REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Correct dimension to case outline. Change table I I_{DD} and I_{EE} limits. Update format. Editorial changes throughout. Change to reflect MIL-H-38534 processing.	1990 JAN 8	William K. Zeckman

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

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: Mary Zaks

CHECKED BY: Donald R. Wallace

APPROVED BY: William K. Zeckman

DRAWING APPROVAL DATE: 2 FEBRUARY 1989

REVISION LEVEL: A

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, QUAD, 12-BIT D/A CONVERTER, HYBRID

SIZE	CAGE CODE	
A	67268	5962-88629

SHEET 1

DESC FORM 193
SEP 87

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5962-E1587

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B hybrid microcircuits to be processed in accordance with MIL-H-38534.

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

5962-88629	01	X	X
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-H-38534

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

Device type	Generic number	Circuit function
01	HS 9342	Quad, 12-bit 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
X	D-10 (28-lead, 1.490" x .620" x .232"), dual-in-line package

1.3 Absolute maximum ratings.

Positive supply voltage range (V_{DD})	-0.3 V dc to +18 V dc
Negative supply voltage range (V_{EE})	+0.3 V dc to -18 V dc
Input voltage, Bits 1 - 12, LBE, HBE, and $\overline{CE}_{1-4}$ (V_{IN})	-0.3 V dc to (V_{DD} + 0.3 V dc)
Reference input voltage ($V_{REF\ IN}$)	±20 V dc
Power dissipation (P_D)	1.8 W
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Junction temperature (T_J)	+150°C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-M-38510, appendix C
Thermal resistance, junction-to-ambient (θ_{JA})	30°C/W

1.4 Recommended operating conditions.

Positive supply voltage range (V_{DD})	+14.25 V dc to +15.75 V dc
Negative supply voltage range (V_{EE})	-14.25 V dc to -15.75 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

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2. APPLICABLE DOCUMENTS

2.1 Government specifications, standards, and bulletin. Unless otherwise specified, the following specifications, standards, 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.

SPECIFICATIONS

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.
MIL-H-38534 - Hybrid Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.
MIL-STD-1772 - Certification Requirements for Hybrid Microcircuit Facilities and Lines.

BULLETIN

MILITARY

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

(Copies of the specifications, standards, 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 MIL-H-38534 and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-H-38534 and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Block diagram. The block diagram shall be as specified on figure 2.

3.2.3 Truth table. The truth table shall be as specified on figure 3.

3.2.4 Case outline. The case outline shall be in accordance with MIL-M-38510 and 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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ V_{DD} = +15 V, V_{EE} = -15 V, unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Resolution			---	12		Bits
Input high voltage	V_{IH}	1/	1, 2, 3	2.4		V
Input low voltage	V_{IL}	1/	1, 2, 3		0.8	V
Input current	I_{IN}	$0 V \le V_{IN} \le V_{DD}$	1, 2, 3		4.0	µA
Input data set-up time	t_{su}	See figure 4 and 4.3.1d 2/	9, 10, 11	250		ns
Input data hold time	t_h	See figure 4 and 4.3.1d	9, 10, 11	0		ns
Input strobe widths ($\overline{CE}$, LBE, HBVE, and LDAC)	t_{PW}	See figure 4 and 4.3.1d 3/	9, 10, 11	250		ns
Reference input voltage range	$V_{REF\ IN}$		1, 2, 3		±10	V
Reference input impedance	Z_{IN}	T_A = +25°C	4	1.2	3.8	kΩ
Reference output voltage error	V_E	T_A = +25°C 4/	1		±5.0	mV
Reference output noise voltage	V_{ON}	Peak-to-peak wideband See 4.3.1d 4/	9, 10, 11		200	µV
Reference output voltage drift	$\frac{\Delta V_{REF}}{\Delta T}$	T_A = +125°C, -55°C 4/	2, 3		8.0	ppm/°C
Total available current	I_{MAX}	$I_{REF} + I_{EXT}$ 4/	1, 2, 3		20	mA

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_{DD} = +15 V, V_{EE} = -15 V, unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Current available for external use	I_{EXT}		1, 2, 3		12	mA
Integral linearity error	LE	T_A = +25°C 5/	1		±0.5	LSB
Integral linearity error drift	$\frac{\Delta LE}{\Delta T}$	T_A = +125°C, -55°C	2, 3	1.0		ppm/°C
Differential linearity error	DLE	Deviation of an output step from the theoretical value of 1LSB for any two adjacent digital input codes. T_A = +25°C	1		±1.0	LSB
Differential linearity error drift	$\frac{\Delta DLE}{\Delta T}$	T_A = +125°C, -55°C	2, 3		1.0	ppm/°C
Bipolar zero error	BZE	Digital input code = 100000000000 T_A = +25°C	1		±2.0	LSB
Bipolar zero error drift	$\frac{\Delta BZE}{\Delta T}$	T_A = +125°C, -55°C	2, 3		5.0	ppm/°C
Gain error	AE	Calculated: All 1's - All 0's -Theoretical value T_A = +25°C	1		±4.0	LSB
Gain error drift	$\frac{\Delta AE}{\Delta T}$	T_A = +125°C, -55°C	2, 3		15	ppm/°C
Settling time to 0.012%	t_S	Small signal, see figure 4 and 4.3.1d	9, 10, 11		2.0	µs
		Full scale, see figure 4 and 4.3.1d	9, 10, 11		5.0	µs
Slew rate	SR	T_A = +25°C	4	8.0		V/µs

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C < T_A < +125°C$ V_{DD} = +15 V, V_{EE} = -15 V, unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
LDAC to output change	t_{LO}	See figure 4 and 4.3.1d	9, 10, 11		300	ns
Positive supply current	I_{DD}	V_{DD} = +15 V ±5.0% 6/	1, 2, 3		35	mA
		V_{DD} = +15 V ±5.0% 7/	1, 2, 3		35	mA
Negative supply current	I_{EE}	V_{EE} = -15V ±5.0% 6/	1, 2, 3		35	mA
		V_{EE} = -15 V ±5.0% 7/	1, 2, 3		35	mA
Functional tests		See 4.3.1c	7, 8			

1/ Digital inputs must never exceed V_{DD} or go below -0.3 V.
2/ Data must be stable before strobe (HBE, LBE, and LDAC) goes to 0.
3/ All strobes ($\overline{CE}$, LBE, HBE, and LDAC) are level triggered.
4/ Measured with REF OUT connected to REF IN.
5/ Integral linearity, for this product, is measured as the arithmetic mean value of the magnitudes of the greatest positive deviation and the greatest negative deviation from the theoretical value of any combination.
6/ Utilizing internal voltage reference.
7/ Applying external voltage reference to REF IN.

3.5 Marking. Marking shall be in accordance with MIL-H-38534. 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 Manufacturer's eligibility. As a minimum the manufacturer listed herein shall be certified to section A of MIL-STD-1772. In addition to the general requirements of MIL-H-38534, the manufacturer of the part described herein shall submit for DESC-ECC review and approval, electrical test data (variables format) on 22 devices from the initial QCI group A lot sample, produced on the certified line, for each device type listed herein. The data should also include a summary of all parameters manually tested, and for those which, if any, are guaranteed.

3.7 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-H-38534 and the requirements herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-H-38534 shall be provided with each lot of microcircuits delivered to this drawing.

Device type	01
Case outline	X
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	$\overline{CE}_1$
14	$\overline{CE}_2$
15	$\overline{CE}_3$
16	$\overline{CE}_4$
17	HBE
18	LBE
19	V_{DD} (+15 V)
20	V_{EE} (-15 V)
21	Ground
22	REF IN
23	REF OUT
24	V_{OUT1}
25	V_{OUT2}
26	V_{OUT3}
27	V_{OUT4}
28	LDAC

FIGURE 1. Terminal connections.

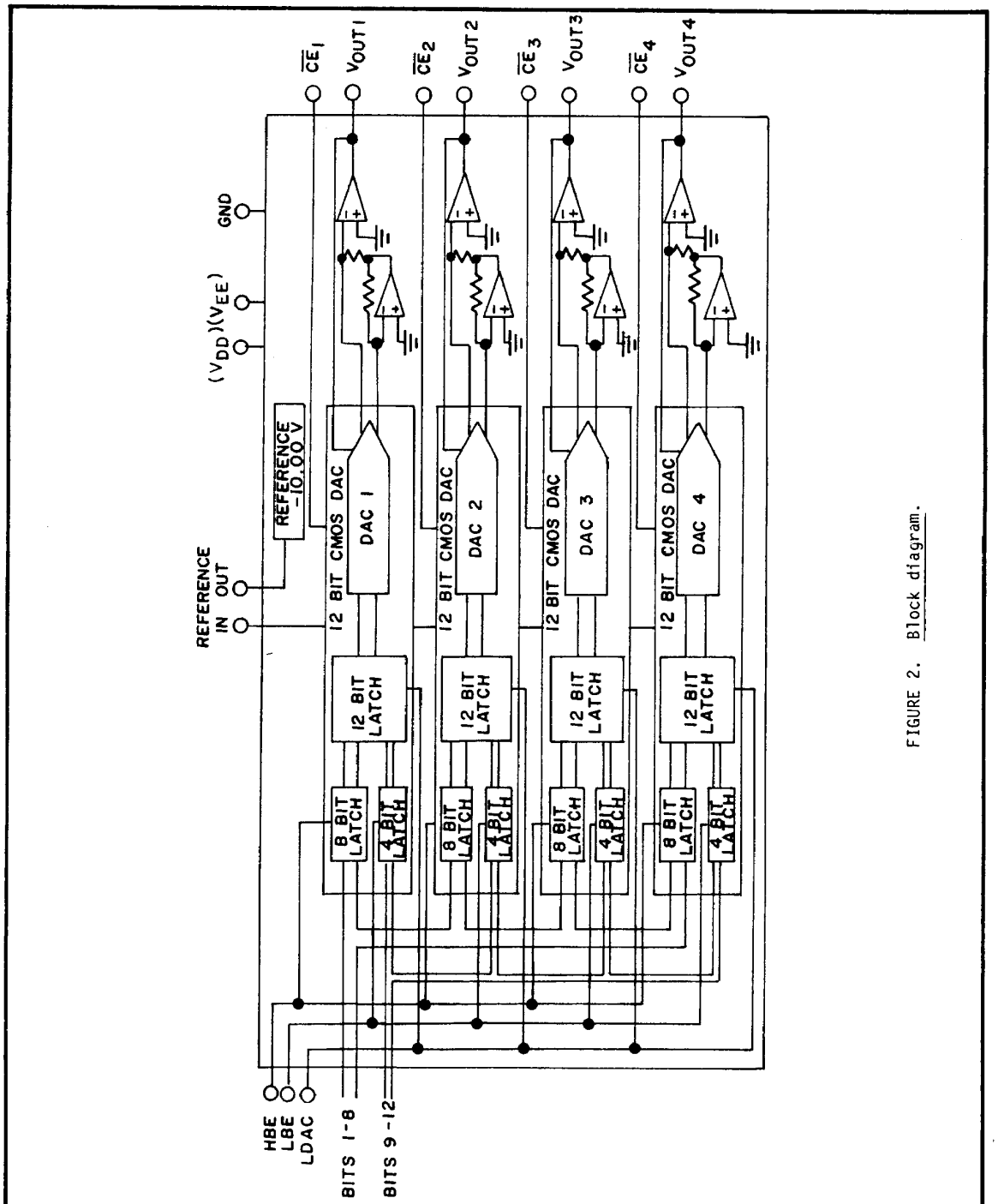

FIGURE 2. Block diagram.

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		REVISION LEVEL A	SHEET 8

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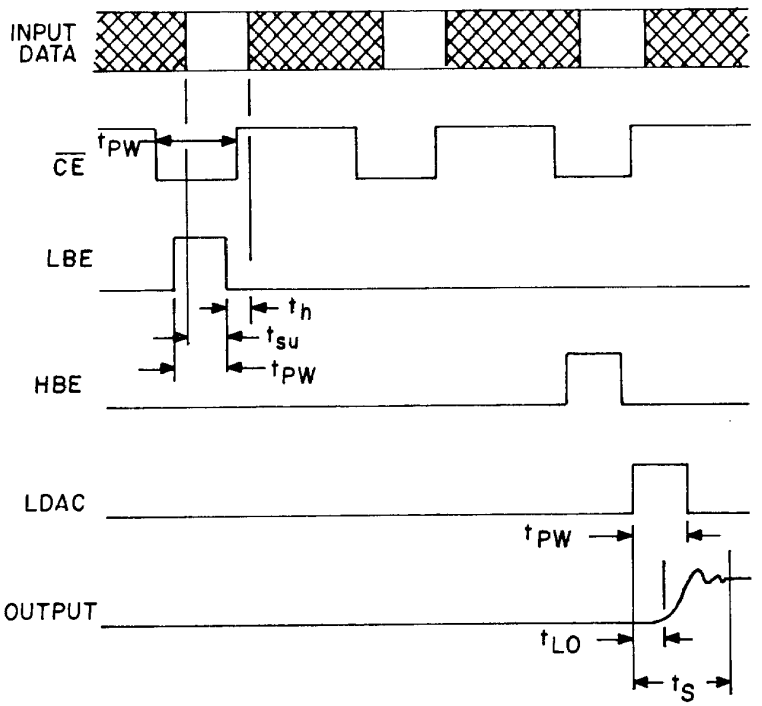
$\overline{CE}_1$	$\overline{CE}_2$	$\overline{CE}_3$	$\overline{CE}_4$	HBE	LBE	LDAC	Description
0	1	1	1	1	1	0	Enables 1st rank of DAC1
1	0	1	1	1	1	0	Enables 1st rank of DAC2
1	1	0	1	1	1	0	Enables 1st rank of DAC3
1	1	1	0	1	1	0	Enables 1st rank of DAC4
X	X	X	X	X	X	1	Load DAC's 1 - 4 secondary register from primary registers

0 = Logic low level
1 = Logic high level
X = Don't care

Strobe logic:

Strobe 0 = Data latched (held)
Strobe 1 = Data changing (transfer)

FIGURE 3. Truth table.



NOTE: Minimum common active time for $\overline{CE}$ and any byte enable is 250 ns.

FIGURE 4. Timing diagram.

3.9 Notification of change. Notification of change to DESC-ECC shall be required in accordance with MIL-H-38534.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-H-38534 and method 5008 of MIL-STD-883.

4.2 Screening. Screening shall be in accordance with method 5008 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 3.7 herein).

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

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 MIL-H-38534 and as specified herein. Inspections to be performed shall be those specified in method 5008 and herein for groups A, B, C, and D inspections (see 4.3.1 through 4.3.4).

4.3.1 Group A inspection. Group A inspection shall be in accordance with table X of method 5008 of MIL-STD-883 and as follows:

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

b. Subgroups 5 and 6 in table X, method 5008 of MIL-STD-883 shall be omitted.

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

d. Subgroups 10 and 11 shall be tested for initial device characterization and after design and process changes. Subgroups 10 and 11 shall be guaranteed to the limits specified in table I for all lots not specifically tested.

4.3.2 Group B inspection. Group B inspection shall be in accordance with table XI of method 5008 of MIL-STD-883.

4.3.3 Groups C inspection. Group C inspection shall be in accordance with table XII of method 5008 of MIL-STD-883 and as follows:

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 3.7 herein).

(2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.

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

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5008, group A test table)
Interim electrical parameters	1
Final electrical test parameters	1*,2,3,4,7,9
Group A test requirements	1,2,3,4,7,8,9, 10**,11**
Groups C end-point electrical parameters	1,2,3,4,9

* PDA applies to subgroups 1.
** See 4.3.1d.

4.3.4 Group D inspection. Group D inspection shall be in accordance with table XIII of method 5008 of MIL-STD-883.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-H-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for original equipment design applications and logistic support of existing equipment.

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) 296-8527.

6.5 Comments. Comments on this drawing should be directed to DESC-ECC, Dayton, Ohio 45444, or telephone (513) 296-8525.

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 3.7 herein) has been submitted to and accepted by DESC-ECC. 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/
5962-8862901XX	33256	HS 9342B

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

Vendor CAGE number	Vendor name and address
33256	Sipex Corporation Hybrid Systems Division 22 Linnell Circle Billerica, MA 01821