

INCH-POUND

MIL-M-38510/311C

25 April 2003

SUPERSEDING

MIL-M-38510/311B

28 February 1984

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, BIPOLAR, LOW-POWER SCHOTTKY TTL,
MAGNITUDE COMPARATORS, 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, magnitude comparator 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 For this product, the requirements of MIL-M-38510 have been superseded by MIL-PRF-38535, (see 6.3).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:

<u>Device type</u>	<u>Circuit</u>
01	4-bit comparator

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:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
E	GDIP1-T16 or CDIP2-T16	16	Dual-in-line
F	GDFP2-F16 or CDFP3-F16	16	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.

MIL-M-38510/311C

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) <u>1/</u>	110 mW dc
Lead temperature (soldering, 10 seconds)	300°C
Thermal resistance, junction to case (θ _{JC}):	
Cases E, F, X, and 2	(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})	0.7 V dc
Normalized fanout (each output)	10 maximum
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 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.

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 for allowable short duration burn-in screening conditions in accordance with MIL-PRF-38535.

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

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

3.3.3 Logic diagram. The logic diagram shall be specified on figure 3.

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.

3.3.5 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 11 (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, appendix B.

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

MIL-M-38510/311C

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C	Limits		Unit
			Min	Max	
High level output voltage	V _{OH}	V _{CC} = 4.5 V, V _{IH} = 2.0 V V _{IL} = 0.7 V, I _{OH} = -400 μA <u>1/</u>	2.5		V
Low level output voltage	V _{OL}	V _{CC} = 4.5 V, V _{IH} = 2.0 V V _{IL} = 0.7 V, I _{OL} = 4 mA <u>1/</u>		0.4	V
Input clamp voltage	V _{IC}	V _{CC} = 4.5 V, I _{IN} = -18 mA, T _C = +25°C		-1.5	V
High level input current (A < B, A > B inputs)	I _{IH1}	V _{CC} = 5.5 V, V _{IN} = 2.7 V		20	μA
High level input current (all other inputs)	I _{IH2}	V _{CC} = 5.5 V, V _{IN} = 2.7 V		60	μA
High level input current (A < B, A > B inputs)	I _{IH3}	V _{CC} = 5.5 V, V _{IN} = 5.5 V		100	μA
High level input current (all other inputs)	I _{IH4}	V _{CC} = 5.5 V, V _{IN} = 5.5 V		300	μA
Low level input current (A < B, A > B inputs)	I _{IL1}	V _{CC} = 5.5 V, V _{IN} = 0.4 V	-0.0005	-0.42	mA
Low level input current (all other inputs)	I _{IL2}	V _{CC} = 5.5 V, V _{IN} = 0.4 V	-0.03	-1.3	mA
Short circuit output current	I _{OS}	V _{CC} = 5.5 V <u>1/</u> , <u>2/</u>	-15	-130	mA
Supply current	I _{CC}	V _{CC} = 5.5 V <u>3/</u>		20	mA
Propagation delay from any A or B input to A < B or A > B outputs	t _{PLH1}	C _L = 50 pF ±10%, 3 gate levels <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	42	ns
Propagation delay from any A or B input to A > B output	t _{PLH2}	C _L = 50 pF ±10%, 3 gate levels <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	42	ns
Propagation delay from A < B or A < B or A = B input to A > B output	t _{PLH3}	C _L = 50 pF ±10%, 2 gate levels <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	25	ns
Propagation delay from A = B input to A = B outputs	t _{PLH4}	C _L = 50 pF ±10%, 1 gate level <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	28	ns
Propagation delay from A > B or A = B input to A < B output	t _{PLH5}	C _L = 50 pF ±10%, 2 gate levels <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	30	ns

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C	Limits		Unit
			Min	Max	
Propagation delay from any A or B input to A > B or A < B outputs	t _{PHL1}	C _L = 50 pF ±10%, 3 gate levels <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	42	ns
Propagation delay from any A or B input to A = B output	t _{PHL2}	C _L = 50 pF ±10%, 3 gate levels <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	39	ns
Propagation delay from A < B or A = B inputs to A > B output	t _{PHL3}	C _L = 50 pF ±10%, 2 gate levels <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	28	ns
Propagation delay from A = B input to A = B output	t _{PHL4}	C _L = 50 pF ±10%, 1 gate level <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	36	ns
Propagation delay from A > B or A = B input to A < B output	t _{PHL5}	C _L = 50 pF ±10%, 2 gate levels <u>4/</u> , <u>5/</u> R _L = 2 kΩ	2	26	ns

1/ All unspecified inputs grounded.

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

3/ I_{CC} is measured with outputs open, A = B grounded, and all other inputs at 4.5 V.

4/ The longest gate level propagation delay paths are not tested (5 gate levels); however, they can be calculated:
t = t_{p1} maximum + t_{p2} maximum - t_{p4} minimum.

5/ Gate level references are made with respect to the logic diagram.

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, 7, 9, 10, 11	1*, 2, 3, 7, 9
Group A test requirements	1, 2, 3, 7, 8, 9, 10, 11	1, 2, 3, 7, 8, 9, 10, 11
Group B electrical test parameters when using method 5005 QCI option	1, 2, 3, 7, 8 9, 10, 11	N/A
Group C end-point electrical parameters	1, 2, 3, 7, 8 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, and 6 shall be omitted.

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II 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.

MIL-M-38510/311C

DEVICE TYPE 01
CASES E AND F

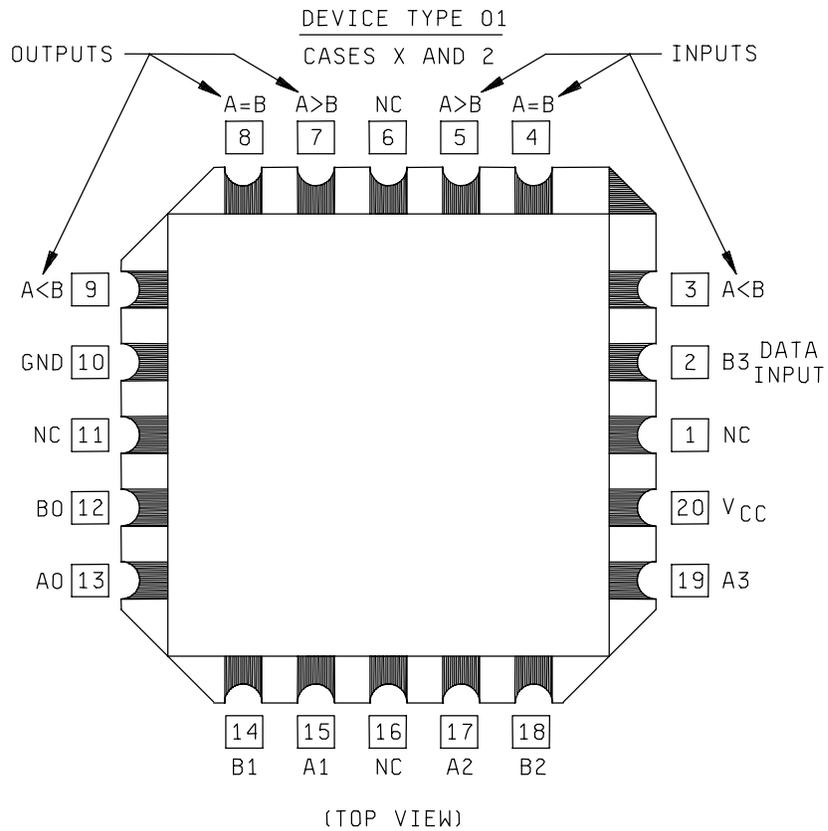
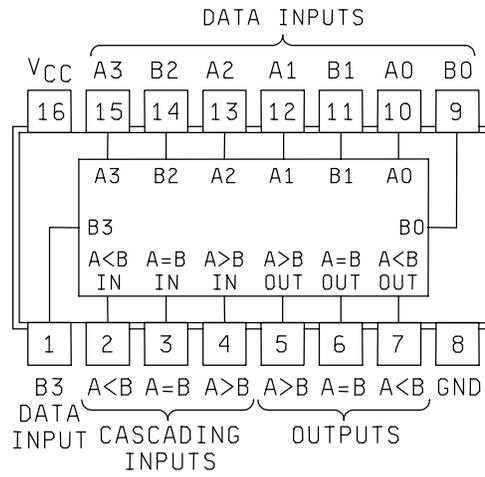


FIGURE 1. Terminal connections.

Device type 01

COMPARING INPUTS				CASCADING INPUTS			OUTPUTS		
A3, B3	A2, B2	A1, B1	A0, B0	A > B	A < B	A = B	A > B	A < B	A = B
A3 > B3	X	X	X	X	X	X	H	L	L
A3 < B3	X	X	X	X	X	X	L	H	L
A3 = B3	A2 > B2	X	X	X	X	X	H	L	L
A3 = B3	A2 < B2	X	X	X	X	X	L	H	L
A3 = B3	A2 = B2	A1 > B1	X	X	X	X	H	L	L
A3 = B3	A2 = B2	A1 < B1	X	X	X	X	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 > B0	X	X	X	H	L	L
A3 = B3	A2 = B2	A1 = B1	A0 < B0	X	X	X	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	L	L	H	L	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	H	L	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	X	X	H	L	L	H
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	H	L	L	L	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	L	L	H	H	L

FIGURE 2. Truth table.

Device type 01

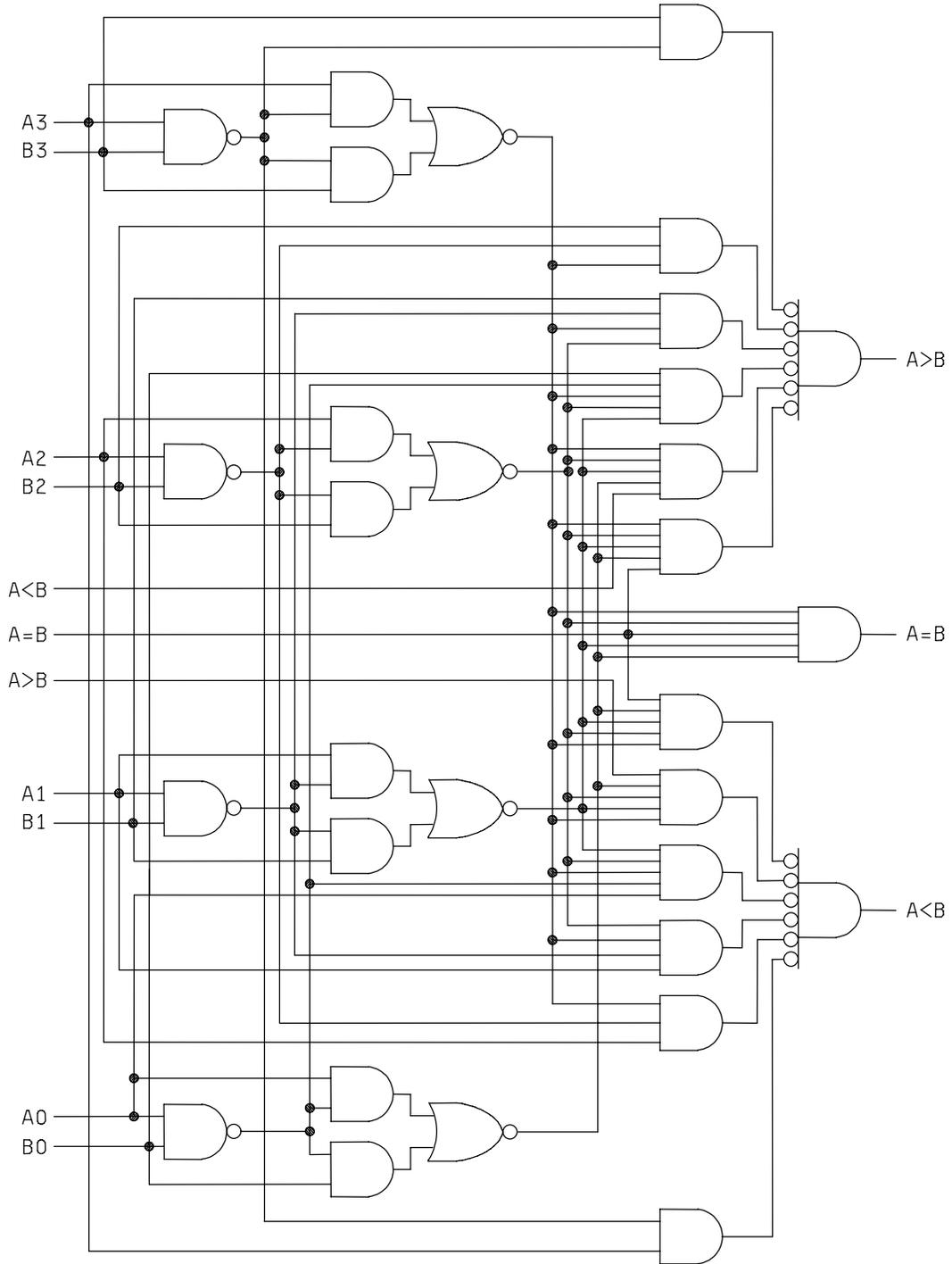
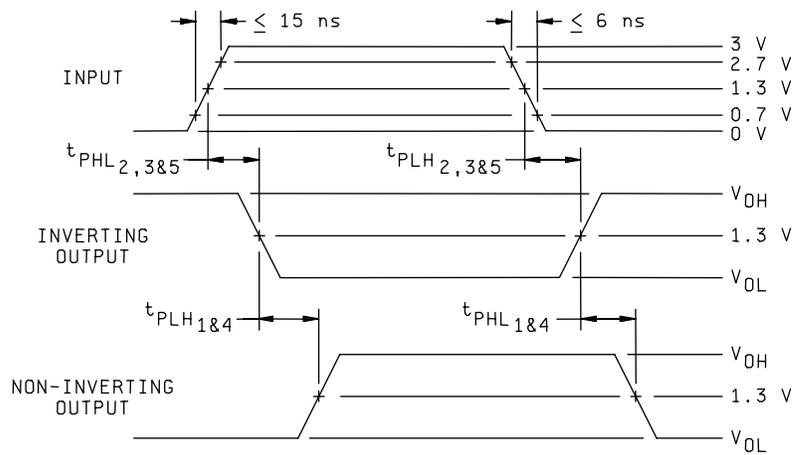
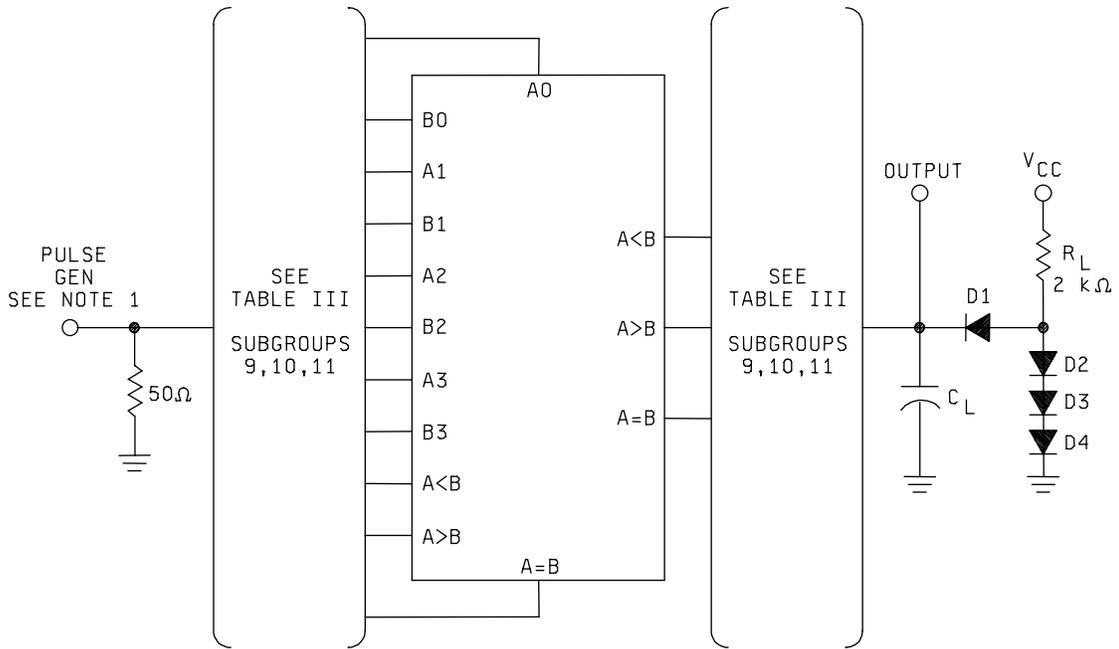


FIGURE 3. Logic diagram.



NOTES:

1. The pulse generator has the following characteristics: $V_{gen} = 3.0 \text{ V}$, $t_1 \leq 15 \text{ ns}$, $t_0 \leq 6 \text{ ns}$, $t_p = 500 \text{ ns}$, $PRR \leq 1.0 \text{ MHz}$, and $Z_{OUT} \approx 50\Omega$.
2. $C_L = 50 \text{ pF} \pm 10\%$ and includes probe and jig capacitance.
3. All diodes are 1N3064, or equivalent.

FIGURE 4. Switching time test circuit.

TABLE III. Group A inspection for device type 01.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 method	Cases E, F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Measured terminal	Limits		Unit				
			Cases 1/2, X	2	3	4	5	7	8	9	10	12	13	14	15	17	18	19	20		Min	Max					
			Test no.	B3	A < B IN	A = B IN	A > B IN	A > B OUT	A = B OUT	A < B OUT	GND	B0	A0	B1	A1	A2	B2	A3	V _{cc}								
1 T _c = 25°C	V _{OH}	3006	1	0.7 V	0.7 V	0.7 V		-400 μ A			GND	0.7 V	GND	0.7 V	GND	GND	0.7 V	GND	4.5 V	A > B OUT	2.5		V				
			2	"		2.0 V			-400 μ A			"	"	0.7 V	"	0.7 V	"	"	"	"	A = B OUT	"		"			
			3	GND		0.7 V	0.7 V					GND		GND			GND			"	A < B OUT	"		"			
	V _{OL}	3007	4	2.0 V	2.0 V	GND		4 mA			"	2.0 V	2.0 V	2.0 V	2.0 V	2.0 V	2.0 V	2.0 V	"	A > B OUT		0.4	"				
			5	"		0.7 V				4 mA		"	"	"	"	"	"	"	"	"	A = B OUT	"		"			
			6	0.7 V		2.0 V	GND					4 mA	"	0.7 V	"	A < B OUT	"		"								
	V _{IC}		7	-18 mA																"	B3		-1.5	"			
			8		-18 mA															"	A < B IN			"			
			9			-18 mA														"	A = B IN			"			
			10				-18 mA													"	A > B IN			"			
			11										-18 mA							"	B0			"			
			12											-18 mA						"	A0			"			
			13												-18 mA					"	B1			"			
			14													-18 mA				"	A1			"			
			15														-18 mA			"	A2			"			
			16															-18 mA		"	B2			"			
			17																-18 mA	"	A3			"			
			I _{H1}	3010	18	GND	2.7 V							GND	5.5 V	5.5 V	5.5 V	5.5 V	A < B IN		20	μ A					
					19	"				2.7 V				"	"	"	"	"	"	"	"	"	A > B IN			"	
			I _{H2}		20	2.7 V															GND	"	B3		60	"	
					21	GND			2.7 V						GND	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	5.5 V	"	A = B IN			"
					22	"									2.7 V	GND	"	"	"	"	"	"	"	B0			"
					23	"									GND	2.7 V	"	"	"	"	"	"	"	"	A0		
	24	"											"	5.5 V	2.7 V	"	"	"	"	"	"	"	B1			"	
	25	"											"	"	GND	2.7 V	"	"	"	"	"	"	A1			"	
	26	"											"	"	"	GND	2.7 V	"	"	"	"	"	A2			"	
	27	"											"	"	"	"	5.5 V	GND	2.7 V	"	"	"	B2			"	
	28	"											"	"	"	"	"	"		2.7 V	"	"	A3			"	
	29	2.7 V											"	"	"	"	"	"	5.5 V	"	"	"	B3			"	
	30	GND											"	2.7 V	5.5 V	GND	5.5 V	5.5 V	GND	"	"	"	B0			"	
	31	"											"	5.5 V	2.7 V	"	"	"	"	"	"	"	A0			"	
	32	"											"	GND	5.5 V	2.7 V	GND	"	"	"	"	"	B1			"	
	33	"											"	"	5.5 V	2.7 V	"	"	"	"	"	"	A1			"	
	34	"											"	"	"	GND	5.5 V	2.7 V	5.5 V	"	"	"	A2			"	
	35	"											"	"	"	"	"	5.5 V	2.7 V	"	"	"	B2			"	
	36	5.5 V											"	"	"	"	"	"	"	2.7 V	"	"	A3			"	
	I _{H3}				37	GND	5.5 V							GND	5.5 V	5.5 V	5.5 V	"	A < B IN		100	"					
			38	"				5.5 V				"	"	"	"	"	"	"	"	"	"	A > B IN			"		
	I _{H4}		39	5.5 V																GND	"	B3		300	"		
			40	GND			5.5 V						GND	5.5 V	"	"	A = B IN			"							
			41	"									5.5 V	GND	"	"	"	"	"	"	"	B0			"		
			42	"									GND	5.5 V	"	"	"	"	"	"	"	"	A0			"	
			43	"									"	"	"	"	"	"	"	"	"	"	B1			"	
			44	"									"	"	"	GND	"	"	"	"	"	"	A1			"	
			45	"									"	"	"	"	GND	"	"	"	"	"	A2			"	
			46	"									"	"	"	"	5.5 V	GND	5.5 V	"	"	"	B2			"	
			47	"									"	"	"	"	"	"	"	"	"	"	A3			"	
			48	5.5 V									"	"	"	"	"	"	"	"	"	"	B3			"	
			49	GND									"	5.5 V	5.5 V	GND	5.5 V	5.5 V	GND	"	"	"	B0			"	
			50	"									"	"	"	"	"	"	"	"	"	"	A0			"	
			51	"									"	GND	"	5.5 V	GND	"	"	"	"	"	"	B1			"
			52	"									"	"	"	"	5.5 V	"	"	"	"	"	"	A1			"
			53	"									"	"	"	GND	"	"	5.5 V	"	"	"	"	A2			"
			54	"									"	"	"	"	"	"	"	"	"	"	"	B2			"
			55	5.5 V									"	"	"	"	"	"	"	"	"	"	"	A3			"

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; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 method	Cases E, F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Measured terminal	Limits		Unit							
			Cases 1/2, X	2	3	4	5	7	8	9	10	12	13	14	15	17	18	19	20		Min	Max								
			Test no.	B3	A < B IN	A = B IN	A > B IN	A > B OUT	A = B OUT	A < B OUT	GND	B0	A0	B1	A1	A2	B2	A3	V _{CC}											
1	I _{IL1} 2/	3009	56	5.5 V	0.4 V								GND	5.5 V	5.5 V	A < B IN	-0.1	-38	mA											
			57				0.4 V																A > B IN							
			58	0.4 V																				B3	3/	3/				
			59	5.5 V		0.4 V																		A = B IN						
			60										0.4 V											B0						
			61										5.5 V	0.4 V										A0						
			62										5.5 V	0.4 V										B1						
			63											5.5 V	0.4 V	0.4 V								A1						
			64													5.5 V	0.4 V							A2						
			65														5.5 V	0.4 V						B2						
66																5.5 V	0.4 V				A3									
I _{OS} 4/	3011	67	GND	GND	GND			GND					GND			A > B OUT	-15	-100												
		68			2.0 V					GND													A = B OUT							
		69		2.0 V	GND	GND					GND												A < B OUT							
I _{CC}	3005	70	4.5 V	4.5 V	GND	4.5 V						4.5 V			V _{CC}			20												
2	Same tests, terminal conditions, and limits as subgroup 1, except T _C = +125°C and V _{IC} tests are omitted.																													
3	Same tests, terminal conditions, and limits as subgroup 1, except T _C = -55°C and V _{IC} tests are omitted.																													
7	Truth table tests	3014	71	B 6/	A 6/	B 6/	B 6/	H 6/	L 6/	L 6/	GND	A 6/	B 6/	A 6/	B 6/	B 6/	A 6/	A 6/	4.5 V		See 5/									
			72	A	B	A	A	L	"	H	"	B	A	B	A	A	B	B	"	"	"	"	"	"	"					
			73	"	A	"	B	H	"	L	"	A	B	A	B	"	"	A	"	"	"	"	"	"	"					
			74	"	B	"	A	L	"	H	"	B	A	B	A	B	A	"	"	"	"	"	"	"	"					
			75	"	A	"	B	H	"	L	"	A	B	A	B	A	A	"	"	"	"	"	"	"	"					
			76	"	B	"	A	L	"	H	"	B	A	A	B	"	"	"	"	"	"	"	"	"	"					
			77	"	A	"	B	H	"	L	"	"	"	"	A	"	"	"	"	"	"	"	"	"	"					
			78	"	B	"	A	L	"	H	"	A	B	"	"	"	"	"	"	"	"	"	"	"	"					
			79	"	"	"	"	H	"	L	"	"	A	"	"	"	"	"	"	"	"	"	"	"	"					
			80	"	"	A	B	L	H	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					
			81	"	"	A	A	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					
			82	"	A	B	B	"	L	H	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					
			83	"	"	A	A	"	"	L	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					
			84	"	"	A	B	"	H	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					
			85	"	"	A	A	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					
			86	"	B	B	B	H	L	H	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					
			8	Repeat subgroup 7 tests at T _C = +125°C and T _C = -55°C.																										
9	t _{PLH1}	3003 Fig. 4	87	IN		GND	GND				OUT	GND	2.7 V	5.0 V	B3 to A < B	2	35	ns												
			88	GND									IN	2.7 V						GND			B0 to A < B							
			89		GND				OUT				2.7 V	IN										A0 to A > B						
			90				GND			OUT			GND	GND	IN	2.7 V									B1 to A < B					
			91			GND			OUT					2.7 V	IN										A1 to A > B					
			92											GND	GND	IN	2.7 V								A2 to A > B					
			93					GND									2.7 V	IN							B2 to A < B					
			94	2.7 V	GND				OUT								GND	GND	IN						A3 to A > B					
			95	IN		2.7 V				OUT																B3 to A = B		36		
			96	GND										IN												B0 to A = B				
			97											GND	IN												A0 to A = B			
			98												GND	IN											B1 to A = B			
			99													GND	IN										A1 to A = B			
			100														GND	IN									A2 to A = B			
101															GND	IN								B2 to A = B						
102																GND	IN							A3 to A = B						
t _{PLH3}				IN	GND		OUT												GND					A<B to A>B		20				
				GND	IN																				A=B to A>B					
t _{PLH5}					IN	GND				OUT															A=B to A<B		22			
					GND	IN																			A>B to A<B					
t _{PLH4}					IN					OUT															A=B to A=B		20			

See footnotes at end of device types 01.

TABLE III. Group A inspection for device type 01 - Continued.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 method	Cases E, F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Measured terminal	Limits		Unit			
			Cases 1/2, X	2	3	4	5	7	8	9	10	12	13	14	15	17	18	19	20		Min	Max				
			Test no.	B3	A < B IN	A = B IN	A > B IN	A > B OUT	A = B OUT	A < B OUT	GND	B0	A0	B1	A1	A2	B2	A3	V _{CC}							
9 T _C = 25°C	t _{PHL1}	3003 Fig. 4	108	IN		GND	GND				OUT	GND	GND	GND	GND	GND	GND	GND	2.7 V	5.0 V	B3 to A < B	2	35	ns		
			109	GND									IN	2.7 V						GND		B0 to A < B	"	"	"	
			110		GND				OUT					2.7 V	IN							A0 to A > B	"	"	"	
			111				GND				OUT			GND	GND	IN	2.7 V					B1 to A < B	"	"	"	
			112			GND				OUT					2.7 V	IN						A1 to A > B	"	"	"	
			113												GND	GND	IN	2.7 V				A2 to A > B	"	"	"	
			114					GND				OUT					2.7 V	IN				B2 to A < B	"	"	"	
			115	2.7 V	GND					OUT								GND	GND	IN		A3 to A > B	"	"	"	
			116	IN		2.7 V				OUT										GND		B3 to A = B	"	33	"	
	t _{PHL2}			117	GND								IN									B0 to A = B	"	"	"	
				118										GND	IN								A0 to A = B	"	"	"
				119											GND	IN							B1 to A = B	"	"	"
				120												GND	IN						A1 to A = B	"	"	"
				121													GND	IN					A2 to A = B	"	"	"
				122														GND	IN				B2 to A = B	"	"	"
				123															GND	IN			A3 to A = B	"	"	"
	t _{PHL3}			124		IN	GND		OUT										GND			A<B to A>B	"	20	"	
				125			GND	IN															A=B to A>B	"	"	"
t _{PHL5}			126			IN	GND				OUT										A=B to A<B	"	20	"		
			127				GND	IN														A>B to A<B	"	"	"	
t _{PHL4}			128			IN			OUT											A=B to A=B	"	25	"			
10	Same tests and terminal conditions as for subgroup 9, except T _C = +125°C and test limits as follows: in minimum limits column limits for all tests are 2 ns; in maximum limits column, limits for t _{PLH1} and t _{PLH2} are 42 ns; t _{PLH3} are 25 ns, t _{PLH5} are 30 ns, t _{PLH4} are 28 ns; t _{PHL1} are 42 ns, t _{PHL2} are 39 ns, t _{PHL3} are 28 ns, t _{PHL5} are 26 ns, t _{PHL4} are 36 ns.																									
11	Same tests, terminal conditions and limits as for subgroup 10, except T _C = -55°C.																									

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

2/ For circuit F, I_{IL1} limits are -0.5 to -400 μA. For circuit B, I_{IL1} limits are -180 to -420 μA.

3/ I_{IL2} limits (mA) min/max values for circuits shown:

Measured Terminal	Circuit					
	A	B	C	D	E	F
B3	-0.03/-0.30	-40/-1.3	-40/-1.2	-40/-1.14	-40/-1.14	-28/-1.14
A = B IN	-32/-1.14	-40/-1.3	-32/-1.2	-32/-1.14	-32/-1.14	-14/-1.14
B0	-20/-0.60	-40/-1.3	-40/-1.2	-40/-1.14	-40/-1.14	-28/-1.14
A0	-20/-0.60	-40/-1.3	-40/-1.2	-40/-1.14	-40/-1.14	-28/-1.14
B1	-40/-1.14	-40/-1.3	-40/-1.2	-40/-1.14	-40/-1.14	-28/-1.14
A1	-40/-1.14	-40/-1.3	-40/-1.2	-40/-1.14	-40/-1.14	-28/-1.14
A2	-40/-1.14	-40/-1.3	-40/-1.2	-40/-1.14	-40/-1.14	-28/-1.14
B2	-40/-1.14	-40/-1.3	-40/-1.2	-40/-1.14	-40/-1.14	-28/-1.14
A3	-20/-0.60	-40/-1.3	-40/-1.2	-40/-1.14	-40/-1.14	-28/-1.14

4/ For circuit B, I_{OS} limits are -30 to -130 mA.

5/ Tests shall be performed in sequence.

6/ A = 3.0 V min.; B = 0.0 V or GND; H > 1.5 V; L < 1.5 V.

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.

MIL-M-38510/311C

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	54LS85

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. Manufacturer's designator.

Device type	CIRCUITS					
	A	B	C	D	E	F
	Texas Instruments	National Semiconductor	Signetics Corp.	Motorola Inc.	Raytheon Co.	Fairchild Co.
01	X	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 5962-1959)

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

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1. DOCUMENT NUMBER
MIL-M-38510/311C

2. DOCUMENT DATE (YYYYMMDD)
2003-04-25

3. DOCUMENT TITLE
MICROCIRCUITS, DIGITAL, BIPOLAR, LOW-POWER SCHOTTKY TTL, MAGNITUDE COMPARATORS OUTPUTS, 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)*
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