National Semiconductor

MICROCIRCUIT DATA SHEET

MNLMC6482AM-X REV 0A0

Original Creation Date: 08/16/95
Last Update Date: 05/19/98
Last Major Revision Date: 04/22/96

CMOS DUAL RAIL-TO-RAIL INPUT AND OUTPUT OPERATIONAL AMPLIFIER

General Description

The LMC6482 provides a common-mode range that extends to both supply rails. This rail-to-rail performance combined with excellent accuracy, due to a high CMRR, makes it unique among rail-to-rail input amplifiers.

It is ideal for systems, such as data acquistion, that require a large input signal range. The LMC6482 is also an excellent upgrade for circuits using limited common-mode range amplifiers such as the TLC272 and TLC277.

Maximum dynamic signal range is assured in low voltage and single supply systems by the LMC6482's rail-to-rail output swing. The LMC6482's rail-to-rail output swing is guaranteed for loads down to 600 Ohms.

Guaranteed low voltage characteristics and low power dissipation make the LMC6482 especially well-suited for battery-operated systems.

See the LMC6484 data sheet for a Quad CMOS operational amplifier with these same features.

Industry Part Number

LMC6482AM

NS Part Numbers

LMC6482AMJ/883

Prime Die

LMC6482

Controlling Document

5962-9453401MPA

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (^{o}C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Features

(Typical Unless Otherwise Noted)
- Rail-to-Rail input common-mode voltage range.
  (Guaranteed Over Temperature)
- Rail-to-Rail output swing.
  (within 20mV of supply rail, 100k Ohms load)
- Guaranteed 3V, 5V and 15V performance.
- Excellent CMRR and PSRR. 82dB
- Ultra low input current. 20fA
- High voltage gain (Rl = 500k Ohms) 130dB
- Specified for 2k Ohms and 600 Ohms load.

Applications

- Data Aquisition Systems.
- Transducer Amplifiers.
- Hand-held Analytic Instruments.
- Medical Instrumentation.
- Active Filter, Peak Detector, Sample and Hold, pH Meter, Current Source.
- Improved Replacement for TLC272, TLC277.

(Absolute Maximum Ratings)

(Note 1)

Supply Voltage (V+ - V-)	16V
Differential Input Voltage	±Supply Voltage
Voltage at Input/Output Pin	(V+)+0.3V,(V-)-0.3V
Current at Input Pin (Note 6)	±5mA
Current at Output Pin (Note 3, 5)	±30mA
Current at Power Supply Pin	40mA
Maximum Junction Temperature (Note 4)	150 C
Power Dissipation (Note 2)	160mW
Storage Temperature Range	-65 C to +150 C
Operating Temperature Range	-55 C ≤ TA ≤ +125 C
Thermal Resistance	
ThetaJA	
8-Pin CERAMIC DIP (Still Air)	117 C/W
8-Pin CERAMIC DIP (500LF/Min Air flow)	62.0 C/W
ThetaJC	
8-Pin CERAMIC DIP	16.0 C/W
Lead Temperature (Soldering, 10 seconds)	260 C
ESD Tolerance (Note 7)	1.5kV

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

Note 2: The maximum power dissipation must be derated at elevated temperatures and is dictated by Tjmax (maximum junction temperature), ThetaJA (package junction to ambient thermal resistance), and TA (ambient temperature). The maximum allowable power dissipation at any temperature is Pdmax = (Tjmax - TA)/ThetaJA or the number given in the Absolute Maximum Ratings, whichever is lower.

Note 3: Applies to both single-supply and split-supply operation. Continous short circuit operation at elevated ambient temperature can result in exceeding the maximum allowed junction temperature of 150 C. Output currents in excess of ±30mA over long term may adversely affect reliability.

Note 4: All numbers apply for packages soldered directly into a PC board.

Note 5: Do not short circuit output to V+, when V+ is greater than 13V or reliability will be adversely affected.

Note 6: Limiting input pin current is only necessary for input voltages that exceed absolute maximum input voltage ratings.

Note 7: Human body model, 1.5k Ohms in series with 100pF. All pins rated per method 3015.6 of MIL-STD-883. This is a Class 1 device rating.

Recommended Operating Conditions
(Note 1)

Supply Voltage

$3.0V \leq V+ \leq 15.5V$

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: V+=5V, V-=0V, Rl>1M, Vcm = Vo = V+/2

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vos	Input Offset Voltage					0.75	mV	1
						1.35	mV	2, 3
Iib	Input Bias Current					25	pA	1
						100	pA	2, 3
Ios	Input Offset Current					25	pA	1
						100	pA	2, 3
CMRR	Common Mode Rejection Ratio	0V<=Vcm<=15.0V, V+=15V			65		dB	1
					62		dB	2, 3
		0V<=Vcm<=5.0V, V+=5V			65		dB	1
					62		dB	2, 3
+PSRR	Positive Power Supply Rejection Ratio	5V<=V+<=15V, Vo=2.5V			65		dB	1
					62		dB	2, 3
-PSRR	Negative Power Supply Rejection Ratio	-5V<=V-<=-15V, Vo=-2.5V, V+=0V			65		dB	1
					62		dB	2, 3
Vcm	Input Common Mode Voltage Range	5V>=Vcm>=15V, For CMRR>=50dB			V++.25	-0.25	V	1
					V+	0	V	2, 3
Isc	Output Short Circuit Current	Sourcing, Vo=0V			16		mA	1
					12		mA	2, 3
		Sinking , Vo=5V			11		mA	1
					9		mA	2, 3
		V+=15V, Sourcing, Vo=0V			28		mA	1
					22		mA	2, 3
		V+=15V, Sinking, Vo=12V	1		30		mA	1
			1		24		mA	2, 3
Icc	Supply Current	Both Amps				1.4	mA	1
						1.8	mA	2, 3
		Both Amps, V+=+15V				1.6	mA	1
						2.0	mA	2, 3

Electrical Characteristics

DC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: V+=5V, V-=0V, Rl>1M, Vcm = Vo = V+/2

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vo	Output Swing	V+=5V, Rl=2K Ohms to V+/2			4.8	0.18	V	4
					4.7	0.24	V	5, 6
		V+=5V, Rl=600 Ohms to V+/2			4.5	0.50	V	4
					4.24	0.65	V	5, 6
		V+=15V, Rl=2K Ohms to V+/2			14.4	0.32	V	4
					14.2	0.45	V	5, 6
		V+=15V, Rl=600 Ohms to V+/2			13.4	1.00	V	4
					13.0	1.30	V	5, 6
Av	Large Signal Voltage Gain	Rl=2K Ohms Sourcing	2		140		V/mV	4
			2		84		V/mV	5, 6
		Rl=2K Ohms Sinking	2		35		V/mV	4
			2		20		V/mV	5, 6
		Rl=600 Ohms Sourcing	2		80		V/mV	4
			2		48		V/mV	5, 6
		Rl=600 Ohms Sinking	2		18		V/mV	4
			2		13		V/mV	5, 6

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: V+=5V, V-=0V, Rl>1M, Vcm = Vo = V+/2

Sr	Slew Rate		3		0.9		V/uS	4
			3		0.6		V/uS	5, 6
Gbw	Gain Bandwidth	V+ = 15V, set up as non-inverting			1.25		MHz	4
					1.15		MHz	5, 6

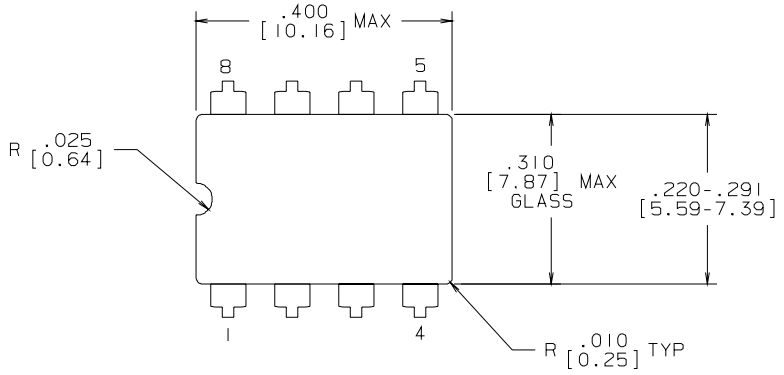
Note 1: Do not short circuit output to V+, when V+ is greater than 13V or reliability will be adversely affected.
Note 2: V+=15V, Vcm=7.5V and Rl connected to 7.5V. For Sourcing tests, 7.5V<=Vo<=11.5V. For Sinking tests, 3.5V<=Vo<=7.5V.
Note 3: V+=15V. Connected as Voltage Follower with 10V step input, 2.5V to 12.5V for +Slew, and 12.5V to 2.5V for -Slew. Number specified is the slower of either the positive or negative slew rates.

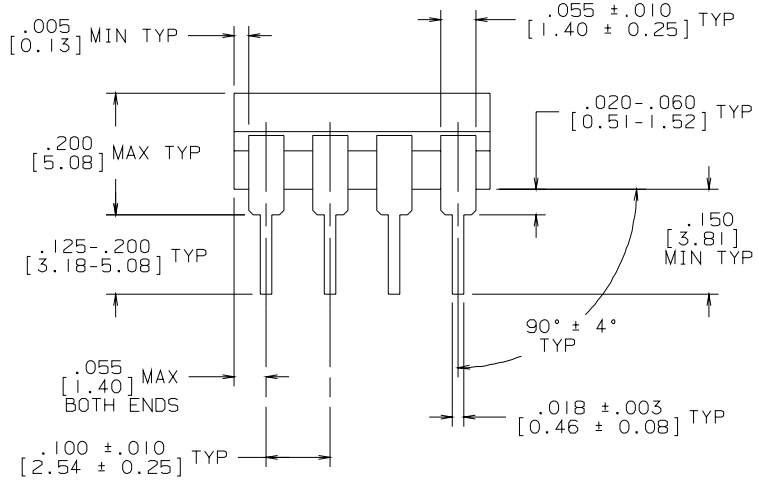
Graphics and Diagrams

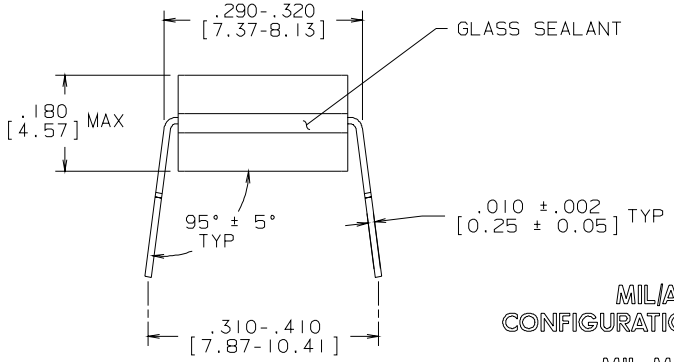
GRAPHICS#	DESCRIPTION
06086HRC4	CERDIP (J), 8 LEAD (B/I CKT)
J08ARL	CERDIP (J), 8 LEAD (P/P DWG)
P000346A	CERDIP (J), 8 LEAD (PINOUT)

See attached graphics following this page.

REVISIONS				
LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
L	REVISE PER CURRENT STD; REDRAW	10002	09/21/93	TL/







MIL/AERO
CONFIGURATION CONTROL

MIL-M-38510
CONFIGURATION CONTROL

NOTES: UNLESS OTHERWISE SPECIFIED

1. LEAD FINISH TO BE 200 MICROINCHES / 5.08 MICROMETERS MINIMUM SOLDER MEASURED AT THE CREST OF THE MAJOR FLATS.
2. JEDEC REGISTRATION MO-036, VARIATION AA, DATED 04/1981.

CONTROLLING DIMENSION: INCH

APPROVALS	DATE
DRAWN T. LEQUANG	09/21/93
DFTG. CHK.	
ENGR. CHK.	
APPROVAL	

PROJECTION

INCH
[MM]

NATIONAL SEMICONDUCTOR CORPORATION
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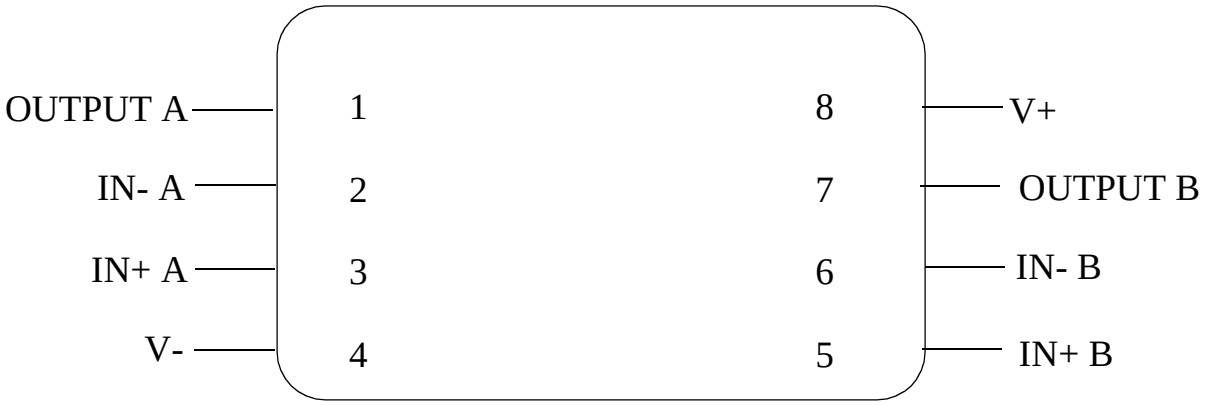
CERDIP (J), 8 LEAD

SCALE	SIZE	DRAWING NUMBER	REV
N/A	B	MKT-J08A	L

DO NOT SCALE DRAWING | SHEET 1 OF 1



LMC6482AMJ

8 - LEAD DIP

CONNECTION DIAGRAM

TOP VIEW

P000346A

National Semiconductor™
MIL/AEROSPACE OPERATIONS
2900 SEMICONDUCTOR DRIVE
SANTA CLARA, CA 95050

Revision History

Rev	ECN #	Rel Date	Originator	Changes
0A0	M0002889	05/19/98	Rose Malone	Changed MDS: MNLMC6482AM-X Rev. 0AL to MNLMC6482AM-X Rev. 0A0. Updated subgroups to match SMD. Added Pinout. Updated Burn-In circuit.