

INCH-POUND

MIL-M-38510/9D
AMENDMENT 6
14 December 1992
SUPERSEDING
AMENDMENT 5
15 April 1985

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, BIPOLAR, TTL,
SHIFT REGISTERS, MONOLITHIC SILICON

This amendment forms a part of MIL-M-38510/9D, dated
4 June 1980, and is approved for use by all
Departments and Agencies of the Department of Defense.

PAGE 1

- * Title: Delete and substitute as printed above.
- 1.1, second sentence: Delete "Three" and substitute "Two".

PAGE 2

- * 1.3, thermal resistance, delete and substitute as follows: (alter change made by previous amendment)
 - "Thermal resistance, junction-to-case (θ_{JC})
Cases A, B, C, D, E, and F - - - - - (See MIL-M-38510, appendix C)."
- 1.3, after junction temperature: Add "2".
- 1.4: Delete "Ambient" and substitute "Case".
- * Footnote 1/ (added from previous amendment), delete in its entirety.
- * Bottom of page, add the following footnote: (alter change made by previous amendment)

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

PAGE 3

- 1.4, device type 06: Delete "27" and substitute "32". Delete "20" and substitute "25".
- 2.1, delete and substitute the following:
 - "2.1 Government specifications and standards. Unless otherwise specified, the following specifications and standards, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

MIL-M-38510/9D
AMENDMENT 6

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

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 specification shall take precedence."

3.4, delete "ambient" and substitute "case".

PAGE 4, 5, 6, and 7

TABLE I, under conditions: Add " $-55^{\circ}\text{C} \leq T_C \leq +125^{\circ}\text{C}$ ".

TABLE I, V_{IC} conditions: Delete " T_A " and substitute " T_C ".

PAGE 5

TABLE I, t_{PLH1} , t_{PHL1} , t_{PLH2} , and t_{PHL3} tests for device type 02, minimum limits column: Delete "12" and substitute "8". (four places)

PAGE 7

TABLE II, group A test requirements, class B device: Add "8".

TABLE II: Delete class C device column in its entirety.

PAGE 17

FIGURE 3: Delete and substitute new figure 3 as printed on page 6 of this amendment.

PAGE 21

NOTE 2, delete and substitute: "2. R values are either 4 k Ω , 5 k Ω , or 6 k Ω ."

PAGE 28

FIGURE 4: Delete and substitute new figure 4 as printed on page 7 of this amendment.

PAGE 38

FIGURE 4: Delete and substitute new figure 4 as printed on page 8 of this amendment.

PAGE 48

FIGURE 6, notes 1, 2, 3, and 4: Delete " T_A " and substitute " T_C ". (six places)

PAGE 54

Notes 1 and 2: Delete " T_A " and substitute " T_C ".

MIL-M-38510/9D
AMENDMENT 6

PAGE 57

FIGURE 9: Delete and substitute new figure 9 as printed on page 9 of this amendment.

PAGE 58

FIGURE 9, clock to output (t_{PHL2} and t_{PLH2}), note 1: Delete " $t_{SETUP2} = 30 \text{ ns}$ " and substitute " $t_{SETUP2} = 34 \text{ ns}$ ".

PAGE 61

Notes 2 and 3: Delete " T_A " and substitute " T_C ".

PAGE 62

Note 2: Delete " T_A " and substitute " T_C ".

PAGES 63 AND 64

FIGURE 11: Delete and substitute new figure 11 as printed on pages 10 and 11 of this amendment.

PAGES 65 THROUGH 90

TABLE III, heading: Delete "(pins not designated are open, high level or low level)" and substitute "(pins not designated may be high $\geq 2.0 \text{ V}$, low $\leq 0.8 \text{ V}$ or open)".

TABLE III: Delete " T_A " and substitute " T_C " for the entire table.

PAGE 67

TABLE III, device type 01, delete and substitute new page as printed on page 12 of this amendment.

PAGES 70 AND 71

TABLE III, device type 02, test numbers 125 through 144 and 146 through 165, minimum limits column: Delete "12" and substitute "8".

PAGE 76

TABLE III, footnote 7/: Add "For schematics incorporating a 4.5 k Ω base resistor, the minimum and maximum limits shall be -0.6 and -1.5 mA, respectively."

TABLE III, footnote 8/, first sentence: Delete "C". Add new sentence: "For schematic circuit C, the minimum and maximum limits shall be -0.6 and -1.5 mA, respectively."

PAGE 79

TABLE III, test number 89, pin 2: Delete "B" and substitute "A".

PAGE 84

TABLE III, device type 05, delete and substitute new table III as printed on page 13 of this amendment.

PAGE 87

TABLE III, device type 06, test number 10, pin 11: Delete "-.8 mA" and substitute "16 mA".

* 4.2a(1), delete and substitute as follows: (alter change made by previous amendment)

"(1) Test condition D or E, using the circuit shown on figure 5, or equivalent. Test condition A and the applicable test circuit shall be allowed with the approval of the qualifying activity."

4.2c, delete in its entirety and substitute the following:

"c. The percent defective allowable (PDA) shall be as specified in MIL-M-38510."

4.4, delete and substitute the following"

"4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510 and as specified herein. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4)."

4.4.2, after MIL-STD-883 add: "Electrical parameters shall be as specified in table II herein."

* 4.4.3b, delete in its entirety. (alter change made by previous amendment)

* 4.4.3c(1), delete and substitute as follows: (alter change made by previous amendment)

"(1) Test condition D or E, using the circuit shown on figure 5, or equivalent. Test condition A and the applicable test circuit shall be allowed with the approval of the qualifying activity."

4.5, delete and substitute the following: "4.5 Methods of inspection. Methods of inspection shall be specified as follows:"

4.5.2: Delete in its entirety.

4.6: Delete in its entirety.

6.1: Delete in its entirety.

6.3d: Delete "procuring" and substitute "the contracting".

6.3e: Delete in its entirety.

6.3h: Delete "Requirements for carriers, special" and substitute "Requirements for special carriers,".

6.3: Delete "electrical ground (common terminal)" and substitute "ground zero voltage potential".

6.3, V_{IC} : Delete in its entirety.

6.6, generic-industry type: Delete "7495", "7496", "74164", "74165", "74194", and "74195".

NOTE: The margins of this amendment are marked with asterisks to indicate where changes from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

MIL-M-38510/9D
AMENDMENT 6

CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 17

Review activities:

Army - AR, MI
Navy - OS, SH, TD
Air Force - 19, 85, 99
DLA - ES

User activities:

Army - SM
Navy - AS, CG, MC

Preparing activity:

Air Force - 17

Agent:

DLA - ES

(Project 5962-1323)

Device type 01

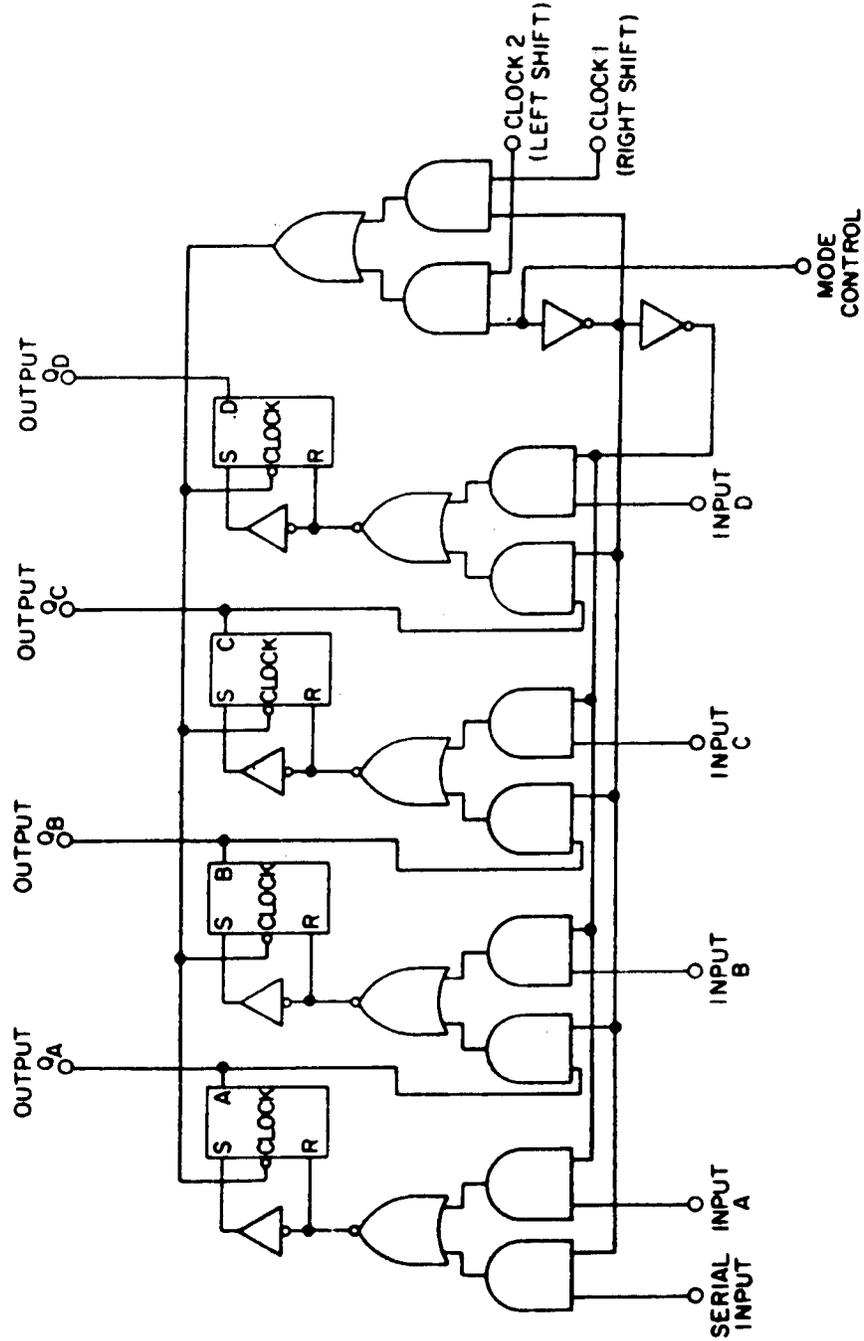
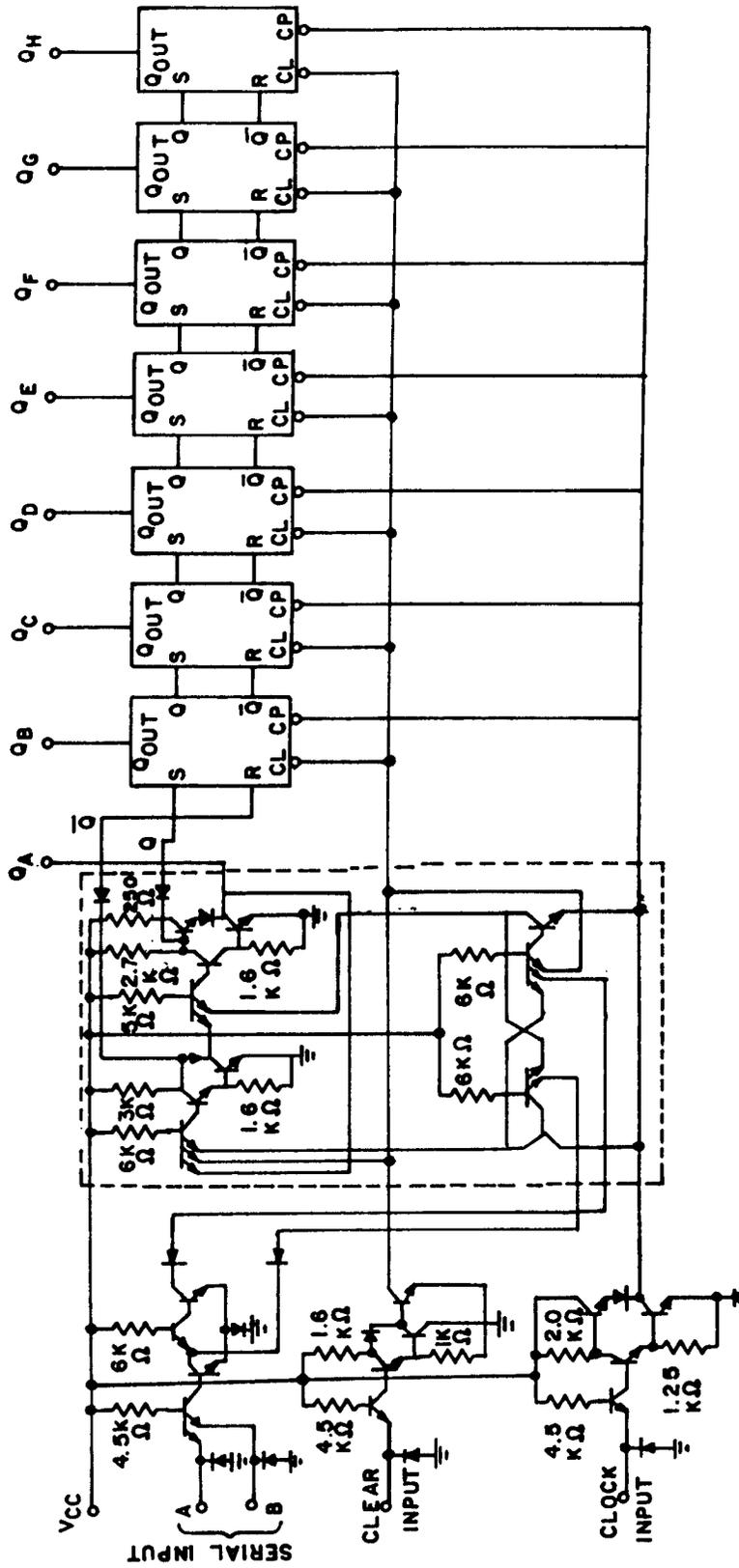


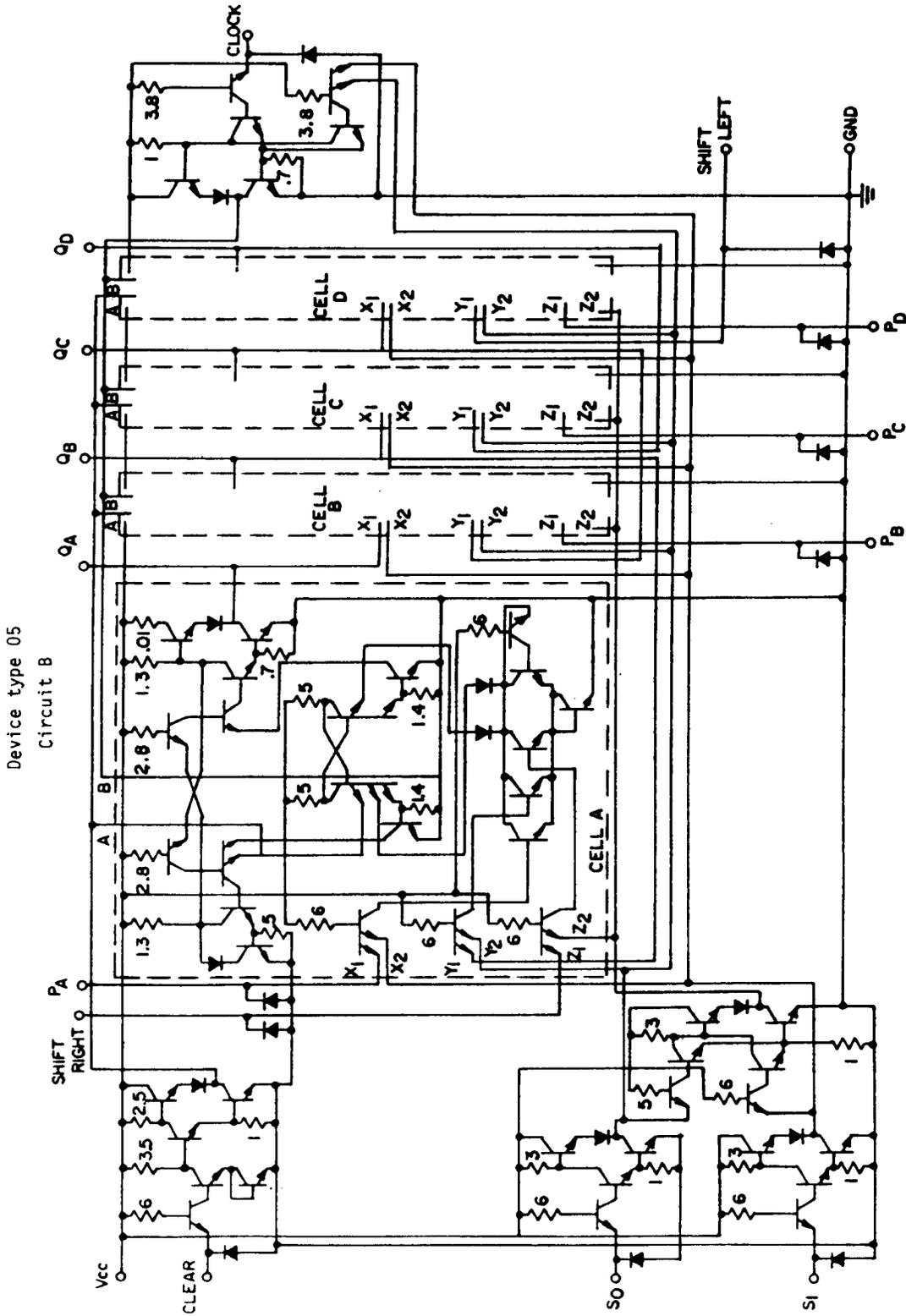
FIGURE 3. Logic diagrams.

Device type 03
 Circuit C



Component values shown are normal.

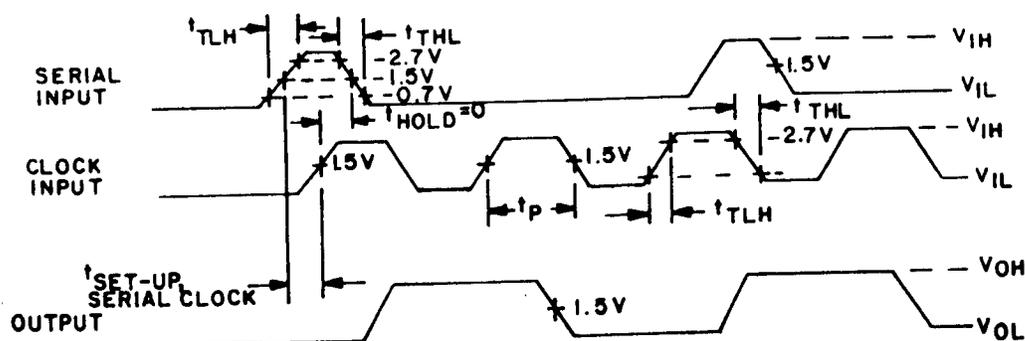
FIGURE 4. Schematic circuits - Continued.



- NOTES:
 1. Component values shown are nominal.
 2. All resistor values are in kΩ.

FIGURE 4. Schematic circuits - Continued.

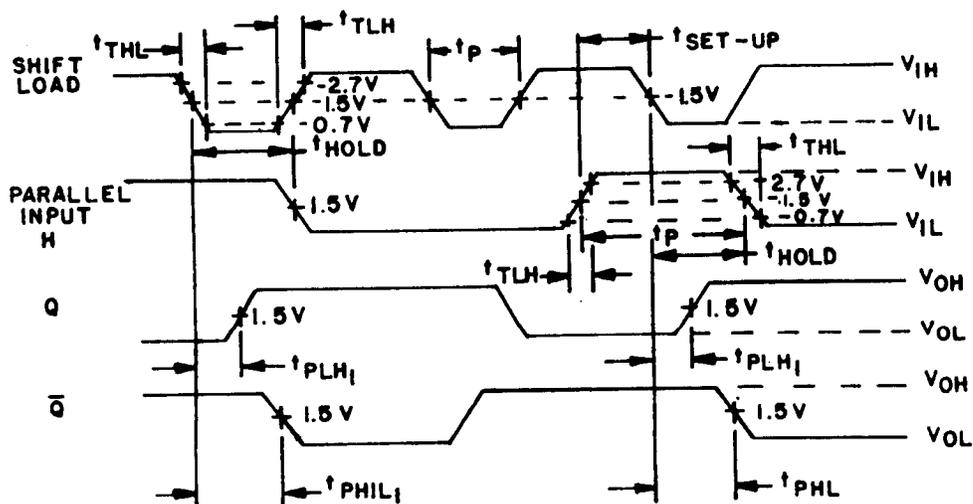
MAXIMUM CLOCK FREQUENCY, f_{MAX}



NOTES:

1. Clock pulse characteristics: PRR = 18 MHz at $T_C = +25^\circ C$, PRR = 14 MHz at $-55^\circ C \leq T_C \leq +125^\circ C$, $t_{TLH} = t_{THL} \leq 10$ ns, $t_p = 20$ ns minimum.
2. Serial pulse characteristics: PRR = 9 MHz at $T_C = +25^\circ C$, PRR = 7 MHz at $-55^\circ C \leq T_C \leq +125^\circ C$, $t_p = t_{SETUP} + t_{HOLD}$, $t_{SETUP} = 35$ ns minimum, $t_{HOLD} = 0$ ns, $t_{TLH} = t_{THL} \leq 5$ ns.
3. Shift load characteristics: $t_{TLH} \leq 10$ ns, $t_{SETUP} = 45$ ns.
4. Clock inhibit = GND, A through H = GND.

SHIFT LOAD TO OUTPUT (t_{PHL1} , t_{PLH1})



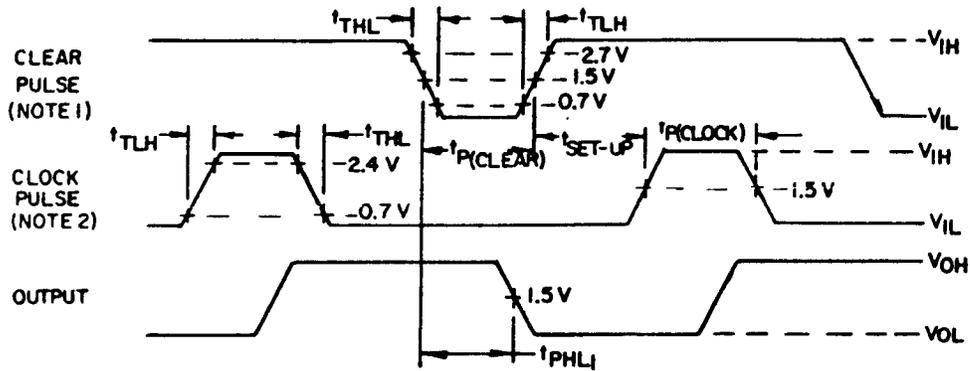
NOTES:

1. Shift load characteristics: PRR = 1 MHz, $t_p = 25$ ns, $t_{TLH} = t_{THL} \leq 10$ ns.
2. Parallel input characteristics: PRR = 500 kHz, $t_p = t_{SETUP} + t_{HOLD} = 40$ ns, $t_{SETUP} = 10$ ns, $t_{HOLD} = 30$ ns, $t_{THL} \leq 10$ ns.
3. Clock = clock inhibit = GND, A through G = GND, serial = OPEN.

FIGURE 9. Switching test circuit and waveforms for device type 04 - Continued.

MIL-M-38510/9D
AMENDMENT 6

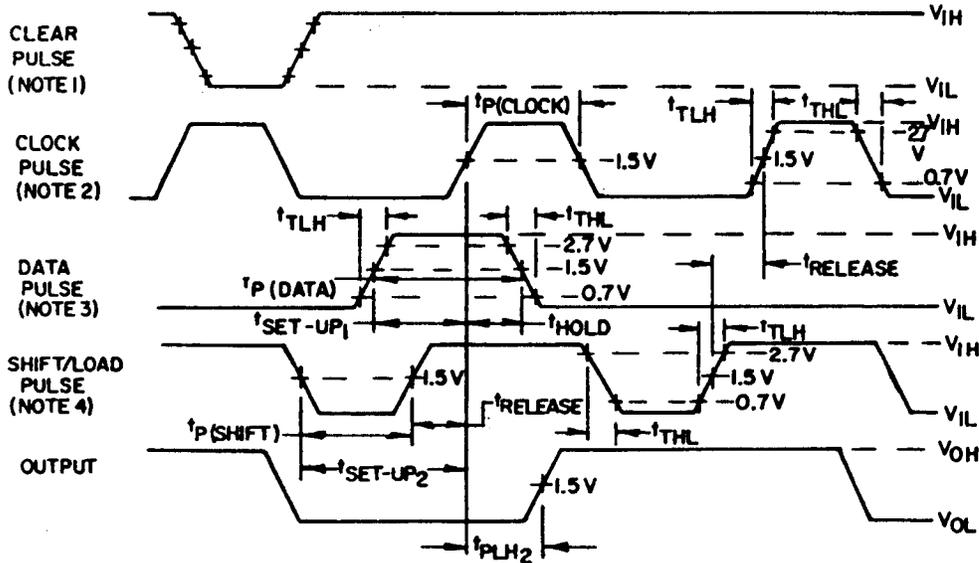
CLEAR TO OUTPUT (t_{PHL1})



NOTES:

1. Clear pulse characteristics: $t_{p(CLEAR)} = 12$ ns, $t_{SETUP} = 25$ ns, PRR = 1 MHz.
2. Clock pulse characteristics: $t_{p(CLOCK)} = 16$ ns, PRR = 1 MHz.

CLOCK TO OUTPUT (t_{PLH2})

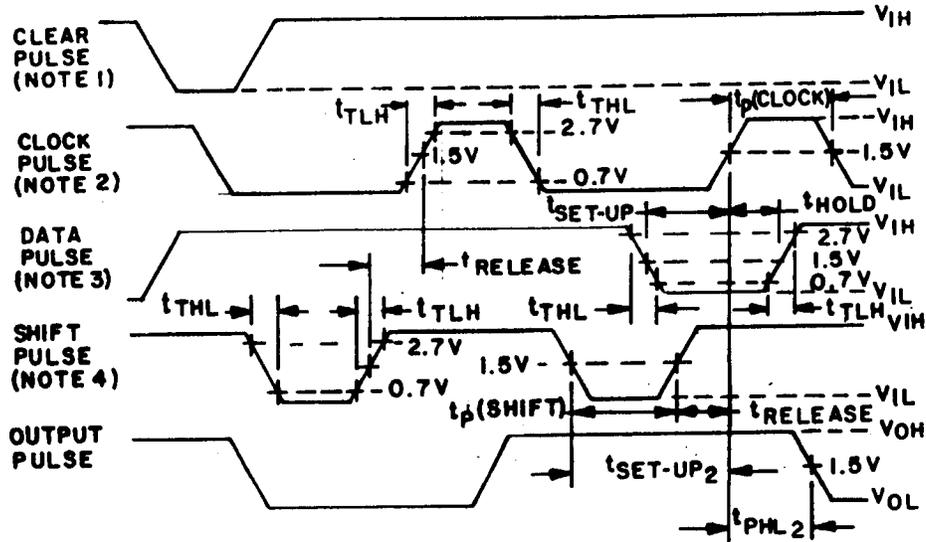


NOTES:

1. The clear pulse is a momentary GND, then V_{IH} is applied to the clear input.
2. Clock pulse characteristics: $t_{p(CLOCK)} = 16$ ns, PRR = 2 MHz.
3. Data pulse characteristics: $t_{p(DATA)} = 25$ ns, $t_{SETUP1} = 25$ ns, $t_{HOLD} = 0$ ns, PRR = 1 MHz.
4. Shift/load pulse characteristics: $t_{p(SHIFT)} = 17$ ns, $t_{RELEASE} = 10$ ns, $t_{SETUP2} = 27$ ns, PRR = 2 MHz.

FIGURE 11. Switching test circuit and waveforms for device type 06 - Continued.

CLOCK TO OUTPUT (t_{PHL2})



NOTES:

1. The clear pulse is a momentary GND, then V_{IH} is applied to the clear input.
2. Clock pulse characteristics: $t_{P(CLOCK)} = 16$ ns, PRR = 2 MHz.
3. Data pulse characteristics: $t_{P(DATA)} = t_{SETUP} + t_{HOLD} = 25$ ns, $t_{SETUP1} = 25$ ns, $t_{HOLD} = 0$ ns, PRR = 1 MHz.
4. Shift/load pulse characteristics: $t_{P(SHIFT)} = 22$ ns, $t_{RELEASE} = 10$ ns, $t_{SETUP2} = 32$ ns, PRR = 2 MHz.

FIGURE 11. Switching test circuit and waveforms for device type 06 - Continued.

TABLE III. Group A inspection for device type 01 - Continued.
Terminal conditions (pins not designated may be H \pm 2.0 V or L \pm 0.8 V, or open).

Subgroup	Symbol	MIL-STD-883 method	Cases A, B, C, D Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits		Unit	
				Input serial	Input A	Input B	Input C	Input D	Mode control	GND	Clock 2	Clock 1	Q _D	Q _C	Q _B	Q _A	V _{CC}		Min	Max		
7 T _C = 25°C 4/ 7/	Truth table test 5/	3014	75	B	A	B	A	B	A	GND	B	B	L	L	L	L	4.5 V					
		"	76	"	A	B	A	B	"	"	A	"	L	L	L	L	"					
		"	77	"	A	B	A	B	"	"	B	"	L	L	L	L	"					
		"	78	"	B	A	"	"	"	"	"	"	L	L	L	L	"					
		"	79	"	B	B	"	"	"	"	"	"	L	L	L	L	"					
		"	80	"	B	B	"	"	"	"	"	"	L	L	L	L	"					
		"	81	"	"	A	"	"	"	"	"	"	L	L	L	L	"					
8 Repeat subgroup 7 at T _C = +125°C and T _C = -55°C.			82	"	A	"	"	"	"	"	"	L	L	L	L	"						
			83	"	A	"	"	"	"	"	"	L	L	L	L	"						
			84	"	B	B	"	"	"	"	"	L	L	L	L	"						
			85	"	B	B	"	"	"	"	"	L	L	L	L	"						
			86	"	B	B	"	"	"	"	"	L	L	L	L	"						
				87	GND	"	"	"	"	GND	"	"	"	"	"	"	"	5.0 V	Q _D	11	30	ns
	9 T _C = 25°C	f _{MAX} (Fig 6)		88	"	IN	"	"	"	5.0 V	"	"	GND	"	"	OUT	OUT	"	Q _A	10	"	"
t _{PLH} (Fig 6)			89	"	"	"	"	"	"	"	"	"	OUT	"	"	"	"	Q _B	"	"	"	
			90	"	"	"	"	"	"	"	"	"	OUT	"	"	"	"	Q _C	"	"	"	
			91	"	"	"	"	"	"	"	"	"	OUT	"	"	"	"	Q _D	"	"	"	
t _{PHL}			92	IN	"	"	"	"	GND	"	GND	IN	"	"	OUT	OUT	"	Q _A	"	35	"	
10 T _C = 125°C			93	"	"	"	"	"	"	"	"	"	OUT	"	"	"	"	Q _B	"	"	"	
			94	"	"	"	"	"	"	"	"	"	OUT	"	"	"	"	Q _C	"	"	"	
			95	"	"	"	"	"	"	"	"	"	OUT	"	"	"	"	Q _D	"	"	"	
	f _{MAX} (Fig 6)		96	GND	"	"	"	"	GND	"	IN	"	"	OUT	"	"	"	Q _D	8	"	"	
	t _{PLH} (Fig 6)		97	"	IN	"	"	"	5.0 V	"	"	GND	"	"	OUT	OUT	"	Q _A	10	42	ns	
11 Same tests, terminal conditions, and limits as for subgroup 10, except T _C = -55°C.			98	"	"	"	"	"	"	"	"	"	OUT	"	"	"	"	Q _B	"	"	"	
			99	"	"	"	"	"	"	"	"	"	OUT	"	"	"	"	Q _C	"	"	"	
			100	"	"	"	"	"	"	"	"	"	OUT	"	"	"	"	Q _D	"	"	"	
	t _{PHL}		101	IN	"	"	"	"	GND	"	GND	"	"	OUT	OUT	OUT	"	Q _A	"	49	"	
		102	"	"	"	"	"	"	"	"	"	"	OUT	"	"	"	Q _B	"	"	"		
		103	"	"	"	"	"	"	"	"	"	"	OUT	"	"	"	Q _C	"	"	"		
		104	"	"	"	"	"	"	"	"	"	"	OUT	"	"	"	Q _D	"	"	"		

1/ A = normal clock pulse, except for subgroups 7 and 8 (see 4/).
2/ For device type 01, with schematics incorporating a 4 k Ω base resistor, the minimum and maximum limits shall be -0.5 and -1.4 mA, respectively. For schematics incorporating a 6 k Ω base resistor, the minimum and maximum limits shall be -0.5 and -1.4 mA, respectively.
3/ For device type 01, with schematics incorporating a 4 k Ω base resistor in the mode control input circuit, the minimum and maximum limits shall be -1.4 and -3.2 mA, respectively. For schematics incorporating a 5 k Ω base resistor, the minimum and maximum limits shall be -1.0 and -2.8 mA, respectively. For schematics incorporating a 6 k Ω base resistor in the mode control input circuit, the minimum and maximum limits shall be -0.8 and -2.6 mA, respectively.
4/ For subgroups 7 and 8, A = V, B = GND, and X = indeterminate.
5/ The tests in subgroups 7 and 8 shall be performed in the sequence specified.
6/ Output voltages shall be either:
(a) H = 2.4 V minimum and L = 0.4 V maximum when using a high speed checker double comparator or
(b) H > 1.5 V and L < 1.5 V when using a high speed checker single comparator.
7/ Only a summary of attribute data is required.

