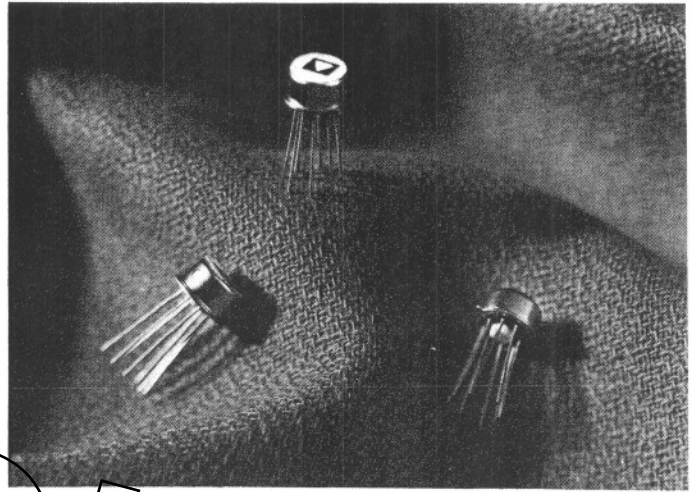


AD101A, AD201A, AD301A, AD301AL

FEATURES

- Low Bias and Offset Current
- Single Capacitor External Compensation for Operating Flexibility
- Nullable Offset Voltage
- No Latch-Up
- Fully Short Circuit Protected
- Wide Operating Voltage Range



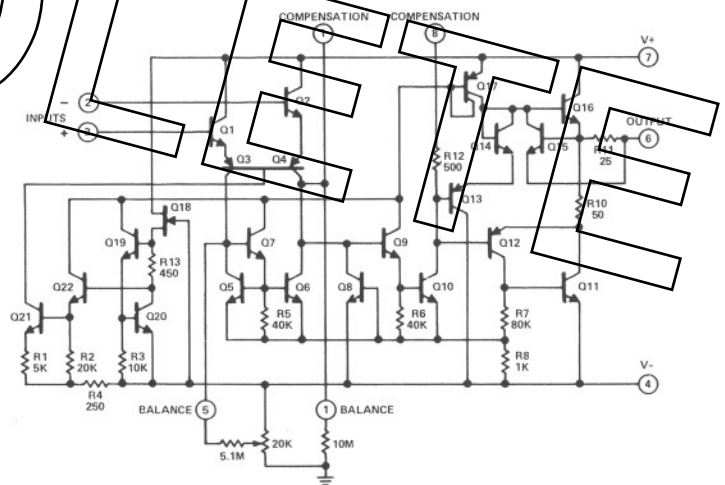
OBSOLETE

GENERAL DESCRIPTION

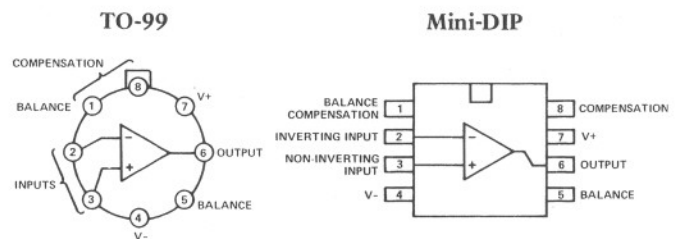
The Analog Devices AD101A, AD201A, AD301A and AD301AL are high performance monolithic operational amplifiers. All the circuits feature full short circuit protection, external offset voltage nulling, wide operating voltage range, and the total absence or "latch-up". Because frequency compensation is performed externally with a single capacitor (30pF maximum), the AD101A, AD201A, AD301A and AD301AL provide greater flexibility than internally compensated amplifiers since the degree of compensation can be fitted to the specific system application.

The AD101A and AD201A have identical specifications in the TO-99 package; the former guaranteed over the -55°C to $+125^{\circ}\text{C}$ temperature range, and the latter over -25°C to $+85^{\circ}\text{C}$. The AD201A is also available in the mini-DIP package for high performance operation over the 0 to $+70^{\circ}\text{C}$ temperature range. The AD301A is specified for operation over the 0 to $+70^{\circ}\text{C}$ temperature range in both the TO-99 and mini-DIP packages. The AD301AL is the highest accuracy version of this series. Improved processing and additional electrical testing allow the user to achieve precision performance at low cost. The device provides substantially increased accuracy by reducing errors due to offset voltage (0.5mV max), offset voltage drift ($5.0\mu\text{V}/^{\circ}\text{C}$ max), bias current (30nA max), offset current (5nA max), voltage gain (80,000 min), PSRR (90dB min), and CMRR (90dB min). The AD301AL is also specified from 0 to $+70^{\circ}\text{C}$ and is available in the TO-99 can or 8-pin mini-DIP.

SCHEMATIC DIAGRAM



CONNECTION DIAGRAMS (TOP VIEW)

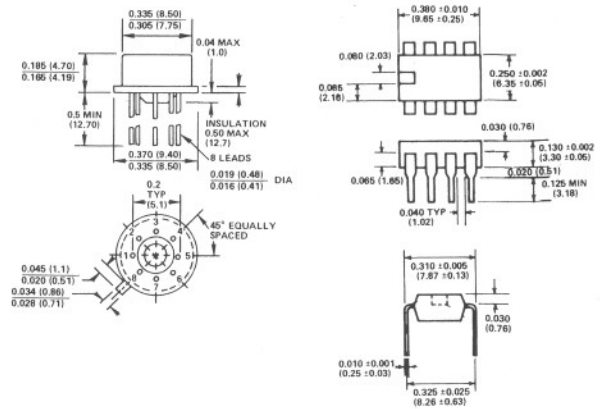


SPECIFICATIONS (typical @ +25°C and ±15V dc, unless otherwise specified)

ABSOLUTE MAXIMUM RATINGS AD101A, AD201A, AD301A, AD301AL unless otherwise specified

| | |
|--|-----------------|
| Supply Voltage | ±22V |
| AD101A, AD201A | |
| AD301A, AD301AL | ±18V |
| Power Dissipation ¹ | 500mW |
| TO-99 (Metal Can) | |
| Dual In-Line (Mini-DIP) | 500mW |
| Differential Input Voltage | ±30V |
| Input Voltage ² | ±15V |
| Output Short Circuit Duration ³ | Indefinite |
| Operating Temperature Range | |
| AD101A | -55°C to +125°C |
| AD201A (TO-99) | -25°C to +85°C |
| AD201A (Mini-DIP) | 0 to +70°C |
| AD301A, AD301AL | 0 to +70°C |
| Storage Temperature Range | -65°C to +150°C |
| Lead Temperature (Soldering, 60sec) | 300°C |

OUTLINE DIMENSIONS Dimensions shown in inches and (mm).



ELECTRICAL CHARACTERISTICS (T_A = +25°C unless otherwise specified)⁴

| Parameter | Conditions | AD101A/AD201A | | | AD301A | | | AD301AL | | | |
|---------------------------|--|---------------|-----|-----|--------|-----|-----|---------|-----|-----|-------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | Units |
| Input Offset Voltage | R _S ≤ 50kΩ | | 0.7 | 2.0 | | 2.0 | 7.5 | | 0.3 | 0.5 | mV |
| Input Offset Current | | | 1.5 | 10 | | 3 | 50 | | 3 | 5 | nA |
| Input Bias Current | | | 30 | 75 | | 70 | 250 | | 15 | 30 | nA |
| Input Resistance | | 1.5 | 4 | | 0.5 | 2 | | 1.5 | 4 | | MΩ |
| Supply Current | V _S = ±20V | | 1.8 | 3.0 | | 1.8 | | | 1.8 | 3 | mA |
| | V _S = ±15V | | | | | 3.0 | | | | | mA |
| Large Signal Voltage Gain | V _S = ±15V, V _{OUT} = ±10V, R _L ≥ 2kΩ | 50 | 160 | | 25 | 160 | | 80 | 500 | | V/mV |

The Following Specifications Apply Over the Operating Temperature Ranges⁴

| | | | | | | | | | | | |
|---|--|-----|------|-----|-----|------|-----|-----|------|-----|-------|
| Input Offset Voltage | R _S ≤ 50kΩ | | | 3.0 | | 10 | | 0.5 | 1 | | mV |
| Input Offset Current | | | | 20 | | 70 | | 5 | 10 | | nA |
| Average Temp. Coefficient of Input Offset Voltage | T _A (min) ≤ T _A ≤ T _A (max) | | 3.0 | 15 | | 6.0 | 30 | | 2 | 5 | μV/°C |
| Average Temp. Coefficient of Input Offset Current | +25°C ≤ T _A ≤ T _A (max) | | 0.01 | 0.1 | | 0.01 | 0.3 | | 0.01 | 0.1 | nA/°C |
| | T _A (min) ≤ T _A ≤ +25°C | | 0.02 | 0.2 | | 0.02 | 0.6 | | 0.01 | 0.1 | nA/°C |
| Input Bias Current | | | | 100 | | 300 | | 30 | 45 | | nA |
| Large Signal Voltage Gain | V _S = ±15V, V _{OUT} = ±10V, R _L ≥ 2kΩ | 25 | | | 15 | | | 40 | 100 | | V/mV |
| Input Voltage Range | V _S = ±20V | | ±15 | | | | | | | | V |
| | V _S = ±15V | | | | ±12 | | | ±12 | | | V |
| Common Mode Rejection Ratio | R _S ≤ 50kΩ | 80 | 96 | | 70 | 90 | | 90 | 100 | | dB |
| Supply Voltage Rejection Ratio | R _S ≤ 50kΩ | 80 | 96 | | 70 | 96 | | 90 | 100 | | dB |
| Output Voltage Swing | V _S = ±15V, R _L = 10kΩ | ±12 | ±14 | | ±12 | ±14 | | ±12 | ±14 | | V |
| | V _S = ±15V, R _L = 2kΩ | ±10 | ±13 | | ±10 | ±13 | | ±10 | ±13 | | V |
| Supply Current | T _A = T _A (max), V _S = ±20V | | 1.2 | 2.5 | | | | 1.8 | 3 | | mA |

¹ The maximum desirable junction temperature of the AD101A is +150°C; that of the AD201A, AD301A and AD301AL is +100°C. For operating at elevated temperatures, devices must be derated based upon 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 +160°C/W, junction to ambient.

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

³ For the AD301A and AD301AL continuous short circuit is allowed for case temperatures to +70°C and ambient temperatures to +55°C.

⁴ Unless otherwise specified, these specifications apply for supply voltages and ambient temperatures of ±5V to ±20V and -55°C to +125°C for the AD101A, ±5V to ±20V and -25°C to +85°C for the AD201AH (0 to +70°C for the AD201AN), and ±5V to ±15V and 0 to +70°C for the AD301A and AD301AL.

Specifications subject to change without notice.

ORDERING GUIDE

| MODEL | TEMP RANGE | ORDER NUMBER |
|---------|-----------------|--------------|
| AD301AL | 0 to +70°C | AD301AL* |
| AD201A | -25°C to +85°C | AD201A* |
| AD301A | 0 to +70°C | AD301A* |
| AD101A | -55°C to +125°C | AD101AH |
| AD101A | -55°C to +125°C | AD101AF |

* Add package type letter: H = TO-99, N = Mini-DIP

FREQUENCY COMPENSATION CIRCUITS

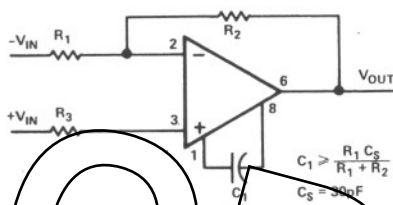


Figure 1. Single Pole Compensation

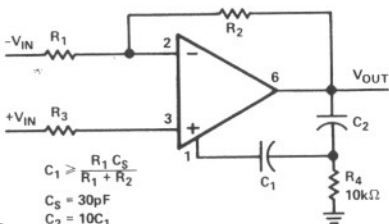


Figure 2. Two Pole Compensation

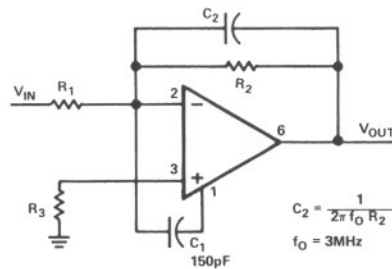
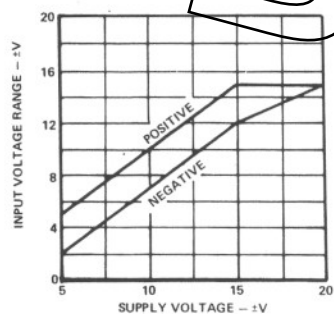
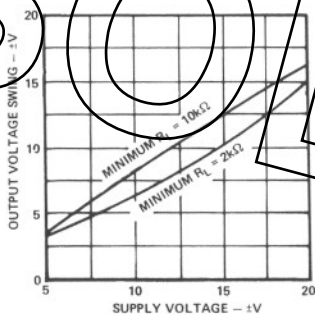


Figure 3. Feedforward Compensation

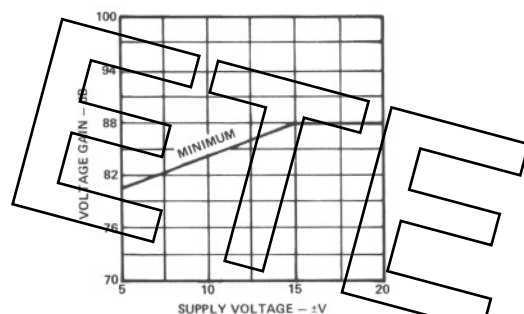
GUARANTEED PERFORMANCE CURVES (Curves apply over the Operating Temperature Ranges)



Input Voltage Range

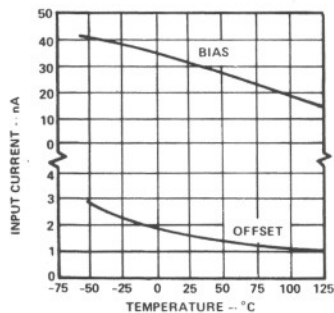


Output Swing

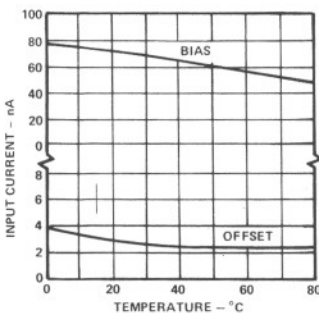


Voltage Gain

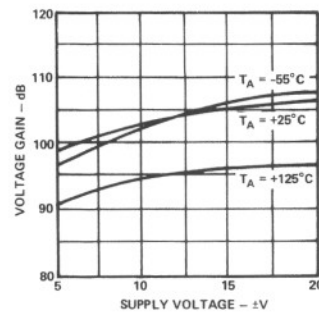
TYPICAL PERFORMANCE CURVES⁴



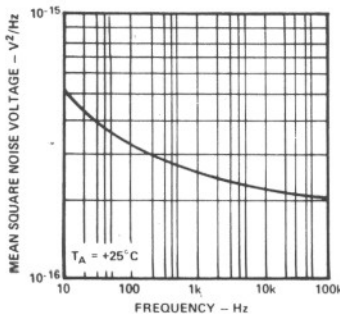
Input Current AD101A, AD201A



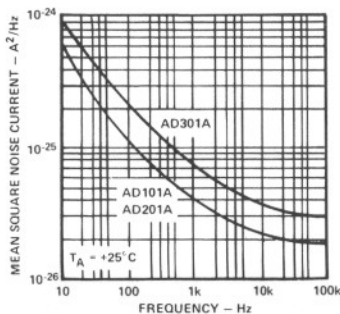
Input Current - AD301A



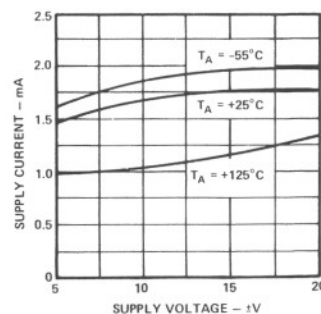
Voltage Gain



Input Noise Voltage

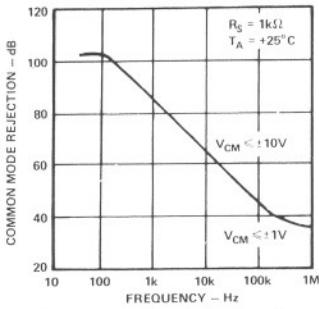


Input Noise Current

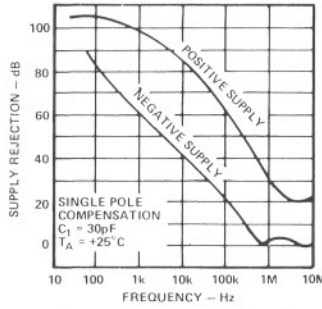


Supply Current

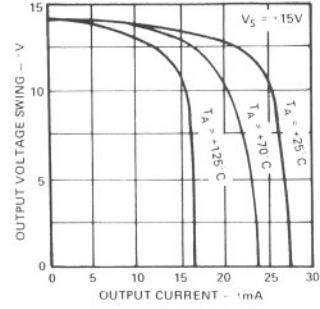
TYPICAL PERFORMANCE CURVES



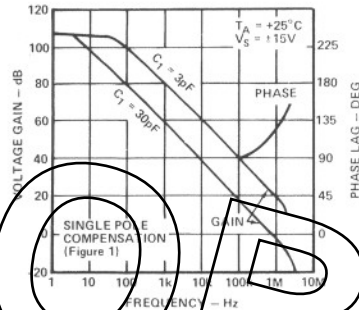
Common Mode Rejection



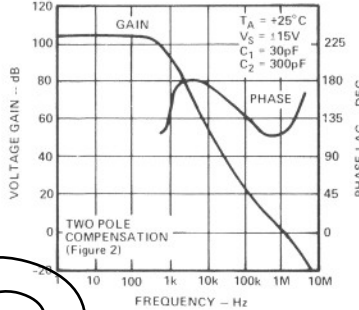
Power Supply Rejection



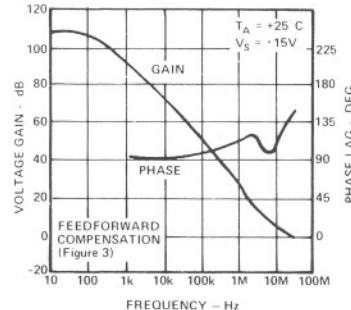
Current Limiting



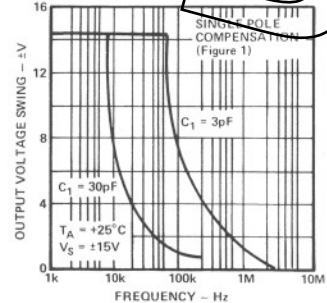
Open Loop Frequency Response



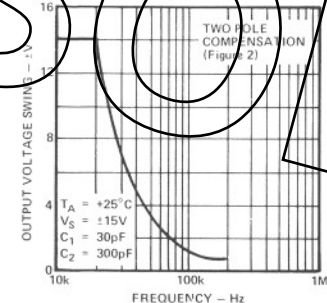
Open Loop Frequency Response



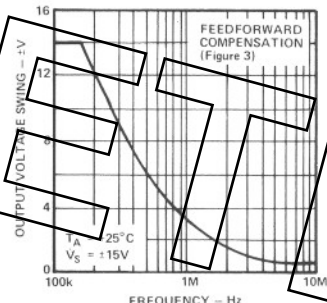
Open Loop Frequency Response



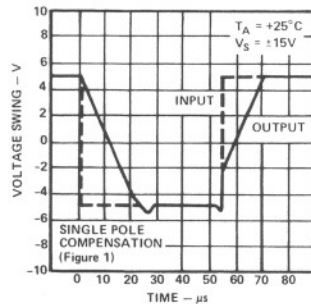
Large Signal Frequency Response



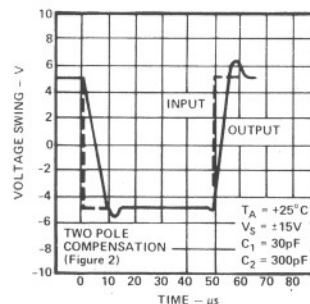
Large Signal Frequency Response



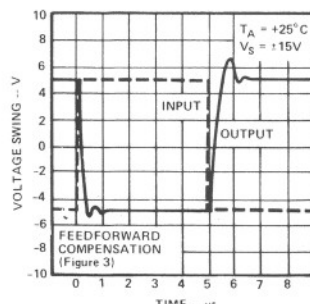
Large Signal Frequency Response



Voltage Follower Pulse Response



Voltage Follower Pulse Response



Inverter Pulse Response

SOL