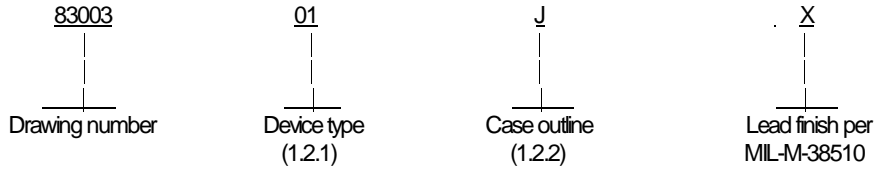


NOTICE OF REVISION (NOR) (See MIL-STD-480 for instructions)		DATE (YYMMDD) 92-11-02	Form Approved OMB No. 0704-0188
This revision described below has been authorized for the document listed.			
Public reporting burden for this collection is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.			
1. ORIGINATOR NAME AND ADDRESS Defense Electronics Supply Center Dayton, Ohio 45444-5277	2. CAGE CODE 67268	3. NOR NO. 5962-R196-92	
	4. CAGE CODE 67268	5. DOCUMENT NO. 83003	
6. TITLE OF DOCUMENT MICROCIRCUITS, LINEAR, 12-BIT D/A CONVERTER, RANGE PROGRAMMABLE, VOLTAGE OUTPUT, MONOLITHIC SILICON	7. REVISION LETTER (Current) A	(New) B	
	8. ECP NO. 83003ECP-1		
9. CONFIGURATION ITEM (OR SYSTEM) TO WHICH ECP APPLIES All			
10. DESCRIPTION OF REVISION Sheet 1: Revisions ltr column; add "B". Revisions description column; add "Changes in accordance with NOR 5962-R196-92". Revisions date column; add "92-11-02". Revision level block; add "B". Rev status above sheet number 1, 4, 5, and 6, add "B". Sheet 4: Table I, VOS test, delete footnote 3. Revision level block; add "B". Sheet 5: Table I, BPAE/BPOE/BZE tests, add footnote 3. Table I, +PSRR test, add "+11.4 V ≤ VCC ≤ 12.6 V, VEE = -12 V" to the conditions column. Table I, -PSRR test, add "-12.6 V ≤ VEE ≤ -11.4 V, VCC = 12 V" to the conditions column. Revision level block; add "B". Sheet 6: Footnote 3, delete "Unless otherwise specified, all tests are performed in the", add "Test". Revision level block; add "B".			
11. THIS SECTION FOR GOVERNMENT USE ONLY			
a. CHECK ONE <input checked="" type="checkbox"/> EXISTING DOCUMENT SUPPLEMENTED BY THIS NOR MAY BE USED IN MANUFACTURE. <input type="checkbox"/> REVISED DOCUMENT MUST BE RECEIVED BEFORE MANUFACTURER MAY INCORPORATE THIS CHANGE. <input type="checkbox"/> CUSTODIAN OF MASTER DOCUMENT SHALL MAKE ABOVE REVISION AND FURNISH REVISED DOCUMENT TO:			
b. ACTIVITY AUTHORIZED TO APPROVE CHANGE FOR GOVERNMENT DESC-ECS	SIGNATURE AND TITLE Michael A. Frye Branch Chief	DATE (YYMMDD) 92-11-02	
12. ACTIVITY ACCOMPLISHING REVISION DESC-ECS	REVISION COMPLETED (Signature) Marcia B. Kelleher	DATE (YYMMDD) 92-11-02	

1. SCOPE

1.1 Scope. This drawing describes the 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 or Identifying Number (PIN). The complete part number shall be as shown in the following example:



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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit</u>
01	DAC 87 (monolithic)	D/A converter, 12 bit with output voltage ranges as follows: 0 V to +5 V unipolar 0 V to +10 V unipolar -2.5 V to +2.5 V bipolar -5 V to +5 V bipolar -10 V to +10 V bipolar

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

<u>Outline letter</u>	<u>Case outline</u>
J	D-3 (24-lead, 1.290" x .610" x .225"), dual-in-line package

1.3 Absolute maximum ratings.

Positive supply voltage V_{CC} to digital return	+18 V dc
Negative supply voltage V_{EE} to digital return	-18 V dc
Digital input voltage to digital return	0 V dc to 7.0 V dc
Output short circuit duration (to ground only)	25 ms
Lead temperature (Soldering, 60 seconds)	+300° C
Storage temperature range	-65° C to +150° C
Junction temperature	+175° C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-M-38510, appendix C.
Thermal resistance, junction-to-ambient (θ_{JA})	48° C/W
Power dissipation (P_D) ^{1/}	550mW

1.4 Recommended operating conditions.

Positive supply voltage range (V_{CC})	16.5 V dc
Negative supply voltage range (V_{EE})	-16.5 V dc
Ambient operating temperature range	-55° C to +125° C

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

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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. Terminal connections shall be as specified on figure 1.

3.2.2 Case outline(s). The case outline(s) 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 PIN listed in 1.2 herein. In addition, the manufacturer's PIN 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 ≤ T _A ≤ +125° C unless otherwise specified ^{1/}	Group A subgroups	Limits		Unit
				Min	Max	
Resolution				12		Bits
Supply current from V _{CC}	I _{CC}	Input bits = 1111 1111 1111 V _{CC} = 15 V	1, 2, 3	1	10	mA
Supply current from V _{EE}	I _{EE}	Input bits = 0000 0000 0000 V _{EE} = -15 V	1, 2, 3 ⁸	-20	-1	mA
Digital input low current	I _{IL}	V _{IN} (logic) = 0.8 V, V _{CC} = 15.0 V, (Each input measured separately)	1, 2, 3	0	+100	μA
Digital input high current	I _{IH}	V _{IN} (logic) = 5.5 V, V _{CC} = 15.0 V,	1, 2, 3	-1	+250	μA
Output short circuit current	I _{OS}	Input bits = 0000 0000 0000	1, 2, 3		40	mA
Reference voltage	V _{REF}	I _O = -2.5 mA, T _A = +25° C	1	6.23	6.37	V
Reference voltage drift	dV _{REF} /dT	^{2/}	2, 3	-10	+10	PPM/°C
Unipolar offset voltage error	V _{OS}	Input bits = 1111 1111 1111 Unipolar, V _{FSR} = 10 V, T _A = +25° C ^{3/}	1	-0.1	+0.1	%FSR
Unipolar offset voltage drift	dV _{OS} /dT	^{2/}	2, 3	-3	+3	PPM/°C
Gain error ^{4/}	AE	Input bits = 0000 0000 0000 and input bits = 1111 1111 1111 Unipolar, V _{FSR} = 10 V, T _A = +25° C	1	-2	+2	%FSR
Gain error drift	dAE/dT	^{2/}	2, 3	-20	+20	PPM/°C

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 specified ^{1/}	Group A subgroups	Limits		Unit
				Min	Max	
Bipolar gain error	BPAE	Input bits = 0000 0000 0000 and input bits = 1111 1111 1111 T _A = +25° C	1	-2	+2	% FSR
Bipolar offset error	BPOE	Inputs bits = 1111 1111 1111 T _A = +25° C	1	-0.1	+0.1	% FSR
Bipolar offset error drift	dBPOE /dT	^{2/}	2, 3	-10	+10	PPM° C
Bipolar zero error	BZE	Input bits = 0111 1111 1111 T _A = +25° C	1	-4	+4	LSB
Bipolar zero error drift	dBZE /dT	^{2/}	2, 3	-10	+10	PPM° C
Power supply sensitivity from V _{CC} at full scale	+PSRR	Input bits = 0000 0000 0000 +13.5 V ≤ V _{CC} ≤ +16.5 V, V _{EE} = -15 V	1, 2, 3	-0.002	+0.002	$\frac{\% \Delta FSR}{\% \Delta V_{CC}}$
Power supply sensitivity from V _{EE} at full scale	-PSRR	Input bits = 0000 0000 0000 -13.5 V ≤ V _{EE} ≤ -16.5 V, V _{CC} = +15 V	1, 2, 3	-0.002	+0.002	$\frac{\% \Delta FSR}{\% \Delta V_{EE}}$
Integral linearity error	LE	(Abbreviate codes test.) ^{5/}	1	-5	+5	LSB
			2, 3	-75	+75	
Differential linearity error	DLE	(Abbreviate codes test.)	1	-0.75	+0.75	LSB
			2, 3	-1.0	+1.0	
Integral linearity error	LE	(All codes test.)	7	-5	+5	LSB
			8	-75	+75	

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 specified 1/	Group A subgroups	Limits		Unit
				Min	Max	
Setting time 6/	t _{SLH}	20 V to ±1/2 LSB 20 V to ±1 LSB Input bits = 1111 1111 1111 to input bits = 0000 0000 0000 T _A = +25° C	9		5 4	μs
		1 LSB to ±1/2 LSB Input bits = 1111 1111 1111 to input bits = 1111 1111 1110 T _A = +25° C			2	
Setting time 6/	t _{SHL}	20 V to ±1/2 LSB 20 V to ±1 LSB Input bits = 0000 0000 0000 to input bits = 1111 1111 1111 T _A = +25° C	9		5 4	μs
		1 LSB to ±1/2 LSB T _A = +25° C Input bits = 1111 1111 1110 to input bits = 1111 1111 1111 T _A = +25° C			2	
Output noise voltage	NO	All inputs = 1111 1111 1111 10 Hz ≤ BW ≤ 100 kHz T _A = +25° C	9		160	μV rms

Notes: 1/ Unless otherwise specified, V_{CC} = 15.0 V, V_{EE} = -15.0 V, logic "0" = 0.8 V, logic "1" = 2.0 V, V_{FSR} = 10 V, and load resistance (R_L) = 2 kΩ. This is a unipolar operation. Load resistor (R_L) not applicable for I_{CC} and I_{EE} test.

2/ Calculations for dV_{OS}/dT, dAE/dT, dBPOE/dT, dBZE/dT, and dV_{REF}/dT are determined from measurements made at +125° C, +25° C, and -55° C for V_{OS}, AE, BPOE, BZE, and V_{REF} respectively.

3/ Unless otherwise specified, all tests are performed in the bipolar mode over a -10 V to +10 V range. The scale factor is V_{FSR}/4096 LSB. (i.e. For V_{FSR} = 20 V, the scale factor is 20 V/4096 LSB = 4.88 mV/LSB.)

4/ The gain error of a 12 bit D/A converter in % of full scale range corresponds to gain error in LSB units by the following relationship: 0.20% x 4096 LSB/100% = 8.192 LSB.

5/ The abbreviated integral linearity error test shown for subgroups 1, 2, and 3 shall represent the minimum number of tests required. The manufacturer shall add additional tests and/or calculations to assure that the worst positive and negative error values, as determined by the abbreviated test, are within 150 milli LSB of the worst positive and negative error values, as determined by the all codes test for subgroups 7 and 8.

6/ If not tested, shall be guaranteed to the limits specified in table I herein.

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Device type	01
Case outline	J
Terminal number	Terminal symbol
1	BIT 1 (MSB)
2	BIT 2
3	BIT 3
4	BIT 4
5	BIT 5
6	BIT 6
7	BIT 7
8	BIT 8
9	BIT 9
10	BIT 10
11	BIT 11
12	BIT 12 (LSB)
13	LOGIC SUPPLY
14	V_{EE}
15	V_{OUT}
16	REF INPUT
17	BIPOLAR OFFSET
18	10 V RANGE
19	20 V RANGE
20	SUMMING JUNCTION
21	COMMON
22	V_{CC}
23	GAIN ADJUST
24	$6.3 V_{REF OUT}$

FIGURE 1. Terminal connections.

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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 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.

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.

4.3.1 Group A inspection.

- a. Tests shall be as specified in table II herein.
- b. Subgroups 4, 5, 6, 10 and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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

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

** Subgroup 9 shall be guaranteed, if not tested, to the limits 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 devices 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 the a QPL source is established, the device specified in this drawing will be replaced by the microcircuit identified as PIN M38510/13702BJX.

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.

6.6 Approved sources of supply. Approved sources of supply are listed MIL-BUL-103. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6) has been submitted to and accepted by DESC-ECS.

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STANDARDIZED MILITARY DRAWING SOURCE APPROVAL BULLETIN

DATE: 91-03-06

Approved sources of supply for SMD 83003 are listed below for immediate acquisition only and shall be added to MIL-BUL-103 during the next revision. MIL-BUL-103 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DESC-ECS. This bulletin is superseded by the next dated revision of MIL-BUL-103.

Standardized military drawing PIN	Vendor CAGE number	Vendor similar PIN 1/	Replacement military specification PIN
8300301JX	24355	AD DAC87D-CBI-V/883B	M38510/1370XBXX

Vendor CAGE number

24355

Vendor name and address

Analog Devices
 Route 1 Industrial Park
 P. O. Box 9106
 Norwood, MA 02062
 Point of contact: 804 Woburn Street
 Wilmington, MA 01887