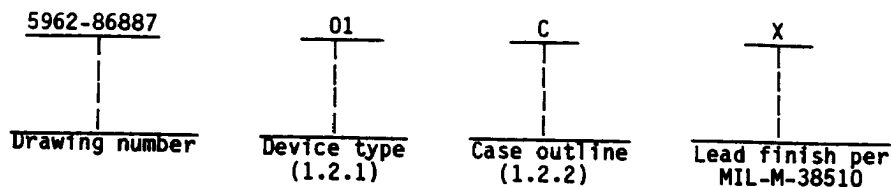


1. SCOPE

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-227A	Dual, low-offset, low noise 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, 1/4" x 3/4"), dual-in-line package.

1.3 Absolute maximum ratings. 1/

Supply voltage (V_{CC})	- - - - -	± 22 V dc
Input voltage range (V_{IN})	- - - - -	± 22 V dc
Output short circuit duration	- - - - -	Indefinite
Differential input current 2/	- - - - -	± 25 mA
Differential input voltage range	- - - - -	± 0.7 V dc
Lead temperature (soldering, 60 seconds)	- - - - -	$+300^\circ\text{C}$
Storage temperature range (T_J)	- - - - -	-65°C to $+150^\circ\text{C}$
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_{CC})	- - - - -	± 4.5 V dc to ± 18 V dc
Ambient operating temperature range	- - - - -	-55°C to $+125^\circ\text{C}$

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/ $^\circ\text{C}$.

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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 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, the electrical performance characteristics are as specified in table 1 and apply over the full recommended 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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ $\pm V_S = \pm 15\text{ V}$ (unless otherwise specified)	Group A subgroups	Limits		Unit
				Min	Max	
Input offset voltage	V_{IO}		1		80	μV
			2, 3		180	
Input offset current	I_{IO}		1		35	nA
			2, 3		50	
Input bias current	I_{IB}		1		40	
			2, 3		60	
Average input offset drift $\frac{1}{\text{}}/$	$TC\ V_{IO}$		1,2,3		1.0	$\mu\text{V}/^{\circ}\text{C}$
Power supply rejection ratio	PSRR	$V_S = \pm 4\text{ to } \pm 18\text{ V}$	1		10	$\mu\text{V}/\text{V}$
			2, 3		16	
Common mode rejection ratio	CMRR	$V_{CM} = \pm 11\text{ V}$	1	114		dB
		$V_{CM} = \pm 10\text{ V}$	2, 3	108		
Large signal voltage gain	A_{VOL}	$V_O = \pm 10\text{ V}; R_L \geq 2\text{ k}\Omega$	4	1000		V/mV
			5, 6	600		
		$V_O = \pm 10\text{ V}; R_L \geq 600\text{ ohms}$	4	800		
Input voltage range	IVR	$T_A = 25^{\circ}\text{C}$	1	± 11.0		V
		$T_A = -55^{\circ}\text{C}, +125^{\circ}\text{C} \frac{1}{\text{}}$	2, 3	± 10.0		
Output voltage swing	V_{OP}	$R_L \geq 2\text{ k}\Omega$	4	± 12		
			5, 6	± 11.5		
		$R_L \geq 600\text{ ohms}$	4	± 10		
Slew rate	SR	$R_L \geq 2\text{ k}\Omega$	7	1.7		V/ μs
Input noise voltage density	E_n	$T_A = 25^{\circ}\text{C}$	7		6.0	$\frac{\text{nV}}{\sqrt{\text{Hz}}}$
		$f_0 = 1,000\text{ Hz}$			3.9	

See footnote at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ $\pm V_S = \pm 15\text{ V}$ (unless otherwise specified)	Group A subgroups	Limits		Unit
				Min	Max	
Input noise current density	I_n	$f_o = 10\text{ Hz}, T_A = 25^{\circ}\text{C}$	7		5.66	$\frac{\text{pA}}{\sqrt{\text{Hz}}}$
		$f_o = 1,000\text{ Hz}, T_A = 25^{\circ}\text{C}$			0.99	
Gain-bandwidth product $\frac{1}{f}$	GBW	$f = 100\text{ kHz}, T_A = 25^{\circ}\text{C}$	4	5.0		MHz
Power consumption	P_D	Each amplifier, $T_A = 25^{\circ}\text{C}$	1		140	mW
Input offset voltage match	V_{OS}	$T_A = 25^{\circ}\text{C}$	1		80	μV
		$T_A = -55^{\circ}\text{C}, +125^{\circ}\text{C}$	2, 3		180	
Average noninverting bias current	I_{B+}	$I_{B+} = \frac{I_{B+A} + I_{B+B}}{2}$	$T_A = 25^{\circ}\text{C}$	1	± 40	nA
			$T_A = -55^{\circ}\text{C},$ $T_A = 125^{\circ}\text{C}$	2, 3	± 60	
Noninverting offset current	I_{OS+}	$I_{OS+} = I_{B+A} - I_{B+B}$	$T_A = 25^{\circ}\text{C}$	1	± 60	
			$T_A = -55^{\circ}\text{C},$ $T_A = 125^{\circ}\text{C}$	2, 3	± 90	
Inverting offset current	I_{OS-}	$I_{OS-} = I_{B-A} - I_{B-B}$	$T_A = 25^{\circ}\text{C}$	1	± 60	
			$T_A = -55^{\circ}\text{C},$ $T_A = 125^{\circ}\text{C}$	2, 3	± 90	

1/ Guaranteed if not tested.

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).

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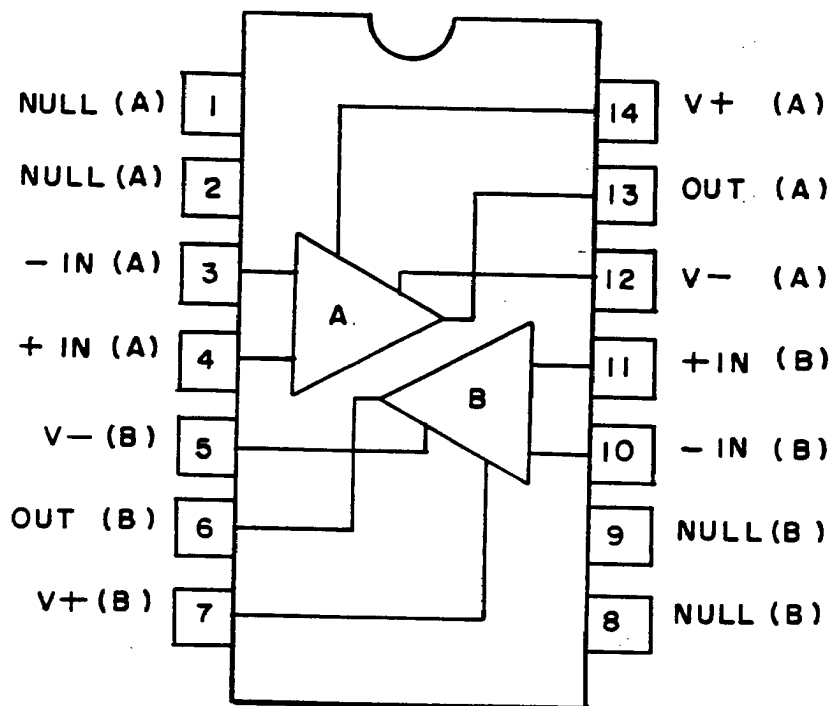


FIGURE 1. Terminal connections and logic diagram. (top view)

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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) $T_A = +125^{\circ}\text{C}$, 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 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 (method 1005 of MIL-STD-883) conditions:

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) $T_A = +125^{\circ}\text{C}$, minimum.

(3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and 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, 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
Additional electrical subgroups for group C periodic inspections	---

*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. Replaceability is determined as follows:

- Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.
- When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/135048CX.

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

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6.4 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have 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 <u>1/</u>	Replacement military specification part number
5962-8688701CX	64155 54186 06665	OP-227AJ/883B MP OP-227AY OP-227A883	M38510/13504BCX

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

64155

54186

06665

Vendor name
and address

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

Micro Power Systems, Inc.
3100 Alfred Street
Santa Clara, CA. 95050-3674

Precision Monolithic, Inc.
1500 Space Park Drive
P. O. Box 58020
Santa Clara, CA. 95050

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