

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add device type 03. Make changes to 1.2.1, 1.2.2, TABLE I, and FIGURE 1.	95-01-13	M. A. FRYE

REV																				
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REV STATUS OF SHEETS	REV	A	A	A	A	A	A	A	A	A										
	SHEET	1	2	3	4	5	6	7	8											

PMIC N/A	PREPARED BY RICK C. OFFICER	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444		
<p align="center">STANDARD MICROCIRCUIT DRAWING</p> <p>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</p> <p>AMSC N/A</p>	CHECKED BY CHARLES E. BESORE			MICROCIRCUIT, LINEAR, QUAD, MATCHED, OPERATIONAL AMPLIFIER, MONOLITHIC SILICON
	APPROVED BY MICHAEL A. FRYE			
	DRAWING APPROVAL DATE 89-10-31	SIZE A	CAGE CODE 67268			5962-89801
	REVISION LEVEL A	SHEET 1 OF 8		

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 or Identifying Number (PIN). The complete PIN 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 function</u>
01	OP-11A	Quad, matched operational amplifier
02	OP-11B	Quad, matched operational amplifier
03	OP-11A	Quad, matched operational amplifier (without noise testing)

1.2.2 Case outline(s). The case outline(s) shall be as designated in MIL-STD-1835 and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line
2	CQCC1-N20	20	Square leadless chip carrier

1.2.3 Lead finish. The lead finish shall be as specified in MIL-STD-883 (see 3.1 herein). Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings.

Positive supply voltage (+V _S)	.....	+22 V dc
Negative supply voltage (-V _S)	.....	-22 V dc
Differential input voltage	.....	±30 V dc
Input voltage (V _{IN})	.....	Supply voltage
Output short circuit duration	.....	Continuous
Power dissipation (P _D):		
Case C	.....	800 mW
Case 2	.....	800 mW
Storage temperature range	.....	-65°C to +150°C
Junction temperature (T _J)	.....	+150°C
Lead temperature (soldering, 10 seconds)	.....	+300°C
Thermal resistance, junction-to-case (Θ _{JC})	.....	See MIL-STD-1835
Thermal resistance, junction-to-ambient (Θ _{JA}):		
Case C	.....	91°C/W
Case 2	.....	110°C/W

1.4 Recommended operating conditions.

Positive supply voltage (+V _S)	.....	+15 V dc
Negative supply voltage (-V _S)	-15 V dc
Ambient operational temperature range (T _A)	-55°C to +125°C

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2. APPLICABLE DOCUMENTS

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

SPECIFICATION

MILITARY

MIL-I-38535 - Integrated Circuits (Microcircuits) Manufacturing, General Specification for.

STANDARDS

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.
MIL-STD-1835 - Microcircuit Case Outlines.

BULLETIN

MILITARY

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

(Copies of the specification, 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 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. Product built to this drawing that is produced by a Qualified Manufacturer Listing (QML) certified and qualified manufacturer or a manufacturer who has been granted transitional certification to MIL-I-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-I-38535. This QML flow as documented in the Quality Management (QM) plan may make modifications to the requirements herein. These modifications shall not affect form, fit, or function of the device. These modifications shall not affect the PIN as described herein. A "Q" or "QML" certification mark in accordance with MIL-I-38535 is required to identify when the QML flow option is used.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-STD-883 (see 3.1 herein) and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein.

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

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 ^{1/} -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits ^{2/}		Unit
					Min	Max	
Input offset voltage	V _{OS}	R _S = 50 Ω, 10 kΩ	1	01,03		±.5	mV
			2,3			±1.0	
			1	02		±2.5	
			2,3			±3.5	
Input offset current	I _{OS}		1	01,03		±20	nA
			2,3			±40	
			1	02		±50	
			2,3			±80	
Input bias current	I _{IB}		1	01,03		±300	nA
			2,3			±375	
			1	02		±500	
			2,3			±650	
Common mode rejection ratio	CMRR	V _{CM} = ±12 V, R _S = 50 Ω and 10 kΩ, V _{CM} = I _{VR} = ±12 V ^{3/}	1,2,3	ALL	100		dB
Power supply rejection	PSRR	V _S = ±5 V, ±15 V R _S = 50 Ω and 10 kΩ	1,2,3	ALL		32	μV/V
Input offset voltage match	Delta V _{OS}		1	01,03		0.75	mV
			2,3			1.0	
			1	02		2.0	
			2,3			2.5	
Common-mode rejection match	Delta CMR	V _{CM} = I _{VR} = ±12 V	1,2,3	ALL	94		dB
Differential input resistance ^{4/ 5/}	R _{IN}		1	01,03	173		kΩ
				02	100		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/</u> $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified	Group A subgroups	Device type	Limits <u>2/</u>		Unit
					Min	Max	
Large signal voltage gain	A_{VOL}	$V_{OUT} = \pm 10 \text{ V},$ $R_L = 2 \text{ k}\Omega$	4	ALL	100		V/mV
			5,6		50		
Output voltage swing	V_{OUT}	$R_L = 2 \text{ k}\Omega$	4,5,6	ALL	+11		V
Output resistance <u>4/</u>	R_{OUT}	$T_A = +25^{\circ}\text{C}$	4	01,02		150	Ω
Quiescent power <u>4/ 6/</u> consumption	P_C	$V_{OUT} = 0 \text{ V}, I_{OUT} = 0 \text{ mA}$	4	ALL		180	mW
			5,6		200		
Channel separation	CS	$T_A = +25^{\circ}\text{C}$	4	ALL	100		dB
Input noise voltage	Ent	$f_O = 0.1 \text{ to } 10 \text{ Hz}$	7	01,02		2.8	$\mu\text{Vp-p}$
Slew rate	SR+	AVCL = +1	7,8 <u>4/</u>	ALL	.7		V/ μs
	SR-				1.0		
Overshoot	OS	$T_A = +25^{\circ}\text{C}$	9	ALL		25	%
Rise time	t_r	AVCL = +1, $V_{IN} = 50 \text{ mV}$ $T_A = +25^{\circ}\text{C}$	9	ALL		145	ns

1/ Unless otherwise specified, $\pm V_S = \pm 15 \text{ V}$, $R_S = 50 \Omega$, and $V_{CM} = 0 \text{ V}$.

2/ The limiting terms "min" (minimum) and "max" (maximum) shall be considered to apply to magnitudes only. Negative current shall be defined as conventional current flow out of a device terminal.

3/ IVR is defined as the V_{CM} range used for the CMRR test.

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

5/ R_{IN} is derived from I_B by the relationship: $R_{IN} = 2kT/qI_B$, where $kT/q = .026 \text{ V}$ at $+25^{\circ}\text{C}$.

6/ Quiescent power consumption based on quiescent power supply current test maximum (no load on outputs).

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Device types	01, 02, and 03	
Case outlines	C	2
Terminal number	Terminal symbol	
1	OUTPUT 1	NC
2	-INPUT 1	OUTPUT 1
3	+INPUT 1	-INPUT 1
4	+V _S	+INPUT 1
5	+INPUT 2	NC
6	-INPUT 2	+V _S
7	OUTPUT 2	NC
8	OUTPUT 3	+INPUT 2
9	-INPUT 3	-INPUT 2
10	+INPUT 3	OUTPUT 2
11	-V _S	NC
12	+INPUT 4	OUTPUT 3
13	-INPUT 4	-INPUT 3
14	OUTPUT 4	+INPUT 3
15	-	NC
16	-	-V _S
17	-	NC
18	-	+INPUT 4
19	-	-INPUT 4
20	-	OUTPUT 4

NC = No connection

Figure 1. Terminal connections.

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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 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).

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-EC 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-EC 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 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. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(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 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 A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.

(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 (in accordance with method 5005, table I)
Interim electrical parameters (method 5004)	---
Final electrical test parameters (method 5004)	1*,2,3,4,5,6
Group A test requirements (method 5005)	1,2,3,4,5,6,7,8**,9
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.

** Subgroup 8, if not tested, shall be guaranteed to the specified limits of table I.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-STD-883 (see 3.1 herein).

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

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-973 using DD Form 1692, Engineering Change Proposal .

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-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444-5270, or telephone (513) 296-5377.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. 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-EC.

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STANDARDIZED MILITARY DRAWING SOURCE APPROVAL BULLETIN

DATE: 95-01-13

Approved sources of supply for SMD 5962-89801 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-EC. This bulletin is superseded by the next dated revision of MIL-BUL-103.

Standardized military drawing PIN	Vendor CAGE number	Vendor similar PIN ^{1/}
5962-8980101CX	06665	OP-11AY
5962-89801012X	06665	OP-11ARC
5962-8980102CX	06665	OP-11BY
5962-89801022X	06665	OP-11BRC
5962-8980103CX	06665	OP-11AY
5962-89801032X	06665	OP-11ARC

^{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

Analog Devices
Precision Monolithic Division
1500 Space Park Drive
Sanat Clara, CA 95050-8020

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