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

REV																									
SHEET																									
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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
11 MAY 1990

REVISION LEVEL

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, LOW NOISE, HIGH SPEED, OPERATIONAL AMPLIFIER, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	67268	5962-90568

SHEET 1

DESC FORM 193
SEP 87

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

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

5962-90568	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 types. The device types shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	OP-237A	Dual, low-offset, low noise, high speed operational amplifier
02	OP-237C	Dual, low-offset, low noise, high speed operational amplifier

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
C	D-1 (14-lead, .785" x .310" x .200"), dual-in-line package

1.3 Absolute maximum ratings. 1/

Supply voltage (V_S)	±22 V dc
Input voltage range (V_{IN})	Equal to supply voltage
Output short circuit duration	Indefinite
Differential input current 2/	±25 mA
Differential input voltage range	±0.7 V dc
Lead temperature (soldering, 60 seconds)	+300°C
Storage temperature range (T_J)	-65°C to +150°C
Maximum power dissipation (P_D)	500 mW 3/
Thermal resistance, junction-to-case (θ_{JC})	See MIL-M-38510, appendix C

1.4 Recommended operating conditions.

Supply voltage (V_S)	±4.5 V dc to ±18 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

1/ Unless otherwise specified, all voltages are referenced to ground.
2/ The inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. If differential input voltage exceeds ±0.7 V, the input current should be limited to 25 mA.
3/ For T_A greater than 106°C, derate linearly at 11.3 mW/°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.

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 Terminal connections and logic diagram. The terminal connections and logic diagram shall be as specified on figure 1.

3.2.2 Case outline. The case outline shall be in accordance with 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.

3.5 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). 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).

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$, $V_S = \pm 15$ V unless otherwise specified	Device types	Group A subgroups	Limits Min	Limits Max	Unit
Input offset voltage 1/	V_{IO}		01	1		80	µV
			02			180	
			01	2, 3		180	
			02			350	
Average input offset voltage drift 2/	TC V_{IO}		01	1, 2, 3		1.0	µV/°C
			02			1.8	
Input offset current	I_{IO}		01	1		35	nA
			02			75	
			01	2, 3		50	
			02			135	
Input bias current	I_{IB}		01	1		±40	
			02			±80	
			01	2, 3		±60	
			02			±150	
Power supply rejection ratio	PSRR	V_S = ±4 V to ±18 V, R_S = 50Ω	01	1		10	µV/V
			02			20	
		V_S = ±4.5 V to ±18 V, R_S = 50Ω	01	2, 3		16	
			02			51	
Common mode rejection ratio	CMRR	V_{CM} = ±11 V, R_S = 50Ω	01	1	114		dB
			02		100		
		V_{CM} = ±10 V, R_S = 50Ω	01	2, 3	108		
			02		94		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$, $V_S = \pm 15$ V (unless otherwise specified)	Device types	Group A subgroups	Limits		Unit
					Min	Max	
Input voltage range 3/	IVR		All	1	±11.0		V
			All	2, 3	±10.0		
Power consumption	P_D	Each amplifier, $T_A = +25°C$	01	1		140	mW
			02			170	
Input offset voltage match	V_{OS}		01	1		80	µV
			02			300	
			01	2, 3		180	
			02			480	
Average noninverting bias current	I_{B+}	$I_{B+} = \frac{I_{B+A} + I_{B+B}}{2}$	01	1		±40	nA
			02			±90	
			01	2, 3		±60	
			02			±170	
Noninverting offset current	I_{OS+}	$I_{OS+} = I_{B+A} - I_{B+B}$	01	1		±60	
			02			±130	
			01	2, 3		±90	
			02			±250	
Inverting offset current	I_{OS-}	$I_{OS-} = I_{B-A} - I_{B-B}$	01	1		±60	
			02			±130	
			01	2, 3		±90	
			02			±250	
Gain-bandwith product 2/	GBW	$f = 10$ kHz, $T_A = +25°C$, $A_{VCL} \ge 5$ 4/	All	4	35		MHz

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$, $V_S = \pm 15$ V (unless otherwise specified)	Device types	Group A subgroups	Limits Min	Limits Max	Unit
Large signal voltage	A_{VOL}	$V_O = \pm 10$ V, $R_L \ge 2$ kΩ	01	4	3000		V/mV
			02		2000		
			01	5, 6	1000		
			02		800		
		$V_O = \pm 10$ V, $R_L \ge 600\Omega$	01	4	1000		
			02		800		
Output voltage swing	V_{OP}	$R_L \ge 2$ kΩ	01	4	±12		V
			02		±11.5		
			01	5, 6	±11.5		
			02		±10.5		
		$R_L \ge 600\Omega$	All	4	±10		
Slew rate	SR	$R_L \ge 2$ kΩ, $A_{VCL} = 5$, $T_A = +25°C$	All	7	10		V/μs
Input noise voltage density	E_n	$f_O = 10$ Hz, $T_A = +25°C$	01	7		6.0	nV/√Hz
			02			9.0	
		$f_O = 1{,}000$ Hz, $T_A = +25°C$	01			3.9	
			02			4.6	
Input noise current	I_n	$f_O = 10$ Hz, $T_A = +25°C$	01	7		4.5	pA/√Hz
			02			5.66	
		$f_O = 1{,}000$ Hz, $T_A = +25°C$	01			0.7	
			02			0.99	

1/ Input offset voltage measurements are performed by automated test equipment approximately 0.5 second after application of power. V_{IO} is excluded from PDA.

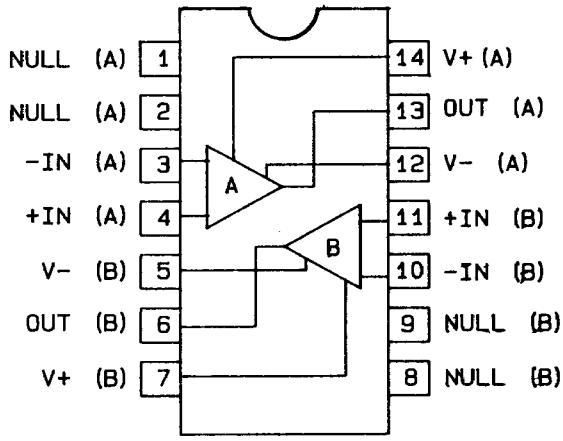
2/ If not tested, shall be guaranteed to the limits specified in table I herein.

3/ Guaranteed by CMRR test.

4/ The symbol A_{VCL} stands for the closed-loop voltage gain.

Case C

Device types 01 and 02



NOTES: The V- supply terminals are both connected to the common substrate and must be tied to the same voltage. Both V- pins should be used.

FIGURE 1. Terminal connections and logic diagram (top view).

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

*PDA applies to subgroup 1 (except V_{IO} is excluded from PDA).

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) 296-6022.

6.5 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone (513) 296-5375.

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 3.6 herein) has been submitted to and accepted by DESC-ECS. 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/
5962-9056801CX	64155	OP-237AJ/883
5962-9056802CX	64155	OP-237CJ/883

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
64155	Linear Technology, Inc. 1630 McCarthy Blvd. Milpitas, CA 95035-7487

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