REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Changes in accordance with NOR 5962-R177-96.	96-07-10	M. A. FRYE
B	Drawing updated to reflect current requirements. Redrawn. - ro	05-05-02	R. MONNIN
C	Update drawing as part of 5 year review. - jt	10-10-25	C. SAFFLE

CURRENT CAGE CODE 67268

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

REV									
SHEET									
REV									
SHEET									
REV STATUS	REV	C	C	C	C	C	C	C	C
OF SHEETS	SHEET	1	2	3	4	5	6	7	8

PMIC N/A

PREPARED BY
DONALD R. OSBORNE

DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990
http://www.dscc.dla.mil

STANDARD MICROCIRCUIT DRAWING

THIS DRAWING IS AVAILABLE
FOR USE BY ALL
DEPARTMENTS
AND AGENCIES OF THE
DEPARTMENT OF DEFENSE

AMSC N/A

CHECKED BY
D. A. DICENZO

APPROVED BY
N.A. HAUCK

DRAWING APPROVAL DATE
87-05-27

REVISION LEVEL
C

MICROCIRCUIT, LINEAR, LOW NOISE OPERATIONAL AMPLIFIER, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	**14933**	**5962-86887**

SHEET 1 OF 8

1. SCOPE

1.1 Scope. This drawing describes device requirements for MIL-STD-883 compliant, non-JAN class level B microcircuits in accordance with MIL-PRF-38535, appendix A.

1.2 Part or Identifying Number (PIN). The complete PIN is as shown in the following example:

5962-86887	01	C	A
Drawing number	Device type (see 1.2.1)	Case outline (see 1.2.2)	Lead finish (see 1.2.3)

1.2.1 Device type(s). The device type(s) 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(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line

1.2.3 Lead finish. The lead finish is as specified in MIL-PRF-38535, appendix A.

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	±25 mA 2/
Differential input voltage range	±0.7 V dc
Lead temperature (soldering, 60 seconds)	+300°C
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D)	500 mW 3/
Thermal resistance, junction-to-case (θ_{JC})	See MIL-STD-1835

1.4 Recommended operating conditions.

Supply voltage (V_{CC})	±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 references 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, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-38535 - Integrated Circuits, Manufacturing, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 -	Test Method Standard Microcircuits.
MIL-STD-1835 -	Interface Standard Electronic Component Case Outlines.

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 -	List of Standard Microcircuit Drawings.
MIL-HDBK-780 -	Standard Microcircuit Drawings.

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-38535, appendix A for non-JAN class level B devices and as specified herein. Product built to this drawing that is produced by a Qualified Manufacturer Listing (QML) certified and qualified manufacturer or a manufacturer who has been granted transitional certification to MIL-PRF-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-PRF-38535. This QML flow as documented in the Quality Management (QM) plan may make modifications to the requirements herein. These modifications shall not affect form, fit, or function of the device. These modifications shall not affect the PIN as described herein. A "Q" or "QML" certification mark in accordance with MIL-PRF-38535 is required to identify when the QML flow option is used.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535, appendix A and herein.

3.2.1 Case outline. The case outline shall be in accordance with 1.2.2 herein.

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

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-PRF-38535, appendix A. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked. For packages where marking of the entire SMD PIN number is not feasible due to space limitations, the manufacturer has the option of not marking the "5962-" on the device.

3.5.1 Certification/compliance mark. A compliance indicator “C” shall be marked on all non-JAN devices built in compliance to MIL-PRF-38535, appendix A. The compliance indicator “C” shall be replaced with a "Q" or "QML" certification mark in accordance with MIL-PRF-38535 to identify when the QML flow option is used.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°\text{C} \leq T_A \leq +125°\text{C}$ $\pm V_S = \pm 15$ V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V_{IO}		1	01		80	µV
			2,3			180	
Input offset current	I_{IO}		1	01		35	nA
			2,3			50	
Input bias current	I_{IB}		1	01		40	nA
			2,3			60	
Average input offset drift 1/	TC V_{IO}		1,2,3	01		1.0	µV/°C
Power supply rejection ratio	PSRR	$V_S = \pm 4$ V to ± 18 V	1	01		10	µV/V
			2,3			16	
Common mode rejection ratio	CMRR	$V_{CM} = \pm 11$ V	1	01	114		dB
		$V_{CM} = \pm 10$ V	2,3		108		
Large signal voltage gain	A_{VOL}	$V_O = \pm 10$ V, $R_L \geq 2$ kΩ	4	01	1000		V/mV
			5,6		600		
		$V_O = \pm 10$ V, $R_L \geq 600$ Ω	4		800		
Input voltage range	IVR	$T_A = +25°\text{C}$	1	01	±11.0		V
		$T_A = -55°\text{C}, +125°\text{C}$ 1/	2,3		±10.0		
Output voltage swing	V_{OP}	$R_L \geq 2$ kΩ	4	01	±12		V
			5,6		±11.5		
		$R_L \geq 600$ Ω	4		±10		
Slew rate	SR	$R_L \geq 2$ kΩ, $T_A = +25°\text{C}$	7	01	1.7		V/µs
Input noise voltage density	E_n	$f_O = 10$ Hz, $T_A = +25°\text{C}$	7	01		6.0	nV / $\sqrt{\text{Hz}}$
		$f_O = 1{,}000$ Hz, $T_A = +25°\text{C}$				3.9	
Input noise current density	I_n	$f_O = 10$ Hz, $T_A = +25°\text{C}$	7	01		5.66	pA / $\sqrt{\text{Hz}}$
		$f_O = 1{,}000$ Hz, $T_A = +25°\text{C}$				0.99	

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions -55°C ≤ T_A ≤ +125°C ±V_S = ±15 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Gain bandwidth product 1/	GBW	f = 100 kHz, T_A = +25°C	4	01	5.0		MHz
Power consumption	P_D	Each amplifier, T_A = +25°C	1	01		140	mW
Input offset voltage match	V_{OS}	T_A = +25°C	1	01		80	µV
		T_A = -55°C, +125°C	2,3			180	
Average noninverting bias current	I_{B+}	I_{B+} = (I_{B+A} + I_{B+B}) / 2, T_A = +25°C	1	01		±40	nA
		I_{B+} = (I_{B+A} + I_{B+B}) / 2, T_A = -55°C, +125°C	2,3			±60	
Noninverting offset current	I_{OS+}	I_{OS+} = (I_{B+A} - I_{B+B}), T_A = +25°C	1	01		±60	nA
		I_{OS+} = (I_{B+A} - I_{B+B}), T_A = -55°C, +125°C	2,3			±90	
Inverting offset current	I_{OS-}	I_{OS-} = (I_{B-A} - I_{B-B}), T_A = +25°C	1	01		±60	nA
		I_{OS-} = (I_{B-A} - I_{B-B}), T_A = -55°C, +125°C	2,3			±90	

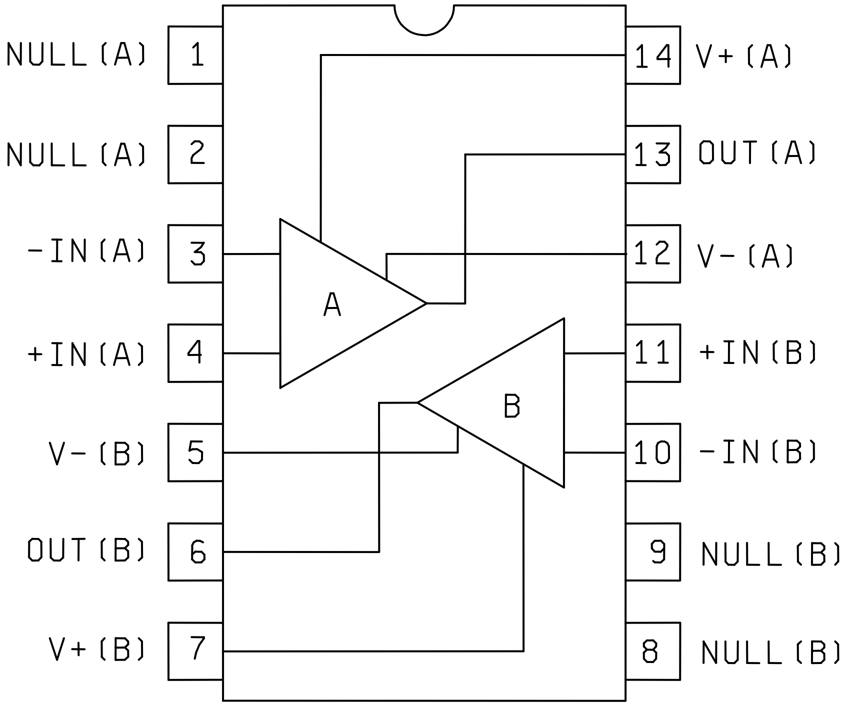
1/ Guaranteed if not tested.

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-HDBK-103 (see 6.6 herein). The certificate of compliance submitted to DLA Land and Maritime -VA prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-PRF-38535, appendix A and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38535, appendix A shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DLA Land and Maritime -VA shall be required for any change that affects this drawing.

3.9 Verification and review. DLA Land and Maritime, DLA Land and Maritime '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.



(Top view)

FIGURE 1. Terminal connections and logic diagram.

4. VERIFICATION

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38535, appendix A.

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. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.

(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.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (in accordance with MIL-STD-883, 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.

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. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.

(2) T_A = +125°C, minimum.

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

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38535, appendix A.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

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 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform DLA Land and Maritime when a system application requires configuration control and the applicable SMD to that system. DLA Land and Maritime 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 DLA Land and Maritime -VA, telephone (614) 692-0547.

6.5 Comments. Comments on this drawing should be directed to DLA Land and Maritime -VA, Columbus, Ohio 43218-3990, or telephone (614) 692-0540.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-HDBK-103. The vendors listed in MIL-HDBK-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DLA Land and Maritime -VA.

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 10-10-25

Approved sources of supply for SMD 5962-86887 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38535 during the next revision. MIL-HDBK-103 and QML-38535 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DLA Land and Maritime -VA. This information bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535. DLA Land and Maritime maintains an online database of all current sources of supply at http://www.dscc.dla.mil/Programs/Smcr/.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/	Reference military specification PIN
5962-8688701CA	60264	MTLOP-227AQD	M38510/13504BCA
	3/	OP-227AJ/883B	
	3/	MP OP-227AY	
	3/	OP-227A883	
5962-8688701CC	3/	MTLOP-227AJ/883	

1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the vendor to determine its availability.
2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
3/ Not available from an approved source of supply.

Vendor CAGE number	Vendor name and address
60264	Minco Technology Labs, Inc. 1805 Rutherford Lane Austin, TX 78754-5101

The information contained herein is disseminated for convenience only and the Government assumes no liability whatsoever for any inaccuracies in the information bulletin.