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					

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

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DRAWING APPROVAL DATE
92-07-07

REVISION LEVEL

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, FAST SETTLING, UNITY-GAIN STABLE, OPERATIONAL AMPLIFIER, MONOLITHIC SILICON

SIZE	CAGE CODE	5962-89641
A	67268	

SHEET 1 OF 10

DESC FORM 193
JUL 91

5962-E423

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:

5962-89641	01	C	X
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

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

Device type	Generic number	Circuit function
01	AD841	Unity-gain stable, fast settling operational amplifier

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

Outline letter	Descriptive designator	Terminals	Package style
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line
X	See figure 1	12	Can
2	CQCC1-N20	20	Square leadless chip carrier

1.3 Absolute maximum ratings. 1/ 2/

Voltage between V+ and V- terminals	36 V dc
Differential input voltage	±6.0 V dc
Voltage at either input terminal	V+ to V-
Peak output current (< 10% duty cycle)	100 mA
Storage temperature range	-65°C to +150°C
Power dissipation (P_D):	
Case C	1.3 W 3/
Case X	1.5 W 3/
Case 2	1.0 W 3/
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC}):	
Cases C and X	30°C/W
Case 2	35°C/W
Thermal resistance, junction-to-ambient (θ_{JA}):	
Case C	110°C/W
Case X	100°C/W
Case 2	150°C/W
Junction temperature (T_J)	+175°C

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/ T_A = +25°C unless otherwise noted.

3/ Derate linearly above T_A = +25°C for case C at 8.7 mW/°C, case X at 10 mW/°C, and case 2 at 6.7 mW/°C.

1.4 Recommended operating conditions.

Positive supply voltage range (V+)	+5 V dc to +15 V dc
Negative supply voltage range (V-)	-5 V dc to -15 V dc
Common mode input voltage (V_{CM})	±10 V
Load resistance (R_L)	500Ω
Ambient operating temperature range (T_A)	-55°C to +125°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.
MIL-STD-1835 - Microcircuit Case Outlines.

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

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ $V\pm = \pm 15$ V unless otherwise specified	Group A subgroups	Limits 2/ Min	Limits 2/ Max	Unit
Input offset voltage	V_{IO}	V_{CM} = 0 V	1	-2.0	+2.0	mV
			2, 3	-5.5	+5.5	
Input bias current	$+I_B$	V_{CM} = 0 V	1		+8	µA
			2, 3		+12	
	$-I_B$	V_{CM} = 0 V	1	-8		
			2, 3	-12		
Input offset current	I_{IO}	V_{CM} = 0 V	1	-0.4	+0.4	µA
			2, 3	-0.6	+0.6	
Common mode voltage range	$+V_{CM}$	V+ = 5.0 V, V- = -25 V, V_{OUT} = -10 V	1, 2, 3	10		V
	$-V_{CM}$	V+ = 25 V, V- = -5.0 V, V_{OUT} = 10 V			-10	
Large signal voltage gain	$+A_{VOL}$	V_{OUT} = 0 V and 10 V, R_L = 500Ω	1	25		V/mV
			2, 3	12		
	$-A_{VOL}$	V_{OUT} = 0 V and -10 V, R_L = 500Ω	1	25		
			2, 3	12		
Output current	$+I_{OUT}$	V_{OUT} = -10 V, T_A = +25°C	1	50		mA
	$-I_{OUT}$	V_{OUT} = +10 V, T_A = +25°C			-50	
Output voltage swing	$+V_{OUT}$	R_L = 500Ω	1, 2, 3	10		V
	$-V_{OUT}$	R_L = 500Ω			-10	
Quiescent power supply current	$+I_{CC}$	V_{OUT} = 0 V, I_{OUT} = 0 mA	1		+12	mA
			2, 3		+16	
	$-I_{CC}$	V_{OUT} = 0 V, I_{OUT} = 0 mA	1	-12		
			2, 3	-16		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ $V\pm = \pm 15$ V unless otherwise specified	Group A subgroups	Limits 2/ Min	Limits 2/ Max	Unit
Power supply rejection ratio	+PSRR	V+ = 5.0 V to 18 V, V- = -15 V	1	86		dB
			2, 3	80		
	-PSRR	V- = -5.0 V to -18 V, V+ = +15 V	1	86		
			2, 3	80		
Quiescent power consumption 3/	P_C	V_{OUT} = 0 V, I_{OUT} = 0 mA	1		360	mW
			2, 3		480	
Common mode rejection ratio	+CMRR	Delta V_{CM} = 10 V, V+ = 5.0 V, V- = -25 V, V_{OUT} = -10 V	4	86		dB
			5, 6	80		
	-CMRR	Delta V_{CM} = -10 V, V+ = 25 V, V- = -5.0 V, V_{OUT} = 10 V	4	86		
			5, 6	80		
Differential input resistance 4/	R_{IN}	V_{CM} = 0 V, T_A = +25°C	4	65		kΩ
Gain bandwidth product 4/	GBWP	V_{OUT} = ±100 mV, R_L = 500Ω, f_1 = 100 kHz, f_2 = 10 MHz, T_A = +25°C	4	23		MHz
Full power bandwidth 4/ 5/	FPBW	V_{PK} = 10 V, R_L = 500Ω T_A = +25°C	4	3.1		MHz
Closed loop stable gain 4/	CLSG	R_L = 500Ω, $C_L \le 10$ pF	4, 5, 6	1		V/V
Slew rate 4/	+SR	V_{OUT} = -5.0 V to 5.0 V, R_L = 500Ω, A_V = -1 V/V, measured from 10% to 90% point, rising edge	4	220		V/μs
			5, 6	140		
	-SR	V_{OUT} = 5.0 V to -5.0 V, R_L = 500Ω, A_V = -1 V/V, measured from 90% to 10% point, falling edge	4	220		
			5, 6	140		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ $V\pm = \pm15$ V unless otherwise specified	Group A subgroups	Limits 2/ Min	Limits 2/ Max	Unit
Rise time 4/ 6/	t_R	V_{OUT} = 0 V to +200 mV, R_L = 500Ω, A_V = +1	9, 10, 11		10	ns
Fall time 4/ 6/	t_F	V_{OUT} = 0 V to -200 mV, R_L = 500Ω, A_V = +1	9, 10, 11		10	ns
Settling time 4/	t_s	A_V = -1 V/V, 10 V step at 0.1% of the final value, R_L = 500Ω, T_A = +25°C	9		150	ns
		A_V = -1 V/V, 10 V step at 0.01% of the final value, R_L = 500Ω, T_A = +25°C			200	
Overshoot 4/	+OS	V_{OUT} = 0 V to +200 mV, A_V = +1, R_L = 500 Ω, T_A = +25°C	9		40	%
	-OS	V_{OUT} = 0 V to -200 mV, A_V = +1, R_L = 500 Ω, T_A = +25°C			40	

1/ Unless otherwise specified, for dc tests, R_L = 100 kΩ and V_{OUT} = 0 V.

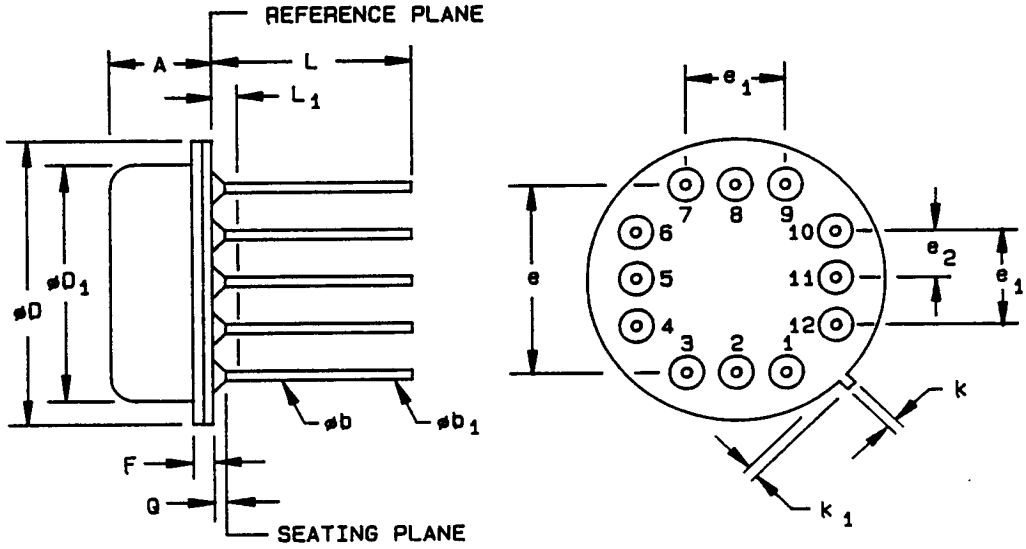
2/ The algebraic convention, whereby the most negative value is a minimum and the most positive is a maximum, is used in this table. Negative current shall be defined as conventional current flow out of device terminal.

3/ Quiescent power consumption is based on quiescent supply current test maximum with no load on outputs.

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

5/ Full power bandwidth = $\frac{SR}{2 \pi V_{PK}}$.

6/ Rise and fall times measured between 10 percent and 90 percent point.



Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.148	.181	3.76	4.60	
ϕb	.016	.019	0.41	0.48	1
ϕb_1	.016	.021	0.41	0.53	1
ϕD	.592	.615	15.04	15.62	
ϕD_1	.545	.555	13.84	14.10	
e	.400 BSC		10.16 BSC		3
e_1	.200 BSC		5.00 BSC		3
e_2	.100 BSC		2.54 BSC		3
F		.040		1.02	
k	.026	.036	0.66	0.91	
k_1	.027	.037	0.68	0.94	2
L	.375		9.50		
L_1		.050		1.27	1
Q	.010	.045	0.25	1.14	

NOTES:
1. All leads ϕb applies between L and L_1. $\phi b1$ applies between L_1 and .375 inch (9.52 mm) from the reference plane.
2. Measured from the maximum diameter of the product.
3. Leads having a maximum diameter .019 inch (0.48 mm) measured in gauging plane .054 inch (1.37 mm) +.001 inch (0.03 mm) -.000 inch (0.000 mm) below the base plane of the product are within .007 inch (0.18 mm) of their true position relative to the maximum width tab.

FIGURE 1. Case outline X.

Device type	01		
Case outlines	C	X	2
Terminal number	Terminal symbol		
1	NC	NC	NC
2	NC	NC	BALANCE
3	BALANCE	BALANCE	NC
4	INPUT-	BALANCE	NC
5	INPUT+	INPUT-	INPUT-
6	V-	INPUT+	NC
7	NC	NC	INPUT+
8	NC	NC	NC
9	NC	NC	NC
10	OUTPUT	V-	V-
11	V+	OUTPUT	NC
12	BALANCE	V+	NC
13	NC	---	NC
14	NC	---	NC
15	---	---	OUTPUT
16	---	---	NC
17	---	---	V+
18	---	---	NC
19	---	---	NC
20	---	---	BALANCE

NC = No connection

FIGURE 2. Terminal connections.

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-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°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 7 and 8 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 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.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	1,4
Final electrical test parameters (method 5005)	1*,2,3,4
Group A test requirements (method 5004)	1,2,3,4,5,6,9**, 10**,11**
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.
** Subgroups 9, 10, and 11 shall be measured only for initial test and after process or design changes and shall be guaranteed to the limits specified in table I.

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-ECS, telephone (513) 296-6010.

6.5 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, 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-ECS.