National Semiconductor

MNLM709A-X REV 0B0

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

LM709A

Prime Die

LM709

NS Part Numbers

LM709AH/883
LM709AJ/883
LM709AW/883

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: Vcc = ±15V, Vcm = 0, Rs = 10K Ohms

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vio	Input Offset Voltage	Rs = 10K Ohms				2	mV	1
						3	mV	2, 3
		Rs = 0 Ohms				2	mV	1
						3	mV	2, 3
		Vcc = ±9V				2	mV	1
		Vcc = ±9V				3	mV	2, 3
Iio	Input Offset Current					50	nA	1, 2
						200	nA	3
		Vcc = ±9V				50	nA	1, 2
		Vcc = ±9V				200	nA	3
Iib	Input Bias Current					200	nA	1, 2
						500	nA	3
		Vcc = ±9V				200	nA	1, 2
		Vcc = ±9V				500	nA	3
Avs	Large Voltage Signal Gain	Rs=0 Ohms, RL=2K Ohms, -10V<=Vo<=10V	4		25	70	V/mV	1, 2, 3
PSRR	Power Supply Rejection Ratio	±15V => Vcm >= ±9V				100	uV/V	1, 2, 3
CMRR	Common Mode Rejection Ratio	-8V <= Vcm <= 8V			80		dB	1, 2, 3
Vout	Output Voltage Swing	Rs = 0 Ohm, RL = 10K Ohms			±12		V	1, 2, 3
		Rs = 0 Ohm, RL = 2K Ohms			±10		V	1, 2, 3
Icc	Power Supply Current	Rs= 0 Ohms			0	3.6	mA	1
					0	3.0	mA	2
					0	4.5	mA	3
Vin	Input Voltage Range		3		±8		V	1, 2, 3
Rin	Input Resistance		1		350		KOhms	1, 2
			1		85		KOhms	3

Electrical Characteristics

DC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vcc = ±15V, Vcm = 0, Rs = 10K Ohms

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Delta Vio/Delta T	Temperature Coefficient	Rs = 50 Ohms	2			10	uV/C	1, 2, 3
		Rs = 10k Ohms	2			25	uV/C	1, 3
			2			15	uV/C	2

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: Vcc = ±15V, Vcm = 0, Rs = 10K Ohms

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Sr	Slew Rate	-5V <= Vin <= 5V			0.2		V/uS	7
Gbw	Gain Bandwidth	Vin = 50mV, f = 20KHz RL = 2K Ohms			250		KHz	7

DC PARAMETERS: DRIFT VALUES

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vcc = ±15V, Vcm = 0, Rs = 10K Ohms. "Deltas not required on B-Level product. Deltas required for S-Level product ONLY as specified on Internal Processing Instructions (IPI)."

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vio	Input Offset Voltage	Rs = 10K Ohms			-1	1	mV	1
Iio	Input Offset Current				-10	10	nA	1
Iib	Input Bias Current				-25	25	nA	1

Note 1:   Parameter test go-no-go only.
Note 2:   Guaranteed parameter not test.
Note 3:   Guaranteed by the CMRR Vcm range.
Note 4:   Datalog in K = V/mV.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
H08CRE	(blank)

See attached graphics following this page.