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	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13			

PMIC N/A	PREPARED BY <i>Rick C. Offin</i>	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444
STANDARDIZED MILITARY DRAWING <small>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</small>	CHECKED BY <i>Charles Reising</i>	MICROCIRCUIT, LINEAR, DUAL 12-BIT, DOUBLE-BUFFERED MULTIPLYING CMOS, D/A CONVERTER, MONOLITHIC SILICON
	APPROVED BY <i>[Signature]</i>	
	DRAWING APPROVAL DATE 03 NOVEMBER 1989	
AMSC N/A	REVISION LEVEL	SIZE A
		CAGE CODE 67268
		5962-89672
		SHEET 1 OF 13

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SEP 87

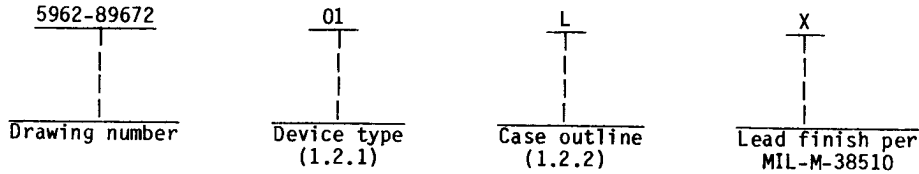
U.S. GOVERNMENT PRINTING OFFICE: 1987 - 748-129/60911
5962-E1515

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

Device type	Generic number	Circuit function
01	DAC-8222A	Dual 12-bit double-buffered multiplying CMOS D/A converter

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
L	D-9 (24-lead, 1.280" x .310" x .200"), dual-in-line package

1.3 Absolute maximum ratings.

V _{DD} to AGND	-----	0 V, +17 V
V _{DD} to DGND	-----	0 V, +17 V
AGND to DGND	-----	-0.3 V, V _{DD} +0.3 V
Digital input voltage to DGND	-----	-0.3 V, V _{DD} +0.3 V
I _{OUTA} , I _{OUTB} to AGND	-----	-0.3 V, V _{DD} +0.3 V
V _{REFA} , V _{REFB} to AGND	-----	±25 V
Voltage from R _{FBA} , R _{FBB} to AGND	-----	±25 V
Power dissipation (P _D) to +75°C	-----	500 mW 1/
Ambient operating temperature range (T _A)	-----	-55°C to +125°C
Dice junction temperature (T _J)	-----	+150°C
Storage temperature	-----	-65°C to +150°C
Lead temperature (soldering, 60 s)	-----	+300°C
Thermal resistance, junction-to-case (θ _{JC})	-----	See MIL-M-38510, appendix C
Thermal resistance, junction-to-ambient (θ _{JA})	-----	150°C/W

1.4 Recommended operating conditions.

Ambient operating temperature range (T _A)	-----	-55°C to +125°C
V _{REF}	-----	±10 V
V _{OUTA} , V _{OUTB}	-----	0 V
V _{DD}	-----	+5 V or +15 V

1/ Derate above 75°C at 6.6 mW/°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 diagram. The functional 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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C < T _A < +125°C V _{OUTA} = V _{OUTB} = 0 V V _{DD} = +5 V or +15 V V _{REF} = ±10 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Relative accuracy	INL		1, 2, 3		±1/2	LSB
Differential nonlinearity	DNL		1, 2, 3		±1	LSB
Gain error	G _{FSE}		1, 2, 3		±1	LSB
DC power supply rejection Delta Gain/Delta V _{DD} 1/	PSRR		1, 2, 3		0.002	%/%
Output leakage current I _{OUTA} , I _{OUTB} 2/	I _{LKG}		1		±10	nA
			2, 3		±50	
Input resistance	R _{IN}		1, 2, 3	8	15	kΩ
Input resistance match	Delta R _{REF}		1, 2, 3		±1.0	%
Digital input high	V _{IH}	V _{DD} = +5 V	1, 2, 3	2.4		V
		V _{DD} = +15 V		13.5		
Digital input low	V _{IL}	V _{DD} = +5 V	1, 2, 3		0.8	V
		V _{DD} = +15 V			1.5	
Input current	I _{IN}	V _{IN} = 0 V or V _{DD}	1		±1.0	μA
			2, 3		±10.0	
Supply current	I _{DD}	Digital inputs V _{INL} or V _{INH}	1, 2, 3		2.0	mA
		Digital inputs 0 V or V _{DD}			0.1	

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 V _{OUTA} = V _{OUTB} = 0 V V _{DD} = +5 V or +15 V V _{REF} = ±10 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Input capacitance	C _{IN}	Measuring at D ₈₀ - D _{B11} pins, see 4.3.1c	4		10	pF
		Measuring at <u>WR</u> , <u>LDAC</u> , <u>DACA/DACB</u> pins, see 4.3.1c			15	
Functional test		See 4.3.1d	7, 8			
DAC select to write setup time <u>3/</u>	t _{AS}	V _{DD} = +5 V	9	150		ns
		V _{DD} = +15 V		60		
		V _{DD} = +5 V	10, 11	210		
		V _{DD} = +15 V	<u>4/</u>	60		
DAC select to write hold time <u>3/</u> <u>4/</u>	t _{AH}		9, 10, 11	0		ns
LDAC to write setup time <u>3/</u>	t _{LS}	V _{DD} = +5 V	9	80		ns
		V _{DD} = +15 V		60		
		V _{DD} = +5 V	10, 11	120		
		V _{DD} = +15 V	<u>4/</u>	60		
LDAC to write hold time <u>3/</u>	t _{LH}		9	20		ns
			10, 11 ^{<u>4/</u>}	10		

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 V _{OUTA} = V _{OUTB} = 0 V V _{DD} = +5 V or +15 V V _{REF} = ±10 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Data valid to write setup time <u>3/</u>	t _{DS}	V _{DD} = +5 V	9	220		ns
		V _{DD} = +15 V		100		
		V _{DD} = +5 V	10, 11	260		
		V _{DD} = +15 V		<u>4/</u>	100	
Data valid to write hold time <u>3/ 4/</u>	t _{DH}	V _{DD} = +5 V	9, 10, 11	0		ns
		V _{DD} = +15 V		10		
Write pulse width <u>3/</u>	t _{WR}	V _{DD} = +5 V	9	130		ns
		V _{DD} = +15 V		90		
		V _{DD} = +5 V	10, 11	170		
		V _{DD} = +15 V		<u>4/</u>	90	
LDAC pulse width <u>3/</u>	t _{LWD}	V _{DD} = +5 V	9	100		ns
		V _{DD} = +15 V		60		
		V _{DD} = +5 V	10, 11	130		
		V _{DD} = +15 V		<u>4/</u>	60	

1/ Delta V_{DD} = ±5%.

2/ DAC loaded with 0000 0000 0000.

3/ See figure 4.

4/ Subgroups 10 and 11, if not tested shall be guaranteed to the limits specified in table I herein.

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Device type	01
Case outline	L
Terminal number	Terminal symbol
1	AGND
2	I _{OUTA}
3	R _{FBA}
4	V _{REFA}
5	DGND
6	D _{B11} (MSB)
7	D _{B10}
8	D _{B9}
9	D _{B8}
10	D _{B7}
11	D _{B6}
12	D _{B5}
13	D _{B4}
14	D _{B3}
15	D _{B2}
16	D _{B1}
17	D _{B0} (LSB)
18	DAC A/DAC B
19	LDAC
20	WR
21	V _{DD}
22	V _{REFB}
23	R _{FBB}
24	I _{OUTB}

FIGURE 1. Terminal connections.

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Digital inputs			DAC register status			
DAC A/B	WR	LDAC	DAC A		DAC B	
			Input latch	DAC latch	Input latch	DAC latch
L	L	L	WRITE	WRITE	LATCHED	WRITE
H	L	L	LATCHED	WRITE	WRITE	WRITE
L	L	H	WRITE	LATCHED	LATCHED	LATCHED
H	L	H	LATCHED	LATCHED	WRITE	LATCHED
X	H	L	LATCHED	WRITE	LATCHED	WRITE
X	H	H	LATCHED	LATCHED	LATCHED	LATCHED

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

FIGURE 2. Truth table.

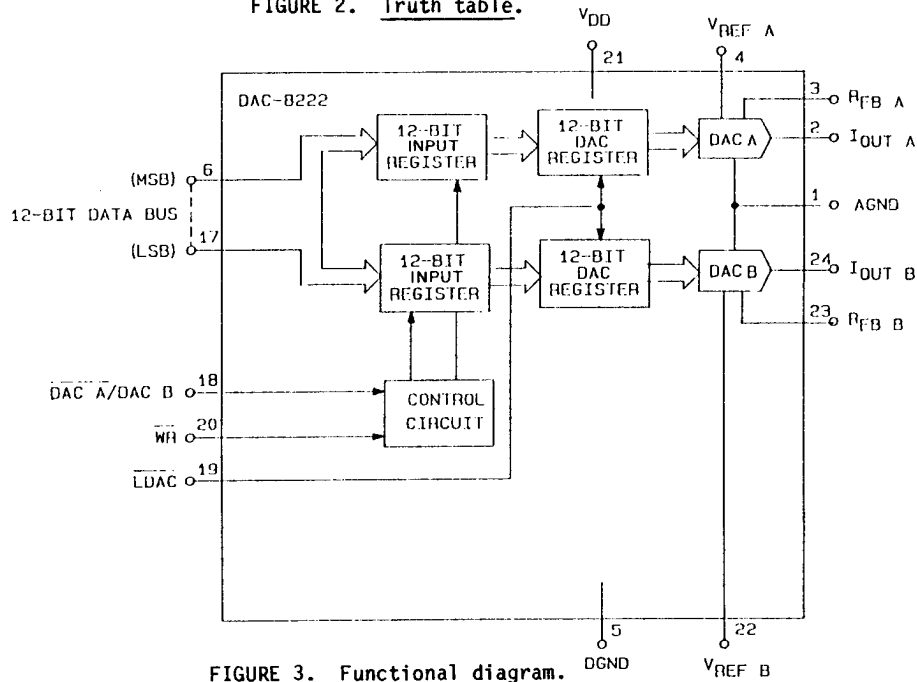


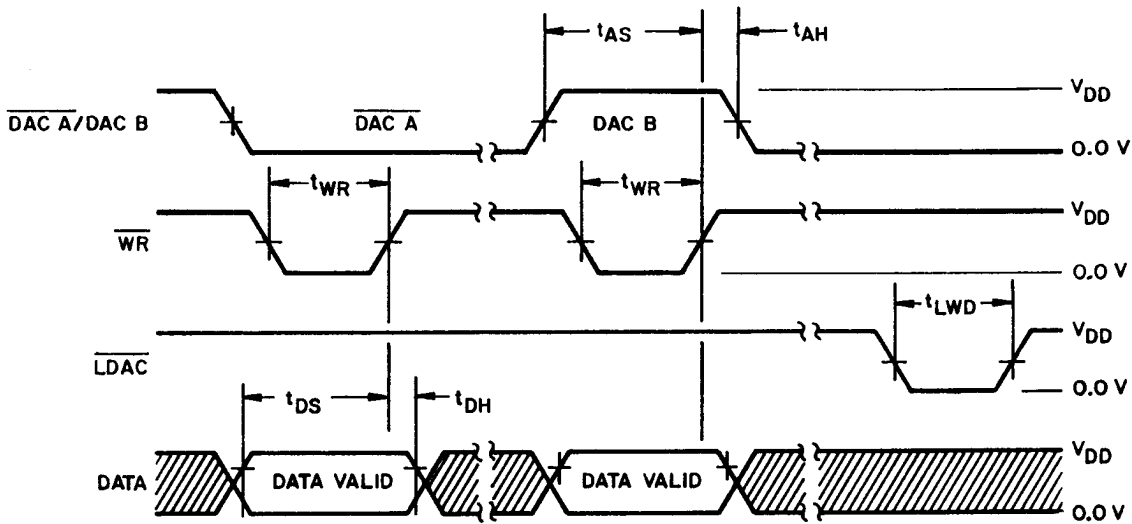
FIGURE 3. Functional diagram.

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THREE CYCLE UPDATE



NOTES:

1. All input signal rise and fall times measured from 10% to 90% of V_{DD}
 $V_{DD} = +5\text{ V}$, $t_r = t_f = 20\text{ ns}$;
 $V_{DD} = +15\text{ V}$, $t_r = t_f = 40\text{ ns}$.
2. Timing measurement reference level is $\frac{V_{IH} + V_{IL}}{2}$
3. Write setup (t_{AS}) and hold times (t_{AH}) also apply for DAC A.

FIGURE 4. Timing diagram.

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TWO CYCLE UPDATE

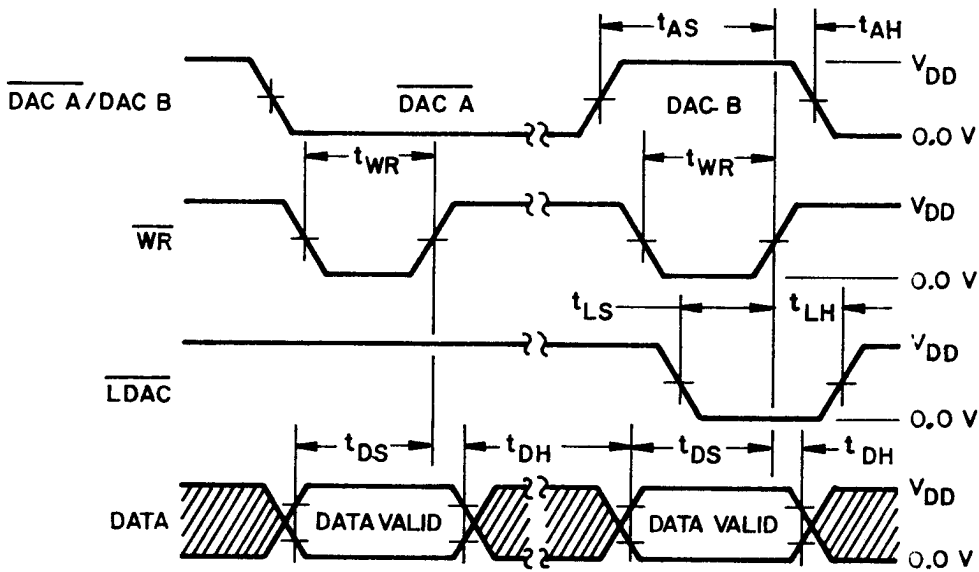


FIGURE 4. Timing diagram - Continued.

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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.

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.

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 5 and 6 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. Subgroups 7 and 8 shall include verification of the truth table.

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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, 7, 8
Group A test requirements (method 5005)	1, 2, 3, 4, 7, 8, 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 limits specified 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) $T_A = +125^{\circ}\text{C}$, 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).

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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 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/
5962-8967201LX	06665	DAC-8222AW/883C

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

06665

Vendor name and address

Precision Monolithics, Inc.
1500 Space Park Drive
Santa Clara, CA 95052

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