REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

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

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: Donald R. Osborne

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APPROVED BY: William K. Hackman

DRAWING APPROVAL DATE: 29 MARCH 1990

REVISION LEVEL:

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, 16-BIT, HIGH SPEED A/D CONVERTER, HYBRID

SIZE	CAGE CODE	5962-89569
A	67268	

SHEET 1

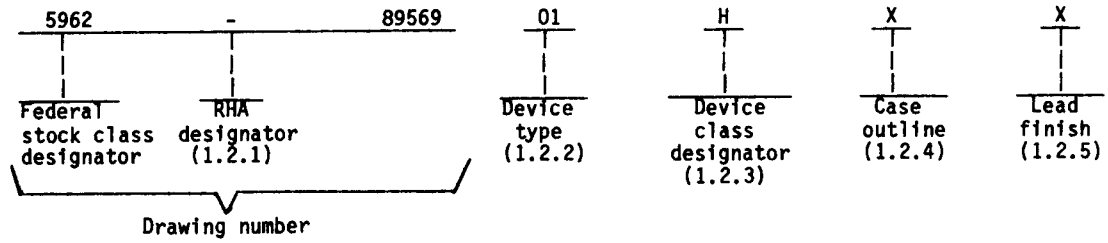
DESC FORM 193
SEP 87

* U.S. GOVERNMENT PRINTING OFFICE: 1987 — 748-129/60911

1. SCOPE

1.1 Scope. This drawing forms a part of a one part - one part number documentation system (see 6.6). This drawing describes device requirements for hybrid microcircuits to be processed in accordance with MIL-H-38534. Two product assurance classes, military high reliability (device class H) and space application (device class K) and a choice of case outline and lead finish are available and are reflected in the complete part number. When available, a choice of radiation hardness assurance levels are reflected in the complete part number.

1.2 Part or Identifying Number (PIN). PIN shall be as shown in the following example:



1.2.1 Radiation hardness assurance (RHA) designator. Device class H or K RHA marked devices shall meet the MIL-H-38534 specified RHA levels and shall be marked with the appropriate RHA designator. A dash (-) indicates a non RHA device.

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

Device type	Generic number	Circuit function
01	MN5295	16-bit A/D converter

1.2.3 Device class designator. The device class designator shall be a single letter identifying the product assurance level (see 6.7 herein) as follows:

Device class	Device requirements documentation
H or K	Certification and qualification to MIL-H-38534

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

Outline letter	Case outline
X	See figure 1 (32-lead, .81" x 1.73" x .172"), hybrid package

1.2.5 Lead finish. The lead finish shall be as specified in MIL-H-38534 for class H or K. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finish A, B, or C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings. 1/

Positive supply voltage (V_{CC})	-0.5 V dc to +18 V dc
Negative supply voltage (V_{EE})	+0.5 V dc to -18 V dc
Logic supply voltage (V_{DD})	0 V dc to +7 V dc
Analog input channels	±22 V dc
Digital input	0 V dc to +5.5 V dc
Power dissipation (P_D)	1.20 W
Thermal resistance (θ_{JC})	5°C/W
Thermal resistance (θ_{JA})	28°C/W
Lead temperature (soldering, 10 seconds)	300°C
Storage temperature range	-65°C to +150°C
Junction temperature (T_J)	+175°C

1.4 Recommended operating conditions.

Postive supply voltage range (V_{CC})	+14.55 V dc to +15.45 V dc
Negative supply voltage range (V_{EE})	-14.55 V dc to -15.45 V dc
Logic supply voltage range (V_{DD})	+4.75 V dc to +5.25 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government specifications, standards, bulletin, and handbook. 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.

STANDARDS

MILITARY

MIL-STD-480 - Configuration Control-Engineering Changes, Deviations and Waivers.
MIL-STD-883 - Test Methods and Procedures for Microelectronics.

BULLETIN

MILITARY

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

HANDBOOK

MILITARY

MIL-HDBK-780 - Military Drawings.

(Copies of the specifications, standards, and bulletin, and handbook required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

1/ Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.

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 Case outline. The case outline shall be in accordance with 1.2.4 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

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-H-38534. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in QML-38534.

3.6 Manufacturer eligibility. 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 quality conformance inspection 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 supply to this drawing. The certificate of compliance submitted to DESC-ECC 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.

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 MIL-H-38534 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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Analog						
Input voltage range	V_I	Unipolar and bipolar	1, 2, 3	0	+5	V
				0	+10	
				0	+20	
				-2.5	+2.5	
				-5	+5	
				-10	+10	
Digital						
Input voltage high	V_{IH}	For all digital inputs	1, 2, 3	+2.0		V
Input voltage low	V_{IL}	For all digital inputs	1, 2, 3		+0.8	
Input current high	I_{IH}	For all digital inputs V_{IH} = +2.4 V	1, 2, 3		+40	µA
Input current low	I_{IL}	For all digital inputs V_{IL} = +0.4 V	1, 2, 3		-1.6	mA
Output voltage high	V_{OH}	I_{OH} = -320 µA	1, 2, 3	+2.4		V
Output voltage low	V_{OL}	I_{OL} = +3.2 mA	1, 2, 3		+0.4	
Power supply						
Supply current	I_{CC}	V_{CC} = +15 V	1, 2, 3		+42	mA
	I_{EE}	V_{EE} = -15 V	1, 2, 3		-32	
	I_{DD}	V_{DD} = +5 V	1, 2, 3		+18	
Power consumption	P_D		1, 2, 3		1200	mW

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Limits Min	Limits Max	Unit
Power supply						
Power supply rejection ratio	PSRR	$+14.5\ V \le +V_{CC} \le +15.5\ V$	1, 2, 3		±0.02	%FS%Vs
		$-15.5\ V \le -V_{CC} \le -14.5\ V$	1, 2, 3		±0.02	
		$+4.75\ V \le V_{DD} \le +5.25\ V$	1, 2, 3		±0.01	
Accuracy 2/						
Unipolar 10 V	V_{+FS}	MSB LSB 1111 1111 1* Nominal (+9.9991)	4	+9.9841	10.0141	V
			5, 6	+9.9691	10.0291	
Bipolar 10 V	V_{+FS}	MSB LSB 1111 1111 1* Nominal (+4.9991)	4	+4.9791	+5.0191	
			5, 6	+4.9591	+5.0391	
Bipolar 20 V	V_{+FS}	MSB LSB 1111 1111 1* Nominal (+9.9982)	4	+9.9582	10.0382	
			5, 6	+9.9182	10.0782	
Unipolar 10 V offset	V_{UO}	MSB LSB 0000 0000 0000 0* Nominal +0.0003	4	-0.0097	+0.0103	V
			5, 6	-0.0147	+0.0153	
Bipolar 10 V zero	V_{BZ1}	MSB LSB **** **** **** ** Nominal -0.0003	4	-0.0123	+0.0117	V
			5, 6	-0.0203	+0.0197	
Bipolar 20 V zero	V_{BZ2}	MSB LSB **** **** **** ** Nominal -0.0006	4	-0.0246	+0.0234	
			5, 6	-0.0406	+0.0394	
Bipolar zero drift	$\frac{\Delta V_{BZ}}{\Delta T}$		5, 6		±15	ppmFSR / °C
Unipolar offset drift	$\frac{\Delta U_O}{\Delta T}$		5, 6		±15	ppmFSR / °C

See footnotes at end of table.

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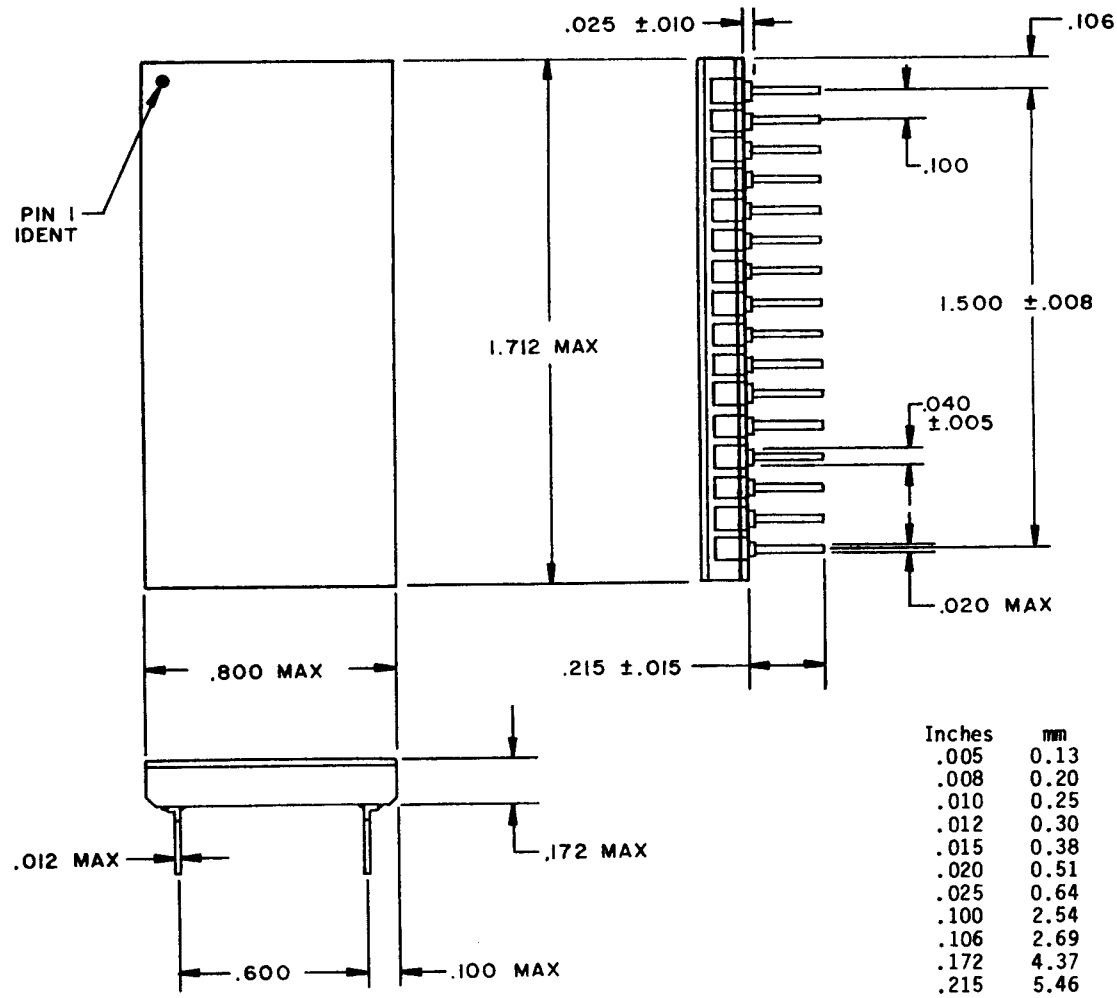
TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C < T_A < +125°C$ unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Accuracy						
Gain error	A_e		4		±0.1	%
			5, 6		±0.2	
Gain drift	$\frac{\Delta A_e}{\Delta T}$		4, 5, 6		±15	ppm/°C
Integral linearity error	LE	14-bit linearity	4	-0.5	+0.5	LSB
			5, 6	-1.0	+1.0	
Differential linearity error	DLE	14-bit linearity	4	-0.5	+0.5	LSB
			5, 6	-1.0	+1.0	
Minimum resolution for no missing codes			4, 5, 6	14		Bits
Reference voltage	V_{REF}		4	+9.990	+10.010	V
Conversion time	t_c		9		17	µs

1/ V_{CC} = +15 V, V_{EE} = -15 V, V_{DD} = +5.0 V, unless otherwise specified.

2/ * The output will transisition from a "1" to "0" or vice-versa as the analog input passes through the voltages listed in limit columns.



Inches	mm
.005	0.13
.008	0.20
.010	0.25
.012	0.30
.015	0.38
.020	0.51
.025	0.64
.100	2.54
.106	2.69
.172	4.37
.215	5.46
.600	15.24
.800	20.32
1.500	38.10
1.712	43.48

NOTES:
1. Dimensions are in inches.
2. Metric dimensions are given for general information only.
3. All dimensions ±.005 inch (0.13 mm), unless otherwise specified.

FIGURE 1. Case outline.

Device type	01	Device type	01
Terminal number		Terminal number	
1	Status (E.O.C.)	17	Bit 6
2	Clock output	18	Bit 5
3	Bit 13	19	Bit 4
4	Bit 14	20	Bit 3
5	Bit 15	21	Bit 2
6	Bit 16 (LSB)	22	Bit 1 (MSB)
7	Bipolar offset	23	V_{EE}
8	10 V input range	24	Reference output
9	20 V input range	25	Gain adjust
10	Serial output	26	Ground
11	Bit 12	27	V_{CC}
12	Bit 11	28	Summing junction
13	Bit 10	29	V_{DD}
14	Bit 9	30	Start convert
15	Bit 8	31	Ground
16	Bit 7	32	Short cycle

FIGURE 2. Terminal connections.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5008, group A test table)
Interim electrical parameters	---
Final electrical test parameters	1*,2,3,4,5,6, 9,10,11
Group A test requirements	1,2,3,4,5,6, 9,10,11
Group C end-point electrical parameters	1, 2, 3
MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Group E end-point electrical parameters	

* PDA applies to subgroup 1.

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 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.3.1 through 4.3.5).

4.3.1 Group A inspection. Group A inspection shall be in accordance with MIL-H-38534 and as follows:

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

b. Subgroups 7 and 8 in table X, method 5008 of MIL-STD-883 shall be omitted.

4.3.2 Group B inspection. Group B inspection shall be in accordance with MIL-H-38534.

4.3.3 Group C inspection. Group C inspection shall be in accordance with MIL-H-38534 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.

4.3.4 Group D inspection. Group D inspection shall be in accordance with MIL-H-38534.

4.3.5 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein). RHA levels for device class H or K shall be M, D, R, and H. RHA quality conformance inspection sample tests shall be performed at the level specified in the aquisition document.

a. RHA tests for device class H or K for levels M, D, R, and H shall be performed through each level to determine at what levels the devices meet the RHA requirements. These RHA tests shall be performed for initial qualification and after design or process changes which may affect the RHA performance of the device.

b. End-point electrical parameters shall be as specified in table II herein.

c. Prior to total dose irradiation, each selected sample shall be assembled in its qualified package. It shall pass the specified group A electrical parameters in table I for subgroups specified in table II herein.

d. For device class H or K the devices shall be subjected to radiation hardness assured tests as specified in MIL-H-38534 for RHA level being tested, and meet the post irradiation end-point electrical parameter limits as defined in table I at T_A = 25°C ±5 percent, after exposure.

e. Prior to and during total dose irradiation testing, the devices shall be biased to establish a worst case condition as specified in the radiation exposure circuit.

(1) Inputs tested high, V_{CC} = volts dc, R_{CC} = Ω +5%, V_{IN} = volts dc, R_{IN} = Ω +20%, and all outputs are open.

(2) Inputs tested low V_{CC} = volts dc, R_{CC} = Ω +5%, V_{IN} = 0.0 V dc, and all outputs are open.

f. For device class H or K, subgroups 1 and 2 in table V, method 5005 of MIL-STD-883 shall be tested as appropriate for device construction.

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 microelectronic 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 One part - one part number system. The one part - one part number system described below has been developed to allow for transitions between identical generic devices covered by the four major microcircuit requirements documents (MIL-M-38510, MIL-H-38534, MIL-I-38535, and 1.2.1 of MIL-STD-883) without the necessity for the generation of unique part numbers. The four military requirements documents represent different class levels, and previously when a device manufacturer upgraded military product from one class level to another, the benefits of the upgraded product were unavailable to the Original Equipment Manufacturer (OEM), that was contractually locked into the original unique part number. By establishing a one part number system covering all four documents, the OEM can procure to the highest class level available for a given generic device to meet system needs without modifying the original contract parts selection criteria.

Military documentation format	Example PIN under new system	Manufacturing source listing	Document listing
New MIL-M-38510 Military Detail Specifications (in the SMD format)	5962-XXXXXZZ(B or S)YY	QPL-38510 (Part 1 or 2)	MIL-BUL-103
New MIL-H-38534 Standardized Military Drawings	5962-XXXXXZZ(H or K)YY	QML-38534	MIL-BUL-103
New MIL-I-38535 Standardized Military Drawings	5962-XXXXXZZ(Q or V)YY	QML-38535	MIL-BUL-103
New 1.2.1 of MIL-STD-883 Standardized Military Drawings	5962-XXXXXZZ(M)YY	MIL-BUL-103	MIL-BUL-103

6.7 Sources of supply for device class H or K. Sources of supply for device class H or K are listed in QML-38534. The vendors listed in QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DESC-ECC and have agreed to this drawing.

STANDARDIZED MILITARY DRAWING SOURCE APPROVAL BULLETIN

DATE: 29 MARCH 1990

An approved source of supply for SMD 5962-89569 is listed below for immediate procurement only and shall be added to QML-38534 during the next revision. QML-38534 will be revised to include the addition or deletion of sources. The vendor listed below has agreed to this drawing and a certificate of compliance has been submitted to and accepted by DESC-ECC. This bulletin is superseded by the next dated revision of QML-38534.

Standardized Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
5962-8956901HXX	50507	5295H/B

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
50507	Unitrode, Micro Networks Division 324 Clark Street Worchester, MA 01606

The information contained herein is disseminated for convenience only and the Government assumes no liability whatsoever for any inaccuracies in this information bulletin.