National Semiconductor

May 2005

LM107QML
Operational Amplifier

General Description

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

Features

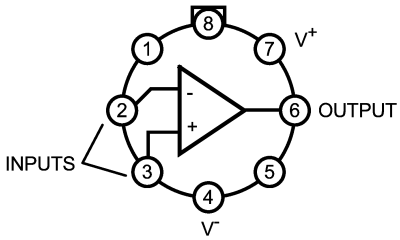
- Offset voltage 3 mV maximum over temperature
- Input current 100 nA maximum over temperature
- Offset current 20 nA maximum over temperature

Ordering Information

NS PART NUMBER	SMD PART NUMBER	NS PACKAGE NUMBER	PACKAGE DISCRIPTION
LM107H/883	5962–8958901GA	H08C	8LD Metal Can

Connection Diagram

Metal Can Package



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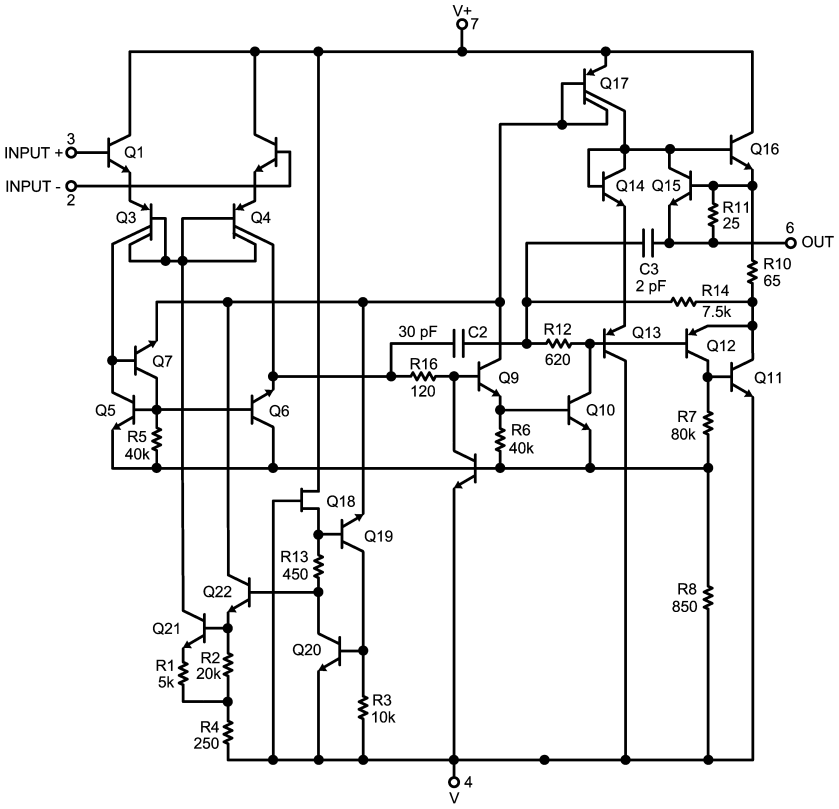
Top View
See NS Package Number H08C

Note: Pin 4 connected to case.

Schematic Diagram (Pin connections shown are for metal can)



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Note: For Performance Characteristics or Typical Applications graphs, Refer to Commercial Data Sheet.

Absolute Maximum Ratings (Note 1)

Supply Voltage	±22V
Power Dissipation (Notes 2, 3)	500 mW
Differential Input Voltage	±30V
Input Voltage (Note 3)	±15V
Output Short Circuit Duration	Continuous
Operating Temperature Range (T_A)	-55˚C ≤ T_A ≤ +125˚ C
Storage Temperature Range	-65˚C ≤ T_A ≤ +150˚C
Lead Temperature (Soldering, 10 seconds)	260˚C
ESD Tolerance (Note 4)	1000V

Quality Conformance Inspection

MIL-STD-883, Method 5005 - Group A

Subgroup	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

LM107 Electrical Characteristics

DC Parameters

The following conditions apply, unless otherwise specified. V_{CC} = ±20V, V_{CM} = 0V, R_S = 50Ω

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-groups
V_{IO}	Input Offset Voltage	V_{CM} = ±15V		-2	2	mV	1
				-3	3	mV	2, 3
				-2	2	mV	1
				-3	3	mV	2, 3
		V_{CC} = ±5V		-2	2	mV	1
				-3	3	mV	2, 3
I_{IO}	Input Offset Current	V_{CM} = ±15V		-10	10	nA	1
				-20	20	nA	2, 3
				-10	10	nA	1
				-20	20	nA	2, 3
		V_{CC} = ±5V		-10	10	nA	1
				-20	20	nA	2, 3
$±I_{IB}$	Input Bias Current	V_{CM} = ±15V		1	75	nA	1
				1	100	nA	2, 3
				1	75	nA	1
				1	100	nA	2, 3
		V_{CC} = ±5V		1	75	nA	1
				1	100	nA	2, 3
I_{CC}	Supply Current				3	mA	1
					2.5	mA	2
					3.5	mA	3
$-I_{OS}$	Short Circuit Current			7	45	mA	1
				5	45	mA	2
				7	50	mA	3
$+I_{OS}$	Short Circuit Current			-45	-7	mA	1
				-45	-5	mA	2
				-50	-7	mA	3
+PSRR	Supply Voltage Rejection Ratio	$+V_{CC}$ = 20V to 5V, $-V_{CC}$ = −20V		80		dB	1, 2, 3
-PSRR	Supply Voltage Rejection Ratio	$-V_{CC}$ = -20V to -5V, $+V_{CC}$ = 20V		80		dB	1, 2, 3
CMRR	Common Mode rejection Ratio	-15V <= V_{CM} <= +15V		80		dB	1, 2, 3
R_{IN}	Input Resistance			1.5		MΩ	1
V_{IR}	Input Voltage Range		(Note 5)	-15	+15	V	1, 2, 3
$-A_{VS}$	Large Signal Voltage Gain	V_{CC} = ±15V, V_{OUT} = 0 to -12V, R_L = 10KΩ		50		V/mV	4
		V_{CC} = ±15V, V_{OUT} = 0 to -12V, R_L = 10KΩ		25		V/mV	5, 6
		V_{CC} = ±15V, V_{OUT} = 0 to -10V, R_L = 2KΩ		50		V/mV	4
		V_{CC} = ±15V, V_{OUT} = 0 to -10V, R_L = 2KΩ		25		V/mV	5, 6

LM107 Electrical Characteristics (Continued)

DC Parameters (Continued)

The following conditions apply, unless otherwise specified. V_{CC} = ±20V, V_{CM} = 0V, R_S = 50Ω

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-groups
$+A_{VS}$	Large Signal Voltage Gain	V_{CC} = ±15V, V_{OUT} = 0 to 12V, R_L = 10KΩ		50		V/mV	4
		V_{CC} = ±15V, V_{OUT} = 0 to 12V, R_L = 10KΩ		25		V/mV	5, 6
		V_{CC} = ±15V, V_{OUT} = 0 to 10V, R_L = 2KΩ		50		V/mV	4
		V_{CC} = ±15V, V_{OUT} = 0 to 10V, R_L = 2KΩ		25		V/mV	5, 6
$+V_{OP}$	Output Voltage Swing	V_{CC} = ±15V, R_L = 10KΩ		12		V	4, 5, 6
		V_{CC} = ±15V, R_L = 2KΩ		10		V	4, 5, 6
		R_L = 10KΩ		16		V	4, 5, 6
		R_L = 2KΩ		15		V	4, 5, 6
$-V_{OP}$	Output Voltage Swing	V_{CC} = ±15V, R_L = 10KΩ			-12	V	4, 5, 6
		VCC = ±15V, R_L = 2KΩ			-10	V	4, 5, 6
		R_L = 10KΩ			-16	V	4, 5, 6
		R_L = 2KΩ			-15	V	4, 5, 6

AC Parameters

The following conditions apply, unless otherwise specified. V_{CC} = ±20V, V_{CM} = 0V, R_S = 50KΩ

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-groups
$+S_R$	Slew Rate	V_{IN} = -5V to +5V, A_V = 1, R_L = 2KΩ		0.2		V/µS	7
$-S_R$	Slew Rate	V_{IN} = +5V to -5V, A_V = 1, R_L = 2KΩ		0.2		V/µS	7
GBW	Gain Bandwidth	V_{IN} = 50mV_{RMS}, f = 20K_{HZ}, R_L = 2KΩ		250		K_{HZ}	7

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 limit s. 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 T_{Jmax} (maximum junction temperature), θ_{JA} (package junction to ambient thermal resistance), and T_A (ambient temperature). The maximum allowable power dissipation at any temperature is $P_{Dmax} = (T_{Jmax} - T_A)/\theta_{JA}$ 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.

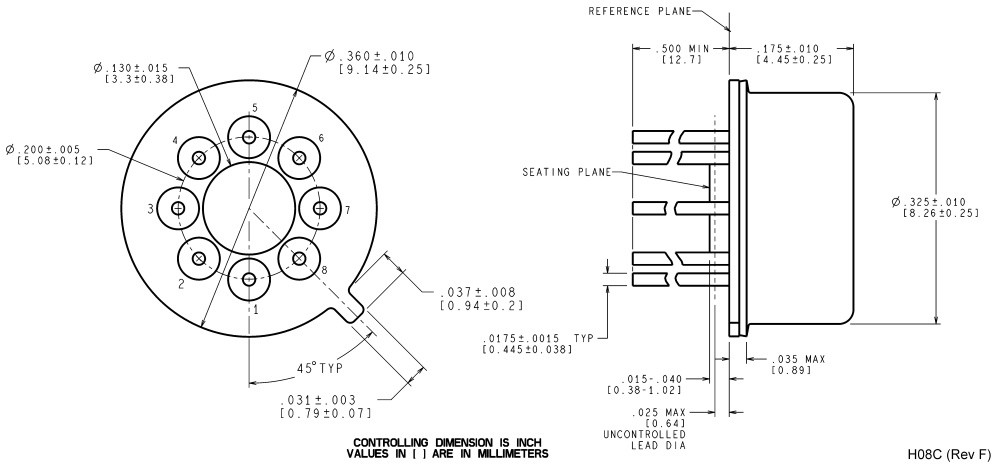
Note 4: Human body model, 1.5 KΩ in series with 100 pF.

Note 5: Guaranteed by CMRR.

Revision History Section

Date Released	Revision	Section	Originator	Changes
05/09/05	A	New Release, Corporate format	R. Malone	New Release, Corporate format. 1 MDS data sheet converted into a Corp. data sheet format. Following MDS data sheets will be Archived MNLM107-X, Rev. 0CL

Physical Dimensions inches (millimeters) unless otherwise noted



Metal Can (H)
NS Package Number H08C

National Semiconductor
Americas Customer
Support Center
Email: new.feedback@nsc.com
Tel: 1-800-272-9959

www.national.com

National Semiconductor
Europe Customer Support Center
Fax: +49 (0) 180-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 69 9508 6208
English Tel: +44 (0) 870 24 0 2171
Français Tel: +33 (0) 1 41 91 8790

National Semiconductor
Asia Pacific Customer
Support Center
Email: ap.support@nsc.com

National Semiconductor
Japan Customer Support Center
Fax: 81-3-5639-7507
Email: jpn.feedback@nsc.com
Tel: 81-3-5639-7560