National Semiconductor

December 1994

LM107/LM207/LM307 Operational Amplifiers

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.

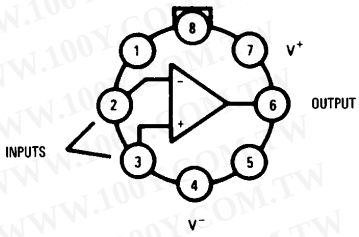
The LM107 is guaranteed over a −55°C to +125°C temperature range, the LM207 from −25°C to +85°C and the LM307 from 0°C to +70°C.

Features

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

Connection Diagrams

Metal Can Package



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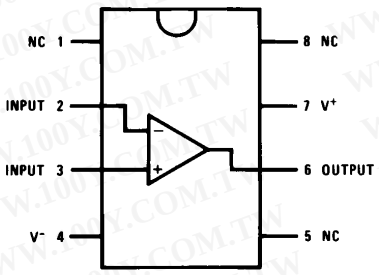
Note: Pin 4 connected to case.

Top View

Order Number LM107H/883*
See NS Package Number H08C

Dual-in-Line Package



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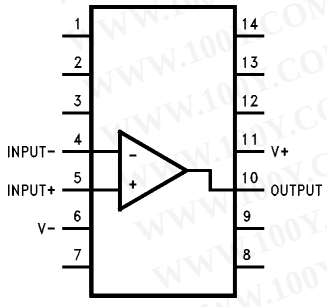
Top View

Order Number LM107J/883* or LM207J
See NS Package Number J08A

Order Number LM307N
See NS Package Number N08A

Dual-in-Line Package



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Order Number LM107J-14/883*
See NS Package Number J14A

*Available per SMD# 5962-8958901.

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RRD-B30M115/Printed in U. S. A.

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.
(Note 4)

	LM107/LM207	LM307
Supply Voltage	±22V	±18V
Power Dissipation (Note 1)	500 mW	500 mW
Differential Input Voltage	±30V	±30V
Input Voltage (Note 2)	±15V	±15V
Output Short Circuit Duration	Continuous	Continuous
Operating Temperature Range (T_A)		
(LM107)	−55°C to +125°C	0°C to +70°C
(LM207)	−25°C to +85°C	
Storage Temperature Range	−65°C to +150°C	−65°C to +150°C
Lead Temperature (Soldering, 10 sec)	260°C	260°C

	T_{MIN}	T_{MAX}
LM107	−55°C	+125°C
LM207	−25°C	+85°C
LM307	0°C	+70°C

ESD rating to be determined.

Electrical Characteristics (Note 3)

Parameter	Conditions	LM107/LM207			LM307			Units
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	$T_A = 25°C$, $R_S \le 50\ k\Omega$		0.7	2.0		2.0	7.5	mV
Input Offset Current	$T_A = 25°C$		1.5	10		3.0	50	nA
Input Bias Current	$T_A = 25°C$		30	75		70	250	nA
Input Resistance	$T_A = 25°C$	1.5	4.0		0.5	2.0		MΩ
Supply Current	$T_A = 25°C$ $V_S = \pm 20V$ $V_S = \pm 15V$		1.8	3.0		 1.8	 3.0	 mA mA
Large Signal Voltage Gain	$T_A = 25°C$, $V_S = \pm 15V$ $V_{OUT} = \pm 10V$, $R_L \ge 2\ k\Omega$	50	160		25	160		V/mV
Input Offset Voltage	$R_S \le 50\ k\Omega$			3.0			10	mV
Average Temperature Coefficient of Input Offset Voltage			3.0	15		6.0	30	μV/°C
Input Offset Current				20			70	nA
Average Temperature Coefficient of Input Offset Current	$25°C \le T_A \le T_{MAX}$ $T_{MIN} \le T_A \le 25°C$		0.01 0.02	0.1 0.2		0.01 0.02	0.3 0.6	nA/°C nA/°C
Input Bias Current				100			300	nA
Supply Current	$T_A = +125°C$, $V_S = \pm 20V$		1.2	2.5				mA

Electrical Characteristics (Note 3) (Continued)

Parameter	Conditions	LM107/LM207			LM307			Units
		Min	Typ	Max	Min	Typ	Max	
Large Signal Voltage Gain	$V_S = \pm 15V$, $V_{OUT} = \pm 10V$ $R_L \geq 2\ k\Omega$	25			15			V/mV
Output Voltage Swing	$V_S = \pm 15V$ $R_L = 10\ k\Omega$ $R_L = 2\ k\Omega$	 ± 12 ± 10	 ± 14 ± 13		 ± 12 ± 10	 ± 14 ± 13		 V V
Input Voltage Range	$V_S = \pm 20V$ $V_S = \pm 15V$	± 15	 $+15$ -13		 ± 12	 $+15$ -13		V V
Common Mode Rejection Ratio	$R_S \leq 50\ k\Omega$	80	96		70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 50\ k\Omega$	80	96		70	96		dB

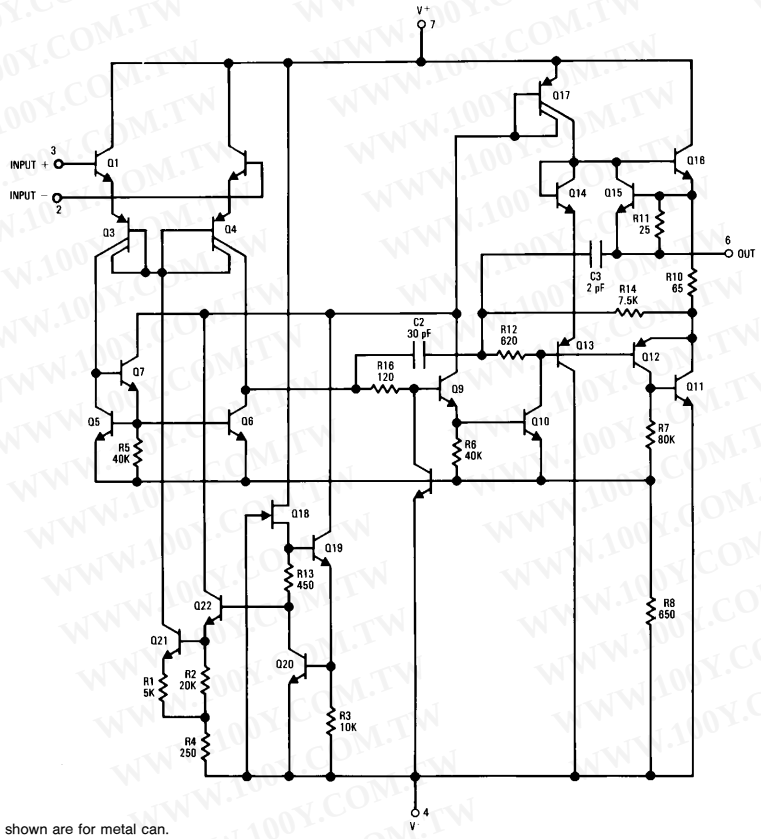
Note 1: The maximum junction temperature of the LM107 is 150°C, and the LM207/LM307 is 100°C. For operating at elevated temperatures, devices in the H08 package must be derated based on a thermal resistance of 165°C/W, junction to ambient, or 30°C/W, junction to case. The thermal resistance of the dual-in-line package is 100°C/W, junction to ambient.

Note 2: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

Note 3: These specifications apply for $\pm 5V \leq V_S \leq +20V$ and $-55°C \leq T_A \leq +125°C$ for the LM107 or $-25°C \leq T_A +85°C$ for the LM207, and $0°C \leq T_A \leq +70°C$ and $\pm 5V \leq V_S \leq \pm 15V$ for the LM307 unless otherwise specified.

Note 4: Refer to RETS107X for LM107H and LM107J military specifications.

Schematic Diagram*



*Pin connections shown are for metal can.

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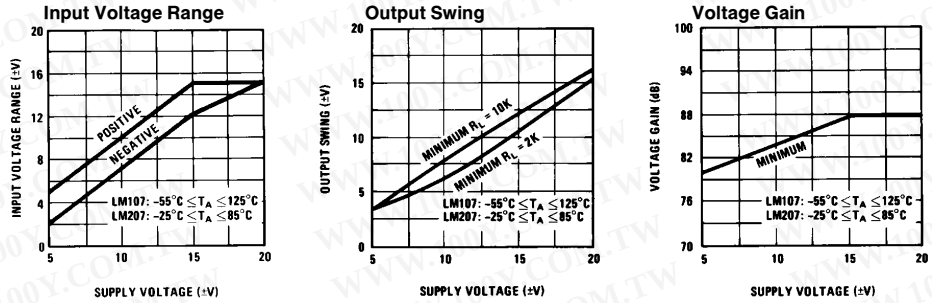
Guaranteed Performance Characteristics LM107/LM207



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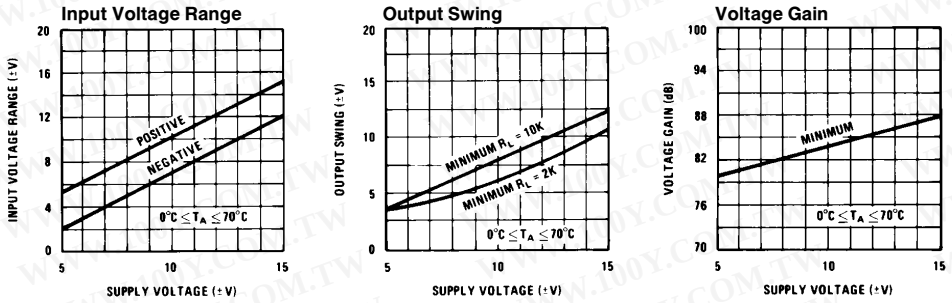
Guaranteed Performance Characteristics LM307



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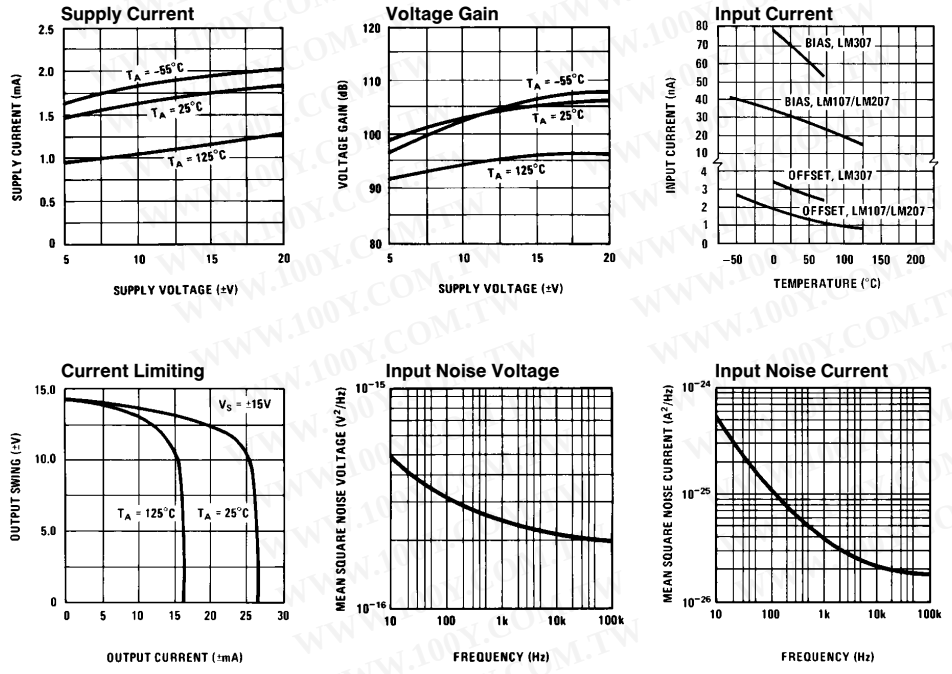
Typical Performance Characteristics



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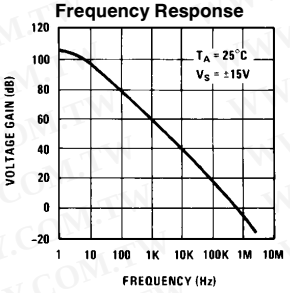
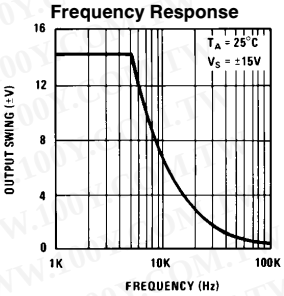
Typical Performance Characteristics (Continued)

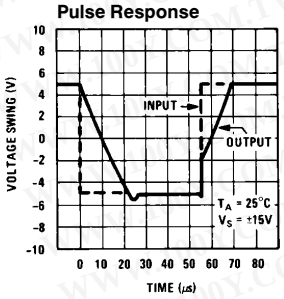
Open Loop Frequency Response



Large Signal Frequency Response



Voltage Follower Pulse Response



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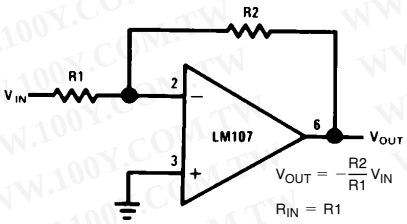
Typical Applications**

Inverting Amplifier



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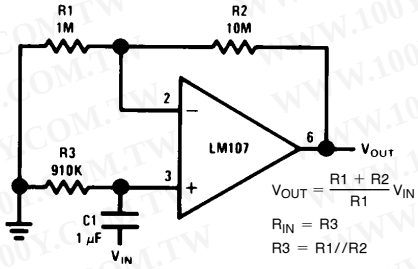
Non-Inverting AC Amplifier



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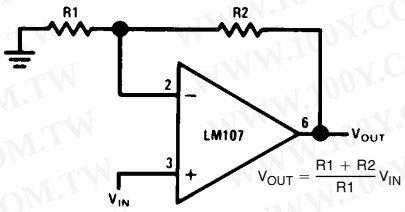
Non-Inverting Amplifier



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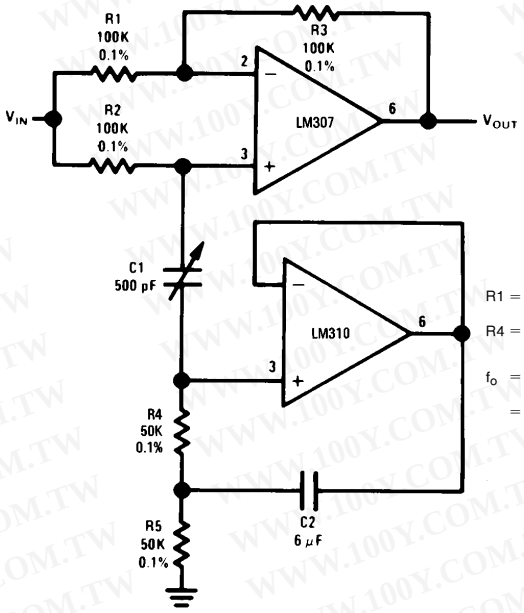
**Pin connections shown are for metal can.

Typical Applications** (Continued)

Turntable Notch Filter



$R1 = R2 = R3$

$R4 = R5 = \frac{R1}{2}$

$f_o = \frac{1}{2\pi\sqrt{C_1 C_2 R_4 R_5}}$

$= 60\ Hz$

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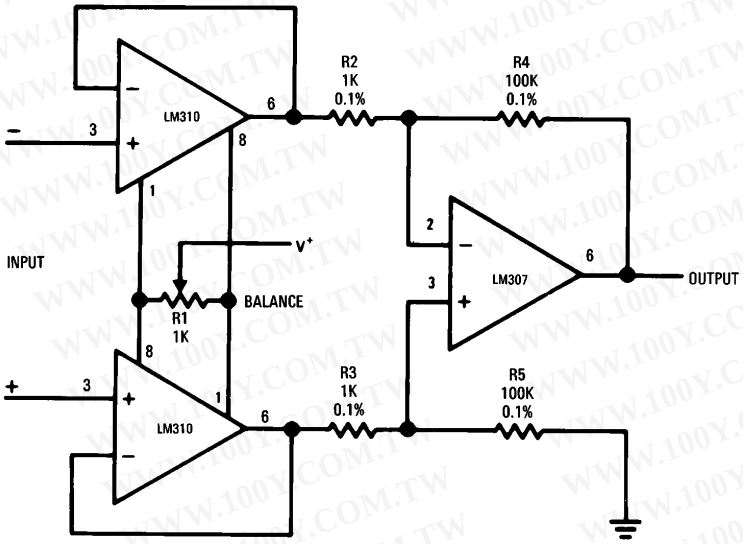
Differential Input Instrumentation Amplifier



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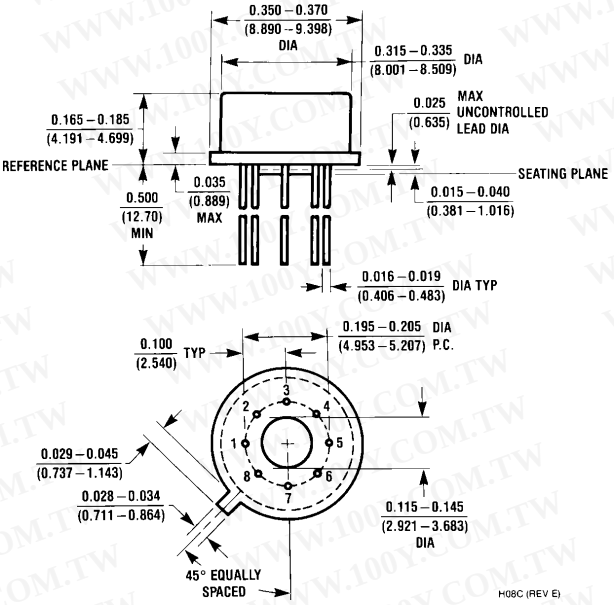
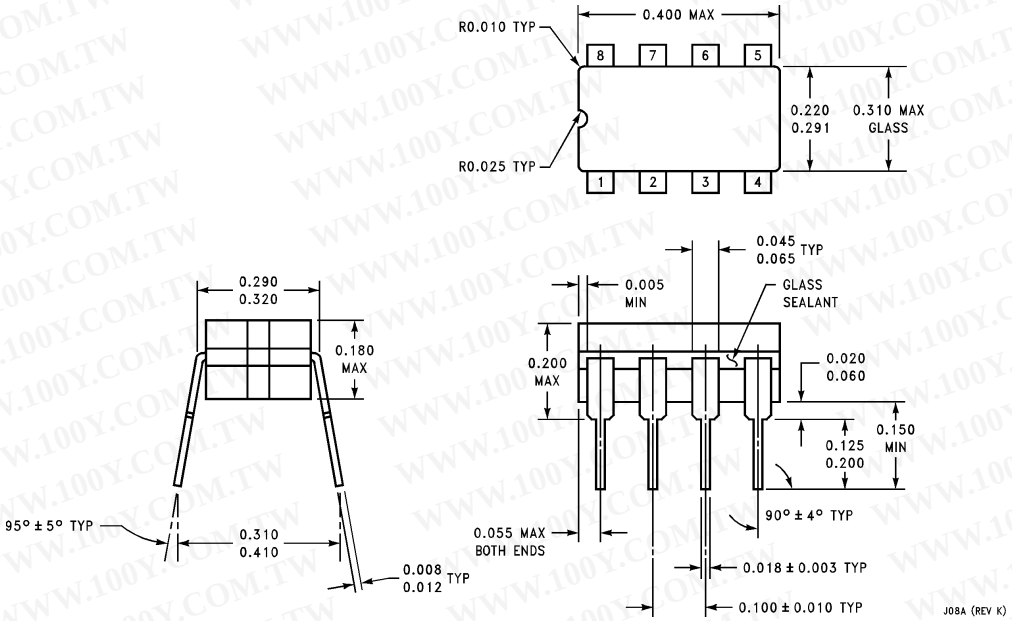
**Pin connections shown are for metal can.

Physical Dimensions inches (millimeters)

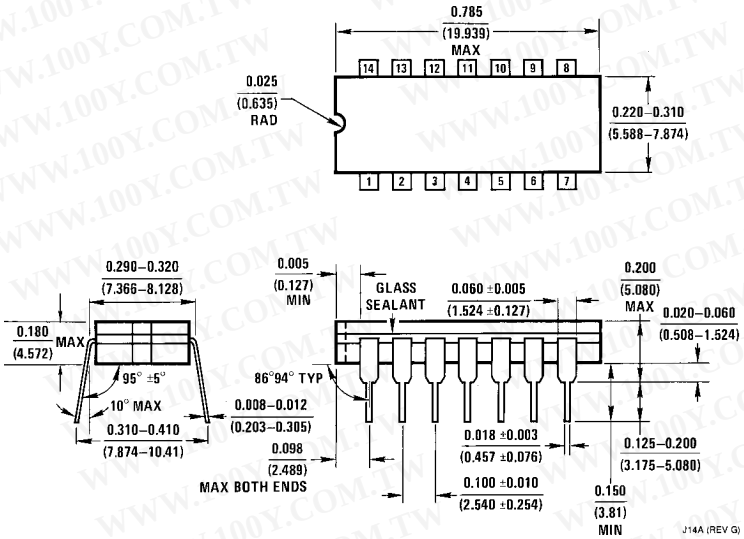


Metal Can Package (H)
Order Number LM107H/883
NS Package Number H08C

Physical Dimensions inches (millimeters) (Continued)

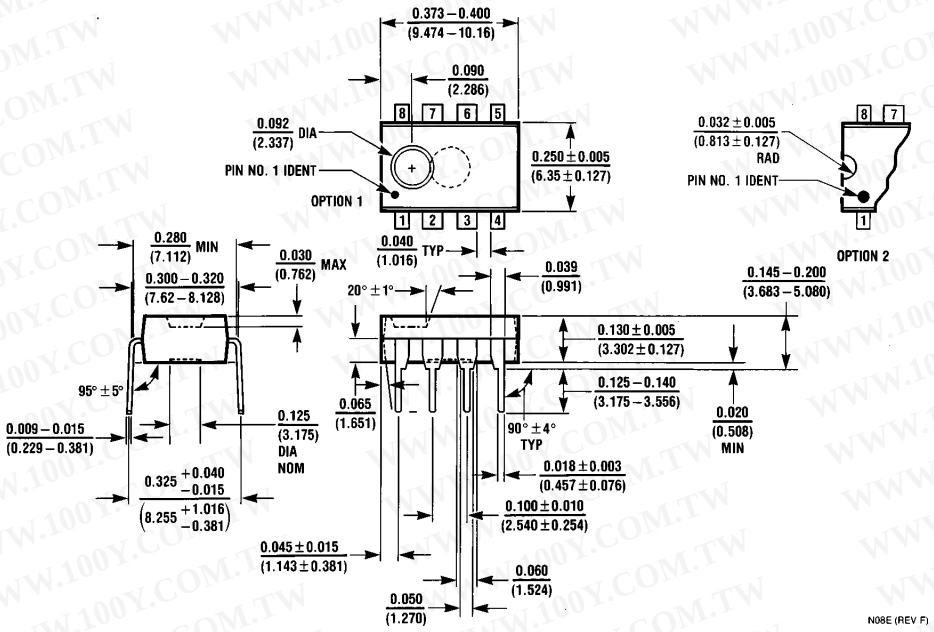


Ceramic Dual-In-Line Package (J)
Order Number LM107J/883 or LM207J
NS Package Number J08A



Ceramic Dual-In-Line Package (J)
Order Number LM107J-14/883
NS Package Number J14A

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number LM307N
NS Package Number N08E

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