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PMIC N/A	PREPARED BY <i>Rich C. Offin</i>	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444										
<b>STANDARDIZED MILITARY DRAWING</b>	CHECKED BY <i>Charles E. Bejore</i>			MICROCIRCUITS, LINEAR, HIGH-OUTPUT-CURRENT, OPERATIONAL AMPLIFIER, MONOLITHIC SILICON								
	APPROVED BY <i>[Signature]</i>											
	THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE	DRAWING APPROVAL DATE 17 NOVEMBER 1989	SIZE <b>A</b>	CAGE CODE <b>67268</b>	<b>5962-89673</b>							
AMSC N/A	REVISION LEVEL	SHEET <span style="float: right;"><b>1</b></span>										

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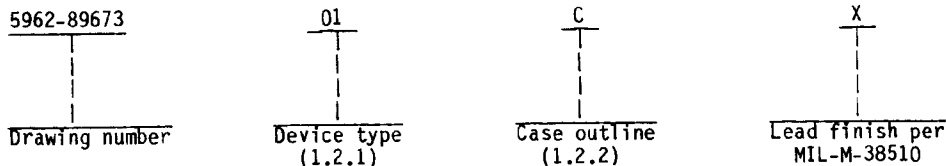
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DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	OP-50A	High-output-current operational amplifier ( $A_{VCL} \geq 5$ )
02	OP-50B	High-output-current operational amplifier ( $A_{VCL} \geq 5$ )

1.2.2 Case outline. The case outline shall be as designated in appendix C of MIL-M-38510, and as follows:

<u>Outline letter</u>	<u>Case outline</u>
C	D-1 (14-lead, .785" x .310" x .200"), dual-in-line package

1.3 Absolute maximum ratings.

Supply voltage 1/	±18 V
Internal power dissipation	500 mW
Input voltage	Supply voltage
Differential input voltage 2/	±10 V
Differential input current 2/	±20 V
Output short-circuit duration	Indefinite
Output current	±50 mA
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 60 seconds)	+300°C
Thermal resistance, junction-to-case ( $\theta_{JC}$ )	See MIL-M-38510, appendix C
Thermal resistance, junction-to-ambient ( $\theta_{JA}$ )	91 C/W

1.4 Recommended operating conditions.

Positive supply voltage (V+)	+V <sub>OP</sub> = +15 V
Negative supply voltage (V-)	-V <sub>OP</sub> = -15 V
No compensation, unless otherwise noted, source resistance (R <sub>S</sub> )	50Ω
Ambient operating temperature range (T <sub>A</sub> )	-55°C to +125°C

- 1/ Supply voltage rating applies to all power supply pins. No device pins should be connected to a voltage potential lower than the negative supply to V-, pin 5.
- 2/ The device inputs are protected by 250Ω series resistors and protection diodes. If the differential input voltage exceeds ±10 V, the input current must be limited to ±20 mA.

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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 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.

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).

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T <sub>A</sub> ≤ +125°C R <sub>S</sub> = 50Ω; V <sub>+</sub> = +V <sub>OP</sub> = +15 V; V <sub>-</sub> = -V <sub>OP</sub> = -15 V unless otherwise specified	Device type	Group A subgroups	Limits		Unit
					Min	Max	
Input offset voltage	V <sub>OS</sub>		01	1	±25		mV
				2,3	±55		
			02	1	±100		
				2,3	±200		
Input offset current	I <sub>OS</sub>	R <sub>S</sub> = 50 kΩ	01	1	±1		nA
				2,3	±3		
			02	1	±3		
				2,3	±12		
Input bias current	I <sub>B</sub>	R <sub>S</sub> = 50 kΩ	01	1	±5		nA
				2,3	±8		
			02	1	±10		
				2,3	±20		
Common-mode rejection ratio	CMRR	V <sub>CM</sub> = ±10 V	01	1	126		dB
				2,3	120		
			02	1	110		
				2,3	105		
Power supply rejection ratio	PSRR	V <sub>S</sub> = ±5 V to ±15 V	01	1	0.5		μV/V
				2,3	1.25		
			02	1	1.0		
				2,3	1.25		
Offset voltage range adjustment	V <sub>OS<sub>adj</sub></sub>	R <sub>p</sub> = 100 kΩ	A11	1	±1		mV

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T <sub>A</sub> ≤ +125°C  R <sub>S</sub> = 50Ω; V <sup>+</sup> = +V <sub>OP</sub> = +15 V; V <sup>-</sup> = -V <sub>OP</sub> = -15 V unless otherwise specified	Device type	Group A subgroups	Limits		Unit
					Min	Max	
Quiescent supply current	I <sub>SY</sub>	No load	A11	1		3.3	mA
				2,3		4.0	
Positive current limit	+I <sub>SC</sub>	Output shorted to ground	A11	1	60	120	mA
Negative current limit	-I <sub>SC</sub>	Output shorted to ground	A11	1	-120	-60	
Output voltage swing	V <sub>O</sub>	R <sub>L</sub> ≥ 500Ω	A11	1	±13		V
				2,3	±12		
		R <sub>L</sub> = 500Ω V <sup>+</sup> = +V <sub>OP</sub> = +5 V V <sup>-</sup> = -V <sub>OP</sub> = -5 V	A11	1	±3.5		
		R <sub>L</sub> = 50Ω V <sup>+</sup> = +V <sub>OP</sub> = +5 V V <sup>-</sup> = -V <sub>OP</sub> = -5 V	A11	1	±2.5		
Large-signal voltage gain	A <sub>VO</sub>	V <sub>O</sub> = ±10 V, R <sub>L</sub> = 1 kΩ	01	1	10		V/μV
			02		7.5		
			A11	2,3	4.0		
Noise voltage density	e <sub>n</sub>	f <sub>0</sub> = 10 Hz	A11	7		12.0	nV/√Hz
		f <sub>0</sub> = 1 kHz	A11	7		10.0	
Slew rate	SR	R <sub>L</sub> > 2 kΩ, R <sub>C</sub> = 560Ω C <sub>C</sub> = 4.7 nF	A11	7	2.5		V/μs
Input offset voltage drift	TCV <sub>OS</sub>		01	8		0.3	μV/°C
			02			1.0	

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Device types	01 and 02
Case outline	C
Terminal number	Terminal symbol
1	+Input
2	-Input
3	NC
4	NC
5	V-
6	Output
7	-V <sub>OP</sub>
8	NC
9	V+
10	+V <sub>OP</sub>
11	Compensation
12	Compensation
13	Null
14	Null

FIGURE 1. Terminal connections.

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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)  $T_A = +125^{\circ}\text{C}$ , 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 4, 5, 6, 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)  $T_A = +125^{\circ}\text{C}$ , minimum.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

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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, 7
Group A test requirements (method 5005)	1, 2, 3, 7, 8
Groups C and D end-point electrical parameters (method 5005)	1

\*PDA applies to subgroup 1.

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.

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6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. Additional sources will be added to MIL-BUL-103 as they become available. 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. 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/
5962-8967301CX	06665	OP-50AY/883C
5962-8967302CX	06665	OP-50BY/883C

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

06665

Vendor name and address

Precision Monolithics Incorporated  
1500 Space Park Drive  
Santa Clara, CA 95050

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