

**MNLM709-X REV 0B0**

Original Creation Date: 06/20/95

Last Update Date: 12/10/96

Last Major Revision Date: 06/20/95

## OPERATIONAL AMPLIFIER

### General Description

The LM709 is a monolithic operational amplifier intended for general-purpose applications. Operation is completely specified over the range of voltages commonly used for these devices. The design, in addition to providing high gain, minimizes both offset voltage and bias currents. Further, the class-B output stage gives a large output capability with minimum power drain.

External components are used to frequency compensate the amplifier. Although the unity-gain compensation network specified will make the amplifier unconditionally stable in all feedback configurations, compensation can be tailored to optimize high-frequency performance for any gain setting.

### Industry Part Number

LM709

### NS Part Numbers

LM709H/883

LM709W/883

### Prime Die

LM709

### 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

**(Absolute Maximum Ratings)**

(Note 1)

Supply Voltage	±18V
Power Dissipation	300mW
Differential Input Voltage	±5V
Input Voltage	±10V
Output Short-Circuit Duration (TA = +25 C)	5 Seconds
Storage Temperature Range	-65 C to +150 C
Lead Temperature (Soldering 10 Sec.)	300 C

Note 1: Absolute Maximum Ratings indicate limits which if exceeded may result in damage. Operating Ratings are conditions where the device is expected to be functional but not necessarily within the guaranteed performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics.

**Recommended Operating Conditions**

Junction Temperature Range (Note 1)	-55 C to +150 C
Thermal Resistance ThetaJA (H Package)	150 C/W
ThetaJC (H Package)	45 C/W

Note 1: For operating at elevated temperatures, the device must be derated based on a 150 C maximum junction temperature. For operating at elevated temperature, the device must be derated based on thermal resistance ThetaJA, Tj(MAX) and TA.

## Electrical Characteristics

### DC PARAMETERS

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

DC:  $V_{CC} = \pm 15V$ ,  $V_{CM} = 0$ ,  $R_S = 10K\ \Omega$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vio	Input Offset Voltage	$R_S = 10K\ \Omega$				5	mV	1
						6	mV	2, 3
		$R_S = 0\ \Omega$				5	mV	1
						6	mV	2, 3
		$V_{CC} = \pm 9V$				5	mV	1
		$V_{CC} = \pm 9V$				6	mV	2, 3
Iio	Input Offset Current					200	nA	1, 2
						500	nA	3
		$V_{CC} = \pm 9V$				200	nA	1, 2
		$V_{CC} = \pm 9V$				500	nA	3
Iib	Input Bias Current					500	nA	1, 2
						1500	nA	3
		$V_{CC} = \pm 9V$				500	nA	1, 2
		$V_{CC} = \pm 9V$				1500	nA	3
Avs	Large Voltage Signal Gain	$R_S=0\ \Omega$ , $R_L=2K\ \Omega$ , $-10V \leq V_O \leq 10V$	3		25	70	V/mV	1, 2, 3
PSRR	Power Supply Rejection Ratio	$\pm 15V \Rightarrow V_{CM} \geq \pm 9V$				150	$\mu V/V$	1, 2, 3
CMRR	Common Mode Rejection Ratio	$-8V \leq V_{CM} \leq 8V$			70		dB	1, 2, 3
Vout	Output Voltage Swing	$R_S = 0\ \Omega$ , $R_L = 10K\ \Omega$			$\pm 12$		V	1, 2, 3
		$R_S = 0\ \Omega$ , $R_L = 2K\ \Omega$			$\pm 10$		V	1, 2, 3
Icc	Power Supply Current	$R_S = 0\ \Omega$			0	5.5	mA	1
					0	4.5	mA	2
					0	6.3	mA	3
Vin	Input Voltage Range		2		$\pm 8$		V	1, 2, 3
Rin	Input Resistance		1		150		K $\Omega$	1, 2
			1		40		K $\Omega$	3

## Electrical Characteristics

### AC PARAMETERS

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

AC:  $V_{cc} = \pm 15V$ ,  $V_{cm} = 0$ ,  $R_s = 10K$  Ohms

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Sr	Slew Rate	$-5V \leq V_{in} < 5V$			0.2		V/uS	7
Gbw	Gain Bandwidth	$V_{in} = 50mV$ , $f = 20KHz$ $R_L = 2K$ Ohms			250		KHz	7

### DC PARAMETERS: DRIFT VALUES

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

DC:  $V_{cc} = \pm 15V$ ,  $V_{cm} = 0$ ,  $R_s = 10K$  Ohms. "Deltas not required on B-Level product. Deltas required for S-Level product ONLY as specified on Internal Processing Instructions (IPI)."

Vio	Input Offset Voltage	$R_s = 10K$ Ohms			-1	1	mV	1
Iio	Input Offset Current				-20	20	nA	1
Iib	Input Bias Current				-50	50	nA	1

Note 1: Parameter test go-no-go only.

Note 2: Guaranteed by the CMRR  $V_{cm}$  range.

Note 3: Datalog in  $K = V/mV$ .

## Graphics and Diagrams

GRAPHICS#	DESCRIPTION
H08CRE	(blank)

See attached graphics following this page.