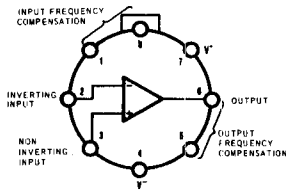


high performance operational amplifier

EXTENDED TEMPERATURE RANGE, $-55^{\circ}\text{C} + 125^{\circ}\text{C}$

CONNECTION DIAGRAM
(Top view)



Note: Pin 4 connected to case.

The μ A709 is a High-Gain Operational amplifier constructed on a single silicon chip using the Planar epitaxial process. It features low offset, high input impedance, large input common mode range, high output swing under load and low power consumption. The device displays exceptional temperature stability and will operate over a wide range of supply voltages with little degradation of performance. The amplifier is intended for use in DC servo systems, high impedance analog computers, in low-level instrumentation applications and for the generation of special linear and nonlinear transfer functions.

ABSOLUTE MAXIMUM RATINGS

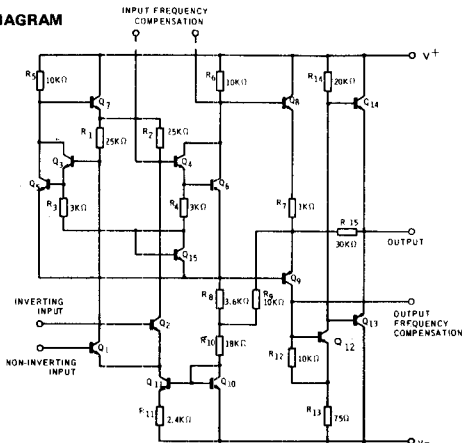
(above which the useful life may be impaired)

Supply Voltage	$\pm 18\text{ V}$
Internal Power Dissipation (Note 1)	300 mW
Differential Input Voltage	$\pm 5\text{ V}$
Input Voltage	$\pm 10\text{ V}$
Output Short-Circuit Duration ($T_A = 25^{\circ}\text{C}$)	5 sec
Storage Temperature Range	-65°C to $+150^{\circ}\text{C}$
Operating Ambient Temperature Range	-55°C to $+125^{\circ}\text{C}$
Lead Temperature (Soldering, 60 sec)	300°C

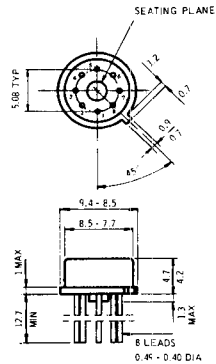
ORDERING NUMBER
U6B770931X

NOTE 1: Rating applies for case temperatures to $+125^{\circ}\text{C}$; derate linearly at 5.5 mW/ $^{\circ}\text{C}$ for ambient temperature above $+95^{\circ}\text{C}$.

SCHEMATIC DIAGRAM



PHYSICAL DIMENSIONS
in accordance with
JEDEC TO-99 outline

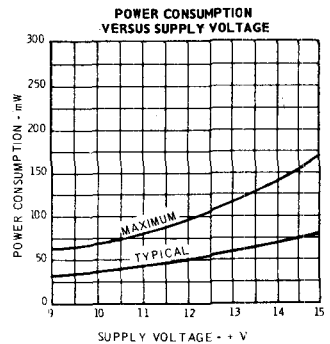
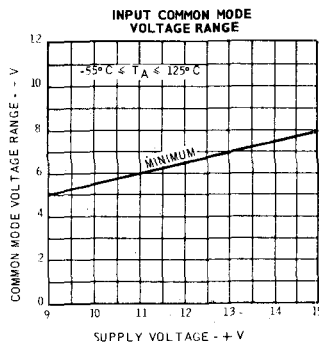
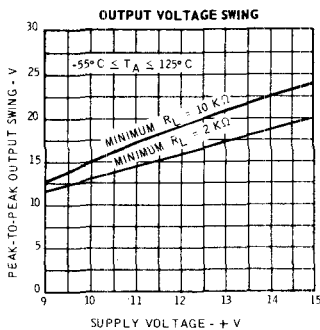
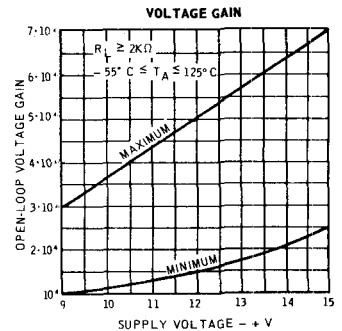


Note: all dimensions in mm.

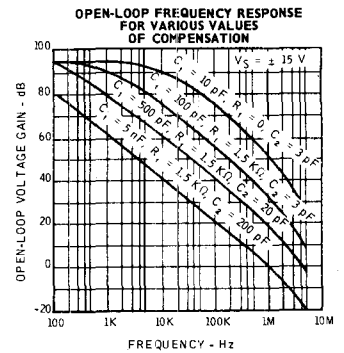
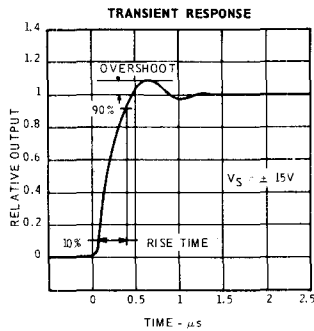
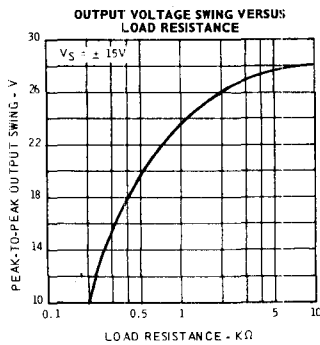
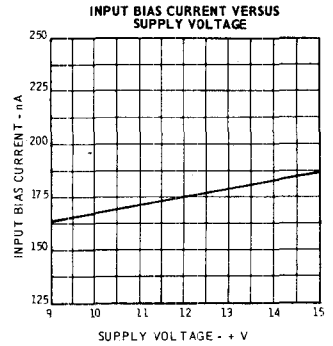
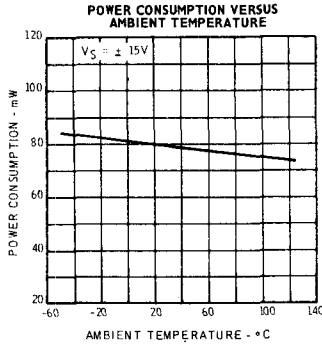
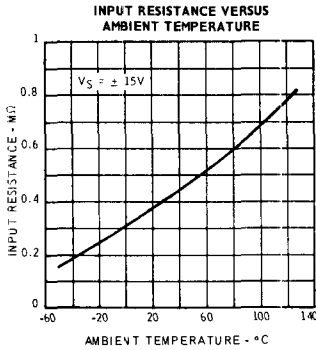
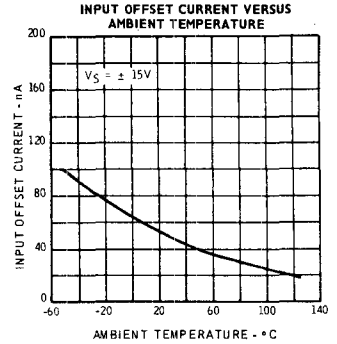
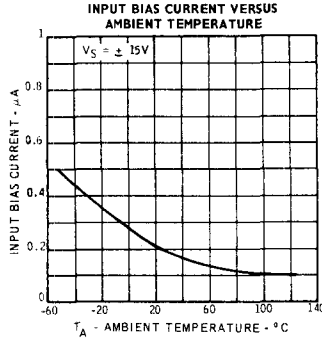
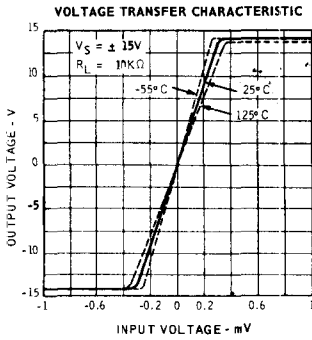
ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, $\pm 9\text{ V} \leq V_S \leq \pm 15\text{ V}$ unless otherwise noted)

PARAMETER (see definitions)	CONDITIONS	Min.	Typ.	Max.	UNIT
Input Offset Voltage	$R_S \leq 10\text{ K}\Omega$		1	5	mV
Input Offset Current			50	200	nA
Input Bias Current			200	500	nA
Input Resistance		150	400		$\text{K}\Omega$
Output Resistance			150		Ω
Power Consumption	$V_S = \pm 15\text{ V}$		80	165	mW
Transient Response	$V_{IN} = 20\text{ mV}$, $R_L = 2\text{ K}\Omega$, $C_1 = 5000\text{ pF}$, $R_1 = 1.5\text{ K}\Omega$, $C_2 = 200\text{ pF}$, $R_2 = 50\Omega$		0.3	1	μs
Risetime	$C_L \leq 100\text{ pF}$		10	30	%
Overshoot					%
The following specifications apply for $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$:					
Input Offset Voltage	$R_S \leq 10\text{ K}\Omega$			6	mV
Average Temperature Coefficient of Input Offset Voltage	$R_S = 50\Omega$		3		$\mu\text{V}/^\circ\text{C}$
	$R_S \leq 10\text{ K}\Omega$		6		$\mu\text{V}/^\circ\text{C}$
Large-Signal Voltage Gain	$V_S = \pm 15\text{ V}$, $R_L \geq 2\text{ K}\Omega$, $V_{OUT} = \pm 10\text{ V}$	25,000	45,000	70,000	
Output Voltage Swing	$V_S = \pm 15\text{ V}$, $R_L \geq 10\text{ K}\Omega$	± 12	± 14		V
	$V_S = \pm 15\text{ V}$, $R_L \geq 2\text{ K}\Omega$	± 10	± 13		V
Input Voltage Range	$V_S = \pm 15\text{ V}$	± 8	± 10		V
Common Mode Rejection Ratio	$R_S \leq 10\text{ K}\Omega$	70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10\text{ K}\Omega$		25	150	$\mu\text{V}/\text{C}$
Input Offset Current	$T_A = +125^\circ\text{C}$		20	200	nA
	$T_A = -55^\circ\text{C}$		100	500	nA
Input Bias Current	$T_A = -55^\circ\text{C}$		0.5	1.5	μA
Input Resistance		40	100		$\text{K}\Omega$

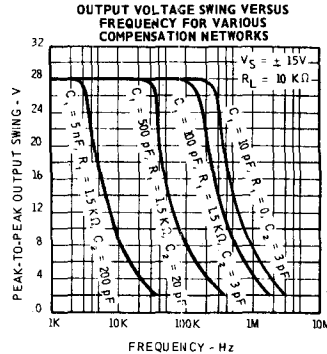
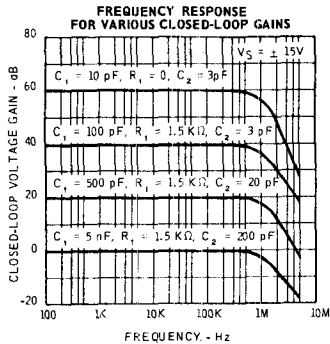
GUARANTEED ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)



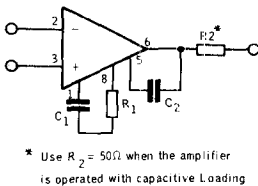
TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)



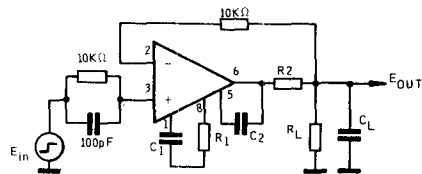
TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)



FREQUENCY COMPENSATION CIRCUIT



TRANSIENT RESPONSE TEST CIRCUIT



DEFINITION OF TERMS

INPUT OFFSET VOLTAGE - That voltage which must be applied between the input terminals to obtain zero output voltage. The input offset voltage may also be defined for the case where two equal resistances are inserted in series with the input leads.

INPUT OFFSET CURRENT - The difference in the currents into the two input terminals with the output at zero volts.

INPUT RESISTANCE - The resistance looking into either input terminal with the other grounded.

INPUT BIAS CURRENT - The average of the two input currents.

INPUT VOLTAGE RANGE - A range of voltage which, if exceeded on either input terminal, could cause the amplifier to cease functioning properly.

INPUT COMMON MODE REJECTION RATIO - The ratio of the input voltage range to the maximum change in input offset voltage over this range.

LARGE-SIGNAL VOLTAGE GAIN - The ratio of the maximum output voltage swing with load to the change in input voltage required to drive the output from zero to this voltage.

OUTPUT VOLTAGE SWING - The peak output swing, referred to zero, that can be obtained without clipping.

OUTPUT RESISTANCE - The resistance seen looking into the output terminal with the output at null. This parameter is defined only under small signal conditions at frequencies above a few hundred cycles to eliminate the influence of drift and thermal feedback.

POWER CONSUMPTION - The DC power required to operate the amplifier with the output at zero and with no load current.

SUPPLY VOLTAGE REJECTION RATIO - The ratio of the change in input offset voltage to the change in supply voltage producing it.

TRANSIENT RESPONSE - The closed-loop step function response of the amplifier under small-signal conditions.