

MNLMC6462AM-X REV 1A1

Original Creation Date: 04/03/96
Last Update Date: 05/19/98
Last Major Revision Date: 02/09/98

PRECISION CMOS DUAL MICROPOWER OPERATIONAL AMPLIFIER

General Description

The LMC6462 is a dual low offset voltage amplifier, combining rail-to-rail Input and Output Range with very low power consumption. Performance characteristics include low input bias current, high voltage gain, rail-to-rail output swing, and an input common mode voltage range that exceeds both rails, operating at 3V, 5V, and 15V. The rail-to-rail output swing of the amplifier, for loads down to 25 KOhms, assures maximum dynamic signal range. These features, plus its low power consumption, make the LMC6462 ideally suited for battery powered applications.

The LMC6462 is an excellent upgrade for circuits using limited common-mode range amplifiers.

For designs that require higher speed, see the LMC6482 dual operational amplifier.

Industry Part Number

LMC6462

NS Part Numbers

LMC6462AMJ-QML

Prime Die

LMC6462

Controlling Document

5962-9560301QPA

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°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

- Low offset voltage. 500uV
- Ultra low supply current. 23uA/Amplifier
- Operates from 3V to 15V single supply.
- Low input bias current. 150fA typ.
- Rail-to-Rail Output Swing within 10mV of rail, Vs = 5V, 25k Ohm load.

Applications

- Battery Operated Circuits.
- Transducer Interface Circuits.
- Portable Communication Devices.
- Medical Application.
- Battery Monitoring.

Recommended Operating Conditions

(Note 1)

Supply Voltage

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

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: 5 Volt

(The following conditions apply to all the following parameters, unless otherwise specified.)
 DC: $V_+ = 5V$, $V_- = 0V$, $V_{cm} = V_o = V_+/2$, $R_l = > 1M$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vio	Input Offset Voltage				0.5		mV	1
					1.4		mV	2, 3
Iib	Input Bias Current		4		25		pA	1
			4		100		pA	2, 3
Iio	Input Offset Current		4		25		pA	1
			4		100		pA	2, 3
CMRR	Common Mode Rejection Ratio	$0V \leq V_{cm} \leq 5.0V$			70		dB	1
					67		dB	2, 3
Vcm	Input Common-Mode Voltage Range	For $CMRR \geq 50$ dB			5.25	-0.10	V	1
					5.00	0.00	V	2, 3
Vop	Output Swing	$R_l = 100K$ Ohms to $V_+/2$			4.990	0.010	V	1
					4.980	0.020	V	2, 3
		$R_l = 25K$ Ohms to $V_+/2$			4.975	0.020	V	1
					4.965	0.035	V	2, 3
Icc	Supply Current	$V_o = V_+/2$			55		uA	1
					70		uA	2, 3
Isc	Output Short Circuit Current	Sourcing, $V_o = 0V$			19		mA	1
					15		mA	2, 3
		Sinking, $V_o = 5V$			22		mA	1
					17		mA	2, 3

Electrical Characteristics

DC PARAMETERS: 15 Volt

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: $V_+ = 15V$, $V_- = 0V$, $V_{cm} = V_o = V_+/2$, $R_l > 1M$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vio	Input Offset Voltage				1.8		mV	1
					2.3		mV	2, 3
Iib	Input Bias Current		4		25		pA	1
			4		100		pA	2, 3
Iio	Input Offset Current		4		25		pA	1
			4		100		pA	2, 3
CMRR	Common Mode Rejection Ratio	$0V \leq V_{cm} \leq 15.0V$			70		dB	1
					67		dB	2, 3
Vcm	Input Common Mode Voltage Range	For CMRR \Rightarrow 50dB			15.25	-0.15	V	1
					15.00	0.00	V	2, 3
+PSRR	Positive Power Supply Rejection Ratio	$5V \leq V_+ \leq 15V$, $V_- = 0V$, $V_o = 2.5V$			70		dB	1
					67		dB	2, 3
-PSRR	Negative Power Supply Rejection Ratio	$-5V \leq V_- \leq -15V$, $V_+ = 0V$, $V_o = -2.5V$			70		dB	1
					67		dB	2, 3
Vop	Output Swing	$R_l = 100K \text{ Ohm to } V_+/2$			14.975	0.025	V	1
					14.965	0.035	V	2, 3
		$R_l = 25K \text{ Ohm to } V_+/2$			14.900	0.050	V	1
					14.850	0.150	V	2, 3
Icc	Supply Current	$V_o = V_+/2$			60		uA	1
					70		uA	2, 3
Isc	Output Short Circuit Current	Sourcing, $V_o = 0V$			24		mA	1
					17		mA	2, 3
		Sinking, $V_o = 12V$	1		55		mA	1
					1		45	

Electrical Characteristics

DC PARAMETERS: 15 Volt(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: $V_+ = 15V$, $V_- = 0V$, $V_{cm} = V_o = V_+/2$, $R_l > 1M$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Av	Large Signal Voltage Gain	Sourcing, $R_l = 100K$ Ohms	2		110		dB	1
			2		80		dB	2, 3
		Sinking, $R_l = 100K$ Ohms	2		100		dB	1
			2		70		dB	2, 3
		Sourcing, $R_l = 25K$ Ohms	2		110		dB	1
			2		70		dB	2, 3
Sinking, $R_l = 25K$ Ohms	2		95		dB	1		
	2		60		dB	2, 3		

DC PARAMETERS: 3 Volt

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: $V_+ = 3V$, $V_- = 0V$, $V_{cm} = V_o = V_+/2$, $R_l > 1M$

Vio	Input Offset Voltage				0.8		mV	1
					1.7		mV	2, 3
Iib	Input Bias Current		4		25		pA	1
			4		100		pA	2, 3
Iio	Input Offset Current		4		25		pA	1
			4		100		pA	2, 3
CMRR	Common Mode Rejection Ratio	$0V \leq V_{cm} \leq 3.0V$			60		dB	1
					57		dB	2, 3
Vcm	Input Common Mode Voltage Range	For $CMRR > 50$ dB			3.0	0.0	V	1
					2.9	0.1	V	2, 3
Vop	Output Swing	$R_l = 25K$ Ohms to $V_+/2$			2.9	0.10	V	1
					2.8	0.15	V	2, 3
Icc	Supply Current	$V_o = V_+/2$			55		uA	1
					70		uA	2, 3
Isc	Output Short Circuit Current	Sourcing, $V_o = 0V$			8		mA	1
					6		mA	2, 3
		Sinking, $V_o = 3V$			23		mA	1
					17		mA	2, 3

Electrical Characteristics

AC PARAMETERS:15 Volts

(The following conditions apply to all the following parameters, unless otherwise specified.)
 AC: $V_+ = 15V$, $V_- = 0V$, $V_{cm} = V_o = V_+/2$, $R_l > 1M$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Sr	Slew Rate		3		15		V/mS	4
			3		7		V/mS	5, 6
Gbw	Gain-Bandwidth				60		KHz	4
					45		KHz	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: $V_{cm}=7.5V$ and R_l connected to 7.5V. For Sourcing tests, $7.5V \leq V_o \leq 11.5V$. For Sinking tests, $3.5V \leq V_o \leq 7.5V$.

Note 3: Device configured as a voltage follower, with a 10V input step. For Positive Slew V_{in} swing is 2.5V to 12.5V, V_{out} is measured between 6.0V and 9.0V. For Negative Slew V_{in} is 12.5V to 2.5V, V_{out} is measured between 9.0V and 6.0V.

Note 4: Limits are dictated by testing limitations and not device performance.

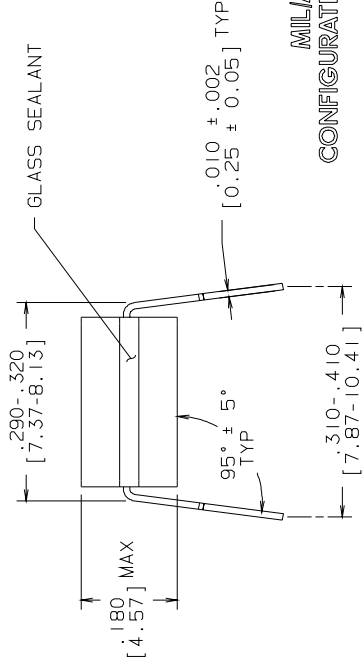
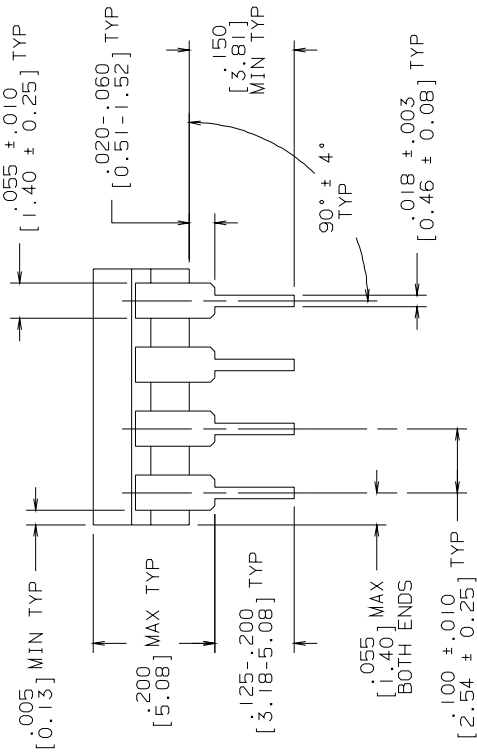
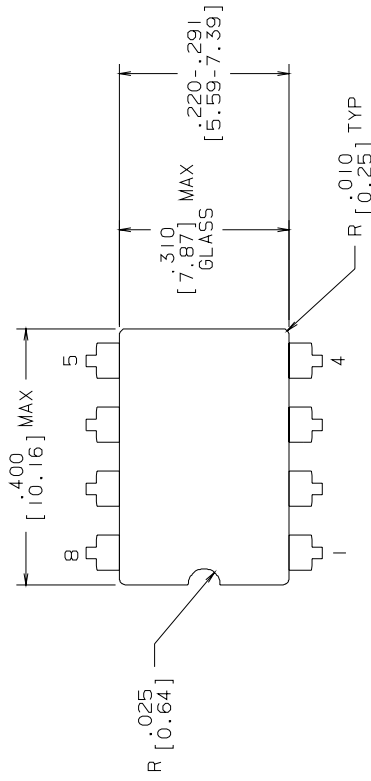
Graphics and Diagrams

GRAPHICS#	DESCRIPTION
06086HRC4	CERDIP (J), 8 LEAD (B/I CKT)
J08ARL	CERDIP (J), 8 LEAD (P/P DWG)
P000114A	CERDIP (J), 8 LEAD (PIN OUT)

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/



MILAERO
CONFIGURATION CONTROL
MIL-M-38510
CONFIGURATION CONTROL

CONTROLLING DIMENSION: INCH

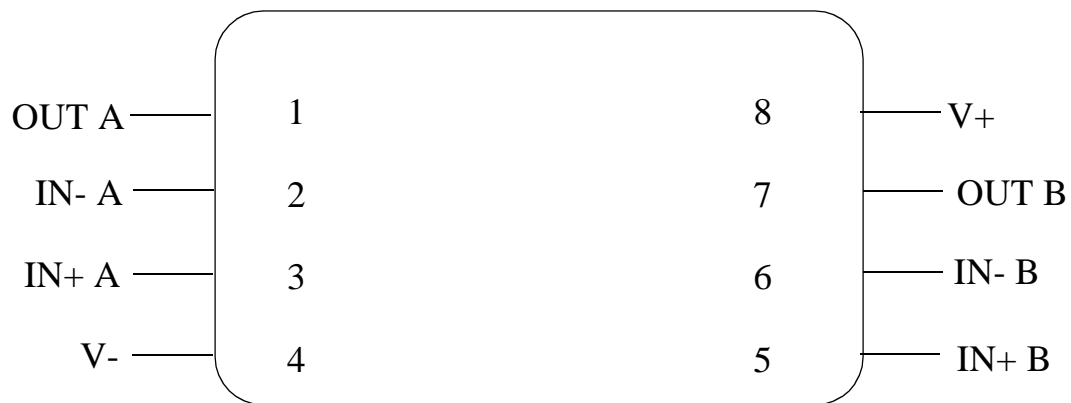
APPROVALS	DATE	NATIONAL SEMICONDUCTOR CORPORATION
DRAWN <i>T. LEQUANG</i>	09/21/93	2900 Semiconductor Drive, Santa Clara, CA 95052-8090
DFTG. CHK.		
ENGR. CHK.		
APPROVAL		

CERDIP (J),
8 LEAD

PROJECTION	SCALE	SIZE	DRAWING NUMBER	REV
	N/A	B	MKT-J08A	L
	DO NOT SCALE DRAWING	SHEET	1	OF 1

NOTES: UNLESS OTHERWISE SPECIFIED

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



LMC6462AMJ

8 - LEAD DIP

CONNECTION DIAGRAM

TOP VIEW

P000114A



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

Revision History

Rev	ECN #	Rel Date	Originator	Changes
1A1	M0002754	05/19/98	Rose Malone	Update MDS: MNLMC6462AM-X Rev. 0A0 to MNLMC6462AM-X Rev. 1A1. Updated subgroups in Electrical section to meet SMD. Update B/I graphic.