QUALIFICATION REQUIREMENTS REMOVED

MIL-M-38510/422A
9 August 1983
SUPERSEDING
MIL-M-38510/422(USAF)
27 November 1979

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, SCHOTTKY TTL, CLOCK GENERATOR AND DRIVER, MONOLITHIC SILICON

INACTIVE FOR NEW DESIGN AFTER DATE OF THIS REVISION

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, Schottky TTL, clock generator/driver microcircuits. One product assurance class and a choice of case outlines and lead finishes are provided and are reflected in the complete part number.

1.2 Part number. The complete part number shall be in accordance with MIL-M-38510, except the "JAN" or "J" certification mark shall not be used.

1.2.1 Device type. The device type shall be as follows:

Device type	Circuit
01	Clock generator/driver

1.2.2 Device class. The device class shall be the product assurance level as defined in MIL-M-38510.

1.2.3 Case outline. The case outline shall be designated as follows:

Outline letter	Case outline (see MIL-M-38510, appendix C)
E	D-2 (16-lead, 1/4" x 7/8"), dual-in-line package

1.3 Absolute maximum ratings.

Supply voltage range (V_{DD})	-0.5 V dc to +13.5 V dc
Supply voltage range (V_{CC})	-0.5 V dc to +7.0 V dc
Input voltage range	-1.0 V dc to +7.0 V dc
Storage temperature range	-65°C to +150°C
Maximum power dissipation, (P_D) 1/	791 mW dc
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC}):	
Case E	0.03°C/mW
Junction temperature (T_J)	+175°C

1/ Must withstand the added P_D due to short circuit test (e.g., I_{OS}).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Rome Air Development Center (RBE-2), Griffiss AFB, NY 13441, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

1.4 Recommended operating conditions.

Supply voltage range (V_{DD})	10.8 V dc minimum to 13.2 V dc maximum
Supply voltage range (V_{CC})	4.5 V dc minimum to 5.5 V dc maximum
Minimum high-level input voltage	
$\overline{RESIN}$ input	2.6 V dc
All other inputs	2.0 V dc
Maximum low-level input voltage	0.8 V dc
Case operating temperature range (T_C)	-55°C to +125°C
Setup time, $t_{SHL/LH}$ $\overline{RESIN}$ to $\overline{STSTB}$	50 ns -4 $\frac{t_p}{9}$ 2/ ns minimum
Hold time, $t_{HHL/HL}$ $\overline{RESIN}$ to $\overline{STSTB}$	4 $\frac{t_p}{9}$ 2/ ns minimum
Pulse width: $\overline{STSTB}$, $t_{w(STSTB)}$	$\frac{t_p}{9}$ 2/ -23 ns minimum
Oscillating frequency (f_{OSC})	4.5 MHz minimum to 18.43 MHz maximum
RESIN input hysteresis (H)	0.25 mV minimum
Positive-going threshold voltage (V_{T+})	2.6 V maximum
Negative-going threshold voltage (V_{T-})	0.8 V minimum

Normalized fanout (maximum values) 3/

	ϕ_2(TTL)OSC	Reset, Ready	STSTB
Low level	40	10	10
High level	10	1	1

2. APPLICABLE DOCUMENTS

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.

STANDARD

MILITARY

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

(Copies of 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. REQUIREMENTS

3.1 Detail specification. The individual item requirements shall be in accordance with MIL-M-38510, and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

2/ $t_p = 9/f_{OSC}$.

3/ Fanout of 1 = 250 µA for low level, fanout of 1 = 100 µA for high level.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/	Limits 1/ Min	Limits 1/ Max	Unit
High level output voltage, ø1, ø2	V_{OH1}	V_{CC} = 4.5 V; V_{DD} = 10.8 V; I_{OH} = -100 µA	9.0		V
High-level output voltage, READY, RESET	V_{OH2}	V_{IL} = GND; V_{IH} = 4.5 V	3.3		V
High-level output voltage, OSC, $\overline{STSTB}$, $ø_2$ (TTL)	V_{OH3}	V_{CC} = 4.5 V; V_{IL} = GND; V_{DD} = 10.8 V; V_{IH} = 4.5 V; I_{OH} = -1 mA	2.4		V
Low-level output voltage, $ø_1$, $ø_2$, READY, RESET, $\overline{STSTB}$	V_{OL1}	V_{CC} = 4.5 V; V_{IL} = GND; V_{DD} = 10.8 V; V_{IH} = 4.5 V; I_{OL} = 2.5 mA		0.45	V
Low-level output voltage, ø2 (TTL), OSC	V_{OL2}	V_{CC} = 4.5 V; V_{IL} = GND; V_{DD} = 10.8 V; V_{IH} = 4.5 V; I_{OL} - 10 mA		0.45	V
Input clamp voltage	V_{IC}	V_{CC} = 4.5 V; V_{DD} = 10.8 V; I_{IN} = -5 mA		-1.2	V
Low-level input current	I_{IL}	V_{CC} = 5.5 V; V_{DD} = 13.2 V; V_{IL} = .45 V		-250	µA
High-level input current	I_{IH}	V_{CC} = 5.5 V; V_{DD} = 13.2 V; V_{IL} = 5.5 V		10	µA
Output short circuit current, OSC, $ø_2$ (TTL), $\overline{STSTB}$, READY, RESET	I_{OS}	V_{CC} - 5.0 V; V_{DD} = 13.2 V	-10	-70	mA
Supply current	I_{CC}	V_{CC} = 5.5 V		115	mA
	I_{DD}	V_{DD} = 13.2 V		12	mA
Input capacitance	C_{IN}	V_{CC} = 5.0 V; V_{DD} = 12 V; V_{BIAS} = 2.5 V; f = 1 MHz; T_C = +25°C		8	pF
ø1 pulse width	$t_{ø1}$	C_L = 50 pF (see fig 5 for R_1)	$\frac{2t_p}{9}$-20		ns
ø2 pulse width	$t_{ø2}$		$\frac{5t_p}{9}$-45		ns
ø1 to ø2 delay	t_{PLH4}		0		ns
ø2 to ø1 delay	t_{PLH6}		$\frac{2t_p}{9}$-25		ns
ø1 to ø2 delay	t_{PLH5}		$\frac{2t_p}{9}$	$\frac{2t_p}{9}$+40	ns
ø1, ø2 rise time	t_{TLH}			25	ns
ø1, ø2 fall time	t_{THL}			25	ns

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/	Limits 1/ Min	Limits 1/ Max	Unit
ø2 to ø2 (TTL) delay	t_{PLH1}	C_L = 50 pF (see fig. 5 for R_1	-5	15	ns
	t_{PHL1}		-5	15	ns
ø2 to $\overline{STSTB}$ delay	t_{PHL4}		$\frac{6t_p}{9}$-30	$\frac{6t_p}{9}$	ns
READY, RESET to ø 2 delay	t_{PLH2} t_{PHL2} t_{PLH3} t_{PHL3}		$\frac{4t_p}{9}$-23		ns
Setup time, $\overline{RESIN}$ to $\overline{STSTB}$	t_{SHL}		$\frac{50-4t_p}{9}$		ns
	t_{SLH} 2/				
Hold time, $\overline{RESIN}$ to $\overline{STSTB}$	t_{HHL}		$\frac{4t_p}{9}$		ns
	t_{HLH} 2/				
Pulse width, $\overline{STSTB}$	$t_{W(STSTB)}$		$\frac{t_p}{9}$-23		ns
Oscillating frequency	f_{OSC}	T_C = +25°C	4.5	18.432	MHz

1/ $t_p = \frac{9 \times 10^3}{f_{OSC}}$

where, f_{OSC} = frequency of oscillation (MHz)
t_p = cycle time (ns)

2/ These parameters are not tested in table III.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (see table III) Class B devices
Interim electrical parameters (pre burn-in) (method 5004)	1
Final electrical test parameters (method 5004)	1*,2,3,7,9,10,11
Group A test requirements (method 5005)	1,2,3,7,8,9, 10,11
Groups C end-point electrical parameters (method 5005)	N/A
Additional electrical subgroups for group C periodic inspections	N/A
Group D end point electrical parameters (method 5005)	1, 2, 3

*PDA applies to subgroup 1 (see 4.2c).

3.2.1 Case outlines. The case outlines shall be as specified in MIL-M-38510, and in 1.2.3 herein.

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

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

3.2.4 Crystal requirements. Crystal requirements shall be as specified on figure 3.

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510 (see 6.5).

3.4 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.

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

3.6 Marking. Marking shall be in accordance with MIL-M-38510 and 1.2 herein. At the option of the manufacturer, marking of the country of origin may be omitted from the body of the microcircuit, but shall be retained on the initial container. The "JAN" or "J" certification mark shall not be used.

3.7 Manufacturer eligibility. To be eligible to supply microcircuits to this specification, a manufacturer shall have a manufacturer certification in accordance with MIL-M-38510 for at least one line, not necessarily the line producing the device type described herein.

3.8 Certification. Certification in accordance with MIL-M-38510 is not required for this device.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-M-38510 and methods 5005 and 5007, as applicable, of MIL-STD-883, except as modified herein.

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test (method 1015 of MIL-STD-883).

(1) Test condition D or E, using the circuit shown on figure 4, or equivalent.

(2) T_A = +125°C minimum.

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. The percent defective allowable (PDA) for class B devices shall be 10 percent based on failures from group A, subgroup 1 test after cooldown as final electrical test in accordance with method 5004 of MIL-STD-883, and with no intervening electrical measurements. If interim electrical parameter tests are performed prior to burn-in, failures resulting from pre burn-in screening may be excluded from the PDA. If interim electrical parameter tests prior to burn-in are omitted, then all screening failures shall be included in the PDA. The verified failures of group A, subgroup 1, after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent defective for that lot, and the lot shall be accepted or rejected based on the PDA for the applicable device class.

Text continues on page 24.

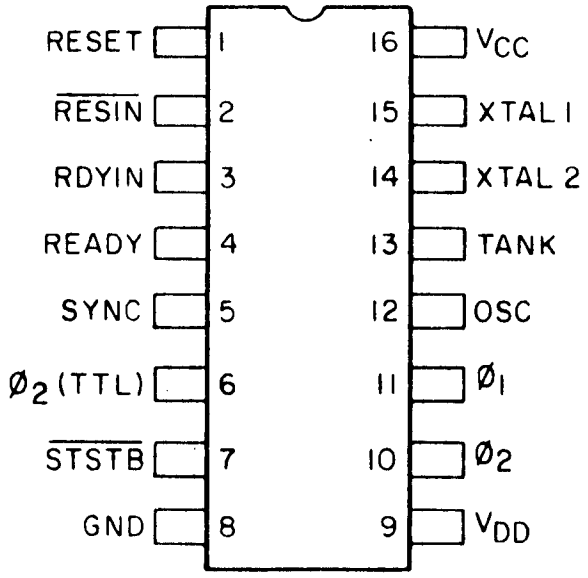


FIGURE 1. Terminal connections.

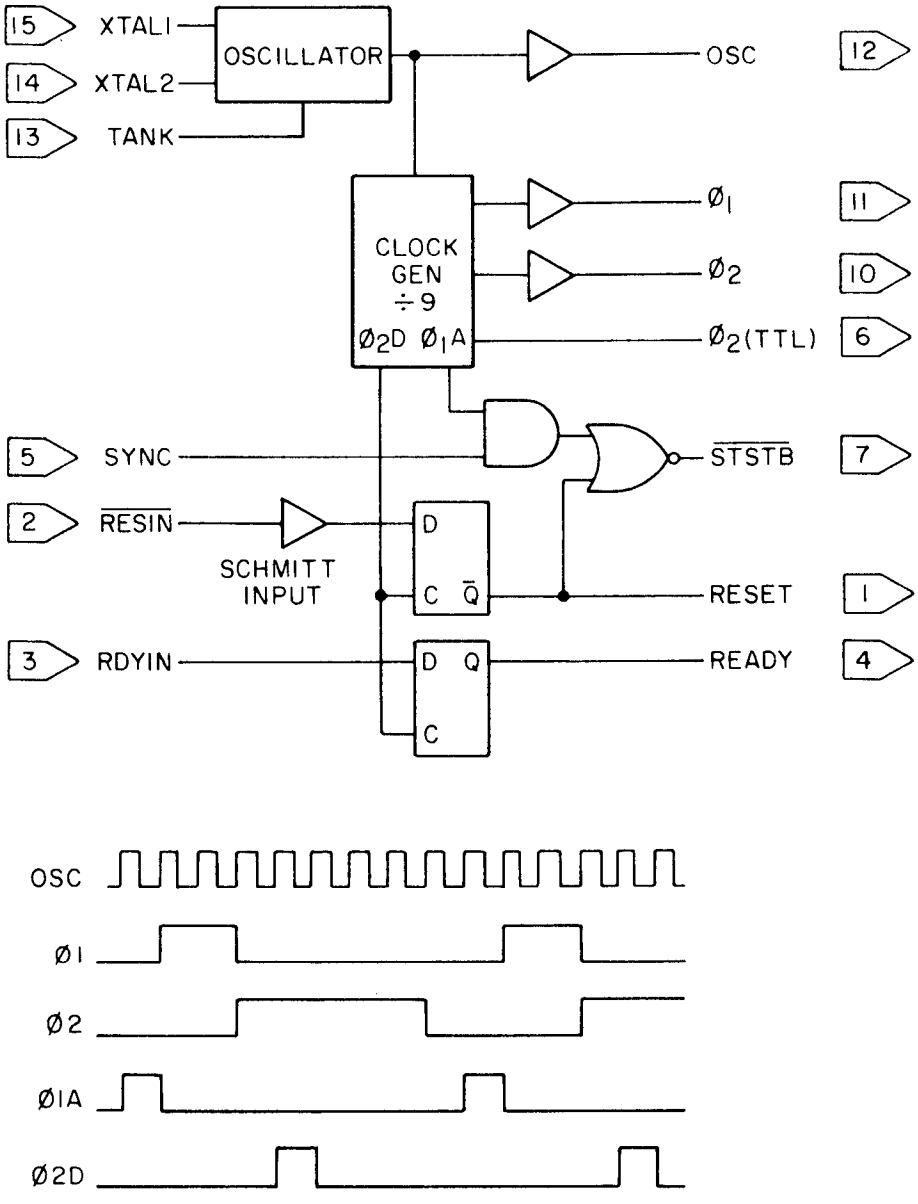


FIGURE 2. Logic and timing diagram.

Oscillator function

The oscillator circuit derives its basic operating frequency from an external, series resonant, fundamental mode crystal. The two inputs, XTAL1 and XTAL2, provide the crystal connections. Crystal frequency is selected to be 9 times the associated processor operating frequency, or:

$$\text{Crystal frequency} = \frac{9}{t_p}$$

Where t_p = processor cycle time (period). Crystals exceeding 10 MHz may require frequency trimming as indicated in the circuit.

The oscillator circuit may be operated with overtone made crystals. An external LC network must be added to the tank input as shown in the diagram to compensate for the lower gain overtone crystal. The LC network is AC coupled to ground. The formula for the LC network is:

$$F = \frac{1}{2\pi\sqrt{LC}}$$

Crystal requirements

Tolerance: .005% @-55° to 125°C
Resonance: Series (fundamental)*
Load capacitance: 20 -35 pF
Equivalent resistance: 75-20Ω
Power dissipation: 4mW min

*With tank circuit use 3rd overtone mode.

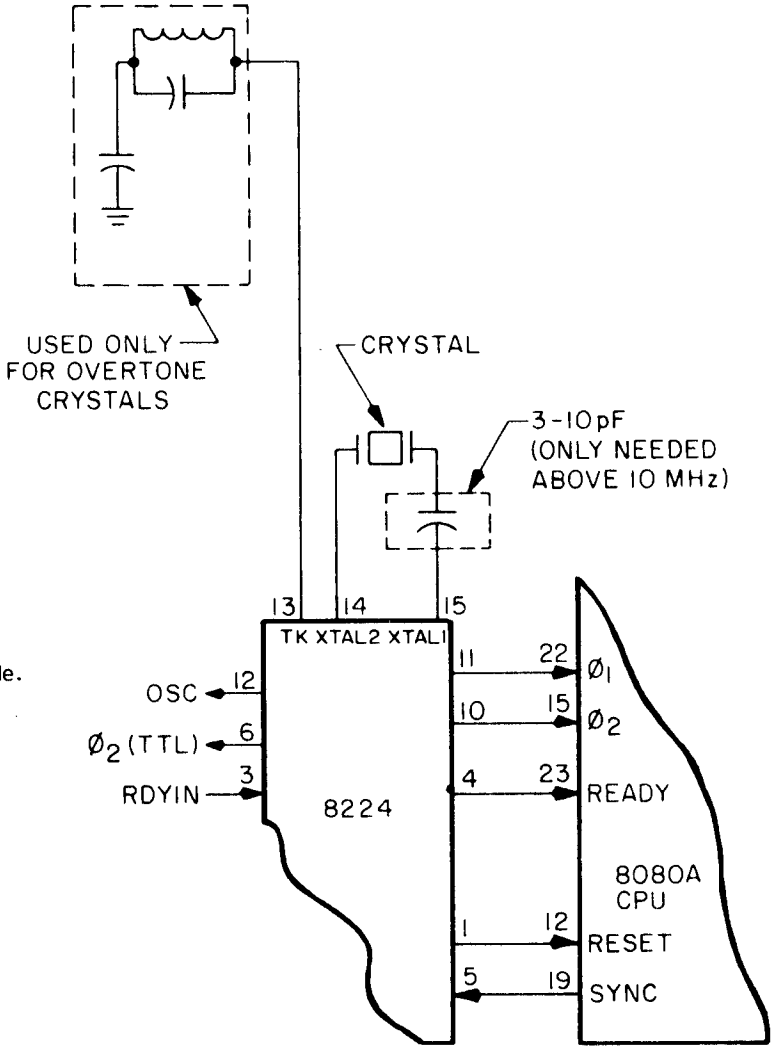
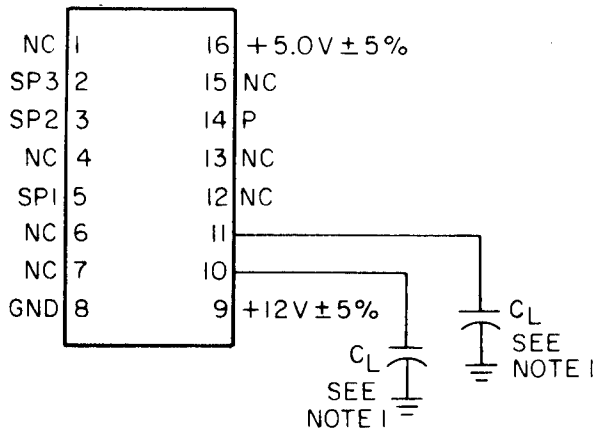


FIGURE 3. Crystal input requirements.



NOTES:
1. C_L = 50 pF ±10%
2. All pulse widths shall be ±5%.
3. The pin designations shown above indicate the stresses to be applied (see waveforms). "NC" indicates no connection.

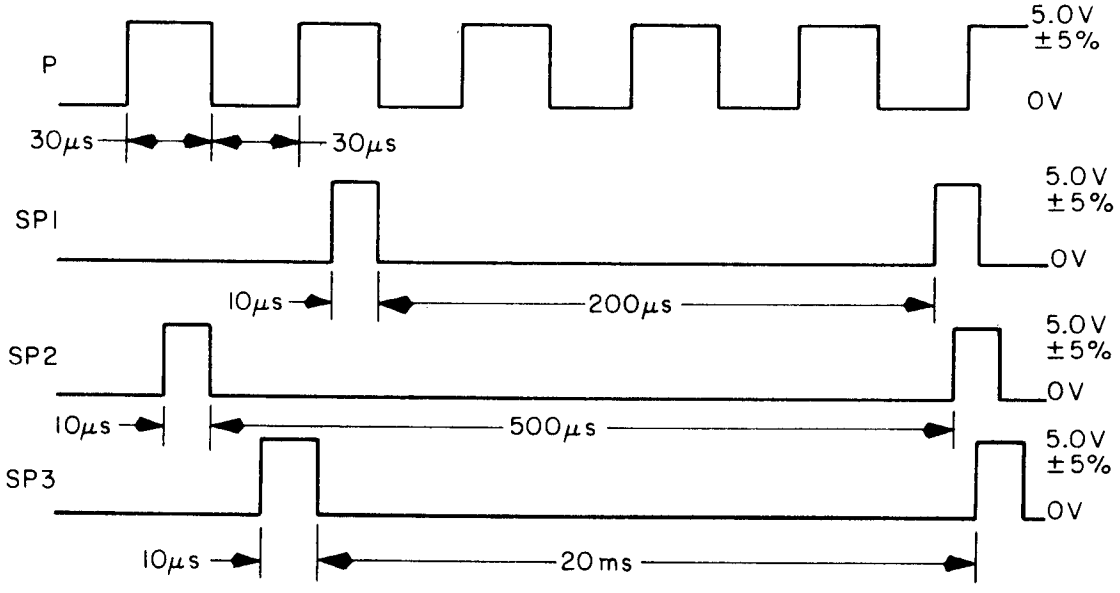
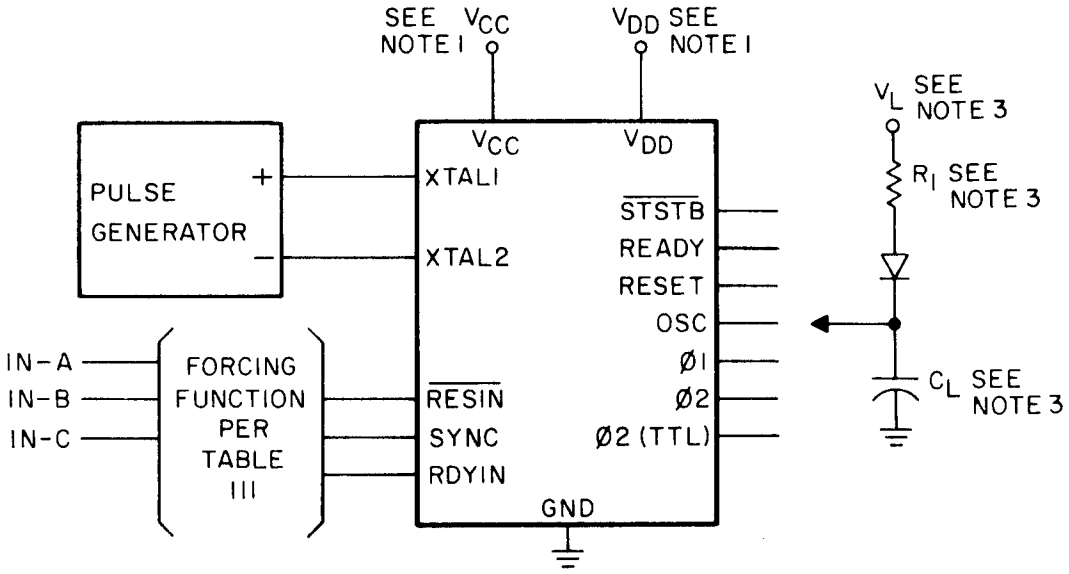


FIGURE 4. Burn-in and steady state life test circuit and input waveforms.

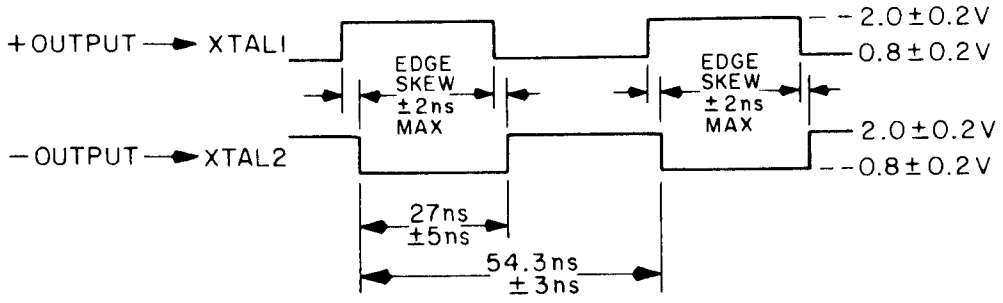


NOTES:
1. V_{CC} = 5.0 V; V_{DD} = 12.0 V
2. D_1 = 1N3064 or equivalent.
3. Loading:

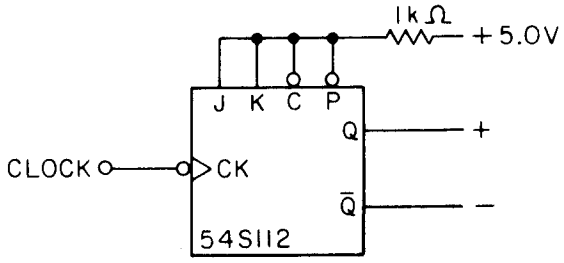
Output	R_1	C_L	V_{LOAD}
$\overline{\text{STSTB}}$, Ready, reset	330Ω ±5%	150 pF ±10%	2.1 V
$Ø_2$ (TTL), OSC	330Ω ±5%	↓	↓
Ø1, Ø2 Open	47Ω ±5%		5.3 V

FIGURE 5. Switching waveforms for device type 01.

4. The XTAL1 and XTAL2 inputs may be driven by either a pulse generator, automatic logic tester or a flip-flop (543112) as shown below. Pulse generator or logic tester waveform characteristics are:



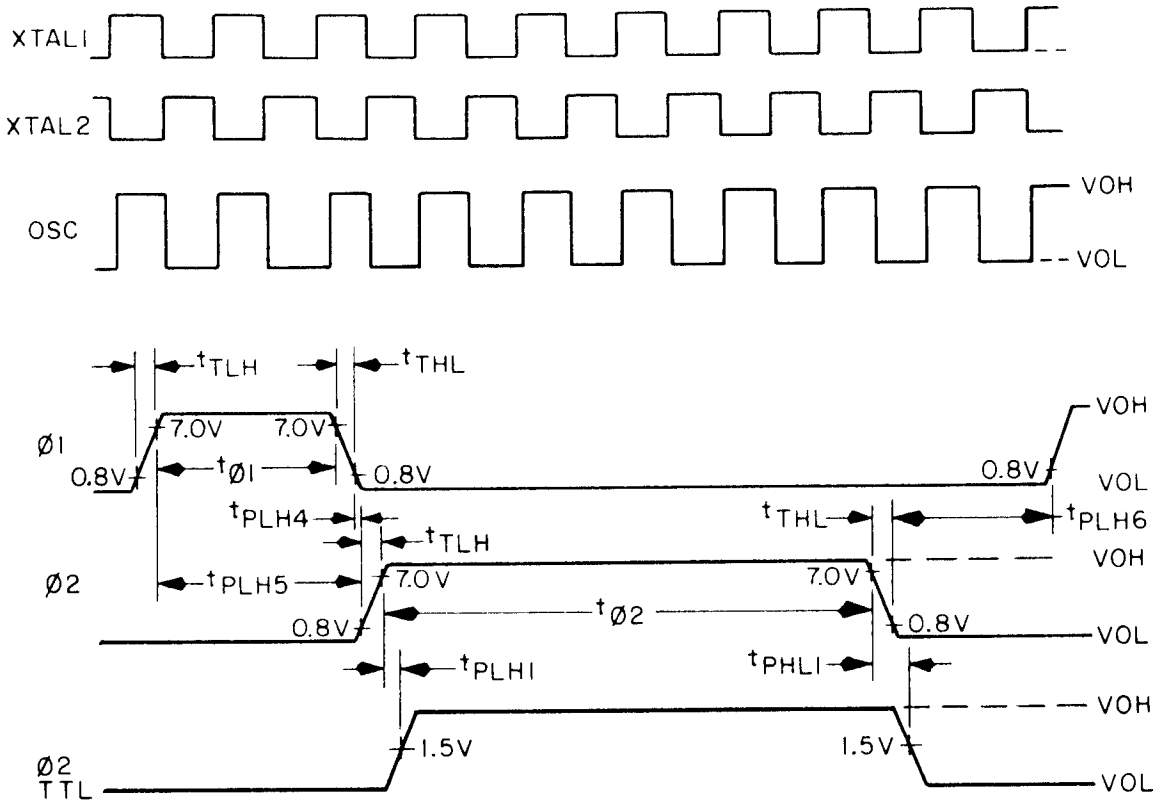
Rise time = fall time = 5 ns max (0.7 V to 2.7 V).
Timing references are at 1.5 V.



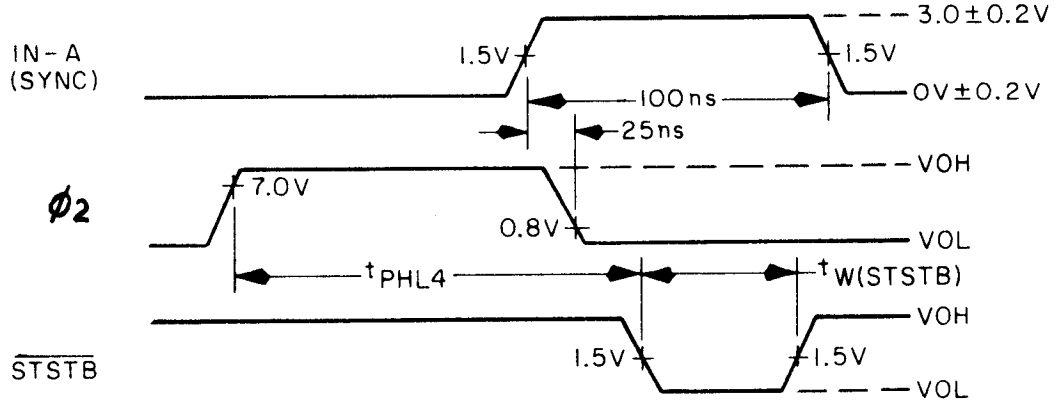
Flip flop input curcuit.

5. IN-A has the following characteristics:
V_{gen} =3.0 V, rise time = fall time = 10 ns
(0.7 V to 2.7 V).
6. IN-B and IN-C have the following characteristics:
V_{gen} = 3.0 V, rise time = fall time = 10 ns (0.7 V to 2.7 V).

FIGURE 5. Switching waveforms for device type 01 - Continued.

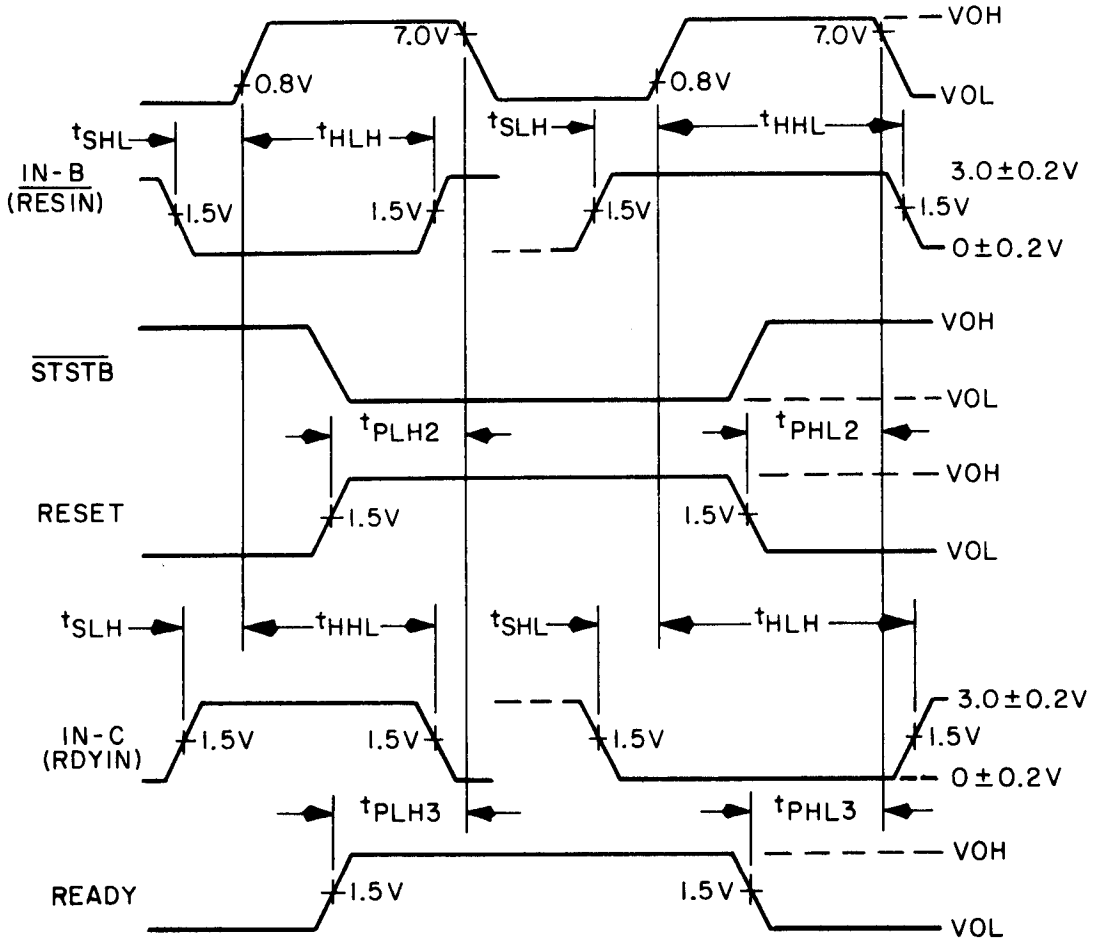


Waveform A



Waveform B

FIGURE 5. Switching waveforms for device type 01 - Continued.



Waveform C

FIGURE 5. Switching waveforms for device type 01 - Continued.

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

Subgroup	Symbol	MIL-STD-883 method	Case E Test no.	1 RESET	2 $\overline{\text{RESIN}}$	3 RDYIN	4 READY	5 SYNC	6 ϕ2 TTL	7 $\overline{\text{STSTB}}$	8 GND	9 V_{DD}	10 ϕ2	11 ϕ1	12 OSC	13 TANK	14 XTAL2	15 XTAL1	16 V_{CC}	Measured terminal	Test limits Min	Max	Unit
1 T_C = 25°C	$\overline{V_{OH}}$ 1/	3006	1	-100 µA	2/						GND	10.8 V					3/	3/	4.5 V	1	3.3		V
			2			4.5 V	-100 µA													4	3.3		
			3						-1 mA											6	2.4		
			4										-100 uA							10	9.0		
			5												-1 mA					12	2.4		
			6		4.5 V					-1 mA										7	2.4		
			7											-100 uA						11	9.0		
	$\overline{V_{OL}}$ 1/	3007	8	2.5 mA	4/															1		0.45	
			9			GND	2.5 mA													4			
			10						10 mA											6			
			11										2.5 mA							10			
			12												10 mA					12			
			13		GND					2.5 mA										7			
			14											2.5 mA						11			
	$\overline{I_{OS}}$ 1/	3011	15	GND	GND							12.0 V							5.0 V	1	-10	-70	mA
			16			4.5 V	GND													4			
			17						GND											6			
			18												GND					12			
			19		4.5 V					GND										7			
	$\overline{I_{CC}}$ 1/	3005	20		4.5 V	GND						13.2 V							5.5 V	16		115	
	$\overline{I_{DD}}$ 1/	3005	21		4.5 V	GND						13.2 V							5.5 V	9		12	

See footnotes at end of table.

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

Subgroup	Symbol	MIL-STD-883 method	Case E Test no.	1 RESET	2 $\overline{\text{RESIN}}$	3 RDYIN	4 READY	5 SYNC	6 ϕ2 TTL	7 $\overline{\text{STSTB}}$	8 GND	9 V_{DD}	10 ϕ2	11 ϕ1	12 OSC	13 TANK	14 XTAL2	15 XTAL1	16 V_{CC}	Measured terminal	Test limits Min	Max	Unit
1 T_C = 25°C	I_{IL}	3009	22		.45 V						GND	13.2 V							5.5 V	2		.25	mA
			23			.45 V														3			
			24					.45 V												5			
	I_{IH}	3010	25		5.5 V															2		10	μA
			26			5.5 V														3			
			27					5.5 V												5			
	V_{IC}		28		-5 mA															2		1.2	V
			29			-5 mA														3			
			30					-5 mA												5			
	C_{IN} 10/		31		2.5 V							12.0 V							5.0 V	2		8	pF
			32			2.5 V														3			
			33					2.5 V												5			
			34													2.5 V				13			
			35														2.5 V			14			
			36															2.5 V		15			
2	Same tests, terminal conditions and limits as subgroup 1 except T_C = 125° 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 footnotes at end of table.

TABLE III. Group A inspection for device type 01 – Continued.
Terminal conditions (pins not designated may be H ≥ 2.0 V, L ≤ 0.7 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Case E Test no.	1 RESET	2 $\overline{\text{RESIN}}$	3 RDYIN	4 READY	5 SYNC	6 ϕ2 TTL	7 $\overline{\text{STSTB}}$	8 GND	9 V_{DD}	10 ϕ2	11 ϕ1	12 OSC	13 TANK	14 XTAL2	15 XTAL1	16 V_{CC}	Measured terminal	Test limits Min	Max	Unit
7 T_C = 25°C	Functional Tests	3014	37	L	B	B	L	B	L	H	GND	12.0 V	L	H	H		B	A	4.5 V	All Outputs	See 5/, 6/, 7/, 8/		
			38	L	B	B	L	B	L	H			L	H	L		A	B					
			39	L	B	B	L	B	L	H			L	H	H		B	A					
			40	L	B	B	L	B	L	H			L	H	L		A	B					
			41	L	B	B	L	B	H	H			H	L	H		B	A					
			42	L	B	B	L	B	H	H			H	L	L		A	B					
			43	H	B	B	L	B	H	L			H	L	H		B	A					
			44	H	B	B	L	B	H	L			H	L	L		A	B					
			45	H	B	B	L	B	H	L			H	L	H		B	A					
			46	H	B	B	L	B	H	L			H	L	L		A	B					
			47	H	B	B	L	B	H	L			H	L	H		B	A					
			48	H	B	B	L	B	H	L			H	L	L		A	B					
			49	H	B	B	L	B	H	L			H	L	H		B	A					
			50	H	B	B	L	B	H	L			H	L	L		A	B					
			51	H	B	B	L	B	L	L			L	L	H		B	A					
			52	H	B	B	L	B	L	L			L	L	L		A	B					
			53	H	B	B	L	A	L	L			L	L	H		B	A					
			54	H	B	B	L	A	L	L			L	L	L		A	B					
			55	H	B	A	L	A	L	L			L	H	H		B	A					
			56	H	B	A	L	A	L	L			L	H	L		A	B					
			57	H	B	A	L	A	L	L			L	H	H		B	A					
			58	H	B	A	L	A	L	L			L	H	L		A	B					
			59	H	B	A	L	A	H	L			H	L	H		B	A					
			60	H	B	A	L	A	H	L			H	L	L		A	B					
			61	H	B	A	H	A	H	L			H	L	H		B	A					
			62	H	B	A	H	A	H	L			H	L	L		A	B					
			63	H	B	A	H	A	H	L			H	L	H		B	A					
			64	H	B	A	H	A	H	L			H	L	L		A	B					
			65	H	A	A	H	A	H	L			H	L	H		B	A					
			66	H	A	A	H	A	H	L			H	L	L		A	B					

See footnotes at end of table.

TABLE III. Group A inspection for device type 01 – Continued.
Terminal conditions (pins not designated may be H ≥ 2.0 V, L ≤ 0.7 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Case E Test no.	1 RESET	2 $\overline{\text{RESIN}}$	3 RDYIN	4 READY	5 SYNC	6 ϕ2 TTL	7 $\overline{\text{STSTB}}$	8 GND	9 V_{DD}	10 ϕ2	11 ϕ1	12 OSC	13 TANK	14 XTAL2	15 XTAL1	16 V_{CC}	Measured terminal	Test limits Min	Max	Unit
7 T_C = 25°C	Functional Tests	3014	67	H	A	A	H	A	H	L	GND	12.0 V	H	L	H		B	A	4.5 V	All Outputs	See 5/, 6/, 7/, 8/		
			68	H	A	A	H	A	H	L			H	L	L		A	B					
			69	H	A	A	H	A	L	L			L	L	H		B	A					
			70	H	A	A	H	A	L	L			L	L	L		A	B					
			71	H	A	A	H	A	L	L			L	L	H		B	A					
			72	H	A	A	H	A	L	L			L	L	L		A	B					
			73	H	A	A	H	A	L	L			L	H	H		B	A					
			74	H	A	A	H	A	L	L			L	H	L		A	B					
			75	H	A	A	H	A	L	L			L	H	H		B	A					
			76	H	A	A	H	A	L	L			L	H	L		A	B					
			77	H	A	A	H	A	H	L			H	L	H		B	A					
			78	H	A	A	H	A	H	L			H	L	L		A	B					
			79	L	A	A	H	A	H	H			H	L	H		B	A					
			80	L	B	B	H	A	H	H			H	L	L		A	B					
			81	L	B	B	H	A	H	H			H	L	H		B	A					
			82	L	B	B	H	A	H	H			H	L	L		A	B					
			83	L	A	A	H	A	H	H			H	L	H		B	A					
			84	L	A	A	H	A	H	H			H	L	L		A	B					
			85	L	A	A	H	A	H	H			H	L	H		B	A					
			86	L	A	B	H	A	H	H			H	L	L		A	B					
			87	L	A	B	H	A	L	H			L	L	H		B	A					
			88	L	A	B	H	A	L	H			L	L	L		A	B					
			89	L	A	B	H	A	L	L			L	L	H		B	A					
			90	L	A	B	H	A	L	L			L	L	L		A	B					
			91	L	A	B	H	A	L	H			L	H	H		B	A					
			92	L	A	B	H	B	L	H			L	H	L		A	B					
			93	L	A	B	H	B	L	H			L	H	H		B	A					
			94	L	A	B	H	B	L	H			L	H	L		A	B					
			95	L	A	B	H	B	H	H			H	L	H		B	A					
			96	L	A	B	H	B	H	H			H	L	L		A	B					

See footnotes at end of table.

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

Subgroup	Symbol	MIL-STD-883 method	Case E Test no.	1 RESET	2 $\overline{\text{RESIN}}$	3 RDYIN	4 READY	5 SYNC	6 ϕ2 TTL	7 $\overline{\text{STSTB}}$	8 GND	9 V_{DD}	10 ϕ2	11 ϕ1	12 OSC	13 TANK	14 XTAL2	15 XTAL1	16 V_{CC}	Measured terminal	Test limits Min	Max	Unit
7 T_C = 25°C	Functional Tests	3014	97	L	A	B	L	B	H	H	GND	12.0 V	H	L	H		B	A	4.5 V	All Outputs	See 5/, 6/, 7/, 8/		
			98	L	A	B	L	B	H	H			H	L	L		A	B					
			99	L	A	B	L	B	H	H			H	L	H		B	A					
			100	L	A	B	L	B	H	H			H	L	L		A	B					
			101	L	A	B	L	B	H	H			H	L	H		B	A					
			102	L	A	B	L	B	H	H			H	L	L		A	B					
			103	L	A	B	L	B	H	H			H	L	H		B	A					
			104	L	B	B	L	B	H	H			H	L	L		A	B					
			105	L	B	B	L	B	L	H			L	L	H		B	A					
			106	L	B	B	L	B	L	H			L	L	L		A	B					
			107	L	B	B	L	B	L	H			L	L	H		B	A					
			108	L	B	B	L	B	L	H			L	L	L		A	B					
			109	L	B	B	L	B	L	H			L	H	H		B	A					
			110	L	B	B	L	B	L	H			L	H	L		A	B					
			111	L	B	B	L	B	L	H			L	H	H		B	A					
			112	L	B	B	L	B	L	H			L	H	L		A	B					
			113	L	B	B	L	B	H	H			H	L	H		B	A					
			114	L	B	B	L	B	H	H			H	L	L		A	B					
			115	H	B	B	L	B	H	L			H	L	H		B	A					
			116	H	A	A	L	B	H	L			H	L	L		A	B					
8	Some tests, terminal conditions and limits as subgroup 7 except T_C = -55°C and T_C = 125°C.																						
9 T_C = 25°C	t_{PHL1}	3003	117						Out		GND	12.0 V					3/	3/	5.0 V	ϕ_{2TTL}	-5	15	ns
	t_{PLH1}		118						Out											ϕ_{2TTL}	-5	15	
	t_{PLH4}		119										Out							ϕ_2	0		
	t_{PLH5}		120										Out							ϕ_2	109	149	
	t_{PLH6}		121											Out						ϕ_1	84		
	t_{PHL2}		122	Out	IN-B			GND												Reset	192		
	t_{PLH2}		123	Out	IN-B			GND												Reset	192		
	t_{PLH3}		124			IN-C	Out													Ready	192		
	t_{PHL3}		125			IN-C	Out													Ready	192		
	t_{TLH}		126											OUT						ϕ1		25	

See footnotes at end of table.

TABLE III. Group A inspection for device type 01 – Continued.
Terminal conditions (pins not designated may be H ≥ 2.0 V, L ≤ 0.7 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Case E Test no.	1 RESET	2 $\overline{\text{RESIN}}$	3 RDYIN	4 READY	5 SYNC	6 ϕ2 TTL	7 $\overline{\text{STSTB}}$	8 GND	9 V_{DD}	10 ϕ2	11 ϕ1	12 OSC	13 TANK	14 XTAL2	15 XTAL1	16 V_{CC}	Measured terminal	Test limits Min	Max	Unit
9 T_C = 25°C	t_{TLH}	3003	127								GND	12.0 V	Out				3/	3/	5.0 V	ϕ_2		25	ns
	t_{THL}		128											Out						ϕ_1			
	t_{THL}		129										Out							ϕ_2			
	$t\phi_1$		130											Out						ϕ_1	89		
	$t\phi_2$		131										Out							ϕ_2	226		
	t_{PHL4}		132					IN-A		Out										$\overline{\text{STSTB}}$	296	326	
	$t_{W(STSTB)}$		133					IN-A		Out										$\overline{\text{STSTB}}$	31		
	10/ F_{OSC}		134											Out			9/	9/		ϕ_1	421	470	
	10/ F_{OSC}		135											Out			9/	9/		ϕ_1	85	135	
	t_{SHL}		136		INB1												3/	3/		$\overline{\text{STSTB}}$	-167		
	t_{HHL}		137		INB2												3/	3/		$\overline{\text{STSTB}}$	217		
10 T_C = 125°C	t_{PHL}		138	Same tests and terminal conditions as for subgroup 9, except F_{OSC} is omitted.																			
	t_{PLH1}		139																				
	t_{PLH4}		140																				
	t_{PLH5}		141																				
	t_{PLH6}		142																				
	t_{PHL2}		143																				
	t_{PLH2}		144																				
	t_{PLH3}		145																				
	t_{PHL3}		146																				
	t_{TLH}		147																				
	t_{TLH}		148																				
	t_{THL}		149																				
	t_{THL}		150																				
	$t\phi_1$		151																				
	$t\phi_2$		152																				
	t_{PHL4}		153																				
	$t_{W(STSTB)}$		154																				
	t_{SHL}		155																				
	t_{HHL}		156																				

See footnotes at end of table.

TABLE III. Group A inspection for device type 01 – Continued.
Terminal conditions (pins not designated may be H ≥ 2.0 V, L ≤ 0.7 V, or open)

Subgroup	Symbol	MIL-STD-883 method	Case E Test no.	1 RESET	2 $\overline{\text{RESIN}}$	3 RDYIN	4 READY	5 SYNC	6 ϕ2 TTL	7 $\overline{\text{STSTB}}$	8 GND	9 V_{DD}	10 ϕ2	11 ϕ1	12 OSC	13 TANK	14 XTAL2	15 XTAL1	16 V_{CC}	Measured terminal	Test limits Min	Max	Unit
11	Same tests, terminal conditions and limits as for subgroup 10 except Tc = −55°C.																						
12 T_C = 25°C T_C = 125°C	t_{PHL1}	3003	157	Same tests and terminal conditions as for subgroup 10.																			
	t_{PLH1}																						
	t_{PLH4}		158																				
	t_{PLH5}		159																				
	t_{PLH6}		160																				
	t_{PHL2}		161																				
	t_{PLH2}																						
	t_{PLH3}																						
	t_{PHL3}																						
	t_{TLH}		162																				
	t_{TLH}																						
	t_{THL}		163																				
	t_{THL}																						
	$t_{\phi 1}$		164																				
	$t_{\phi 2}$		165																				
	t_{PHL4}		166																				
	$t_{w(STSTB)}$		167																				
	t_{SHL}		168																				
	t_{HHL}		169																				

See footnotes at end of table.

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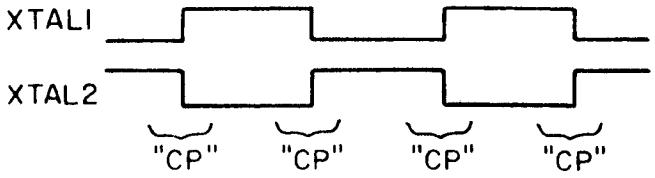
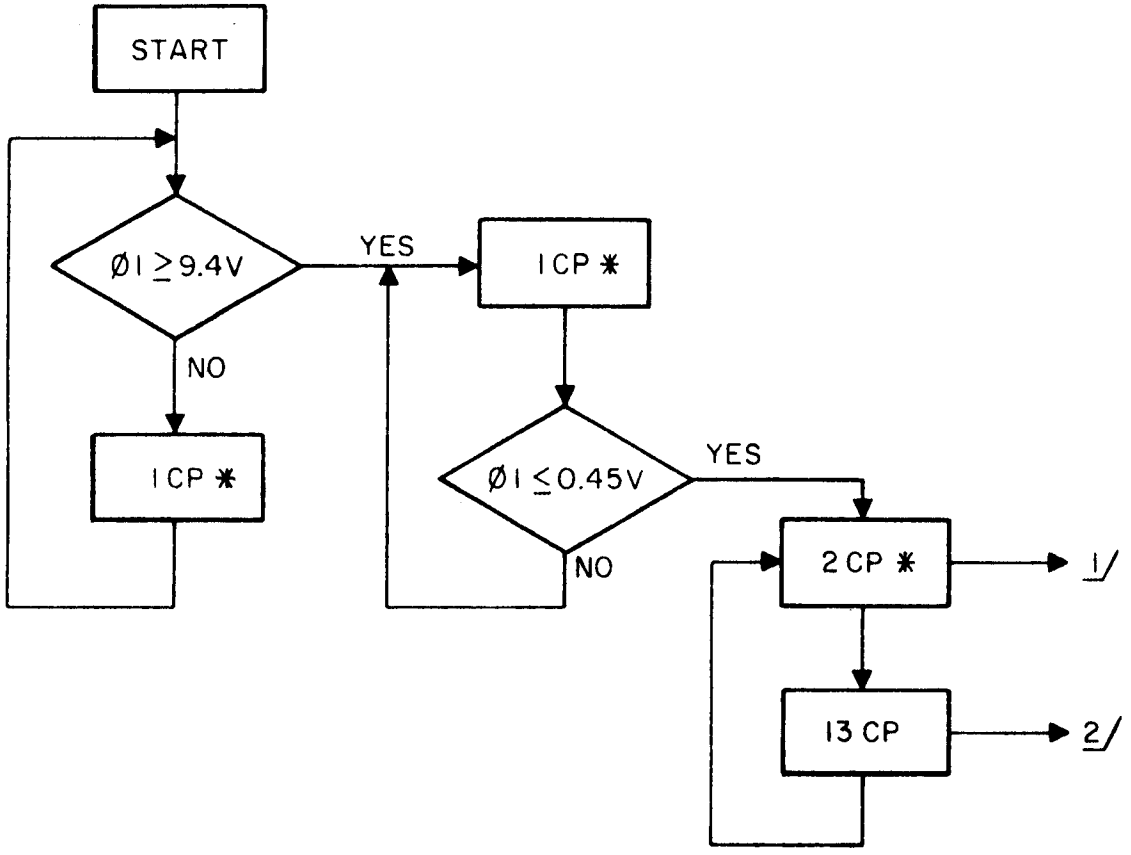
NOTES:

1/ Prior to measuring output parameters, the device under test must be initialized according to the following flow diagram. Terminal conditions must be applied prior to initialization. Clock pulse "CP" is a level change as defined in Figure 5, note 5 and by the waveforms below:



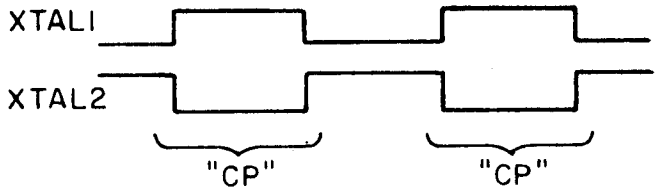


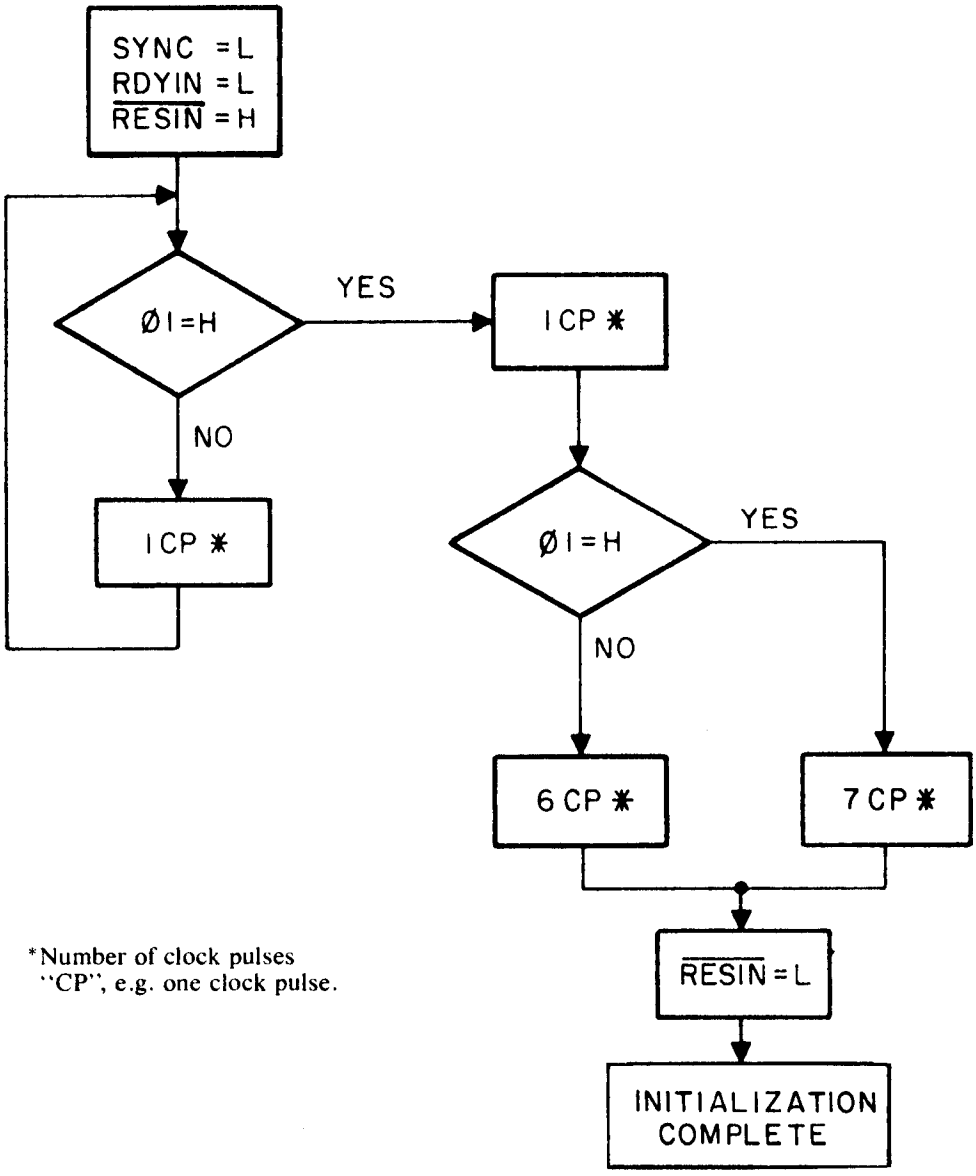
* Number of clock pulses "CP", e.g. one clock pulse.

2/ 0.8 V, then V_{T+} min.
3/ XTAL1 and XTAL2 inputs are defined by figure 5, note 5.

4/ 2.6 V, then V_{T-} max.

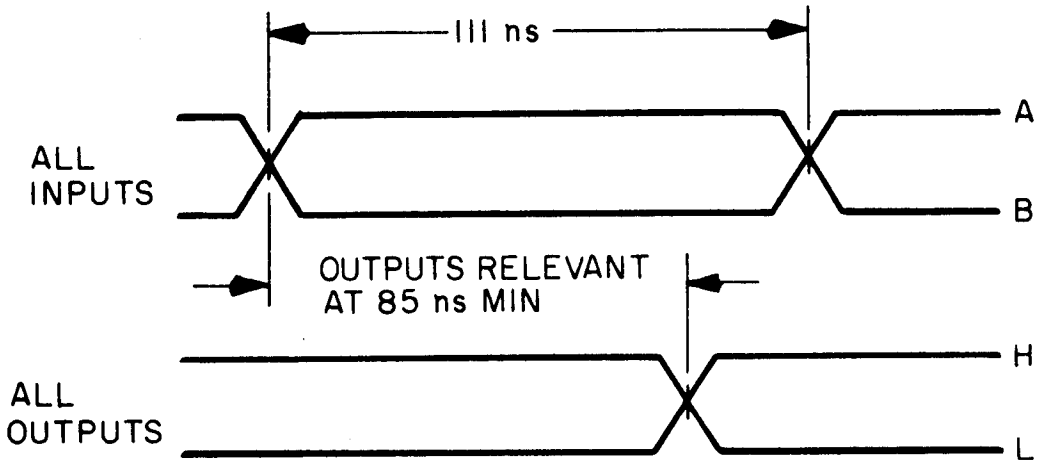
5/ Prior to performing truth table tests, the device under test must be initialized according to the following flow diagram. Clock pulse "CP" is a single pulse as defined in table III, note 6 and by the waveforms below:





*Number of clock pulses "CP", e.g. one clock pulse.

6/ Functional test timing waveforms:



7/ Input voltages are: A ≥ 2.0 V, B ≤ 0.8 V except $\overline{\text{RESIN}}$: A ≥ 2.6 V; B ≤ 0.8 V

The measurement terminal is all outputs. Output voltages are defined in the following table:

Outputs	L	H
ϕ 1, ϕ 2	≤ 0.45 V	≥ 9.0 V
Ready, Reset	≤ 0.45 V	≥ 3.3 V
All other outputs	≤ 0.45 V	≥ 2.4 V

8/ Test numbers 37 through 116 shall be run in sequence.

9/ Tests shall be performed with fundamental mode crystals as specified in figure 3. Crystal frequencies shall be:
Test No. 128 – 4.5 MHz
Test No. 129 – 18.432 MHz

10/ These tests shall be performed for initial qualification only and shall only apply to subgroup one for C_{IN} or subgroup 9 for F_{OSC} (see 4.4.1).

4.3 Qualification inspection. Qualification inspection is not required.

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). Generic test data (see 6.6) may be used to satisfy the requirements for groups C and D inspections. Quality conformance inspection shall be completed on the specific devices covered by this specification before they are shipped.

4.4.1 Group A inspection. Group A inspection shall be in accordance with table I of method 5005 of MIL-STD-883 and as follows:

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

b. Subgroups 4, 5, and 6 of table I of method 5005 of MIL-STD-883 shall be omitted.

c. The C_{IN} measurement under subgroup 1 shall be performed after process or design changes which may affect design capacitance.

d. The read and record measurements under subgroups 1, 2, and 12 only shall be performed after process or design changes which may affect oscillator design characteristics.

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of method 5005 of MIL-STD-883. Electrical paramters shall be as specified in table II herein.

4.4.3 Group C inspection. Group C inspection shall be in accordance with table III of method 5005 of MIL-STD-883 and as follows:

a. End-point electrical test 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.

c. Steady-state life test (method 1005 of MIL-STD-883) conditions:

(1) Test condition D or E, using the circuit shown on figure 4, or equivalent.

(2) T_A = +125°C minimum.

(3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510.

4.4.4 Group D inspection. Group D inspection shall be in accordance with table IV of method 5005 of MIL-STD-883. End-point electrical parameters shall be as specified in table II herein.

4.5 Methods of inspection. Methods of inspection shall be specified 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.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging of microcircuits shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Notes. The notes specified in MIL-M-38510 are applicable to this specification.

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

6.3 Ordering data. The acquisition document should specify the following:

a. Complete part number (see 1.2).

b. 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.

c. Requirements for certificate of compliance, if applicable.

d. Requirements for notification of change of product or process to the contracting activity, if applicable.

e. Requirements for packaging and packing.

f. Requirements for special carriers, lead lengths, or lead forming, if applicable. These requirements shall not affect the part number. Unless otherwise specified, these requirements shall not apply to direct purchase by or direct shipment to the Government.

6.4 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-M-38510, MIL-STD-1331, and as follows:

GND - - - - - - - - - - - - - - - - - Electrical ground (common terminal)
V_{IN} - - - - - - - - - - - - - - - - - Voltage level at an input terminal

6.5 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) and lead material and finish C (see 3.3). Longer length leads and lead forming shall not affect the part number.

6.6 Generic test data. Generic test data may be used to satisfy the requirements of 4.4.3. Group C generic test data shall be on date codes no more than one year old and on a die in the same microcircuit group (see appendix E of MIL-M-38510) with the same material, design and process and from the same plant as the die represented. Group D (see 4.4.4) generic data shall be on date codes no more than one year old and on the same package type (see terms, definitions, and symbols of MIL-M-38510) and from the same plant as the package represented. The vendor is required to retain the generic data for a period of not less than 36 months from the date of shipment.

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 shall 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-M-38510.

Military device type	Generic-industry type
01	8224

6.8 Ordering guidance. Since the qualification and certification requirements have been removed from the specification, orders may be placed immediately.

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 - ER
Navy - EC
Air Force - 17

Review activities:
Army - AR, MI
Air Force - 11, 19, 85, 99
Navy - OS, SH
DLA - ES

User activities:
Army - SM
Navy - AS, CG, MC

Agent:
DLA - ES

Preparing activity:
Air Force - 17

(Project 5962-0603-5)