REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Make changes to table I, 1.4, figure 1 and throughout. Add a new figure to the drawing. Editorial changes throughout.	1990 MAR 06	M. A. Frye

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REV STATUS OF SHEETS																
REV	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
ASHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14		

PMIC N/A11

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

PREPARED BY
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DRAWING APPROVAL DATE
23 NOVEMBER 1988

REVISION LEVEL
A

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUITS, LINEAR, 8-BIT A/D CONVERTER WITH INPUT AMPLIFIER, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	**67268**	**5962-87635**

SHEET 1 OF 14

DESC FORM 193-1
SEP 87

* US GOVERNMENT PRINTING OFFICE: 1987--748-129/60911

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

5962-87635	01	R	X
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

1.2.1 Device type. The device type shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	AD670	8-bit A/D converter withinput amplifier

1.2.2 Case outline. The case outline shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
R	D-8 (20-lead, 1.060" x .310" x .200"), dual-in-line package

1.3 Absolute maximum ratings.

V_{CC} to ground	0 V dc to +7.5 V dc
Digital inputs (pins 11-15)	-0.5 V dc to V_{CC} + 0.5 V dc
Digital outputs (pins 1-9)	Momentary short to V_{CC} or ground
Analog inputs (pins 16-19)	-30 V dc to +30 V dc
Power dissipation (P_D)	450 mW
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (O_{JC})	See MIL-M-38510, appendix C
Thermal resistance, junction-to-ambient (O_{JA})	85°C/W

1.4 Recommended operating conditions.

Supply voltage range (V_{CC})	4.75 V dc to 5.5 V dc
Operating ambient temperature range	-55°C to +125°C

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2. APPLICABLE DOCUMENTS

2.1 Government specification, standard, and bulletin. Unless otherwise specified, the following specification, standard, and bulletin 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 drawing 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.

BULLETIN

MILITARY

MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

(Copies of the specification, standard, and bulletin required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" 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 Truth tables. The truth tables shall be as specified on figures 2, 3, and 4.

3.2.3 Block diagram. The functional block diagram shall be as specified on figure 5.

3.2.4 Case outline. The case outline shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full ambient operating temperature range.

3.4 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 I.

3.5 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ V_{CC} = +5 V (unless otherwise specified)	Group A subgroups	Limits		Unit
				Min	Max	
Relative accuracy 1/	RA		1		1/2	LSB
			2, 3		1	
Differential nonlinearity 2/ 3/	DNL		1, 2, 3		8	Bits
Gain error 1/	A_E		1		±1.5	LSB
			2, 3		±2.5	
Unipolar offset error	O_E	0 V to +2.56 V input range FS	1		±1	
			2, 3		±2	
Bipolar offset error	B_{OE}	-1.28 V to +1.27 V FS	1		±1	
			2, 3		±2	
Input resistance 3/	R_{IN}	2.55 V input range	1	8	12	kΩ
Input bias current 3/	I_B	255 mV input range	1, 2, 3		500	nA
Input offset current 3/	I_{OS}	255 mV input range	1, 2, 3		200	
Absolute input signal range 3/ 4/ 5/	V_{ABS}	Low range	1	-.34	V_{CC} -3.3	V
			2, 3	-.15	V_{CC} -3.5	
		High range	1	-3.4	V_{CC}	
			2, 3	-1.5	V_{CC}	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ V_{CC} = +5 V (unless otherwise specified)	Group A subgroups	Limits		Unit
				Min	Max	
Power supply rejection ratio	PSRR	2.55 V FS, V_{CC} = +4.75 V to +5.5 V	1, 2, 3		±.015	%FS/%
Power supply current	I_{CC}	V_{CC} = 5.5 V (DB0-DB7, R/$\overline{W}$ high); (STATUS, $\overline{CE}$, $\overline{CS}$, FORMAT, BPO, $\overline{UPO}$-low)	1, 2, 3		45	mA
Digital input high voltage 3/	V_{IH}		1, 2, 3	2.0		V
Digital input low voltage 3/	V_{IL}		1		0.8	
			2, 3		0.7	
Digital input high current 3/	I_{IH}	V_{IH} = 5 V	1, 2, 3		100	µA
Digital input low current 3/	I_{IL}	V_{IL} = 0 V	1, 2, 3		-100	
Digital output low voltage	V_{OL}	I_{OL} = 1.6 mA, V_{CC} = 5.5 V	1, 2, 3		0.4	V
Digital output high voltage	V_{OH}	I_{OH} = 0.5 mA, V_{CC} = 4.5 V	1, 2, 3	2.4		
Digital output low current	I_{OL}	V_{OL} = 0.4 V, V_{CC} = 5.5 V	1, 2, 3	-1.6		mA
Digital output high current	I_{OH}	V_{OH} = 2.4 V, V_{CC} = 4.5 V	1, 2, 3	0.5		
Common mode rejection ratio 3/	CMRR	V_{CM} = -0.15 to V_{CC} -3.8 V	1		±1	LSB
			2, 3		±2	
Three-state leakage current 3/	I_{OZ}	$V_{applied}$ = 5 V, $V_{applied}$ = 0 V	1, 2, 3		±40	µA
Functional tests		See 4.3.1c	7, 8			

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ V_{CC} = +5 V (unless otherwise specified)	Group A subgroups	Limits		Unit
				Min	Max	
Bus access time 3/	t_{TD}	See figure 5, T_A = +25°C R_L = 3 kΩ, C_L = 90 pF	9		250	ns
Output float delay 3/	t_{DT}	See figure 5, T_A = +25°C R_L = 3 kΩ			150	
Write/start pulse width 3/	t_W	R_L = 3 kΩ C_L = 90 pF		300		
Input data setup time	t_{DS}	See figure 6 T_A = +25°C 6/		200		
Input data hold time	t_{DH}			10		
R/$\overline{W}$ setup before control	t_{RWC}			0		
Delay to convert start	t_{DC}				700	
Delay from STATUS OUTPUT to data read	t_{SD}				250	
Data hold time	t_{DH}			25		
Conversion time 3/	t_C	V_{CC} = +5 V	9		10	µs
			10, 11 7/		13	

1/ Tested on both 2.55 V full scale and -1.28 V to 1.27 V full scale.
2/ Minimum resolution for which there are no missing codes.
3/ Parameter is tested at V_{CC} = 5 V but is guaranteed from V_{CC} = 4.5 V to V_{CC} = 5.5 V.
4/ The absolute input signal range defines the limits of input signal value from either the (+) or (-) input to ground (as a function of V_{CC}) over which the device will produce distinct output codes.
5/ The differential input signal range defines the input signal span over which distinct output codes are produced. As this range is exceeded, the device ceases to change output state (see figure 4).
6/ Guaranteed, if not tested, to the specified limits.
7/ 255 mV range. CMRR tested with 0 V and full scale applied to analog inputs output change measured from 0 to V_{CM} maximum and 0 to V_{CM} minimum and will not exceed specified limits.

Device type	01
Case outline	R

Terminal number	Terminal symbol
1	DBO LSB
2	DB1
3	DB2
4	DB3
5	DB4
6	DB5
7	DB6
8	DB7 MSB
9	Status output
10	Power ground
11	BPO/ $\overline{UPO}$
12	Format (See note)
13	R/$\overline{W}$
14	$\overline{CS}$
15	$\overline{CE}$
16	V_{IN} - (High)
17	V_{IN} - (Low)
18	V_{IN} + (High)
19	V_{IN} + (Low)
20	V_{CC}

NOTE: Twos complement/$\overline{straight\ binary}$.

FIGURE 1. Terminal connections.

R/$\overline{W}$	$\overline{CS}$	$\overline{CE}$	Operation	Output
X	X	X	Converting (see note 1)	Three-state
0	0	0	Write/convert (see note 2)	Three-state
1	0	0	Read (see note 2)	Data valid
X	X	1	None (see note 3)	Three-state
X	1	X	None (see note 3)	Three-state

NOTES:
1. Status output high.
2. Status output low.
3. Status output don't care.

FIGURE 2. Control signal truth table.

Mode	Range	Min	Max	Unit
Unipolar	Low	0	255	mV
Unipolar	High	0	2.55	V
Bipolar	Low	-128	127	mV
Bipolar	High	-1.28	1.27	V

FIGURE 3. Differential input signal range truth table.

BPO/$\overline{UPO}$	Format	Input range/output format
0	0	Unipolar/straight binary
1	0	Bipolar/offset binary
0	1	Unipolar/2s complement
1	1	Bipolar/2s complement

FIGURE 4. Input selection/output format truth table.

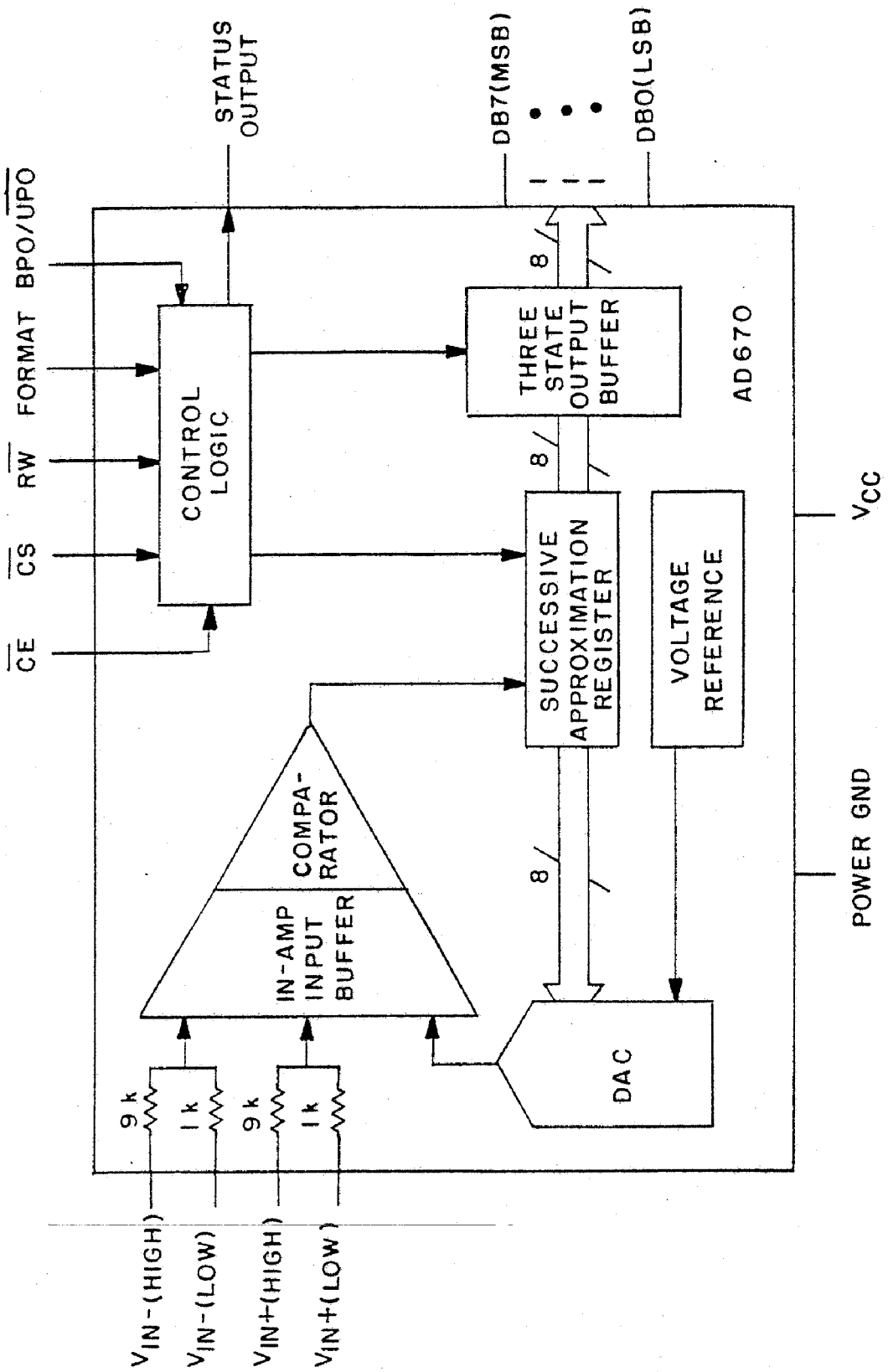

FIGURE 5. Block diagram.

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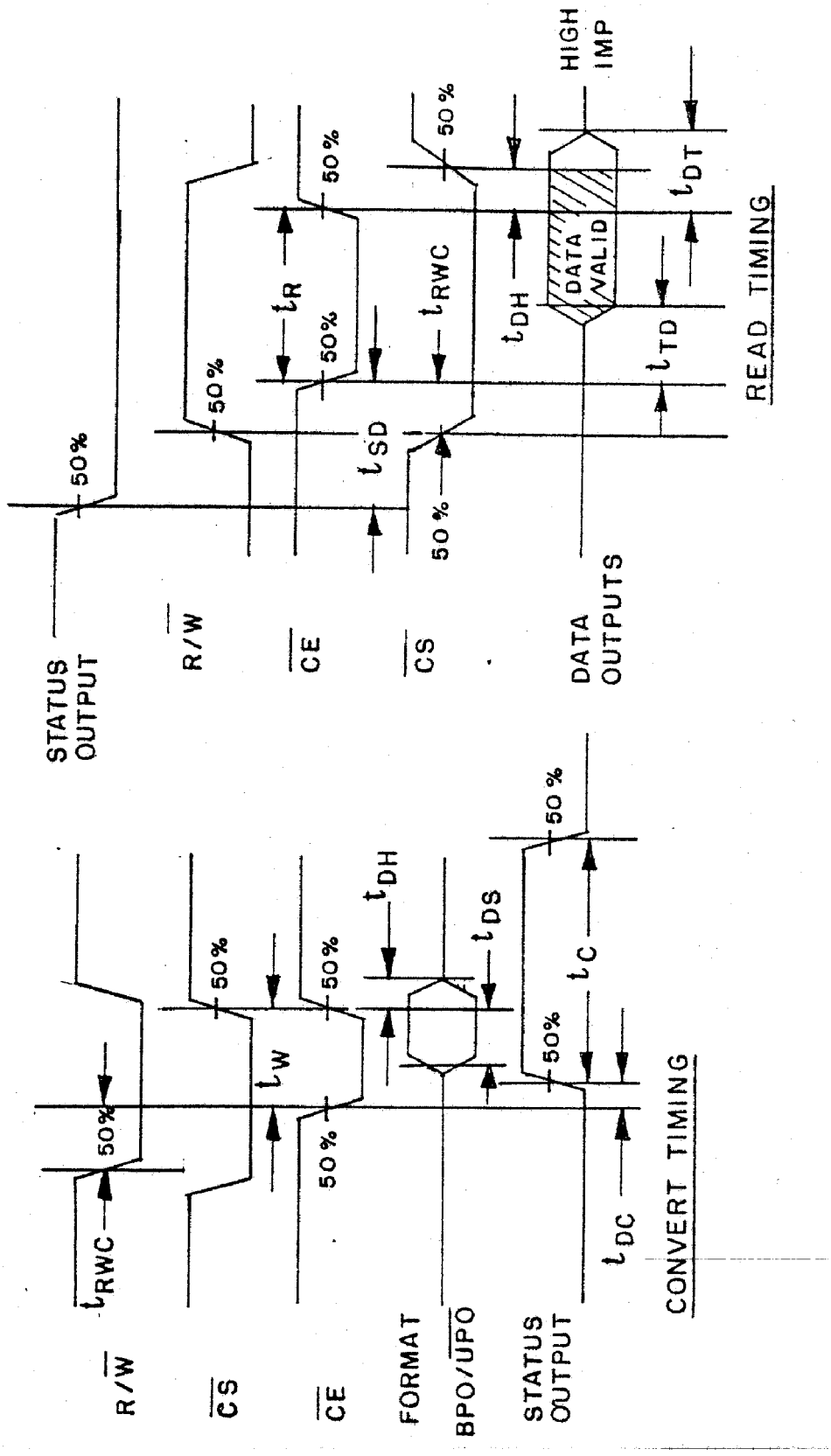
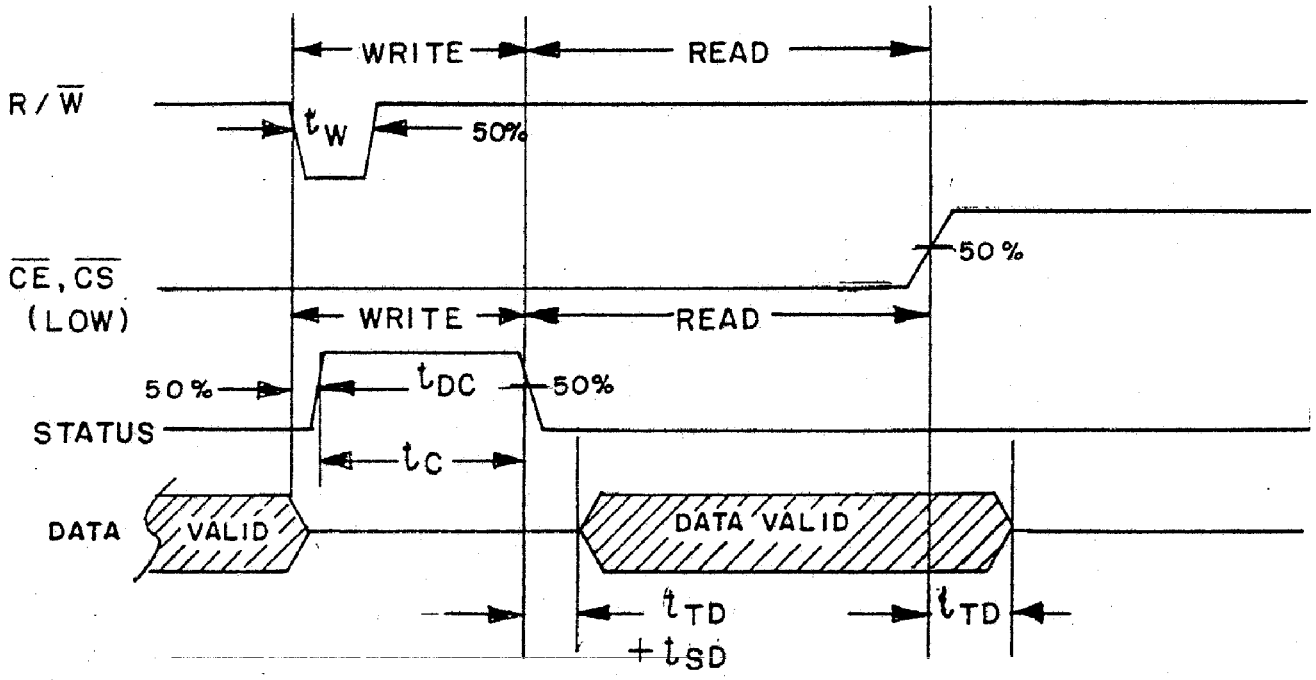


FIGURE 6. Timing diagrams



STAND-ALONE TIMING

FIGURE 6. Timing diagrams - Continued.

3.6 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.9 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 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 A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

(2) T_A = +125°C, minimum.

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

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

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

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

c. Subgroups 7 and 8 shall include verification of the truth table.

4.3.2 Groups C and D inspections.

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

b. Steady-state life test conditions, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

(2) T_A = +125°C, minimum.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

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TABLE II. Electrical test requirements.

MIL -STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 9
Group A test requirements (method 5005)	1, 2, 3, 7, 9, 10**, 11**
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.
** Subgroups 10 and 11 are guaranteed, if not tested, to the limits as specified in table I.

5. PACKAGING

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

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. The coordination will be accomplished in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordiantion and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DESC-ECS, telephone (513) 296-6022.

6.5 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone (513) 296-5375.

6.6 Approved source of supply. An approved source of supply is listed in MIL-BUL-103. Additional sources will be added to MIL-BUL-103 as they become available. The vendor listed in MIL-BUL-103 has agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-ECS. The approved source of supply listed below is for information purposes only and is current only to the date of the last action of this document.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
5962-8763501RX	51640	AD670SD/883B

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
51640	Analog Devices Micro Electronics Division 829 Woburn Street Wilmington, MA 01887

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