Operational Amplifiers

LM302 voltage follower

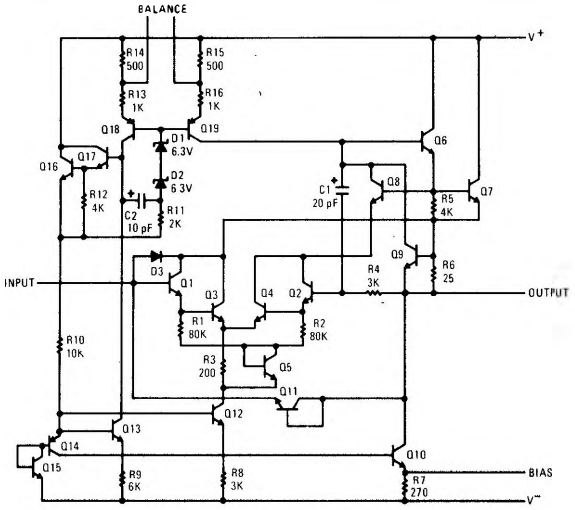
general description

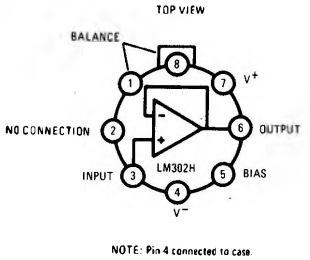
The LM302, an epoxy encapsulated version of the LM102, is a high gain operational amplifier designed specifically for unity-gain voltage follower applications. Built on a single silicon chip, the device incorporates advanced processing techniques to obtain very low input current and high input impedance. Further, the input transistors are operated at zero collector-base voltage to virtually eliminate high temperature leakage currents. It can therefore be operated in a temperature stabilized component oven to get extremely low input currents and low offset voltage drift. Other outstanding characteristics of the device include:

- Fast Slewing – 10V/μs
- Low input current – 30 nA (max)
- High input resistance – 1,000 MΩ
- No external frequency compensation required
- Simple offset balancing with optional 1K potentiometer
- Specified for operation from 0°C to 70°C
- Plug-in replacement for both the LM201 and LM709C in voltage follower applications.

The LM302, which is designed to operate with supply voltages between ±12V and ±15V, also features low input capacitance as well as excellent small signal and large signal frequency response – all of which minimize high frequency gain error. Because of the low wiring capacitances inherent in monolithic construction, this fast operation can be realized without increasing power consumption.

schematic and connection diagrams

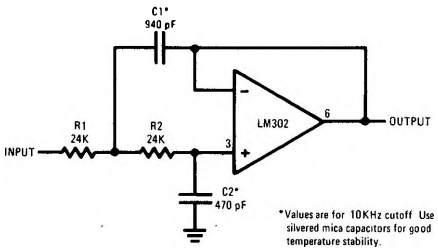




NOTE: Pin 4 connected to case.

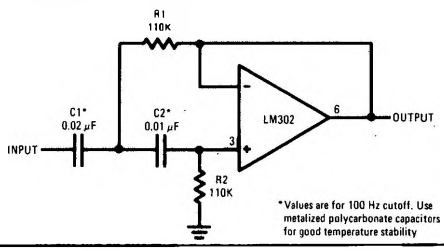
typical applications

Low Pass Active Filter



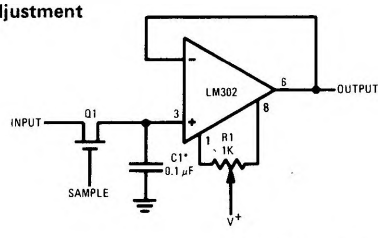
*Values are for 10KHz cutoff. Use silvered mica capacitors for good temperature stability.

High Pass Active Filter



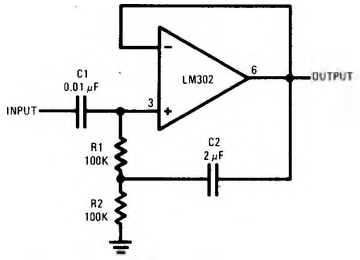
*Values are for 100 Hz cutoff. Use metalized polycarbonate capacitors for good temperature stability.

Sample and Hold With Offset Adjustment



*Polycarbonate-dielectric capacitor.

High Input Impedance AC Amplifier



absolute maximum ratings

Supply Voltage	±18V
Power Dissipation (Note 1)	400 mW
Input Voltage (Note 2)	±15V
Output Short Circuit Duration (Note 3)	Indefinite
Operating Temperature Range	0°C to 70°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature (soldering, 60 sec)	300°C

electrical characteristics (Note 4)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Offset Voltage			5	15	mV
Average Temperature Coefficient of Offset Voltage			20		μV/°C
Input Current			10	30	nA
Input Resistance		10^9	10^{12}		Ω
Voltage Gain	$R_L > 8$ KΩ	0.9985	0.9995	1.000	
Output Resistance			0.8	2.5	Ω
Output Voltage Swing	$R_L \geq 8$ KΩ	±10			V
Supply Current			3.5	5.5	mA
Positive Supply Rejection		60			dB
Negative Supply Rejection		70			dB
Input Capacitance			3.0		pF
Offset Voltage	$0°C \leq T_A \leq 70°C$			20	mV
Input Current	$T_A = 70°C$ $T_A = 0°C$		3.0 20	15 50	nA nA

Note 1: For operating at elevated temperatures, the device must be derated based on a 85°C maximum junction temperature and a thermal resistance of 45°C/W junction to case or 150°C/W junction to ambient (see curve).

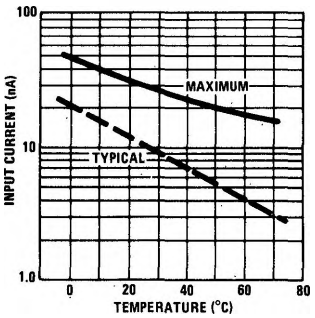
Note 2: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

Note 3: Continuous short circuit is allowed for case temperatures to 70°C and ambient temperatures to 55°C. It is necessary to insert a resistor greater than 2 KΩ in series with the input when the amplifier is driven from low impedance sources to prevent damage when the output is shorted.

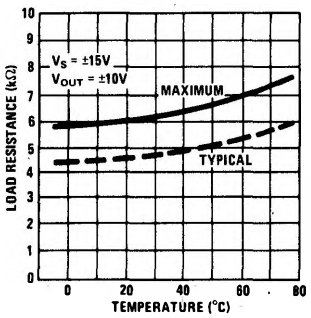
Note 4: These specifications apply for $T_A = 25°C$, $V_S = \pm 15V$ and $C_L \leq 100$ pF unless otherwise noted.

guaranteed performance

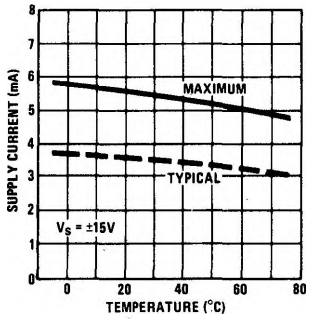
Input Current



Output Swing

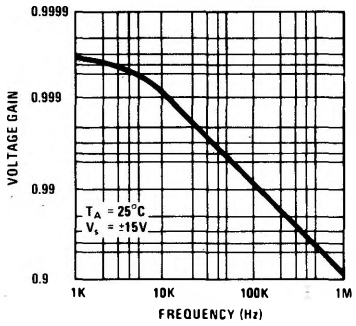


Supply Current

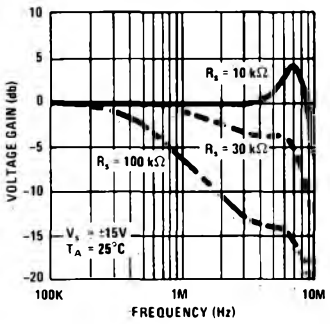


typical performance

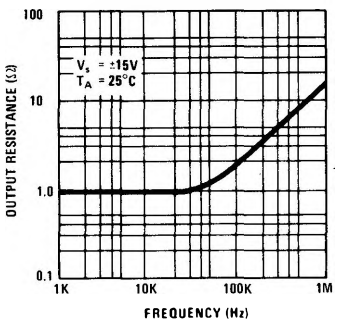
Voltage Gain



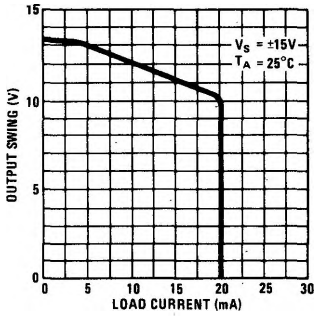
Voltage Gain



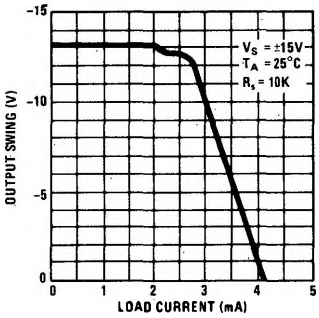
Output Resistance



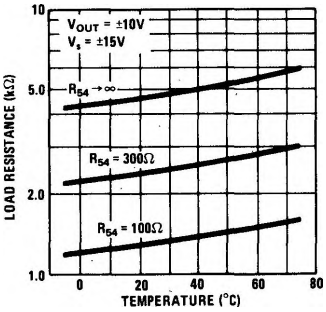
Positive Output Swing



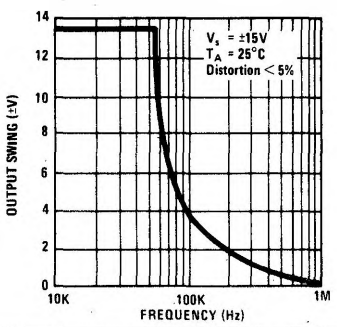
Negative Output Swing



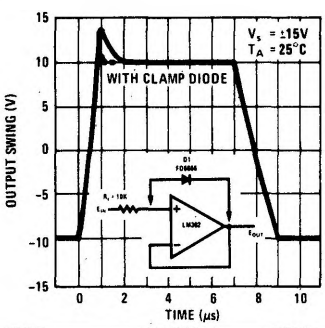
Output Swing



Large Signal Frequency Response



Large Signal Pulse Response



Maximum Power Dissipation