

Amplifier pricing where you want it, performance where you need it.



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System design engineers often have to accept compromises on important specifications such as offset voltage, amplifier noise, signal distortion, bandwidth, or less than ideal voltage rails to meet aggressive cost targets. Analog Devices offers one of the largest portfolios of amplifiers designed to meet specific performance levels at competitive prices.

ADI's breakthrough in process technologies enables a wide range of low cost amplifiers that redefines performance at the value end of the market. With ADI low cost amps, system designers no longer have to accept inferior specifications for cost budgets. When designing a high volume, cost-sensitive device such as a handset, a DVD player, or laptop computer, look to ADI for the right low cost amplifier to meet your needs.



High Precision, Ultralow Offset Operational Amplifier

The OP07D is a low cost option of the OP07 family with voltage offset performance of $150\ \mu\text{V}$ max. It provides low power (1.1 mA typical), low input bias current ($\pm 1\ \text{nA}$ maximum), and high CMRR/PSRR (130 dB) performance. Operation is fully specified from $\pm 5\ \text{V}$ to $\pm 15\ \text{V}$ supply.

The OP07D provides higher accuracy than industry-standard OP07-type amplifiers due to Analog Devices' *iPolar*™ process technology. *iPolar* enables dramatically improved performance of linear products including wider output swing, lower power, and higher CMRR and PSRR. The OP07D maintains stability of offsets and gain virtually regardless of variations in time or temperature. Excellent linearity and gain accuracy can be maintained at high closed-loop gains.

The OP07D is fully specified over the extended industrial temperature range of -40°C to $+125^\circ\text{C}$. It is available in 8-lead DIP and the popular 8-lead, narrow SOIC lead-free packages.

16 V Low Noise, Wide Bandwidth Operational Amplifier Family

The AD8665 family is the first in a series of low cost devices fabricated on the ADI proprietary *iCMOS*™ process technology. These 16 V operational amplifiers offer a low noise specification of $10\ \text{nV}/\sqrt{\text{Hz}}$, 4 MHz wide gain-bandwidth (GBW), single-supply operation, $3\ \text{mm} \times 3\ \text{mm}$ LFCSP package (SOIC also available). In addition, the *iCMOS* inputs are inherently low in bias current making the amps very useful in I-V converters, photodiodes, and other high impedance applications typical of consumer medical devices. Its 16 V power supply capability makes it ideal for secondary gain and filter stages in many industrial applications where $\pm 5\ \text{V}$ supplies are popular. Rounding out the performance parameters are high PSRR, high phase margin, low distortion specs, and an extended industrial temperature range. The combination of high performance characteristics and low costs make this family of midvoltage amps ideal in high volume applications in power supplies, consumer medical devices, and industrial applications. The AD8665 is available in 5-lead SOT-23 and 8-lead SOIC; the AD8666 is available in 8-lead MSOP and SOIC; and the AD8668 is available in 14-lead TSSOP and SOIC.



High Bandwidth, Low Noise Operational Amplifier Family

Featuring 24 MHz of gain bandwidth, $8\ \text{nV}/\sqrt{\text{Hz}}$ voltage noise density, and only 2 mV of voltage offset, the AD8646 family of dual and quad CMOS amplifiers are ideal for use in filters, integrators, photodiode amplifiers, and high impedance sensor amplifications. The addition of 150 mA output current and $-100\ \text{dB}$ of distortion, combined with rail-to-rail inputs/outputs, provides great performance in audio applications such as headphone drivers for MP3 players, DVD players, personal media players, and a host of other personal audio devices. Very wide operating temperature range and small packaging provide additional flexibility for consumer, medical, industrial, and automotive applications. The AD8646 is available in 8-lead MSOP and SOIC; and the AD8648 is available in 14-lead TSSOP and SOIC.

JFET Input Operational Amplifiers for 36 V High Volume Applications

The ADTL082 and ADTL084 are fabricated on the revolutionary *iPolar* process technology permitting tighter spacing of adjacent transistors which results in less noise, power consumption, and stray capacitance, more phase margin, and higher stability, as well as a host of other performance factors. All these performance characteristics and a smaller die size combine to give a high performance ADTL08x amp at a cost of merely a few cents. With its two performance grades and industry-standard packages as well as space-saving MSOP packages, the ADTL082 and ADTL084 amplifiers will be the new industry standard for low cost 36 V amps widely used in high volume industrial, consumer, computer, server, and communications applications.



Selection Table

| Part Number | Description | Number of Amps | | | | Supply Voltage | BW @ A _{CL} Min (MHz) | V _{OS} (mV Max) | Noise (nV/√Hz) | Supply Current per Amp (mA Typ) | Package | Price @ 100k (\$U.S.) | |
|-------------------------------|---------------------------------------|----------------|---|---|---|----------------|--------------------------------|--------------------------|----------------|---------------------------------|---------|-----------------------|------|
| | | 1 | 2 | 3 | 4 | | | | | | | | |
| Operational Amplifiers | | | | | | | | | | | | | |
| AD8515 | 1.8 V, R-R I/O | • | | | | 1.8 | 6 | 5 | 6 | 22 | 0.35 | SC70 | 0.20 |
| AD8531 | 250 mA output, R-R I/O | • | | | | 2.7 | 6 | 3 | 25 | 45 | 0.75 | SC70 | 0.20 |
| AD8541 | Micropower, R-R I/O | • | | | | 2.7 | 6 | 1 | 6 | 42 | 0.038 | SC70 | 0.20 |
| AD8631 | 1.8 V, low power, R-R I/O | • | | | | 1.8 | 6 | 5 | 4 | 23 | 0.3 | SOT-23 | 0.20 |
| AD8591 | 250 mA output with shutdown | • | | | | 2.7 | 6 | 3 | 25 | 45 | 0.75 | SOT-23 | 0.21 |
| AD8691 | Low noise, R-R output | • | | | | 2.7 | 6 | 10 | 2 | 8 | 0.85 | SC70 | 0.21 |
| AD8692 | Low noise, R-R output | | • | | | 2.7 | 6 | 10 | 2 | 8 | 0.85 | SOIC-8 | 0.21 |
| OP07D | Ultralow offset voltage | • | | | | 10 | 36 | 0.6 | 0.15 | 11 | 2.7 | SOIC-8 | 0.25 |
| AD8517 | 1.8 V, low noise, R-R input/output | • | | | | 1.8 | 6 | 7 | 3.5 | 15 | 0.9 | SOT-23 | 0.27 |
| AD8613 | 1.8 V, micropower, low noise, R-R I/O | • | | | | 1.8 | 6 | 0.4 | 2.2 | 25 | 0.038 | SC70 | 0.29 |
| AD8542 | Micropower, R-R I/O | | • | | | 2.7 | 6 | 1 | 6 | 42 | 0.038 | SOIC-8 | 0.30 |
| AD8632 | 1.8 V, low power, R-R I/O | | • | | | 1.8 | 6 | 5 | 4 | 23 | 0.3 | SOIC-8 | 0.30 |
| AD8532 | 250 mA output, R-R I/O | | • | | | 2.7 | 6 | 3 | 25 | 45 | 0.75 | TSSOP | 0.31 |
| AD8592 | 250 mA output with shutdown | | • | | | 2.7 | 6 | 3 | 25 | 45 | 0.75 | MSOP | 0.31 |
| AD8565 | Single-supply, R-R I/O | • | | | | 4.5 | 18 | 5 | 10 | 26 | 0.7 | SC70 | 0.34 |
| AD8665 | 16 V, 4 MHz, R-R output | • | | | | 5 | 16 | 4 | 2.5 | 10 | 1.8 | SOT-23-5 | 0.37 |
| AD8566 | Single-supply, R-R I/O | | • | | | 4.5 | 18 | 5 | 10 | 26 | 0.7 | MSOP-8 | 0.38 |
| AD8646 | 24 MHz, R-R | | • | | | 2.7 | 6 | 24 | 2.5 | 8 | 2 | MSOP-8 | 0.39 |
| AD8567 | Single-supply, R-R I/O | | | | • | 4.5 | 18 | 5 | 10 | 26 | 0.7 | LFCSP | 0.42 |
| AD8534 | 250 mA output, R-R I/O | | | | • | 2.7 | 6 | 3 | 25 | 45 | 0.75 | TSSOP | 0.45 |
| AD8544 | Micropower, R-R I/O | | | | • | 2.7 | 6 | 1 | 6 | 42 | 0.038 | SOIC-14 | 0.45 |
| AD8617 | 1.8 V, micropower, low noise, R-R I/O | | • | | | 1.8 | 6 | 0.4 | 2.2 | 25 | 0.038 | SOIC-8 | 0.45 |
| AD8594 | 250 mA output with shutdown | | | | • | 2.7 | 6 | 3 | 25 | 45 | 0.75 | SOIC-16 | 0.46 |



| Part Number | Description | Number of Amps | | | | Supply Voltage | BW @ A _{CL} Min (MHz) | V _{OS} (mV Max) | Noise (nV/√Hz) | Supply Current per Amp (mA Typ) | Package | Price @ 100k (\$U.S.) | |
|---|---|----------------|---|---|---|----------------|--------------------------------|--------------------------|----------------|---------------------------------|---------|-----------------------|------|
| | | 1 | 2 | 3 | 4 | | | | | | | | |
| Operational Amplifiers (continued) | | | | | | | | | | | | | |
| AD8527 | 1.8 V, low noise, R-R input/output | • | | | | 1.8 | 6 | 7 | 3.5 | 15 | 0.9 | SOIC-8 | 0.47 |
| AD8666 | 16 V, 4 MHz, R-R output | • | | | | 5 | 16 | 4 | 2.5 | 10 | 1.8 | MSOP-8 | 0.50 |
| AD8648 | 20 MHz, quad, R-R I/O | | | • | | 2.7 | 6 | 24 | 2.5 | 8 | 2 | TSSOP | 0.58 |
| AD8668 | 16 V, 4 MHz, R-R output | | | • | | 5 | 16 | 4 | 2.5 | 10 | 1.8 | TSSOP | 0.68 |
| AD8619 | 1.8 V, micropower, low noise, R-R I/O | | | • | | 1.8 | 6 | 0.4 | 2.2 | 25 | 0.038 | SOIC-14 | 0.71 |
| AD8694 | Low noise, R-R output | | | • | | 2.7 | 6 | 10 | 2 | 8 | 0.85 | TSSOP | 0.99 |
| Video Amplifiers | | | | | | | | | | | | | |
| ADA4860-1 | High speed current feedback | • | | | | 5 | 12 | 730 | 13 | 3.8 | 5.3 | SOT-23 | 0.39 |
| ADA4851-1 | Voltage feedback R-R output | • | | | | 3 | 12 | 130 | 3.3 | 10 | 2.4 | SOT-23 | 0.39 |
| ADA4850-1 | Ultralow power-down | • | | | | 2.7 | 12 | 175 | 4.1 | 10 | 2.4 | LFCSP | 0.45 |
| ADA4853-1 | Ultralow power, high speed R-R output | • | | | | 2.65 | 5 | 80 | 2 | 20 | 1 | SC70 | 0.45 |
| ADA4851-2 | Voltage feedback R-R output | | • | | | 3 | 12 | 130 | 3.3 | 10 | 2.4 | MSOP-8 | 0.48 |
| ADA4850-2 | Ultralow power-down | | • | | | 2.7 | 12 | 175 | 4.1 | 10 | 2.4 | LFCSP | 0.59 |
| ADA4861-3 | High speed current feedback | | | • | | 5 | 12 | 730 | 13 | 3.8 | 5.3 | SOIC-14 | 0.67 |
| ADA4862-3 | High speed internally fixed G = +2 | | | • | | 5 | 12 | 300 | 25 | 10.6 | 5.3 | SOIC | 0.67 |
| ADA4851-4 | Voltage feedback R-R output | | | | • | 3 | 12 | 130 | 3.3 | 10 | 2.4 | TSSOP | 0.79 |
| ADD8710 | 10-channel Gamma buffer + V _{COM} driver | 10 amp device | | | | 4.5 | 18 | 5 | 12 | | 0.8 | TSSOP | 0.85 |
| Instrumentation Amplifiers | | | | | | | | | | | | | |
| AD8553 | Auto-zero with shutdown | • | | | | 1.8 | 6 | 1 | 0.02 | 30 | 1.1 | MSOP | 0.88 |
| Audio Power Amplifiers | | | | | | | | | | | | | |
| SSM2211 | Low distortion, 1.5 watt | • | | | | 2.7 | 6 | 4 | 25 | 85 | 4.2 | LFCSP | 0.27 |
| SSM2167 | Low voltage microphone preamp | • | | | | 2.7 | 6 | 1 | — | 20 | 2.3 | MSOP | 0.35 |



Low Noise, CMOS Rail-to-Rail Output Operational Amplifiers

The AD8691 family combines a number of high performance parameters including low $8 \text{ nV}/\sqrt{\text{Hz}}$ voltage noise density, rail-to-rail output, extended industrial temperature range, high output current, very low distortion, and less than 1 mA of quiescent current. With a low operating range from 2.7 V to 5.5 V, utility feature set, and a very low price, the AD8691 family of amps finds its way into applications as diverse as computers, handsets, and consumer electronics to become one of the most useful amplifiers in a design engineer's bag of tricks. Overcome your design limitations with the AD8691/AD8692/AD8694 amplifiers from ADI. The AD8691 is available in 5-lead SC70 and TSOT; the AD8692 is available in 8-lead MSOP and SOIC; and the AD8694 is available in 14-lead TSSOP and SOIC.

1.8 V to 5 V Auto-Zero Instrumentation Amplifier with Shutdown

To lower costs, there is no longer a need to accept low CMRR solutions. The AD8553 is a CMOS in-amp that offers accuracy to satisfy even the most demanding current sensing or power management applications. The AD8553 offers ultralow $20 \mu\text{V}$ offset voltage and nearly zero drift while achieving 140 dB of CMRR on a single 1.8 V to 5 V supply. Gain from 0.1 to 10,000 can be set with just two external resistors and a shutdown/disable feature, which maximizes battery life in portable applications. The AD8553 satisfies demanding voltage amplification, current sensing, or power measurement applications; even in noisy environments including medical, computer, server, and communications. The AD8553 is available in 10-lead MSOP.



**AD8613/AD8617/
AD8619**



Low Power, Low Voltage, Low Noise Operational Amplifier Family

The AD8613, AD8617, and AD8619 devices are single, dual, and quad op amps with rail-to-rail inputs and outputs that deliver 50% lower noise and 30% lower power with twice the precision of competing devices. These devices feature supply current of only 38 microamps maximum, low offset voltage of 2 mV maximum, ultralow input bias current of 1 pA maximum, and low noise of $22 \text{ nV}/\sqrt{\text{Hz}}$. Fully guaranteed 1.8 V to 5 V operation makes these op amps ideal for battery-operated devices, such as temperature monitors and carbon dioxide detectors, where power management and reliability are critical. The rail-to-rail outputs make them suitable for driving ADCs (analog-to-digital converters) and buffering DACs (digital-to-analog converters) in lower power 12-bit to 16-bit applications. The AD8613 is available in 5-lead SC70 and SOT-23; the AD8617 is available in 8-lead MSOP and SOIC; and the AD8619 is available in 14-lead TSSOP and SOIC.

High Speed, Rail-to-Rail Output Operational Amplifier Family

When your portable video players require an op amp with gain bandwidth in excess of 100 MHz, ADI's new ADA4851 family of low cost, high speed amps fits the need perfectly. The ADA4851 family of high speed amplifiers will help to conserve battery life with low 2.5 mA quiescent current, a shutdown pin, and low operating voltage while providing the bandwidth that the applications demand. Rail-to-rail input and output simplify portable design and maximize dynamic range. The single amp version ADA4851-1 is available in a 6-pin SOT-23 package with a power-down mode to conserve battery power, making it perfect for the new generation of ultraportable video display devices. Dual and quad versions are also available in a variety of space-saving packages to accommodate almost any design in consumer video electronics.



Low Supply Current, Rail-to-Rail I/O, Single-Supply Operational Amplifier Family

The AD8541 family of amplifiers offers a bandwidth of 1 MHz with a very modest supply current of only 55 μ A maximum per channel. This unique combination of useful bandwidth and low power makes the AD8541 family of amps a perfect fit for many portable designs in a wide variety of application areas from audio preamps, to instrumentation and battery-powered consumer products. There are single, dual, and quad amp configurations to accommodate all potential needs. The AD8541 single amp comes in a tiny SC70 package to meet tight board space requirements in modern portable designs in handsets, PDAs, and computers. The AD8541 is available in 5-lead SC70 and SOT-23 as well as 8-lead SOIC; the AD8542 is available in 8-lead MSOP, TSSOP and SOIC; and the AD8544 is available in 14-lead TSSOP and SOIC.

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