

## LM108/LM308 Operational Amplifiers

### General Description

The LM108 series are precision operational amplifiers having specifications a factor of ten better than FET amplifiers over a -55°C to +125°C temperature range. It is possible to eliminate offset adjustments, in most cases, and obtain performance approaching chopper stabilized amplifiers.

The devices operate with supply voltages from  $\pm 3$  to  $\pm 20V$  and have sufficient supply rejection to use unregulated supplies. They are fabricated using the Harris dielectric isolation process which coupled with our unique design, makes external compensation unnecessary. Outstanding characteristics include:

- Maximum input bias current of 6.0 nA over temperature

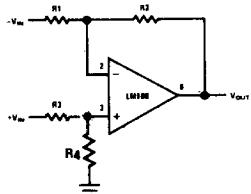
- Offset current less than 5.5 nA over temperature
- Supply current of only 1.0 mA
- Guaranteed drift characteristics
- External compensation components not required

The low current error of the LM108 series makes possible many designs that are not practical with conventional amplifiers. In fact, it operates from  $10\text{ M}\Omega$  source resistances, introducing less error than devices like the 709 with  $10\text{ k}\Omega$  sources. Integrators with drifts less than  $500\text{ }\mu\text{V/sec}$  and analog time delays in excess of one hour can be made using capacitors no larger than  $1\text{ }\mu\text{F}$ .

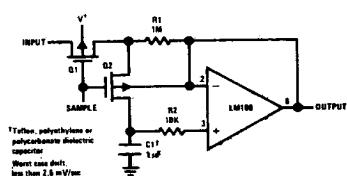
The LM108 is guaranteed from -55°C to +125°C, and the LM308 from 0°C to +70°C.

### Typical Applications

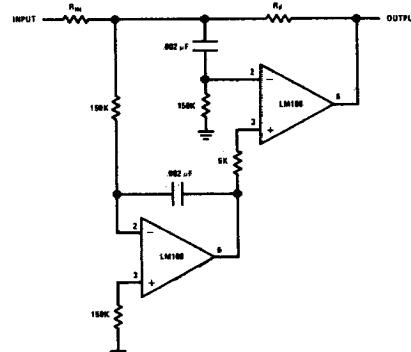
#### Standard Differential Amplifier



#### Sample and Hold



#### High Speed Amplifier with Low Drift and Low Input Current



## Absolute Maximum Ratings

	LM108	LM308
Supply Voltage	$\pm 20V$	$\pm 18V$
Power Dissipation (Note 1)	500 mW	500 mW
Differential Input Current (Note 2)	$\pm 10$ mA	$\pm 10$ mA
Input Voltage (Note 3)	$\pm 15V$	$\pm 15V$
Output Short-Circuit Duration	Indefinite	Indefinite
Operating Temperature Range (LM108)	-55°C to +125°C	0°C to +70°C
Storage Temperature Range	-65°C to +150°C	-65°C to +150°C
Lead Temperature (Soldering, 10 seconds)	300°C	300°C

## Electrical Characteristics (Note 4)

PARAMETER	CONDITIONS	LM108			LM308			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	$V_S = \pm 15V, T_A = 25^\circ C$		0.7	2.0		2.0	7.5	mV
Input Offset Current			0.05	4.0		0.2	4.0	nA
Input Bias Current			0.8	4.0		1.5	7	nA
Input Resistance		10	30		10	30		MΩ
Supply Current			1.0	1.7		1.0	1.7	mA
Large Signal Voltage Gain	$V_{OUT} = \pm 10V, R_L \geq 10 k\Omega$	50	300		25	300		V/mV
Input Offset Voltage	$V_S = \pm 15V$			3.0			10	mV
Average Temperature Coefficient of Input Offset Voltage	$0^\circ C \leq T_A \leq 70^\circ C$ (LM308)		3.0	15		6.0	30	µV/°C
Input Offset Current	$-55^\circ C \leq T_A \leq 125^\circ C$ (LM108)			5.5			5.5	nA
Average Temperature Coefficient of Input Offset Current			0.04	0.06		0.04	0.06	nA/°C
Input Bias Current				6.0			10	nA
Supply Current			1.0	1.7				mA
Large Signal Voltage Gain	$V_{OUT} = \pm 10V$ $R_L \geq 10 k\Omega$	25			15			V/mV
Output Voltage Swing	$R_L = 10 k\Omega$	$\pm 10$	$\pm 12$		$\pm 10$	$\pm 12$		V
Input Voltage Range		$\pm 12$			$\pm 12$			V
Common-Mode Rejection Ratio		85	100		80	100		dB
Supply Voltage Rejection Ratio		80	96		80	96		dB

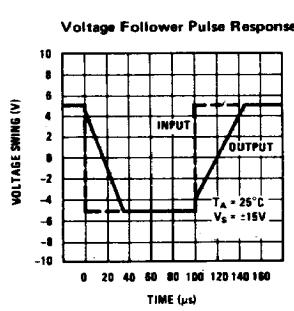
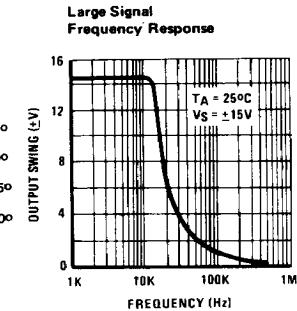
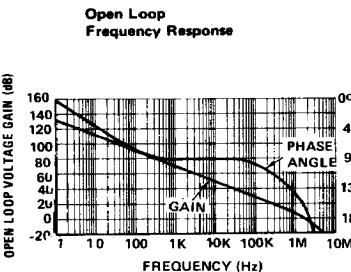
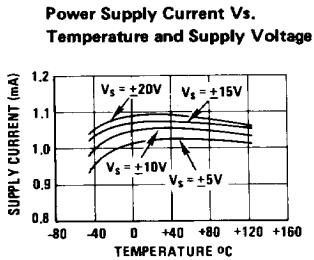
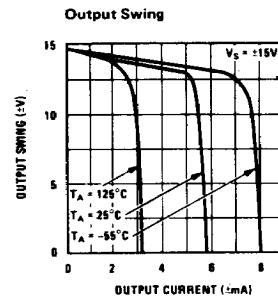
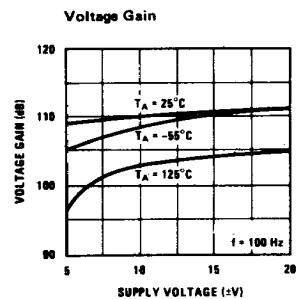
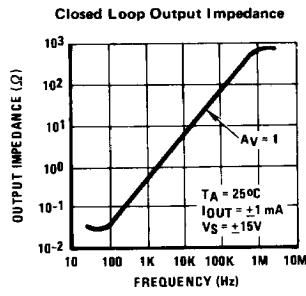
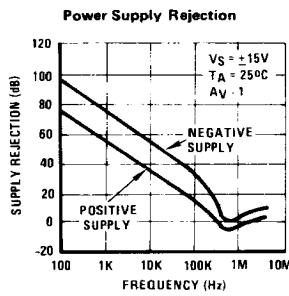
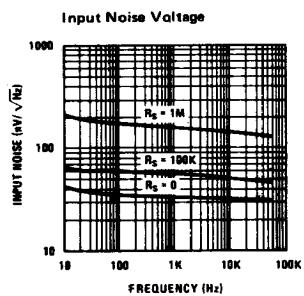
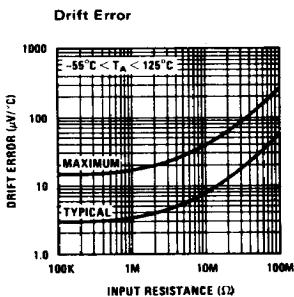
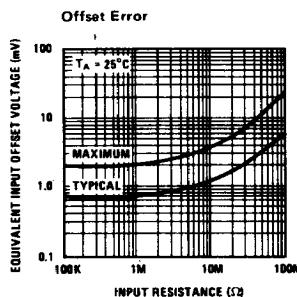
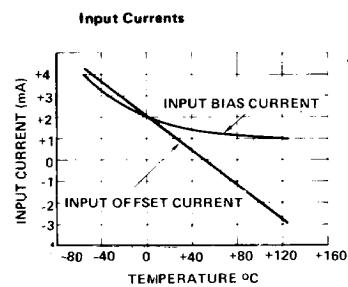
Note 1: The maximum junction temperature of the LM108 is 150°C and 85°C for the LM308. For operating at elevated temperatures, devices in the TO-5 package must be derated based on a thermal resistance of 150°C/W, junction to ambient or 45°C/W, junction to case. The thermal resistance of the dual-in-line package is 100°C/W, function to ambient.

Note 2: If a differential input voltage in excess of the operating supply is applied between the inputs, excessive current will flow unless some limiting resistance is used.

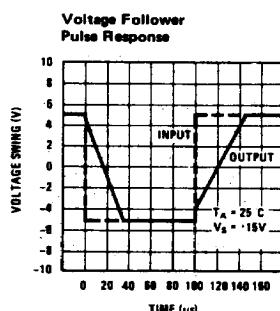
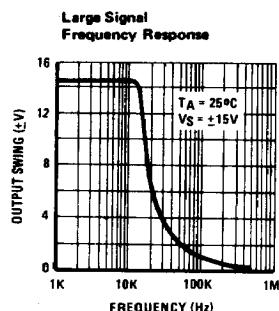
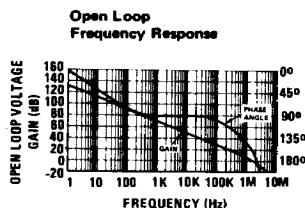
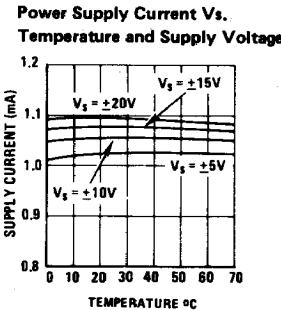
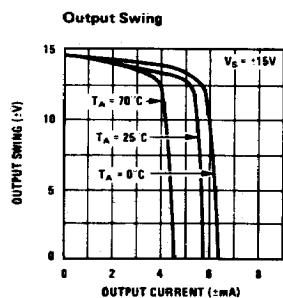
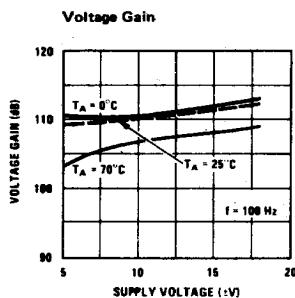
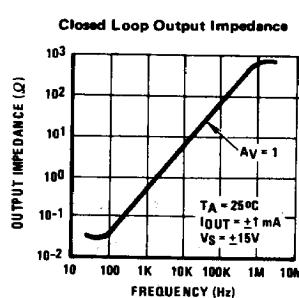
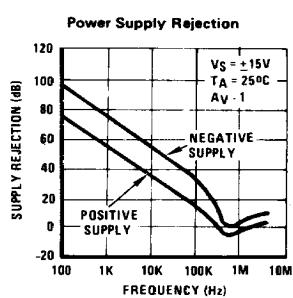
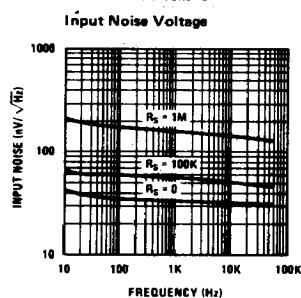
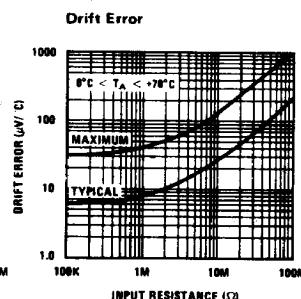
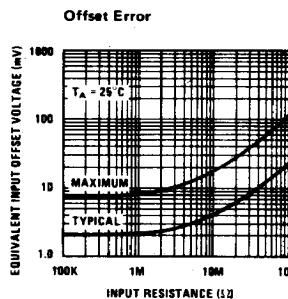
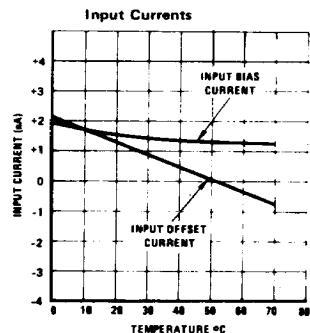
Note 3: For supply voltages less than  $\pm 15V$ , the absolute maximum input voltage is equal to the supply voltage.

Note 4: The device operating supply voltage range is  $\pm 3V \leq V_S \leq \pm 18V$ .

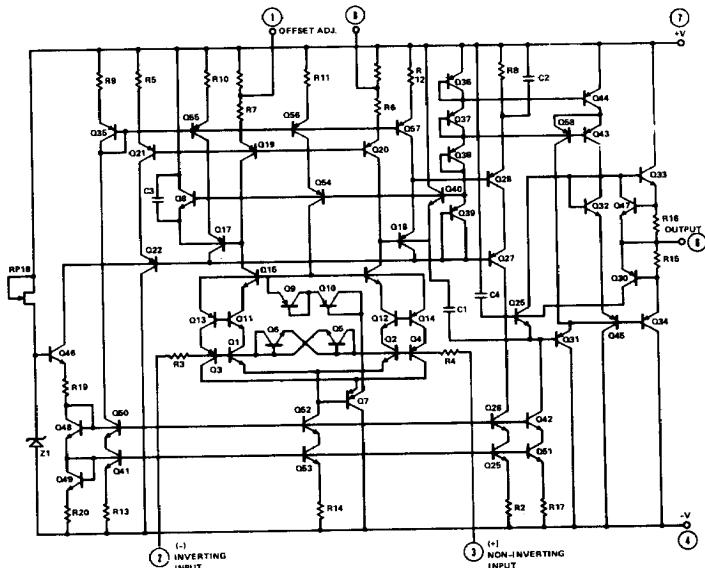
## Typical Performance Characteristics LM108



## Typical Performance Characteristics LM308

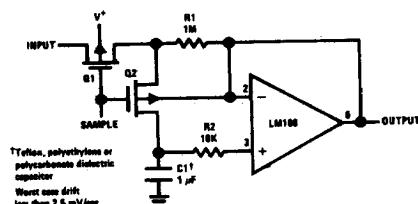


## Schematic Diagram

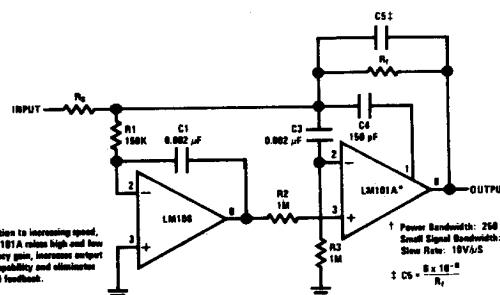


## Typical Applications (Continued)

## Sample and Hold



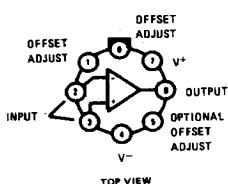
Trilene, polyethylene or  
polypropylene dielectric  
resistor  
Worst case drift  
less than 2.5 mV/sec

Fast<sup>†</sup> Summing Amplifier

\* In addition to increasing speed,  
the LM108A retains high and low  
frequency gain, increases output  
drive capability and eliminates  
thermal feedback.

## Connection Diagrams Section 11 for Packaging

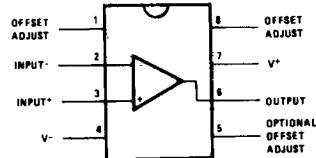
## Metal Can Package



Order Number LM108H  
LM308H

\*Pin connections shown on  
schematic diagram are for  
TO-5 and Dual-In-Line Package

## Dual-In-Line Package



Order Number LM108J-8,  
LM308J-8

Order Number LM308N

## Standard Differential Amplifier

