							5.5 V	1A		20	μA
		"	34	GND	2.7 V					“							"	1B		"	"
		"	35				2.7 V	GND		“							"	2A		"	"
		"	36				GND	2.7 V		“							"	2B		"	"
		"	37							“		2.7 V	GND				"	3A		"	"
		"	38							“		GND	2.7 V				"	3B		"	"
		"	39							“					2.7 V	GND	"	4A		"	"
		"	40							“					GND	2.7 V	"	4B		"	"
	I_{IH2}	"	41	5.5 V	GND					“							"	1A		100	"
		"	42	GND	5.5 V					“							"	1B		"	"
		"	43				5.5 V	GND		“							"	2A		"	"
		"	44				GND	5.5 V		“							"	2B		"	"
		"	45							“		5.5 V	GND				"	3A		"	"
		"	46							“		GND	5.5 V				"	3B		"	"
		"	47							“					5.5 V	GND	"	4A		"	"
		"	48							“					GND	5.5 V	"	4B		"	"

See footnotes at end of table.

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

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 X, 2 2/	2	3	4	6	8	9	10	12	13	14	16	18	19	20				
			Test no.	1A	1B	1Y	2A	2B	2Y	GND	3Y	3A	3B	4Y	4A	4B	V_{CC}		Min	Max	
1 Tc = 25°C	I_{IL} 5/	3009	49	0.4 V	5.5 V					GND							5.5 V	1A	-.12	-.36	mA
		"	50	5.5 V	0.4 V					“							"	1B	"	"	"
		"	51				0.4 V	5.5 V		"							"	2A	"	"	"
		"	52				5.5 V	0.4 V		"							"	2B	"	"	"
		"	53							"		0.4 V	5.5 V				"	3A	"	"	"
		"	54							"		5.5 V	0.4 V				"	3B	"	"	"
		"	55							"					0.4 V	5.5 V	"	4A	"	"	"
		"	56							"					5.5 V	0.4 V	"	4B	"	"	"
	I_{OS}	3011	57	GND	GND	GND				"							"	1Y	-15	-100	"
		"	58				GND	GND	GND	"							"	2Y	"	"	"
		"	59							"	GND	GND	GND				"	3Y	"	"	"
		"	60							"				GND	GND	GND	"	4Y	"	"	"
	I_{CCH}	3005	61	GND	GND		GND	GND		“		GND	GND		GND	GND	"	V_{CC}		11.0	"
	I_{CCL}	3005	62	5.5 V	5.5 V		5.5 V	5.5 V		“		5.5 V	5.5 V		5.5 V	5.5 V	"	V_{CC}		14.0	"
2	Same tests, terminal conditions and limits as for subgroup 1, except T_C = +125°C and V_{IC} tests are omitted.																				
3	Same tests, terminal conditions and limits as for subgroup 1, except T_C = -55°C and V_{IC} tests are omitted.																				
9 Tc = 25°C	t_{PHL}	3003	63	IN	5.0 V	OUT				GND							5.0 V	1A to 1Y	5	32	ns
		Fig. 3	64				IN	5.0 V	OUT	“							"	2A to 2Y	“	“	“
		"	65							"	OUT	IN	5.0 V				"	3A to 3Y	"	"	"
		"	66							"				OUT	IN	5.0 V	"	4A to 4Y	"	"	"
	t_{PLH}	"	67	IN	5.0 V	OUT				"							"	1A to 1Y	"	"	"
		"	68				IN	5.0 V	OUT	“							"	2A to 2Y	“	“	“
		"	69							"	OUT	IN	5.0 V				"	3A to 3Y	"	"	"
		"	70							"				OUT	IN	5.0 V	"	4A to 4Y	"	"	"
10 Tc = 125°C	t_{PHL}	"	71	IN	5.0 V	OUT				"							"	1A to 1Y	"	52	"
		"	72				IN	5.0 V	OUT	“							"	2A to 2Y	“	“	“
		"	73							"	OUT	IN	5.0 V				"	3A to 3Y	"	"	"
		"	74							"				OUT	IN	5.0 V	"	4A to 4Y	"	"	"
	t_{PLH}	"	75	IN	5.0 V	OUT				"							"	1A to 1Y	"	"	"
		"	76				IN	5.0 V	OUT	“							"	2A to 2Y	“	“	“
		"	77							"	OUT	IN	5.0 V				"	3A to 3Y	"	"	"
		"	78							"				OUT	IN	5.0 V	"	4A to 4Y	"	"	"
11	Same tests, terminal conditions, and limits as for subgroup 10, except T_C = -55°C.																				

1/ Terminal conditions (pins not designated may be H ≥ 1.4 V; L ≤ 1.0 V; or open).

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

3/ Momentary 0.5 V, then 1.4 V without overshoot during test.

4/ Momentary 1.9 V, then 1.0 V without undershoot during test.

5/ For CKT E I_{IL} limits are as follows, -0.17 to -0.41 mA.

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 actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department of Defense Agency, or within the Military Department'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 which may be helpful, but is not mandatory.)

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

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of the specification.

b. Complete part number (see 1.2).

c. 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.

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.

j. Requirements for "JAN" marking.

6.3 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.

6.4 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.

6.5 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
I_{IN} .... Current flowing into an input terminal
V_{IN} .... Voltage level at 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.

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.

Military device type	Generic-industry type
01	54LS13
02	54LS14
03	54LS132

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

TABLE IV. Manufacturers' designations.

Device type	Circuits				
	A	B	C	D	E
	Texas Instruments	Signetics Corp.	Motorola Inc.	Raytheon Co.	National Semiconductor Corp.
01	X	X	X	X	
02	X	X	X	X	X
03	X	X	X	X	X

6.9 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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

Preparing activity:
DLA - CC

(Project 5962-1962)

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

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-M-38510/313B	2. DOCUMENT DATE *(YYYYMMDD)* 2003-05-23

3. DOCUMENT TITLE
MICROCIRCUITS, DIGITAL, LOW-POWER SCHOTTKY TTL, SCHMITT TRIGGER POSITIVE NAND GATE AND INVERTER, MONOLITHIC SILICON

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include Zip Code)*	d. TELEPHONE *(Include Area Code)* (1) Commercial (2) DSN *(If applicable)*	7. DATE SUBMITTED *(YYYYMMDD)*

8. PREPARING ACTIVITY

a. NAME Defense Supply Center, Columbus	b. TELEPHONE *(Include Area Code* (1) Commercial 614-692-0536 (2) DSN 850-0536
c. ADDRESS *(Include Zip Code)* DSCC-VA P. O. Box 3990 Columbus, Ohio 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703)767-6888 DSN 427-6888