INCH-POUND

MIL-M-38510/18B
6 June 2005
SUPERSEDING
MIL-M-38510/18A
9 August 1983

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, TTL, REGISTER FILE, MONOLITHIC SILICON

Inactive for new design after 9 August 1983.

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, TTL, bistable logic gating microcircuits. One product assurance class and a choice of case outlines and lead finishes are provided for each type and are reflected in the complete part number. For this product, the requirements of MIL-M-38510 have been superseded by MIL-PRF-38535, (see 6.4).

1.2 Part or Identifying Number (PIN). The PIN is in accordance with MIL-PRF-38535, and as specified herein.

1.2.1 Device types. The device types are as follows:

Device type	Circuit
01	4 x 4 register files

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
E	GDIP1-T16 or CDIP2-T16	16	Dual-in-line
F	GDFP2-F16 or CDFP3-F16	16	Flat-pack

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 per flip-flop, (P_D) 1/	770 mW
Lead temperature (soldering 10 seconds)	300°C
Thermal resistance, junction-to-case (θ_{JC})	(See MIL-STD-1835)
Junction temperature (T_J)	175°C

Comments, suggestions, or questions on this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAS, P. O. Box 3990, Columbus, OH 43218-3990, or emailed to bipolar@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.

1.4 Recommended operating conditions.

Supply voltage	+4.5 V dc minimum to +5.5 V dc maximum
Minimum high level input voltage	+2.0 V dc
Maximum low level input voltage	+0.8 V dc
Normalized fanout (each output) 2/	10 maximum
Case operating temperature range (T_C)	-55°C to 125°C
Input setup time 3/	
Data input	10 ns minimum
Write select 4/	15 ns minimum
Input hold time 3/	
Data input	15 ns minimum
Write select 4/	5 ns minimum
Latch time for new data 5/	25 ns minimum

1.5 Description. The 16-bit TTL register file incorporates the equivalent of 98 gates on a monolithic chip measuring only 90 by 110 mils. The register file is organized as 4 words of 4 bits each and separate on-chip decoding is provided for addressing the four word locations to either write in or retrieve data. This permits simultaneous writing into one location and reading from another word location.

Four data inputs are available which are used to supply the 4-bit word to be stored. Location of the word is determined by the write address inputs A and B in conjunction with a write enable signal. Data applied at the inputs should be in its true form. That is, if a high level signal is desired from the output, a high level is applied at the data input for that particular bit location. The latch inputs are arranged so that new data will be accepted only if both internal address gate inputs are high. When this condition exists, data at the D input is transferred to the latch output. When the write enable input, GW, is high the data inputs are inhibited and their levels can cause no change in the information stored in the internal latches. When the read enable input, GR, is high the data outputs are inhibited and remain high.

The individual address lines permit direct acquisition of data stored in any four of the latches. Four individual decoding gates are used to complete the address for reading a word. When the read address is made in conjunction with the read enable signal, the word appears at the four outputs.

This arrangement (data entry addressing separate from data read addressing and individual sense line) eliminates recovery times, permits simultaneous reading and writing, and is limited in speed only by the write time (45 nanoseconds maximum) and the read time (35 nanoseconds maximum). The register file has a nondestructive readout in that data is not lost when addressed.

All inputs are buffered to lower the drive requirements to one normalized load, and input clamping diodes minimize switching transients to simplify system design. High speed, double ended AND-OR-INVERT gates are employed for the read address function and drive high sink current, open collector outputs. Up to 246 of these outputs may be wire-AND connected for increasing the capacity up to 1024 words. Any number of these registers may be paralleled to provide n-bit word length.

1/ Must withstand the added P_D due to short circuit condition (e.g. I_{OS}).
2/ Device will fanout in both high and low levels to the specified number of inputs of the same device type as that being tested.
3/ With respect to write enable.
4/ Write select setup time will protect the data written into the previous address. If the protection of data in the previous address is not required, write select setup time can be ignored as any address selection sustained for the final 30 ns of the write enable pulse and during the write select hold time will result in data being written with that location. Depending on the duration of the input conditions, one of a number of previous addresses may have been written into.
5/ Latch time is the time required for the internal output of the latch to assume the state of the new data. This is important only when attempting to read from a location immediately after that location has received new data.

2.0 APPLICABLE DOCUMENT

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

2.2 Government documents.

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

DEPARTMENT OF DEFENSE SPECIFICATIONS

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

DEPARTMENT OF DEFENSE STANDARDS

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

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

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

3. REQUIREMENTS

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

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

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

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

3.3.2 Logic diagram. The logic diagram shall be as specified on figure 2.

3.3.3 Truth tables and functional description. The truth tables and functional descriptions shall be as specified on figure 3.

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

3.4 Lead material and finish. 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 1 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 5 (see MIL-PRF-38535, appendix A).

4. VERIFICATION

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

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

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

b. Interim and final electrical test parameters shall be as specified in table II, except interim electrical parameters test prior to burn-in is optional at the discretion of the manufacturer.

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

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/	Limits		Unit
			Min	Max	
Low-level output voltage	V_{OL}	V_{CC} = 4.5 V, I_{OL} = 16 mA		0.4	V
Maximum collector cut-off current	I_{CEX}	V_{CC} = 4.5 V, V_0 = 5.5 V		30	μA
Input clamp voltage	V_{IC}	V_{CC} = 4.5 V, I_{IN} = 12 mA		-1.5	V
Low-level input current	I_{IL}	V_{CC} = 5.5 V, V_{IN} = 0.4 V	-0.7	-1.6	mA
High-level input current	I_{IH1}	V_{CC} = 5.5 V, V_{IN} = 2.4 V		40	μA
	I_{IH2}	V_{CC} = 5.5 V, V_{IN} = 5.5 V		100	μA
Supply current	I_{CC}	V_{CC} = 5.5 V		140	mA
Propagation delay time, Read enable to any output	t_{PLH1}	V_{CC} = 5.0 V, R_L = 400Ω, C_L = 50 pF	5	18	ns
	t_{PHL1}		5	36	ns
Propagation delay time, Write enable to any output	t_{PLH2}		5	48	ns
	t_{PHL2}		5	54	ns
Propagation delay time, Read address to any output	t_{PLH3}		5	42	ns
	t_{PHL3}		5	54	ns
Propagation delay time, Data to any output	t_{PLH4}		5	36	ns
	t_{PHL4}		5	54	ns

1/ Complete terminal conditions are specified in table III.

TABLE II. Electrical test requirements.

MIL-PRF-38535 Test requirement	Subgroups (see table III) Class B Devices
Interim electrical parameters	1
Final electrical test parameters	1*, 2, 3, 7, 9
Group A test requirements	1, 2, 3, 7, 9,
Groups C end point electrical parameters	1, 2, 3
Group D end point electrical parameters	1, 2, 3
Additional electrical subgroups for Group C periodic inspections	10, 11

*PDA applies to subgroup 1.

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

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

a. Tests shall be as specified in table II herein.

b. Subgroups 4, 5, 6, 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. Subgroups 3 and 4 shall be added to the group C inspection requirements for class B devices and shall consist of the tests, conditions, and limits specified for subgroups 10 and 11 of group A. The sample size series number shall be 5 (45 devices accept on 0).

c. 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 as specified in the appropriate tables and as follows:

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

CASES E AND F

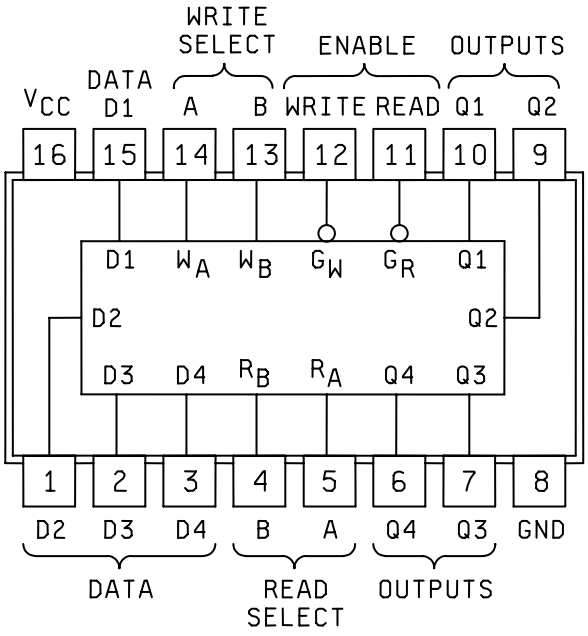


Figure 1. Terminal connections.

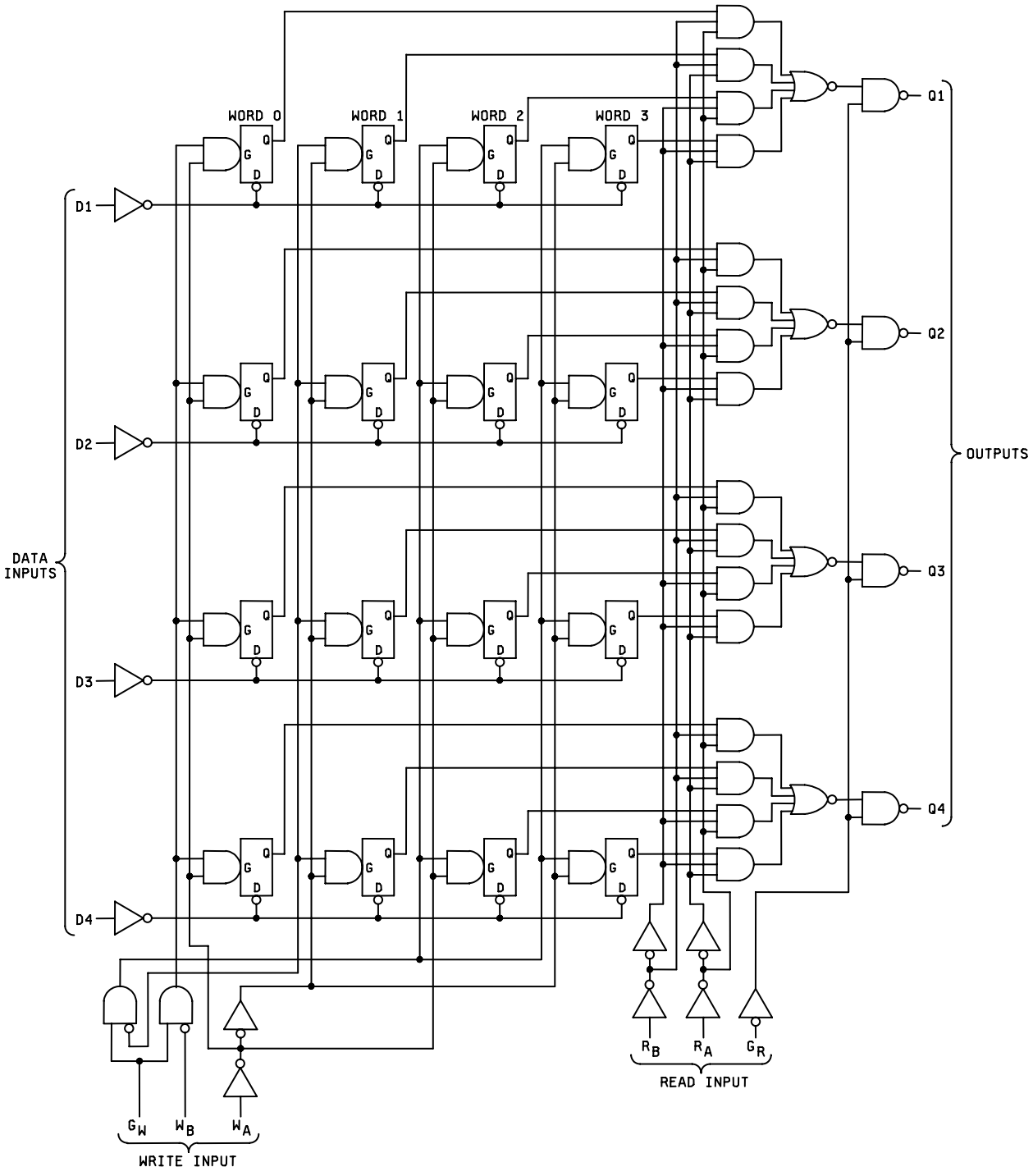


Figure 2. Logic diagram.

Write function table (see notes 1, 2, and 3)

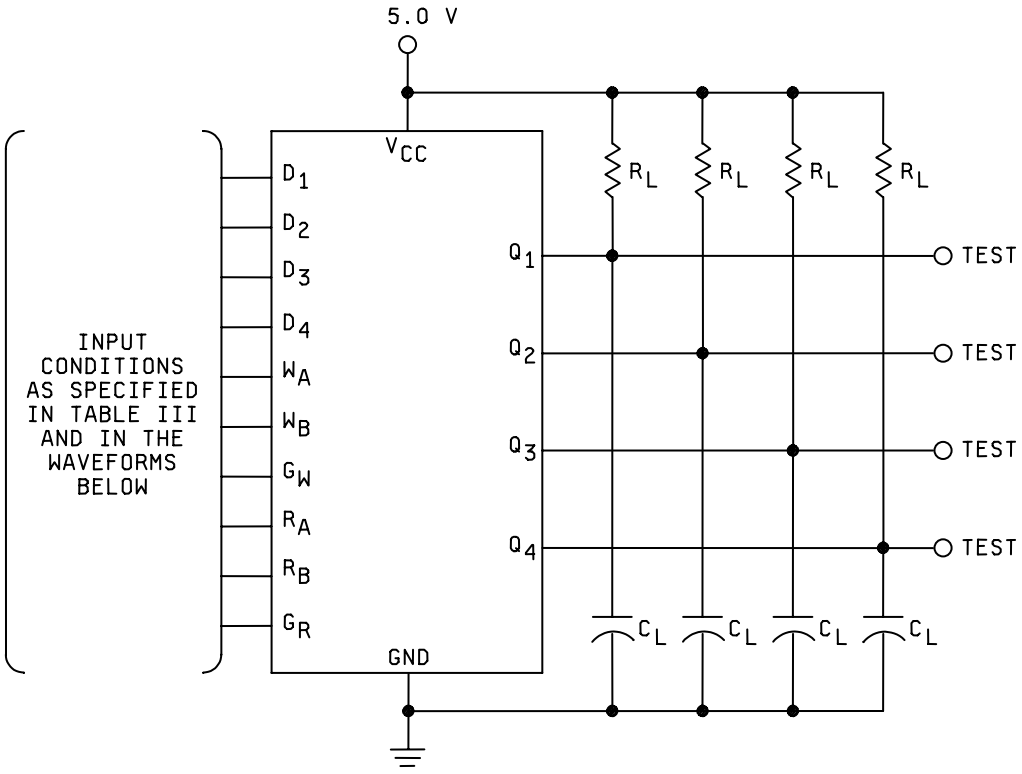
Write inputs			Word			
W_B	W_A	G_W	0	1	2	3
L	L	L	Q = D	Q_0	Q_0	Q_0
L	H	L	Q_0	Q = D	Q_0	Q_0
H	L	L	Q_0	Q_0	Q = D	Q_0
H	H	L	Q_0	Q_0	Q_0	Q = D
X	X	H	Q_0	Q_0	Q_0	Q_0

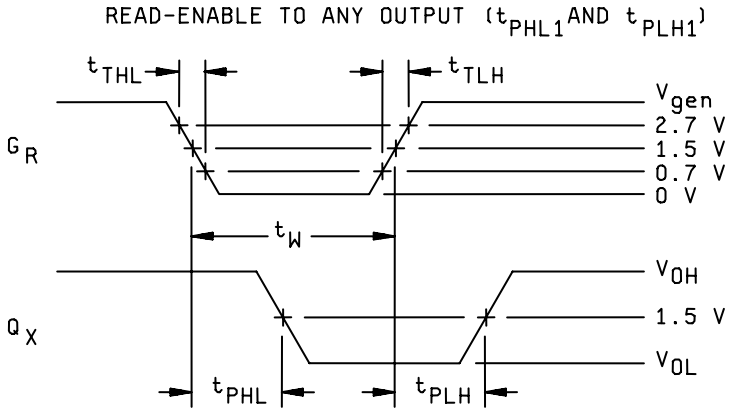
Read function table (see notes 1 and 4)

Read inputs			Outputs			
R_B	R_A	G_R	Q1	Q2	Q3	Q4
L	L	L	W0B1	W0B2	W0B3	W0B4
L	H	L	W1B1	W1B2	W1B3	W1B4
H	L	L	W2B1	W2B2	W2B3	W2B4
H	H	L	W3B1	W3B2	W3B3	W3B4
X	X	H	H	H	H	H

NOTES:
1. H = high level, L = low level, X = irrelevant.
2. (Q = D) = The four selected internal flip-flop outputs will assume the states applied to the four external data inputs.
3. Q_0 = The level of Q before the indicated input conditions were established.
4. W0B1 = The first bit of word 0, etc.

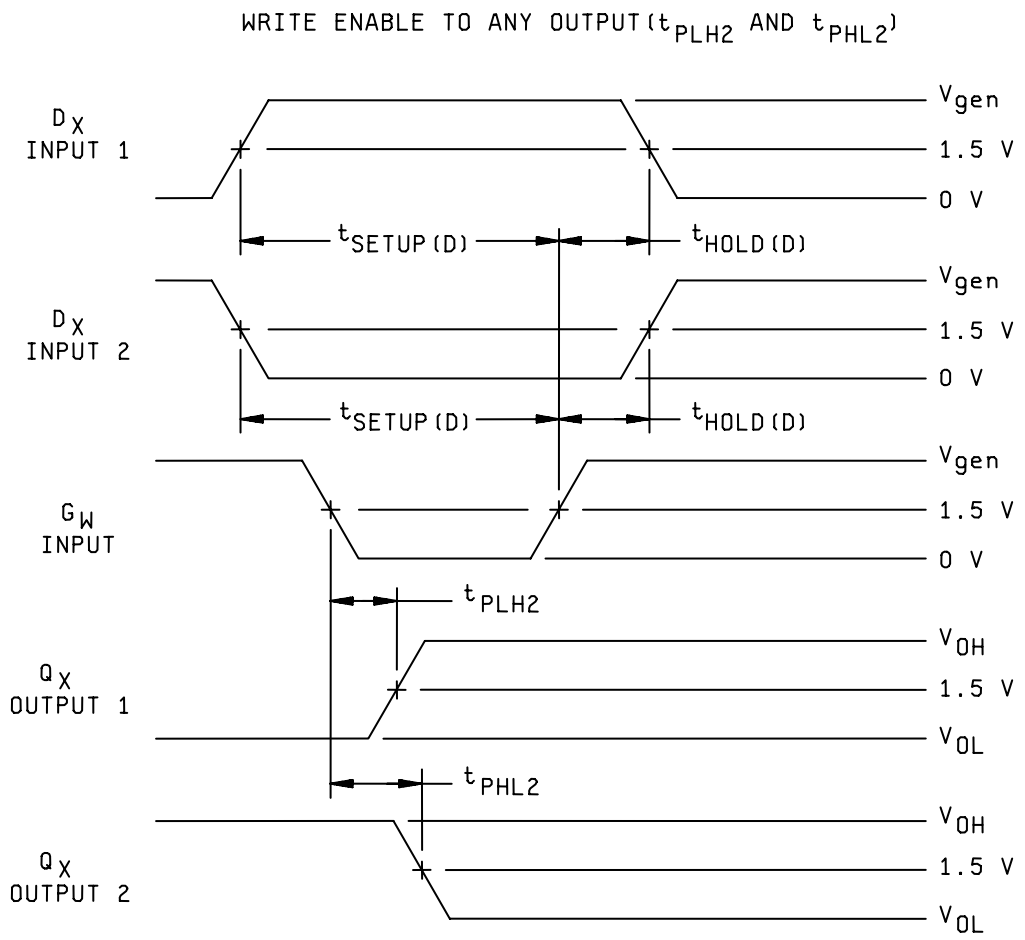
Figure 3. Truth tables.





NOTES:
1. R_L = 400 Ω ± 5%.
2. C_L = 50 pF ± 10% (including jig and probe capacitance).
3. Read enable (G_R) pulse characteristics shall be as follows: Vgen = 3.0 V minimum, t_{THL} and $t_{TLH} \leq$ 10 ns, t_W = 25 ns, and PRR = 1 MHz.

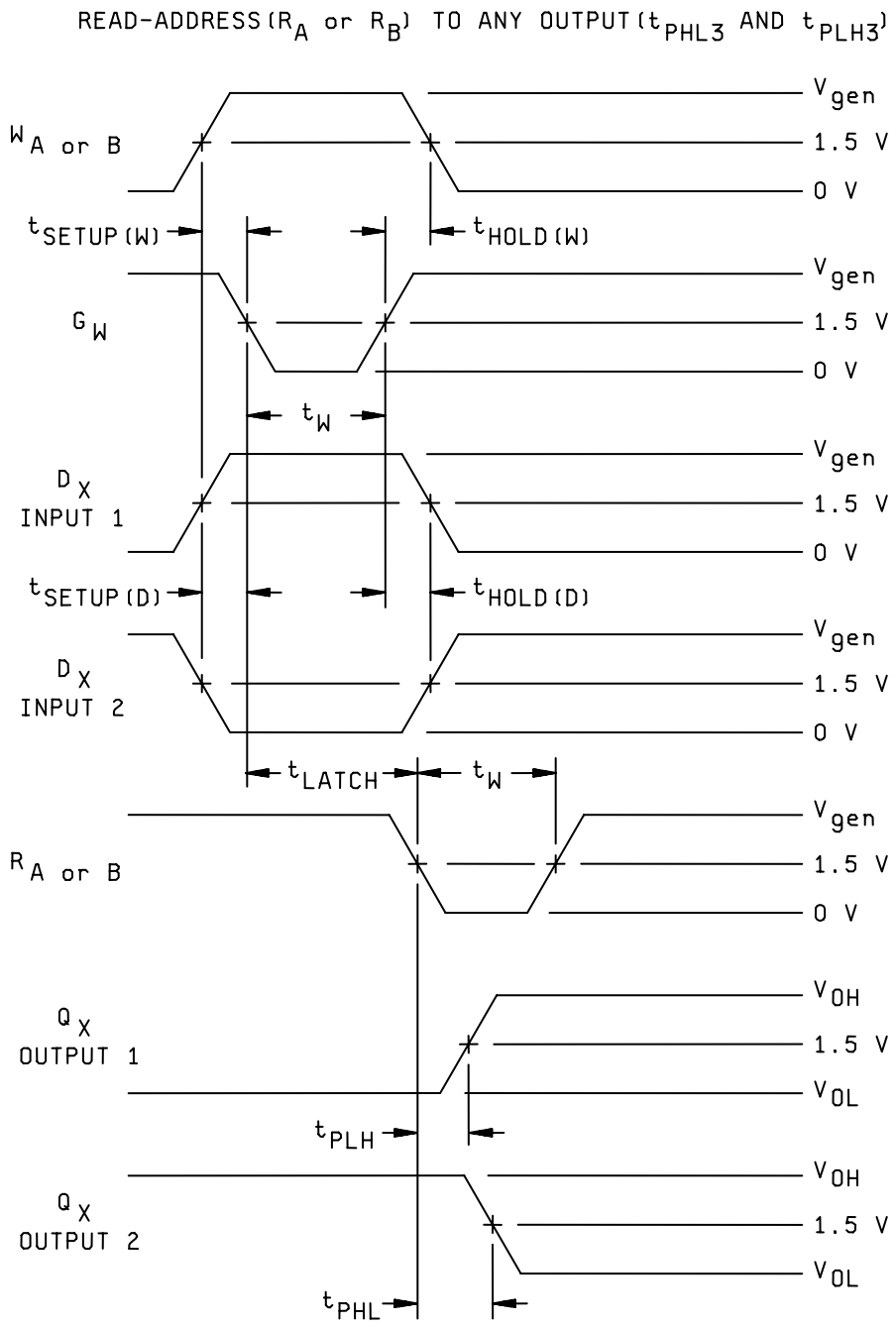
Figure 4. Switching circuit and waveforms.



NOTES:

1. All pulse generators have the following characteristics: t_{TLH} (0.7 V to 2.7 V) and t_{THL} (2.7 V to 0.7 V) ≤ 10 ns and Vgen ≥ 3.0 V.
2. PRR for "D" pulse generator shall be 500 kHz. PRR for "G_W" pulse generator shall be 1 MHz.
3. $t_{SETUP(D)}$ = 10 ns, $t_{HOLD(D)}$ = 15 ns and t_W = 25 ns.

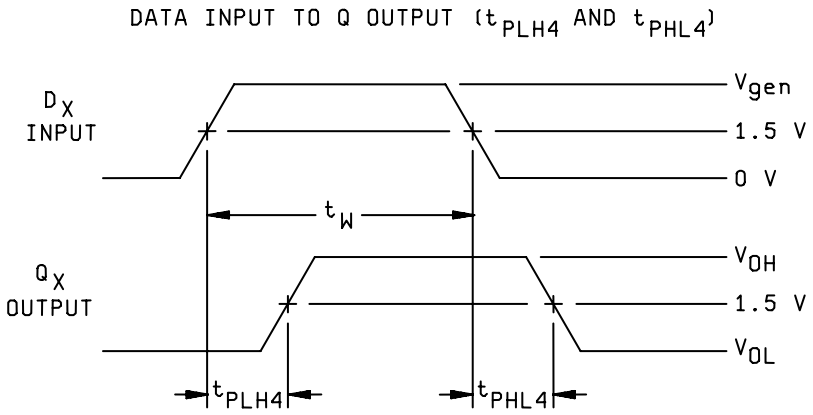
Figure 4. Switching circuit and waveforms - Continued.



NOTES:

1. All pulse generators have the following characteristics: t_{TLH} (0.7 V to 2.7 V) and t_{THL} (2.7 V to 0.7 V) ≤ 10 ns and Vgen ≥ 3.0 V.
2. $t_{SETUP(W)}$ = 15 ns, $t_{HOLD(W)}$ = 5 ns, $t_{SETUP(D)}$ = 10 ns, $t_{HOLD(D)}$ = 15 ns and t_W = 25 ns.
3. PRR = 1 MHz for $W_{A \text{ or } B}$ and G_W; PRR = 500 kHz for D_X and $R_{A \text{ or } B}$.

Figure 4. Switching circuit and waveforms - Continued.



NOTES:
1. Data pulse generator has the following characteristics: t_{TLH} (0.7 V to 2.7 V) and t_{THL} (2.7 V to 0.7 V) ≤ 10 ns and Vgen ≥ 3.0 V, t_W ≤ 100 ns and PRR = 1 MHz.

Figure 4. Switching circuit and waveforms - Continued.

TABLE III. Group A inspection for device type 01.

Terminal conditions (pins not designated are high level, low level or open)

Subgroup	Symbol	MIL-STD-883 method	Case E,F Test No.	1 D2	2 D3	3 D4	4 R_B	5 R_A	6 Q4	7 Q3	8 GND	9 Q2	10 Q1	11 G_R	12 G_W	13 W_B	14 W_A	15 D1	16 V_{CC}	Meas. terminal	Test limits Min	Max	Unit
1 T_C = 25°C	V_{OL}	3007	1	0.8V			0.8V	0.8V			GND		16mA	0.8V	0.8V	0.8V	0.8V	0.8V	4.5V	Q1		0.4	V
"	"	"	2				0.8V	2.0V			"	16mA		"	"	0.8V	2.0V		"	Q2		"	"
"	"	"	3		0.8V		2.0V	0.8V		16mA	"			"	"	2.0V	0.8V		"	Q3		"	"
"	"	"	4			0.8V	2.0V	2.0V	16mA		"			"	"	2.0V	2.0V		"	Q4		"	"
"	I_{CEX}	3008	5				0.8V	0.8V			"		5.5V	"	"	0.8V	0.8V	2.0V	"	Q1		30	µA
"	"	"	6	2.0V			0.8V	2.0V			"	5.5V		"	"	0.8V	2.0V		"	Q2		"	"
"	"	"	7		2.0V		2.0V	0.8V		5.5V	"			"	"	2.0V	0.8V		"	Q3		"	"
"	"	"	8			2.0V	2.0V	2.0V	5.5V		"			"	"	2.0V	2.0V		"	Q4		"	"
"	V_{IC}		9								"							-12mA	"	D1		-1.5	"
"	"		10	-12mA							"								"	D2		"	"
"	"		11		-12mA						"								"	D3		"	"
"	"		12			-12mA					"								"	D4		"	"
"	"		13					-12mA			"								"	R_A		"	"
"	"		14				-12mA				"								"	R_B		"	"
"	"		15								"			-12mA					"	G_R		"	"
"	"		16								"				-12mA				"	G_W		"	"
"	"		17								"						-12mA		"	W_A		"	"
"	"		18								"					-12mA			"	W_B		"	"
"	I_{IL}	3009	19								"							0.4V	5.5V	D1	-0.7	-1.6	mA
"	"	"	20	0.4V							"								"	D2	"	"	"
"	"	"	21		0.4V						"								"	D3	"	"	"
"	"	"	22			0.4V					"								"	D4	"	"	"
"	"	"	23					0.4V			"								"	R_A	"	"	"
"	"	"	24				0.4V				"								"	R_B	"	"	"
"	"	"	25								"			0.4V					"	G_R	"	"	"
"	"	"	26								"				0.4V				"	G_W	"	"	"
"	"	"	27								"						0.4V		"	W_A	"	"	"
"	"	"	28								"					0.4V			"	W_B	"	"	"
"	I_{IH1}	3010	29								"							2.4V	"	D1	0	40	µA
"	"	"	30	2.4V							"								"	D2	"	"	"
"	"	"	31		2.4V						"								"	D3	"	"	"
"	"	"	32			2.4V					"								"	D4	"	"	"
"	"	"	33					2.4V			"								"	R_A	"	"	"
"	"	"	34				2.4V				"								"	R_B	"	"	"
"	"	"	35								"			2.4V					"	G_R	"	"	"
"	"	"	36								"				2.4V				"	G_W	"	"	"
"	"	"	37								"						2.4V		"	W_A	"	"	"
"	"	"	38								"					2.4V			"	W_B	"	"	"
"	I_{IH2}	"	39								"							5.5V	"	D1		100	"
"	"	"	40	5.5V							"								"	D2		"	"
"	"	"	41		5.5V						"								"	D3		"	"
"	"	"	42			5.5V					"								"	D4		"	"
"	"	"	43					5.5V			"								"	R_A		"	"
"	"	"	44				5.5V				"								"	R_B		"	"
"	"	"	45								"			5.5V					"	G_R		"	"
"	"	"	46								"				5.5V				"	G_W		"	"
"	"	"	47								"						5.5V		"	W_A		"	"
"	"	"	48								"					5.5V			"	W_B		"	"
	I_{CC}	3005	49	4.5V	4.5V	4.5V	GND	GND			"			4.5V	4.5V	GND	GND	4.5V	"	V_{CC}		140	mA
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.																						

See notes at end of device type 01.

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

Subgroup	Symbol	MIL-STD-883 method	Case E,F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits		
			Test No.	D2	D3	D4	R_B	R_A	Q4	Q3	GND	Q2	Q1	G_R	G_W	W_B	W_A	D1	V_{CC}		Min	Max	Unit
7	(truth		50	0.8 V	0.8 V	0.8 V	0.8 V	0.8 V	L	L	GND	L	L	0.8 V	0.8 V	0.8 V	0.8 V	0.8 V	5.0 V	See note at the end of this table			
T_C = 25°C	table		51	2.0 V	2.0 V	2.0 V	"	0.8 V	H	H	"	H	H	0.8 V	0.8 V	"	0.8 V	2.0 V	"				
"	test)		52	2.0 V	2.0 V	2.0 V	"	0.8 V	H	H	"	H	H	2.0 V	2.0 V	"	0.8 V	2.0 V	"				
"	"		53	0.8 V	0.8 V	0.8 V	"	2.0 V	H	H	"	H	H	2.0 V	2.0 V	"	2.0 V	0.8 V	"				
"	"		54	0.8 V	0.8 V	0.8 V	"	2.0 V	L	L	"	L	L	0.8 V	0.8 V	"	2.0 V	0.8 V	"				
"	"		55	2.0 V	2.0 V	2.0 V	"	2.0 V	H	H	"	H	H	0.8 V	0.8 V	"	2.0 V	2.0 V	"				
"	"		56	2.0 V	2.0 V	2.0 V	"	2.0 V	H	H	"	H	H	2.0 V	2.0 V	"	2.0 V	2.0 V	"				
"	"		57	0.8 V	2.0 V	2.0 V	2.0 V	0.8 V	H	H	"	H	H	2.0 V	2.0 V	2.0 V	0.8 V	0.8 V	"				
"	"		58	0.8 V	2.0 V	2.0 V	"	0.8 V	H	L	"	H	L	0.8 V	0.8 V	"	0.8 V	0.8 V	"				
"	"		59	2.0 V	0.8 V	0.8 V	"	0.8 V	L	H	"	L	H	0.8 V	0.8 V	"	0.8 V	2.0 V	"				
"	"		60	2.0 V	0.8 V	0.8 V	"	0.8 V	H	H	"	H	H	2.0 V	2.0 V	"	0.8 V	2.0 V	"				
"	"		61	0.8 V	0.8 V	0.8 V	"	2.0 V	H	H	"	H	H	2.0 V	2.0 V	"	2.0 V	0.8 V	"				
"	"		62	0.8 V	0.8 V	0.8 V	"	2.0 V	L	L	"	L	L	0.8 V	0.8 V	"	2.0 V	0.8 V	"				
"	"		63	2.0 V	2.0 V	2.0 V	"	2.0 V	H	H	"	H	H	0.8 V	0.8 V	"	2.0 V	2.0 V	"				
"	"		64	2.0 V	2.0 V	2.0 V	"	2.0 V	H	H	"	H	H	2.0 V	2.0 V	"	2.0 V	2.0 V	"				
"	"		65	0.8 V	0.8 V	0.8 V	0.8 V	0.8 V	H	H	"	H	H	2.0 V	2.0 V	0.8 V	0.8 V	0.8 V	"				
"	"		66	0.8 V	0.8 V	0.8 V	"	0.8 V	L	L	"	L	L	0.8 V	0.8 V	"	0.8 V	0.8 V	"				
"	"		67	0.8 V	0.8 V	0.8 V	"	0.8 V	H	H	"	H	H	2.0 V	2.0 V	"	0.8 V	0.8 V	"				
"	"		68	2.0 V	2.0 V	2.0 V	"	0.8 V	H	H	"	H	H	2.0 V	2.0 V	"	2.0 V	2.0 V	"				
"	"		69	2.0 V	2.0 V	2.0 V	"	0.8 V	L	L	"	L	L	0.8 V	2.0 V	"	2.0 V	2.0 V	"				
9	t_{PLH1}	3003	70	GND	GND	GND	GND	GND			GND		OUT	IN	GND	GND	GND	GND	5.0 V	G_R to Q1	5	15	ns
T_C = 25°C	"	(Fig 4)	71	"	"	"	"	"			"	OUT		"	"	"	"	"	"	G_R to Q2	"	"	"
"	"	"	72	"	"	"	"	"		OUT	"			"	"	"	"	"	"	G_R to Q3	"	"	"
"	"	"	73	"	"	"	"	"	OUT		"			"	"	"	"	"	"	G_R to Q4	"	"	"
"	t_{PHL1}	"	74	"	"	"	"	"			"		OUT	"	"	"	"	"	"	G_R to Q1	"	30	"
"	"	"	75	"	"	"	"	"			"	OUT		"	"	"	"	"	"	G_R to Q2	"	"	"
"	"	"	76	"	"	"	"	"		OUT	"			"	"	"	"	"	"	G_R to Q3	"	"	"
"	"	"	77	"	"	"	"	"	OUT		"			"	"	"	"	"	"	G_R to Q4	"	"	"
"	t_{PLH2}	"	78				"	"			"		OUT	GND	IN	GND	GND	IN1	"	G_W to Q1	"	40	"
"	"	"	79	IN1			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	80		IN1		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	81			IN1	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	82				"	5.0 V			"		OUT	"	"	"	5.0 V	IN1	"	G_W to Q1	"	"	"
"	"	"	83	IN1			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	84		IN1		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	85			IN1	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	86				5.0 V	GND			"		OUT	"	"	5.0 V	GND	IN1	"	G_W to Q1	"	"	"
"	"	"	87	IN1			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	88		IN1		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	89			IN1	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	90				"	5.0 V			"		OUT	"	"	"	"	IN1	"	G_W to Q1	"	"	"
"	"	"	91	IN1			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	92		IN1		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	93			IN1	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"

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

Subgroup	Symbol	MIL-STD-883 method	Case E,F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits		
			Test No.	D2	D3	D4	R_B	R_A	Q4	Q3	GND	Q2	Q1	G_R	G_W	W_B	W_A	D1	V_{CC}		Min	Max	Unit
9	t_{PHL2}	3003	94				GND	GND			GND		OUT	GND	IN	GND	GND	IN2	5.0 V	G_W to Q1	5	45	ns
T_C = 25°C	"	(Fig 4)	95	IN2			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	96		IN2		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	97			IN2	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	98				"	5.0 V			"		OUT	"	"	"	5.0 V	IN2	"	G_W to Q1	"	"	"
"	"	"	99	IN2			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	100		IN2		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	101			IN2	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	102				5.0 V	GND			"		OUT	"	"	5.0 V	GND	IN2	"	G_W to Q1	"	"	"
"	"	"	103	IN2			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	104		IN2		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	105			IN2	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	106				"	5.0 V			"			"	"	"	5.0 V	IN2	"	G_W to Q1	"	"	"
"	"	"	107	IN2			"	"			"			"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	108		IN2		"	"			"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	109			IN2	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	t_{PLH3}	"	110				GND	IN			"		OUT1	"	"	GND	IN	IN1	"	R_A to Q1	"	35	"
"	"	"	111	IN1			"	"			"	OUT1		"	"	"	"		"	R_A to Q2	"	"	"
"	"	"	112		IN1		"	"		OUT1	"			"	"	"	"		"	R_A to Q3	"	"	"
"	"	"	113			IN1	"	"	OUT1		"			"	"	"	"		"	R_A to Q4	"	"	"
"	t_{PHL3}	"	114				IN	GND			"		OUT2	"	"	IN	GND	IN2	"	R_B to Q1	"	45	"
"	"	"	115	IN2			"	"			"	OUT2		"	"	"	"		"	R_B to Q2	"	"	"
"	"	"	116		IN2		"	"		OUT2	"			"	"	"	"		"	R_B to Q3	"	"	"
"	"	"	117			IN2	"	"	OUT2		"			"	"	"	"		"	R_B to Q4	"	"	"
"	t_{PLH4}	"	118				GND	"			"		OUT	"	GND	GND	"	IN	"	D_1 to Q1	"	30	"
"	"	"	119	IN			"	"			"	OUT		"	"	"	"		"	D_2 to Q2	"	"	"
"	"	"	120		IN		"	"		OUT	"			"	"	"	"		"	D_3 to Q3	"	"	"
"	"	"	121			IN	"	"	OUT		"			"	"	"	"		"	D_4 to Q4	"	"	"
"	t_{PHL4}	"	122				"	"			"		OUT	"	"	"	"	IN	"	D_1 to Q1	"	45	"
"	"	"	123	IN			"	"			"	OUT		"	"	"	"		"	D_2 to Q2	"	"	"
"	"	"	124		IN		"	"		OUT	"			"	"	"	"		"	D_3 to Q3	"	"	"
"	"	"	125			IN	"	"	OUT		"			"	"	"	"		"	D_4 to Q4	"	"	"
10	t_{PLH1}	"	126	GND	GND	GND	"	"			"		OUT	IN	"	"	"	GND	"	G_R to Q1	"	18	"
T_C = 125°C	"	"	127	"	"	"	"	"			"	OUT		"	"	"	"	"	"	G_R to Q2	"	"	"
"	"	"	128	"	"	"	"	"		OUT	"			"	"	"	"	"	"	G_R to Q3	"	"	"
"	"	"	129	"	"	"	"	"	OUT		"			"	"	"	"	"	"	G_R to Q4	"	"	"
"	t_{PHL1}	"	130	"	"	"	"	"			"		OUT	"	"	"	"	"	"	G_R to Q1	"	36	"
"	"	"	131	"	"	"	"	"			"	OUT		"	"	"	"	"	"	G_R to Q2	"	"	"
"	"	"	132	"	"	"	"	"		OUT	"			"	"	"	"	"	"	G_R to Q3	"	"	"
"	"	"	133	"	"	"	"	"	OUT		"			"	"	"	"	"	"	G_R to Q4	"	"	"
"	t_{PLH2}	"	134				"	"			"		OUT	GND	IN	"	"	IN1	"	G_W to Q1	"	48	"
"	"	"	135	IN1			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	136		IN1		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	137			IN1	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"

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

Terminal conditions (pins not designated are high level, low level or open)

Subgroup	Symbol	MIL-STD-883 method	Case E,F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Meas. terminal	Test limits		
			Test No.	D2	D3	D4	R_B	R_A	Q4	Q3	GND	Q2	Q1	G_R	G_W	W_B	W_A	D1	V_{CC}		Min	Max	Unit
10	t_{PLH2}	3003	138				GND	5.0 V			GND		OUT	GND	IN	GND	5.0 V	IN1	5.0 V	G_W to Q1	5	48	ns
T_C = 125°C	"	(Fig 4)	139	IN1			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	140		IN1		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	141			IN1	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	142				5.0 V	GND			"		OUT	"	"	5.0 V	GND	IN1	"	G_W to Q1	"	"	"
"	"	"	143	IN1			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	144		IN1		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	145			IN1	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	146				"	5.0 V			"		OUT	"	"	"	5.0 V	IN1	"	G_W to Q1	"	"	"
"	"	"	147	IN1			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	148		IN1		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	149			IN1	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	t_{PHL2}	"	150				GND	GND			"		OUT	"	"	GND	GND	IN2	"	G_W to Q1	"	54	"
"	"	"	151	IN2			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	152		IN2		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	153			IN2	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	154				"	5.0 V			"		OUT	"	"	"	5.0 V	IN2	"	G_W to Q1	"	"	"
"	"	"	155	IN2			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	156		IN2		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	157			IN2	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	158				5.0 V	GND			"		OUT	"	"	5.0 V	GND	IN2	"	G_W to Q1	"	"	"
"	"	"	159	IN2			"	"			"	OUT		"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	160		IN2		"	"		OUT	"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	161			IN2	"	"	OUT		"			"	"	"	"		"	G_W to Q4	"	"	"
"	"	"	162				"	5.0 V			"			"	"	"	5.0 V	IN2	"	G_W to Q1	"	"	"
"	"	"	163	IN2			"	"			"			"	"	"	"		"	G_W to Q2	"	"	"
"	"	"	164		IN2		"	"			"			"	"	"	"		"	G_W to Q3	"	"	"
"	"	"	165			IN2	"	"			"			"	"	"	"		"	G_W to Q4	"	"	"
"	t_{PLH3}	"	166				GND	IN			"		OUT1	"	"	GND	IN	IN1	"	R_A to Q1	"	42	"
"	"	"	167	IN1			"	"			"	OUT1		"	"	"	"		"	R_A to Q2	"	"	"
"	"	"	168		IN1		"	"		OUT1	"			"	"	"	"		"	R_A to Q3	"	"	"
"	"	"	169			IN1	"	"	OUT1		"			"	"	"	"		"	R_A to Q4	"	"	"
"	t_{PHL3}	"	170				IN	GND			"		OUT2	"	"	IN	GND	IN2	"	R_B to Q1	"	54	"
"	"	"	171	IN2			"	"			"	OUT2		"	"	"	"		"	R_B to Q2	"	"	"
"	"	"	172		IN2		"	"		OUT2	"			"	"	"	"		"	R_B to Q3	"	"	"
"	"	"	173			IN2	"	"	OUT2		"			"	"	"	"		"	R_B to Q4	"	"	"
"	t_{PLH4}	"	174				GND	"			"		OUT	"	GND	GND	"	IN	"	D_1 to Q1	"	36	"
"	"	"	175	IN			"	"			"	OUT		"	"	"	"		"	D_2 to Q2	"	"	"
"	"	"	176		IN		"	"		OUT	"			"	"	"	"		"	D_3 to Q3	"	"	"
"	"	"	177			IN	"	"	OUT		"			"	"	"	"		"	D_4 to Q_4	"	"	"
"	t_{PHL4}	"	178				"	"			"		OUT	"	"	"	"	IN	"	D_1 to Q1	"	54	"
"	"	"	179	IN			"	"			"	OUT		"	"	"	"		"	D_2 to Q2	"	"	"
"	"	"	180		IN		"	"		OUT	"			"	"	"	"		"	D_3 to Q3	"	"	"
"	"	"	181			IN	"	"	OUT		"			"	"	"	"		"	D_4 to Q4	"	"	"
11	Same tests, terminal conditions and limits as subgroup 10, except T_C = -55°C.																						

NOTE: Output voltages shall be either:

(a) H = 2.4 volts minimum and L = 0.4 volt maximum when using a high speed checker double comparator, or

(b) H ≥ 1.0 volt and L < 1.0 volt when using a high speed checker single comparator.

5. PACKAGING

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

6. NOTES

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

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

6.2 Acquisition requirements. Acquisition documents should specify the following:

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

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

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

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

GND ..... Electrical ground (common terminal)
I_{IN} ..... Current-flowing into an input terminal
T_C ..... Case temperature
V_{IN} ..... Voltage level at 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 lead lengths 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-35810 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.

Device type	Commercial type
01	54170

6.8 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
DLA - CC

Preparing activity:
DLA - CC

(Project 5962-2107)

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

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