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

REV																									
SHEET																									
REV																									
SHEET																									
REV STATUS OF SHEETS	REV																								
	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
16 JANUARY 1990

REVISION LEVEL

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, HIGH-SPEED, JFET, OPERATIONAL AMPLIFIER, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	67268	5962-89622

SHEET 1 OF 9

DESC FORM 193
SEP 87

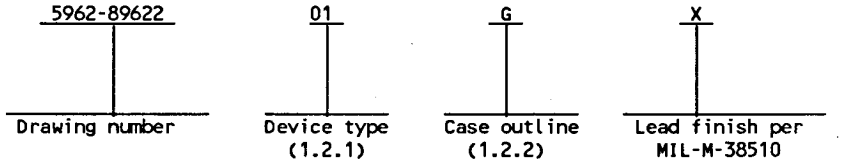
* U.S. GOVERNMENT PRINTING OFFICE: 1987 — 748-129/60911

5962-E1396

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:



1.2.1 Device types. The device types shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	LT1022A	Single, high-speed, precision JFET input operational amplifier
02	LT1022	Single, high speed, precision JFET input 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
G	A-1 (8-lead, .370" x .185"), can package

1.3 Absolute maximum ratings.

Supply voltage (V_S)	±20 V dc
Input voltage	±20 V dc
Differential input voltage range	±40 V dc
Output short-circuit duration	Indefinite
Power dissipation (P_D)	210 mW
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Junction temperature (T_J)	+150°C
Thermal resistance, junction-to-case (Θ_{JC})	See MIL-M-38510, appendix C
Thermal resistance, junction-to-ambient (Θ_{JA})	150°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

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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. The terminal connections 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, 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, $V_{CM} = 0$ V unless otherwise specified	Device type	Group A subgroups	Limits		Unit
					Min	Max	
Input offset current	I_{IO}	Fully warmed up	01	1		10	pA
			02			20	
			01	2		2	nA
			02			3	
Input bias current	I_B	Fully warmed up	01, 02	1		±50	pA
			01	2		±4	nA
			02			±6	
		$V_{CM} = \pm 10$ V	01	1		+100	pA
			02			+150	
Supply current	I_{SY}		01, 02	1		7	mA
			01, 02	2,3		11	
Input voltage range	V_{IR}	1/	01, 02	1	±10.5		V
			01, 02	2,3	±10.4		
Common-mode rejection ratio	CMRR	$V_{CM} = \pm 10.5$ V	01	1	86		dB
			02		82		
		$V_{CM} = \pm 10.4$ V	01	2,3	85		
			02		80		
Power supply rejection ratio	PSRR	$V_S = \pm 10$ V to ± 18 V	01	1	88		dB
			02		86		
		$V_S = \pm 10$ V to ± 17 V	01	2,3	86		dB
			02		84		
Input offset voltage	V_{IO}	2/	01	4		250	µV
			02			600	
			01	5,6		750	
			02			1500	

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, $V_{CM} = 0$ V unless otherwise specified		Device type	Group A subgroups	Limits		Unit
						Min	Max	
Large signal voltage gain	A_{VO}	$V_O = \pm 10$ V	$R_L = 2$ kΩ	01	4	150		V/mV
				02		120		
				01	5,6	40		
				02		35		
			$R_L = 1$ kΩ	01	4	130		
				02		100		
Output voltage swing	V_O	$R_L = 2$ kΩ		01, 02	4,5,6	±12		V
Input noise voltage density	e_n	$f_O = 10$ Hz 3/ $T_A = +25°C$		01	7		50	nV/√Hz
				02			60	
		$f_O = 1$ kHz 3/ $T_A = +25°C$		01	7		20	
				02			22	
Input noise current density	i_n	$f_O = 10$ Hz, 1 kHz $T_A = +25°C$ 4/ 5/		01	7		4	fA/√Hz
				02			4	
Gain-bandwidth product	GBW	f = 1 MHz 5/		01	7,8	6		MHz
				02		5		
Slew rate	SR			01	7	23		V/μs
				02		18		
				01	8	14		
				02		10		
Settling time	t_S	$A_{VCL} = -1$, $C_L \le 10$ pF		01	9		1.3	μs
		10 V step to ±0.1 % 5/		02			1.4	

See footnotes at end of table.

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1/ Guaranteed by CMRR test.

2/ Offset voltage is measured under two different conditions:
a. Approximately 0.5 seconds after application of power.

b. At T_A = +25°C, with the chip self heated to approximately +45°C to account for chip temperature rise when the device is fully warmed up.

3/ Noise voltage density is sample tested on every lot to an LTPD of 15.

4/ Current noise is calculated from the formula: $i_n = (2qI_B)^{1/2}$, where $q = 1.6 \times 10^{-19}$ coulombs. The noise of source resistors up to 1 GΩ swamps the contribution of current noise.

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

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Device type	01
Case outline	G
Terminal number	Terminal symbol
1	Balance
2	-Input
3	+Input
4	V-
5	Balance
6	Output
7	V+
8	No connection

FIGURE 1. Terminal connections.

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 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, 8, 9**
Group C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.
** If not tested, 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) 296-6022.

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 are current only to the date of the last action of this document.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
5962-8962201GX	64155	LT1022AMH/883
5962-8962202GX	64155	LT1022MH/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 Corporation 1630 McCarthy Boulevard Milpitas, CA 95035-7487

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