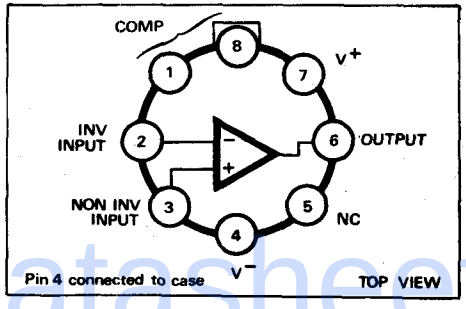
LM108, LM108A, LM308A Super Beta Operational Amplifiers

GENERAL DESCRIPTION

The 108 series of Super Beta Operational Amplifiers is constructed using the Fairchild Planar epitaxial process. High input impedance, low noise, input offsets, and temperature drift are made possible through use of super beta processing, making the device suitable for applications requiring high accuracy and low drift performance. The 108A series is specially selected for extremely low offset voltage and drift, and high common mode rejection, making possible superior performance in applications where offset nulling is undesirable.

CONNECTION DIAGRAM

See outline drawing No. 97 for dimensions.



ABSOLUTE MAXIMUM RATINGS

Supply Voltage 108A, 108	±20 V
308A	±18 V
Internal Power Dissipation	500 mW
Differential Input Current	±10 mA
Input Voltage	±15 V
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	
Military (108A, 108)	−55°C to +125°C
Commercial (308A)	0°C to +70°C
Lead Temperature (Soldering, 60 seconds)	300°C
Output Short Circuit Duration	Indefinite

FEATURES

Guaranteed low input offset characteristics.
High input impedance.
Low offset current.
Low bias current.
Operation over wide supply range.

REFERENCE TABLE

Code	Stock No.
LM108H	**35797D**
LM108AH	**35798B**
LM308AH	**35799X**

LM108A Series Operational Amplifiers

REFERENCE TABLE

Code	Stock No.
LM108AH	33136X
LM208AH	33137R
LM308AH	30603D

GENERAL DESCRIPTION

The LM108A, LM208A and LM308A are precision operational amplifiers having specifications about a factor of ten better than FET amplifiers over their operating temperature range. In addition to low input currents, these devices have extremely low offset voltage, making it possible to eliminate offset adjustments, in most cases, and obtain performance approaching chopper stabilised amplifiers.
The devices operate with supply voltages from ±2V to ±20V and have sufficient supply rejection to use unregulated supplies. Although the circuit is interchangeable with and uses the same compensation as the LM101A, an alternative compensation scheme can be used to make it particularly insensitive to power supply noise and to make supply bypass capacitors unnecessary.

FEATURES

Offset voltage guaranteed less than 0.5mV

Maximum input bias current of 3.0nA over temperature

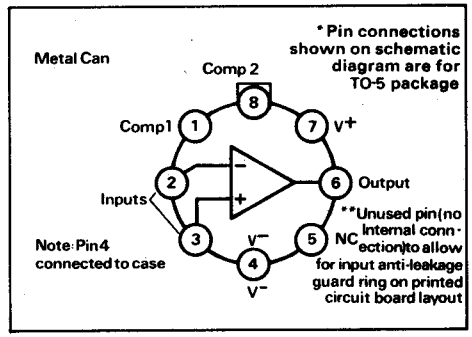
Offset current less than 400pA over temperature

Supply current of only 300μA, even in saturation

Guaranteed 5μV/°C drift.

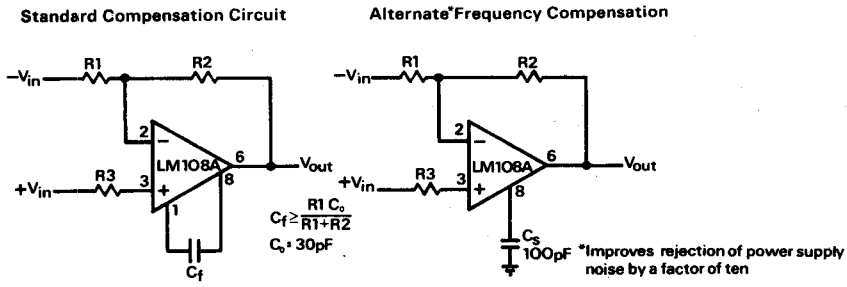
The low current error of the LM108A series makes possible many designs that are not practical with conventional amplifiers. In fact, it operates from 10 MΩ source resistances, introducing less error than devices like the 709 with 10kΩ sources. Integrators with drifts less than 500μV/sec and analog time delays in excess of one hour can be made using capacitors no larger than 1μF.
The LM208A is identical to the LM108A, except that the LM208A has its performance guaranteed over a —25 C to 85°C temperature range, instead of —55°C to 125°C. The LM308A has slightly-relaxed specifications and has its performance guaranteed over a 0°C to 70°C temperature range.

CONNECTION DIAGRAM*



See outline drawing No. 97 for dimensions.

COMPENSATION CIRCUITS



ABSOLUTE MAXIMUM RATINGS

Supply Voltage	±20V (±18V LM308A)
Power Dissipation (Note 1)	500mW
Differential Input Current (Note 2)	±10mA
Input Voltage (Note 3)	±15V
Output Short-Circuit Duration	Indefinite

Operating Temperature Range	
LM108A	—55°C to 125°C
LM208A	—25°C to 85°C
LM308A	0°C to 70°C
Storage Temperature Range	—65°C to 150°C
Lead Temperature (Soldering, 10 sec)	300°C

ELECTRICAL CHARACTERISTICS (Note 4)

Parameter	Conditions	LM108A/LM208A Min.	Typ.	Max.	LM308A Min.	Typ.	Max.	Units
Input Offset Voltage	$T_A = 25°C$		0.3	0.5		0.3	0.5	mV
Input Offset Current	$T_A = 25°C$		0.05	0.2		0.2	1	nA
Input Bias Current	$T_A = 25°C$		0.8	2.0		1.5	7	nA
Input Resistance	$T_A = 25°C$	30	70		10	40		MΩ
Supply Current	$T_A = 25°C$		0.3	0.6		0.3	0.8	mA
Large Signal Voltage Gain	$T_A = 25°C$, $V_S = \pm 15V$ $V_{OUT} = \pm 10V$, $R_L \geq 10\ k\Omega$	80	300		80	300		V/mV
Input Offset Voltage				1.0			0.73	mV
Average Temperature Coefficient of Input Offset Voltage			1.0	5.0		1.0	5.0	µV/°C
Input Offset Current				0.4			1.5	nA
Average Temperature Coefficient of Input Offset Current			0.5	2.5		2.0	10	pA/°C
Input Bias Current				3.0			10	nA
Supply Current	$T_A = +125°C$		0.15	0.4		—	—	mA
Large Signal Voltage Gain	$V_S = \pm 15V$, $V_{OUT} = \pm 10V$ $R_L \geq 10\ k\Omega$	40			60			V/mV
Output Voltage Swing	$V_S = \pm 15V$, $R_L = 10\ k\Omega$	±13	±14		±13	±14		V
Input Voltage Range	$V_S = \pm 15V$	±13.5			±14			V
Common Mode Rejection Ratio		96	110		96	110		dB
Supply Voltage Rejection Ratio		96	110		96	110		dB

Note 1: The maximum junction temperature of the LM108A is 150°C, whilst the LM208A is 100°C and that of the LM308A is 85°C. 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.

Note 2: The inputs are shunted with back-to-back diodes for overvoltage protection. Therefore, excessive current will flow if a differential input voltage in excess of 1V is applied between the inputs unless some limiting resistance is used.

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

Note 4: For LM108A $\pm 5V \leq V_S \leq \pm 20V$ $-55°C \leq T_A \leq 125°C$
For LM208A $\pm 5V \leq V_S \leq \pm 20V$ $-25°C \leq T_A \leq 85°C$
For LM308A $\pm 5V \leq V_S \leq \pm 15V$ $0°C \leq T_A \leq 70°C$