Space Products Selection Guide

ADI's Commitment to Space

Analog Devices designs, manufactures, and markets high performance linear, mixed-signal, and digital integrated circuits (ICs) that address a wide range of real-world signal processing applications. Analog Devices has been supplying products for military and space applications since 1972. The Space Products Group is dedicated to supporting space flight and satellite applications. More importantly, Analog Devices is committed to the long-term support of the space market.

The Space Products Group is the center of excellence for unique device processing and qualification. This product line has a corporate responsibility to develop, market, and sell many of Analog Devices' state-of-the-art linear IC, data conversion, and digital signal processing technologies with QML Class V processing to the space user community. Our purpose is to provide leading edge, space qualified products and services to customers who require innovative solutions to achieve a competitive position in their markets.

Located in Greensboro, NC, the Space Products Group coordinates all space level QML Class V (Class Level S) activities, including business development, manufacturing, and engineering.

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ANALOG DEVICES

Radiation Testing

The Space Products Group understands the requirement for radiation tolerant devices and continues to offer products with total ionizing dose (TID) guaranteed levels. Generic test reports for products with a TID guarantee can be found at *www.analog.com/aerospace*.

Moving forward with the space community, Analog Devices will offer a number of products that are low dose rate tested. Furthermore, future product offerings will include SEE test data for customer review. Please visit our website (*www.analog.com/aerospace*) or email us at *aero@analog.com* for the latest radiation information updates.

Processing Flows

The Space Products Group is committed to releasing state-of-the-art products to meet the rigorous demands of the space market. Products offered are processed and manufactured to meet the space environment needs. Furthermore, all of our space qualified products are assembled and tested at our captive QML Class V qualified facilities.

Product offerings include QML Class V devices with radiation qualification and continued support on JAN S products. These products are screened to the guidelines of the MIL-PRF-38535 QML Class V processing flow.

Analog Devices also offers products processed through our internal standard space level products program, a lower cost, shorter lead time alternative to source control drawings, if the device is not offered as an SMD or JAN S. The processing of these products is based on the current issue of MIL-PRF-38535 QML Class V. Electrical parameters and screening exceptions (if any) are described in the current revision of the Analog Devices space level data sheet for each part offered.

Features of the Analog Devices standard space level products program include the following:

- MIL-PRF-38535 QML Class V certified facilities (fab, assembly, and test) unless otherwise noted on the product data sheet
- Parallel processing that mirrors the QML Class V flow, unless otherwise noted
- Wafer lot acceptance and SEM available on most products
- Wafer lot traceability
- Hot solder dip lead finish as described in MIL-PRF-38535
- Marking with standard part number, lot seal date code, and Analog Devices logo
- Technology conformance inspection
  - Group C and Group D generic data may be available
  - Group C and Group D can be performed at customer's request
- Product change notification

Analog Devices will continue to support devices to specific source control drawings. However, in most cases, the standard Analog Devices space level products should satisfy most customer requirements for full process control, traceability, and reliability through certified manufacturing, assembly, and test lines.

Space Grade Dice Offering

The Analog Devices Space Products Group provides Class K space qualified chips (dice) on most products, which include die qualification as described in MIL-PRF-38534, Appendix C, Table C-II. Dice are fully traceable to the wafer lot or, if requested, to the individual wafer. All space level die/chips are available only through the Analog Devices Space Products Group located in Greensboro, NC, and franchised distributors.

To view all of Analog Devices' space grade products, please visit our website (*www.analog.com/aerospace*) or call our factory contacts for the latest QML Class V product updates on these and other products.

Analog-to-Digital Converters

Part Number	Description	Bits	Speed (MSPS)	Supply (V)	Differential Nonlinearity (25°C)	Power Dissipation (mW)	Interface	Package
AD670S	8-bit signal conditioning	8	0.1	±15, ±5	No missing code	225	Parallel	DIP
AD9058S	8-bit, dual 50 MSPS	8	50	±5	±0.5 LSB	770	Parallel	DIP
AD9283S	8-bit, 100 MSPS	8	100	3	±1.25 LSB	115	Parallel	LCC
AD9054S	8-bit, 200 MSPS	8	200	5	±1.5 LSB	700	Parallel	LCC
AD571S	10-bit complete ADC	10	0.025	+4.5 to +5.5, –13.5 to –16	±3 LSB	275	Parallel	Flatpack, DIP
AD574S	12-bit with processor interface	12	0.029	±12, ±5	No missing code	725	Byte, parallel	Flatpack, DIP
AD1671S	12-bit, 1.25 MSPS	12	1.25	±5	±1 LSB	750	Parallel	Flatpack
AD1672S	12-bit, 3 MSPS	12	3	5	±1.5 LSB	240	Parallel	Flatpack
AD9042S	12-bit, 41 MSPS	12	41	5	±2 LSB	595	Parallel	Flatpack, DIP
AD6645S	14-bit, 80 MSPS	14	80	3.3, 5	±1.5 LSB	1750	Parallel	Flatpack
AD9254S	14-bit, 150 MSPS, 1.8 V	14	150	1.8 to 3.3	±1 LSB	408	Parallel	Flatpack

Digital-to-Analog Converters

Part Number	Description	Single or Dual Supply	Supply (V)	Input	Settling Time	Integral Nonlinearity (25°C)	Power Dissipation (mW)	Package
DAC08S	8-bit high speed multiplying DAC	Dual	±4.5 to ±18	Parallel	135 ns	±0.19% FS	48	Flatpack, DIP, LCC
DAC100S	10-bit current output DAC	Dual	±6 to ±18	Parallel	375 ns	±0.1% FS	500	DIP
AD561S	10-bit current output DAC	Dual	+5 V_{CC}, –15 V_{EE}	Parallel	250 ns	±1 LSB	500	DIP
AD9731S	10-bit, 170 MSPS DAC	Single	±5 (logic), –5	Parallel	3.8 ns	±1 LSB	439	Flatpack, DIP
AD565AS	12-bit current output complete	Dual	±15	Parallel	250 ns	±¼ LSB	345	Flatpack, DIP
AD667S	12-bit microprocessor compatible	Dual	±12, ±15	Byte, parallel	3 µs	±½ LSB	555	Flatpack, DIP
AD768S	16-bit, 30 MSPS DAC	Dual	±5	Parallel	25 ns	±9 LSB	600	Flatpack, DIP

Clock and Timing

Part Number	Description	Supply (V)	Output Frequency (GHz)	No. of Inputs	No. of Outputs	Random Jitter (ps-RMS)	Clock Function	Output Logic
ADCLK925S*	Ultrafast SiGe ECL clock/data buffers	3.3	6	1	2	60 fs	Clock fanout buffer	ECL

*In development.

Interface and Isolation

Part Number	Description	No. of Inputs Side 1	No. of Inputs Side 2	Insulation Rating (Vrms)	Max Data Rate (Mbps)	Propagation Delay (ns)	Supply (V)	Operating Temperature (°C)
ADuM7442S*	Quad channel digital isolator	2	2	1000	25	56	5.5	–55°C to +125°C

*In development.

Low Offset Operational Amplifiers

Part Number	Description	No. of Amps	Supply (V)	V_{OS} (µV)	V_{OS} Drift	Input Noise (nV/√Hz)	GBW (MHz)	CMRR (dB)	Supply (mA)	Package
AD8629S	Dual low offset precision op amp	2	2.7 to 5	±10	0.06	22	2.5	120	2.2	Flatpack
OP27S	Low noise precision op amp	1	±15	±25	0.6	4	5	114	4.67	Flatpack, can, DIP, LCC
OP07S	Ultralow offset voltage op amp	1	±5, ±20	±25	0.6	12	0.6	110	4	Flatpack, can, DIP
OP77S	Low offset op amp	1	±3, ±18	±25	0.6	11	0.4	120	2	Flatpack, can, DIP, LCC
OP200S	Dual low offset, low power op amp	2	±15	±75	0.5	11	0.5	120	1.45	DIP, LCC
OP270S	Dual very low noise precision op amp	2	±15	±75	1	11	5	106	6.5	Flatpack, DIP, LCC
OP400S	Quad low offset, low power op amp	4	±15	±150	1.2	22	0.5	120	2.9	Flatpack, DIP, LCC
OP484S	Precision R-R op amp	4	±15	±200	2	3.9	4.5	86	5.8	Flatpack, DIP
OP207S	Dual ultralow V_{OS} matched op amp	2	±15	±100	1.3	24	0.6	106	8	DIP
OP227S	Dual low noise, low offset instrumentation op amp	2	±15	±80	1	3.9	5	114	6	Flatpack, DIP
OP11S	Quad matched 741 type op amp	4	±15	±500	1	12	3	100	12	Flatpack, DIP
OP22S	Programmable micropower op amp	1	±15	±300	0.75	22	10	100	12.5	Can
OP37S	Low noise precision, high speed op amp	1	±15	±25	0.6	3	68	114	4.67	Flatpack, can, DIP, LCC
AD8671S	Low noise, low input bias current op amp	1	±5, ±15	±75	0.5	3.8	10	100	3.5	Flatpack
ADA4084S*	Low noise, low power, RRIO dual op amp	2	±1.5, ±15	±300	1.75	3.9	12	64	0.625	Flatpack

*In development.

Low Bias Operational Amplifiers

Part Number	Description	No. of Amps	Supply (V)	V_{OS} (µV)	Input Bias (nA)	Slew (V/µs)	CMRR (dB)	Supply (mA)	Package
PM156S	Monolithic JFET input op amp	1	±5, ±20	±2000	3.5	10	85	7	Can, DIP
PM155S	Monolithic JFET input op amp	1	±5, ±20	±2000	3.5	3	85	4	Can, DIP
AD648S	Dual precision, low power BiFET op amp	2	±18	±2000	0.02	1	76	0.4	Can, DIP
PM108S	Low input current op amp	1	±5, ±20	±500	2	0.05	96	0.6	Flatpack, can, DIP
OP12S	Precision low input current op amp	1	±15	±150	2	0.12	104	0.6	Can
OP15S	Precision JFET input op amp	1	±15	±500	0.05	10	86	4	Flatpack, can, DIP
OP16S	Precision JFET input op amp	1	±20	±500	0.05	18	86	7	Flatpack, can, DIP
OP42S	High speed, fast settling, precision JFET input op amp	1	±15	±1000	0.2	45	86	6	Can, DIP
OP215S	Dual precision JFET input op amp	2	±15	±1000	0.1	10	86	8.5	Can, DIP, LCC
ADA4610S*	Low noise, precision RRO, JFET dual op amp	2	±15	±400	0.02	17	100	1.85	Flatpack

*In development.

High Speed/Low Noise Operational Amplifiers

Part Number	Description	No. of Amps	Supply (V)	V_{OS} (µV)	Input Noise (nV/√Hz)	–3 dB (MHz)	Slew (V/µs)	CMRR (dB)	Supply (mA)	Package
OP471S	High speed, low noise quad op amp	4	±15	±800	6.5	6.5	6.5	105	11	Flatpack, DIP
OP467S	Quad high precision op amp	4	±15	±500	6	28	85	76	5.8	Flatpack, DIP
OP470S	Very low noise quad op amp	4	±15	±400	3.2	6	1.4	110	11	Flatpack, DIP

Wide Bandwidth Operational Amplifiers

Part Number	Description	No. of Amps	Supply (V)	V_{OS} (µV)	GBW (MHz)	Input Noise (nV/√Hz)	Input Bias (nA)	Slew (V/µs)	CMRR (dB)	Supply (mA)	Package
AD8001S	800 MHz, 50 mW current feedback op amp	1	±5	±5500	350	2	6000	800	50	5.5	Flatpack, DIP
AD8041S	160 MHz R-R amplifier with disable op amp	1	3, 5, ±5	±9500	160	16	3400	160	70	6.1	Flatpack, DIP
AD847S	High speed, low power op amp	1	±5, ±15	±1000	25	15	5000	300	80	5.7	DIP
AD844S	60 MHz, 2000 V/µs current feedback op amp	1	±5, ±15	±300	60	2	400	2000	70	7.5	DIP, LCC

High Speed/Differential Amplifiers

Part Number	Description	No. of Amps	Supply (V)	V_{OS} (µV)	Slew (V/µs)	Input Noise (nV/√Hz)	–3 dB (MHz)	CMRR (dB)	Supply (mA)	Package
AD8138S	Low distortion differential amp	1	±5	±2500	1500	17	320	64	21	Flatpack
AD8351S	Low distortion fully differential amp	1	5	10,000	13,000	2.9	450	35	33	LCC

Low Power Amplifiers

Part Number	Description	No. of Amps	IQ/Amp (µA)	Supply (V)	V_{OS} (µV)	Input Noise (nV/√Hz)	Input Offset Current (nA)	Input Bias Current (nA)	Slew Rate (V/µs)
ADA4096S	30 V micropower, overvoltage protection, RRIO, dual op amp	2	60	±1.5, ±15	±300	27	1.5	10	0.25
ADA4084S*	30 V low noise, low power, RRIO, dual op amp	2	650	±1.5, ±15	±300	3.9	25	300	2.4

*In development.

Comparators

Part Number	Description	Channels	Supply (V)	Response Time (ns)	V_{OS} (mV)	Input Offset Current (µA)	CMRR (dB)	Package
AD8561S	7 ns single comparator	1	±5	9.8	7	±4	60	Flatpack, DIP
PM111S	Precision voltage comparator	1	±15	180	4	±0.01	90	Can, DIP
PM139S	Quad low power voltage comparator	4	+5 to +30, ±18	500	4	±0.025	70	Flatpack, DIP, LCC

Instrumentation Amplifiers

Part Number	Description	Channels	Single or Dual Supply	Supply (V)	Gain Range	V_{OS} (µV)	Noise (µV p-p)	Input Bias Current (nA)	Package
AD524S	Precision monolithic instrumentation amplifier	1	Dual	±18	1000	250	0.3	±50	DIP, LCC
AMP01S	Low noise precision instrumentation amplifier	1	Dual	±18	10,000	100	13	±4	Flatpack, DIP, LCC
AD8229S	Low noise instrumentation amplifier	1	Dual	±15	1000	100	5	±150	Flatpack

Sample-and-Hold Amplifiers

Part Number	Description	Channels	Supply (V)	Supply Current (mA)	PSRR (dB)	Acquisition Time (µs)	Droop Rate (V/ms)	Slew Rate (V/µs)	Package
AD585S	High speed precision sample-and-hold amp	1	±12, ±15	10	70	3	0.001	10	Flatpack, DIP
SMP11S	Low droop rate/accurate sample-and-hold amp	1	±18	7	77	3.5	0.0024	10	DIP

Logarithmic Amplifiers

Part Number	Description	RF Frequency (MHz)	Dynamic Range (dB)	Temperature Stability (dB)	Response Time (ns typ)	Voltage Supply (V)	Supply Current (mA)	Package
AD8306S	5 MHz to 400 MHz, 100 dB high precision limiting-logarithmic amplifier	5 to 400	100	±1	73	2.7 to 5.5	16	Flatpack
ADL5513S	1 MHz to 4 GHz, 80 dB logarithmic detector/controller	1 to 4000	80	±0.5	20	2.7 to 5.5	31	Flatpack

Shunt Monitor

Part Number	Description	QML	Minimum Common-Mode Input (V)	Maximum Common-Mode Input (V)	Bandwidth Typ (kHz) G = 10	V_{CC} – V_{EE} (V)	Voltage Offset (mV)	Supply Current	Package
AD8212S	High voltage current shunt monitor	R	7	65	1000	7 to 65	±2	720 µA	Flatpack
AD8210S*	High voltage current shunt monitor	R	–2	65	450	5	±1.8	2 mA	Flatpack

*In development.

Voltage References

Part Number	Description	V_{OUT} (V)	Accuracy (%)	Supply (V)	TC (ppm/°C)	Noise (µV p-p)	Package
AD589S	Precision 1.2 V IC reference	1.2	1.2	Shunt type reference	50	5	Can
REF43S	2.5 V low power precision voltage reference	2.5	0.02	4.5 to 40	15	4	Flatpack, can, DIP, LCC
AD584S	Pin-programmable precision voltage reference	2.5, 5, 7.5, 10 programmable	0.05	4.5 to 30	15	50	Can
REF02S	5 V precision voltage reference/ temperature transducer	5	0.15	7 to 40	8.5	10	Flatpack, can, DIP, LCC
REF05S	5 V precision voltage reference	5	0.15	15	8.5	15	Flatpack, can, DIP, LCC
REF01S	10 V precision voltage reference	10	0.3	12 to 40	8.5	30	Flatpack, can, DIP, LCC
REF10S	10 V precision voltage reference	10	0.15	15	8.5	30	Flatpack, can, DIP, LCC
AD780S*	2.5 V/3 V precision voltage reference	2.5/3	0.04	4 to 36	3	4	Flatpack

*In development.

Switches

Part Number	Description	Channels	Supply (V)	R_{ON}	Total Switching Time (ns)	Power Dissipation (mW)	Switch Type	Package
ADG201S	LCMOS high speed quad SPST switch	4	±15	300	100	240	SPST	DIP
SW201S	Quad SPST JFET analog switch	4	±15	75	100	470	SPST	DIP

Muxes

Part Number	Description	Channels	Supply (V)	R_{ON}	Break-Before-Make Delay (ns)	Power Dissipation (mW)	Mux Type	Package
MUX08S	8-channel/dual 4-channel JFET analog multiplexer	8	±15	300	0.8	500	Single ended	DIP, LCC
AD8182S	Dual 2:1 buffered 10 ns switching multiplexer	2	±5	N/A	N/A	40	Single ended	Flatpack

Matched Pair Transistors

Part Number	Description	Offset Voltage (µV)	Offset Voltage Tempco (µV/°C)	Noise Voltage Density (nV/√Hz)	Breakdown Voltage	Package
MAT02S	Low noise matched dual NPN transistor	50	0.3	2	0.1	Can
MAT03S	Low noise matched dual PNP transistor	100	0.5	2	0.1	Flatpack, can

Multiplier

Part Number	Description	BW	Output Offset Voltage Drift	Multiplier Drift	Input Offset Current	Output Voltage Swing (V)	Package
AD534S	Internally trimmed precision IC multiplier	1 MHz	±300 µV/°C	±0.01%/°C	±2 µA	±11	Can, DIP

Analog Front End

Part Number	Description	Resolution (Bits)	Sample Rate (MSPS)	Power Dissipation (mW)	INL (LSB)	DNL (LSB)	Package
AD9814S	14-bit, 3-channel CCD signal processor	14	10	450	11	1.25	Flatpack

Temperature Transducer

Part Number	Description	25°C Temperature Error (°C)	Sensor Output	Supply Voltage Range (V)	Package
AD590S	2-terminal IC temperature transducer	±2.5	1 µA/K	4 to 30	Flatpack, can, DIP

Resolver-to-Digital Converter

Part Number	Description	Resolution (Bits)	Accuracy (Arcmin)	Reference Frequency	Interface	Power Dissipation (mW)	Supply (V)	Package
AD2S80S	Variable resolver-to-digital converter	16	±8	50 Hz to 20 kHz	Parallel	300	±12	DIP

Voltage-to-Frequency Converter

Part Number	Description	Architecture	No. of Channels	Input Voltage Range	Full Scale f_{OUT} (kHz)	Reference Voltage	Gain Drift (ppm/°C)	Supply (V)	Package
AD537S	Voltage-to-frequency converter	Nonsynchronous	1	±11	150	5	±250	±5 to ±18	DIP
AD652S	Voltage-to-frequency converter	Synchronous	1	±10	2500	5	±50	±6 to ±18	DIP

Modulator

Part Number	Description	Function	RF Frequency (MHz)	IQ Frequency (MHz)	Voltage Supply (V)	Max Supply Current (mA)	Standby Supply Current (µA)	Package
AD8346S	2.5 GHz direct conversion quadrature modulator	Mod	800 to 2500	70	2.7 to 5.5	55	20	Flatpack

Variable Gain Amplifiers

Part Number	Description	QML	RF Frequency (MHz)	Gain Range (dB)	Gain Scaling Factor (mV/dB)	Gain Conformance (dB)	Supply Voltage (V)	Supply Current (mA)	Package
AD8367S	500 MHz variable gain amplifier with on-chip square law detector	R703	10 to 500	–2.5 to 42.5	20	±0.5	2.7 to 5	30	Flatpack

RF ICs

Part Number	Description	QML	RF Frequency (GHz)	Dynamic Range (dB)	Output Response	Response Time (µs)	Temperature Stability (dB/°C)	Supply Voltage (V)	Supply Current (mA)	Package
ADL5501S	RMS power detector	R	6	30	Linear in voltage	6	0.0017	3 to 5	1.5	Flatpack

Part Number	Description	QML	RF Frequency (GHz)	Normalized Phase Noise (dBc/Hz)	Max REF_{IN} Frequency (MHz)	RF Prescaler	Supply Voltage (V)	Supply Current (mA)	Package
ADF4108S	PLL frequency synthesizer	L703	7	–223	250	16/17, 32/33, 64/65, 8/9	3.2 to 3.6	15	Flatpack

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