ANALOG DEVICES
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High Speed Signal Processing

System designers for aerospace and defense, communication infrastructure, and instrumentation are faced with the challenge of meeting increasing bandwidth demands in a progressively congested frequency spectrum. Frequency planning compromises—along with size, weight, power, and performance requirements—increase signal chain complexity as system operation moves from the RF to the millimeter wave spectrum domain and as bandwidth demands move from megahertz to gigahertz. The ability to utilize more of the frequency spectrum enables new system capabilities and features to create a better user experience.

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High Speed ADCs

Analog Devices' broad high speed analog-to-digital converter (ADC) portfolio delivers the high performance and optimized power consumption necessary for today's demanding receiver/data acquisition applications. These products are employed in wired and wireless communications, instrumentation, radar, electronic warfare, and general data acquisition. Our High Speed Signal Processing guide is designed to aid selection of the most relevant parts for your applications using a matrix across sample rate, channel count, and interface type. Recommended high speed amplifier and clocking solutions can be found in this guide, with additional design support via ADI field applications.

The extensive high speed ADC portfolio is supported with evaluation boards, data sheets, and evaluation/design tools, demonstrating best practices for achieving the highest performance design, and accelerating time to market. Visit the relevant product page for these details.

Single-Channel, Parallel Interface High Speed ADC Portfolio (<170 MSPS)

- Widest family of pin-compatible parts for design flexibility and future-proofing.
- Highest AC performance for demanding dynamic range receiver/data acquisition solutions.
- Features for reducing digital feedback and improving SFDR performance.
- Double-date-rate interfaces for reducing data lines to FPGA.
- Lowest power consumption ADC portfolio in the industry to ease thermal management challenges.

Resolution	Supply Voltage and I/O	10 MSPS	≥20 MSPS	40 MSPS	65 MSPS	80 MSPS	105 MSPS	≥125 MSPS	≥150 MSPS
16-Bit	3.3 V parallel LVDS or CMOS				LTC2215	LTC2216	LTC2217	LTC2208	LTC2209
	3.3 V parallel CMOS	LTC2202	LTC2203	LTC2204	LTC2205	LTC2206	LTC2207		
	1.8 V parallel CMOS or LVDS		LTC2160 AD9266-20 LTC2269	LTC2161 AD9266-40	LTC2162 AD9266-65	LTC2163 AD9266-80 AD9265-80	LTC2164 AD9265-105	LTC2165 AD9265-125	
14-Bit	3.3 V parallel LVDS or CMOS							LTC2208-14	
	3.3 V parallel CMOS				LTC2205-14	LTC2206-14	LTC2207-14		
	1.8 V parallel CMOS or LVDS		LTC2256-14 AD9649-20	LTC2257-14 AD9649-40	LTC2258-14 AD9649-65	LTC2259-14 AD9649-80 AD9255-80	LTC2260-14 AD9255-105	LTC2261-14 AD9255-125	LTC2262-14
	3 V parallel CMOS	LTC2245	LTC2246	LTC2247	LTC2248	LTC2249	LTC2254	LTC2255	
	5 V parallel CMOS	AD9240		AD9244-40	AD9244-65	AD6645-80	AD6645-105		
12-Bit	1.8 V parallel CMOS or LVDS		LTC2256-12 AD9629-20	LTC2257-12 AD9629-40	LTC2258-12 AD9629-65	LTC2259-12 AD9629-80	LTC2260-12	LTC2261-12	LTC2262-12
	3 V parallel CMOS	LTC2225	LTC2226	LTC2227	LTC2228	LTC2229	LTC2252	LTC2253	
10-Bit	1.8 V parallel CMOS		AD9609-20	AD9609-40	AD9609-65	AD9609-80			
	3 V parallel CMOS		LTC2236	LTC2237	LTC2238 AD9215-65	LTC2239 AD9215-80	LTC2250 AD9215-105	LTC2251	

Suggested Part Smaller Solution Lower Power Higher Performance

Dual-Channel, Parallel Interface High Speed ADC Portfolio (<170 MSPS)

- Widest family of pin-compatible parts helping user with design flexibility and future-proofing.
- Highest AC performance for demanding dynamic range receiver/data acquisition solutions.
- Features for reducing digital feedback and improving SFDR performance.
- Double-date-rate interfaces for reducing data lines to FPGA.
- Lowest power consumption ADC portfolio in the industry to ease thermal management challenges.

Resolution	Supply Voltage and I/O	≥20 MSPS	40 MSPS	65 MSPS	80 MSPS	105 MSPS	125 MSPS
16-Bit	1.8 V parallel CMOS or LVDS	LTC2180 AD9650-25 LTC2270	LTC2181	LTC2182 AD9650-65	LTC2183 AD9650-80	LTC2184 AD9650-105	LTC2185
14-Bit	1.8 V parallel CMOS or LVDS	LTC2140-14 AD9251-20	LTC2141-14 AD9251-40	LTC2142-14 AD9251-65	LTC2143-14 AD9251-80 AD9258-80	LTC2144-14 AD9648-105 AD9258-105	LTC2145-14 AD9648-125 AD9258-125
	3 V parallel CMOS	LTC2296	LTC2297	LTC2298	LTC2299	LTC2284	LTC2285
12-Bit	1.8 V parallel CMOS or LVDS	LTC2140-12	LTC2141-12	LTC2142-12	LTC2143-12	LTC2144-12 AD9628-105	LTC2145-12 AD9628-125
	3 V parallel CMOS	LTC2296	LTC2297	LTC2298	LTC2299	LTC2282	LTC2283
10-Bit	1.8 V parallel CMOS	AD9204-20	AD9204-40	AD9204-65	AD9204-80		
	1.8 V parallel CMOS or LVDS					AD9608-105	AD9608-125
	3 V parallel CMOS	LTC2286	LTC2287	LTC2288 AD9216-65	LTC2289 AD9216-80	LTC2280 AD9216-105	LTC2281

Resolution	Supply Voltage and I/O	Channels	160 MSPS	250 MSPS	320 MSPS	500 MSPS	640 MSPS	1 GSPS
12-Bit	1.8 V serial LVDS	4	HMCAD1520					
		2			HMCAD1520			
		1					HMCAD1520	
8-Bit	1.8 V serial LVDS	4		HMCAD1511				
		2				HMCAD1511		
		1						HMCAD1511

Suggested Part Smaller Solution Lower Power Higher Performance

Serial LVDS Interface High Speed ADC Portfolio (>150 MSPS)

- Multi-ADC core (2 channels to 16 channels) enabling higher density, multichannel data acquisition applications.
- Optimized power/performance to meet dynamic range needs.
- Serial interface enables lower cost FPGA/processing.

Resolution	Supply Voltage and I/O	Channels	≥20 MSPS	40 MSPS	65 MSPS	80 MSPS	105 MSPS	125 MSPS
14-Bit	1.8 V serial LVDS	16			■ AD9249			
14-Bit	1.8 V serial LVDS	8	■ LTM9006-14	■ LTM9007-14 ■ AD9257-40	■ LTM9008-14 ■ AD9257-65	■ LTM9009-14	■ LTM9010-14	■ LTM9011-14 ■ AD9681
12-Bit	1.8 V serial LVDS			■ AD9637-40		■ AD9637-80		
10-Bit	1.8 V serial LVDS			■ AD9212-40	■ AD9212-65			
16-Bit	1.8 V serial LVDS	4						■ AD9653
14-Bit	1.8 V serial LVDS		■ LTC2170-14	■ LTC2171-14	■ LTC2172-14	■ LTC2173-14 ■ AD9253-80	■ LTC2174-14 ■ AD9253-105 ■ HMCAD1520	■ LTC2175-14 ■ AD9253-125
12-Bit	1.8 V serial LVDS		■ LTC2170-12	■ LTC2171-12	■ LTC2172-12	■ LTC2173-12 ■ AD9633-80	■ LTC2174-12 ■ AD9633-105	■ LTC2175-12 ■ AD9633-125
10-Bit	1.8 V serial LVDS			■ AD9219-40	■ AD9219-65			
16-Bit	1.8 V serial LVDS	2	■ LTC2190 ■ LTC2271	■ LTC2191	■ LTC2192	■ LTC2193	■ LTC2194	■ LTC2195 ■ AD9655-125
14-Bit	1.8 V serial LVDS		■ LTC2263-14	■ LTC2264-14	■ LTC2265-14	■ LTC2266-14 ■ AD9645-80	■ LTC2267-14	■ LTC2268-14 ■ AD9645-125
12-Bit	1.8 V serial LVDS		■ LTC2263-12	■ LTC2264-12	■ LTC2265-12	■ LTC2266-12 ■ AD9635-80	■ LTC2267-12	■ LTC2268-12 ■ AD9635-125

170 MSPS to 500 MSPS, Parallel Interface High Speed ADC Portfolio

- Enables bandwidth expansion while keeping a legacy interface.
- High analog input bandwidth for undersampling applications.

Resolution	Supply Voltage and I/O	Channels	170 MSPS	210 MSPS	250 MSPS	≥310 MSPS	500 MSPS
16-Bit	3.3 V/1.8 V parallel LVDS	2				■ AD9652-310	
		1		■ AD9467-200	■ AD9467-250		
	2.5 V parallel LVDS	1		■ LTC2107			
14-Bit	1.25 V/2.5 V/3.3 V parallel LVDS	2					■ AD9684-500
	1.8 V parallel LVDS	2	■ AD9643-170	■ AD9643-210	■ AD9643-250		
		1	■ AD9642-170	■ AD9642-210	■ AD9642-250		
12-Bit	1.8 V parallel LVDS	2	■ AD9613-170	■ AD9613-210	■ AD9613-250		
		1	■ AD9634-170	■ AD9634-210	■ AD9634-250	■ AD9434-370	■ AD9434-500
10-Bit	1.8 V parallel LVDS	1		■ AD9211-200	■ AD9211-250	■ AD9211-300	
8-Bit	1.8 V parallel LVDS	1					■ AD9286-500 ■ AD9484-500

■ Suggested Part ■ Smaller Solution ■ Lower Power ■ Higher Performance

≥125 MSPS to 10 GSPS, JESD204B Interface High Speed ADC Portfolio

- Digitizing the RF spectrum of interest and enabling software-defined receivers.
- Wide analog input bandwidths enable capture of fast time events.
- Integrated signal processing features—DDC, filters, and NCOs—enable faster time to market and reduced system cost.

Resolution	I/O	Channels	≥125 MSPS	≥500 MSPS	1 GSPS	≥1.25 GSPS	≥2 GSPS	≥10 GSPS
16-Bit	JESD204B	4	AD9656-125					
14-Bit	JESD204B	4	AD9083	AD9694-500				
		2	AD9250-170 AD9250-250	AD9680-500 AD9680-820 AD9695-625	AD9680-1000	AD9680-1250 AD9691-1250 AD9695-1300	AD9689-2000 AD9689-2600 AD9208-3000	
		1	AD9683-170 AD9683-250	AD9690-500	AD9690-1000	AD9697-1300	AD9699	
12-Bit	JESD204B	2		AD9234-500	AD9234-1000		AD9209 AD9207	AD9213
		1					AD9625-2000 AD9625-2500	AD9215-6G AD9213-10G
8-Bit to 10-Bit	JESD204B				AD9094			
					AD9094			

Suggested Part Smaller Solution Lower Power Higher Performance

Mixed-Signal Front Ends (MxFE)

MxFE® devices offer smart integration of RF analog-to-digital converters (ADCs), RF digital-to-analog converters (DACs), on-chip digital signal processing, and clock/PLL for multichip synchronization. This allows for the elimination of discrete data converters and traditional RF front-end components to reduce size, weight, power, and cost. Integrated digital signal processing supports the transition to software-defined radio platforms, creating a highly configurable, common hardware/software platform that can be used in multiple applications across a broad array of end markets.

Part Number	# of ADCs/ Resolution	# of DACs/ Resolution	ADC Sample Rate (GSPS)	DAC Sample Rate (GSPS)	Analog RF BW (–3 dB) (GHz)	Max Rx Channel BW (GHz)	Max Tx Channel BW (GHz)	Interface
AD9081	4/12 bits	4/16 bits	4	12	8	2	1.6*	JESD204B JESD204C
AD9082	2/12 bits	4/16 bits	6	12	8	3	2.4**	JESD204B JESD204C
AD9084	4/12 bits	4/16 bits	20	28	18	18	8	JESD204B JESD204C
AD9088	8/12 bits	8/16 bits	8	16	8	12	3	JESD204B JESD204C

* N′ = 12
** N′ = 16; two DACs enabled

ADI RadioVerse and Software-Defined Narrow-Band Transceivers

Integrated wideband RF transceivers are system-on-chip radio solutions that replace as many as 20 high performance discrete components and offer:

- Carrier-grade performance (zero IF and high linearity)
- Reduced size, weight, and power (SWaP)
- Ease of use (complete API, on-chip tracking self-calibration)
- Versatile platform for multiple designs and standards

Part Number	# of Tx/Rx/ORx Channels	RF Frequency Range	Rx BW	Tx/ORx BW	Radio Mode support	Interface Type/Rate	DPD Support/ BW
AD9361	2/2/0	70 MHz to 6 GHz	56 MHz	56 MHz/-	TDD/ FDD	CMOS, LVDS	No
AD9371	2/2/1	300 MHz to 6 GHz	100 MHz	100 MHz/250 MHz	TDD/FDD	JESD/6 Gbps	No
AD9375	2/2/1	300 MHz to 6 GHz	100 MHz	100 MHz/250 MHz	TDD/FDD	JESD/ 6 Gbps	Yes/40 MHz
ADRV9008-1	0/2/0	75 MHz to 6 GHz	200 MHz	–	FDD Rx	JESD/ 12 Gbps	No
ADRV9008-2	2/0/1	75 MHz to 6 GHz	–	200/450 MHz	FDD Tx	JESD/12 Gbps	No
ADRV9009	2/2/1	75 MHz to 6 GHz	200 MHz	200/450 MHz	TDD	JESD/ 12 Gbps	No
ADRV9026	4/4/2	75 MHz to 6 GHz	200 MHz	200/450 MHz	TDD/FDD	JESD/ 25 Gbps	No
ADRV9029	4/4/2	75 MHz to 6 GHz	200 MHz	200/450 MHz	TDD/FDD	JESD/ 25 Gbps	Yes/200 MHz
ADRV9002	2/2/2[1]	30 MHz to 6 GHz	12 kHz to 40 MHz	12 kHz to 40 MHz	TDD/FDD	CMOS 80 MHz max clk/LVDS 491.52 MHz max clk	Yes/20 MHz
ADRV9003	1/2/2[1]	30 MHz to 6 GHz	12 kHz to 40 MHz	12 kHz to 40 MHz	TDD/FDD	CMOS 80 MHz max clk/LVDS 491.52 MHz max clk	No
ADRV9004	2/2/2[1]	30 MHz to 6 GHz	12 kHz to 40 MHz	12 kHz to 40 MHz	TDD/FDD	CMOS 80 MHz max clk/LVDS 491.52 MHz max clk	No

[1] Receive channels can be switched between Rx and ORx functionality.

High Speed DACs

ADI's high speed digital-to-analog converters (DACs) include wideband radio frequency, intermediate frequency signal processing, and general-purpose baseband classes. These products are employed in wired and wireless communications, instrumentation, radar, electronic warfare, and general waveform synthesis. Our guide is designed to aid selection of the relevant parts for applications using a matrix across sample rate, channel count, and interface type, with additional design support via ADI field applications.

The extensive high speed DAC portfolio is supported with evaluation boards, data sheets, and evaluation/design tools, demonstrating best practices for achieving the highest performance design and helping accelerate time to market. Visit the relevant product page for these details.

Baseband High Speed DAC Portfolio (<1.2 GSPS)

- TxDAC+™ proprietary output allows synthesis beyond Nyquist and extends usable bandwidth.
- The devices include gain and offset compensation for direct conversion transmit applications.
- Low power dissipation for portable and space constrained applications.

Resolution	Interface	Channels	Low Power	≤175 MSPS	≤600 MSPS	≤1 GSPS
16-Bit	Parallel CMOS	1	LTC1668			
		2			AD9747	AD9788
14-Bit		1	LTC1667	AD9707	AD9744	
		2	AD9717	AD9117	AD9746	AD9787
12-Bit		1	LTC1666	AD9706	AD9742	
		2	AD9716	AD9116	AD9745	AD9785
10-Bit		1		AD9705	AD9740	
		2	AD9715	AD9115	AD9743	
8-Bit		1		AD9704	AD9748	
		2	AD9714	AD9114		
16-Bit	Parallel LVDS	2			AD9783	
14-Bit		2			AD9781	
12-Bit		2			AD9780	

Direct Digital Synthesis and Waveform Generation Portfolio

DDS synthesis products incorporate features such as NCOs, fast SPI writes, and phase accumulators, making them an ideal agile frequency synthesizer solution in systems for communications, test equipment, and radar.

Resolution	Interface	Channels	400 MSPS to 500 MSPS	≤1 GSPS	≤2.5 GSPS	≤12 GSPS
16-Bit	JESD204B	1				AD9164
14-Bit	Serial I/O	1	AD9951-6 AD9102	AD9912		
12-Bit	Serial/Parallel	1	AD9106		AD9915	AD9914
10-Bit	Serial I/O	1	AD9911	AD9858		
	Serial I/O	2	AD9958			
	Serial I/O	4	AD9959			

Suggested Part DAC and DDS

IF and RF DAC Portfolio (>1.2 GSPS)

- Users can synthesize full spectrum RF signals for a variety of applications through programmable signal processing and wide output bandwidth.
- Highest AC performance for demanding dynamic range signal synthesis solutions.
- Mix-mode: DAC operation that reconstructs RF carriers in the second and third Nyquist zones while maintaining exceptional dynamic range.
- Integrated signal processing features—DUCs, channelizers, and NCOs—enable faster time to market and reduced system cost.

Resolution	Interface	Channels	≤1.2 GSPS	≤2 GSPS	≤3 GSPS	≤6 GSPS	≤12 GSPS
16-Bit	Parallel CMOS	2	■ AD9779A ■ AD9125				
14-Bit	Parallel CMOS	2	■ AD9778A				
12-Bit	Parallel CMOS	2	■ AD9776A				
16-Bit	Parallel LVDS	1		■ AD9139	■ LTC2000-16 ■ LTC2000A-16		
16-Bit	Parallel LVDS	2	■ AD9146	■ AD9122 ■ AD9142A			
16-Bit	Parallel LVDS	4	■ AD9148				
14-Bit	Parallel LVDS	1		■ AD9736	■ LTC2000-14 ■ LTC2000A-14 ■ AD9739A	■ AD9129	
14-Bit	Parallel LVDS	2		■ AD9121	■ MAX5879		
14-Bit	Parallel LVDS	4		■ AD9789			
12-Bit	Parallel LVDS	1		■ AD9735		■ MAX19693	
11-Bit	Parallel LVDS	1			■ LTC2000-11 ■ LTC2000A-11 ■ AD9737A	■ AD9119	
10-Bit	Parallel LVDS	1		■ AD9734			
16-Bit	JESD204B	1				■ AD9163	■ AD9162
16-Bit	JESD204B	2			■ AD9136 ■ AD9152	■ AD9171	■ AD9172 ■ AD9176
16-Bit	JESD204B	4			■ AD9144	■ MAX5855	
11-Bit	JESD204B	1				■ MAX5857 ■ MAX5869 ■ MAX5871	■ AD9161
11-Bit	JESD204B	2			■ AD9135	■ AD9173	■ AD9175

■ Suggested Part ■ Higher Performance ■ Supports Mix-Mode Operation

High Speed Clocking

Many high speed data converter applications require an external sample clock source to provide a lower jitter signal than the integrated data converter clock. ADI has a broad range of PLL/VCO-based clock sources whose implementation allows for ultralow jitter performance.

The introduction of JESD204B Subclass 1 in 2011 created a new standard data converter clock interface to resolve the deterministic latency errors seen in JESD204A, now referred to as JESD204B Subclass 0. The ADI clock portfolio offers a wide range of products that supports both JESD204B Subclass 0 and Subclass 1.

The current portfolio has varying degrees of JESD204B/JESD204C support—some products have full JESD204B Subclass 1 support, while others support Subclass 0 with optional phase adjustment.

JESD204B Subclass 1

JESD204B Subclass 1 products are available for sample clock frequencies from 1 Hz to 4.5 GHz. Several of these products can be used together to create a huge array of fully synchronized device clock and SYSREF signals for high channel count applications. Reference designs are available for clock networks with over 1000 clock signals.

JESD204B Subclass 0

Above 4.5 GHz, integrated PLL/VCO or discrete PLL and discrete VCO solutions can be used to generate very low jitter clock sources. A discrete PLL and discrete VCO solution will give the absolute best jitter performance while an integrated PLL/VCO solution will save board space and design work. Both solutions have multiple product options with sample clock frequencies up to 12 GHz and higher. These products have <µHz output phase control (programmable by SPI), which can be used to assist in a synchronization scheme.

ADI recommends carefully reviewing data sheets for performance needs for each use. Our guide easily navigates the user to a variety of high performance options.

High Speed Data Converter External Clock Selection Table

			Part Number	Sample Clock Frequency Range	Jitter (fs_{rms})*		JESD204B Support**	Comments
					12 kHz to 20 MHz	ADC SNR Method		
Clock Generation and Distribution	Sample Clock Frequency	<2.7 GHz	LTC6951-x	LF to 2.7 GHz	90	115	Subclass 0 and Subclass 1	▶ Integrated PLL and VCO ▶ Noise floor: –165 dBc/Hz @ 250 MHz ▶ 5 outputs with timing control ▶ Multichip synchronization
			AD9545	1 Hz to 500 MHz	220	300		▶ Quad input dual digital PLL ▶ 5 outputs with timing and power control ▶ GPS and IEEE 1588 support ▶ Multichip synchronization
			AD9523-1	1 MHz to 1 GHz	150	220		▶ Dual-loop PLL ▶ 14 outputs with timing and power control ▶ Internal EEPROM
			LTC6955	DC to 7.5 GHz	5	45	Subclass 0 and Subclass 1 with SYSREF modes	▶ Eleven ultralow noise CML outputs ▶ Parallel control for multiple output configurations ▶ –40°C to 125°C operating junction temperature range
			AD9546	DC to 0.75 GHz	235	-	Subclass 0 and Subclass 1	▶ 5 pairs of clock output pins ▶ 2 differential or 8 single-ended input references ▶ Single 1.8 V power supply operation with internal regulation
		<4.5 GHz	AD9528	25 MHz to 1.25 GHz	160	230	Subclass 0 and Subclass 1 with SYSREF modes	▶ Dual-loop PLL ▶ 14 outputs with timing and power control ▶ PLL bypass (full JESD204B buffer)
			HMC7043	LF to 3.2 GHz	7	80		▶ HMC7044 without PLLs/VCOs ▶ 14 outputs with timing and power control ▶ Multichip synchronization
			HMC7044	LF to 3.2 GHz	44	89		▶ Dual-loop PLL ▶ 14 outputs with timing and power control ▶ Multichip synchronization
			LTC6952†	LF to 4.5 GHz	14	70		▶ Internal PLL, external VCO ▶ Noise floor: –154 dBc/Hz @ 4.5 GHz ▶ 11 outputs with timing control ▶ Multichip synchronization
			LTC6953†	LF to 4.5 GHz	5	65		▶ LTC6952 without PLL ▶ Noise floor: –154 dBc/Hz @ 4.5 GHz ▶ 11 outputs with timing control ▶ Multichip synchronization
Low Jitter PLL and VCOs	Sample Clock Frequency	≤32 GHz	ADF4371	LF to 32 GHz	40	60		▶ Int-N FOM: –234 dBc/Hz ▶ PFD spurs: –100 dBc ▶ Integrated LDOs ▶ Subharmonic filtering may be needed > 8 GHz
			ADF4382	687.5 MHz to 22 GHz (11 GHz to 22 GHz fundamental range)	24	35	Subclass 0	▶ Temperature drift: 0.06 ps/°C ▶ Bidirectional phase adjust control using 2-wire digital interface designed for Apollo MxFE™ ▶ Multichip synchronization capabilities
			ADF4377/ ADF4368	0.08 to 12.8	18	27		▶ Int-N FOM: -239 dBc/Hz ▶ 1/f: -147 dBc/Hz ▶ Noise floor: –160 dBc/Hz @ 12 GHz ▶ .05 ps/°C temperature coefficient ▶ Sub-1 ps output delay control ▶ ADF4368 is the frac-N version of ADF4377
			Discrete PLL and VCO†	Several options available	<40			▶ Large selection of suitable PLLs and VCOs available, contact factory ▶ Example: fS = 5.6 GSPS: ADF41513† (low noise PLL) and HMC513 (low noise vco; family of frequencies) ▶ Example: fS = 18 GSPS: ADF41513† (low noise PLL) and HMC8362 (low noise VCO)

* Integrated jitter numbers assume a high quality, ultralow phase noise reference input. ADC SNR method jitter numbers are integrated from 1 kHz to FCLK. LTC6952 jitter numbers assume low phase noise external VCO.
** Above 4.5 GHz, JESD204B Subclass 1 must be handled externally to the PPL/VCO; however, the PPL/VCO <µHz phase adjustment can assist.
† Part in development.

High Speed Amplifiers

ADI's wide portfolio of best-in-class differential amplifier solutions allows the user to optimally match to an analog-to-digital converter across a wide variety of sampling speed grades. This differential amplifier selection section is designed to assist you in selecting the most relevant parts for specific applications using a comparison matrix across gain, bandwidth, and AC-to-DC coupling axis. While ADI recommends carefully reviewing data sheets for performance needs, our guide quickly navigates the user to a variety of high performance options.

DC-Coupled External Gain Setting Differential Amplifiers

- DC-coupled differential amplifiers offer adjustable output common-mode voltages for a direct match with the input of the ADC for DC-coupled, single-ended to differential, or differential-to-differential applications.
- The differential gain is flexible and easily realized with a simple external four-resistor feedback network that determines the closed-loop gain of the amplifier.
- Ideally suited for driving precision ADCs targeting sampling speed of <100 MSPS.

Spurious Free Dynamic Range (SFDR in dB)	3 dB Bandwidth					
	≤100 MHz	>100 MHz to 300 MHz	>300 MHz to 500 MHz	>500 MHz to 1 GHz	>1 GHz to 2 GHz	>2 GHz to 4 GHz
>70 to 80	ADA4941-1				ADA4939-1 ADA4937-1 ADA4939-2 ADA4937-2	
>80 to 90			AD8132 AD8139	ADA4938-1 ADA4938-2		ADA4927-1 ADA4927-2
>90 to 100	AD8137	ADA4940-1 ADA4940-2	AD8138 AD8131			
>100 to 120	ADA4922-1	AD8475		ADA4932-1 ADA4950-1 ADA4932-2 ADA4950-2	ADA4930-1 ADA4930-2	

Fixed or Pin-Strapped Differential Amplifiers

- AC-coupled amplifiers (with provisions for DC-coupled amplifiers) that have fixed or selectable gain settings to allow flexibility in a broad range of applications.
- Ideally suited for ADCs targeting sampling speeds from 100 MSPS to multi-GSPS that require exceptional performance at very wide bandwidths.

SFDR	Coupling	3 dB Bandwidth					
		≤100 MHz	>100 MHz to 300 MHz	>500 MHz to 1 GHz	>1 GHz to 2 GHz	>2 GHz to 4 GHz	>4 GHz to 6 GHz
1 to 10	DC		LT6402-6	LTC6404-1 LT1993-2 LT6411	LTC6417 LTC6416 LTC6410-6	LTC6400-8 LTC6401-8	
>10 to 20	AC				LTC6430-15 LTC6432-15	ADL5561* ADL5562*	ADA4960-1 ADL5565* ADL5567* ADL5566*
	DC	LT1994	LT6402-12 LT6402-20	LTC6404-1/LTC6404-2	LTC6400-14/LTC6400-20 LTC6401-14/LTC6401-20 LTC6421-20 LTC6420-20		ADL5569
>20 to 40	AC					LTC6430-20 AD8351	
	DC	LTC6405 LTC6406	LTC6403-1		LTC6401-26 LTC6400-26		
>40 to 60	DC			LTC6409 LTC6419			
>70 to 80			AD8350			ADL5580	
>80 to 90			LTC6404-4		AD8352		

* Can be DC-coupled using negative supply on the ground plane.

One Channel Two Channel

Differential Variable Gain Amplifiers

- Digital or analog controlled variable gain amplifiers provide discrete or continuous levels of gain control.
- ADI's differential VGAs offer a balanced interface to high speed converters while improving the dynamic range of a circuit by allowing users to adjust the amplitude of a signal in real time.

Gain CNTRL Range (dB)	Gain Control	3 dB Bandwidth						
		≤100 MHz	>100 MHz to 300 MHz	>300 MHz to 500 MHz	>500 MHz to 1 GHz	>1 GHz to 2 GHz	>2 GHz to 4 GHz	4 GHz to 12 GHz
>10 to 20	Analog				■ LTC6412 ■ LT5554		■ ADRF6521	
	Digital		■ MAX2055					
>20 to 40	Analog	■ AD602 ■ AD600			■ ADL6216	■ ADL5331 ■ ADL6317		
	Digital			■ ADL6336A	■ LT5524 ■ AD8375 ■ ADL5201 ■ LT5514 ■ ADL5202 ■ AD8376	■ ADL5205 ■ ADL5206	■ ADA4961 ■ ADL6337B	
> 40 to 60	Analog	■ AD603 ■ AD8338 ■ AD605 ■ AD604	■ AD8330				■ ADL5330	
	Digital		■ AD8372		■ AD8369 ■ AD8370 ■ ADL5336			■ ADL6331A ■ ADL6331B ■ ADL6332A ■ ADL6332B

■ One Channel ■ Two Channel

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