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																

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
15 AUGUST 1989

REVISION LEVEL

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUITS, LINEAR, LOW-POWER, HIGH PRECISION OPERATIONAL AMPLIFIER, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	67268	5962-89544

SHEET 1

DESC FORM 193
SEP 87

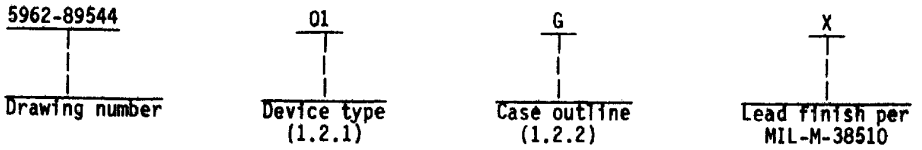
* U.S. GOVERNMENT PRINTING OFFICE: 1987 — 748-129/60911

5962-E1196

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 type. The device type shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	OP-97	Low-power high precision operational amplifier

1.2.2 Case outlines. The case outlines 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"), metal can package
P	D-4 (8-lead, .405" x .310" x .200"), dual-in-line package

1.3 Absolute maximum ratings.

Positive supply voltage (V+)	+20 V dc
Negative supply voltage (V-)	-20 V dc
Input voltage 1/	±20 V dc
Differential input voltage 2/	±1 V dc
Differential input current 2/	±10 mA
Maximum power dissipation (P_D) 3/	500 mW
Output short-circuit duration	Indefinite
Storage temperature range	-65°C to +150°C
Lead temperature range (soldering, 60 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}):	
Case G	150°C/W
Case P	119°C/W

1.4 Recommended operating conditions.

Ambient operating temperature range	-55°C to +125°C

1/ For supply voltages less than ±20 V, the absolute maximum input voltage is equal to the supply voltage.
2/ The inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. Differential input voltages greater than +1 V will cause excessive current to flow through the input protection diodes unless limiting resistance is used.
3/ Derate linearly 7.1 mW/°C above T_A = +80°C for G package.
Derate linearly 6.7 mW/°C above T_A = +75°C for P package.
Must withstand added P_D due to short circuit test; e.g., I_{OS}.

2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, 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.

(Copies of the specification and standard 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 outlines. The case outlines 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 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 6.4 herein.

3.5 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 6.4. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 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.

3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C < T_A < +125°C$ $V_S = \pm 15$ V; $R_S = 50\Omega$ unless otherwise specified	Group A subgroups	Limits Min	Limits Max	Unit
Input offset voltage	V_{IO}		1		±25	µV
			2, 3		±60	
Input offset voltage temperature coefficient	TCV_{OS}		2, 3		0.6	µV/°C
Input offset current	I_{IO}		1		±100	pA
			2, 3		±250	
Input bias current	I_{IB}		1		±100	pA
			2, 3		±250	
Common-mode rejection ratio	CMRR	V_{CM} = IVR = ±13.5 V 1/	1	114		dB
			2, 3	108		
Power supply rejection ratio	PSRR	V_S = ±2 V to ±20 V	1	114		dB
		V_S = ±2.5 V to ±20 V	2, 3	108		
Supply current	I_S	No load	1		600	µA
			2, 3		800	
Large-signal voltage gain	A_{VO}	V_O = ±10 V, R_L = 2 kΩ	4	300		V/mV
			5, 6	200		
Output voltage swing	V_O	R_L = 10 kΩ	4, 5, 6	±13		V
Slew rate	SR		7	0.1		$\frac{V}{\mu s}$
			8	0.05		
Input noise voltage	E_{nt}	0.1 Hz to 10 Hz, T_A = +25°C	9		280	nV_{rms}
Output short circuit current	I_{OS}		1	20		mA
			2, 3	30		
Closed loop bandwidth	BW	A_{VCL} = +1, T_A = +25°C	4	0.4		MHz

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

☆ U. S. GOVERNMENT PRINTING OFFICE: 1988—549-904

Device type	01
Case outlines	G and P
Terminal number	Terminal symbols
1	NULL
2	-IN
3	+IN
4	V-
5	COMP
6	OUT
7	V+
8	NULL

FIGURE 1. Terminal connections

3.8 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 3.5 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 10, 11, and 12 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 3.5 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*,2,3,4,5, 6,7,8
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, excluding V_{IO} end-points. (No other subgroups are included in PDA).
** In accordance with table 1, except V_{IO} = ±50 µV maximum.

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

6.4 Approved source of supply. An approved source of supply is listed herein. Additional sources will be added as they become available. The vendor listed herein has agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
5962-8954401GX	06665	OP-97AJ/883
5962-8954401PX	06665	OP-97AZ/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
06665	Precision Monolithics Incorporated 1500 Space Park Drive Santa Clara, CA 95052-8020