INCH-POUND
MIL-M-38510/151B
19 January 2005
SUPERSEDING
MIL-M-38510/151A
30 September 1985

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, BIPOLAR, TTL, SCHMITT-TRIGGER NAND GATES, MONOLITHIC SILICON

Inactive for new design after 8 July 1997

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 line, TTL, Schmitt-Trigger, positive NAND logic gating microcircuits. Two product assurance classes and a choice of case outlines and lead finishes are provided 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 For this product, the requirements of MIL-M-38510 have been superseded by MIL-PRF-38535, (see 6.3)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 or Identifying Number (PIN). The PIN is 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 positive NAND gate, Schmitt-Trigger
02	Hex, 1-input inverter gate, Schmitt-Trigger
03	Quadruple, 2-input positive NAND gate, Schmitt-Trigger

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:

Outline letter	Descriptive designator	Terminals	Package style
A 1/	GDFP5-F14 or CDFP6-F14	14	Flat pack
B 1/	GDFP4-F14	14	Flat pack
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line
D	GDFP1-F14 or CDFP2-F14	14	Flat pack

1/ Inactive package case outline.

Comments, suggestions, or questions on this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAS, 3990 East Broad St., Columbus, OH 43218-3990, or email mailto:bipolar@dscc.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	-1.5 V dc at -12 mA to 5.5 V dc
Storage temperature range	-65°C to 150°C
Maximum power dissipation (P_D)	176 mW dc 1/
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC}):	
Cases A, B, C, D	See MIL-STD-1835
Junction temperature (T_J)	+175°C 2/

1.4 Recommended operating conditions.

Supply voltage (V_{CC})	4.5 V dc minimum to 5.5 V dc maximum
Positive-going threshold voltage	1.5 V dc minimum to 2.0 V dc maximum
Negative-going threshold voltage	0.6 V dc minimum to 1.1 V dc maximum
Normalized fanout (each output)	10 maximum 3/
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.

2.2 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 shall 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 conditions (e.g. I_{OS}) at one output for 5 seconds.

2/ Maximum junction temperature shall not be exceeded except for allowable short duration burn-in screening per method 5004 of MIL-STD-883.

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

3.3.2 Truth tables and logic equations. The truth tables and logic equations 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. 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 1 (see MIL-PRF-38535, appendix A).

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$	Device type	Limits		Unit
				Min	Max	
Positive-going threshold voltage	V_{T+}	V_{CC} = 5.0 V	All	1.5	2.0	V
Negative-going threshold voltage	V_{T-}	V_{CC} = 5.0 V	All	0.6	1.1	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, V_{IN} = 2/ I_{OH} = -0.8 mA	All	2.4		V
Low-level output voltage	V_{OL1}	V_{CC} = 4.5 V, I_{OL} = 16 mA V_{IN} = 2.0 V for all inputs of gate under test	All		0.4	V
High-level output voltage	V_{OH2}	V_{CC} = 5.0 V, V_{IN} = 3/ I_{OH} = -0.8 mA	All	2.4		V
Low-level output voltage	V_{OL2}	V_{CC} = 5.0 V, I_{OL} = 16 mA V_{IN} = 4/ for all inputs of gate under test	All		0.4	V
Input clamp voltage	V_{IC}	V_{CC} = 4.5 V, I_{IN} = -12 mA, T_C = 25°C	All		-1.5	V
High-level input current	I_{IH1}	V_{CC} = 5.5 V, V_{IN} = 2.4 V	All		40	µA
High-level input current	I_{IH2}	V_{CC} = 5.5 V, V_{IN} = 5.5 V	All		100	µA
Low-level input current	I_{IL}	V_{CC} = 5.5 V, V_{IN} = 0.4 V	01	-0.5	-1.6	mA
			02,03	-0.5	-1.2	mA
Short-circuit output current	I_{OS}	V_{CC} = 5.5 V 5/	All	-18	-55	mA
High-level supply current (total)	I_{CCH}	V_{CC} = 5.5 V V_{IN} = 0 V	01		23	mA
			02		36	mA
			03		24	mA
Low-level supply current (total)	I_{CCL}	V_{CC} = 5.5 V V_{IN} = 5.5 V	01		32	mA
			02		60	mA
			03		40	mA
Propagation delay time, high-to-low level	t_{PHL}	C_L = 50 pF, R_L = 390Ω	01	5	32	ns
Propagation delay time, low-to-high level	t_{PLH}	C_L = 50 pF, R_L = 390Ω	01	5	37	ns
Propagation delay time, high-to-low level	t_{PHL}	C_L = 50 pF, R_L = 390Ω	02,03	5	35	ns
Propagation delay time, low-to-high level	t_{PLH}	C_L = 50 pF, R_L = 390Ω	02,03	5	40	ns

1/ Complete terminal conditions shall be as specified in table III.
2/ At T_C = 25°C and T_C = -55°C, V_{IN} = 0.6 V. At T_C = 125°C, V_{IN} = 0.5 V.
3/ 0.6 V, then 1.5 V.
4/ 2.0 V, then 1.1 V.
5/ 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	1, 2, 3
Group D end-point electrical parameters	1, 2, 3	1, 2, 3

*PDA applies to subgroup 1.

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 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.

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

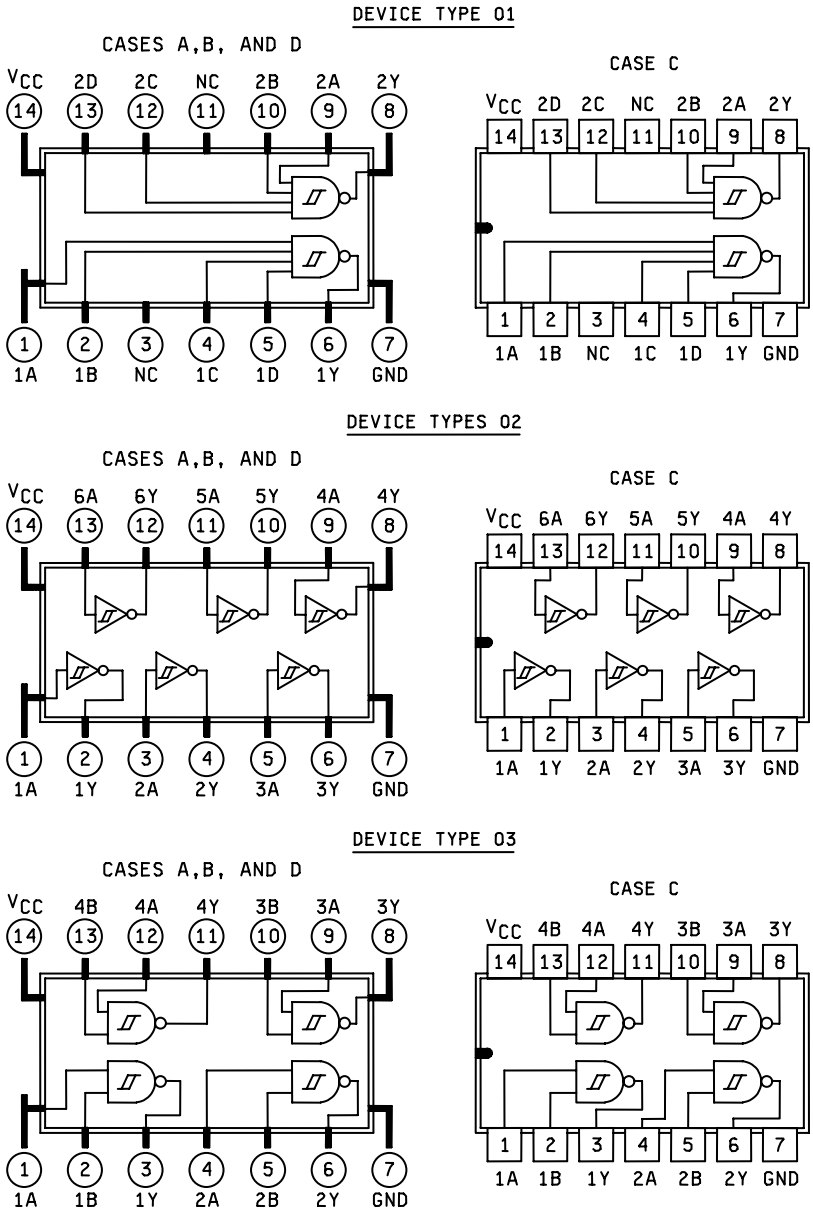


Figure 1. Logic diagrams and terminal connections (top view).

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

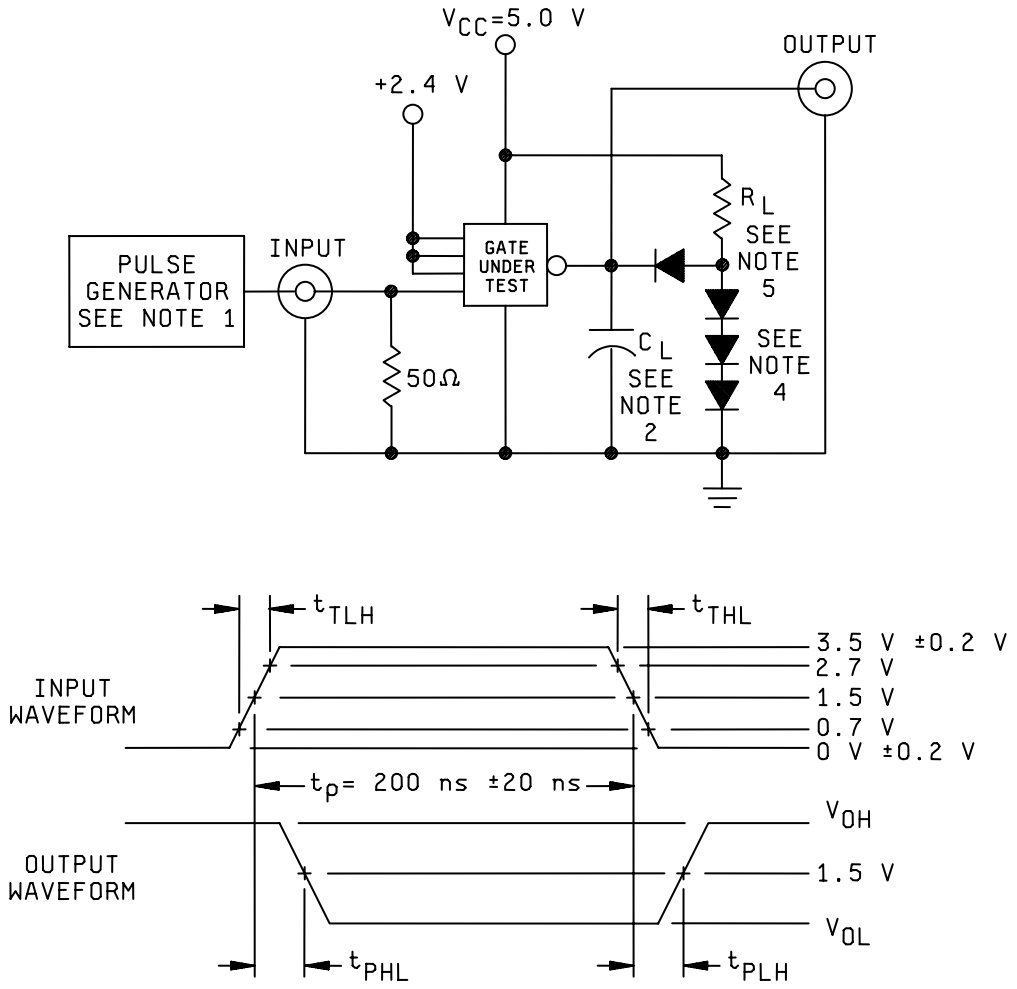
Positive logic $Y = \overline{A}$

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. The pulse generator has the following characteristics: $t_{TLH} = t_{THL} \leq 10$ ns, P_{RR} = 1 MHz, Z_{OUT} = 50 Ω.
2. C_L = 50 pF minimum, including scope probe, wiring, and stray capacitance, without package in test fixture.
3. Voltage measurements are to be made with respect to network ground terminal.
4. All diodes are 1N3064 or equivalent.
5. R_L = 390 Ω ±5 percent.

FIGURE 3. Switching time test circuit.

TABLE III. Group A inspection for device type 01.
Terminal conditions (pins not designated are open, high level or low level)

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,C,D Test no.	1 1A	2 1B	3 NC	4 1C	5 1D	6 1Y	7 GND	8 2Y	9 2A	10 2B	11 NC	12 2C	13 2D	14 VCC	Measured terminal	Limits Min	Limits Max	Unit
1	V_{OL1}	3007	1	2.0V	2.0V		2.0V	2.0V	16mA	GND							4.5V	1Y		0.4	V
T_C=25°C	V_{OL1}	3007	2							"	16mA	2.0V	2.0V		2.0V	2.0V	"	2Y		0.4	"
	V_{OH1}	3006	3	0.6V	2.0V		2.0V	2.0V	-0.8mA	"							"	1Y	2.4		"
		"	4	2.0V	0.6V		2.0V	2.0V	-0.8mA	"							"	1Y	"		"
		"	5	2.0V	2.0V		0.6V	2.0V	-0.8mA	"							"	1Y	"		"
		"	6	2.0V	2.0V		2.0V	0.6V	-0.8mA	"							"	1Y	"		"
		"	7							"	-0.8mA	0.6V	2.0V		2.0V	2.0V	"	2Y	"		"
		"	8							"	-0.8mA	2.0V	0.6V		2.0V	2.0V	"	2Y	"		"
		"	9							"	-0.8mA	2.0V	2.0V		0.6V	2.0V	"	2Y	"		"
		"	10							"	-0.8mA	2.0V	2.0V		2.0V	0.6V	"	2Y	"		"
	V_{OL2}	3007	11	1/	1/		1/	1/	16mA	"							5.0V	1Y		0.4	"
	V_{OL2}	3007	12								16mA	1/	1/		1/	1/	"	2Y		0.4	"
	V_{OH2}	3006	13	2/	2.0V		2.0V	2.0V	-0.8mA	"							"	1Y	2.4		"
		"	14	2.0V	2/		2.0V	2.0V	-0.8mA	"							"	1Y	"		"
		"	15	2.0V	2.0V		2/	2.0V	-0.8mA	"							"	1Y	"		"
		"	16	2.0V	2.0V		2.0V	2/	-0.8mA	"							"	1Y	"		"
		"	17							"	-0.8mA	2/	2.0V		2.0V	2.0V	"	2Y	"		"
		"	18							"	-0.8mA	2.0V	2/		2.0V	2.0V	"	2Y	"		"
		"	19							"	-0.8mA	2.0V	2.0V		2/	2.0V	"	2Y	"		"
		"	20							"	-0.8mA	2.0V	2.0V		2.0V	2/	"	2Y	"		"
	V_{IC}		21	-12mA						"							4.5V	1A		-1.5	"
			22		-12mA					"							"	1B		"	"
			23				-12mA			"							"	1C		"	"
			24					-12mA		"							"	1D		"	"
			25							"		-12mA					"	2A		"	"
			26							"			-12mA				"	2B		"	"
			27							"					-12mA		"	2C		"	"
			28							"						-12mA	"	2D		"	"
	I_{IH1}	3010	29	2.4V	GND		GND	GND		"							5.5V	1A		40	μA
		"	30	GND	2.4V		GND	GND		"							"	1B		"	"
		"	31	GND	GND		2.4V	GND		"							"	1C		"	"
		"	32	GND	GND		GND	2.4V		"							"	1D		"	"
		"	33							"		2.4V	GND		GND	GND	"	2A		"	"
		"	34							"		GND	2.4V		GND	GND	"	2B		"	"
		"	35							"		GND	GND		2.4V	GND	"	2C		"	"
		"	36							"		GND	GND		GND	2.4V	"	2D		"	"
	I_{IH2}	3010	37	5.5V	GND		GND	GND		"							"	1A		100	"
		"	38	GND	5.5V		GND	GND		"							"	1B		"	"
		"	39	GND	GND		5.5V	GND		"							"	1C		"	"
		"	40	GND	GND		GND	5.5V		"							"	1D		"	"
		"	41							"		5.5V	GND		GND	GND	"	2A		"	"
		"	42							"		GND	5.5V		GND	GND	"	2B		"	"
		"	43							"		GND	GND		5.5V	GND	"	2C		"	"
		"	44							"		GND	GND		GND	5.5V	"	2D		"	"
	I_{IL}	3009	45	0.4V	5.5V		5.5V	5.5V		"							"	1A	See 3/		
		"	46	5.5V	0.4V		5.5V	5.5V		"							"	1B			
		"	47	5.5V	5.5V		0.4V	5.5V		"							"	1C			
		"	48	5.5V	5.5V		5.5V	0.4V		"							"	1D			
		"	49							"		0.4V	5.5V		5.5V	5.5V	"	2A			
		"	50							"		5.5V	0.4V		5.5V	5.5V	"	2B			
		"	51							"		5.5V	5.5V		0.4V	5.5V	"	2C			
		"	52							"		5.5V	5.5V		5.5V	0.4V	"	2D			

See footnotes at end of device type 01.

TABLE III. Group A inspection for device type 01 – Continued.
Terminal conditions (pins not designated are open, high level or low level)

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,C,D Test no.	1 1A	2 1B	3 NC	4 1C	5 1D	6 1Y	7 GND	8 2Y	9 2A	10 2B	11 NC	12 2C	13 2D	14 VCC	Measured terminal	Limits Min	Limits Max	Unit
1 T_C=25°C	I_{OS}	3011	53	GND	GND		GND	GND	GND	GND							5.5V	1Y	-18	-55	mA
	I_{OS}	3011	54							"	GND	GND	GND		GND	GND	"	2Y	-18	-55	mA
	I_{CCH}	3005	55	GND	GND		GND	GND		"		GND	GND		GND	GND	"	VCC		23	mA
	I_{CCL}	3005	56	5.5V	5.5V		5.5V	5.5V		"		5.5V	5.5V		5.5V	5.5V	"	VCC		32	mA
2	Same tests, terminal conditions and limits as for subgroup 1, except T_C = 125°C, V_{IC} tests are omitted, and V_{IN} = 0.5 V for V_{OH1} testing.																				
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	57	IN	2.4V		2.4V	2.4V	OUT	GND							5.0V	1A to 1Y	5	24	ns
	t_{PHL}	(Fig. 3)	58							"	OUT	IN	2.4V		2.4V	2.4V	"	2A to 2Y	5	24	ns
	t_{PLH}	"	59	IN	2.4V		2.4V	2.4V	OUT	GND							"	1A to 1Y	5	28	"
	t_{PLH}	"	60							"	OUT	IN	2.4V		2.4V	2.4V	"	2A to 2Y	5	28	"
10 T_C=125°C	t_{PHL}	"	61	IN	2.4V		2.4V	2.4V	OUT	GND							"	1A to 1Y	5	32	"
	t_{PHL}	"	62							"	OUT	IN	2.4V		2.4V	2.4V	"	2A to 2Y	5	32	"
	t_{PLH}	"	63	IN	2.4V		2.4V	2.4V	OUT	GND							"	1A to 1Y	5	37	"
	t_{PLH}	"	64							"	OUT	IN	2.4V		2.4V	2.4V	"	2A to 2Y	5	37	"
11	Same tests, terminal conditions and limits as for subgroup 10, except T_C = -55°C.																				

1/ 2.0 V, then 1.1 V. 0.0 V (verify output = high), 0.2 V, then 1.1 V.

2/ 0.6 V, then 1.5 V. 5.0 V (verify output = low), 0.6 V, then 1.5 V.

3/ For device type 01, with schematics incorporating a 4 kΩ base resistor, the minimum and maximum limits shall be –0.7 and –1.6 mA, respectively. For schematics incorporating a 6 kΩ base resistor, the minimum and maximum limits shall be –0.5 and –1.2 mA respectively.

TABLE III. Group A inspection for device type 02.
Terminal conditions (pins not designated are open, high level or low level)

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,C,D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits		Unit
			Test no.	1A	1Y	2A	2Y	3A	3Y	GND	4Y	4A	5Y	5A	6Y	6A	VCC		Min	Max	
1 T_C=25°C	V_{OL1}	3007	1	2.0V	16mA					GND							4.5V	1Y		0.4	V
		"	2			2.0V	16mA			"							"	2Y		"	"
		"	3					2.0V	16mA	"							"	3Y		"	"
		"	4							"	16mA	2.0V					"	4Y		"	"
		"	5							"			16mA	2.0V			"	5Y		"	"
		"	6							"					16mA	2.0V	"	6Y		"	"
	V_{OH1}	3006	7	0.6V	-0.8mA					"							"	1Y	2.4		"
		"	8			0.6V	-0.8mA			"							"	2Y	"		"
		"	9					0.6V	-0.8mA	"							"	3Y	"		"
		"	10							"	-0.8mA	0.6V					"	4Y	"		"
		"	11							"			-0.8mA	0.6V			"	5Y	"		"
		"	12							"					-0.8mA	0.6V	"	6Y	"		"
	V_{OL2}	3007	13	1/	16mA					"							5.0V	1Y		0.4	"
		"	14			1/	16mA			"							"	2Y		"	"
		"	15					1/	16mA	"							"	3Y		"	"
		"	16							"	16mA	1/					"	4Y		"	"
		"	17							"			16mA	1/			"	5Y		"	"
		"	18							"					16mA	1/	"	6Y		"	"
	V_{OH2}	3006	19	2/	-0.8mA					"							"	1Y	2.4		"
		"	20			2/	-0.8mA			"							"	2Y	"		"
		"	21					2/	-0.8mA	"							"	3Y	"		"
		"	22							"	-0.8mA	2/					"	4Y	"		"
		"	23							"			-0.8mA	2/			"	5Y	"		"
		"	24							"					-0.8mA	2/	"	6Y	"		"
	V_{IC}		25	-12mA						"							4.5V	1A		-1.5	"
			26			-12mA				"							"	2A		"	"
			27					-12mA		"							"	3A		"	"
			28							"	-12mA						"	4A		"	"
			29							"			-12mA				"	5A		"	"
			30							"					-12mA		"	6A		"	"
	I_{IH1}	3010	31	2.4V						"							5.5V	1A		40	µA
		"	32			2.4V				"							"	2A		"	"
		"	33					2.4V		"							"	3A		"	"
		"	34							"		2.4V					"	4A		"	"
		"	35							"				2.4V			"	5A		"	"
		"	36							"						2.4V	"	6A		"	"
	I_{IH2}	"	37	5.5V						"							"	1A		100	"
		"	38			5.5V				"							"	2A		"	"
		"	39					5.5V		"							"	3A		"	"
		"	40							"		5.5V					"	4A		"	"
		"	41							"				5.5V			"	5A		"	"
		"	42							"						5.5V	"	6A		"	"
	I_{IL}	3009	43	0.4V						"							"	1A	-0.5	-1.2	"
		"	44			0.4V				"							"	2A	"	"	"
		"	45					0.4V		"							"	3A	"	"	"
		"	46							"		0.4V					"	4A	"	"	"
		"	47							"				0.4V			"	5A	"	"	"
		"	48							"						0.4V	"	6A	"	"	"

See footnotes at end of device type 02.

TABLE III. Group A inspection for device type 02 – Continued.
Terminal conditions (pins not designated are open, high level or low level)

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,C,D Test no.	1 1A	2 1Y	3 2A	4 2Y	5 3A	6 3Y	7 GND	8 4Y	9 4A	10 5Y	11 5A	12 6Y	13 6A	14 VCC	Measured terminal	Limits Min	Limits Max	Unit
1 T_C=25°C	I_{OS}	3011	49	GND	GND					GND							5.5V	1Y	-18	-55	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	"	VCC		36	"
	I_{CCL}	3005	56	5.5V		5.5V		5.5V		"		5.5V		5.5V		5.5V	"	VCC		60	"
2	Same tests, terminal conditions and limits as for subgroup 1, except T_C = 125°C V_{IC} tests are omitted, and V_{IN} = 0.5 V for V_{OH1} testing.																				
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	OUT					GND							5.0V	1A to 1Y	5	26	ns
		"	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	"	28	"
		"	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 T_C=125°C	t_{PHL}	"	69	IN	OUT					"							"	1A to 1Y	"	35	"
		"	70			IN	OUT			"							"	2A to 2Y	"	"	"
		"	71					IN	OUT	"							"	3A to 3Y	"	"	"
		"	72							"	OUT	IN					"	4A to 4Y	"	"	"
		"	73							"			OUT	IN			"	5A to 5Y	"	"	"
		"	74							"					OUT	IN	"	6A to 6Y	"	"	"
	t_{PLH}	"	75	IN	OUT					"							"	1A to 1Y	"	40	"
		"	76			IN	OUT			"							"	2A to 2Y	"	"	"
		"	77					IN	OUT	"							"	3A to 3Y	"	"	"
		"	78							"	OUT	IN					"	4A to 4Y	"	"	"
		"	79							"			OUT	IN			"	5A to 5Y	"	"	"
		"	80							"					OUT	IN	"	6A to 6Y	"	"	"
11	Same tests, terminal conditions and limits as for subgroup 10, except T_C= -55°C.																				

1/ 2.0 V, then 1.1 V.

2/ 0.6 V, then 1.5 V.

TABLE III. Group A inspection for device type 03.
Terminal conditions (pins not designated are open, high level or low level)

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,C,D Test no.	1 1A	2 1B	3 1Y	4 2A	5 2B	6 2Y	7 GND	8 3Y	9 3A	10 3B	11 4Y	12 4A	13 4B	14 VCC	Measured terminal	Limits Min	Limits Max	Unit
1 T_C=25°C	V_{OL1}	3007	1	2.0V	2.0V	16mA				GND							4.5V	1Y		0.4	V
		“	2				2.0V	2.0V	16mA	“							“	2Y		“	“
		“	3							“	16mA	2.0V	2.0V				“	3Y		“	“
		“	4							“				16mA	2.0V	2.0V	“	4Y		“	“
	V_{OH1}	3006	5	0.6V	2.0V	-0.8mA				“							“	1Y	2.4		V
		“	6	2.0V	0.6V	-0.8mA				“							“	1Y	“		“
		“	7				0.6V	2.0V	-0.8mA	“							“	2Y	“		“
		“	8				2.0V	0.6V	-0.8mA	“							“	2Y	“		“
		“	9							“	-0.8mA	0.6V	2.0V				“	3Y	“		“
		“	10							“	-0.8mA	2.0V	0.6V				“	3Y	“		“
		“	11							“				-0.8mA	0.6V	2.0V	“	4Y	“		“
		“	12							“				-0.8mA	2.0V	0.6V	“	4Y	“		“
	V_{OL2}	3007	13	1/	1/	16mA				“							5.0V	1Y		0.4	“
		“	14				1/	1/	16mA	“							“	2Y		“	“
		“	15							“	16mA	1/	1/				“	3Y		“	“
		“	16							“				16mA	1/	1/	“	4Y		“	“
	V_{OH2}	3006	17	2/	2.0V	-0.8mA				“							“	1Y	2.4		“
		“	18	2.0V	2/	-0.8mA				“							“	1Y	“		“
		“	19				2/	2.0V	-0.8mA	“							“	2Y	“		“
		“	20				2.0V	2/	-0.8mA	“							“	2Y	“		“
		“	21							“	-0.8mA	2/	2.0V				“	3Y	“		“
		“	22							“	-0.8mA	2.0V	2/				“	3Y	“		“
		“	23							“				-0.8mA	2/	2.0V	“	4Y	“		“
		“	24							“				-0.8mA	2.0V	2/	“	4Y	“		“
	V_{IC}		25	-12mA						“							4.5V	1A		-1.5	“
			26		-12mA					“							“	1B		“	“
			27				-12mA			“							“	2A		“	“
			28					-12mA		“							“	2B		“	“
			29							“		-12mA					“	3A		“	“
			30							“			-12mA				“	3B		“	“
			31							“					-12mA		“	4A		“	“
			32							“						-12mA	“	4B		“	“
	I_{IH1}	3010	33	2.4V	GND					“							5.5V	1A		40	µA
		“	34	GND	2.4V					“							“	1B		“	“
		“	35				2.4V	GND		“							“	2A		“	“
		“	36				GND	2.4V		“							“	2B		“	“
		“	37							“		2.4V	GND				“	3A		“	“
		“	38							“		GND	2.4V				“	3B		“	“
		“	39							“					2.4V	GND	“	4A		“	“
		“	40							“					GND	2.4V	“	4B		“	“
	I_{IH2}	“	41	5.5V	GND					“							“	1A		100	“
		“	42	GND	5.5V					“							“	1B		“	“
		“	43				5.5V	GND		“							“	2A		“	“
		“	44				GND	5.5V		“							“	2B		“	“
		“	45							“		5.5V	GND				“	3A		“	“
		“	46							“		GND	5.5V				“	3B		“	“
		“	47							“					5.5V	GND	“	4A		“	“
		“	48							“					GND	5.5V	“	4B		“	“

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 03 – Continued.
Terminal conditions (pins not designated are open, high level or low level)

Subgroup	Symbol	MIL-STD-883 method	Cases A,B,C,D Test no.	1 1A	2 1B	3 1Y	4 2A	5 2B	6 2Y	7 GND	8 3Y	9 3A	10 3B	11 4Y	12 4A	13 4B	14 VCC	Measured terminal	Limits Min	Limits Max	Unit
1 T_C=25°C	I_{IL}	3009	49	0.4V	5.5V					GND							5.5V	1A	-0.5	-1.2	mA
		"	50	5.5V	0.4V					"							"	1B	"	"	"
		"	51				0.4V	5.5V		"							"	2A	"	"	"
		"	52				5.5V	0.4V		"							"	2B	"	"	"
		"	53							"		0.4V	5.5V				"	3A	"	"	"
		"	54							"		5.5V	0.4V				"	3B	"	"	"
		"	55							"					0.4V	5.5V	"	4A	"	"	"
		"	56							"					5.5V	0.4V	"	4B	"	"	"
	I_{OS}	3011	57	GND	GND	GND				"							"	1Y	-18	-55	"
		"	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	"	VCC	"	24	"
	I_{CCL}	3005	62	5.5V	5.5V		5.5V	5.5V		"		5.5V	5.5V		5.5V	5.5V	"	VCC	"	40	"
2	Same tests, terminal conditions and limits as for subgroup 1, except T_C = 125°C, V_{IC} tests are omitted, and V_{IN} = 0.5 V for V_{OH1} testing.																				
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)	63	IN	2.4V	OUT				GND							5.0V	1A to 1Y	5	22	ns
		"	64				IN	2.4V	OUT	"							"	2A to 2Y	"	"	"
		"	65							"	OUT	IN	2.4V				"	3A to 3Y	"	"	"
		"	66							"				OUT	IN	2.4V	"	4A to 4Y	"	"	"
	t_{PLH}	"	67	IN	2.4V	OUT				"							"	1A to 1Y	"	26	"
		"	68				IN	2.4V	OUT	"							"	2A to 2Y	"	"	"
		"	69							"	OUT	IN	2.4V				"	3A to 3Y	"	"	"
		"	70							"				OUT	IN	2.4V	"	4A to 4Y	"	"	"
10 T_C=125°C	t_{PHL}	"	71	IN	2.4V	OUT				"							"	1A to 1Y	"	27	"
		"	72				IN	2.4V	OUT	"							"	2A to 2Y	"	"	"
		"	73							"	OUT	IN	2.4V				"	3A to 3Y	"	"	"
		"	74							"				OUT	IN	2.4V	"	4A to 4Y	"	"	"
	t_{PLH}	"	75	IN	2.4V	OUT				"							"	1A to 1Y	"	40	"
		"	76				IN	2.4V	OUT	"							"	2A to 2Y	"	"	"
		"	77							"	OUT	IN	2.4V				"	3A to 3Y	"	"	"
		"	78							"				OUT	IN	2.4V	"	4A to 4Y	"	"	"
11	Same tests, terminal conditions and limits as for subgroup 10, except T_C = -55°C.																				

1/ 2.0 V, then 1.1 V.

2/ 0.6 V, then 1.5 V.

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 voltage values given are referenced to the microcircuit ground terminals. Currents given are conventional current and positive when flowing into the referenced terminal.

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 that 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 acquiring activity in addition to notification of the qualifying activity, if applicable.

f. Requirements for failure analysis (including required test condition of MIL-STD-883, method 5003), 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 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 and MIL-STD-1331, and as follows:.

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

6.6 Logistic support. Lead materials and finishes (see 3.3) are interchangeable. Unless otherwise specified, microcircuits acquired for Government logistic support will be acquired to device class B (see 1.2.2), lead material and finish 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	5413, 7413
02	5414, 7414
03	54132, 74132

6.8 Manufacturers' designations. Manufacturers' circuit included in this specification are designated with an "X" as shown in table IV herein.

Table IV. Manufacturers' designations.

Device type	Circuits		
	A	B	C
	National Semiconductor	Motorola	Signetics
01		X	X
02	X	X	X
03		X	X

6.9 Changes from previous issue. Marginal notations 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
NASA - NA
DLA – CC

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

Preparing activity:
DLA - CC

Project 5962-2095

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 .