

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add case outline 2. Delete subgroups 2 and 3 from C and D end points. Editorial changes throughout. Change footnote 4/ on table I.	1990 FEB 2	<i>M.A. Lyle</i>

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

PMIC N/A	PREPARED BY <i>Joseph A. Kerby</i>	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	
STANDARDIZED MILITARY DRAWING	CHECKED BY <i>Ray Monnin</i>	MICROCIRCUITS, LINEAR, MICROPROCESSOR COMPATIBLE 8-BIT DIGITAL-TO-ANALOG CONVERTER, MONOLITHIC SILICON	
	APPROVED BY <i>M.A. Lyle</i>	SIZE A	CAGE CODE 67268
	DRAWING APPROVAL DATE 30 JUNE 1988	5962-87789	
AMSC N/A	REVISION LEVEL A	SHEET 1	OF 12

DESC FORM 193
SEP 87

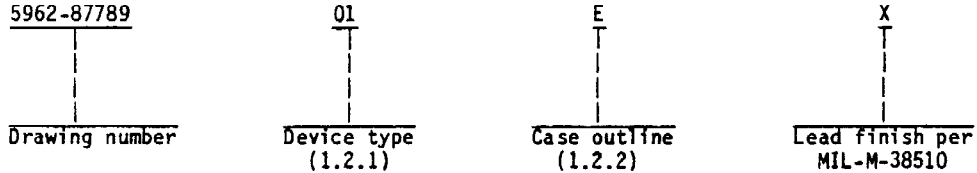
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5962-E1548

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

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:



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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	AD558S	8-bit D/A with full microprocessor interface
02	AD558T	8-bit D/A with full microprocessor interface

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

<u>Outline letter</u>	<u>Case outline</u>
E	D-2 (16-lead, .840" x .310" x .200"), dual-in-line package
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings.

Positive supply voltage V_{CC} to digital return	- - - 0 to +18 V dc
Digital input voltage to digital return	- - - - - 0 V dc to +7.0 V dc
Output short circuit duration (to ground)	- - - - - Indefinite
Output short circuit duration (to V_{CC})	- - - - - Momentary
Power dissipation	- - - - - 450 mW
Lead temperature (soldering, 10 seconds)	- - - - - +300°C
Storage temperature range	- - - - - -65°C to +150°C
Junction temperature (T_J)	- - - - - +175°C
Thermal resistance junction-to-case (θ_{JC})	- - - - - See MIL-M-38510, appendix C
Thermal resistance junction-to-ambient (θ_{JA}):	
Case outline E	- - - - - 100°C/W
Case outline 2	- - - - - 120°C/W

1.4 Recommended operating conditions.

Positive supply voltage range (V_{CC}):	
2.56 V output range	- - - - - 4.5 V dc to 5.5 V dc
10 V output range	- - - - - 11.4 V dc to 16.5 V dc
Ambient operating temperature range (T_A)	- - - - - -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 table. The truth table shall be as specified on figure 2.

3.2.3 Functional block diagram. The functional block diagram shall be as specified on figure 3.

3.2.4 Timing diagram. The timing diagram shall be as specified on figure 4.

3.2.5 Case outlines. The case outlines 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 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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C unless otherwise <u>1/</u> specified	Device type	Group A subgroups	Limits		Unit
					Min	Max	
Relative accuracy	RA	All bits with positive errors on and all bits with negative errors on	A11	1		±0.50	LSB
			01	2, 3		±0.75	
			02	12		±0.25	
			02	2, 3		±0.375	
Differential nonlinearity	DNL	All major carriers	A11	1, 2, 3		±1	LSB
Zero error	V _{ZE}	All bits off	A11	1		±1	LSB
			01	2, 3		±2	
			02	12		±0.5	
			02	2, 3		±1	
Gain error	A _E	No load and 5 mA load, all bits on	A11	1		±1.5	LSB
			01	2, 3		±2.5	
			02	12		±0.5	
			02	2, 3		±1.0	
Output voltage settling time <u>3/</u>	t _{vo} (set- tling)	0 to 10 V range <u>2/</u>	A11	7		3.0	μs
				8		5.0	
		0 to 2.56 V range <u>2/</u>	A11	7		1.5	
				8		3.0	
Power supply rejection ratio	PSRR	<u>4/</u>	A11	1, 2, 3		0.03	%per%
Power supply current	I _{CC}	All bits on	A11	1, 2, 3		±25	mA
Digital input high voltage	V _{IH}		A11	1, 2, 3	2.0		V
Digital input low voltage	V _{IL}		A11	1, 2, 3		0.8	V
Functional tests <u>3/</u>		See 4.3.1c	A11	7,8			

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C unless otherwise <u>1/</u> specified	Device type	Group A subgroups	Limits		Unit
					Min	Max	
Digital input high current	I _{IH}	V _{IH} = 7 V	A11	1, 2, 3		±100	μA
Digital input low current	I _{IL}	V _{IL} = 0 V	A11	1, 2, 3		±100	μA
Write pulse width (strobe)	t _{WR}	<u>5/</u>	A11	9	200		ns
				10, 11	270		
Data setup time	t _{DS}	<u>5/</u>	A11	9	200		ns
				10, 11	270		
Data hold time	t _{DH}	<u>5/</u>	A11	9, 10, 11	10		ns

- 1/ V_{CC} = +5 V for 0 to 2.56 V range, V_{CC} = +15 V for 0 to 10 V range (unless otherwise specified).
- 2/ Settling time is specified for a positive full scale step to ±1/2 LSB.
- 3/ Guaranteed if not tested.
- 4/ V_{CC} = 4.5 V to 5.5 V for 0 to 2.56 V range, V_{CC} = 11.4 V to 16.5 V for 0 to 10 V range.
- 5/ Timing per figure 4.

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).

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.

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Device types	01 and 02	
Case outlines	E	2
Terminal number	Terminal symbol	
1	DB0 (LSB)	NC
2	DB1	DB0 (LSB)
3	DB2	DB1
4	DB3	DB2
5	DB4	DB3
6	DB5	NC
7	DB6	DB4
8	DB7 (MSB)	DB5
9	\overline{CE}	DB6
10	\overline{CS}	DB7 (MSB)
11	+V _{CC}	NC
12	GND	\overline{CE}
13	GND	\overline{CS}
14	V _{OUTselect}	+V _{CC}
15	V _{OUTsense}	GND
16	V _{OUT}	NC
17	---	GND
18	---	V _{OUTselect}
19	---	V _{OUTsense}
20	---	V _{OUT}

FIGURE 1. Terminal connections.

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Input data	\overline{CE}	\overline{CS}	DAC data	Latch condition
0	0	0	0	"Transparent"
1	0	0	1	"Transparent"
0	†	0	0	Latching
1	†	0	1	Latching
0	0	†	0	Latching
1	0	†	1	Latching
X	1	X	Previous data	Latched
X	X	1	Previous data	Latched

X = Does not matter.

† = Logic threshold at positive-going transition.

FIGURE 2. Truth table.

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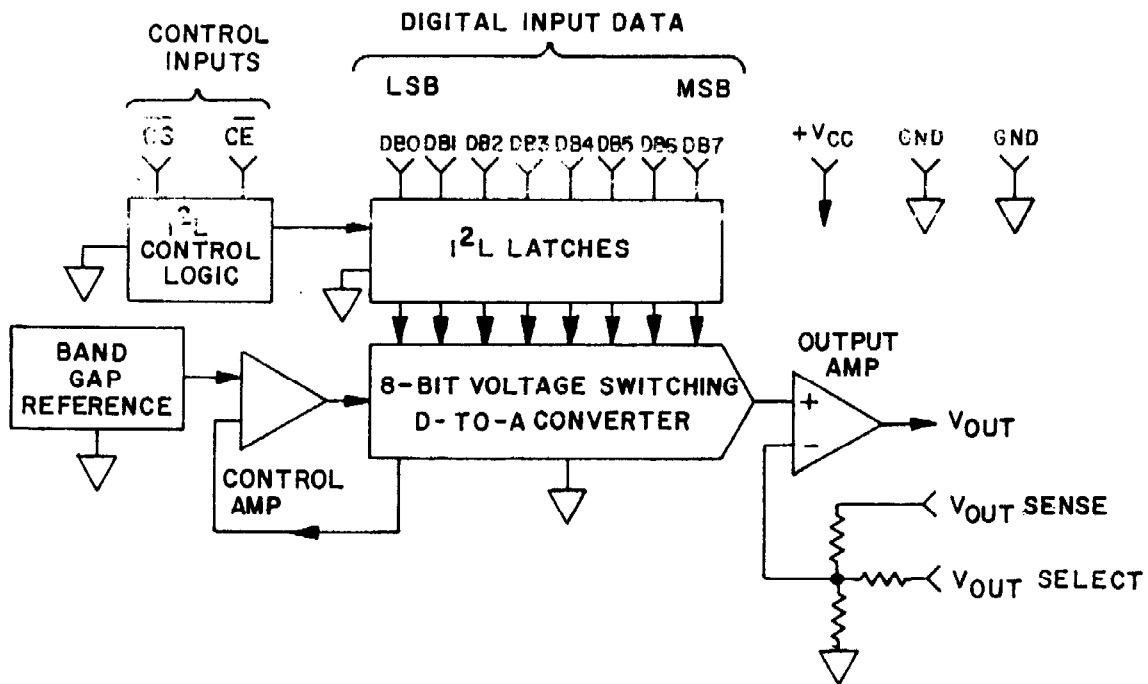


FIGURE 3. Functional block diagram.

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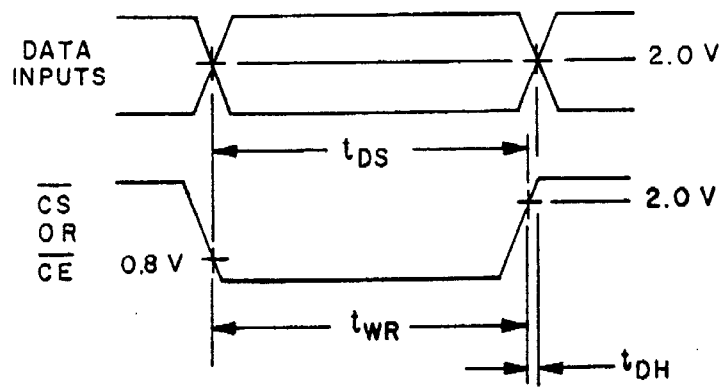


FIGURE 4. Timing diagram.

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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) $T_A = +125^{\circ}\text{C}$, 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.
- c. Optional subgroup 12 is used for grading and part selection at $+25^{\circ}\text{C}$, it is not included in PDA.

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 verify the truth table.
- d. Optional subgroup 12 is used for grading and part selection at $+25^{\circ}\text{C}$.

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) $T_A = +125^{\circ}\text{C}$, minimum.
 - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

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MILITARY DRAWING**

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DAYTON, OHIO 45444

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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, 9,12
Group A test requirements (method 5005)	1,2,3,7**,8**, 9,10,11,12
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.

** If not tested shall be guaranteed to the specified limits 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. Replaceability is determined as follows:

- a. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.
- b. When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/14401BEX.

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. This 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 coordination and distribution of changes to the drawings. Users of drawings covering microelectronics 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.

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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 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 <u>1/</u>	Replacement military specification part number
5962-8778901EX 5962-87789012X	51640 51640	AD558SD/883B AD558SE/883B	M38510/14401BEX
5962-8778902EX 5962-87789022X	51640 51640	AD558TD/883B AD558TE/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

51640

Vendor name and address

Analog Devices Incorporated
Semiconductor Division
829 Woburn Street
Wilmington, MA 01887

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