

INCH-POUND

MIL-M-38510/325D
17 September 2003
SUPERSEDING
MIL-M-38510/325C
24 September 1987

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, BIPOLAR, LOW-POWER SCHOTTKY TTL,
FLIP-FLOPS, CASCADABLE, 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, bipolar, low-power Schottky TTL, flip-flops, bistable logic 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 For this product, the requirements of MIL-M-38510 have been superseded by MIL-PRF-38535, (see 6.3).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	Octal D flip-flop with clear, cascadable
02	Octal D flip-flop with transparent latch and 3 state outputs non-cascadable
03	Octal D flip-flop with 3 state outputs, cascadable
04	Octal D flip-flop with enable, cascadable

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>
R	GDIP1-T20 or CDIP2-T20	20	Dual-in-line
S	GDFP2-F20 or CDFP3-F20	20	Flat pack
2	CQCC1-N20	20	Square leadless chip carrier

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

AMSC N/A

FSC 5962

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

1.3 Absolute maximum ratings.

Supply voltage range	-0.5 V dc to 7.0 V dc
Input voltage range	-1.5 V dc at -18 mA to 5.5 V dc
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D) <u>1/</u>	
Device type 01	149 mW
Device type 02 and 03	231 mW
Device type 04	176 mW
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction to case (θ_{JC}):	
Cases R, S, 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
Case operating temperature range (T_C)	-55°C to +125°C
Normalized fanout (each output) <u>3/</u>	10 maximum at low logic level 20 maximum at high logic level
Input setup time, $t_{(setup)}$:	
Device type 01, 03	20 ns minimum
Device type 02	5 ns minimum
Device type 04	
data	20 ns minimum
enable active	25 ns minimum
enable inactive	10 ns minimum
Input hold time, $t_{(hold)}$:	
Device type 01, 03, 04	5 ns minimum
Device type 02	20 ns minimum
Input pulse width, t_P :	
Device type 01, 04 (clock)	20 ns minimum
Device type 01 (clear)	20 ns minimum
Device type 02 (enable)	15 ns minimum
Device type 03 (clock)	15 ns minimum

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/ Device will fanout in both high and low levels to the specified number of data inputs on the same device as that being tested.

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.

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

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

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

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

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

3.5 Electrical performance characteristics. The electrical performance characteristics are as specified in table I, and apply over the full recommended case operating temperature range, unless otherwise specified.

3.6 Electrical test requirements. The electrical test requirements for each device class shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table III.

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

3.8 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 10 (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.

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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C		Device type	Limits		Unit
					Min	Max	
High level output voltage	V _{OH}	V _{IH} = 2.0 V, V _{CC} = 4.5 V	I _{OH} = -400 μA	01, 04	2.5		V
			I _{OH} = -1 mA	02, 03	2.4		
Low level output voltage	V _{OL}	V _{IL} = 0.7 V, V _{CC} = 4.5 V	I _{OL} = 4 mA	01, 04		0.4	V
			I _{OL} = 12 mA	02, 03			
Input clamp voltage	V _{IC}	V _{CC} = 4.5 V, I _{OL} = -18 mA, T _C = +25°C		All		-1.5	V
Low level input current	I _{IL}	V _{CC} = 5.5 V, V _{IL} = 0.4 V	clear	01	-30	-360	μA
			clock	01, 04	-30	-400	
				03	0	-400	
			data	01, 04	-100	-400	
				02	0	-400	
				03	0	-400	
			O/C	02, 03	0	-420	
			enable	02		-400	
04	-30	-360					
High level input current all inputs	I _{IH1}	V _{CC} = 5.5 V, V _{IN} = 2.7 V		All		20	μA
	I _{IH2}	V _{CC} = 5.5 V, V _{IN} = 5.5 V		All		100	μA
Short circuit output current	I _{OS}	V _{CC} = 5.5 V, V _{IN} = 0 V <u>1/</u>		02, 03	-15	-225	mA
				01, 04	-15	-100	
Output current, high level, outputs off	I _{OZH}	V _{CC} = 5.5 V, V _O = 2.7 V		02, 03		20	μA
Output current, low level, outputs off	I _{OZL}	V _{CC} = 5.5 V, V _O = 0.4 V		02, 03		-20	μA
Supply current	I _{CC}	V _{CC} = 5.5 V	V _{IN} = 5.0 V	01		27	mA
				02		40	
				03		42	
			V _{IN} = GND	04		32	
Maximum clock frequency	f _{MAX}	V _{CC} = 4.5 V C _L = 50 pF ±10%	R _L = 2 kΩ ±5%	01, 04	25		MHz
			R _L = 110 Ω ±5%	03	26		

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

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C	Device type	Limits		Unit
				Min	Max	
To low level clr to Q	t _{PHL1}	C _L = 50 pF ±10%, V _{CC} = 5.0 V, R _L = 2 kΩ ±5%	01	5	42	ns
To high level clk to Q	t _{PLH2}		01	5	42	ns
To low level clk to Q	t _{PHL2}		01	5	42	ns
To high level D to Q	t _{PLH1}	V _{CC} = 5.0 V, C _L = 50 pF ±10%, R _L = 110 Ω ±5%	02	3	24	ns
To low level D to Q	t _{PHL1}		02	3	24	ns
To high level G to Q	t _{PLH2}		02	3	39	ns
To low level G to Q	t _{PHL2}		02	3	39	ns
To high level O/C to Q	t _{PZH}		02	3	37	ns
To low level O/C to Q	t _{PZL}		02	3	47	ns
To Z from high O/C to Q	t _{PHZ}		02	3	35	ns
To Z from low O/C to Q	t _{PLZ}		02	3	39	ns
To high level clk to Q	t _{PLH2}		03	5	37	ns
To low level clk to Q	t _{PHL2}		03	5	37	ns
To high level O/C to Q	t _{PZH}		03	3	37	ns
To low level O/C to Q	t _{PZL}		03	3	37	ns
To Z from high O/C to Q	t _{PHZ}		03	3	37	ns
To Z from low O/C to Q	t _{PLZ}		03	3	39	ns
To high level clk to Q	t _{PLH2}	C _L = 50 pF ±10%, R _L = 2 kΩ ±5%, V _{CC} = 5.0 V	04	5	42	ns
To low level clk to Q	t _{PHL2}		04	5	42	ns

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
Group B electrical test parameters when using the 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
Additional electrical subgroups for group C periodic inspections	N/A	10, 11
Group D end-point electrical parameters	1, 2, 3	1, 2, 3

*PDA applies to subgroup 1.

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 parameters for class B devices and shall consist of the tests, conditions, and limits specified for subgroups 10 and 11 of group A.
- 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.

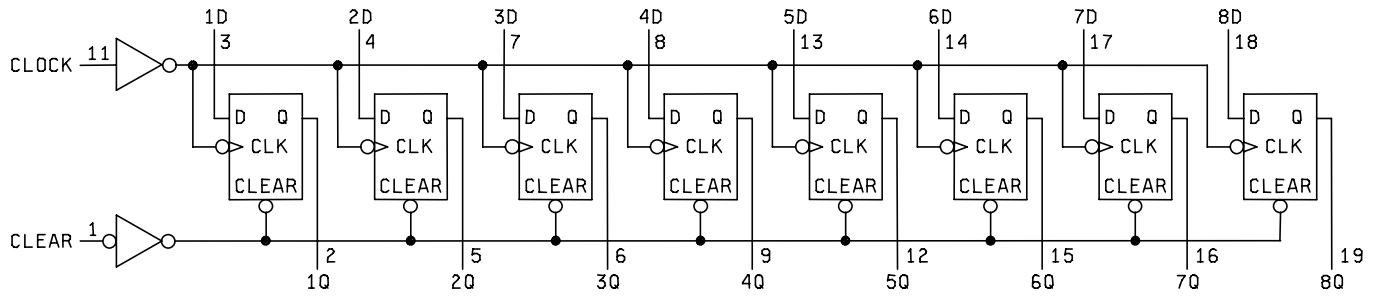
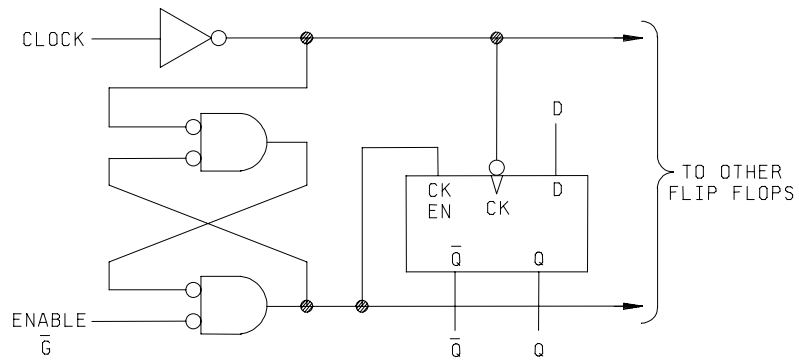
4.4.4 Group D inspection. Group D inspection shall be in accordance with table V of MIL-PRF-38535. End-point electrical parameters shall be as specified in table II herein.

4.5 Methods of inspection. Methods of inspection shall be 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.

Terminal number	Terminal symbol			
	Device type 01	Device type 02	Device type 03	Device type 04
	Cases R, S, 2	Cases R, S, 2	Cases R, S, 2	Cases R, S, 2
1	CLEAR	OUTPUT CONTROL	OUTPUT CONTROL	ENABLE $\bar{G}$
2	1Q	1Q	1Q	1Q
3	1D	1D	1D	1D
4	2D	2D	2D	2D
5	2Q	2Q	2Q	2Q
6	3Q	3Q	3Q	3Q
7	3D	3D	3D	3D
8	4D	4D	4D	4D
9	4Q	4Q	4Q	4Q
10	GND	GND	GND	GND
11	CLOCK	ENABLE G	CLOCK	CLOCK
12	5Q	5Q	5Q	5Q
13	5D	5D	5D	5D
14	6D	6D	6D	6D
15	6Q	6Q	6Q	6Q
16	7Q	7Q	7Q	7Q
17	7D	7D	7D	7D
18	8D	8D	8D	8D
19	8Q	8Q	8Q	8Q
20	V _{CC}	V _{CC}	V _{CC}	V _{CC}

FIGURE 1. Logic diagrams and terminal connections.

DEVICE TYPE 01DEVICE TYPE 04FIGURE 1. Logic diagrams and terminal connections - Continued.

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DEVICE TYPE 02

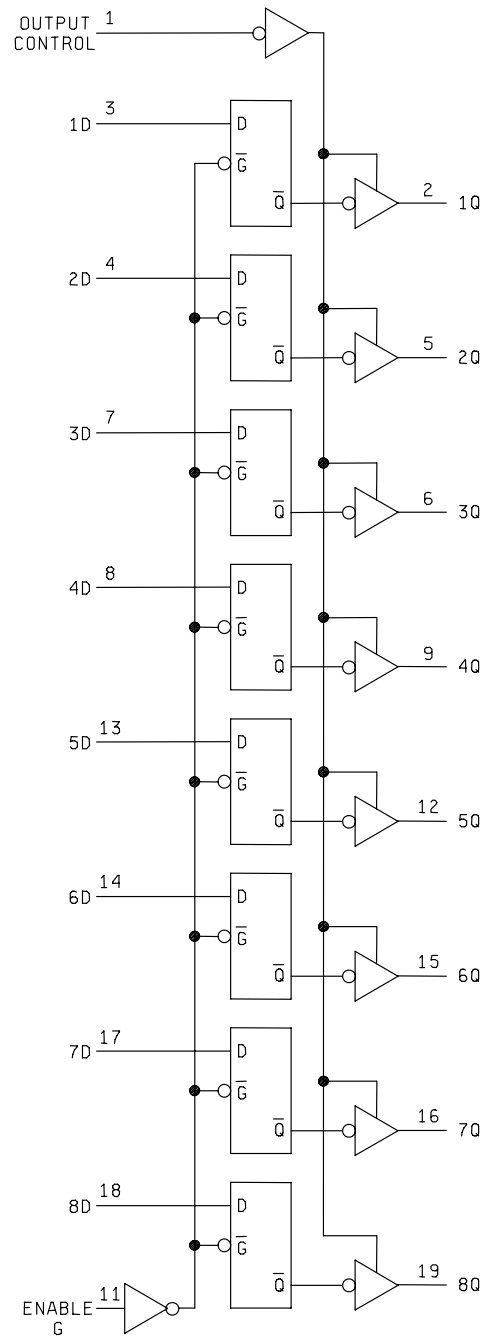
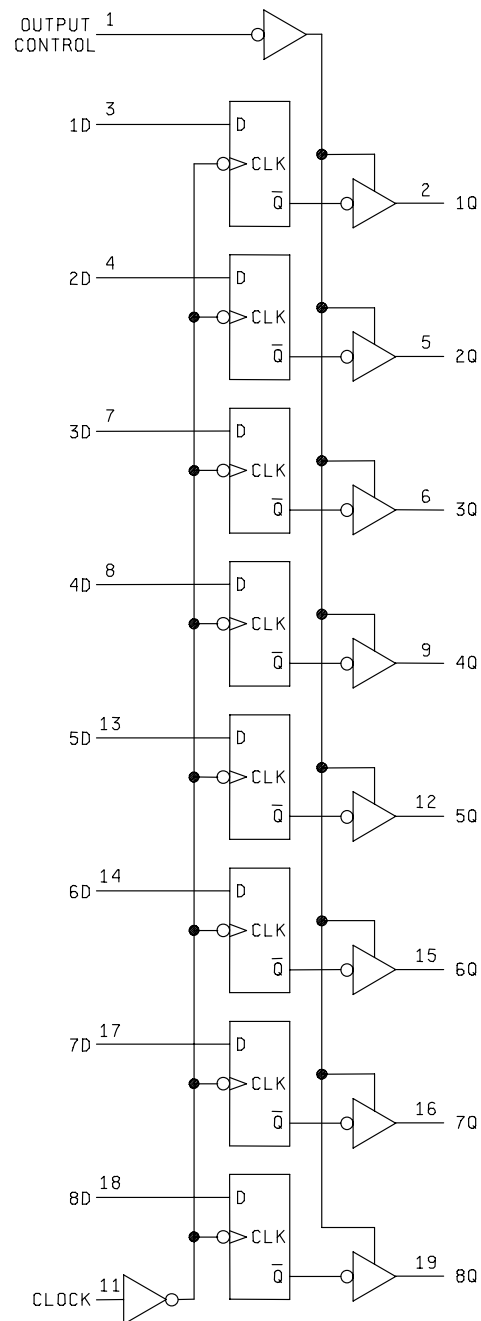


FIGURE 1. Logic diagrams and terminal connections - Continued.



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Device type 01

Inputs			Output
Clear	Clock	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q ₀

H = high level (steady state)

L = low level (steady state)

X = irrelevant

↑ = transition from low to high level

Q₀ = the level of Q before the indicated input conditions were establishedDevice type 02

Output control	Enable G	D	Output
L	H	H	H
L	H	L	L
L	L	X	Q ₀
H	X	X	Z

H = high level (steady state)

L = low level (steady state)

X = irrelevant

Q₀ = the level of Q before the indicated input conditions were established

Z = high impedance state

FIGURE 2. Truth tables.

Device type 03

Output control	Clock	D	Output
L	↑	H	H
L	↑	L	L
L	L	X	Q ₀
H	X	X	Z

H = high level (steady state)

L = low level (steady state)

X = irrelevant

↑ = transition from low to high level

Q₀ = the level of Q before the indicated input conditions were established

Z = high impedance state

Device type 04

Inputs			Output
$\overline{G}$	Clock	Data	Q
H	X	X	Q ₀
L	↑	H	H
L	↑	L	L
X	L	X	Q ₀

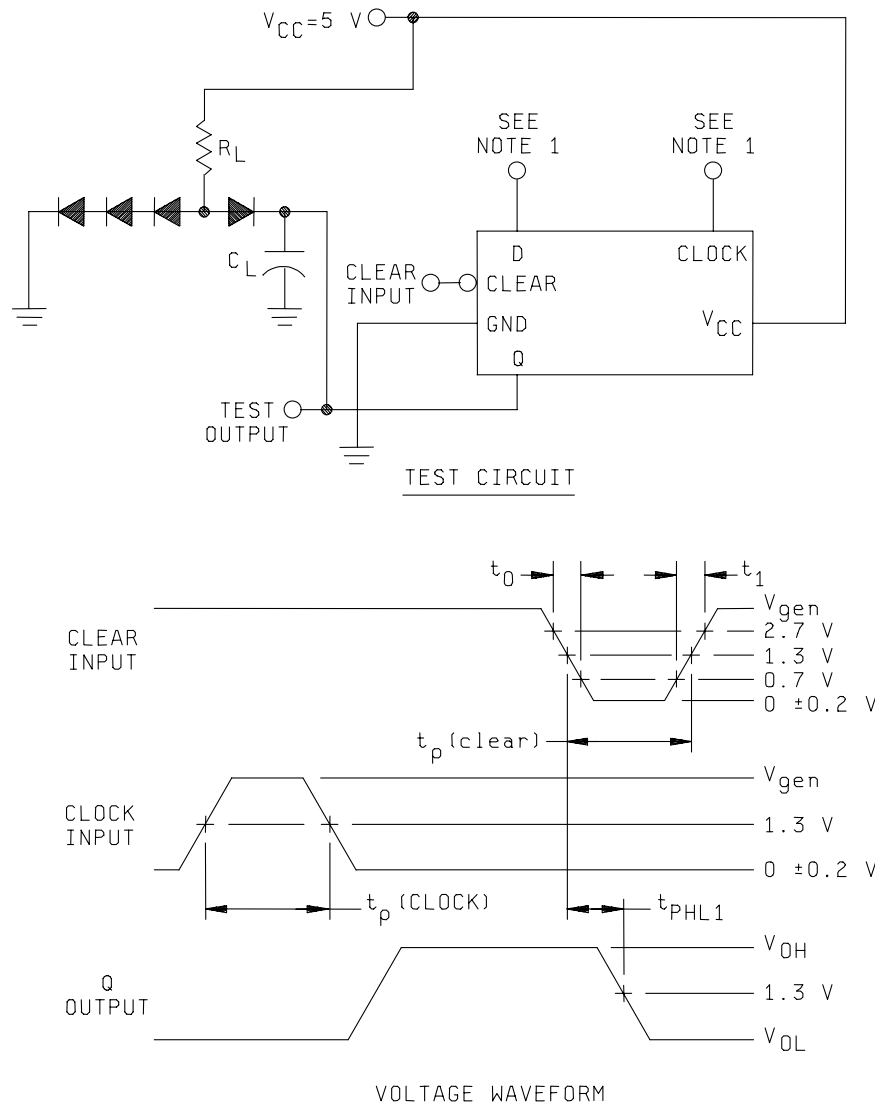
H = high level (steady state)

L = low level (steady state)

X = irrelevant

↑ = transition from low to high level

Q₀ = the level of Q before the indicated input conditions were establishedFIGURE 2. Truth tables - Continued.

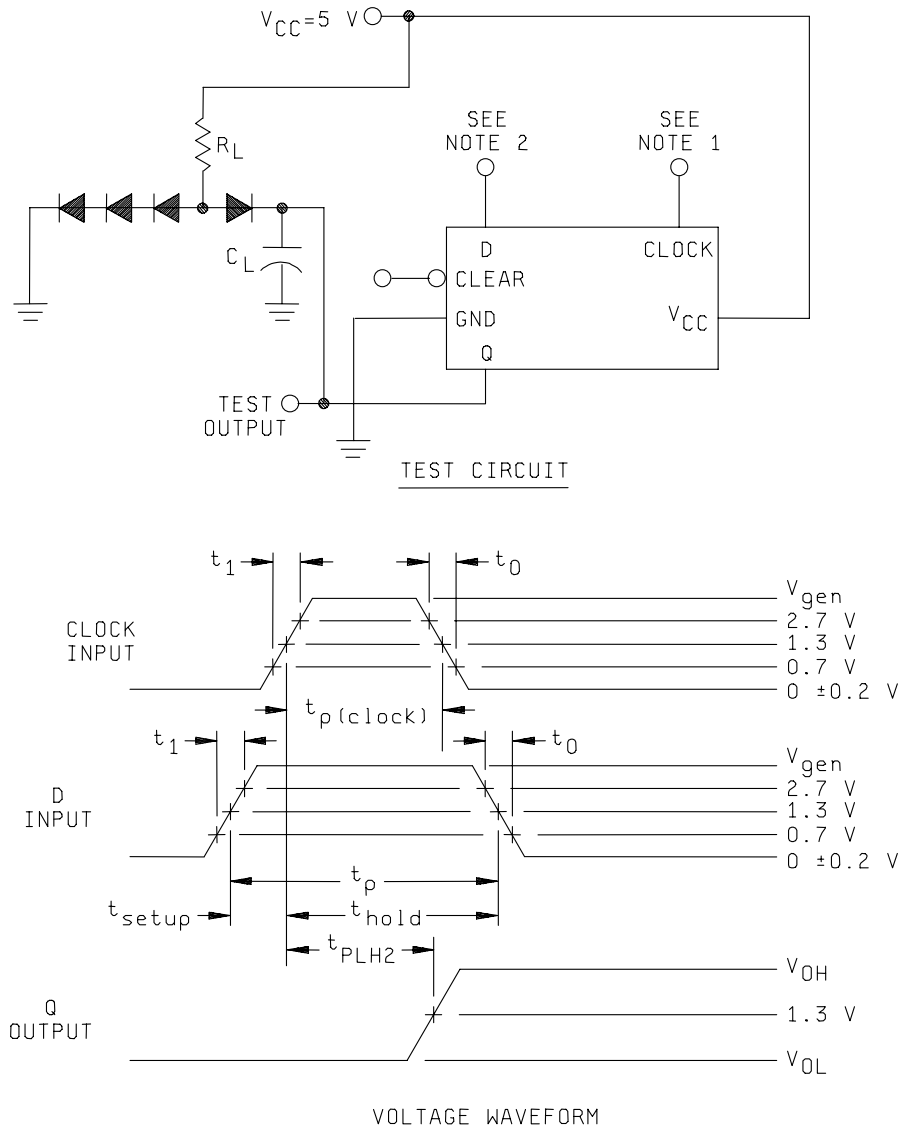


NOTES:

1. Clear input dominates regardless of the state of clock or D inputs.
2. All diodes are 1N3064 or equivalent.
3. Clear input pulse characteristics: V_{gen} = 3.0 ± 0.2 V, t_o ≤ 6 ns, t_i ≤ 15 ns, t_p(clear) = 20 ns minimum and PRR ≤ 1 MHz.
4. C_L = 50 pF ± 10% (including probe and jig capacitance).
5. R_L = 2 kΩ ± 5 percent.
6. Clock input pulse characteristics: t_p(clock) ≥ 20 ns, V_{GEN} = 3.0 ± 0.2 V, PRR ≤ 1 MHz.

FIGURE 3. Asynchronous switching test circuit for device type 01.

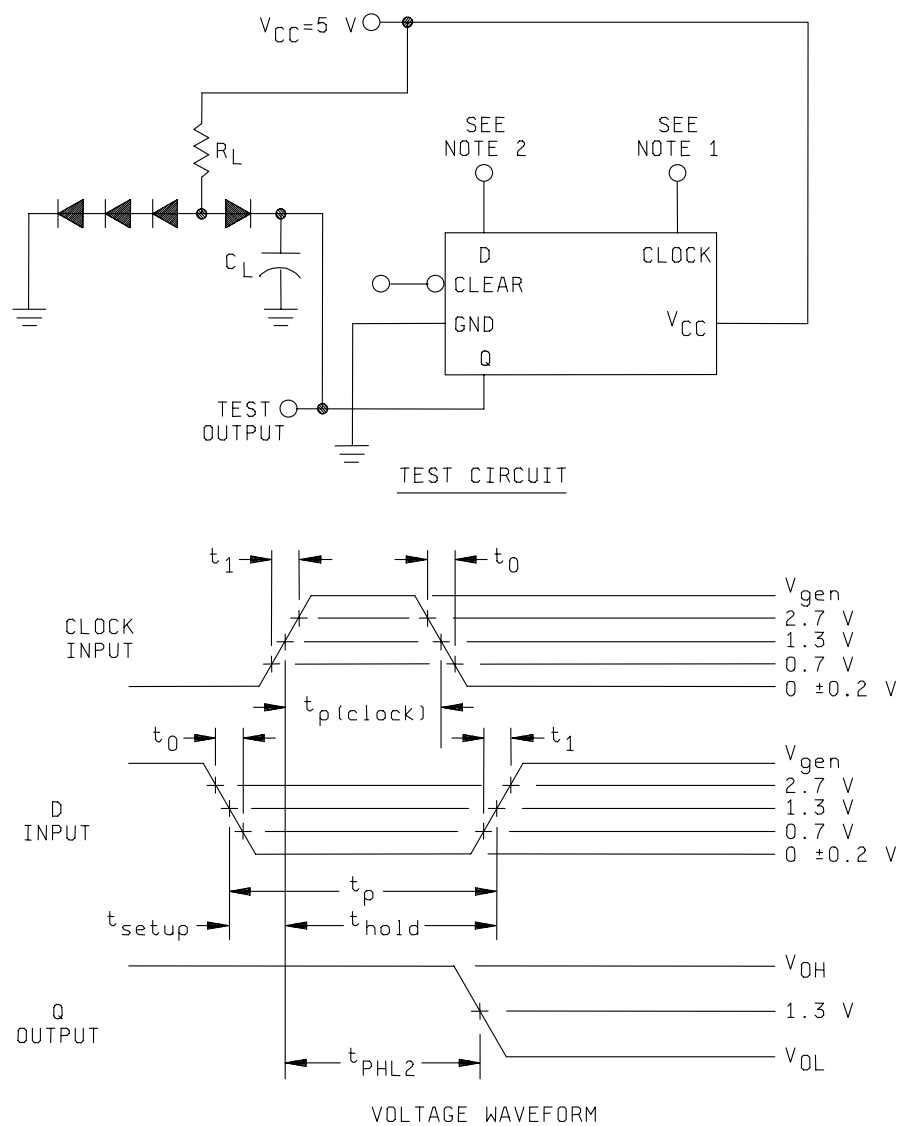
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NOTES:

1. Clock input pulse has the following characteristics: $V_{gen} = 3.0 \pm 0.2$ V, $t_1 \leq 15$ ns, $t_0 \leq 6$ ns, $t_{p(clock)} \geq 30$ ns, $PRR \leq 1$ MHz. When testing f_{MAX} , $PRR =$ see table III, and $t_0 = t_1 \leq 6$ ns.
2. D input has the following characteristics: $V_{gen} = 3.0 \pm 0.2$ V, $t_1 \leq 15$ ns, $t_0 \leq 6$ ns, $t_{setup} = 20$ ns, $t_{hold} = 5$ ns, $t_p = 25$ ns, and PRR is 50 percent of the clock PRR . For f_{MAX} , $t_0 = t_1 \leq 6$ ns.
3. All diodes are 1N3064 or equivalent.
4. $C_L = 50$ pF $\pm 10\%$ (including probe and jig capacitance).
5. $R_L = 2$ k Ω ± 5 percent.

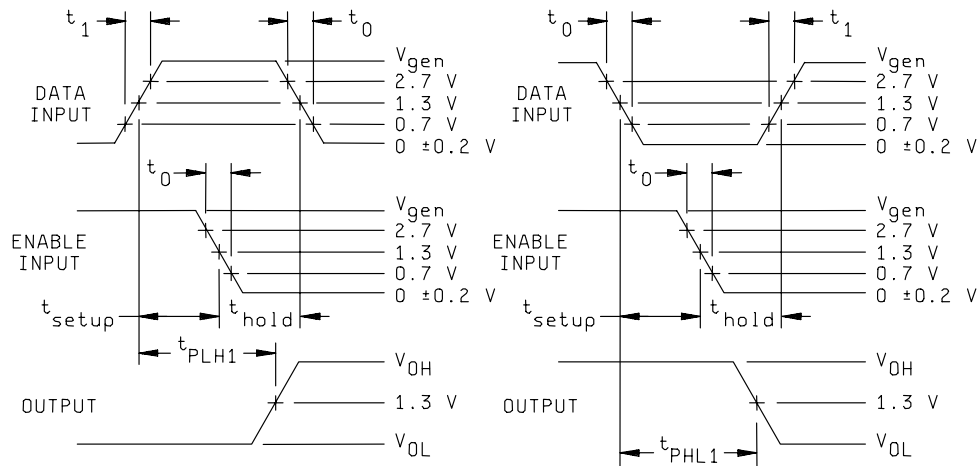
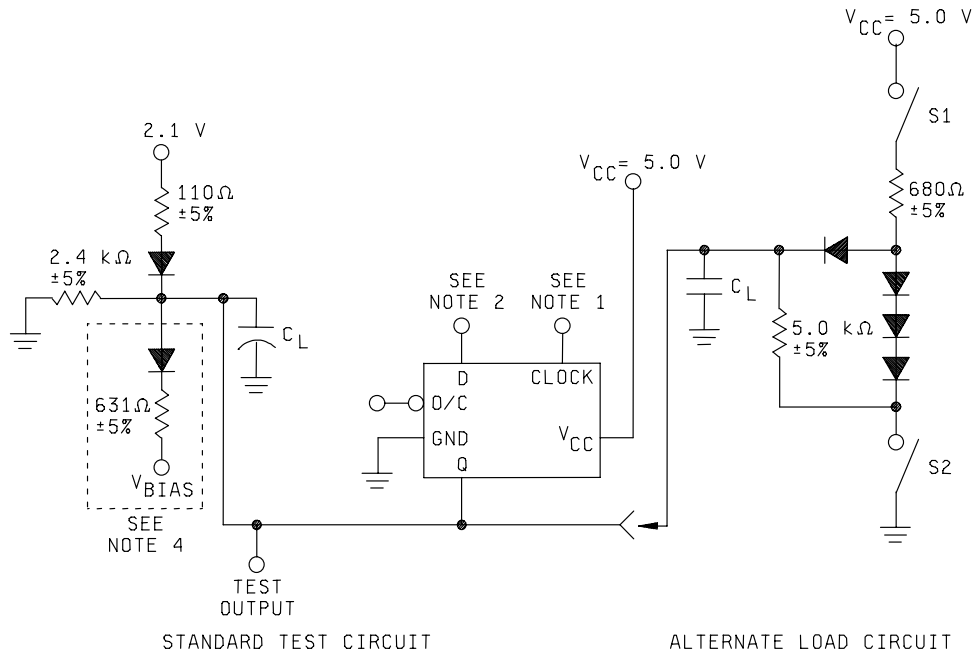
FIGURE 3. Synchronous switching test circuit (high level data) for device types 01 and 04 - Continued.



NOTES:

1. Clock input pulse has the following characteristics: $V_{gen} = 3.0 \pm 0.2$ V, $t_i \leq 15$ ns, $t_o \leq 6$ ns, $t_p(\text{clock}) = 30$ ns, and $PRR \leq 1$ MHz.
2. D input has the following characteristics: $V_{gen} = 3.0 \pm 0.2$ V, $t_i \leq 15$ ns, $t_o \leq 6$ ns, $t_{setup} = 20$ ns, $t_{hold} = 5$ ns, $t_p = 25$ ns, and PRR is 50 percent of the clock PRR .
3. All diodes are 1N3064 or equivalent.
4. $C_L = 50$ pF $\pm 10\%$ (including probe and jig capacitance).
5. $R_L = 2$ k Ω ± 5 percent.

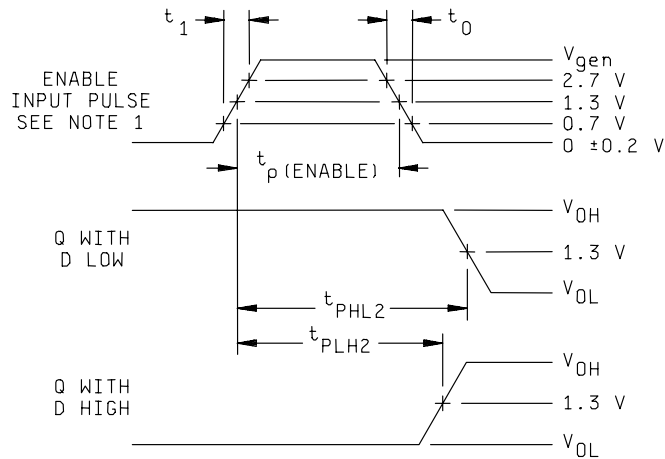
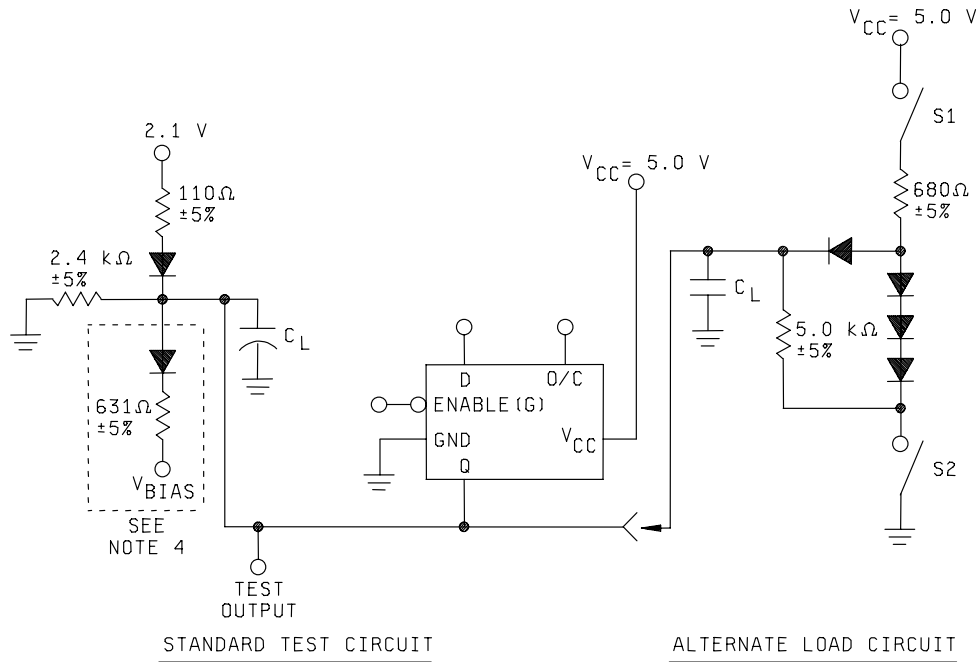
FIGURE 3. Synchronous switching test circuit (low level data) for device types 01 and 04 - Continued.



NOTES:

1. Enable pulse has the following characteristics: $V_{gen} = 3.0 \pm 0.2$ V, $t_0 \leq 6$ ns.
2. D input pulse has the following characteristics: $V_{gen} = 3.0 \pm 0.2$ V, $t_i \leq 15$ ns, $t_0 \leq 6$ ns, $t_{setup} = 5$ ns, $t_{hold} = 20$ ns, $t_p = 25$ ns.
3. All diodes are 1N3064 or equivalent.
4. The diode and resistor shown within the dotted area are optional. When the diode and resistor are used, V_{BIAS} shall be 5.5 V for all tests except for t_{PHZ} ; for t_{PHZ} tests, V_{BIAS} shall be -0.6 V.
5. $C_L = 50$ pF $\pm 10\%$ (including probe and jig capacitance).
6. Switches S1 and S2 are closed for t_{PLH1} and t_{PHL1} , when using the alternate load circuit.

FIGURE 3. Switching test circuit (t_{PLH1} , t_{PHL1}) for device type 02 - Continued.



NOTES:

1. Enable input pulse characteristics for t_{PLH2} and t_{PHL2} : $V_{gen} = 3.0 \pm 0.2$ V, $t_0 \leq 6$ ns, $t_1 \leq 15$ ns, $t_{(enable)} = 15$ ns, and $PRR \leq 1$ MHz.
2. All diodes are 1N3064 or equivalent.
3. $C_L = 50$ pF $\pm 10\%$ (including probe and jig capacitance).
4. The diode and resistor shown within the dotted area are optional. When the diode and resistor are used, V_{BIAS} shall be 5.5 V for all tests except for t_{PHZ} ; for t_{PHZ} tests, V_{BIAS} shall be -0.6 V.
5. Switches S1 and S2 are closed for t_{PLH2} and t_{PHL2} , when using the alternate load circuit.

FIGURE 3. Switching test circuit (t_{PLH1} , t_{PHL1}) for device type 02 - Continued.

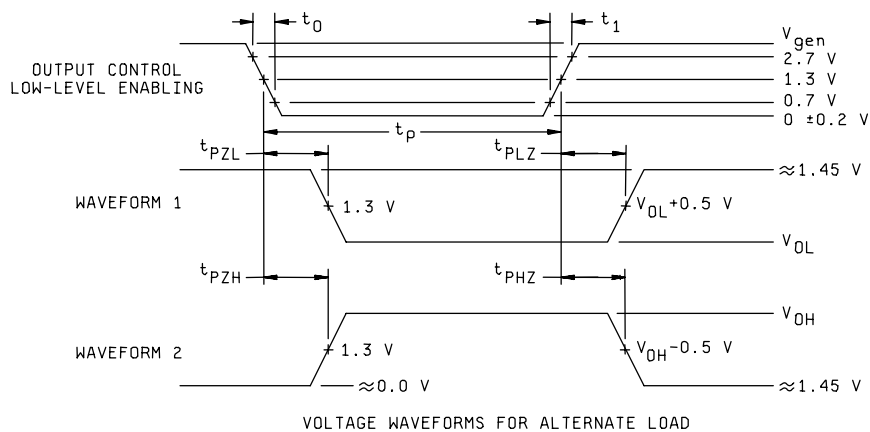
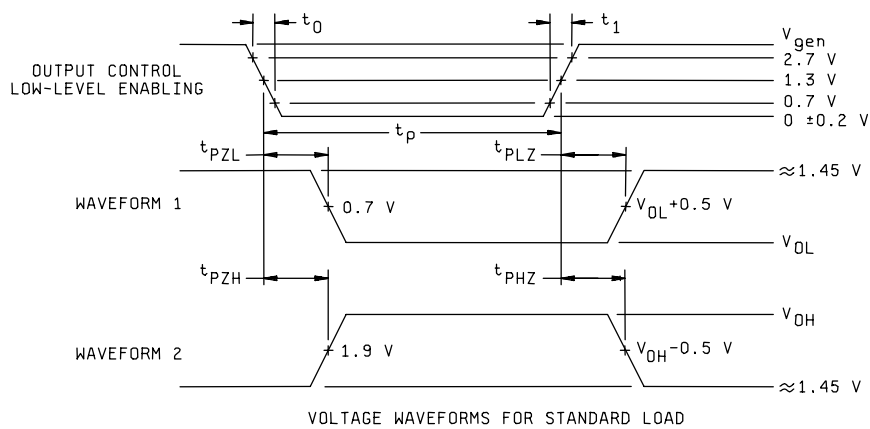
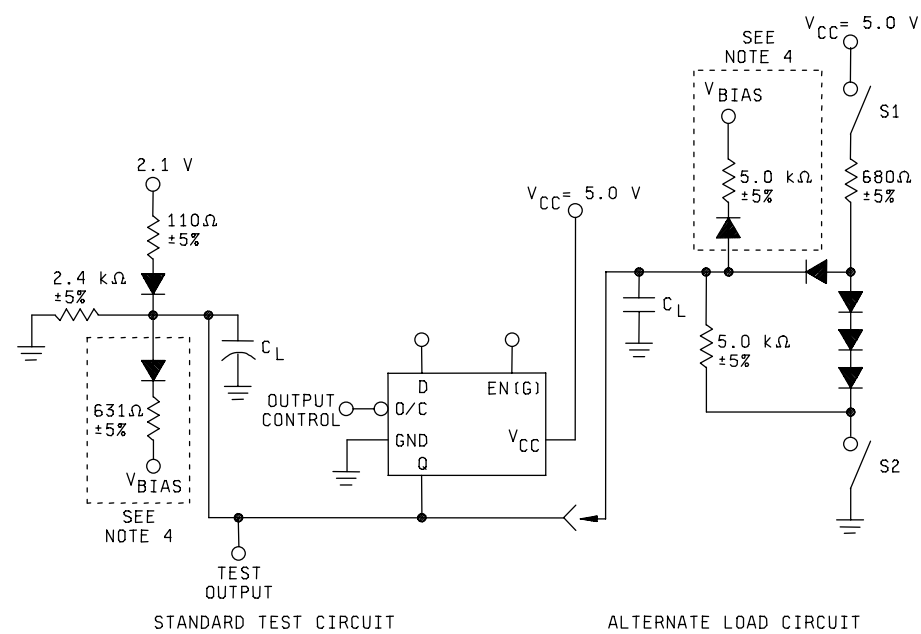


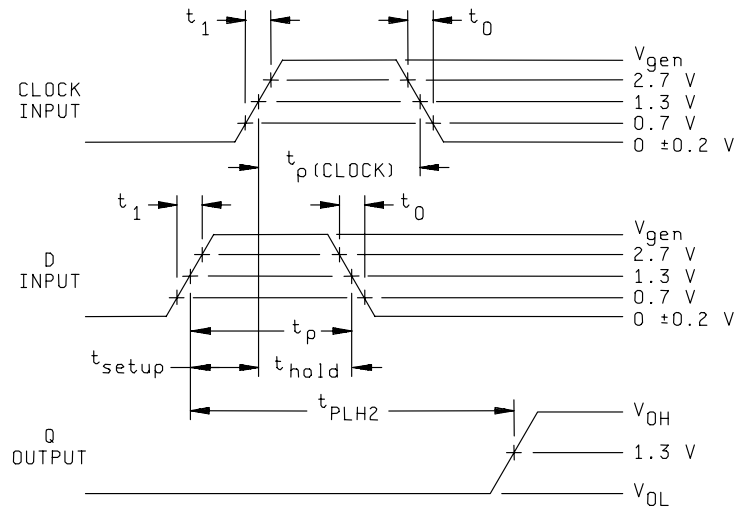
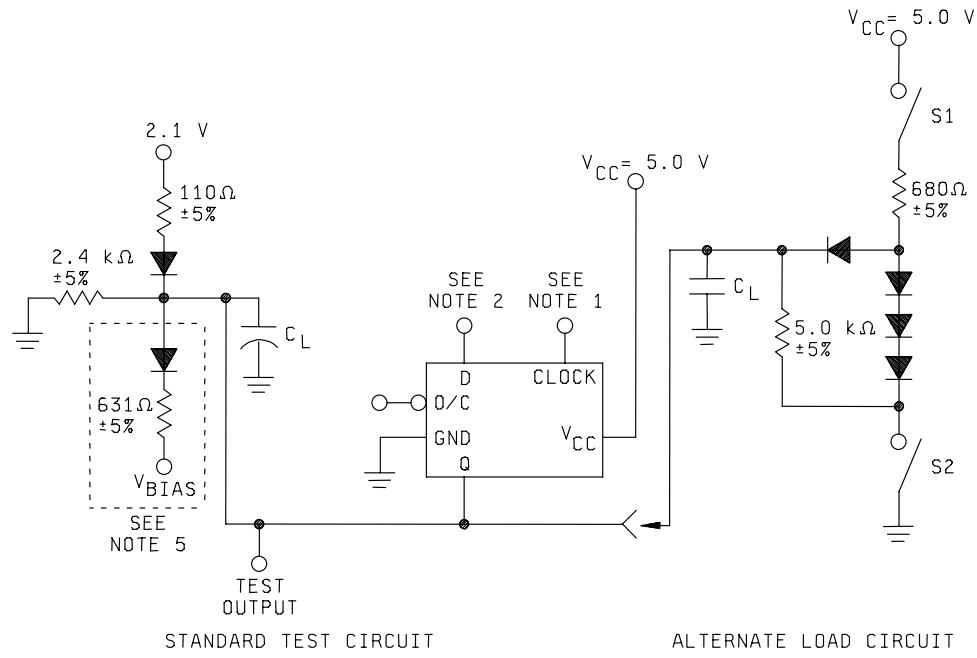
FIGURE 3. Three state switching test circuit and waveforms for device type 02 - Continued.

NOTES:

1. All diodes are 1N3064 or equivalent.
2. Output control input pulse characteristics: $V_{\text{gen}} = 3.0 \pm 0.2 \text{ V}$, $t_i \leq 15 \text{ ns}$, $t_o \leq 6 \text{ ns}$, $t_{P(\text{input})} \geq 200 \text{ ns}$, and $\text{PRR} \leq 1 \text{ MHz}$.
3. For the standard test circuit, $C_L = 50 \text{ pF} \pm 10\%$. For the alternate load circuit, $C_L = 50 \text{ pF} \pm 10\%$ for t_{PZL} and t_{PZH} and $C_L = 15 \text{ pF}$ minimum for t_{PLZ} and t_{PHZ} . All capacitive load values include jig and probe capacitance.
4. The diodes and resistors shown within the dotted area are optional. When the diodes and resistors are used, V_{BIAS} shall be 5.5 V for all tests except for t_{PHZ} ; for t_{PHZ} tests, V_{BIAS} shall be -0.6 V .
5. When using the alternate load circuit, the appropriate switch positions for the three state tests are listed in the table below.

Test	S1	S2
t_{PZL}	Closed	Open
t_{PLZ}	Closed	Closed
t_{PZH}	Open	Closed
t_{PHZ}	Closed	Closed

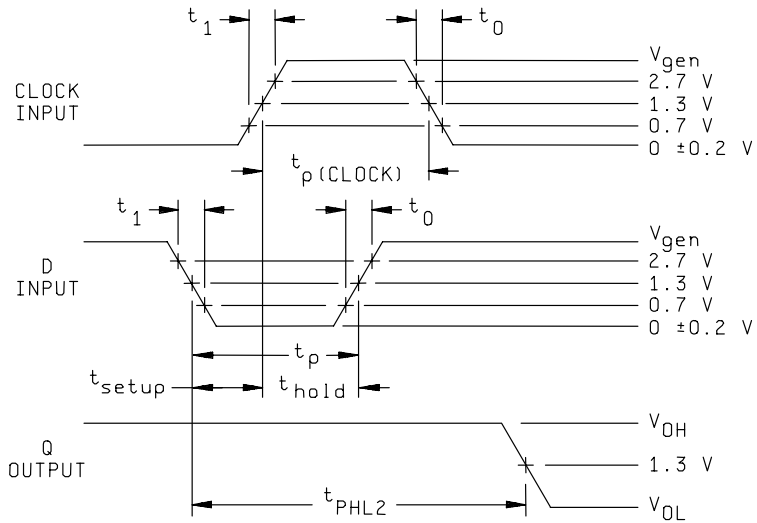
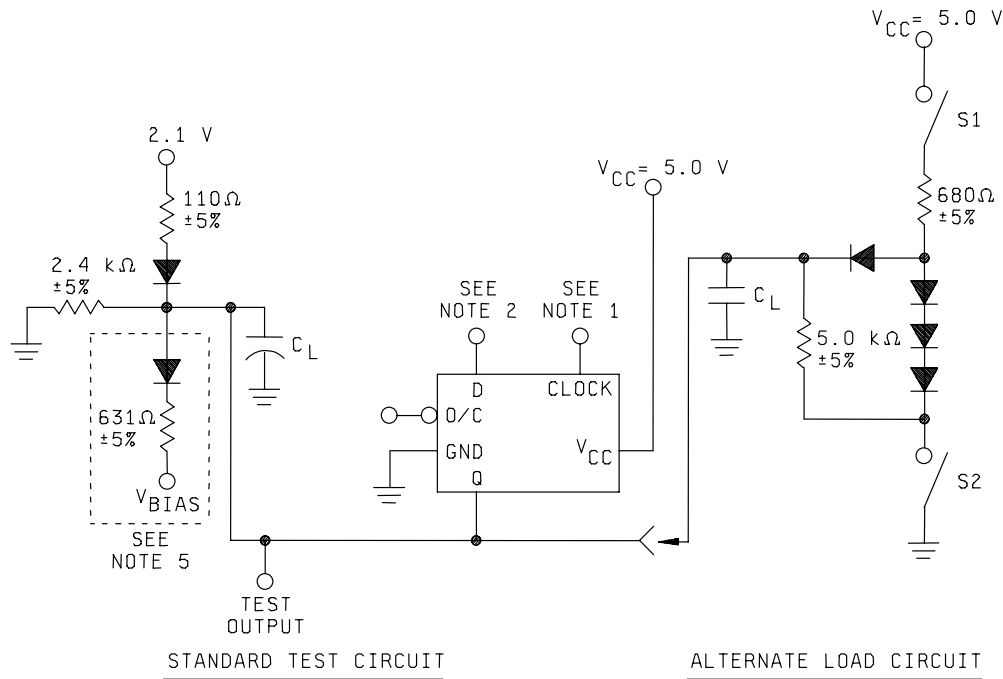
FIGURE 3. Three state switching test circuit and waveforms for device type 02 - Continued.



NOTES:

1. Clock input pulse has the following characteristics: $V_{\text{gen}} = 3.0 \pm 0.2 \text{ V}$, $t_i \leq 15 \text{ ns}$, $t_o \leq 6 \text{ ns}$, $t_{p(\text{clock})} = 15 \text{ ns}$, $\text{PRR} \leq 1 \text{ MHz}$. When testing f_{MAX} , $\text{PRR} = \text{see table III}$, and $t_o = t_i \leq 6 \text{ ns}$.
2. D input has the following characteristics: $V_{\text{gen}} = 3.0 \pm 0.2 \text{ V}$, $t_i \leq 15 \text{ ns}$, $t_o \leq 6 \text{ ns}$, $t_{\text{setup}} = 20 \text{ ns}$, $t_{\text{hold}} = 5 \text{ ns}$, $t_p = 25 \text{ ns}$, and PRR is 50 percent of the clock PRR . For f_{MAX} , $t_o = t_i \leq 6 \text{ ns}$.
3. All diodes are 1N3064 or equivalent.
4. $C_L = 50 \text{ pF} \pm 10\%$ (including probe and jig capacitance).
5. The diode and resistor shown within the dotted area are optional. When the diode and resistor are used, V_{BIAS} shall be 5.5 V for all tests except for t_{PHZ} ; for t_{PHZ} tests, V_{BIAS} shall be -0.6 V.
6. Switches S1 and S2 are closed for t_{PHL2} , when using the alternate load circuit.

FIGURE 3. Synchronous switching test circuit (high level data) for device type 03 - Continued.

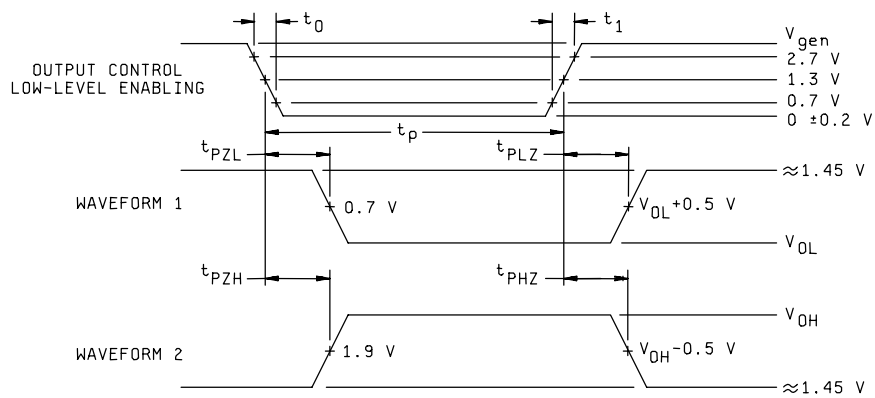
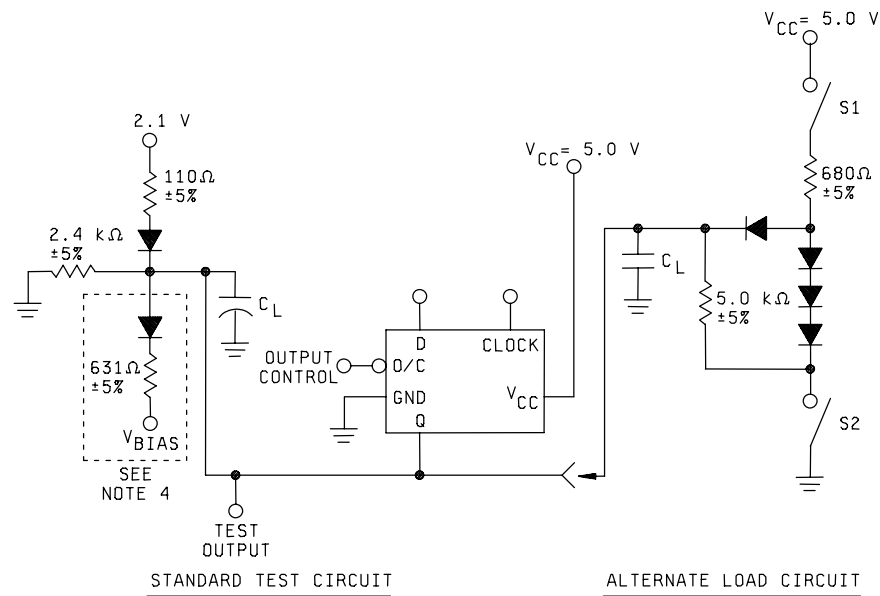


NOTES:

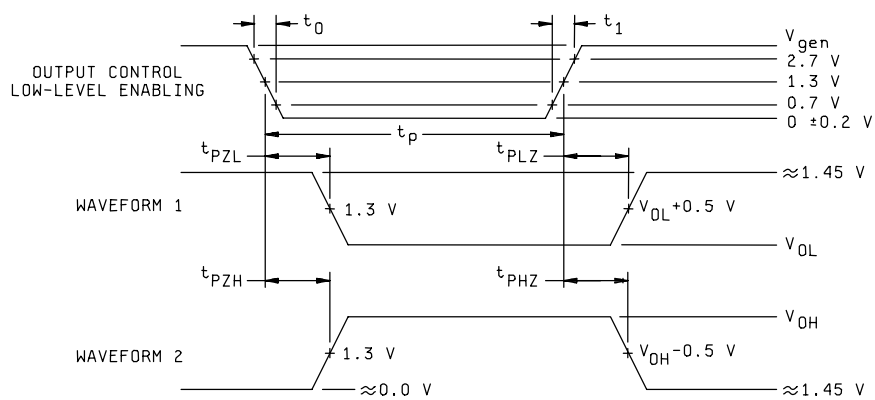
1. Clock input pulse has the following characteristics: $V_{\text{gen}} = 3.0 \pm 0.2 \text{ V}$, $t_1 \leq 15 \text{ ns}$, $t_0 \leq 6 \text{ ns}$, $t_{\text{p}(\text{clock})} = 15 \text{ ns}$ and $\text{PRR} \leq 1 \text{ MHz}$.
2. D input has the following characteristics: $V_{\text{gen}} = 3.0 \pm 0.2 \text{ V}$, $t_1 \leq 15 \text{ ns}$, $t_0 \leq 6 \text{ ns}$, $t_{\text{setup}} = 20 \text{ ns}$, $t_{\text{hold}} = 5 \text{ ns}$, $t_{\text{p}} = 25 \text{ ns}$, and PRR is 50 percent of the clock PRR .
3. All diodes are 1N3064 or equivalent.
4. $C_L = 50 \text{ pF} \pm 10\%$ (including probe and jig capacitance).
5. The diode and resistor shown within the dotted area are optional. When the diode and resistor are used, V_{BIAS} shall be 5.5 V for all tests except for t_{PHZ} ; for t_{PHZ} tests, V_{BIAS} shall be -0.6 V.
6. Switches S1 and S2 are closed for t_{PHL2} , when using the alternate load circuit.

FIGURE 3. Synchronous switching test circuit (low level data) for device type 03 - Continued.

MIL-M-38510/325D



VOLTAGE WAVEFORMS FOR STANDARD LOAD



VOLTAGE WAVEFORMS FOR ALTERNATE LOAD

FIGURE 3. Three state switching test circuits and waveforms for device type 03 - Continued.

NOTES:

1. O/C input pulse characteristics: $V_{\text{gen}} = 3.0 \pm 0.2 \text{ V}$, $t_i \leq 15 \text{ ns}$, $t_o \leq 6 \text{ ns}$, $t_{\text{P(input)}} \geq 200 \text{ ns}$, and $\text{PRR} \leq 1 \text{ MHz}$.
2. All diodes are 1N3064 or equivalent.
3. For the standard test circuit, $C_L = 50 \text{ pF} \pm 10\%$. For the alternate load circuit, $C_L = 50 \text{ pF} \pm 10\%$ for t_{PZL} and t_{PZH} and $C_L = 15 \text{ pF}$ minimum for t_{PLZ} and t_{PHZ} . All capacitive load values include jig and probe capacitance.
4. The diodes and resistors shown within the dotted area are optional. When the diodes and resistors are used, V_{BIAS} shall be 5.5 V for all tests except for t_{PHZ} ; for t_{PHZ} tests, V_{BIAS} shall be -0.6 V.
5. When using the alternate load circuit, the appropriate switch positions for the three state tests are listed in the table below.

Test	S1	S2
t_{PZL}	Closed	Open
t_{PLZ}	Closed	Closed
t_{PZH}	Open	Closed
t_{PHZ}	Closed	Closed

FIGURE 3. Three state switching test circuits and waveforms for device type 03 - Continued.

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 R, S, 2 Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured terminal	Test limits Min	Test limits Max	Unit
1 $T_c = 25^\circ\text{C}$	V_{OH}	3006	1	2.0 V	CLR	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	CLK	5Q	6D	6Q	7Q	7D	8D	8Q	V_{CC}	1Q	2.5		V
			2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Q	"	"	"
			3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3Q	"	"	"
			4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4Q	"	"	"
			5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5Q	"	"	"
			6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6Q	"	"	"
			7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7Q	"	"	"
			8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	8Q	"	"	"
			9	"	"	"	0.7 V	"	4 mA	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Q	"	0.4	"
			10	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Q	"	"	"
			11	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3Q	"	"	"
			12	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4Q	"	"	"
			13	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5Q	"	"	"
			14	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6Q	"	"	"
			15	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7Q	"	"	"
			16	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	8Q	"	"	"
			17	0.7 V	4 mA	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Q	"	"	"
	I_C	3007	18	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Q	"	"	"
			19	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3Q	"	"	"
			20	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4Q	"	"	"
			21	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5Q	"	"	"
			22	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6Q	"	"	"
			23	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7Q	"	"	"
			24	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	8Q	"	"	"
			25	-18 mA	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLR	"	-1.5	"
			26	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1D	"	"	"
			27	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2D	"	"	"
			28	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3D	"	"	"
			29	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4D	"	"	"
			30	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK	"	"	"
			31	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5D	"	"	"
			32	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6D	"	"	"
			33	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7D	"	"	"
			34	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	8D	"	"	"
	I_L	3009	35	0.4 V	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5.5 V	CLR	2I	2I	μA
			36	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1D	"	"	"
			37	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2D	"	"	"
			38	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3D	"	"	"
			39	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4D	"	"	"
			40	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK	"	"	"
			41	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5D	"	"	"
			42	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6D	"	"	"
			43	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7D	"	"	"
			44	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	8D	"	"	"
			45	2.7 V	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLR	"	20	"
			46	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1D	"	"	"
			47	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2D	"	"	"
			48	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3D	"	"	"
			49	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4D	"	"	"
			50	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK	"	"	"
			51	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5D	"	"	"
			52	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6D	"	"	"
			53	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7D	"	"	"
			54	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	8D	"	"	"

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 R, S, 2	Cases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured terminal	Test limits	Unit				
1	I _{H2} Tc = 25°C	3010	Test no.	CLR	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	CLK	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}	CLR	100	µA				
			55	5.5 V																				1D						
			56		5.5 V																				2D					
			57																						3D					
			58								5.5 V															4D				
			59																							CLK				
			60																							5D				
			61															5.5 V								6D				
			62																							7D				
			63																5.5 V							8D				
			64																							1Q	-15	-100	mA	
			3011	65	4.5 V	GND	4.5 V	4.5 V	GND																		2Q			
				66									4.5 V															3Q		
				67										4.5 V														4Q		
	68											GND													5Q					
	69															4.5 V	4.5 V	GND							6Q					
	70																								7Q					
	71																								8Q					
	72																													
	73						4.5 V	4.5 V			4.5 V					4.5 V	4.5 V			4.5 V	4.5 V		V _{CC}		27					
2	os	3011	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 4/5	Truth table tests	3014	74	B	L	A	A	L	L	A	A	L	GND	A	L	A	A	A	L	L	A	A	L	5.0 V	6/					
			75												B															
			76												A															
			77	A											A															
			78												B															
			79		H				H	H			H		A	H			B	B			H							
			80			B	B		B	B					A		B	B					B							
			81												B															
			82		L			L	L		A	L		L		A	L			L	L			L						
			83			A	A		A	A					A		A	A			A	A								
			84												B															
			85		H			H	H			H		H		A	H			H	H			H						
			86		H			H	H			H		H		B	H			H	H			H						
			8				B	L			L	L			L		B	L			L	L						L		
9	f _{max} Tc = 25°C	3003	88	4.5 V	OUT	IN	IN	OUT					GND	IN									5.0 V	1Q	30		MHz			
			89					IN	OUT		IN														2Q					
			90								OUT															3Q				
			91									IN	OUT														4Q			
			92														OUT	IN									5Q			
			93																IN	OUT							6Q			
			94																	OUT	IN						7Q			
			95																			IN	OUT				8Q			
			96	IN	OUT	4.5 V	4.5 V	OUT																		CLR to 1Q	5	32	ns	
			97							OUT	4.5 V															CLR to 2Q				
			98																							CLR to 3Q				
			99										4.5 V	OUT												CLR to 4Q				
			100																							CLR to 5Q				
			101																4.5 V	OUT							CLR to 6Q			
102																		OUT						CLR to 7Q						
103																								CLR to 8Q						

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	Cases R, S, 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured terminal	Test limits Min Max	Unit	
9 T _C = 25°C	t _{PLH2}	3003 Fig 3	Test no.	CLR	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	CLK	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}	CLK to 1Q	5 32	ns	
			104	4.5 V	OUT	IN	IN	OUT	OUT	IN	IN	OUT	"	"	"	"	"	"	"	"	"	"	"	CLK to 2Q	"	"	"
			105	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 3Q	"	"	"
			106	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 4Q	"	"	"
			107	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 5Q	"	"	"
			108	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 6Q	"	"	"
			109	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 7Q	"	"	"
			110	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 8Q	"	"	"
			111	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 1Q	"	"	"
			112	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 2Q	"	"	"
10 T _C = 125°C	f _{MAX} t _{PH11} PLH2		Same tests and terminal conditions as subgroup 9 except T _C = +125°C.																					25	42	MHz	
			Same tests and terminal conditions as subgroup 9 except T _C = +125°C.																					5	"	ns	
			Same tests and terminal conditions as subgroup 9 except T _C = +125°C.																					"	"	"	
			Same tests and terminal conditions as subgroup 9 except T _C = +125°C.																					"	"	"	
			Same tests and terminal conditions as subgroup 9 except T _C = +125°C.																					"	"	"	
11 T _C = -55°C	PHL2		Same tests and terminal conditions, and limits as subgroup 10 except T _C = -55°C.																					"	"	"	

1/  - - 2.5 V minimum/5.5 V maximum.
0 V

2/ I_{IL} limits in μA are as follows:

Parameter	Circuit			
	A	F	B	E
Clear	-120/-360	-105/-345	-30/-300	-120/-360
Clock	-120/-360	-160/-400	-30/-300	-120/-360
Data	-100/-340	-160/-400	-120/-360	-120/-360

3/  - - 2.5 V minimum/5.5 V maximum.
0 V

4/ Input voltages shown are: A = 3.0 volts minimum and B = 0.0 V or GND.

5/ Tests shall be performed in sequence, attributes data only.

6/ Outputs: H > 1.5 V, L < 1.5 V.

7/ f_{MAX} , minimum limit specified is the frequency of the input pulse. The output frequency shall be one half of the input frequency.

TABLE III. Group A inspection for device type 02.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 method	Cases R, S, 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured terminal	Test limits		Unit	
																									Min	Max		
1 Tc = 25°C	V _{OH}	3006	Test no.	O/C	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	G	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}	1Q	2.4	V		
				1	0.7 V	-1 mA	2.0 V	-1 mA									2.0 V									4.5 V		
				2	"	"	2.0 V	-1 mA	-1 mA	2.0 V							"	"	"	"	"	"	"	"	"	"	2Q	"
				3	"	"			2.0 V							"	"	"	"						"	3Q	"	
				4	"	"									-1 mA	"	"	"							"	4Q	"	
				5	"	"										"	"	-1 mA	2.0 V						"	5Q	"	
				6	"	"										"	"	"		2.0 V	-1 mA				"	6Q	"	
				7	"	"										"	"	"				-1 mA	2.0 V		"	7Q	"	
				8	"	"										"	"	"					2.0 V	-1 mA	"	8Q	"	
				9	"	12 mA	0.7 V				12 mA					"	"	"							"	1Q	"	0.4
				10	"	"	0.7 V									"	"	"							"	2Q	"	
				11	"	"						12 mA	0.7 V			"	"	"							"	3Q	"	
				12	"	"										"	"	"							"	4Q	"	
				13	"	"										"	"	12 mA	0.7 V						"	5Q	"	
				14	"	"										"	"	"		0.7 V	12 mA				"	6Q	"	
				15	"	"										"	"	"				12 mA	0.7 V		"	7Q	"	
16	"	"										"	"	"						0.7 V	12 mA	"	8Q	"				
1C	IC		Test no.	-18 mA		-18 mA							"	"	"								"	O/C	-1.5			
				17							"	"	"			"	"	"						"	1D	"		
				18			-18 mA				"	"	"			"	"	"							"	2D	"	
				19					-18 mA			"	"	"		"	"	"							"	3D	"	
				20							"	"	"			"	"	"							"	4D	"	
				21							"	"	"			"	"	"							"	G	"	
				22									-18 mA			"	"	"							"	5D	"	
				23												"	"	"	-18 mA						"	6D	"	
				24												"	"	"							"	7Q	"	
				25												"	"	"							"	8Q	"	
				26												"	"	"							"	O/C	-1.5	
				27	0.4 V		0.4 V									"	"	"					-18 mA		5.5 V	1/I	1/I	μA
				28				0.4 V								"	"	"								"	1D	"
				29												"	"	"							"	2D	"	
				30									0.4 V			"	"	"							"	3D	"	
				31												"	"	"							"	4D	"	
32												"	"	0.4 V							"	G	"					
33												"	"	"							"	5D	"					
34												"	"	"		0.4 V					"	6D	"					
35												"	"	"				0.4 V			"	7D	"					
36												"	"	"						0.4 V		"	8D	"				
1H1	IH1	Test no.	2.7 V										"	"	"								"	O/C	20			
			37											"	"	"							"	1D	"			
			38			2.7 V								"	"	"								"	2D	"		
			39				2.7 V							"	"	"								"	3D	"		
			40									2.7 V			"	"	"							"	4D	"		
			41										2.7 V		"	"	"							"	5D	"		
			42												"	"	2.7 V						"	6D	"			
			43												"	"	"						"	7D	"			
			44												"	"	"						"	8D	"			
			45												"	"	"						"	O/C	100			
			46												"	"	"						"	1D	"			
			47	5.5 V		5.5 V									"	"	"							"	2D	"		
			48												"	"	"							"	3D	"		
			49									5.5 V			"	"	"							"	4D	"		
			50										5.5 V		"	"	"							"	G	"		
			51												"	"	5.5 V							"	5D	"		
52												"	"	"							"	6D	"					
53												"	"	"							"	7D	"					
54												"	"	"							"	8D	"					
55												"	"	"					5.5 V		"	1D	"					
56												"	"	"						5.5 V	"	2D	"					

See footnotes at end of device type 02.

TABLE III. Group A inspection for device type 02 - 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 R, S, 2 Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured	Test limits	Unit		
1 Tc = 25°C	Ios	3011	57	GND	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	G	5Q	5D	6D	6Q	7Q	7D	8D	8Q	Vcc	terminal	Min	Max		
			58	"	"	"	4.5V	GND	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5.5V	1Q	-30	-130	mA
			59	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Q	2/	"	
			60	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3Q	"	"	
			61	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4Q	"	"	
			62	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5Q	"	"	
			63	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6Q	"	"	
			64	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7Q	"	"	
			65	4.5V	2.7V	2.0V	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	8Q	"	"	
			66	"	"	"	2.0V	2.7V	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Vcc	1Q	40	
			67	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Q	20	µA
			68	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3Q	"	"
			69	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4Q	"	"
			70	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5Q	"	"
			71	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6Q	"	"
			72	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7Q	"	"
2	O2L		73	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		
			74	"	0.4V	0.7V	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2.0V	2.7V	"	8Q	"	"	
			75	"	"	"	0.7V	0.4V	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Q	-20	"	
			76	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Q	"	"	
			77	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3Q	"	"	
			78	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4Q	"	"	
			79	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5Q	"	"	
			80	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6Q	"	"	
3	7 3/4/	Truth table tests	81	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7Q	"	"			
			82	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	8Q	"	"		
8 9 Tc = 25°C	tPLH1 PHL1	3003 Fig 3	83	B	H	A	A	H	H	A	A	GND	A	L	A	A	A	A	H	A	A	H	5.0V	5/	1D to 1Q	ns		
			84	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	2D to 2Q	"	
			85	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	3D to 3Q	"
			86	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	4D to 4Q	"
			87	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	5D to 5Q	"
			88	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	6D to 6Q	"
			89	GND	OUT	IN	IN	OUT	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	7D to 7Q	"
			90	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	8D to 8Q	"
			91	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	1D to 1Q	"
			92	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	2D to 2Q	"
			93	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	3D to 3Q	"
			94	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	4D to 4Q	"
			95	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	5D to 5Q	"
			96	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	6D to 6Q	"
			97	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	7D to 7Q	"
			98	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	8D to 8Q	"
99	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1D to 1Q	"				
100	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2D to 2Q	"				
101	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3D to 3Q	"			
102	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4D to 4Q	"			
103	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5D to 5Q	"			
104	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6D to 6Q	"			
																								7D to 7Q	"			
																								8D to 8Q	"			

See footnotes at end of device type 02.

TABLE III. Group A inspection for device type 02 - 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 R, S, 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured terminal	Test limits		Unit
																									Min	Max	
9 Tc = 25°C	t _{PH2}	3003 Fig 3	105 Test no.	O/C	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	G	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}	G to 1Q	3	30	ns
				GND	OUT	4.5V	4.5V	OUT	OUT	4.5V	4.5V	OUT	"	"	"	"	"	"	"	"	"	"	5.0 V	G to 2Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 3Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 4Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 5Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 6Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 7Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 8Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 1Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 2Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 3Q	"	"	"
	PH2			"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 4Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 5Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 6Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 7Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	G to 8Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 1Q	"	28	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 2Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 3Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 4Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 5Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 6Q	"	"	"
	P2L			"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 7Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 8Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 1Q	"	36	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 2Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 3Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 4Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 5Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 6Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 7Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 8Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 1Q	"	31	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 2Q	"	"	"
	PHZ			"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 3Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 4Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 5Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 6Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 7Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 8Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 1Q	"	30	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 2Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 3Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 4Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 5Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 6Q	"	"	"
	PLZ			"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 7Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 8Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 1Q	"	30	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 2Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 3Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 4Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 5Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 6Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 7Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 8Q	"	"	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 1Q	"	30	"
				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	O/C to 2Q	"	"	"

See footnotes at end of device type 02.

TABLE III. Group A inspection for device type 02 - 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 R, S, 2	Test no.	O/C	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	G	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}	Measured terminal	Test limits		Unit
																										Min	Max	
10	t _{PH1}																									3	24	ns
	PHL1																									"	24	"
	PLH2																									"	39	"
	PHL2																									"	39	"
	PZH																									"	37	"
	PZL																									"	47	"
	PHZ																									"	35	"
	PLZ																									"	39	"
11		Same tests and terminal conditions as subgroup 10 except T _C = -55°C.																										

1/ I_L limits in μ A are as follows:

Parameter	Circuit				
	A	B	F	C	D
O/C	-10/-200	-1/-100	-400 max	-180/-420	-400 max
G	-400 max	-1/-100	-400 max	-160/-400	-400 max
D	-120/-360	-1/-100	-105/-345	-160/-400	-120/-360

31

2/ For circuits C and D, I_{OS} limits shall be -15/-100 mA. For circuit E, I_{OS} limits shall be -40/-225 mA.

3/ A = 3.0 V minimum. B = 0.0 V or GND.

4/ Tests shall be performed in sequence, attributes data only.

5/ Output voltages shall be:

H > 1.5 V
L < 1.5 V

TABLE III. Group A inspection for device type 03.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 method	Cases R, S, 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured	Test limits		Unit	
				Test no.	O/C	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	CLK	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}	1Q	Min		Max
1 Tc = 25°C	V _{OH}	3006	1	0.7 V	-1 mA	2.0 V	2.0 V	-1 mA																4.5 V	2Q	2.4	V	
			2	"	"	"	"	"	-1 mA	2.0 V														"	3Q	"	"	
			3	"	"	"	"	"	"	"														"	4Q	"	"	
			4	"	"	"	"	"	"	"														"	5Q	"	"	
			5	"	"	"	"	"	"	"														"	6Q	"	"	
			6	"	"	"	"	"	"	"														"	7Q	"	"	
			7	"	"	"	"	"	"	"														"	8Q	"	"	
			8	"	"	"	"	"	"	"														"	1Q	"	"	
	OL	3007	9	"	12 mA	0.7 V																	"	1Q		0.4		
			10	"	"	"																	"	2Q		"		
			11	"	"	"																	"	3Q		"		
			12	"	"	"																	"	4Q		"		
			13	"	"	"																	"	5Q		"		
			14	"	"	"																	"	6Q		"		
			15	"	"	"																	"	7Q		"		
			16	"	"	"																	"	8Q		"		
	IC		17	-18 mA																			"	O/C		-1.5		
			18			-18 mA																	"	1D		"		
			19																				"	2D		"		
			20																				"	3D		"		
			21																				"	4D		"		
			22																				"	G		"		
			23																				"	5D		"		
			24																				"	6D		"		
	IL	3009	25																				"	7D		"		
			26																				"	8D		"		
			27	0.4 V																				5.5 V	O/C	2/	2/	μA
			28	"		0.4 V																		"	1D		"	
			29	"																				"	2D		"	
			30	"																				"	3D		"	
			31	"																				"	4D		"	
			32	"																				"	G		"	
	IH1	3010	33																				"	5D		"		
			34																				"	6D		"		
			35																				"	7D		"		
			36																				"	8D		"		
			37	2.7 V																				"	O/C		20	
			38	"		2.7 V																		"	1D		"	
			39	"			2.7 V																	"	2D		"	
			40	"																				"	3D		"	
	IH2		41																				"	4D		"		
			42																				"	G		"		
			43																				"	5D		"		
			44																				"	6D		"		
			45																				"	7D		"		
			46																					"	8D		"	
			47	5.5 V																				"	O/C		100	
			48	"		5.5 V																		"	1D		"	

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 03 - Continued.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 R, S, 2	Cases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured	Test limits	Unit						
1 Tc = 25°C	Ios	3011	Test no.	O/C	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	CLK	5Q	5D	6D	6Q	7Q	7D	8D	8Q	Vcc	Min	Max							
			57	GND	GND	4.5 V									GND	I/									5.5 V	-30	-130	mA				
			58	"	"	"	4.5 V	GND							"	"	"	"	"	"	"	"	"	"	"	2Q	3/	3/	"			
			59	"	"	"	"	"							"	"	"	"	"	"	"	"	"	"	"	3Q	"	"	"			
			60	"	"	"	"	"	4.5 V						"	"	"	"	"	"	"	"	"	"	"	4Q	"	"	"			
			61	"	"	"	"	"	"						"	"	"	"	"	"	"	"	"	"	"	5Q	"	"	"			
			62	"	"	"	"	"	"						"	"	"	"	4.5 V	GND				"	"	6Q	"	"	"			
			63	"	"	"	"	"	"						"	"	"	"	"	GND				"	"	7Q	"	"	"			
			64	"	"	"	"	"	"						"	"	"	"	"	"	4.5 V			"	"	8Q	"	"	"			
			65	4.5 V	2.7 V	2.0 V									"	"	"	"	"	"			4.5 V	GND	"	"	"	"	"			
			66	"	"	"	2.0 V	2.7 V							"	"	"	"	"	"					Vcc	1Q	42	20	μA			
			67	"	"	"	"	2.7 V	2.0 V						"	"	"	"	"	"					"	2Q	"	"	"			
			68	"	"	"	"	"	2.0 V						"	"	"	"	"	"					"	3Q	"	"	"			
			69	"	"	"	"	"	"						"	"	"	"	"	"					"	4Q	"	"	"			
			70	"	"	"	"	"	"						"	"	"	"	2.0 V	2.7 V					"	5Q	"	"	"			
2 Tc = 25°C	O2L	3014	71	"	"	"	"						"	"	"	"	"	"	2.7 V	2.0 V			"	6Q	"	"	"					
			72	"	"	"	"	"	"					"	"	"	"	"	"	"	"	"	"	"	7Q	"	"	"				
			73	"	"	"	"	"	"					"	"	"	"	"	"	"	"	"	"	"	8Q	"	"	"				
			74	"	"	0.4 V	0.7 V			0.7 V	0.4 V			"	"	"	"	"	"	"	"	2.0 V	2.7 V	"	"	1Q	-20	"				
			75	"	"	"	"	"	0.7 V	0.4 V				"	"	"	"	"	"	"	"	"	"	"	"	2Q	"	"	"			
			76	"	"	"	"	"	"		0.4 V	0.7 V		"	"	"	"	"	"	"	"	"	"	"	"	3Q	"	"	"			
			77	"	"	"	"	"	"		"	0.4 V		"	"	"	"	"	"	"	"	"	"	"	"	4Q	"	"	"			
			78	"	"	"	"	"	"		"	"		"	"	"	"	"	0.4 V	0.7 V				"	"	5Q	"	"	"			
			79	"	"	"	"	"	"		"	"		"	"	"	"	"	"	0.4 V				"	"	6Q	"	"	"			
			80	"	"	"	"	"	"		"	"		"	"	"	"	"	"	"	0.4 V	0.7 V		"	"	7Q	"	"	"			
			81	"	"	"	"	"	"		"	"		"	"	"	"	"	"	"	"	0.7 V	0.4 V	"	"	"	8Q	"	"	"		
			2	Same tests, terminal conditions, and limits as subgroup 1, except Tc = +125°C and V1C tests are omitted.																												
			3	Same tests, terminal conditions, and limits as subgroup 1, except Tc = -55°C and V1C tests are omitted.																												
			7 4/5	Truth table tests	3014	82	B	X6/	A	A	X6/	X6/	A	A	A	X6/	GND	B	X6/	A	A	X6/	X6/	A	A	A	X6/	5.0V	Z/			
						83	"	"	H	A	A	H	A	A	H	"	A	"	A	H	A	A	H	H	A	A	H	"				"
84	"	"				"	B	B	"	B	B	"	"	"	"	"	"	"	B	B	"	"	"	B	"	"	"	"				
85	"	"				"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"				
86	"	"				L	"	"	"	L	L	"	"	"	"	"	"	"	"	"	L	L	"	"	"	"	"	"				
87	"	"				L	A	A	A	L	L	A	A	L	"	B	L	A	A	L	L	A	A	L	"	"	"	"				
88	"	"				H	A	A	A	H	H	A	A	H	"	A	H	A	A	H	H	A	A	H	"	"	"	"				
8	fmax	3003 Fig 3				89	GND	OUT	IN	IN	OUT					GND	IN	IN									5.0 V	1Q	35	MHz		
						90	"	"	"	"	OUT						"	"	"	"	"	"	"	"	"	"	"	2Q	"	"	"	
						91	"	"	"	"							"	"	"	"	"	"	"	"	"	"	"	3Q	"	"	"	
						92	"	"	"	"							"	"	"	"	"	"	"	"	"	"	"	4Q	"	"	"	
						93	"	"	"	"							"	"	"	"	IN	IN	OUT				"	5Q	"	"	"	
						94	"	"	"	"							"	"	"	"	"	"	"	OUT	IN			"	6Q	"	"	"
						95	"	"	"	"							"	"	"	"	"	"	"	"	"	"	"	"	7Q	"	"	"
						96	"	"	"	"							"	"	"	"	"	"	"	"	"	"	"	"	8Q	"	"	"
			97	"	"	OUT	IN	IN	OUT	OUT				"	"	"	"	"	"	"	"	"	IN	OUT	"	C to 1Q	3	28	ns			
			98	"	"	"	"							"	"	"	"	"	"	"	"	"	"	"	"	C to 2Q	"	"	"			
			99	"	"	"	"							"	"	"	"	"	"	"	"	"	"	"	"	C to 3Q	"	"	"			
			100	"	"	"	"							"	"	"	"	"	"	"	"	"	"	"	"	C to 4Q	"	"	"			
			101	"	"	"	"							"	"	"	"	IN	IN	OUT				"	"	C to 5Q	"	"	"			
			102	"	"	"	"							"	"	"	"	"	"	"	OUT	"			"	"	C to 6Q	"	"	"		
			103	"	"	"	"							"	"	"	"	"	"	"	"	"	"	"	"	"	C to 7Q	"	"	"		
104	"	"	"	"							"	"	"	"	"	"	"	OUT	IN	IN	OUT	"	"	C to 8Q	"	"	"					

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 03 - Continued.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 method	Cases R, S, 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured terminal	Test limits		Unit
																									Min	Max	
9 Tc = 25°C	t_{PHL2}	3003 Fig 3	Test no.	O/C	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	CLK	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}	C to 1Q	3	28	ns
		"	105	GND	OUT	IN	IN	OUT					GND	IN									5.0 V	C to 1Q	"	"	"
		"	106	"					OUT	IN	IN	OUT	"	"									"	C to 2Q	"	"	"
		"	107	"									"	"									"	C to 3Q	"	"	"
		"	108	"									"	"									"	C to 4Q	"	"	"
		"	109	"									"	"	OUT		IN	OUT					"	C to 5Q	"	"	"
		"	110	"									"	"									"	C to 6Q	"	"	"
		"	111	"									"	"									"	C to 7Q	"	"	"
		"	112	"									"	"									"	C to 8Q	"	"	"
		"	113	IN	OUT	4.5 V	4.5 V	OUT					"	1/								OUT	"	O/C to 1Q	"	"	"
		"	114	"						4.5 V			"	"									"	O/C to 2Q	"	"	"
		"	115	"					OUT				"	"									"	O/C to 3Q	"	"	"
		"	116	"							4.5 V	OUT	"	"									"	O/C to 4Q	"	"	"
		"	117	"									"	"	OUT	4.5 V							"	O/C to 5Q	"	"	"
	t_{PL2}	"	118	"									"	"			4.5 V	OUT					"	O/C to 6Q	"	"	"
		"	119	"									"	"					OUT	4.5 V			"	O/C to 7Q	"	"	"
		"	120	"									"	"							4.5 V		"	O/C to 8Q	"	"	"
		"	121	"									"	"								OUT	"	O/C to 9Q	"	"	"
		"	122	"			GND	OUT					"	"									"	O/C to 1Q	"	"	"
		"	123	"				OUT		GND			"	"									"	O/C to 2Q	"	"	"
		"	124	"							GND	OUT	"	"									"	O/C to 3Q	"	"	"
		"	125	"									"	"	OUT								"	O/C to 4Q	"	"	"
		"	126	"									"	"			GND	OUT					"	O/C to 5Q	"	"	"
		"	127	"									"	"					OUT	GND			"	O/C to 6Q	"	"	"
		"	128	"									"	"									"	O/C to 7Q	"	"	"
		"	129	"									"	"								OUT	"	O/C to 8Q	"	32	"
	t_{PHZ}	"	130	"			4.5 V	OUT		4.5 V			"	"									"	O/C to 1Q	"	"	"
		"	131	"									"	"									"	O/C to 2Q	"	"	"
		"	132	"							4.5 V	OUT	"	"									"	O/C to 3Q	"	"	"
		"	133	"									"	"	OUT	4.5 V							"	O/C to 4Q	"	"	"
		"	134	"									"	"			4.5 V	OUT					"	O/C to 5Q	"	"	"
		"	135	"									"	"					OUT	4.5 V			"	O/C to 6Q	"	"	"
		"	136	"									"	"									"	O/C to 7Q	"	"	"
		"	137	"									"	"									"	O/C to 8Q	"	"	"
		"	138	"			GND	OUT					"	"									"	O/C to 1Q	"	30	"
		"	139	"					OUT	GND			"	"									"	O/C to 2Q	"	"	"
		"	140	"							GND	OUT	"	"									"	O/C to 3Q	"	"	"
		"	141	"									"	"									"	O/C to 4Q	"	"	"
		"	142	"									"	"	OUT	GND		OUT					"	O/C to 5Q	"	"	"
	t_{PLZ}	"	143	"									"	"			GND	OUT					"	O/C to 6Q	"	"	"
		"	144	"									"	"					OUT		GND	OUT	"	O/C to 7Q	"	"	"

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 03 - Continued.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 Cases R, S, 2	Test no.																				Measured terminal	Test limits		Unit
			O/C	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	G	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}		Min	Max	
10	f _{max}		Same tests and terminal conditions as subgroup 9 except T _C = +125°C.																					26		MHz
	PLH2																							3	37	ns
	PHL2																									"
	P2H																									"
	P2L																									"
	PHZ																									"
11	PLZ		Same tests and terminal conditions as subgroup 10 except T _C = -55°C.																							"
																									39	

1/ Apply  - - 2.5 V min/5.5 V max. Pulse prior to test.
0 V

2/ I_L limits in μ A are as follows:

Parameter	Circuit				
	A	B	C	D	E
O/C	-10/-200	-400 max	-180/-420	-400 max	0/-400
Clock	-400 max	-400 max	-160/-400	-400 max	0/-400
Data	-75/-250	-400 max	-100/-340	-75/250	-120/-360

3/ For circuits C and D, I_{OS} limits shall be -15/-100 mA. For circuit E, I_{OS} limits shall be -40/-225 mA.

4/ A = 3.0 V minimum. B = 0.0 V or GND.

5/ Tests shall be performed in sequence, attributes data only.

6/ X = Indeterminate output voltage.

7/ Output voltages shall be:

H > 1.5 V
L < 1.5 V

8/ f_{MAX}, minimum limit specified is the frequency of the input pulse. The output frequency shall be one half of the input frequency.

TABLE III. Group A inspection for device type 04.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 method	Cases R, S, 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured terminal	Test limits		Unit																																																																																																																																																				
																									Min	Max																																																																																																																																																					
1 Tc = 25°C	V _{OH}	3006	1	0.7 V	G	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	CLK	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}	1Q	2.4	V																																																																																																																																																				
																												2	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"																																																																																																																											
																																																					3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"																																																																																																			
																																																																													4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"																																																																											
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																																																																																																																																																																													8	"	"
	9	"	4 mA	0.7 V	4 mA	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"																																																																																																																																																						
																										10	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"																																																																																																																													
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																																																																																																																																																																													16	"	"
17	-18 mA	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"																																																																																																																																																						
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																																																		27	0.4 V	"	"	"	"	"	"	"	"	"	"	"	"																																																																																																																

See footnotes at end of device type 04.

TABLE III. Group A inspection for device type 04 - Continued.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883 R, S, 2	Cases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured terminal	Test limits	Unit					
1 Tc = 25°C	I _{OS}	3011	Test no.	G	1Q	1D	2D	2Q	3Q	3D	4D	4Q	GND	CLK	5Q	5D	6D	6Q	7Q	7D	8D	8Q	V _{CC}	1Q	Min	Max					
			57	0.7 V	GND	4.5 V									GND	3/								5.5 V	-15	-100	mA				
			58	"	"	"	4.5 V	GND							"	"	"	"	"	"	"	"	"	"	2Q	"	"	"			
			59	"	"	"			GND	4.5 V					"	"	"	"	"	"	"	"	"	"	3Q	"	"	"			
			60	"	"	"						4.5 V		GND	"	"	"							4Q	"	"	"				
			61	"	"	"								"	"	"	GND	4.5 V						5Q	"	"	"				
			62	"	"	"									"	"	"		4.5 V	GND				6Q	"	"	"				
			63	"	"	"								"	"	"	"							7Q	"	"	"				
			64	"	"								GND	"	"	"	"							8Q	"	"	"				
			3005	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	4.5 V	GND	GND	V _{CC}		32	"			
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 Z/	Truth table tests	3014	66	B	X 6/	B	B	X 6/	X 6/	B	B	X 6/	GND	B	X 6/	B	B	B	X 6/	B	B	B	X 6/	5.0 V	Z/						
			67	"	L	B	B	L	L	B	B	L	"	"	A	L	B	B	A	"	L	B	B	L				"	"	"	
			68	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"				"	"	"	"
			69	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"				"	"	"	"
			70	"	H	"	"	H	H	"	"	"	"	"	"	"	"	"	"	"	H	"	"	"				"	"	"	"
			71	A	"	B	B	"	"	"	B	"	"	"	"	"	B	B	"	"	"	B	B	"				"	"	"	
			72	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"				"	"	"	"
			73	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"				"	"	"	"
			74	B	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"				"	"	"	"
			75	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"				"	"	"	"
8	Same tests and terminal conditions as subgroup 7, except T _C = +125°C and -55°C.	3003	82	"	H	"	"	H	H	"	"	H	"	"	"	"	"	"	H	H	"	"	H	"	"	"					
			83	GND	OUT	IN	IN	OUT	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	5.0 V	CLK to Q	30	"	"		
			84	"	"	"	"	"	OUT	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"			
			85	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"			
			86	"	"	"	"	"	"	"	"	IN	OUT	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"			
			87	"	"	"	"	"	"	"	"	"	"	"	"	"	OUT	IN	IN	OUT	"	"	"	"	"	"	"	"			
			88	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"			
			89	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	OUT	IN	IN	OUT	"	"	"	"			
			90	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"			
			91	"	"	OUT	IN	IN	OUT	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 1Q	5	32	ns		
9 Tc = 25°C	f _{MAX} g/	Fig 3	92	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 2Q	"	"	"			
			93	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 3Q	"	"	"			
			94	"	"	"	"	"	"	"	"	IN	OUT	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 4Q	"	"	"		
			95	"	"	"	"	"	"	"	"	"	"	"	"	"	OUT	IN	IN	OUT	"	"	"	"	"	CLK to 5Q	"	"	"		
			96	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 6Q	"	"	"	
			97	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	OUT	IN	IN	OUT	"	"	"	CLK to 7Q	"	"	"
			98	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 8Q	"	"	"	
			99	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		

See footnotes at end of device type 04.

TABLE III. Group A inspection for device type 04 - Continued.
Terminal conditions (pins not designated may be high ≥ 2.0 V; low ≤ 0.7 V; or open).

Subgroup	Symbol	MIL-STD-883	Cases Test no. method	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Measured terminal	Test limits		Unit
				G	1Q OUT	1D IN	2D IN	2Q OUT	3Q OUT	3D IN	4D IN	4Q OUT	GND	CLK IN	5Q OUT	5D IN	6D IN	6Q OUT	7Q OUT	7D IN	8D IN	8Q OUT	V _{CC}		Min	Max	
9	t _{PHL2} T _C = 25°C	3003 See Fig 3 "	99	GND	OUT	IN	IN	OUT	OUT	IN	OUT	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 1Q	5	32	ns
			100	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 2Q	"	"	"
			101	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 3Q	"	"	"
			102	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 4Q	"	"	"
			103	"	"	"	"	"	"	"	"	"	"	OUT	IN	IN	OUT	"	"	"	"	"	"	CLK to 5Q	"	"	"
			104	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 6Q	"	"
10	f _{MAX} PH2	Same tests and terminal conditions as subgroup 9 except T _C = +125°C.	105	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	OUT	IN	IN	OUT	"	CLK to 7Q	"	"	"
			106	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	CLK to 8Q	25	"	MHz
11	PH2	Same tests and terminal conditions as subgroup 10 except T _C = -55°C.																							5	42	ns
																									5	42	ns

1/  - - 2.5 V minimum/5.5 V maximum.
0 V

2/ I_L limits in μ A are as follows:

Parameter	Circuit			
	A	F	B	D
Enable	-120/-360	-105/-345	-30/-300	-120/-360
Clock	-120/-360	-160/-400	-30/-300	-160/-400
Data	-100/-340	-160/400	-120/-360	-100/-340

3/  - - 2.5 V min/5.5 V max.
0 V

4/ A = 3.0 V minimum. B = 0.0 V or GND.

5/ Tests shall be performed in sequence, attributes data only.

6/ X = Indeterminate output voltage.

7/ Output shall be: H > 1.5 V, L < 1.5 V

8/ f_{max}, minimum limit specified is the frequency of the input pulse. The output frequency shall be one half of the input frequency.

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.
- i. Requirements for "JAN" marking.

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

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

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

GND	Ground zero voltage potential
V _{IN}	Voltage level at an input terminal
f _{MAX}	Maximum clock frequency

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	54LS273
02	54LS373
03	54LS374
04	54LS377

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	Circuit					
	A	B	C	D	F	E
	Texas Instruments	Signetics Corp.	National Semiconductor	Raytheon Co.	Motorola Inc.	Fairchild Semiconductor
01	X	X		X	X	X
02	X		X	X	X	
03	X	X	X	X		
04	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 5962-1972)

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

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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

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

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-M-38510/325D

2. DOCUMENT DATE (YYYYMMDD)
2003-09-17

3. DOCUMENT TITLE

MICROCIRCUITS, DIGITAL, BIPOLAR, LOW-POWER SCHOTTKY TTL, FLIP-FLOPS, CASCADABLE,
MONOLITHIC SILICON

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

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First Middle Initial)*

b. ORGANIZATION

c. ADDRESS *(Include Zip Code)*

d. TELEPHONE *(Include Area Code)*
(1) Commercial
(2) DSN
(If applicable)

7. DATE SUBMITTED
(YYYYMMDD)

8. PREPARING ACTIVITY

a. NAME
Defense Supply Center, Columbus

b. TELEPHONE *(Include Area Code)*
(1) Commercial 614-692-0536 (2) DSN 850-0536

c. ADDRESS *(Include Zip Code)*
DSCC-VA
P. O. Box 3990
Columbus, Ohio 43216-5000

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:
Defense Standardization Program Office (DLSC-LM)
8725 John J. Kingman Road, Suite 2533
Fort Belvoir, Virginia 22060-6221
Telephone (703)767-6888 DSN 427-6888