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

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	SHEET	1	2	3	4	5	6	7	8	9						

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
93-01-20

REVISION LEVEL

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, LOW POWER BUFFER AMPLIFIER, MONOLITHIC SILICON

SIZE	CAGE CODE	5962-90509
A	67268	

SHEET 1 OF 9

1

DESC FORM 193
JUL 91

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

5962-E590-92

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:

Device type	Generic number	Circuit function
01	EL2002A	Low power buffer amplifier
02	EL2002	Low power buffer 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
P	GDIP1-T8 or CDIP2-T8	8	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-M-38510. 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.

Total supply voltage ($+V_S$ to $-V_S$)	36 V dc
Supply voltage (V_S)	±18 V dc
Input voltage (V_{IN}) 1/	±15 V dc or V_S
Input current (I_{IN}) 1/	±50 mA
Output short circuit duration 2/	Continuous
Junction temperature (T_J)	+175°C
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (Θ_{JC}) 3/	See MIL-STD-1835
Thermal resistance, junction-to-ambient (Θ_{JA}): 3/	
Case P	+125°C/W
Case 2	+100°C/W

1.4 Recommended operating conditions.

Supply voltage (V_S)	±15 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

1/ If the input exceeds the ratings shown (or the supplies), or if the input to the output voltage exceeds ±7.5 V, then the input current must be limited to ±50 mA.
2/ A heat sink is required to keep the junction temperature below the absolute maximum when the output is short circuited.
3/ The maximum power dissipation depends on package type, ambient temperature, and heat sinking.

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-M-38510 - Microcircuits, General Specification for.

STANDARDS

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.
MIL-STD-1835 - Microcircuits 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.

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.

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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ $V_S = \pm 15$ V, $R_S = 50\Omega$ unless otherwise specified	Group A subgroups	Device type	Limits 1/		Unit
					Min	Max	
Offset voltage	V_{OS}	V_{IN} = 0 V, $R_L = \infty$	1	01	-15	+15	mV
			2,3		-20	+20	
			1	02	-40	+40	
			2,3		-50	+50	
Input current	I_{IN}	V_{IN} = 0 V, $R_L = \infty$	1	01	-10	+10	µA
			2,3		-15	+15	
			1	02	-15	+15	
			2,3		-20	+20	
Input resistance	R_{IN}	$V_{IN} = \pm 12$ V, $R_L = 100\Omega$	1	All	1		MΩ
			2,3		.1		
Voltage gain	A_{V1}	$V_{IN} = \pm 12$ V, $R_L = \infty$	1	All	.990		V/V
			2,3		.985		
	A_{V2}	$V_{IN} = \pm 10$ V, $R_L = 100\Omega$	1		.85		
			2,3		.83		
	A_{V3}	$V_{IN} = \pm 3$ V, $R_L = 100\Omega$, $V_S = \pm 5$ V	1		.83		
			2,3		.80		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$, $V_S = \pm 15$ V, $R_S = 50\Omega$ unless otherwise specified	Group A subgroups	Device type	Limits 1/ Min	Limits 1/ Max	Unit
Output voltage swing	$+V_O$	$V_{IN} = +12$ V, $R_L = 100\Omega$	1	All	+10		V
			2,3		+9.5		
	$-V_O$	$V_{IN} = -12$ V, $R_L = 100\Omega$	1			-10	
			2,3			-9.5	
Output resistance	R_{OUT}	$V_{IN} = \pm 2$ V, $R_L = 100\Omega$	1	All		13	Ω
			2,3			15	
Output current	$+I_{OUT}$	$V_{IN} = +12$ V, $V_{OUT} = +10$ V	1	All	+100		mA
			2,3		+95		
	$-I_{OUT}$	$V_{IN} = -12$ V, $V_{OUT} = -10$ V	1			-100	
			2,3			-95	
Supply current	I_S	$V_{IN} = 0$ V, $R_L = \infty$	1	All		7.5	mA
			2,3			10	
Power supply rejection ratio	PSRR	$V_{IN} = 0$ V, $R_L = \infty$ 2/	1	All	60		dB
			2,3		50		
Slew rate	+SR	$V_{IN} = \pm 10$ V, $R_L = 100\Omega$, $A_V = +1$, $C_L = 10$ pF, 3/ 4/ Rising edge	4	All	1200		V/μs
			5, 6		800		
	-SR	$V_{IN} = \pm 10$ V, $R_L = 100\Omega$, $A_V = +1$, $C_L = 10$ pF, 3/ 4/ Falling edge	4		1200		
			5, 6		800		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ $V_S = \pm 15$ V, $R_S = 50\Omega$ unless otherwise specified	Group A subgroups	Device type	Limits 1/		Unit
					Min	Max	
-3 dB bandwidth		V_{OUT} = 10 mV, $R_L = 100\Omega$, 4/ C_L = 0 pF	4, 5, 6	All	90		MHz
Rise time	t_r	V_{IN} = 5 V, $R_L = 100\Omega$, 4/ $T_A = +25°C$	9	All		4.0	ns
Propagation delay	t_d	V_{IN} = 5 V, $R_L = 100\Omega$, 4/ $T_A = +25°C$	9	All		4.0	ns

1/ The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum, is used in this table. Negative current shall be defined as conventional current flow out of a device terminal.
2/ V_{OS} is measured at $+V_S$ = 4.5 V, $-V_S$ = -4.5 V and at $+V_S$ = +18 V, $-V_S$ = -18 V. Both supplies are changed simultaneously.
3/ Slew rate is measured between V_{OUT} = +5 V and -5 V.
4/ If not tested, shall be guaranteed to the limits specified in table I herein.

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.

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

NC = No connection

FIGURE 1. Terminal connections.

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. 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°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, 8, 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°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.

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
Group A test requirements (method 5005)	1, 2, 3, 4**, 5**, 6**, 9**
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3

* PDA applies to subgroup 1.
** Subgroup 4, 5, 6, and 9 are guaranteed, if not tested, to the limits specified in table I.

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 Original Equipment Manufacturer 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-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, 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-EC.