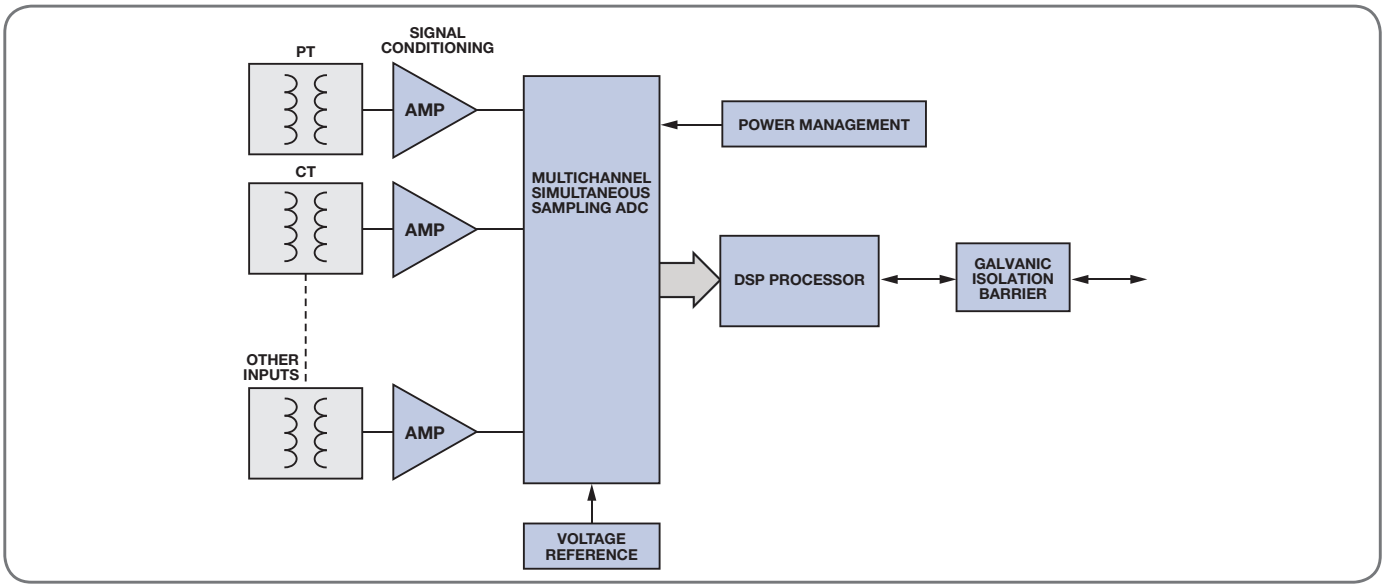
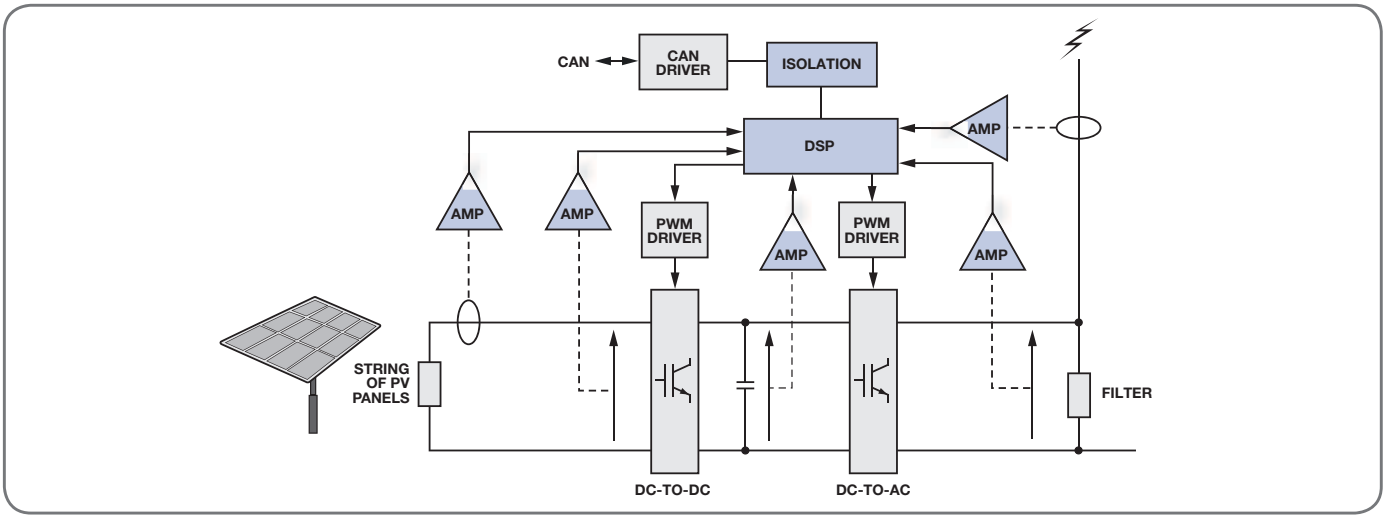
Amplifiers for Energy Applications

Analog Devices has been developing innovative energy solutions for over a decade. Our portfolio of high performance amplifiers plays a key role in advancing power quality monitoring in substation equipment and, more recently, enables breakthrough solutions in renewable energy systems.



Typical substation automation system diagram.



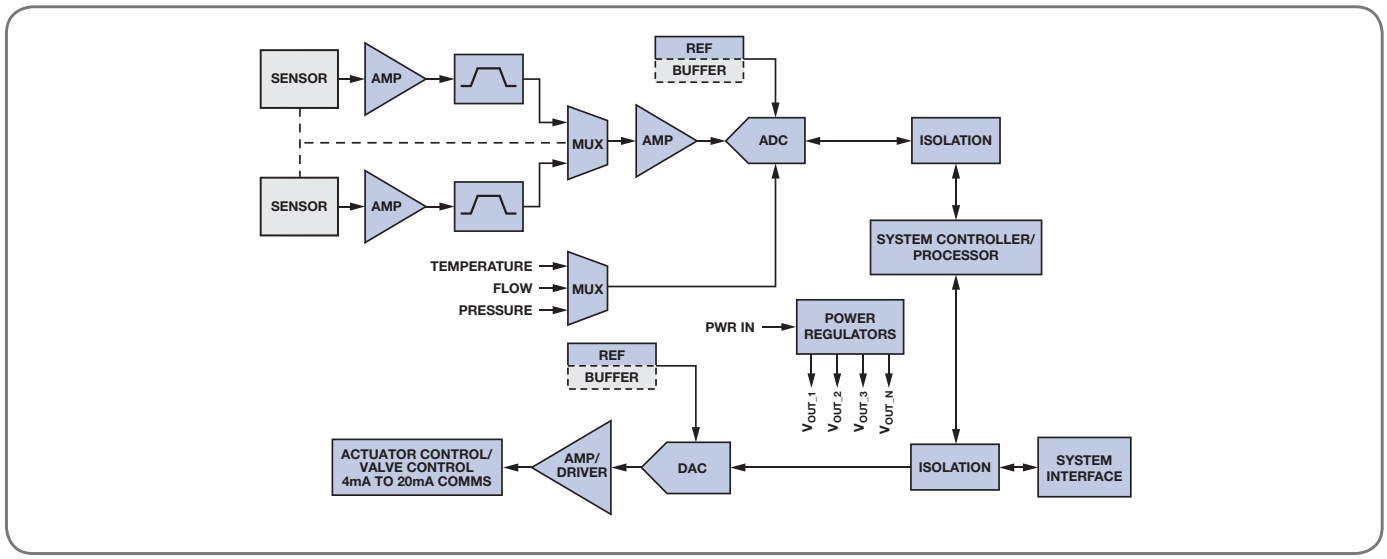
Typical solar cell system diagram.

Application	Recommended Amplifiers	Key Amplifier Characteristics
Renewable energy generation—wind turbines	Precision: OP282, AD820, AD822, AD824, OP4177, OP2177, AD8622, AD8624	Low noise, high load drive
Renewable energy generation—solar inverters	Precision: AD8512, AD824, ADA4610-2 High speed: AD8039, AD8092	Low noise, low input bias current low power, low cost
Substation automation—transmission and distribution	Precision: AD8510, AD8512, AD8513, OP4177, AD8622, AD8624	Low noise, low input bias current

For more information in energy applications, visit *energy.analog.com.*

Amplifiers for Applications in Process Control and Industrial Automation

For over 40 years, designers of industrial process control systems and Analog Devices have worked together to define, develop, and deploy complete signal chain solutions, optimized for a wide array of applications. We bring reliability and innovation to this process with precision control and monitoring solutions based on our industry-leading technologies and systems-level expertise.

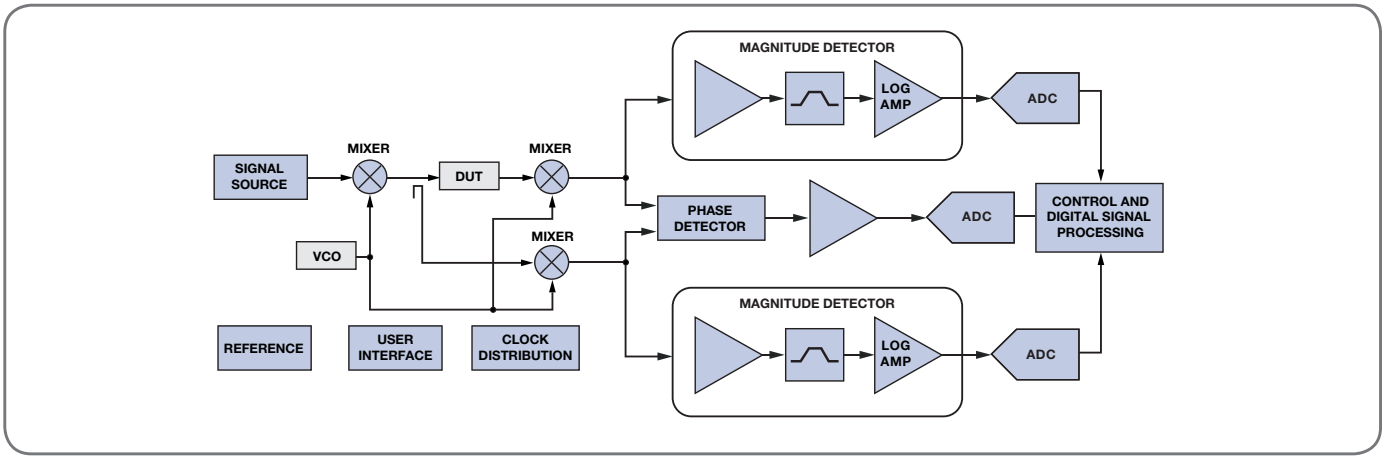


Application	Recommended Amplifiers for Input Stage	Recommended Amplifiers for Output Stage	Key Amplifier Characteristics
Programmable logic controllers (PLC)/ distribution contol systems (DCS)	Precision: OP2177, OP177, OP07, ADA4091-2, AD8677, OP213, OP295, OP284, AD822, ADA4091, ADA4092, ADA4051-2, AD8629, AD8639, AD8572, AD8539, AD8607, AD8606, AD8542, ADA4692, AD8617, AD8657	Precision: AD8622, AD822, OP297, ADTL082, AD8607, AD8606, AD8542, ADA4692, AD8617, AD8657, OP2177, OP177, OP07, ADA4091, AD8677, ADA4062, ADA4692	Precision, low power, overvoltage protection, high voltage
	High speed: AD8021, AD8051, AD8032, AD8029, AD8062, AD8099, AD8045, ADA4899-1, ADA4899-2, ADA4898-1, AD4898-2, AD8139, ADA4927, ADA4940	High speed: AD8397, ADA4891-1, ADA4891-2, ADA4891-3, ADA4891-4, AD8017	High speed, low noise, high output current
Field instrumentation and smart transmitters	Precision: AD8538, AD8628, OP4177	Precision: AD8655, AD8656, AD8615, AD8616, AD8618	Precision, low power

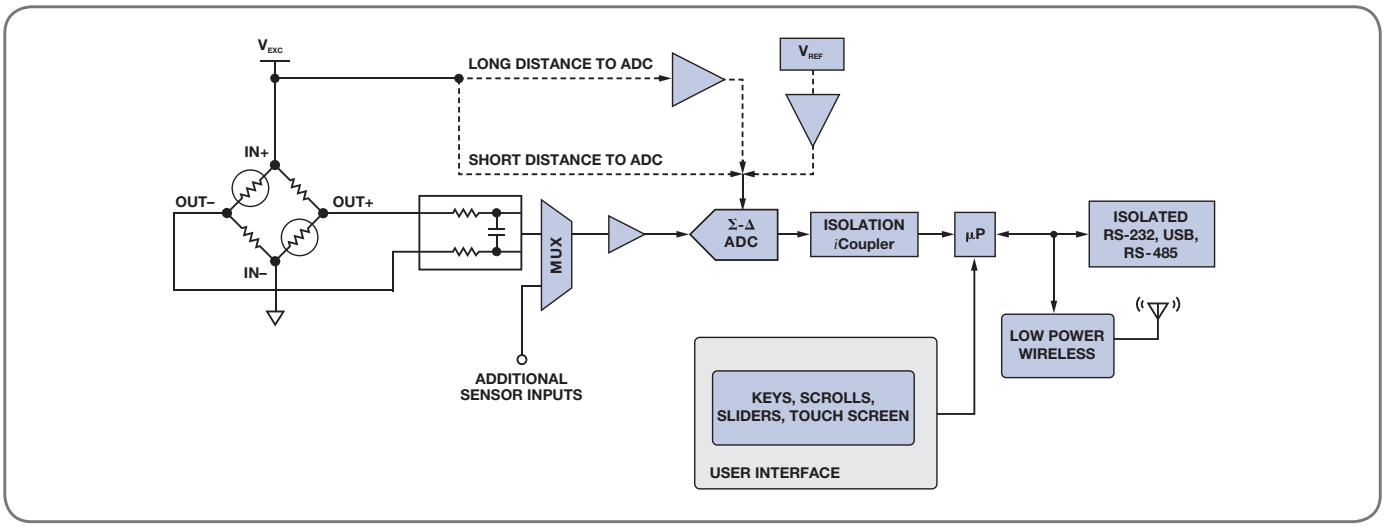
For more information in process control and industrial automation applications, visit *processcontrol.analog.com.*

Amplifiers for Instrumentation and Measurement Applications

ADI offers high performance analog solutions that detect, measure, and control a variety of sensors. Our technology enables a wide range of innovative equipment used to identify and characterize liquids, powders, solids, and gases. Our portfolio of leading-edge amplifiers can help you optimize the performance of your quantitative and qualitative instruments.



Network analyzer block diagram.



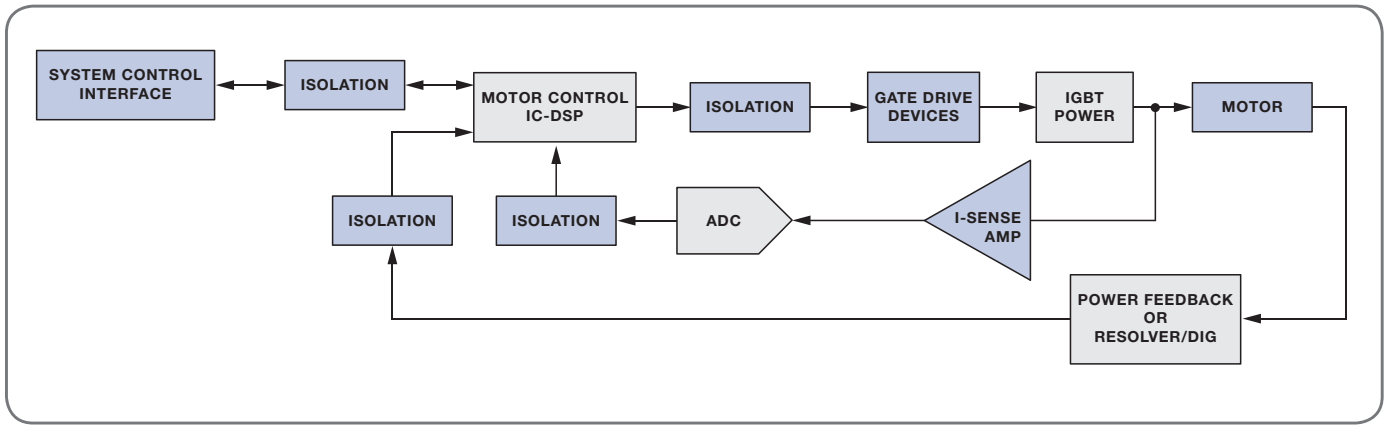
Weight scales block diagram.

Application	Recommended Amplifiers	Key Amplifier Characteristics
Electronic test and measurement	Precision: ADA4051, AD8655, AD8656, AD8615, AD8605, ADA4528	High input impedance, low noise, low drift
	High speed: ADA4899, ADA4927, ADA4937, ADA4938, ADA4939, ADA4960, ADA4932, ADA4817	Low noise, wide bandwidth, high input impedance, differential input and output
Chemical analysis	Precision: AD8616, AD8603, AD8607, AD8609	Low power
	High speed: ADA4930, ADA4940, ADA4932-1, ADA4932-2	Low voltage, low power
Weigh scales	Precision: ADA4051, AD8628, AD8638, AD8639, AD8571, AD8677, AD8675, AD8676, ADA4528, AD8671, AD8672, AD8674	Low offset; low offset drift, high CMRR/PSRR
Environmental monitors	Precision: AD8657, AD8655, AD8615, AD8622, ADA4528, ADA4610-2	Low bias current, low current noise, low drift

For more information in instrumentation and measurement applications, *visit instrumentation.analog.com.*

Amplifiers for Motor and Power Control Applications

Analog Devices offers a complete product portfolio to optimize system-level and applications-oriented designs for motor and power control solutions. ADI's amplifier products provide many advantages in current sensing and voltage sensing applications.

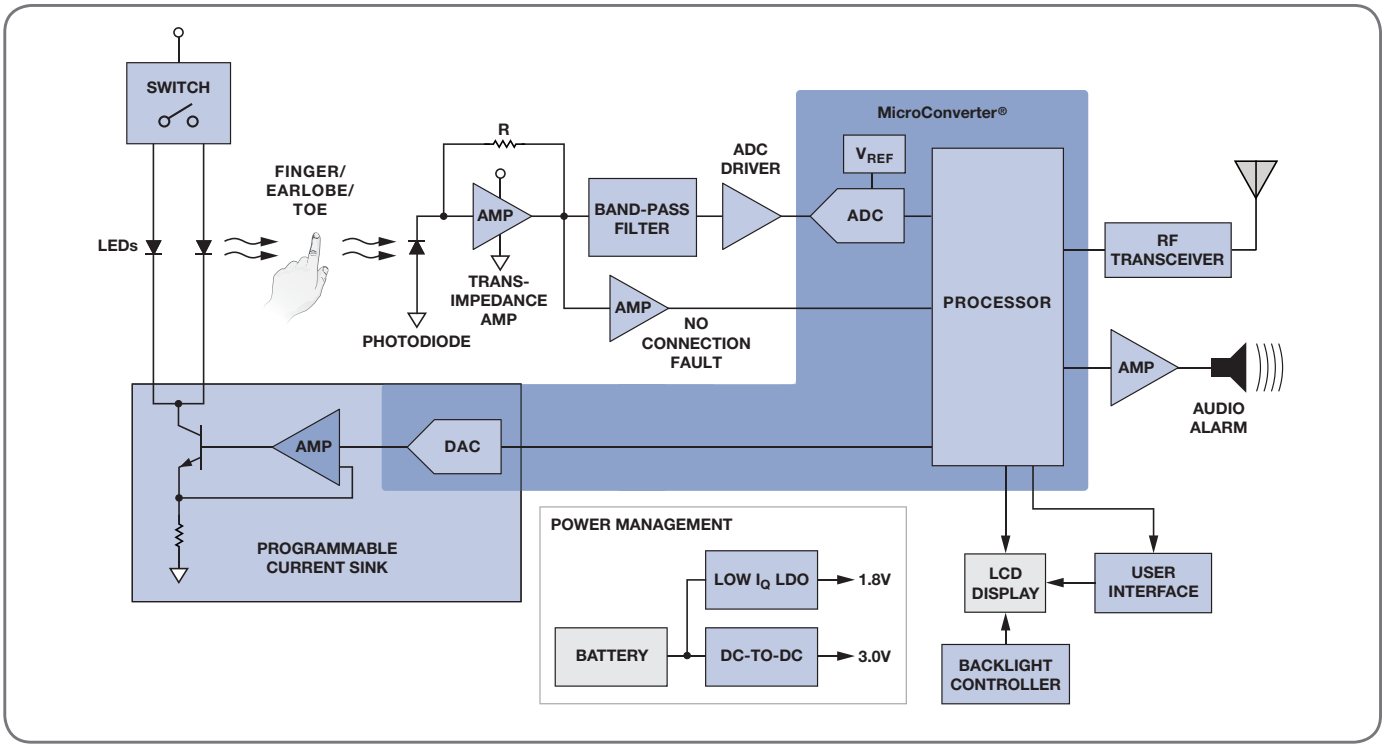


Application	Recommended Amplifiers	Key Amplifier Characteristics
Motor control	ADA4051, AD8657, AD8512, AD8620, AD8622, AD8624, OP1177, OP2177, OP4177, AD8510, AD8513, AD8602, AD8604, ADA4000, ADA4096, ADA4528	Low noise, low offset voltage, low offset drift

For more information in motor and power control applications, visit *motorcontrol.analog.com.*

Amplifiers for Healthcare Applications

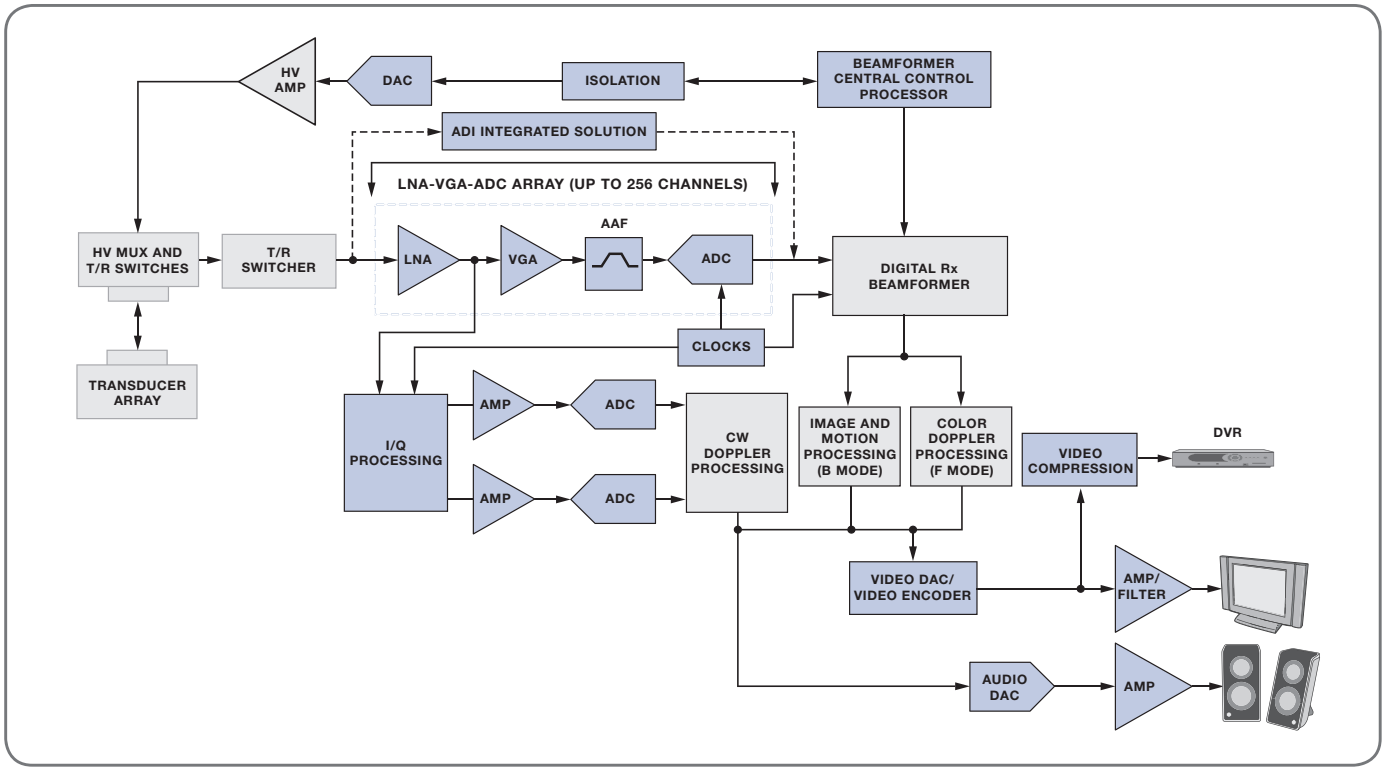
ADI's portfolio of high performance op amps and signal processing expertise enable innovative solutions to healthcare designs—helping shape the future of diagnostics and monitoring equipment, as well as health and wellness devices.



Pulse oximetry functional diagram.

Application	Recommended Amplifiers		Key Amplifier Characteristics
Pulse oximetry	Transimpedance amp	Precision: AD8603, AD8607, AD8609, AD8663, AD8667, AD8669, AD8622, AD549	Low input bias current
	Band-pass filter	Precision: AD8605, AD8606, AD8608, AD8603, AD8607, AD8609, AD8597, AD8599, AD8641, AD8642, AD8643	Low noise, wide bandwidth
	ADC driver	Precision: AD8605, AD8606, AD8608, AD8661, AD8662, AD8664, AD8597, AD8599, AD820, AD822, AD824, ADA4505-2, ADA4505-4	Low noise, low offset, high slew rate
		High speed: AD8132, ADA4841-1, ADA4932-1, ADA4941-1	High speed differential drivers
	Programmable current sink/DAC buffer	Precision: AD8661, AD8662, AD8664, ADA4075-2 Precision: AD8663, AD8605, AD8603, AD8613, ADA4004-1, ADA4004-2	Wide bandwidth, high output drive, unity-gain stable
		High speed: AD8017, AD8022, AD817 High speed: AD8065, AD8066, ADA4817-1, ADA4817-2, AD843	Wide bandwidth, FET input, rail-to-rail output
	No connection fault amplifiers	Precision: AD8605, AD8601, AD8541, AD8505	Low power

Amplifiers for Healthcare Applications (continued)



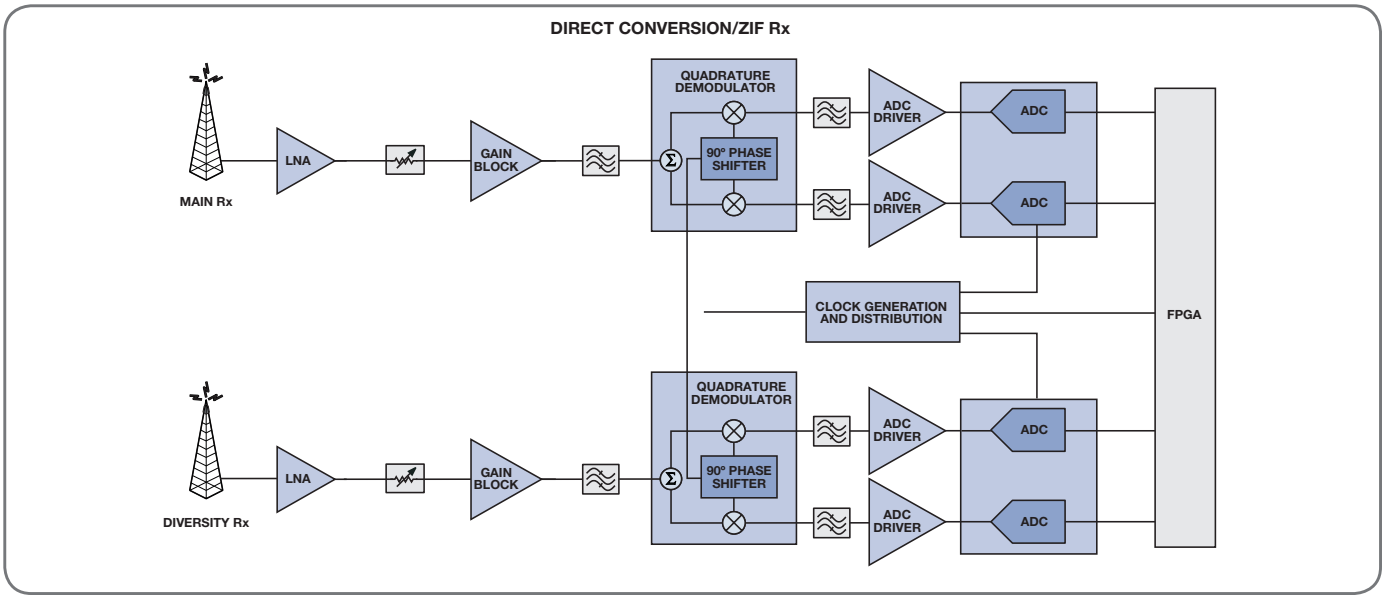
Ultrasound functional diagram.

Application	Recommended Amplifiers		Key Amplifier Characteristics
Ultrasound			Dual channel, low noise
	High speed: AD810, AD812, AD813, AD815, AD817, AD825, AD826, AD818, AD827, AD828, AD829, AD847, ADA4898-1, ADA4898-2, OP467		High voltage, wide bandwidth
	High speed: ADA4841-1, ADA4898-1, ADA4899-1, AD8012, AD8021, AD8022, AD8099		Low noise, high speed
Instrumentation/blood analysis using flow cytometry	Transimpedance amp	Precision: AD8603, AD8607, AD8609, AD8610, AD8620, AD8663, AD8667, AD8669, AD8622, AD549, ADA4051-1, ADA4627, ADA4610	Low input bias current
	DAC buffer	Precision: AD8605, AD8606, AD8608, AD8661, AD8662, AD8664, ADA4075-2	High bandwidth, high output drive
	Photodiode pre-amp	High speed: AD8033, AD8034, AD8065, AD8066, AD8067, AD8610, AD8615, AD8618, AD8620, ADA4817-1, ADA4817-2	High speed, FET input
		High speed: AD8022, AD8029, AD8041, AD812, AD818, ADA4851-1, ADA4851-2	Wide bandwidth, low noise, rail-to-rail, low power
	ADC driver	High speed: ADA4941-1, ADA4932-1, ADA4932-2, ADA4940-1, ADA4940-2, ADA4950-1, ADA4950-2, AD8138, AD8137	Low noise, low offset, high slew rate
HRM (heart rate monitoring devices)/ blood pressure monitor	Band-pass filter	Precision: AD8500, ADA4051-1, ADA4051-2, AD8603, AD8607, AD8609, AD8508, AD8541, AD8538, AD8539, AD8642, ADA4505, AD8655, AD8656, ADA4505-4	Low noise, low power, wide bandwidth
	Audio amp	Precision: AD8691, AD8692, AD8694, AD8665, ADA4665-2, AD8668, ADA4075-2	Low noise, high output drive
	ADC driver	High speed: ADA4941, ADA4940	Low noise, low offset, high slew rate

For more information in healthcare applications, visit *healthcare.analog.com.*

Amplifiers for Communications Applications

Whether transmitting critical information, reporting breaking news, or linking people with family and friends, communications systems connect the world. And designers of these broadband systems have come to rely on Analog Devices to make a difference in their designs. Our broad op amp portfolio enables low power, high capacity, and cost-effective results demanded in the network of point-to-point communications systems, private mobile radios, and wireless infrastructure equipment.



Direct conversion block diagram.

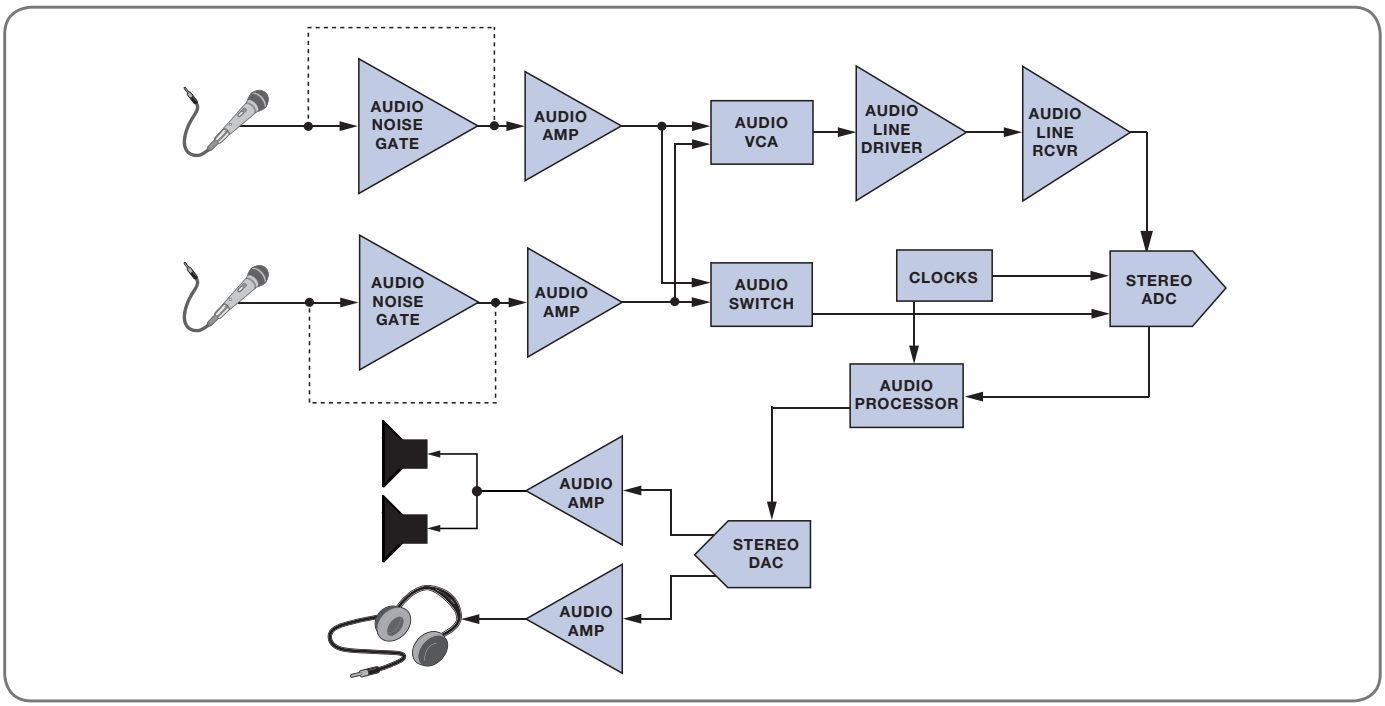
Communications

Category	Recommended Components	Key Parameters
ADC drivers	ADA4927-1/ADA4927-2	Current feedback, wide bandwidth, high slew rate
	ADA4930-1/ADA4930-2	1.8 V ADC driver
	ADA4932-1/ADA4932-2	Low power, wide bandwidth
	ADA4937-1/ADA4937-2	Low voltage, wide bandwidth
	ADA4938-1/ADA4938-2	+ 5 V, ± 5 V supply, wide bandwidth
	ADA4939-1/ADA4939-2	+ 5 V, ± 5 V supply, wide bandwidth, G > 2
	ADA4950-1/ADA4950-2	Wide bandwidth, low power, fixed G = 1, 2, 3
	ADA4960-1	5 GHz bandwidth, slew rate = 8 kV
High speed amplifiers	ADA4891-1/ADA4891-2/ADA4891-3/ADA4891-4	CMOS, high speed low cost
	ADA4857-1/ADA4857-2	High slew rate, wide bandwidth, low power
	ADA4817-1/ADA4817-2	FET input, wide bandwidth
	ADA4896-1/ADA4896-2*	Low noise, low power, high speed
	ADA4897-1/ADA4897-2*	Low noise, low power, high speed, power down
	AD8045	Low noise low distortion, high slew rate
	AD8009	Current feedback, super high slew rate, ultrawide bandwidth
	AD8003	Triple current feedback, super high slew rate, ultrawide bandwidth
	AD8000	Current feedback, super high slew rate, ultrawide bandwidth, power down

*Prerelease

For more information in communications applications, visit *communications.analog.com.*

Amplifiers for Consumer Audio Applications



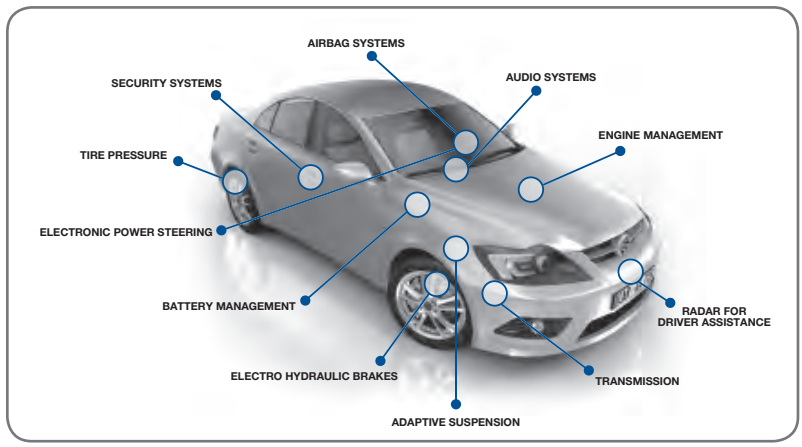
Application	Recommended Amplifiers	Key Amplifier Characteristics
Audio pre-amps	AD8597, AD8599, AD797	Low noise
Microphone pre-amps	ADA4004	Low distortion
	AD8510, AD8512, AD8513	Low power
	AD8627, AD8646, AD8647, AD8648, AD8691, AD8692, AD8694, ADA4075, ADA4692	Low cost

For more information in consumer applications, visit *consumer.analog.com.*

Amplifiers for Automotive Applications

With over 45 years of experience in signal processing and the industry's leading portfolio, ADI provides design engineers with the robust amplifier products and technical support to build any automotive applications. ADI's technologies are used to address the most challenging signal chain requirements in advanced safety, infotainment, power-train, and body/chassis electronics systems for electric, hybrid, and fossil fuel powered vehicles worldwide.

ADI's automotive grade amplifiers are identified by the "W" suffix immediately after the part number. These products are qualified for automotive applications and meet or exceed the rigorous requirements of the automotive industry.

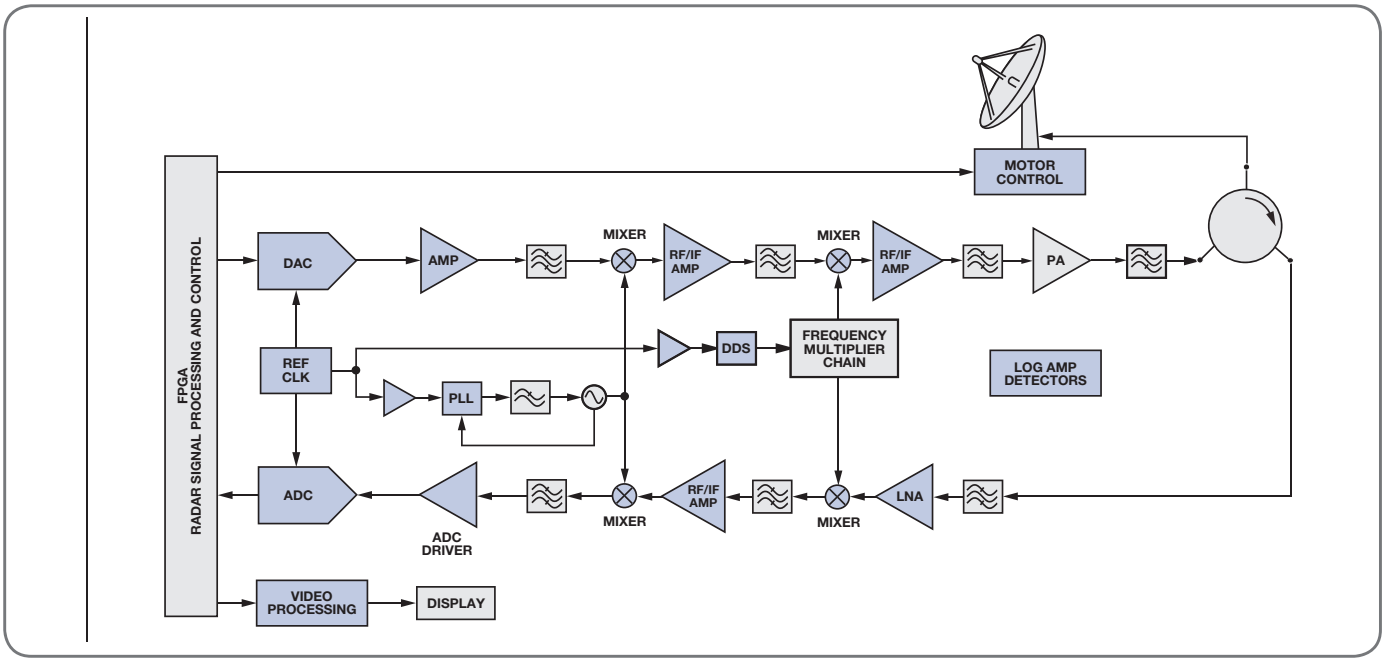


Application	Recommended Amplifiers	Part Description	Key Amplifier Characteristics
Automotive sensing	Precision: AD8601WARTZ-R7, AD8601WARTZ-RL, AD8601WDRTZ-REEL	DigiTrim rail-to-rail input and output single amplifier with very low offset voltage	Auto-zero, low offset voltage and low offset voltage
	Precision: AD8617WARMZ-REEL, AD8617WARZ-R7, AD8617WARZ-RL	Low cost, micropower, low noise, CMOS, rail-to-rail input/output op amp	
	Precision: AD8628WARTZ-R7, AD8628WARTZ-RL, AD8628WARZ-R7, AD8628WARZ-RL, AD8628WAUJZ-R7, AD8628WAUJZ-RL	Zero drift, single-supply, rail-to-rail input/output operational amplifier	
	Precision: AD8629WARZ-R7, AD8629WARZ-RL	Zero drift, single-supply, rail-to-rail, input/output operational amplifier	
	Precision: AD8630WARZ-R7, AD8630WARZ-RL	Quad, zero drift, single-supply, rail-to-rail operational amplifier	
	Precision: AD8646WARMZ-R7, AD8646WARMZ-RL, AD8646WARZ-R7, AD8646WARZ-RL	24 MHz, rail-to-rail, dual amplifier	
	Precision: AD8648WARUZ, AD8648WARUZ-RL	24 MHz, rail-to-rail, quad amplifier	
	Precision: AD8656WARMZ-REEL	Low noise, precision CMOS dual amplifier	
Infortainment and vision ADAS	High speed: ADA4851-1WYRJZ-R7, ADA4851-2WYRMZ-R7, ADA4851-4WYRUZ-R7	Low cost, rail-to-rail output op amp	Video amplifiers
	High speed: ADA4853-3WYRUZ-R7	Ultralow power, rail-to-rail output op amp	
	High speed: ADA4891-1WARJZ-R7, ADA4891-2WARMZ-R7, ADA4891-4WARUZ-R7	Low cost, CMOS, rail-to-rail op amp	
		Low cost	
Advanced driver assistance (ADAS)	High speed: AD8040WARUZ-R7, AD8028WARMZ-R7, AD8065WARTZ-R7	Rail-to-rail, FET input	Wide bandwidth, low power
	High speed: AD8132WARMZ-R7, AD8137WYCPZ-R7	Single ended input or differential input, differential output	Differential amps
Pressure sensing In antilock braking systems (ABS)	Precision: AD8628WARTZ-R7, AD8628WARTZ-RL, AD8628WARZ-R7, AD8628WARZ-RL, AD8628WAUJZ-R7, AD8628WAUJZ-RL	Zero-drift, single-supply, rail-to-rail input/output operational amplifier	Low offset, low noise
	Precision: AD8629WARZ-R7, AD8629WARZ-RL	Zero-drift, single-supply, rail-to-rail, input/output operational amplifier	
	Precision: AD8630WARZ-R7, AD8630WARZ-RL	Quad, zero-drift, single-supply, rail-to-rail operational amplifier	
	Precision: AD8601WARTZ-R7, AD8601WARTZ-RL, AD8601WDRTZ-REEL	DigiTrim rail-to-rail input and output single amplifier with very low offset voltage	
	Precision: AD8692WARMZ-REEL	Dual, low cost, low noise, CMOS rail-to-rail output operational amplifier	
	Precision: AD8694WARUZ, AD8694WARUZ-REEL	Quad, low cost, low noise, CMOS rail-to-rail output operational amplifier	

For more information in automotive applications, visit *automotive.analog.com.*

Amplifiers for Applications in Defense and Aerospace

For over 45 years Analog Devices has been at the forefront of innovation in signal processing for aerospace and defense applications. ADI's commitment to performance and reliability has made ADI a preferred supplier to the Department of Defense and other U.S. and foreign defense agencies around the world. Today's advanced defense systems in radar, communications, avionics, defense electronics, and much more demand the best in system level performance. ADI's superior products and system level knowledge will help you overcome the most difficult of design challenges.



Defense Qualified Products

Precision			High Speed		
Part Number	**Model Number**	**Description**	**Part Number**	**Model Number**	**Description**
OP11	5962-89801012A 5962-8980101CA	Quad matched 741-Type op amp	AD830	5962-9313001MPA	Video difference amp
OP27	OP27AJ/883C OP27AZ/883C	Low noise, Precision op amp	AD713	5962-9063301MCA	Quad precision, low cost, BiFET op amp
OP77	5962-87738012A 5962-8773802GA 5962-8773802PA	Ultralow offset voltage op amp	AD8001	5962-9459301MPA	800 MHz, 50 mW current feedback amplifier
OP400	5962-8777101M3A 5962-8777101MCA	Quad low offset, low power op amp	AD8004	AD8004SQ	Quad 3000 V/μs, 35 mW current feedback amplifier
AD712	AD712SQ/883B	Precision, low cost, high speed, BiFET dual op amp	AD8036	5962-9559701MPA	Unity gain stable, low distortion, wide bandwidth voltage feedback clamp amps
OP470	5962-88565012A 5962-8856501CA	Very low noise, quad op amp	AD8041	5962-9683901MPA	160 MHz rail-to-rail amplifier with disable
OP270	5962-8872101PA	Very low noise dual op amp	AD810	5962-9313201MPA	Low power video op amp with disable
OP471	5962-88565022A 5962-88565023A 5962-8856502CA	High speed, low noise quad op amp	AD811	5962-9313101M2A 5962-9313101MPA AD811SCHIPS AD811SE/883B AD811SQ/883B	High performance video op amp
AD549	AD549SH/883B	Ultralow input-bias current op amp	AD813	5962-9559601M2A	Single supply, low power triple video amplifier
OP200	5962-8859301MPA 5962-8859301M2A	Dual low offset, low power operational amplifier	AD827	5962-9211701M2A 5962-9313101MPA AD827SCHIPS AD827SE/883B AD827SQ AD827SQ/883B	High performance video op amp

Defense Qualified Products (Continued)

Precision			High Speed		
Part Number	Model Number	Description	Part Number	Model Number	Description
OP97	5962-8954401PA	Low power, high precision op amp	AD829	5962-9312901M2A 5962-9312901MPA AD829SCHIPS AD829SE/883B AD829SQ AD829SQ/883B	Low noise video op amp
AD713	5962-9063301MCA	Precision, high speed, BiFET quad op amp	AD830	5962-9313001MPA	Video difference amplifier
AD708	AD708SQ/883B	Ultralow offset voltage dual op amp	AD843	5962-9098001M2A 5962-9098001MPA 5962-9098001MXA AD843SCHIPS AD843SH/883B AD843SQ AD843SQ/883B	34 MHz, CBFET fast settling op amp
OP249	5962-9151901M2A 5962-9151901MPA	Dual, precision JFET high speed operational amplifier	AD844	5962-8964401PA AD844SCHIPS AD844SQ AD844SQ/883B	60 MHz, 2000 V/µms monolithic op amp
AD704	AD704SE/883B	Picoampere input current quad bipolar op amp	AD845	5962-8964501PA AD845SQ AD845SQ/883B	Precision, 16 MHz CBFET op amp
OP497	5962-9452101M2A	Precision picoampere input current quad operational amplifier	OP249	5962-9151901M2A 5962-9151901MPA OP249AZ	Dual, precision JFET high speed operational amplifier

For more information in defense and aerospace applications, visit *mil-aero.analog.com.*

Space Qualified Products

Analog Devices is committed to serving the needs of the world space community by providing the highest quality linear and mixed-signal products. In addition to the comprehensive offering of amplifier products indentified below, ADI offers a broad range of other linear and data conversion device types for space applications. Analog Devices processes its space products to the highest quality levels of MIL-PRF-38535 QML Level V, including radiation hardness assurance (RHA) testing.

Precision Op Amps

Part Number	Model Number	Package	Description
Low Offset			
AD8629S	AD8629D703L	10-lead FP	Zero-drift, single-supply, rail-to-rail input/output op amp
AD8671S	5962L0922301VHA	10-lead FP	Single, very low noise, low input bias current op amp
OP07S	5962R9863901VGA 5962R9863901VHA 5962R9863901VPA OP070000C OP07R000C	8-lead can 10-lead FP 8-lead DIP Class K die Class K die	Ultralow offset voltage op amp
OP22S	OP220903J	8-lead can	Programmable micropower op amp
OP27S	5962R9468002VGA 5962R9468002VHA 5962R9468002V2A 5962R9468002VPA OP484-000C OP484R000C	8-lead can 10-lead FP 20-lead LCC 8-lead DIP Class K die Class K die	Low noise precision op amp
OP37S	5962-8853701VGA 5962-8853701VPA	8-lead can 8-lead DIP	Low noise precision high speed op amp
OP77S	5962-8773802VGA 5962-8773802VHA 5962-8773802V2A 5962-8773802VPA	8-lead can 10-lead FP 20-lead LCC 8-lead DIP	Ultralow offset voltage operational amplifier
OP200S	5962-8859301V2A 5962-8859301VPA	20-lead LCC 8-lead DIP	Dual low offset, low power op amp
OP207S	5962R0821401VCA	14-lead DIP	Dual ultralow V_{OS} matched op amp
OP227S	OP227R903Y OP227R903M	14-lead DIP 14-lead FP	Dual low noise low offset instrumentation op amp
OP270S	5962-8872101VPA 5962-8872101VDA 5962-8872101V2A 5962R8872101VPA 5962R8872101VDA 5962R8872101V2A OP2700000C OP270R000C	8-lead DIP 14-lead FP 20-lead LCC 8-lead DIP 14-lead FP 20-lead LCC Class K die Class K die	Dual very low noise precision op amp
OP400S	5962-8777101VKA 5962-8777101V3A 5962-8777101VCA OP400-000C	24-lead FP 28-lead LCC 14-lead DIP Class K die	Quad low offset, low power op amp
OP484S	5962-0051701VCA 5962-0051701VDA 5962R0051701VCA 5962R0051701VDA OP484-000C OP484R000C	14-lead DIP 14-lead FP 14-lead DIP 14-lead FP Class K die Class K die	Rail-to-rail input and output op amp
Low Input Bias			
AD648S	5962-9753501VGA 5962-9753501VPA 5962-9753502VGA 5962-9753502VPA	6-lead can 8-lead DIP 6-lead can 8-lead DIP	Dual low power BiFET op amp
OP12S	OP120903J OP120000C	8-lead can Class K die	Precision low input current operational amplifier
OP15S	5962R8954203VGA 5962R8954203VHA 5962R8954203VPA	6-lead can 10-lead FP 8-lead DIP	Precision JFET input op amp
OP16S	5962R8954304VGA 5962R8954304VPA	6-lead can 8-lead DIP	Precision JFET input op amp
OP42S	5962-8851301VGA 5962-8851301VPA	6-lead can 8-lead DIP	
OP215S	5962-8853801VGA 5962-8853801VPA 5962R8853801VGA 5962R8853801VPA 5962R8853804V2A OP215-000C OP215R000C	6-lead can 8-lead DIP 6-lead can 8-lead DIP 20-lead LCC Class K die Class K die	Dual precision JFET input op amp

Part Number	Model	Package	Description
Low Input Bias (Continued)			
PM108S	5962R9863701VGA 5962R9863701VHA 5962R9863701VPA PM1080000C PM108R000C	6-lead can 10-lead FP 8-lead DIP Class K die Class K die	Low input current operational amplifier
PM155S	5962R9863601VGA 5962R9863601VPA	6-lead can 8-lead DIP	Monolithic JFET input operational amplifier
PM156S	5962R9863602VGA 5962R9863602VPA	6-lead can 8-lead DIP	Monolithic JFET input operational amplifier

High Speed Op Amps

Part Number	Model	Package	Description
Low Noise			
OP467S	5962-9325801VCA 5962-9325801V2A 5962R9325801VDA 5962R9325801VCA	14-lead FP 20-lead LCC 14-lead FP 14-lead DIP	Quad, high speed, precision op amp
OP470S	5962-8856501V2A 5962-8856501VCA 5962R8856501V2A 5962R8856501VKA 5962R8856501VCA OP470-000C OP470R000C	20-lead LCC 14-lead FP 20-lead LCC 24-lead FP 14-lead DIP Class K die Class K die	Very low noise, quad op amp
OP471S	5962-8856502VCA 5962R8856502VDA 5962R8856502VKA 5962R8856502VCA	14-lead DIP 14-lead FP 24-lead FP 14-lead FP	High speed, low noise, quad op amp
Wide Bandwidth			
AD8001S	5962-9459301VPA 5962-9459301VHA 5962R9459301VPA 5962R9459301VHA	8-lead DIP 10-lead FP 8-lead DIP 10-lead FP	800 MHz, 50 mW current feedback amplifier
AD8041S	5962R9683902VPA 5962R9683902VHA AD8041-000C	8-lead DIP 10-lead FP Class K die	160 MHz rail-to-rail amplifier with disable
Differential			
AD8138S	5962R092001VHA	10-lead FP	320 MHz, low distortion differential amplifier