NOTICE OF REVISION (NOR)

This revision described below has been authorized for the document listed.

1. DATE (YYMMDD)	Form Approved OMB No. 0704-0188
93/10/15	

2. PROCURING ACTIVITY NO.	
3. DODAAC	

4. ORIGINATOR	b. ADDRESS (Street, City, State, Zip Code)	5. CAGE CODE	6. NOR NO.
a. TYPED NAME (First, Middle Initial, Last)	Defense Electronics Supply Center 1507 Wilmington Pike Dayton, OH 45444-5270	67268	5962-R006-94
		7. CAGE CODE 67268	8. DOCUMENT NO. **5962-87802**

9. TITLE OF DOCUMENT	10. REVISION LETTER		11. ECP NO.
Microcircuits, Linear, 8-Bit Quad D/A Converter, Monolithic Silicon.	a. CURRENT A	b. NEW B	No ECP necessary

12. CONFIGURATION ITEM (OR SYSTEM) TO WHICH ECP APPLIES

13. DESCRIPTION OF REVISION

Sheet 1: Revisions ltr column; add "B".
Revisions description column; add "Changes in accordance with NOR 5962-R006-94".
Revisions date column; add "93-10-15".
Revision level block; add "B".
Rev status of sheets; For sheets 1, 4, and 5 add "B".

Sheet 4: Table I; Reference input capacitance test, C_{IN}, delete conditions "Each DAC loaded with all 0's" and "see 4.3.1c" and delete minimum limit "65 pF".
Revision level block; add "B".

Sheet 5: Table I; Reference input capacitance test, C_{IN}, delete conditions "Each DAC loaded with all 0's" and "see 4.3.1c" and delete minimum limit "65 pF".
Revision level block; add "B".

14. THIS SECTION FOR GOVERNMENT USE ONLY

a. (X one)		
	X	(1) Existing document supplemented by the NOR may be used in manufacture.
		(2) Revised document must be received before manufacturer may incorporate this change.
		(3) Custodian of master document shall make above revision and furnish revised document.

b. ACTIVITY AUTHORIZED TO APPROVE CHANGE FOR GOVERNMENT	c. TYPED NAME (First, Middle Initial, Last)
DESC	Michael A. Frye

d. TITLE	e. SIGNATURE	f. DATE SIGNED (YYMMDD)
Chief, Microelectronics Branch	Michael A. Frye	93/10/15

15a. ACTIVITY ACCOMPLISHING REVISION	b. REVISION COMPLETED (Signature)	c. DATE SIGNED (YYMMDD)
DESC	Sandra B. Rooney	93/10/15

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add case 2 for vendor CAGE 06665 and vendor CAGE 24355. Change to Standardized Military Drawing CAGE code 67268. Add testing at temperature for dynamic and ac tests. Editorial changes throughout.	1990 JAN 30	

CURRENT CAGE CODE 67268

REV																											
SHEET																											
REV																											
SHEET																											
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																

PMIC N/A

STANDARDIZED MILITARY DRAWING

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

AMSC N/A

PREPARED BY: Joseph A. Kerby

CHECKED BY: Charles E. Besore

APPROVED BY:

DRAWING APPROVAL DATE: 1 JUNE 1987

REVISION LEVEL: A

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUITS, LINEAR, 8 BIT QUAD DIGITAL-TO-ANALOG CONVERTER, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	14933	5962-87802

SHEET 1 OF 10

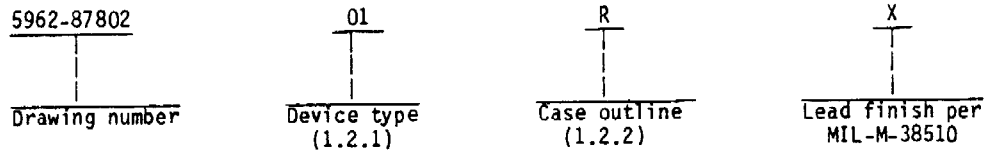
DESC FORM 193-1
SEP 87

U.S. GOVERNMENT PRINTING OFFICE: 1987 — 748-129/60912

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

Device type	Generic number	Circuit function
01	7226	Four 8-bit digital-to-analog converters with output amplifiers

1.2.2 Case outlines. The case outlines 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
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings. 1/

V_{DD} to AGND or DGND	-0.3 V dc to +17.0 V dc
V_{DD} to V_{SS}	-0.3 V dc to +24.0 V dc
AGND to DGND	-0.3 V dc to V_{DD}
Digital input voltage to DGND	-0.3 V dc to V_{DD}
V_{REF} to AGND	-0.3 V dc to V_{DD}
V_{OUT} to AGND 2/	V_{SS} to V_{DD}
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D)	500 mW 3/
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC}):	
Cases R and 2	See MIL-M-38510, appendix C
Junction temperature (T_J)	+150°C

1.4 Recommended operating conditions.

Power supply range (V_{DD})	+11.4 V dc to +16.5 V dc
Input reference voltages:	
Dual supply operation	+2.0 V dc to V_{DD}-4 V dc
Single supply operation	+10.0 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

1/ Unless otherwise specified all voltages are referenced to ground.
2/ Outputs may be shorted to AGND provided that the power dissipation of the package is not exceeded. Typically short circuit current to AGND is 60 mA.
3/ For temperatures above +75°C derate linearly at 2.0 mW/°C.

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 Drawing (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 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).

TABLE I-1. Electrical performance characteristics (dual supply).

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Limits Min	Limits Max	Unit
Supply current from V_{DD}	I_{DD}	Outputs unloaded; $V_{IN} = V_{INL}$ or V_{INH}	1, 2, 3		13.0	mA
Supply current from V_{SS}	I_{SS}	Outputs unloaded; $V_{IN} = V_{INL}$ or V_{INH}	1, 2, 3		11.0	mA
Reference voltage	V_{REF}		1, 2, 3	2.0	V_{DD} -4	V
Reference input resistance	R_I		1, 2, 3	2		kΩ
Reference input capacitance	C_{IN}	Each DAC loaded with all 0's see 4.3.1c	4	65		pF
		Each DAC loaded with all 1's see 4.3.1c			300	
Total unadjusted error		V_{DD} = +15 V ±5% V_{REF} = +10 V	1, 2, 3		±2	LSB
Relative accuracy			1, 2, 3		±1	
Differential nonlinearity		Guaranteed monotonic	1, 2, 3		±1	
Full scale error			1, 2, 3		±1.5	
Zero code error			1, 2, 3		±30	mV
Input high voltage	V_{INH}		1, 2, 3	2.4		V
Input low voltage	V_{INL}		1, 2, 3		0.8	V
Input leakage current	I_{Ikg}	V_{IN} = 0 V or V_{DD}	1, 2, 3		±1	µA
Functional tests		See 4.3.1d	7			
Voltage output slew rate 2/	SR		4, 5, 6	2.5		V/µs
Voltage output settling time (pos. full scale change) 2/	t_{tot}	Settling time to ±1/2 LSB V_{REF} = +10 V	4, 5, 6		5.0	µs
Voltage output settling time (neg. full scale change) 2/	t_{tot}	Settling time to ±1/2 LSB V_{REF} = +10 V	4, 5, 6		7.0	µs
Load resistance	R_O	V_{OUT} = +10 V	4	2.0		kΩ
Address to write setup time	t_{AS}		9, 10, 11	0.0		ns
Address to write hold time	t_{AH}		9, 10, 11	10.0		
Data valid to write setup time	t_{DS}		9	90		
			10, 11	100		
Data valid to write hold time	t_{DH}		9, 10, 11	10.0		
Write pulse width	t_{WR}		9	150		
			10, 11	250		

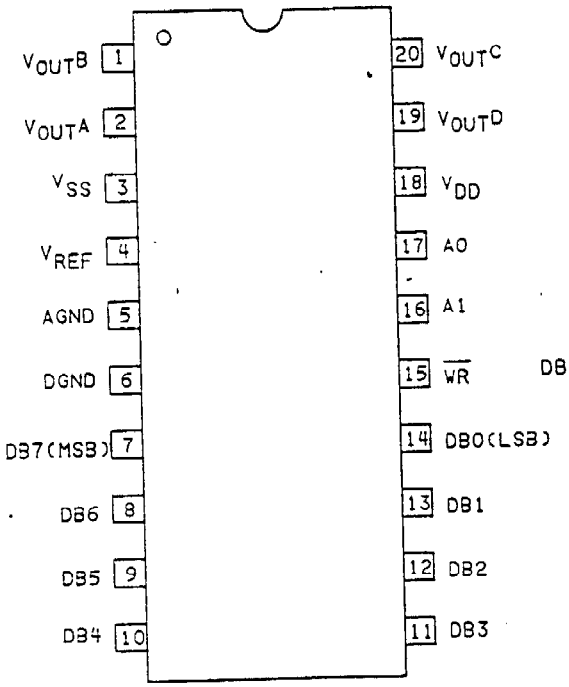
See footnotes at end of table.

TABLE I-2. Electrical performance characteristics (single supply).

Test	Symbol	Conditions 3/ $-55°C < T_A < +125°C$ unless otherwise specified	Group A subgroups	Limits Min	Limits Max	Unit
Supply current from V_{DD}	I_{DD}	Outputs unloaded; $V_{IN} = V_{INL}$ or V_{INH}	1, 2, 3		13.0	mA
Reference input resistance	R_I		1, 2, 3	2		kΩ
Reference input capacitance	C_{IN}	Each DAC loaded with all 0's see 4.3.1c	4	65		pF
		Each DAC loaded with all 1's see 4.3.1c			300	
Total unadjusted error			1, 2, 3		±2	LSB
Differential nonlinearity		Guaranteed monotonic	1, 2, 3		±1	
Input high voltage	V_{INH}		1, 2, 3	2.4		V
Input low voltage	V_{INL}		1, 2, 3		0.8	V
Input leakage current	I_{Ikg}	$V_{IN} = 0$ V or V_{DD}	1, 2, 3		±1	µA
Functional tests		See 4.3.1d	7			
Voltage output slew rate 2/	SR		4, 5, 6	2.0		V/µs
Voltage output settling time (pos. full scale change) 2/	t_{tot}	Settling time to ±1/2 LSB	4, 5, 6		5.0	µs
Voltage output settling time (neg. full scale change) 2/	t_{tot}	Settling time to ±1/2 LSB	4, 5, 6		20.0	µs
Load resistance	R_O	$V_{OUT} = +10$ V	4	2.0		kΩ
Address to write setup time	t_{AS}		9, 10, 11	0.0		ns
Address to write hold time	t_{AH}		9, 10, 11	10.0		
Data valid to write setup time	t_{DS}		9	90		
			10, 11	100		
Data valid to write hold time	t_{DH}		9, 10, 11	10.0		
Write pulse width	t_{WR}		9	150		
			10, 11	250		

1/ V_{DD} = 11.4 V to 16.5 V; V_{SS} = -5 V ±10%; AGND = DGND = 0.0 V; V_{REF} = 2 V to (V_{DD} - 4 V) (unless otherwise specified).
2/ Guaranteed if not tested to the limits specified.
3/ V_{DD} = +15 V ±5%; V_{SS} = AGND = DGND = 0.0 V; V_{REF} = +10 V (unless otherwise specified).

Case outline R



Case outline 2

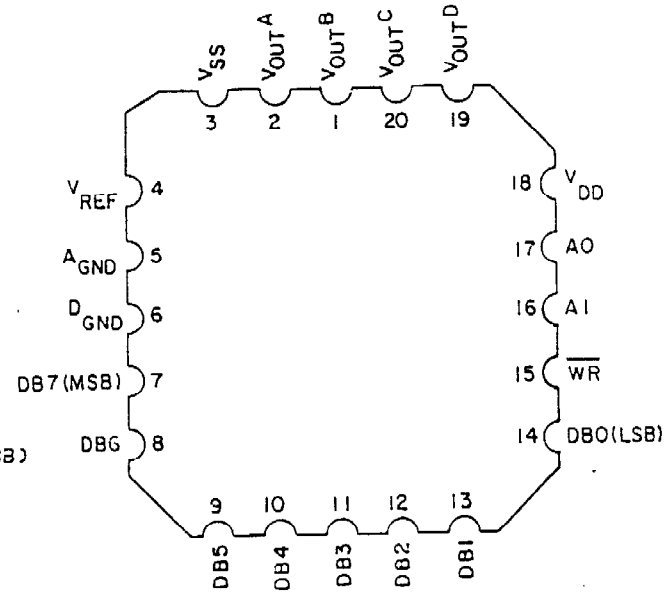


FIGURE 1. Terminal connections.

Control inputs WR	A1	A0	Operation
H	X	X	No operation device not selected
L	L	L	DAC A transparent
↑	L	L	DAC A latched
L	L	H	DAC B transparent
↑	L	H	DAC B latched
L	H	L	DAC C transparent
↑	H	L	DAC C latched
L	H	H	DAC D transparent
↑	H	H	DAC D latched

L = Low state, H = High state, X = Don't care

FIGURE 2. Truth table.

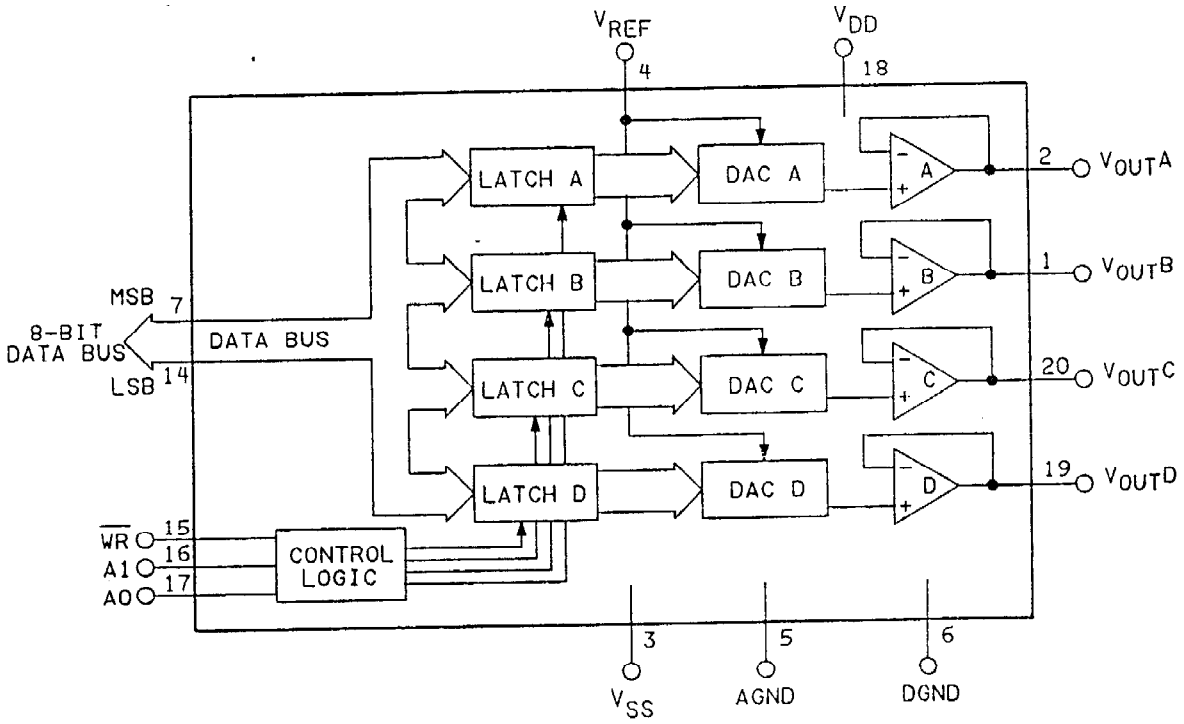


FIGURE 3. Functional block diagram.

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-ECC 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-ECC 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. Subgroup 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroup 4 (C_{IN} measurement) shall be measured only for the initial test and after process or design changes which may affect input capacitance.

d. Subgroup 7 tests shall verify the truth table on figure 2.

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, 4, 5, 6, 7, 9, 10, 11**
Groups C and D end-point electrical parameters (method 5005)	1

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

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.

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. 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-ECC, telephone (513) 296-6022.

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

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

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
5962-8780201RX	24355	AD7226TQ/883B
5962-8780201RX	06665	PM7226AR/883
5962-87802012X	24355	AD7226TE/883
5962-87802012X	06665	PM7226ARC/883

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
24355	Analog Devices Rt. 1 Industrial Park P.O. Box 9106 Norwood, MA 02062 Point of contact: 181 Ballardvale Street Wilmington, MA 01887-1024
06665	Precision Monolithics Inc. 1500 Space Park Drive P.O. Box 58020 Santa Clara, CA 95052-8020