National Semiconductor

# MICROCIRCUIT DATA SHEET

## MNLM107-X REV 0CL

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Last Major Revision Date: 08/20/01

# OPERATIONAL AMPLIFIER

## General Description

The LM107 series are complete, general purpose operational amplifiers, with the necessary frequency compensation built into the chip. Advanced processing techniques make the input currents a factor of ten lower than industry standards like the 709. Yet, they are a direct, plug-in replacement for the 709, LM101A and 741.

The LM107 series offers the features of the LM101A, which makes its application nearly foolproof. In addition, the device provides better accuracy and lower noise in high impedance circuitry. The low input currents also make it particularly well suited for long interval integrators or timers, sample and hold circuits and low frequency waveform generators. Further, replacing circuits where matched transistor pairs buffer the inputs of conventional IC op amps, it can give lower offset voltage and drift at a lower cost.

The LM107 is guaranteed over a -55C to + 125C temperature range, the LM207 from -25C to +85C and the LM307 from 0C to + 70C.

## Industry Part Number

LM107

## NS Part Numbers

LM107H/883

## Prime Die

LM107

## Controlling Document

SEE FEATURES SECTION

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## 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

CONTROLLING DOCUMENT:

- LM107H/883 5962-8958901GA

## (Absolute Maximum Ratings)
(Note 1)

| | |
|---|---|
| Supply Voltage | ± 22V |
| Power Dissipation (Note 2, 3) | 500 mW |
| Differential Input Voltage | ± 30V |
| Input Voltage (Note 3) | ± 15V |
| Output Short Circuit Duration | Continuous |
| Operating Temperature Range (TA) | -55 C to + 125 C |
| Storage Temperature Range | -65 C to +150 C |
| Lead Temperature (Soldering, 10 seconds) | 260 C |
| ESD | Rating to be determined |

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: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

# Electrical Characteristics

## DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vcc = ± 20V, Vcm = 0V, Rs = 50 Ohms

| SYMBOL | PARAMETER | CONDITIONS | NOTES | PIN-NAME | MIN | MAX | UNIT | SUB-GROUPS |
|---|---|---|---|---|---|---|---|---|
| Vio | Input Offset Voltage | Vcm = ± 15V | | | -2 | 2 | mV | 1 |
| | | | | | -3 | 3 | mV | 2, 3 |
| | | | | | -2 | 2 | mV | 1 |
| | | | | | -3 | 3 | mV | 2, 3 |
| | | Vcc = ± 5V | | | -2 | 2 | mV | 1 |
| | | | | | -3 | 3 | mV | 2, 3 |
| Iio | Input Offset Current | Vcm = ±15V | | | -10 | 10 | nA | 1 |
| | | | | | -20 | 20 | nA | 2, 3 |
| | | | | | -10 | 10 | nA | 1 |
| | | | | | -20 | 20 | nA | 2, 3 |
| | | Vcc = ± 5V | | | -10 | 10 | nA | 1 |
| | | | | | -20 | 20 | nA | 2, 3 |
| ±Iib | Input Bias Current | Vcm = ±15V | | | 1 | 75 | nA | 1 |
| ±Iib | Input Bias Current | Vcm = ±15V | | | 1 | 100 | nA | 2, 3 |
| ±Iib | Input Bias Current | | | | 1 | 75 | nA | 1 |
| ±Iib | Input Bias Current | | | | 1 | 100 | nA | 2, 3 |
| ±Iib | Input Bias Current | Vcc = ± 5V | | | 1 | 75 | nA | 1 |
| ±Iib | Input Bias Current | Vcc = ± 5V | | | 1 | 100 | nA | 2, 3 |
| Icc | Supply Current | | | | | 3 | mA | 1 |
| | | | | | | 2.5 | mA | 2 |
| | | | | | | 3.5 | mA | 3 |
| Ios- | Short Circuit Current | | | | 7 | 45 | mA | 1 |
| | | | | | 5 | 45 | mA | 2 |
| | | | | | 7 | 50 | mA | 3 |
| Ios+ | Short Circuit Current | | | | -45 | -7 | mA | 1 |
| | | | | | -45 | -5 | mA | 2 |
| | | | | | -50 | -7 | mA | 3 |

# Electrical Characteristics

## DC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vcc = ± 20V, Vcm = 0V, Rs = 50 Ohms

| SYMBOL | PARAMETER | CONDITIONS | NOTES | PIN-NAME | MIN | MAX | UNIT | SUB-GROUPS |
|---|---|---|---|---|---|---|---|---|
| PSRR+ | Supply Voltage Rejection Ratio | +Vcc = 20V to 5V | | | 80 | | dB | 1, 2, 3 |
| PSRR- | Supply Voltage Rejection Ratio | -Vcc = -20V to -5V | | | 80 | | dB | 1, 2, 3 |
| CMRR | Common Mode rejection Ratio | -15V <= Vcm <= +15V | | | 80 | | dB | 1, 2, 3 |
| Rin | Input Resistance | | | | 1.5 | | MOhms | 1 |
| Vir | Input Voltage Range | | 1 | | -15 | +15 | V | 1, 2, 3 |
| Avs- | Large Signal Voltage Gain | Vcc = ±15V, Vout = 0 to -12V, Rl = 10K Ohms | | | 50 | | V/mV | 4 |
| | | | | | 25 | | V/mV | 5, 6 |
| | | Vcc = ±15V, Vout = 0 to -10V, Rl = 2K Ohms | | | 50 | | V/mV | 4 |
| | | | | | 25 | | V/mV | 5, 6 |
| Avs+ | Large Signal Voltage Gain | Vcc = ±15V, Vout = 0 to 12V, Rl = 10K Ohms | | | 50 | | V/mV | 4 |
| | | | | | 25 | | V/mV | 5, 6 |
| | | Vcc = ±15V, Vout = 0 to 10V, Rl = 2K Ohms | | | 50 | | V/mV | 4 |
| | | | | | 25 | | V/mV | 5, 6 |
| Vop+ | Output Voltage Swing | Vcc = ±15V, Rl = 10K Ohms | | | 12 | | V | 4, 5, 6 |
| | | Vcc = ±15V, Rl = 2K Ohms | | | 10 | | V | 4, 5, 6 |
| | | Rl = 10K Ohms | | | 16 | | V | 4, 5, 6 |
| | | Rl = 2K Ohms | | | 15 | | V | 4, 5, 6 |
| Vop- | Output Voltage Swing | Vcc = ±15V, Rl = 10K Ohms | | | | -12 | V | 4, 5, 6 |
| | | Vcc = ±15V, Rl = 2K Ohms | | | | -10 | V | 4, 5, 6 |
| | | Rl = 10K Ohms | | | | -16 | V | 4, 5, 6 |
| | | Rl = 2K Ohms | | | | -15 | V | 4, 5, 6 |

# Electrical Characteristics

## AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: Vcc = ±20V, Vcm = 0V

| SYMBOL | PARAMETER | CONDITIONS | NOTES | PIN-NAME | MIN | MAX | UNIT | SUB-GROUPS |
|---|---|---|---|---|---|---|---|---|
| Sr+ | Slew Rate | Vin = -5V to +5V, Av=1, Rl=2K | | | 0.2 | | V/uS | 7 |
| Sr- | Slew Rate | Vin = +5V to -5V, Av=1, Rl=2K | | | 0.2 | | V/uS | 7 |
| Gbw | Gain Bandwidth | Vin = 50mVrms, f = 20Khz, Rl=2KOhms | | | 250 | | Khz | 7 |

Note 1: Guaranteed by CMRR.

## Graphics and Diagrams

| GRAPHICS# | DESCRIPTION |
|---|---|
| 09413HR | (blank) |
| MKT-H08CRE | (blank) |
| MKT-J08ARL | (blank) |

**See attached graphics following this page.**

## Revision History

| Rev | ECN # | Rel Date | Originator | Changes |
|---|---|---|---|---|
| 0CL | M0004057 | 09/04/02 | Rose Malone | Update MDS: MNLM107-X, Rev. 0BL to MNLM107-X, Rev. 1CL. Deleted from Main Table reference to NSID's LM107J-14/883 and LM107J/883. NSID's no longer avtive. |