QUALIFICATION
REQUIREMENTS
REMOVED

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, CMOS, MONOLITHIC N-BIT ONE OF EIGHT DECODER

INACTIVE FOR NEW DESIGN AFTER DATE OF THIS REVISION

This specification is approved for use by the George C. Marshall Space Flight Center, National Aeronautics and Space Administration, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for a monolithic silicon, silicon gate CMOS microcircuit. 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 as specified in MIL-M-38510, except that "JAN" or "J" certification shall not be used.

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

Device type	Circuit
01	N-bit one of eight decoder

1.2.2 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
F	F-5 (16-lead, 1/4" x 3/8"), flat package

1.3 Absolute maximum ratings.

Storage-temperature range (T_{stg})	-65°C to +150°C
Case operating temperature range (T_C)	-55°C to +125°C
Supply voltage range (V_{DD} - V_{SS})	-0.5 V to +13 V
Power dissipation per package (P_D)	
For T_C = -55°C to +100°C	500 mW
For T_C = +100°C to 125°C	Derate linearly at 12 mW/°C to 200 mW
Device dissipation per output transistor	
For T_C = -55°C to +125°C	100 mW
Input voltage range (all inputs)	-0.5 V to V_{DD} +0.5 V
DC input current (any one input)	+10 mA
Lead temperature (during soldering)	
At distance 1/16 +1/32 inch (1.59 +0.79 mm) from case for 10 s maximum	+265°C
Maximum junction temperature (T_J)	+150°C
Thermal resistance, junction to case (Θ_{JC})	
Case E	0.0833°C/mW
Case F	.15°C/mW

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: George C. Marshall Space Flight Center, National Aeronautics and Space Administration (ATTN: EG02), Marshall Space Flight Center, AL 35812 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. (At T_C = -55°C to +125°C.)

Supply voltage range (V_{DD} - V_{SS})	4 to 11 V
Input low voltage range (V_{IL})	0 to 1.5 V at V_{DD} = 5 V 0 to 3 V at V_{DD} = 10 V
Input high voltage range (V_{IH})	3.5 V to 5 V at V_{DD} = 5 V 7 V to 10 V at V_{DD} = 10 V

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.

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

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

3.2.3 Functional diagram. The functional description shall be as specified in the truth table and timing diagram on figure 3.

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

3.3 Lead material and finish. Lead material and finish shall be in accordance with MIL-M-38510.

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. 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. At the option of the manufacturer, 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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ V_{SS} = 0 V, $-55°C \leq T_A \leq 125°C$, Unless otherwise specified	Device type	Limits		Unit
				Min	Max	
Positive clamping input to V_{DD}	$V_{IC(pos)}$	T_A = 25°C, V_{DD} = 0 V, V_{SS} Open, Outputs Open, I_I = 1 mA	01		1.5	V
Negative clamping input to V_{SS}	$V_{IC(neg)}$	T_A = 25°C, V_{DD} Open, V_{SS} = 0 V, Outputs Open, I_I = -1 mA	01		-1.5	V
Quiescent supply current	I_{SS}	V_{DD} = 13 V, any combination of inputs	01		-10	A
High level output voltage	V_{OH1}	V_{DD} = 10 V, I_{OH} 1 A (see table III for V_I)	01	9.95		
Low level output voltage	V_{OL1}	V_{DD} = 10 V, I_{OL} 1 A (see table III for V_I)	01		0.05	V
Output high (source) current	I_{OH1}	V_{DD} = 5 V, V_{OH1} = 4.6 V	01	-1.5		mA
	I_{OH2}	V_{DD} = 10 V, V_{OH2} = 9.5 V	01	-3.0		
Output low (sink) current	I_{OL1}	V_{DD} = 5 V, V_{OL1} = 0.4 V	01	2.0		mA
	I_{OL2}	V_{CC} = 10 V, V_{OL2} = 0.5 V	01	5.0		
Input leakage current (any input)	I_{IH}	V_{DD} = 13 V, V_I = 13 V	01		100	nA
	I_{IL}	V_{DD} = 13 V, V_I = 0 V	01		-100	
Propagation delay (CE to output)	t_{PLH1} t_{PHL1}	V_{DD} = 5 V, C_L = 50 pF, R_L = 200 k	01	34	256	ns
	t_{PLH4} t_{PHL4}	V_{DD} = 10 V, C_L = 50 pF, R_L = 200 k	01	16	114	
Propagation delay (NO, 1,2, to output)	t_{PLH2}	V_{DD} = 5 V, C_L = 50 pF, R_L = 200 k	01	40	296	ns
	t_{PLH5}	V_{DD} = 10 V, C_L = 50 pF, R_L = 200 k	01	18	138	
Propagation delay (NO, 1,2, to output)	t_{PHL2}	V_{DD} = 5 V, C_L = 50 pF, R_L = 200 k	01	25	176	ns
	t_{PHL5}	V_{DD} = 10 V, C_L = 50 pF, R_L = 200 k	01	12	80	
Propagation delay (CLK A to output)	t_{PLH3} t_{PHL3}	V_{DD} = 5 V, C_L = 50 pF, R_L = 200 k	01	36	268	ns
Propagation delay (CLK B to output)	t_{PLH6} t_{PHL6}	V_{DD} = 10 V, C_L = 50 pF, R_L = 200 k	01	16	120	
Transition time	t_{TLH1} t_{THL1}	V_{DD} = 5 V, C_L = 50 pF, R_L = 200 k	01		60	ns
	t_{TLH2} t_{THL2}	V_{DD} = 10 V, C_L = 50 pF, R_L = 200 k	01		33	

TABLE II. Electrical test requirements

MIL-STD-883 method	MIL-STD-883 test requirement	Subgroups (see table III unless otherwise specified)
		Class B devices
5004	Interim electrical parameters (pre burn-in)	1
	Interim electrical parameters (between state burn-in and dynamic burn-in)	Not applicable
	Final electrical test parameters	1*, 2, 7*, 8
5005	Group A electrical tests	1, 2, 7, 8, 9
	Group B electrical tests	None
	V_{ZAP}	See 4.5.3
	Group C end-point electrical parameters	1, 2, 7, 8
	Additional electrical subgroups for group C periodic inspection	10
	Group D end-point electrical parameters	1, 2, 7, 8

* PDA applies to subgroups 1 and 7 (see 4.2b).

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 of MIL-STD-883, as applicable, 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 modifications and additional criteria shall apply:

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

(1) The burn-in test as described in 3.1.10 of method 5004 shall be performed as indicated. (3.1.11 and 3.1.12 are not required; 3.1.9 is required for class B devices.)

(2) For class B devices, the circuit shown on figure 4 shall be used.

b. The percent defective allowable (PDA) is specified as 10 percent for class B devices based on failures from group A, subgroups 1 and 7 (after cooldown) of 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, subgroups 1 and 7 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. The lot shall be accepted or rejected based on the PDA for the applicable device class.

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

4.3 Qualification inspection. Qualification inspection 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 consist of the test subgroups and LTPD values shown in table I of method 5005 of MIL-STD-883 and as follows:

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

b. Subgroups 5 and 6 shall be omitted.

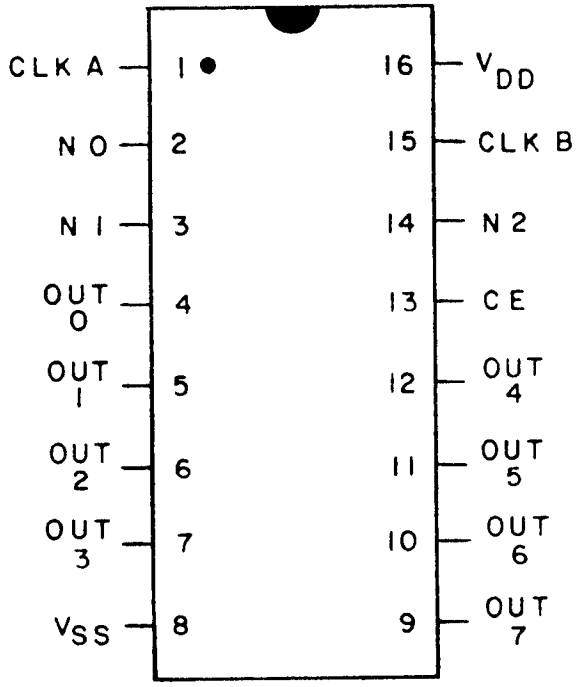


FIGURE 1. Terminal connections.

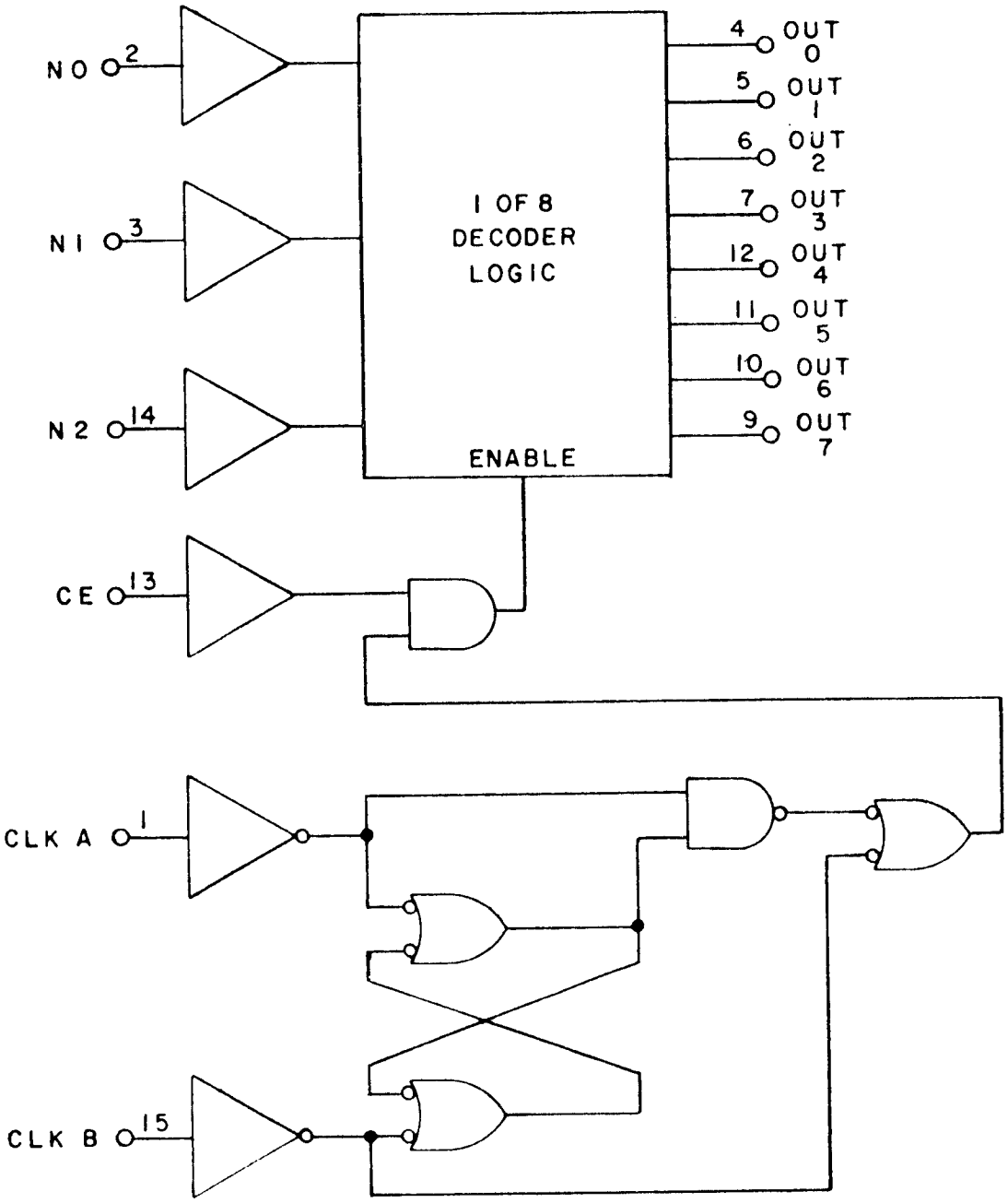


FIGURE 2. Logic diagram.

CE	CLK A	CLK B	EN
1	0	0	#
1	0	1	1
1	1	0	0
1	1	1	1
0	X	X	0

1 = High level
0 = Low level
X = Don't care
EN = Internal enable signal - see timing diagram below and figure 2.
# = Dependent on previous state - see timing diagram below

N2	N1	N0	EN	Outputs							
				OUT 0	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6	OUT 7
0	0	0	1	1	0	0	0	0	0	0	0
0	0	1	1	0	1	0	0	0	0	0	0
0	1	0	1	0	0	1	0	0	0	0	0
0	1	1	1	0	0	0	1	0	0	0	0
1	0	0	1	0	0	0	0	1	0	0	0
1	0	1	1	0	0	0	0	0	1	0	0
1	1	0	1	0	0	0	0	0	0	1	0
1	1	1	1	0	0	0	0	0	0	0	1
X	X	X	0	0	0	0	0	0	0	0	0

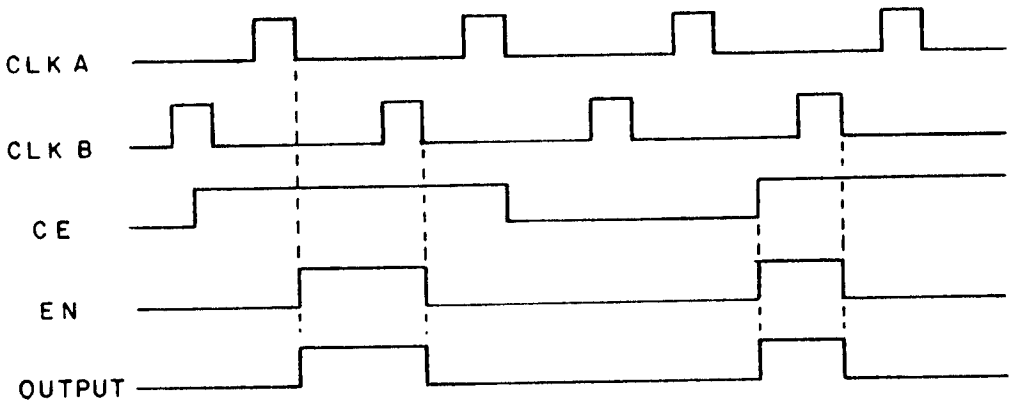
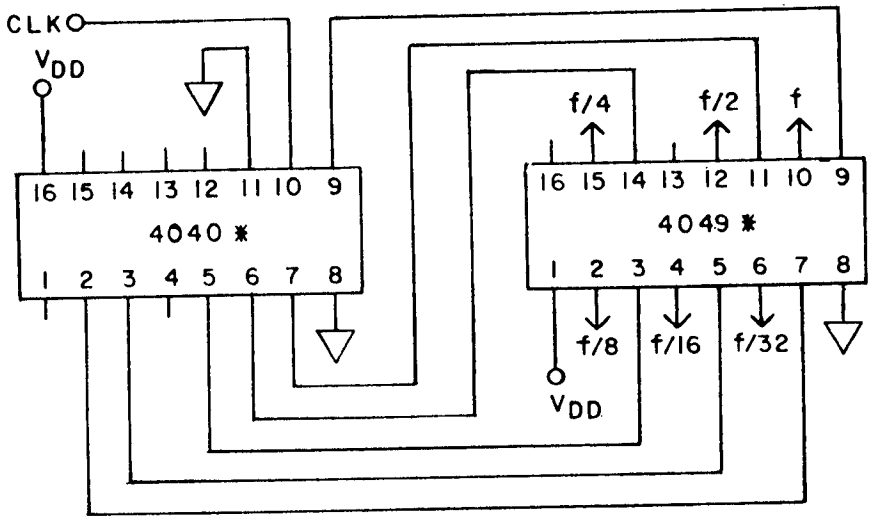
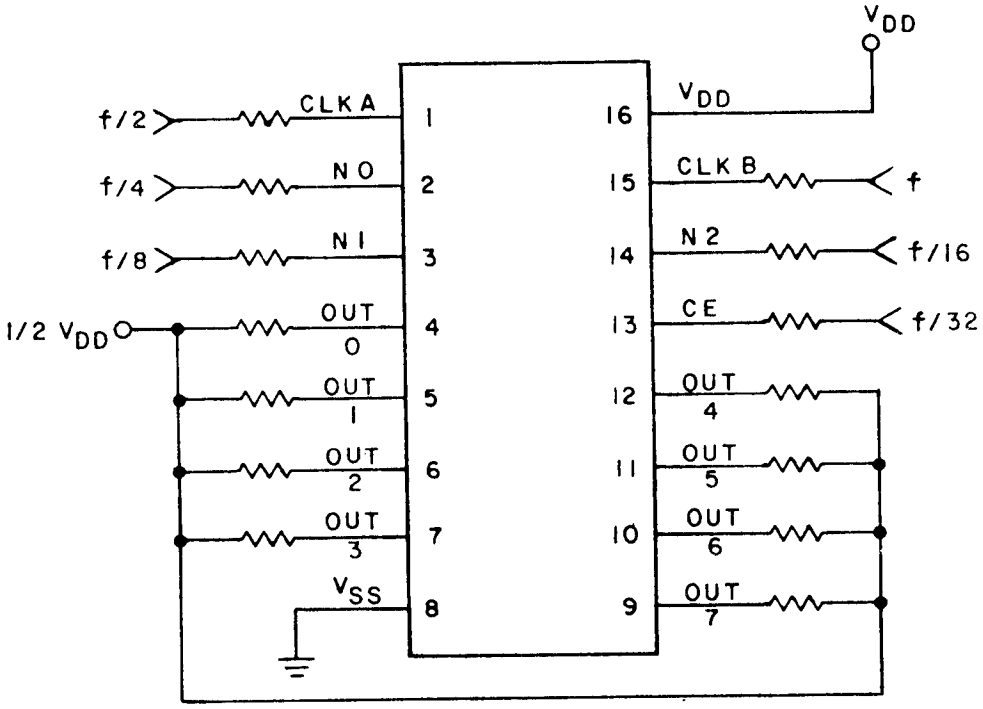


FIGURE 3. Truth table and timing diagram.



* OR EQUIVALENT CIRCUIT



NOTES:
1. All resistors shall be 47 kΩ ±5%.
2. CLOCK: 50 kHz square wave, amplitude = V_{DD}.
3. V_{DD} = 13 V.

FIGURE 4. Dynamic burn-in and steady state life test circuit.

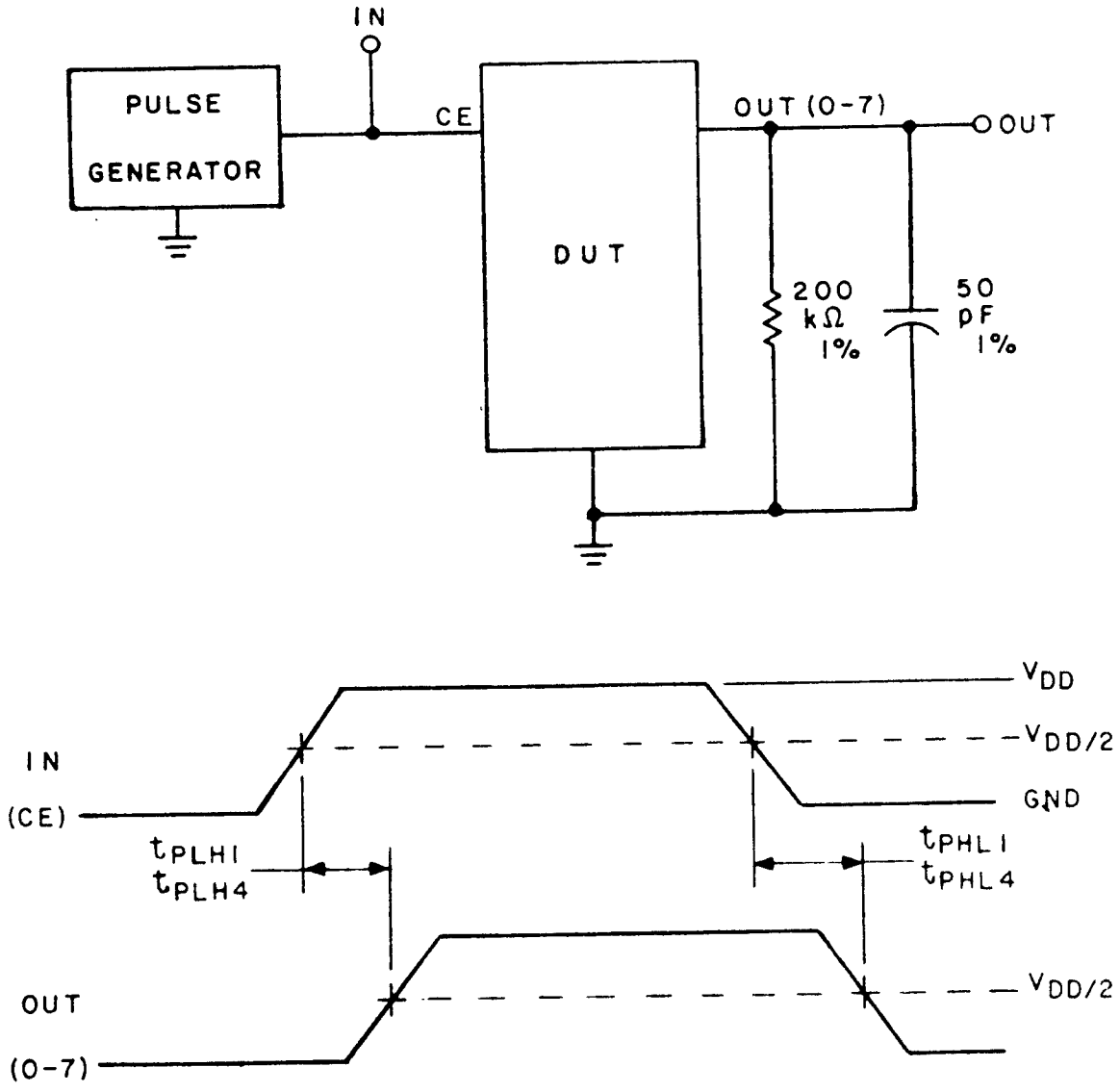


FIGURE 5a. Chip enable switching time test circuit and waveforms.

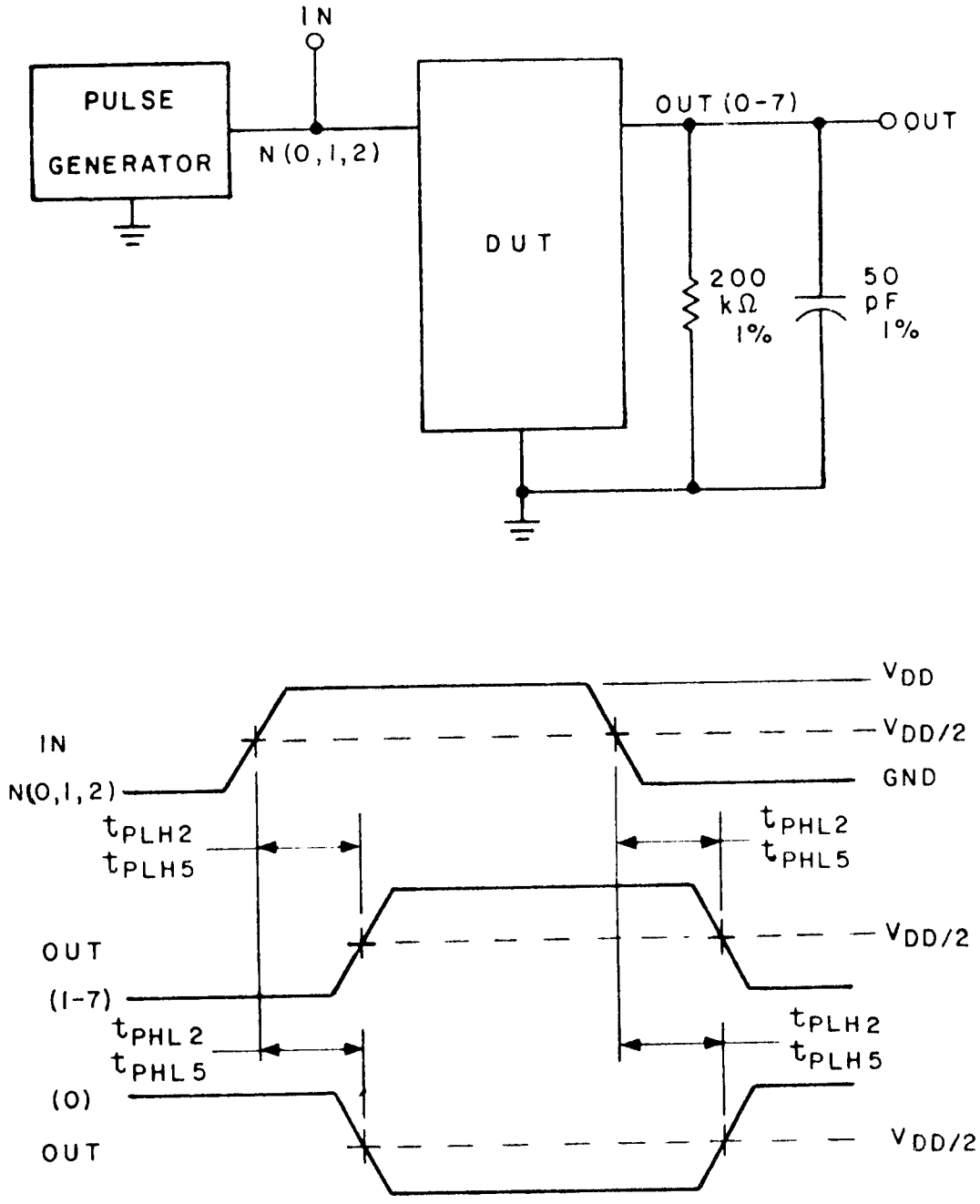
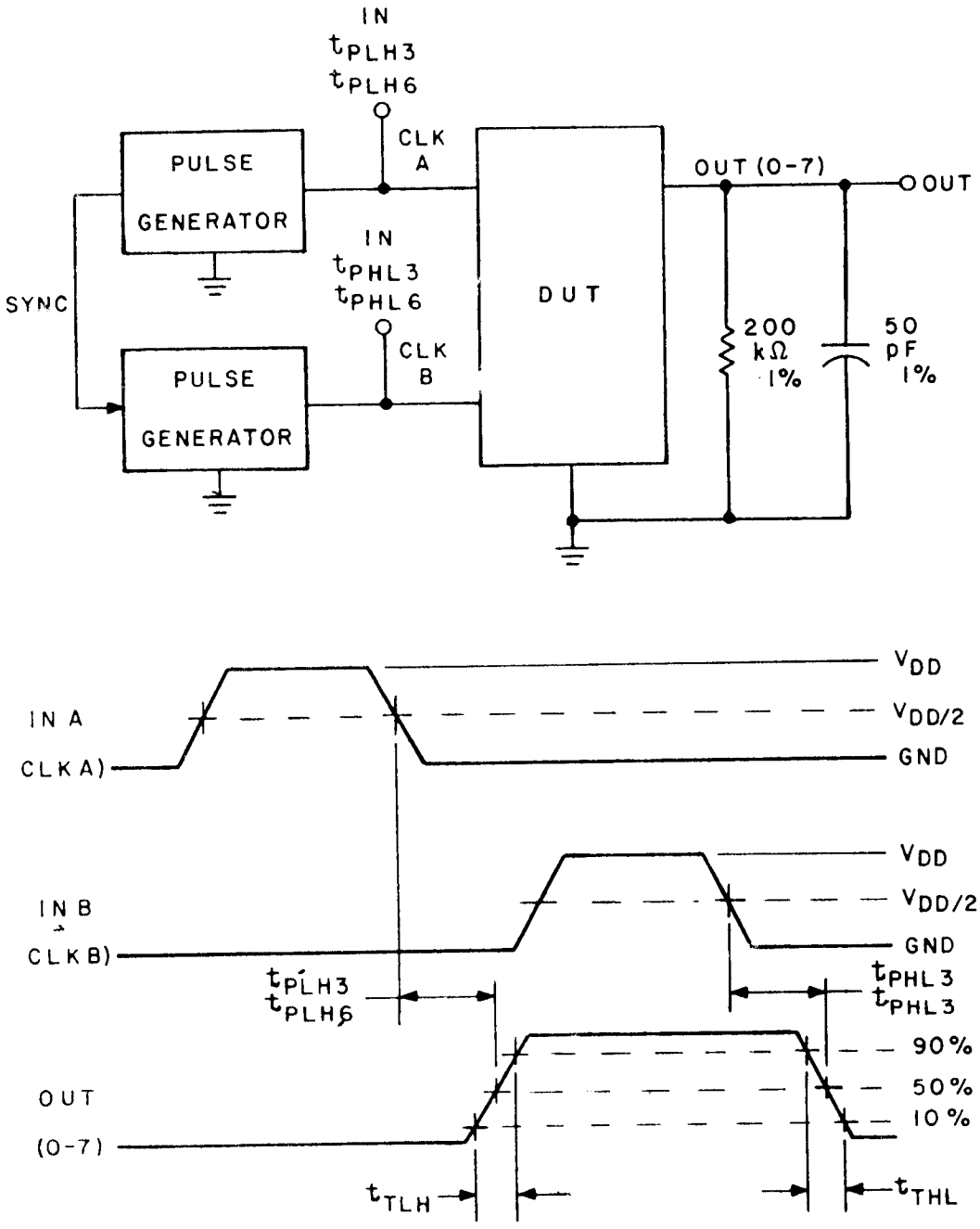


FIGURE 5b. Input (N) to output switching time test circuit and waveform.



NOTES FOR FIGURES 7a - 7c:
1. Pulse generator output: amplitude = V_{DD}, t_{TLH} and t_{THL} = 10 ±2 ns.
2. See table III for complete terminal connections.
3. Load capacitance includes wiring and probe capacitance.

FIGURE 5c. Clock A and clock B to output switching time test circuit and waveform.

TABLE III. Group A inspection for device type 01.

Symbol	MIL-STD-883 method	Cases E,F	Terminal conditions 1/																Measured terminal	Test limits						Unit
			CLK A	NO	N1	OUT 0	OUT 1	OUT 2	OUT 3	V_{SS}	OUT 7	OUT 6	OUT 5	OUT 4	CE	N2	CLK B	V_{DD}		Subgroup 1 T_A=25°C		Subgroup 2 T_A=125°C		Subgroup 3 T_A=-55°C		
		Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		Min	Max	Min	Max	Min	Max	
V_{IC} (pos)		1	1 mA															GND	CLK A		1.5					V
		2		1 mA															NO							
		3			1 mA														N1							
		4													1 mA				CE							
		5														1 mA			N2							
		6															1 mA		CLK B							
V_{IC} (neg)		7	-1 mA							GND									CLK A		-1.5					
		8		-1 mA															NO							
		9			-1 mA														N1							
		10													-1 mA				CE							
		11														-1 mA			N2							
		12															-1 mA		CLK B							
I_{SS} 2/	3005	13	13 V	GND	GND										13.0 V	GND	13.0 V	13.0 V	V_{SS}		-.5		-10		-.5	μA
		14		13.0 V	GND																					
		15		GND	13.0 V																					
		16		13.0 V	13.0 V																					
		17		GND	GND											13.0 V										
		18		13.0 V	GND																					
		19		GND	13.0 V												GND									
		20	GND	GND													GND									
		21		13.0 V													13.0 V									
		22		13.0 V											GND		13.0 V									
I_{OH1}	3006	23	V_{DD}	GND	GND	4.6 V									V_{DD}	GND	V_{DD}	5.0 V	OUT 0	-2		-1.5		-2.5		mA
		24		V_{DD}	GND		4.6 V												OUT 1							
		25		GND	V_{DD}			4.6 V											OUT 2							
		26		V_{DD}	V_{DD}				4.6 V										OUT 3							
		27		GND	GND									4.6 V		V_{DD}			OUT 4							
		28		V_{DD}	GND								4.6 V						OUT 5							
		29		GND	V_{DD}							4.6 V							OUT 6							
		30		V_{DD}	V_{DD}						4.6 V								OUT 7							
I_{OH2}		31		GND	GND	9.5 V										GND		10.0 V	OUT 0	-4.0		-3.0		-5.0		
		32		V_{DD}	GND		9.5 V												OUT 1							
		33		GND	V_{DD}			9.5 V											OUT 2							
		34		V_{DD}	V_{DD}				9.5 V										OUT 3							
		35		GND	GND									9.5 V		V_{DD}			OUT 4							
		36		V_{DD}	GND								9.5 V						OUT 5							
		37		GND	V_{DD}							9.5 V							OUT 6							
		38		V_{DD}	V_{DD}						9.5 V								OUT 7							
V_{OH1}		39	10 V	GND	GND										10.0 V	GND	10.0 V		OUT 0	9.95		9.95		9.95		V
		40		10.0 V	GND														OUT 1							
		41		GND	10.0 V														OUT 2							
		42		10.0 V	10.0 V														OUT 3							
		43		GND	GND											10.0 V			OUT 4							
		44		10.0 V	GND														OUT 5							
		45		GND	10.0 V														OUT 6							
		46		10.0 V	10.0 V														OUT 7							
I_{OL1}	3007	47				0.4 V									GND			5.0 V	OUT 0	3.0		2.0		4.0		mA
		48					0.4 V												OUT 1							
		49						0.4 V											OUT 2							
		50							0.4 V										OUT 3							
		51												0.4 V					OUT 4							
		52											0.4 V						OUT 5							
		53										0.4 V							OUT 6							
		54									0.4 V								OUT 7							

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

Symbol	MIL-STD-883 method	Cases E,F	Terminal conditions 1/																Measured terminal	Test limits						Unit
			CLK A	NO	N1	OUT 0	OUT 1	OUT 2	OUT 3	V_{SS}	OUT 7	OUT 6	OUT 5	OUT 4	CE	N2	CLK B	V_{DD}		Subgroup 1 T_A=25°C		Subgroup 2 T_A=125°C		Subgroup 3 T_A=-55°C		
		Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		Min	Max	Min	Max	Min	Max	
I_{OL2}	3007	55				0.5 V				GND					GND			10.0 V	OUT 0	6.0		7.0		5.0		mA
		56					0.5 V												OUT 1							
		57						0.5 V											OUT 2							
		58							0.5 V										OUT 3							
		59												0.5 V					OUT 4							
		60											0.5 V						OUT 5							
		61										0.5 V							OUT 6							
		62									0.5 V								OUT 7							
V_{OL1}		63	10.0 V	GND	GND											GND	10.0 V		OUT 0	.05		.05		.05		V
		64		10.0 V	GND														OUT 1							
		65		GND	10.0 V														OUT 2							
		66		10.0 V	10.0 V														OUT 3							
		67		GND	GND											10.0 V			OUT 4							
		68		10.0 V	GND														OUT 5							
		69		GND	10.0 V														OUT 6							
		70		10.0 V	10.0 V														OUT 7							
I_{IH} 2/	3010	71	13.0 V	GND	GND											GND	GND	13.0 V	CLK A		10		100		20	nA
		72	GND	13.0 V	GND														NO							
		73		GND	13.0 V														N1							
		74			GND										13.0 V				CE							
		75													GND	13.0 V			N2							
		76													GND	GND	13.0 V		CLK B							
I_{IL} 2/	3009	77		13.0 V	13.0 V										13.0 V	13.0 V			CLK A		-10		-100		-20	
		78	13.0 V	GND	13.0 V														NO							
		79		13.0 V	GND														N1							
		80			13.0 V										GND				CE							
		81													13.0 V	GND			N2							
		82													13.0 V	13.0 V	GND		CLK B							

																				Subgroup 7 T_A = 25°C		Subgroup 8 T_A = 125°C		T_A = -55°C		
																				Min	Max	Min	Max	Min	Max	
Functional tests	3014	83	3/	3/	3/	3/	3/	3/	3/	GND	3/	3/	3/	3/	3/	3/	3/	4.0 V	All outputs	3/	3/	3/	3/	3/	3/	3/
	3014	84	3/	3/	3/	3/	3/	3/	3/	GND	3/	3/	3/	3/	3/	3/	3/	13.0 V	All outputs	3/	3/	3/	3/	3/	3/	3/

																				Subgroup 9 T_A = 25°C		Subgroup 10 T_A = 125°C		Subgroup 11 T_A = -55°C		
																				Min	Max	Min	Max	Min	Max	
t_{PLH1}	3003 Fig. 5a	85	V_{DD}	GND	GND	OUT				GND					IN	GND	V_{DD}	5.0 V	CE to OUT 0	47	188	64	256	34	136	ns
t_{PLH1}	3003 Fig. 5a	86	V_{DD}	V_{DD}	GND		OUT			GND									CE to OUT 1	47	188	64	256	34	136	ns
t_{PLH1}	3003 Fig. 5a	87	V_{DD}	GND	V_{DD}			OUT		GND									CE to OUT 2	47	188	64	256	34	136	ns

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

Symbol	MIL-STD-883 method	Cases E,F	Terminal conditions 1/																Measured terminal	Test limits						Unit
			CLK A	NO	N1	OUT 0	OUT 1	OUT 2	OUT 3	V_{SS}	OUT 7	OUT 6	OUT 5	OUT 4	CE	N2	CLK B	V_{DD}		Subgroup 9 T_A=25°C		Subgroup 10 T_A=125°C		Subgroup 11 T_A=-55°C		
		Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		Min	Max	Min	Max	Min	Max	
t_{PLH1}	3003 Fig. 5a	88	V_{DD}	V_{DD}	V_{DD}				OUT	GND					IN	GND	V_{DD}	5.0 V	CE to OUT 3	47	188	64	256	34	136	ns
		89		GND	GND									OUT		V_{DD}			CE to OUT 4							
		90		V_{DD}	GND								OUT						CE to OUT 5							
		91		GND	V_{DD}							OUT							CE to OUT 6							
		92		V_{DD}	V_{DD}						OUT								CE to OUT 7							
t_{PHL1}		93		GND	GND	OUT										GND			CE to OUT 0							
		94		V_{DD}	GND		OUT												CE to OUT 1							
		95		GND	V_{DD}			OUT											CE to OUT 2							
		96		V_{DD}	V_{DD}				OUT										CE to OUT 3							
		97		GND	GND									OUT		V_{DD}			CE to OUT 4							
		98		V_{DD}	GND								OUT						CE to OUT 5							
		99		GND	V_{DD}							OUT							CE to OUT 6							
		100		V_{DD}	V_{DD}						OUT								CE to OUT 7							
t_{PLH2}	3003 Fig. 5b	101		IN	GND		OUT								V_{DD}	GND			NO to OUT 1	55	220	74	296	40	160	
		102			V_{DD}				OUT							GND			NO to OUT 3							
		103			GND								OUT			V_{DD}			NO to OUT 5							
		104			V_{DD}						OUT					V_{DD}			NO to OUT 7							
		105		GND	IN			OUT								GND			N1 to OUT 2							
		106			IN							OUT				V_{DD}			N1 to OUT 6							
		107			GND									OUT		IN			N2 to OUT 4							
		108			GND	OUT										IN			N2 to OUT 0							
t_{PHL2}		109		IN	GND		OUT									GND			NO to OUT 1	34	136	44	176	23	100	
		110			V_{DD}				OUT							GND			NO to OUT 3							
		111			GND								OUT			V_{DD}			NO to OUT 5							
		112			V_{DD}						OUT					V_{DD}			NO to OUT 7							
		113		GND	IN			OUT								GND			N1 to OUT 2							
		114			IN							OUT				V_{DD}			N1 to OUT 6							
		115			GND									OUT		IN			N2 to OUT 4							
		116				OUT										IN			N2 to OUT 0							

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

Symbol	MIL-STD-883 method	Cases E,F	Terminal conditions 1/															Measured terminal	Test limits						Unit
			CLK A	NO	N1	OUT 0	OUT 1	OUT 2	OUT 3	V_{SS}	OUT 7	OUT 6	OUT 5	OUT 4	CE	N2	CLK B	V_{DD}		Subgroup 9 T_A=25°C		Subgroup 10 T_A=125°C		Subgroup 11 T_A=-55°C		
		Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		Min	Max	Min	Max	Min	Max	
t_{PLH3}	3003 Fig. 5c	117	IN A	GND	GND	OUT				GND					V_{DD}	GND	IN B	5.0 V	CLK A to OUT 0	50	200	67	268	36	146	ns
		118		V_{DD}	GND		OUT												CLK A to OUT 1							
		119		GND	V_{DD}			OUT											CLK A to OUT 2							
		120		V_{DD}	V_{DD}				OUT										CLK A to OUT 3							
		121		GND	GND									OUT		V_{DD}			CLK A to OUT 4							
		122		V_{DD}	GND								OUT						CLK A to OUT 5							
		123		GND	V_{DD}							OUT							CLK A to OUT 6							
		124		V_{DD}	V_{DD}						OUT								CLK A to OUT 7							
t_{PHL3}		125		GND	GND	OUT										GND			CLK B to OUT 0							
		126		V_{DD}	GND		OUT												CLK B to OUT 1							
		127		GND	V_{DD}			OUT											CLK B to OUT 2							
		128		V_{DD}	V_{DD}				OUT										CLK B to OUT 3							
		129		GND	GND									OUT		V_{DD}			CLK B to OUT 4							
		130		V_{DD}	GND								OUT						CLK B to OUT 5							
		131		GND	V_{DD}							OUT							CLK B to OUT 6							
		132		V_{DD}	V_{DD}						OUT								CLK B to OUT 7							
t_{TLH1}		133		GND	GND	OUT										GND			CLK A to OUT 0		42		60		32	
		134		V_{DD}	GND		OUT												CLK A to OUT 1							
		135		GND	V_{DD}			OUT											CLK A to OUT 2							
		136		V_{DD}	V_{DD}				OUT										CLK A to OUT 3							
		137		GND	GND									OUT		V_{DD}			CLK A to OUT 4							
		138		V_{DD}	GND								OUT						CLK A to OUT 5							
		139		GND	V_{DD}							OUT							CLK A to OUT 6							
		140		V_{DD}	V_{DD}						OUT								CLK A to OUT 7							
t_{THL1}		141		GND	GND	OUT										GND			CLK B to OUT 0							
		142		V_{DD}	GND		OUT												CLK B to OUT 1							
		143		GND	V_{DD}			OUT											CLK B to OUT 2							
		144		V_{DD}	V_{DD}				OUT										CLK B to OUT 3							
		145		GND	GND									OUT		V_{DD}			CLK B to OUT 4							
		146		V_{DD}	GND								OUT						CLK B to OUT 5							

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

Symbol	MIL-STD-883 method	Cases E,F	Terminal conditions 1/																Measured terminal	Test limits						Unit
			CLK A	NO	N1	OUT 0	OUT 1	OUT 2	OUT 3	V_{SS}	OUT 7	OUT 6	OUT 5	OUT 4	CE	N2	CLK B	V_{DD}		Subgroup 9 T_A=25°C		Subgroup 10 T_A=125°C		Subgroup 11 T_A=-55°C		
		Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		Min	Max	Min	Max	Min	Max	
t_{TLH1}	3003 Fig. 5c	147	IN A	GND	V_{DD}					GND		OUT			V_{DD}	V_{DD}	IN B	5.0 V	CLK B to OUT 6		42		60		32	ns
t_{THL1}	3003 Fig. 5c	148	IN A	V_{DD}	V_{DD}						OUT				V_{DD}	V_{DD}	IN B	5.0 V	CLK B to OUT 7		42		60		32	
t_{PHL4}	3003 Fig. 5a	149	V_{DD}	GND	GND	OUT									IN	GND	V_{DD}	10.0 V	CE to OUT 0	22	86	28	114	16	64	
		150		V_{DD}	GND		OUT												CE to OUT 1							
		151		GND	V_{DD}			OUT											CE to OUT 2							
		152		V_{DD}	V_{DD}				OUT										CE to OUT 3							
		153		GND	GND									OUT		V_{DD}			CE to OUT 4							
		154		V_{DD}	GND								OUT						CE to OUT 5							
		155		GND	V_{DD}							OUT							CE to OUT 6							
		156		V_{DD}	V_{DD}						OUT								CE to OUT 7							
t_{PLH4}		157		GND	GND	OUT										GND			CE to OUT 0							
		158		V_{DD}	GND		OUT												CE to OUT 1							
		159		GND	V_{DD}			OUT											CE to OUT 2							
		160		V_{DD}	V_{DD}				OUT										CE to OUT 3							
		161		GND	GND									OUT		V_{DD}			CE to OUT 4							
		162		V_{DD}	GND								OUT						CE to OUT 5							
		163		GND	V_{DD}							OUT							CE to OUT 6							
		164		V_{DD}	V_{DD}						OUT								CE to OUT 7							
t_{PLH5}	3003 Fig. 5b	165		IN	GND		OUT								V_{DD}	GND			NO to OUT 1	25	100	34	138	18	74	
		166			V_{DD}				OUT							GND			NO to OUT 3							
		167			GND								OUT			V_{DD}			NO to OUT 5							
		168			V_{DD}						OUT					V_{DD}			NO to OUT 7							
		169		GND	IN			OUT								GND			N1 to OUT 2							
		170			IN							OUT				V_{DD}			N1 to OUT 6							
		171			GND									OUT		IN			N2 to OUT 4							
		172			GND	OUT										IN			N2 to OUT 0							
t_{PHL5}		173		IN	GND		OUT									GND			NO to OUT 1	15	60	20	80	12	50	
		174		IN	V_{DD}				OUT							GND			NO to OUT 3							
		175		IN	GND								OUT			V_{DD}			NO to OUT 5							

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

Symbol	MIL-STD-883 method	Cases E,F	Terminal conditions 1/															Measured terminal	Test limits						Unit
			CLK A	NO	N1	OUT 0	OUT 1	OUT 2	OUT 3	V_{SS}	OUT 7	OUT 6	OUT 5	OUT 4	CE	N2	CLK B	V_{DD}		Subgroup 9 T_A=25°C		Subgroup 10 T_A=125°C		Subgroup 11 T_A=-55°C		
		Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		Min	Max	Min	Max	Min	Max	
t_{PHL5}	3003 Fig. 5b	176	V_{DD}	IN	V_{DD}					GND	OUT				V_{DD}	V_{DD}	V_{DD}	10.0 V	N0 to OUT 7	15	60	20	80	12	50	ns
		177		GND	IN			OUT								GND			N1 to OUT 2							
		178			IN							OUT				V_{DD}			N1 to OUT 6							
		179			GND									OUT		IN			N2 to OUT 4							
		180			GND	OUT										IN			N2 to OUT 0							
t_{PLH6}	3003 Fig. 5c	181	IN A			OUT										GND	IN B		CLK A to OUT 0	22	89	30	120	16	66	
		182		V_{DD}			OUT												CLK A to OUT 1							
		183		GND	V_{DD}			OUT											CLK A to OUT 2							
		184		V_{DD}	V_{DD}				OUT										CLK A to OUT 3							
		185		GND	GND									OUT		V_{DD}			CLK A to OUT 4							
		186		V_{DD}	GND								OUT						CLK A to OUT 5							
		187		GND	V_{DD}							OUT							CLK A to OUT 6							
		188		V_{DD}	V_{DD}						OUT								CLK A to OUT 7							
t_{PHL6}		189		GND	GND	OUT										GND			CLK B to OUT 0							
		190		V_{DD}	GND		OUT												CLK B to OUT 1							
		191		GND	V_{DD}			OUT											CLK B to OUT 2							
		192		V_{DD}	V_{DD}				OUT										CLK B to OUT 3							
		193		GND	GND									OUT		V_{DD}			CLK B to OUT 4							
		194		V_{DD}	GND								OUT						CLK B to OUT 5							
		195		GND	V_{DD}							OUT							CLK B to OUT 6							
		196		V_{DD}	V_{DD}						OUT								CLK B to OUT 7							
t_{TLH2}		197		GND	GND	OUT										GND			CLK A to OUT 0		26		33		20	
		198		V_{DD}	GND		OUT												CLK A to OUT 1							
		199		GND	V_{DD}			OUT											CLK A to OUT 2							
		200		V_{DD}	V_{DD}				OUT										CLK A to OUT 3							
		201		GND	GND									OUT		V_{DD}			CLK A to OUT 4							
		202		V_{DD}	GND								OUT						CLK A to OUT 5							
		203		GND	V_{DD}							OUT							CLK A to OUT 5							
		204		V_{DD}	V_{DD}						OUT								CLK A to OUT 7							

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

Symbol	MIL-STD-883 method	Cases E,F	Terminal conditions 1/																Measured terminal	Test limits						Unit
			CLK A	NO	N1	OUT 0	OUT 1	OUT 2	OUT 3	V_{SS}	OUT 7	OUT 6	OUT 5	OUT 4	CE	N2	CLK B	V_{DD}		Subgroup 9 T_A=25°C		Subgroup 10 T_A=125°C		Subgroup 11 T_A=-55°C		
		Test no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		Min	Max	Min	Max	Min	Max	
t_{THL2}	3003 Fig. 5c	205	IN A	GND	GND	OUT				GND					V_{DD}	GND	IN B	10.0 V	CLK B to OUT 0		26		33		20	ns
		206		V_{DD}	GND		OUT												CLK B to OUT 1							
		207		GND	V_{DD}			OUT											CLK B to OUT 2							
		208		V_{DD}	V_{DD}				OUT										CLK B to OUT 3							
		209		GND	GND									OUT		V_{DD}			CLK B to OUT 4							
		210		V_{DD}	GND								OUT						CLK B to OUT 5							
		211		GND	V_{DD}							OUT							CLK B to OUT 6							
		212		V_{DD}	V_{DD}						OUT								CLK B to OUT 7							

1/ Pins not designated may be "HIGH" level logic, "LOW" level logic or open. Exceptions are as follows: $V_{IC(pos)}$ tests, the V_{SS} terminals shall be open; $V_{IC(neg)}$ tests, the V_{DD} terminal shall be open; I_{SS} tests, the output terminals shall be open.

2/ Leakage currents (I_{SS}, I_{IH}, I_{IL}), subgroup 3, shall be performed using the sample size and acceptance number per the LTPD specified in method 5005 of MIL-STD-883.

3/ Perform the functional test using the test pattern and expected outputs shown in the following table. Input levels shall be 0 = V_{SS} and 1 = V_{DD}. Output levels shall be 0 $\leq$ .5 V and 1 $\geq$ V_{DD} -.5 V.

Functional test pattern

	Name	Pin	TIME SLOTS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INPUTS	CLK A	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0
	CLK B	15	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0
	CE	13	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1
	NO	2	0	1	0	1	1	0	1	0	1	1	0	0	0	0	1	1
	N1	3	0	0	1	1	1	0	0	1	1	1	0	0	0	0	1	1
	N2	14	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1
OUTPUTS	OUT 0	4	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
	OUT 1	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	OUT 2	6	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	OUT 3	7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	OUT 4	12	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	OUT 5	11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	OUT 6	10	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	OUT 7	9	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1

4.4.2 Group B inspection. Group B inspection shall consist of the test subgroups and LTPD values shown in table II of method 5005 of MIL-STD-883 and as follows:

a. A special subgroup shall be added to the group B inspection requirements for class B devices and shall consist of the tests, conditions and limits specified in 4.5.2. The LTPD for this subgroup shall be 15.

4.4.3 Group C inspection. Group C inspection shall consist of the test subgroups and LTPD values shown in table III of method 5005 of MIL-STD-883 and as follows:

a. End-point electrical parameters shall be as specified in table II.

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

(1) Test condition D or E, as specified in 4.5.2, and as shown on figure 4, or equivalent.

(2) T_A = 125°C minimum.

c. Additional electrical subgroups as specified in table II shall be added to the group C inspection requirements for class B devices.

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.

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 V_{SS} terminal. Currents given are conventional and positive when flowing into the referenced terminal.

4.5.2 High voltage (V_{ZAP}) test of input protection circuits. Unless otherwise specified, all input terminals (up to a maximum of four) of the device under test (DUT) shall be subjected to a voltage pulse from a 100 pF source charged to 400 V (see figure 6). This destructive test shall be conducted in the following sequence:

a. Measure I_{IH} and I_{IL} at inputs selected, as stated above, at 25°C and V_{DD} = 13 V. Also measure I_{SS} at 25°C and V_{DD} = 13 V. These measurements shall be made in accordance with table III herein. The test limits for a single terminal measurement of I_{IH} and I_{IL} shall be 100 nA maximum.

b. With S_1 in position 1, charge C_1 to 400 V. With S_1 in position 2, apply the test voltage (V_{ZAP}) to the same terminal selected for leakage current measurements. Apply V_{ZAP} in a 3 pulse sequence as follows:

(1) Input (-) to V_{DD}.

(2) Input (+) to V_{SS}.

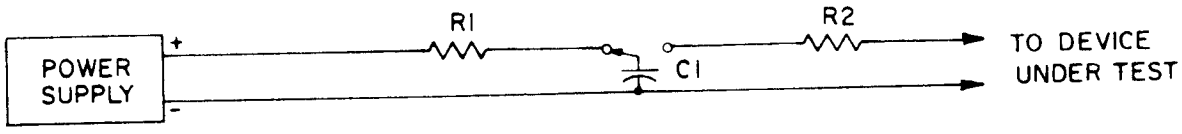
(3) Input (+) to Output.

In each case, V_{ZAP} shall be applied by charging C_1 to 400 V with S_1 in position 1 and then switching to position 2.

c. Within 24 hours, repeat the I_{SS} measurement and the I_{IH} and the I_{IL} measurements on the same terminals as performed above. At this time a DUT exhibiting leakage currents in excess of the specified limits is defective.

4.6 Data reporting. When specified in the contract, a copy of the following data, as applicable, shall be supplied:

a. Attributes data for all screening tests (see 4.2) and variables data for all dynamic burn-in, and operating life tests (see 3.5).



R1 = 10 MΩ ≤R1 ≤ 50 MΩ.
R2 = 1.5 kΩ.
C1 = 100 pF.
V_{ZAP} = 400 V charge on C1.
S1 = Hg-wetted "bounceless" relay.

FIGURE 6. High voltage (V_{ZAP}) test circuit.

b. The quality conformance inspection data (see 4.4).

c. Final electrical parameters data (see 4.2c).

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510. These devices require electrostatic protection.

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 original equipment design applications and logistic support of existing equipment.

6.3 Ordering data. The contract or purchase order 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. Requirement for certificate of compliance, if applicable.

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

e. Requirements for failure analysis (including required test condition of method 5003), corrective action and reporting of results, if applicable.

f. Requirements for product assurance options.

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

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

GND	Ground. Zero voltage potential.
T_A	Free air temperature.
t_{THL}	Fall time. Time duration during which the amplitude of the trailing edge of the input forcing condition or waveform is decreasing from 90 to 10 percent of the maximum amplitude.
t_{TLH}	Rise time. Time duration during which the amplitude of the leading edge of the input forcing condition or waveform is increasing from 10 to 90 percent of the maximum amplitude.
V_{DD}	Positive supply voltage.
V_{SS}	Negative supply voltage.
I_{SS}	Quiescent supply current.

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	1853

6.8 Handling. MOS devices must be handled with certain precautions to avoid damage due to accumulation to static charge. Input protective devices have been designed in the chip to minimize the effect of this static buildup. However, the following handling practices are recommended:

a. Devices should be handled on benches with conductive and grounded surface.

b. Ground test equipment and tools.

c. Do not handle devices by the leads.

d. Store devices in conductive foam or carriers.

e. Avoid use of plastic, rubber, or silk in MOS areas.

f. Maintain relative humidity above 50 percent, if practical.

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

6.10 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.

Custodian:
NASA - NA

Review activity:
DLA - ES

Agent:
DLA - ES

Preparing activity:
NASA - NA

(Project 5962-K646-4)