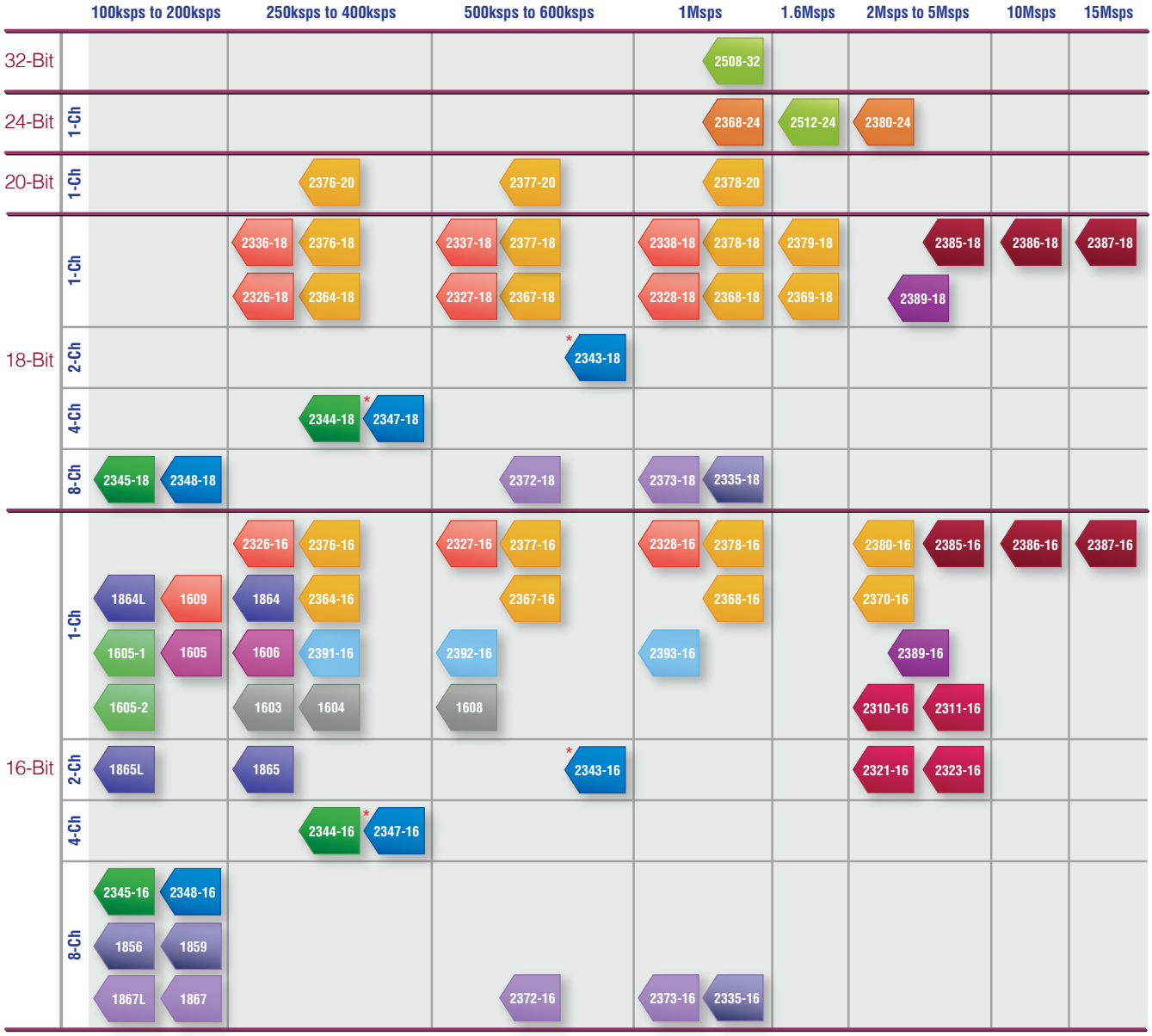
Precision Signal Chain Products

High Precision SAR ADCs

16-Bit to 32-Bit Resolution, 100ksps Up to 15Msps



Serial

- Pseudo- or Fully Differential ±5V Input ADCs
- ±10V True Bipolar Inputs
- 8-Channel MUX'd Input ADCs
- ±10V True Bipolar MUX'd Input ADCs
- High Speed, Wideband ADCs
- 3V/5V Supply µPower ADCs
- Wide Input Common Mode ADCs
- ±4.096V SoftSpan™ Simultaneous Sampling ADCs
- ±10V SoftSpan True Bipolar Simultaneous Sampling ADCs
- 24-Bit ADCs with Digital Averaging Filter
- Oversampling ADCs with Configurable Digital Filter

Serial/Parallel

- Pseudo- or Fully Differential ±4.096V Input ADCs
- Fully Differential ±4.096V Input ADCs

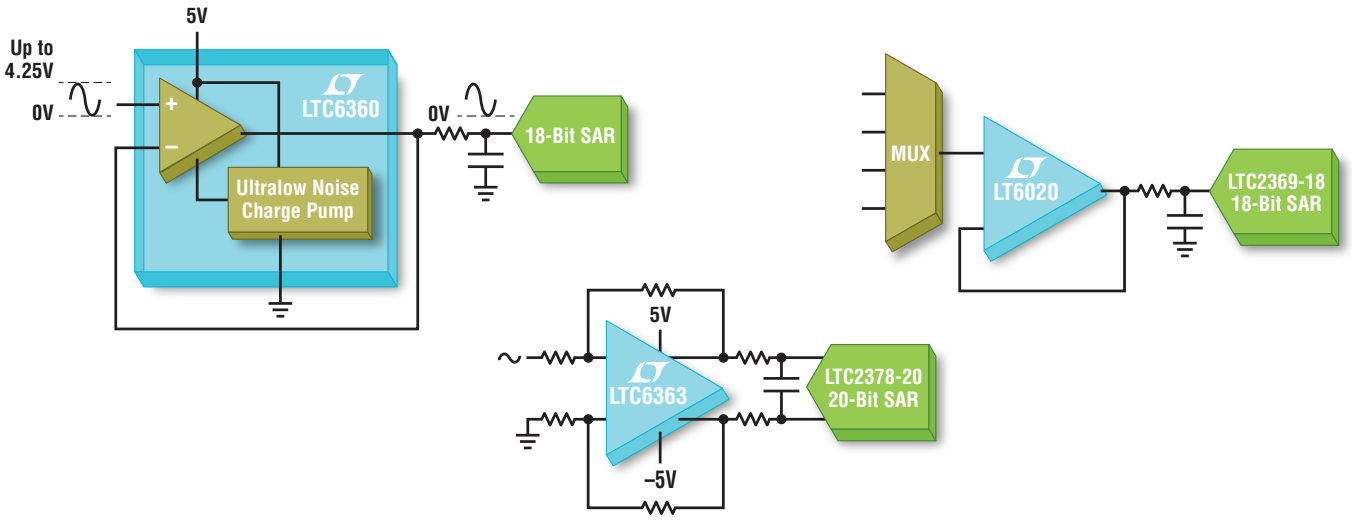
Parallel

- ±10V True Bipolar Inputs
- 0V to 4V, ±4V Unipolar/True Bipolar Inputs
- ±2.5V True Bipolar Inputs

*Future Product

LINEAR TECHNOLOGY

SAR ADC Drivers



Linear Technology offers a wide range of amplifiers for driving the industry's highest performance successive approximation register (SAR) ADCs, including:

LTC®6363: High Performance Low Power Differential Driver

- 100µV Max V_{OS}, 2.9nV/√Hz e_n
- Single-Ended or Differential In, Differential Out
- 1.8mA I_S, 20µA Shutdown
- 780ns 18-Bit, $8V_{P-P}$ Settling

LT®6350: Low Noise Single-Ended to Differential Conversion

- 350ns Settling to 16 Bits
- 400µV Max V_{OS}, 1.9nV/√Hz e_n
- 2.7V to 12V Supply

LT6020: Precision Op Amp for Low Power, Fast Multiplexing

- 100µA/Amplifier, 5V/µs Enhanced Slew Rate
- 30µV Maximum V_{OS}, 0.5µV/°C Maximum Drift
- High Dynamic Input Impedance

LTC6246/LTC6247/LTC6248, LTC6252/LTC6253/LTC6254, LTC6255/LTC6256/LTC6257: Power Efficient Op Amps

- Single in SOT-23, Dual in 2mm × 2mm DFN, SOT-23, MSOP, Quad in MSOP Packages
- LTC6252: 720MHz GBW, 2.75nV/√Hz e_n, 3.5mA Max
- LTC6246: 180MHz GBW, 4.2nV/√Hz e_n, 1mA Max
- LTC6255: 6.5MHz GBW, 20nV/√Hz e_n, 85µA Max

Linear Technology Signal Chain Products

- Differential Amplifiers
- Precision Amplifiers
- High Speed Amplifiers
- Comparators
- Filters
- Matched Resistors
- ΔΣ Delta Sigma ADCs
- SAR SAR ADCs
- HS High Speed ADCs
- Switches and Multiplexers
- VREF Voltage References
- DAC D-to-A Converters
- TimerBlox® Silicon Timers and Silicon Oscillators
- Interface and Isolation
- WSN Wireless Sensor Networks

Differential Output Amplifiers for SAR ADCs

Part Number	Input	V_{OS} Max 25°C (µV)	I_B Max 25°C (nA)	GBW Typ 25°C (MHz)	0.1% Settling Time (ns)	e_n Typ 25°C (nV/√Hz)	I_S Max 25°C (mA)	V_S Min (V)	V_S Max (V)	Rail-to-Rail I/O
LTC6363	SE, Diff	100	1000	500	350	2.9	1.8	2.8	11	Out
LTC6362	SE, Diff	200	260	180	230	3.9	0.96	2.8	5.25	Yes
LT6350	SE	500	6800	85	200	1.9	5.8	2.7	12	Yes
LTC1992	SE, Diff	2500	0.25	4		45	1	2.7	12	Out
LT1994	SE, Diff	2000	45000	70	90	3	18.5	2.375	12.6	Out
LTC6403	SE, Diff	1500	25000	200	30	2.8	11.8	2.7	5.25	Out
LTC6404	SE, Diff	2000	60000	500	13	1.5	35.5	2.7	5.25	Out
LTC6405	SE, Diff	3500	24000	2700	11	1.6	23	4.5	5.5	In
LTC6406	SE, Diff	3500		3000	11	1.6	22	2.7	3.5	In
LTC6409	SE, Diff	1000	14000	10000	1.9	1.1	56	2.7	5.25	SS

Good
Better
Best

Operational Amplifiers for Driving SAR ADCs

Highest Precision

Single Part Number	Dual Part Number	Quad Part Number	V_{OS} Max 25°C (µV)	I_B Max 25°C (nA)	GBW Typ 25°C (MHz)	0.1% Settling Time (ns)	e_n Typ 25°C (nV/√Hz)	I_S Max 25°C (mA)	V_S Min (V)	V_S Max (V)	Rail-to-Rail I/O
LTC2054	LTC2055		3	0.15	0.5	5000		0.18	2.7	12	Out
LTC2050	LTC2051	LTC2052	3	0.05	3	2000		1.5	2.7	12	Out
LTC2057			4	0.015	1.5		11	1.21	4.75	60	Out
	LTC6078	LTC6079	25	0.001	0.75	24000	18	0.072	2.7	6	Yes
LT1007			25	0.1	8		2.5	4	4	44	
	LT6023		30	3	0.04	40000	132	0.02	3	30	Out
	LT6020		30	3	0.4	6000	46	0.1	3	30	Out
LT1028			40	90	75		0.85	9.5	8	44	
LT1097			50	0.25	0.7		14	0.56	2	40	
LT6015	LT6016	LT6017	50	5	3.2	3500	18	0.335	3	50	OTT
LT6018			50	150	15	1200	1.2	7.67	8	33	
LT1677			60	20	7.2	5000	3.2	3.5	2.5	44	Yes
	LT2078	LT2079	70	8	0.2	10000	28	0.05	2.3	44	SS
	LTC6081	LTC6082	70	0.001	3.6	6000	13	0.43	2.7	5.5	Yes
	LT1124	LT1125	70	20	12.5		2.7	2.75	8	44	
LT1468	LT1469		75	40	90	760	5	5	9	36	
LT1468-2	LT1469-2		75	40	200	600	5	5	9	36	
	LT1678	LT1679	100	20	20		3.9	3.4	3	36	Yes
	LTC6244		100	0.075	50	535	8	7.4	2.8	7	Out
LTC6240	LTC6241	LTC6242	125	0.075	18	900	7	2.2	2.8	6	Out
	LT1211	LT1212	150	100	13	900	12	1.8	2.5	36	SS
	LT1492	LT1493	180	100	4.5	2600	16.5	0.55	2.1	36	SS
	LT1498	LT1499	475	650	10.5		12	2.2	2.2	36	Yes
LT6003	LT6004	LT6005	500	0.09	0.002		325	0.001	1.6	16	Yes
LTC6255	LTC6256	LTC6257	350	60	6.5	4000	20	0.073	1.8	5.25	Yes
LT6230-10			500	10000	1450		1.1	3.75	3	12.6	Out
LT6000	LT6001	LT6002	600	5	0.05		75	0.016	1.8	18	Yes
	LT1630	LT1631	525	1000	30	520	6	4.4	2.6	36	Yes
	LT1632	LT1633	1350	2200	45	400	12	5.2	2.6	36	Yes
LT1803	LT1804	LT1805	2000	750	80	350	21	3	2.3	12.6	Yes
LT6220	LT6221	LT6222	350	150	60	300	10	1	2.2	12.6	Yes
LT1800	LT1801	LT1802	350	250	80	250	8.5	2	2.3	12.6	Yes
LT1354	LT1355	LT1356	800	300	12	230	10	1.25	5	36	
LT6233	LT6234	LT6235	350	3000	60	170	1.9	1.25	3	12.6	Out
LT6200	LT6201		1000	40000	165	140	0.95	23	2.5	12.6	Yes
LT1357	LT1358	LT1359	600	500	25	115	8	2.5	5	36	
LT1226			1000	8000	1000	100	2.6	9	5	36	
LT1722	LT1723	LT1724	400	300	200	91	3.8	4.5	4.6	12.6	
LT6202	LT6203	LT6204	500	7000	100	78	1.9	3.5	2.50	12.6	Yes
LT1222			300	300	500	75	3	10.5	5	36	
LTC6246	LTC6247	LTC6248	500	350	180	74	4.2	1	2.5	5.25	Yes
LT1360	LT1361	LT1362	1000	1000	50	60	9	4.8	3	36	
LT1806	LT1807		550	4000	325	60	3.5	13	2.5	12.6	Yes
LT1363	LT1364	LT1365	1500	2000	70	50	9	7.5	3	36	
LT6236	LT6237	LT6238	500	10000	215	50	1.1	3.75	3	12.6	Out
LT6360			250	30000	1000	45	2.3	17.5	4.75	5.25	Out
LTC6252	LTC6253	LTC6254	350	650	720	36	2.75	3.5	2.5	5.25	Yes
LT1812	LT1813	LT1814	1500	4000	100	30	8	3.6	2.5	12.6	
LT1809	LT1810		2500	8000	160	27	16	17	2.5	12.6	Yes
LT1815	LT1816	LT1817	1500	8000	220	15	6	7.8	2.5	12.6	
LT1818	LT1819		1500	8000	400	10	6	10	3.5	12.6	

Fastest

* Some parameters vary between single/dual/quad versions. For a complete list of products and full specifications visit www.linear.com

OTT = Over-The-Top®. This feature allows full functionality when the input voltage exceeds the supply voltage.

SS = Single Supply. Input common mode range includes V^-. See data sheet for details.

SAR ADC Driver Amplifier Selector Guide

SAR ADC Specifications										ADC Driver Recommendations**								
Part Number	Bits	Speed	Input Channels	Input Type	Input Range	SNR	Power (ADC)	Interface	Demo Board	ADC Driver on Demo Board	Lower V_{OS}	Lower I_B	Lowest Noise (<2nV/√Hz)	Lower Power (≤1mA)	High Speed (GBW ≥ 100MHz)	Higher Speed (GBW ≥ 200MHz)	Highest Speed (GBW ≥ 400MHz)	Fully Differential Outputs
32-Bit SAR ADCs																		
LTC2500-32	32	1Msps	1	Differential with Wide Common Mode	±5V 0V to 5V	131dB to 145dB	?	Serial SPI	DC2222A-A	*LTC6363	LTC2057	LTC6244	LT6201	LTC6247	LT6203	LT6237	LTC6253	*LTC6363
LTC2508-32							24mW		DC2222A-B	*LTC2057	*LTC2057	LTC6244	LT6018	LTC6247				LTC6363
24-Bit SAR ADCs																		
LTC2512-24	24	1.6Msps	1	Differential with Wide Common Mode	±5V 0 to –5V	108dB to 117dB	34mW	Serial SPI	DC2222A-C	*LT6202	LTC2057	LTC6244	LT6201	LTC6247	LT6203	LT6237	LTC6253	LTC6363
LTC2380-24	24	2Msps	1	Fully Differential	±5V	100dB	28mW	Serial SPI	DC2289A-A	*LT6203	LTC2057	LTC6244	LT6201	LTC6247	*LT6203	LT6237	LTC6253	LTC6363
LTC2368-24		1Msps		Pseudo-Differential	0V to 5V	98dB	21mW		DC2289A-B		LTC2057	LTC6240	LT6200	LTC2057	LT6202	LT6236	LTC6252	N/A
20-Bit SAR ADCs																		
LTC2378-20	20	1Msps	1	Fully Differential	±5V	104dB	21mW	Serial SPI	DC1925A-A	*LT6203	*LT1468 LTC2055 LTC6081 LTC6253 LTC2057	*LT1468 LTC6244 LT1469 LTC6241	LT6201 LT6237 LT6203	LTC6081 LTC6247 LTC6221 LTC2057	LT6201 *LT6203	LT6237	LTC6253	*LTC6363 LT6350
LTC2377-20		500ksps					10.5mW		DC1925A-B									
LTC2376-20		250ksps					5.3mW		DC1925A-C									
18-Bit SAR ADCs																		
LTC2387-18	18	15Msps	1	Fully Differential	±4.096V	95.7dB	125mW	Serial LVDS	DC2290A-A		LTC6363		*LT6200 *LT6237		*LT6200	*LT6237		LTC6363 LTC6404
LTC2386-18		10Msps					97mW		DC2290A-C									
LTC2385-18		5Msps					78mW		DC2290A-E									
LTC2389-18	18	2.5Msps	1	Pseudo-Differential	0V to 4.096V	94.6dB	162.5mW	Serial SPI or Parallel	DC1826A-A	*LT6201	LTC6252 LTC2054 LT1468 LT6015	LT6015 LT1468 LTC6240	LT1028 *LT6200 *LT6236	LTC6246 LT6220 LT6015	LT6202 *LT6200 LT1468 LTC6246	LT1468-2 LT1806 *LT6236 LT1815	LTC6360 LTC6252 LT1818	LTC6363
					±2.048V	95.2dB												
				Fully Differential	±4.096V	99.8dB					LTC6253 LTC2055 LT1469 LT6016 LTC6081	LT6016 LT1469 LTC6241 LTC6244	LT6201 LT6237 *LT6203	LTC6081 LTC6247 LT6221	*LT6203 LT6201	LT1807 LT6237	LTC6253	LTC6363 *LT6350 *LTC6362 LTC1992
LTC2379-18	18	1.6Msps	1	Fully Differential	±5V	101.2dB	18mW	Serial SPI	DC1783A-E/F/G/H or DC1805A-E/F/G/H	*LT6350 or *LTC6362								
LTC2378-18		1Msps				102dB	13.5mW											
LTC2377-18		500ksps					6.75mW											
LTC2376-18		250ksps					3.4mW											
LTC2369-18	18	1.6Msps	1	Pseudo-Differential	0V to 5V	96.5dB	18mW	Serial SPI	DC1813A-E	*LT6202	LTC6252 LTC2054 LT1468 LT6015	LT6015 LT1468 LTC6240	LT1028 LT6200 LT6236	LTC6246 LT6220	*LT6202 LT6200	LT1806 LT6236	*LTC6360 LTC6252	N/A
LTC2368-18		1Msps				97dB	13.5mW		DC1813A-F									
LTC2367-18		500ksps					6.75mW		DC1813A-G									
LTC2364-18		250ksps					3.4mW		DC1813A-H									
LTC2338-18	18	1Msps	1	Fully Differential, True Bipolar	±10.24V	100dB	50mW	Serial SPI	DC1908A-A	*LT1469	LTC2057	LT6011 *LT1469	LT1128	LT6016				N/A
LTC2337-18		500ksps					35mW		DC1908A-B									
LTC2336-18		250ksps					27.5mW		DC1908A-C									
LTC2328-18		1Msps		Pseudo-Differential, True Bipolar		95dB	50mW		DC1908A-D		LTC2057	LT6010 *LT1468	LT1128	LT6015				N/A
LTC2327-18		500ksps					35mW		DC1908A-E									
LTC2326-18		250ksps					27.5mW		DC1908A-F									

SAR ADC Specifications										ADC Driver Recommendations**								
Part Number	Bits	Speed	Input Channels	Input Type	Input Range	SNR	Power (ADC)	Interface	Demo Board	ADC Driver on Demo Board	Lower V_{OS}	Lower I_B	Lowest Noise (<2nV/√Hz)	Lower Power (≤1mA)	High Speed (GBW ≥ 100MHz)	Higher Speed (GBW ≥ 200MHz)	Highest Speed (GBW ≥ 400MHz)	Fully Differential Outputs
LTC2373-18	18	1Msps	8 (MUX)	Fully Differential Pseudo-Differential Bipolar/Unipolar	±4.096V ±2.048V 0V to 4.096V	99.8dB	40mW	Serial SPI	DC2071A-A	*LT6237 *LT6350 *LTC6362 *LT1469	LTC2057	LTC6241 LTC6244	LT6238	LT6248	LT6204	LT6238	LTC6254 LT1819	LT6350 LTC6363
LTC2372-18		500ksps					27mW		DC2071A-B									
LTC2335-18	18	1Msps	8 (MUX)	Differential True Bipolar with Wide Common Mode Range	±10.24V ±5.12V 0V to 10.24V 0V to 5.12V	96.7dB	180mW	Serial SPI or Serial LVDS	DC2412A-A	*LT1358	LT1469 LTC2057 *LT6020 LT6011	LT1469 LT6011 LT6016 LT6020	LT1128	LT6011 LT6020 LT6016			LT1222	
LTC2348-18	18	200ksps	8				140mW		DC2094A-A	*LT1355								
LTC2345-18	18	200ksps	8	Differential with Wide Common Mode	±4.096V ±2.048V 0V to 4.096V 0V to 2.048V	91.8dB	81mW		DC2326A-A	*LT6237	LT6011 LTC2055 LT1469 LT6016 LTC6081	LT6011 LT6016 LT1469 LTC6241 LTC6244	LT6201 *LT6237 LT6203	LT6020 LTC6081 LTC6247 LT6221 LT6016	LT6203 LT6201	LT1807 LT6237	*LTC6253 LT1222	LT6350 LTC6363 LTC1992
LTC2344-18	18	400ksps	4	Differential with Wide Common Mode	±4.096V ±2.048V 0V to 4.096V 0V to 2.048V	95dB	81mW		DC2520A-B	*LT6237	LTC6253 LTC2055 LT1469 LT6016 LTC6081	LT6016 LT1469 LTC6241 LTC6244	LT6201 *LT6237 LT6203	LTC6081 LTC6247 LT6221	LT6203 LT6201	LT1807 LT6237	LTC6253	LT6350 LTC6363 LTC1992
16-Bit SAR ADCs																		
LTC2387-16	16	15Msps	1	Fully Differential	±4.096V	94.8dB	125mW	Serial LVDS	DC2290A-B		LTC6363		*LT6200 *LT6237		*LT6200	*LT6237		LTC6363 LTC6404
LTC2386-16		10Msps					97mW		DC2290A-D									
LTC2385-16		5Msps					78mW		DC2290A-F									
LTC2311-16	16	5Msps	1	Differential with Wide Common Mode	±4.096V ±2.048V 0V to 4.096V 0V to 2.048V	81dB	45mW	Serial SPI (CMOS or LVDS)	DC2425A-A	*LT1819	LTC2055 LT1469 LT6016 LTC6253	LT1469 LT6016 LTC6241	LT1028 LT6201 LT6237 LT6203	LTC6247 LT6221 LT6016	LT6203 LT6201 LT1469 LTC6247 LT1810	LT1807 LT1469-2 LT1816 LT6237	LTC6253 LT1819	LTC6403
LTC2310-16		2Msps				81.7dB	35mW		DC2425A-B									
LTC2323-16		5Msps	2			80dB	80mW		DC1996A-A									
LTC2321-16		2Msps				80dB	62mW		DC1996A-B									
LTC2325-16		5Msps	4			?dB	?mW		DC2395A-C	*LT6202								
LTC2324-16		2Msps				?dB	?mW		DC2395A-B									
LTC2320-16		1.5Msps	8			82dB	162mW		DC2395A-A									
LTC2389-16	16	2.5Msps	1	Pseudo-Differential	0V to 4.096V	93.2dB	162.5mW	Serial SPI or Parallel	DC1826A-E	*LT6201	LTC6252 LTC2054 LT1468 LT6015	LT6015 LT1468 LTC6240	LT1028 *LT6200 *LT6236	LTC6246 LT6220 LT6015	LT6202 *LT6200 LT1468 LTC6246	LT1806 LT1468-2 LT1815 *LT6236	LTC6360 LTC6252 LT1818	LTC6363
					±2.048V	93.5dB												
				Fully Differential	±4.096V	96dB					LTC6253 LTC2055 LT1469 LT6016 LTC6081	LT6016 LT1469 LTC6241 LTC6244	LT6201 LT6237 *LT6203	LTC6081 LTC6247 LT6221 LT6016 LT6020 LT6023	*LT6203 LT6201 LT1469 LTC6247	LT1807 LT1469-2 LT1816 LT6237	LTC6253 LT1819	LTC6363 *LT6350 *LTC6362 LTC1992
LTC2380-16	16	2Msps	1	Fully Differential	±5V	96.2dB	19mW	Serial SPI	DC1783A-A/B/C/D or DC1805A-A/B/C/D	*LT6350 or *LTC6362								
LTC2378-16		1Msps				97dB	13.5mW											
LTC2377-16		500ksps				97dB	6.75mW											
LTC2376-16		250ksps				97dB	3.4mW											
LTC2370-16		2Msps	1	Pseudo-Differential	0V to 5V	94dB	19mW	Serial SPI	DC1813A-A	*LT6202	LTC6252 LTC2054 LT1468 LT6015	LT6015 LT1468 LTC6240	LT1028 LT6200 LT6236	LTC6246 LT6220 LT6015	*LT6202 LT6200 LT1468 LTC6246	LT1806 LT1468-2 LT1815 *LT6236	*LT6360 LTC6252 LT1818	N/A
LTC2368-16		1Msps				94.7dB	13.5mW		DC1813A-B									
LTC2367-16		500ksps				94.7dB	6.75mW		DC1813A-C									
LTC2364-16		250ksps				94.7dB	3.4mW		DC1813A-D									

SAR ADC Specifications

ADC Driver Recommendations**

Part Number	Bits	Speed	Input Channels	Input Type	Input Range	SNR	Power (ADC)	Interface	Demo Board	ADC Driver on Demo Board	Lower V_{OS}	Lower I_B	Lowest Noise (<2nV/√Hz)	Lower Power (≤1mA)	High Speed (GBW ≥ 100MHz)	Higher Speed (GBW ≥ 200MHz)	Highest Speed (GBW ≥ 400MHz)	Fully Differential Outputs
LTC2328-16	16	1Msps	1	Pseudo-Differential True Bipolar	±10.24V	95dB	50mW	Serial SPI	DC1908A-G	*LT1469	LTC2057	LT6090 *LT1468	LT1128	LTC2057	LT1227	LT1252		
LTC2327-16		500ksps					35mW		DC1908A-H									
LTC2326-16		250ksps					27.5mW		DC1908A-I									
LTC2374-16	16	1.6Msps	8 (MUX)	Fully Differential Pseudo-Differential Bipolar Pseudo-Differential Unipolar	±4.096V ±2.048V 0V to 4.096V	96dB	55mW	Serial SPI	DC2071A-C	*LT6237 *LTC6362 *LT6350 *LT1469	LTC2057	LTC6240	LT6236	LT6015	LT6202	LT6236	LTC6252	LTC6363
LTC2373-16		1Msps					40mW		DC2071A-A									
LTC2372-16		500ksps					27mW		DC2071A-B		LTC2057	LTC6244	LT6237	LT6016	LT6203	LT6237	LTC6253	LTC6362
LTC2335-16	16	1Msps	8 (MUX)	Differential True Bipolar with Wide Common Mode	±10.24V ±5.12V 0V to 10.24V 0V to 5.12V	94.4dB	180mW	Serial SPI or Serial LVDS	DC2412A-B	*LT1358	LTC2057 *LT6020	LT1468 LT6011	LT1128	LT6011				
LTC2348-16	16	200ksps	8				140mW		DC2094A-B	*LT1355								
LTC2345-16	16	200ksps	8	Differential with Wide Common Mode	±4.096V ±2.048V 0V to 4.096V 0V to 2.048V	91dB	81mW		DC2326A-B	*LT6237	LT6011 LTC2055 LT1469 LT6016 LTC6081	LT6011 LT6016 LT1469 LTC6241 LTC6244	LT6201 LT6237 LT6203	LT6020 LTC6081 LTC6247 LT6221 LT6016	LT6203 LT6201	LT1807 LT6237	*LTC6253 LT1222	LT6350 LTC6363 LTC1992
LTC2344-16	16	400ksps	4	Differential With Wide Common Mode	±4.096V ±2.048V 0V to 4.096V 0V to 2.048V	93.4dB	81mW		DC2520A-B	*LT6237	LTC6253 LTC2055 LT1469 LT6016 LTC6081	LT6016 LT1469 LTC6241 LTC6244	LT6201 LT6237 LT6203	LTC6081 LTC6247 LT6221	LT6203 LT6201	LT1807 LT6237	LTC6253	LT6350 LTC6363 LTC1992
14-Bit SAR ADCs																		
LTC2311-14	14	5Msps	1	Differential with Wide Common Mode	±4.096V ±2.048V 0V to 4.096V 0V to 2.048V	80dB	50mW	Serial SPI (CMOS or LVDS)	DC2425A-C	*LT1819	LTC2055 LT1469 LT6016 LTC6253	LT1469 LT6016 LTC6241	LT1028 LT6201 LT6237 LT6203	LTC6247 LT6221 LT6016	LT6203 LT6201 LT1469 LTC6247 LT1810	LT1807 LT1469-2 LT1816 LT6237	LTC6253 LT1819	LTC6403
LTC2310-14		2Msps				82dB	38mW		DC2425A-D									
LTC2323-14		5Msps	2			79dB	76mW		DC1996A-C									
LTC2321-14		2Msps				80dB	66mW		DC1996A-D									
LTC2325-14		5Msps	4			?dB	?mW		DC2395A-F	*LT6202								
LTC2324-14		2Msps				?dB	?mW		DC2395A-E									
LTC2320-14		1.5Msps	8			?dB	?mW		DC2395A-D									
LTC2314-14	14	4.5Msps	1	Single-Ended	0V to 4.096V	77dB	31mW/18mW	Serial SPI	DC1563A-F	-	LTC2054 LT1468 LT6015 LTC2057	LT6015 LT1468 LTC6240	LT1028 LT6200 LT6236 LT6202	LTC6246 LT6220 LT6015	LT6202 LT6200 LT1468 LTC6246 LT1809	LT1806 LT1468-2 LT1815 *LT6236	LT6360 LTC6252 *LT1818	N/A
LTC2313-14		2.5Msps				77dB	26mW/14mW		DC1563A-G									
LTC2312-14		1Msps				77dB	14mW/8mW		DC1563A-H									
LTC2355-14	14	3.5Msps	1	Differential with Wide Common Mode	0V to 2.5V	74.2dB	18mW	Serial SPI	DC1082A-F	-	LTC6253 LTC2055 LT1469 LT6016 LTC6081	LT6015 LT1468 LTC6241 LTC6081 LTC6087 LTC6244	LT6201 LT6203 LT6237	LTC6247 LT6221 LTC6081 LT6016 LT6020 LT6023	LT6203 LT6201 LT1469 LTC6247 LT1810	LT1807 LT1469-2 LT1816 LT6237	LTC6253 LT1819	LT6350 LTC6362 LTC1992 LT6600 LT6604 LTC1566
LTC2356-14					±1.25V	74.1dB	18mW		DC1082A-E	-								
LTC1403A	14	2.8Msps	1		0V to 2.5V	73.5dB	12mW		DC1082A-D	-								
LTC1403A-1					±1.25V	73.5dB	12mW		DC1082A-C	-								
LTC1407A	14	1.5Msps	2		0V to 2.5V	73.5dB	12mW		DC1082A-B	-								
LTC1407A-1					±1.25V	73.5dB	12mW		DC1082A-A	-								
LTC2351-14	14	1.5Msps	6		0V to 2.5V, ±1.25V	75dB	16.5mW		DC1278A	-								
LTC1408-14	14	600ksps	6		0V to 2.5V, ±1.25V	76dB	15mW		DC887A	-								

SAR ADC Specifications										ADC Driver Recommendations**								
Part Number	Bits	Speed	Input Channels	Input Type	Input Range	SNR	Power (ADC)	Interface	Demo Board	ADC Driver on Demo Board	Lower V_{OS}	Lower I_B	Lowest Noise (<2nV/√Hz)	Lower Power (≤1mA)	High Speed (GBW ≥ 100MHz)	Higher Speed (GBW ≥ 200MHz)	Highest Speed (GBW ≥ 400MHz)	Fully Differential Outputs
12-Bit SAR ADCs																		
LTC2311-12	12	5Msps	1	Differential with Wide Common Mode	±4.096V ±2.048V 0V to 4.096V 0V to 2.048V	74dB	45mW	Serial SPI (CMOS or LVDS)	DC2425A-E	*LT1819	LTC2055 LT1469 LT6016 LTC6253	LT1469 LT6016 TC6241	LT1028 LT6201 LT6237 LT6203	LTC6247 LT6221 LT6016	LT6203 LT6201 LT1469 LTC6247 LT1810	LT1807 LT1469-2 LT1816 LT6237	LTC6253 LT1819	LTC6403
LTC2310-12		2Msps				74dB	38mW		DC2425A-F									
LTC2323-12		5Msps	2			73dB	76mW		DC1996A-E									
LTC2321-12		2Msps				73dB	60mW		DC1996A-F									
LTC2325-12		5Msps	4			?dB	?mW		DC2395A-I	*LT6202								
LTC2324-12		2Msps				?dB	?mW		DC2395A-H									
LTC2320-12		1.5Msps	8			?dB	?mW		DC2395A-G									
LTC2315-12	12	5Msps	1	Single-Ended	0V to 4.096V	72.6dB	31mW/18mW	Serial SPI	DC1563A-A	-	LTC6252 LTC2054 LT1468 LT6015	LT6015 LT1468 LTC6240	LT1028 LT6200 LT6202	LTC6246 LT6220 LT6015	LT6202 LT6200 LT1468 LTC6246 LT1809	LT1806 LT1468-2 LT1815 *LT6236	LT6360 LTC6252 *LT1818	N/A
LTC2313-12		2.5Msps				72.6dB	26mW/14mW		DC1563A-B	-								
LTC2312-12		1Msps				72.6dB	14mW/8mW		DC1563A-C	-								
LTC2355-12	12	3.5Msps	1	Differential with Wide Common Mode	0V to 2.5V	71.1dB	18mW	Serial SPI	DC1082A-F	-	LTC6253 LTC2055 LT1469 LT6016 LTC6081	LT6016 LT1469 LTC6241 LTC6081 LTC6087 LTC6244	LT6201 LT6203 LT6237	LTC6247 LT6221 LTC6081 LT6016 LT6020 LT6023	LT6203 LT6201 LT1469 LTC6247 LT1810	LT1807 LT1469-2 LT1816 LT6237	LTC6253 *LT1819	LT6350 LTC6362 LTC1992 LT6600 LT6604 LTC1566
LTC2356-12					±1.25V	71.1dB	18mW		DC1082A-E	-								
LTC1403	12	2.8Msps	1		0V to 2.5V	70.5dB	12mW		DC1082A-D	-								
LTC1403-1					±1.25V	70.5dB	12mW		DC1082A-C	-								
LTC1407	12	1.5Msps	2		0V to 2.5V	70.5dB	12mW		DC1082A-B	-								
LTC1407-1					±1.25V	70.5dB	12mW		DC1082A-A	-								
LTC2351-12	12	1.5Msps	6		0V to 2.5V, ±1.25V	72dB	16.5mW		DC1278A	-								
LTC1408-12	12	600ksps	6		0V to 2.5V, ±1.25V	72dB	15mW		DC887A	-								

For further reference see:
ADC Driver Consolidated Specifications: SAR ADC Drivers Flyer www.linear.com/saradc
SAR ADC and ADC Driver Circuit Collection: circuits.linear.com
SAR ADCs: www.linear.com/products/General_Purpose_ADCs

* Reference circuits are available for these drivers
** Recommendations that do not have reference circuits must be verified

SAR ADC Input Types

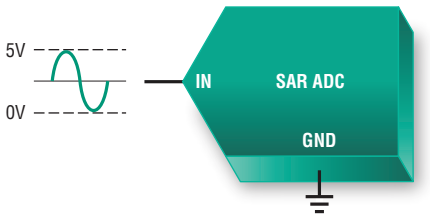


Figure 1a. Single-Ended Unipolar

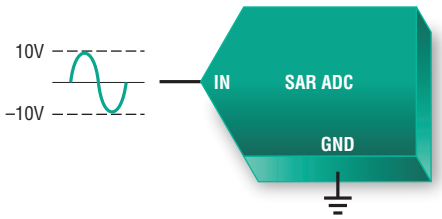


Figure 1b. Single-Ended True Bipolar

Single-Ended Inputs

An ADC with single-ended inputs digitizes the analog input voltage relative to ground. Single-ended inputs simplify ADC driver requirements, reduce complexity and lower power dissipation in the signal chain. Single-ended inputs can either be unipolar or bipolar, where the analog input on a single-ended unipolar ADC swings only above GND (0V to V_{FS}, where V_{FS} is the full-scale input voltage that is determined by a reference voltage) (Figure 1a) and the analog input on a single-ended bipolar ADC also called true bipolar, swings above or below GND ($\pm V_{FS}$) (Figure 1b).

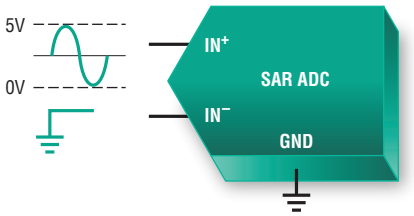


Figure 2a. Pseudo-Differential Unipolar

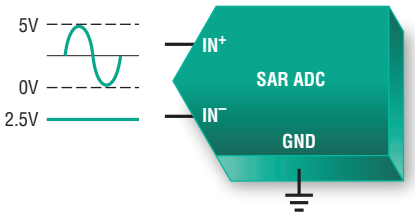


Figure 2b. Pseudo-Differential Bipolar

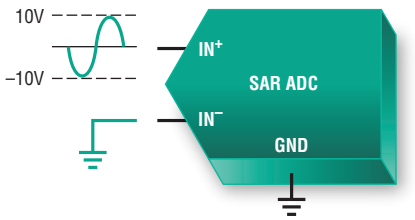


Figure 2c. Pseudo-Differential True Bipolar

Pseudo-Differential Inputs

An ADC with pseudo-differential inputs digitizes the differential analog input voltage ($IN^+ - IN^-$) over a limited range. The IN^+ input has the actual analog input signal, while the IN^- input has a restricted range.

A pseudo-differential unipolar ADC digitizes the differential analog input voltage ($IN^+ - IN^-$) over a span of 0V to V_{FS}. In this range, a single-ended unipolar input signal, driven on the IN^+ pin, is measured with respect to the signal ground reference level, driven on the IN^- pin. The IN^+ pin is allowed to swing from GND to V_{FS}, while the IN^- pin is restricted to around GND ± 100mV (Figure 2a).

A pseudo-differential bipolar ADC digitizes the differential analog input voltage ($IN^+ - IN^-$) over a span of $\pm V_{FS}/2$. In this range, a single-ended bipolar input signal, driven on the IN^+ pin, is measured with respect to the signal mid-scale reference level, driven on the IN^- pin. The IN^+ pin is allowed to swing from GND to V_{FS}, while the IN– pin is restricted to around $V_{FS}/2$ ± 100mV (Figure 2b).

A pseudo-differential true bipolar ADC digitizes the differential analog input voltage ($IN^+ - IN^-$) over a span of $\pm V_{FS}$. In this range, a true bipolar input signal, driven on the IN^+ pin, is measured with respect to the signal ground reference level, driven on the IN^- pin. The IN^+ pin is allowed to swing above or below GND to $\pm V_{FS}$, while the IN^- pin is restricted to around GND ± 100mV (Figure 2c).

Pseudo-differential inputs help separate signal ground from the ADC ground, allowing small common-mode voltages to be cancelled. They also allow single-ended input signals that are referenced to ADC ground. Pseudo-differential ADCs are ideal for applications that require DC common-mode voltage rejection, for single-ended input signals and for applications that do not want the complexity of differential drivers. Pseudo-differential inputs simplify the ADC driver requirement, reduce complexity and lower power dissipation in the signal chain.

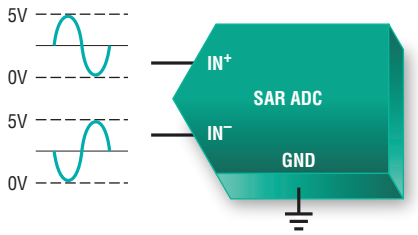


Figure 3a. Fully Differential

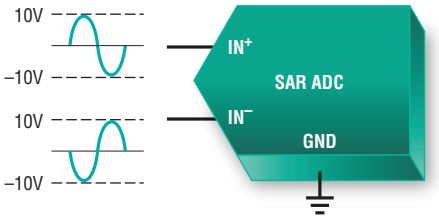


Figure 3b. Fully Differential True Bipolar

Fully Differential Inputs

An ADC with fully-differential inputs digitizes the differential analog input voltage ($IN^+ – IN^–$) over a span of $\pm V_{FS}$. In this range, the IN^+ and $IN^–$ pins should be driven 180° out-of-phase with respect to each other, centered on a fixed common mode voltage, for example, $V_{REF}/2$ ±50mV. In most fully-differential ADCs, both the IN^+ and $IN^–$ pins are allowed to swing from GND to V_{FS} (Figure 3a), while in fully-differential true bipolar ADCs, both the IN^+ and $IN^–$ pins are allowed to swing above or below GND to $\pm V_{FS}$ (Figure 3b).

Fully-differential inputs offer wider dynamic range and better SNR performance over single-ended or pseudo-differential inputs. Fully differential ADCs are ideal for applications that require the highest performance.

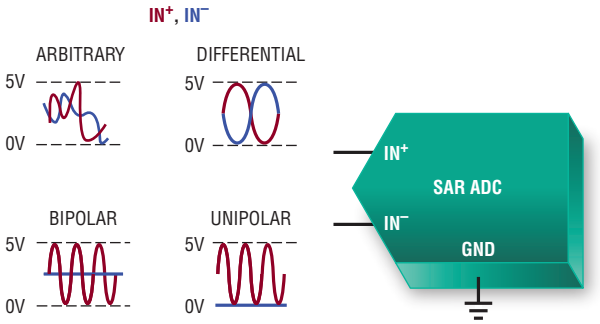


Figure 4a. Differential with Wide Input Common Mode

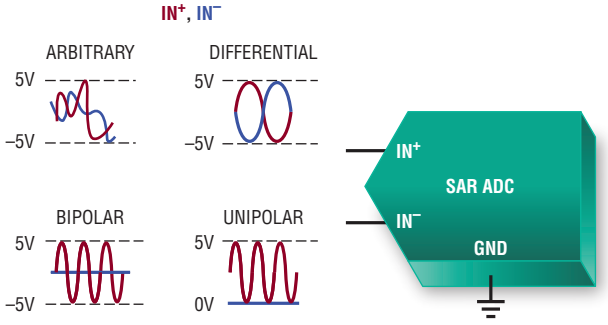


Figure 4b. Differential True Bipolar

Differential Inputs with Wide Input Common Mode

An ADC with differential inputs digitizes the voltage difference between the IN^+ and $IN^–$ pins while supporting a wide common mode input range. The analog input signals on IN^+ and $IN^–$ can have an arbitrary relationship to each other. In most differential ADCs, both IN^+ and $IN^–$ remain between GND and V_{FS} (Figure 4a), while in differential true bipolar ADCs, both the IN^+ and $IN^–$ pins are allowed to swing above or below GND to $\pm V_{FS}$ (Figure 4b). Differential inputs are ideal for applications that require a wide dynamic range with high common mode rejection. Being one of the most flexible ADC input types, an ADC with differential inputs can also digitize other types of analog input signals such as single-ended unipolar, pseudo-differential unipolar/bipolar and fully-differential.

Input Types		Linear Technology SAR ADCs
Single-Ended	Single-Ended Unipolar	LTC1865, LTC2314, LTC2315, LTC2360, LTC2361, LTC2362, LTC2365, LTC2366
	Single-Ended True Bipolar	LTC1400, LTC1404, LTC1605, LTC1606, LTC1609
Pseudo-Differential	Pseudo-Differential Unipolar	LTC1864, LTC2305, LTC2306, LTC2308, LTC2309, LTC2364, LTC2367, LTC2368, LTC2369, LTC2370, LTC2389, LTC2372, LTC2373
	Pseudo-Differential Bipolar	LTC2305, LTC2306, LTC2308, LTC2309, LTC2389, LTC2372, LTC2373
	Pseudo-Differential True Bipolar	LTC1414, LTC1419, LTC1854, LTC1855, LTC1856, LTC1857, LTC1858, LTC1859, LTC2328, LTC2327, LTC2326
Fully Differential	Fully Differential	LTC2376, LTC2377, LTC2378, LTC2379, LTC2380, LTC2383, LTC2389, LTC2393, LTC2372, LTC2373, LTC2387, LTC2386, LTC2385
	Fully Differential True Bipolar	LTC2338, LTC2337, LTC2336
Differential with Wide Input Common Mode	Differential	LTC1403, LTC1407, LTC1408, LTC2351, LTC2355, LTC2356, LTC2323, LTC2321, LTC2345, LTC2311, LTC2310
	Differential True Bipolar	LTC1604, LTC1608, LTC2348, LTC2335

No Latency Delta-Sigma™ ADCs

Easy Drive™ ΔΣ ADC Family 600nVRMS Core, Matched Source RCs								
Part Number	Bits	# Ch	Speed (sps)	Noise (µV)	INL (ppm)	I/O	50Hz/60Hz* Rejection	MUXOUT/ ADCIN
LTC2480	16	1	7.5/15	0.6	2	SPI	Simultaneous	No
LTC2481	16	1	7.5/15	0.6	2	I²C	Simultaneous	No
LTC2482	16	1	6.8	0.6	2	SPI	Simultaneous	No
LTC2483	16	1	6.8	0.6	2	I²C	Simultaneous	No
LTC2484	24	1	7.5/15	0.6	2	SPI	Simultaneous	No
LTC2485	24	1	7.5/15	0.6	2	I²C	Simultaneous	No
LTC2486	16	4	7.5/15	0.6	2	SPI	Simultaneous	No
LTC2487	16	4	7.5/15	0.6	2	I²C	Simultaneous	No
LTC2488	16	4	6.8	0.6	2	SPI	Simultaneous	No
LTC2489	16	4	6.8	0.6	2	I²C	Simultaneous	No
LTC2492	24	4	7.5/15	0.6	2	SPI	Simultaneous	No
LTC2493	24	4	7.5/15	0.6	2	I²C	Simultaneous	No
LTC2494	16	16	7.5/15	0.6	2	SPI	Simultaneous	Yes
LTC2495	16	16	7.5/15	0.6	2	I²C	Simultaneous	Yes
LTC2496	16	16	6.8	0.6	2	SPI	Simultaneous	Yes
LTC2497	16	16	6.8	0.6	2	I²C	Simultaneous	Yes
LTC2498	24	16	7.5/15	0.6	2	SPI	Simultaneous	Yes
LTC2499	24	16	7.5/15	0.6	2	I²C	Simultaneous	Yes

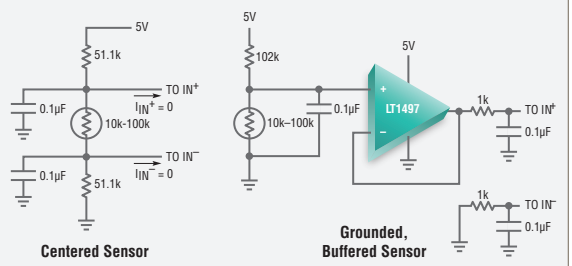
24-Bit First Generation Differential ΔΣ ADC Family ≈1µV Noise Core								
Part Number	Bits	# Ch	Speed (sps)	Noise (µV)	INL (ppm)	I/O	50Hz/60Hz* Rejection	MUXOUT/ ADCIN
LTC2410	24	1	7.5	0.8	1	SPI	Selectable	No
LTC2411	24	1	7.5	1.45	1	SPI	Selectable	No
LTC2411-1	24	1	7.5	1.45	1	SPI	Simultaneous	No
LTC2412	24	2	7.5	0.8	1	SPI	Selectable	No
LTC2413	24	1	6.9	0.8	1	SPI	Simultaneous	No
LTC2415	24	1	15	1.1	1	SPI	Selectable	No
LTC2415-1	24	1	13.7	1.1	1	SPI	Simultaneous	No
LTC2414	24	8	7.5	1	1	SPI	Selectable	No
LTC2418	24	16	7.5	1	1	SPI	Selectable	No

20-Bit First Generation Differential ΔΣ ADC Family Shrunk Sample Capacitor, Easier to Drive, Allows Overclocking								
Part Number	Bits	# Ch	Speed (sps)	Noise (µV)	INL (ppm)	I/O	50Hz/60Hz* Rejection	MUXOUT/ ADCIN
LTC2430	20	1	7.5	2.8	2	SPI	Selectable	No
LTC2431	20	1	7.5	2.8	2	SPI	Selectable	No
LTC2435	20	1	15	4	2	SPI	Selectable	No
LTC2435-1	20	1	13.6	4	2	SPI	Simultaneous	No

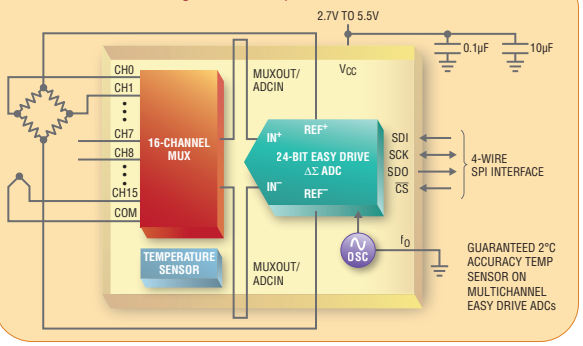
16-Bit First Generation Differential ΔΣ ADC Family ≈1µV Noise Core								
Part Number	Bits	# Ch	Speed (sps)	Noise (µV)	INL (ppm)	I/O	50Hz/60Hz* Rejection	MUXOUT/ ADCIN
LTC2433-1	16	1	6.8	1.45	1	SPI	Simultaneous	No
LTC2436-1	16	2	6.8	0.8	1	SPI	Simultaneous	No
LTC2439-1	16	16	6.8	1	1	SPI	Simultaneous	No

*Simultaneous 50Hz/60Hz rejection; Selectable 50Hz or 60Hz notch filter

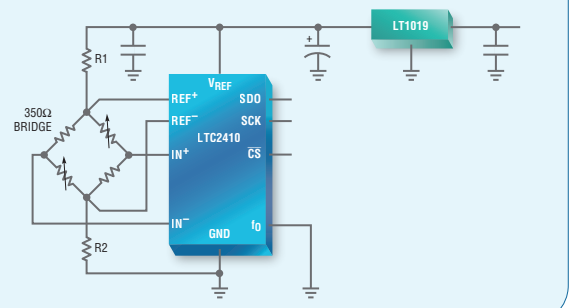
Direct Sensor Digitization



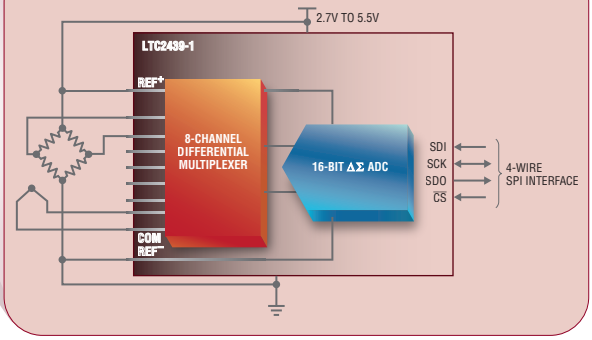
Integrated Temperature Sensor



Basic Weigh Scale



Low Cost 16-Bit Family



24-Bit First Generation Single-Ended ΔΣ ADC Family 12.5% Underrange and Overrange Capability								
Part Number	Bits	# Ch	Speed (sps)	Noise (μV)	INL (ppm)	I/O	50Hz/60Hz* Rejection	MUXOUT/ ADCIN
LTC2400	24	1	7.5	1.5	2	SPI	Selectable	No
LTC2401	24	1	7.5	3	2	SPI	Selectable	No
LTC2402	24	2	7.5	3	2	SPI	Selectable	No
LTC2404	24	4	7.5	1.5	2	SPI	Selectable	Yes
LTC2408	24	8	7.5	1.5	2	SPI	Selectable	Yes

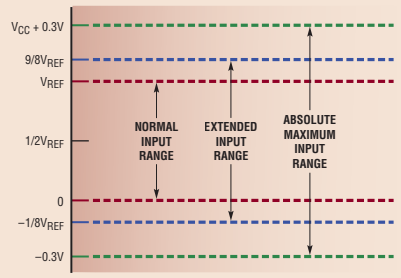
20-Bit First Generation Single-Ended ΔΣ ADC Family Shrunk Sample Capacitor, Easier to Drive, Allows Overclocking								
Part Number	Bits	# Ch	Speed (sps)	Noise (μV)	INL (ppm)	I/O	50Hz/60Hz* Rejection	MUXOUT/ ADCIN
LTC2420	20	1	7.5	6	4	SPI	Selectable	No
LTC2421	20	1	7.5	6	4	SPI	Selectable	No
LTC2422	20	2	7.5	6	4	SPI	Selectable	No
LTC2424	20	4	7.5	6	4	SPI	Selectable	Yes
LTC2428	20	8	7.5	6	4	SPI	Selectable	Yes

24-Bit High Speed ΔΣ ADC Family 200nVRMS, 10-Speed Gearshift Core								
Part Number	Bits	# Ch	Speed (sps)	Noise (μV)	INL (ppm)	I/O	50Hz/60Hz* Rejection	MUXOUT/ ADCIN
LTC2440	24	1	4000	0.2	3	SPI	Simultaneous	No
LTC2445	24	8	8000	0.2	3	SPI	Simultaneous	Yes
LTC2447	24	8	8000	0.2	5	SPI	Simultaneous	Yes
LTC2449	24	16	8000	0.2	3	SPI	Simultaneous	Yes
LTC2442	24	4	8000	0.22	2	SPI	Simultaneous	Yes
LTC2444	24	8	8000	0.28	3	SPI	Simultaneous	No
LTC2446	24	8	8000	0.28	3	SPI	Simultaneous	No
LTC2448	24	16	8000	0.28	3	SPI	Simultaneous	No

Ultra-Tiny 16-Bit ΔΣ ADC Family Input Current Cancellation, Easy to Drive, Simple RC Filters with No Accuracy Penalty								
Part Number	Bits	# Ch	Speed (sps)	Noise (μV)	INL (LSB)	I/O	Differential Input	Internal Reference
LTC2450	16	1	30	1.4	2	SPI	No	No
LTC2450-1	16	1	60	1.4	2	SPI	No	No
LTC2451	16	1	60	1.4	2	I^2C	No	No
LTC2452	16	1	60	1.4	1	SPI	Yes	No
LTC2453	16	1	60	1.4	2	I^2C	Yes	No
LTC2460	16	1	60	2.2	1	SPI	No	Yes
LTC2461	16	1	60	2.2	1	I^2C	No	Yes
LTC2462	16	1	60	2.2	1	SPI	Yes	Yes
LTC2463	16	1	60	2.2	1	I^2C	Yes	Yes
LTC2470	16	1	833	3	8	SPI	No	Yes
LTC2471	16	1	833	3	8	I^2C	No	Yes
LTC2472	16	1	833	3	8	SPI	Yes	Yes
LTC2473	16	1	833	3	8	I^2C	Yes	Yes

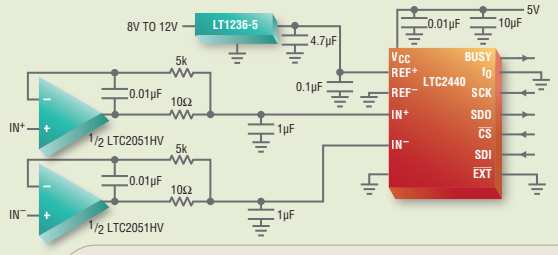
*Simultaneous 50Hz/60Hz rejection; Selectable 50Hz or 60Hz notch filter

0V to 5V Input Range

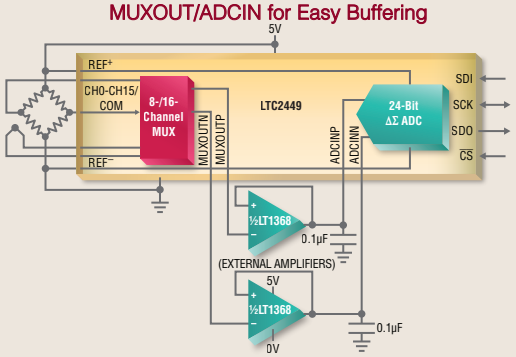


LTC2400 Input Range

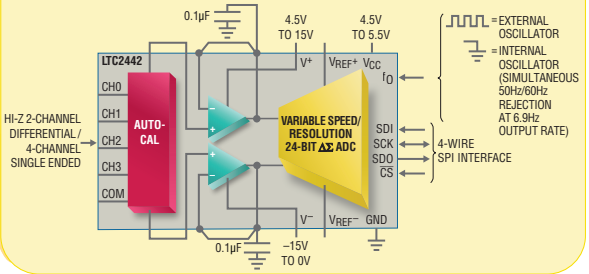
Buffer for Max Performance



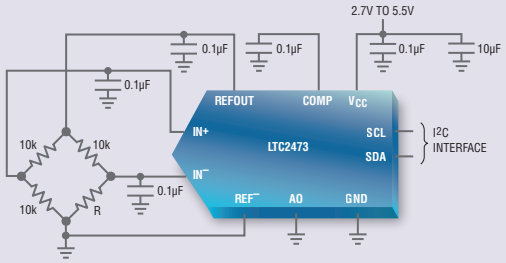
MUXOUT/ADCIN for Easy Buffering



Integrated Amplifier

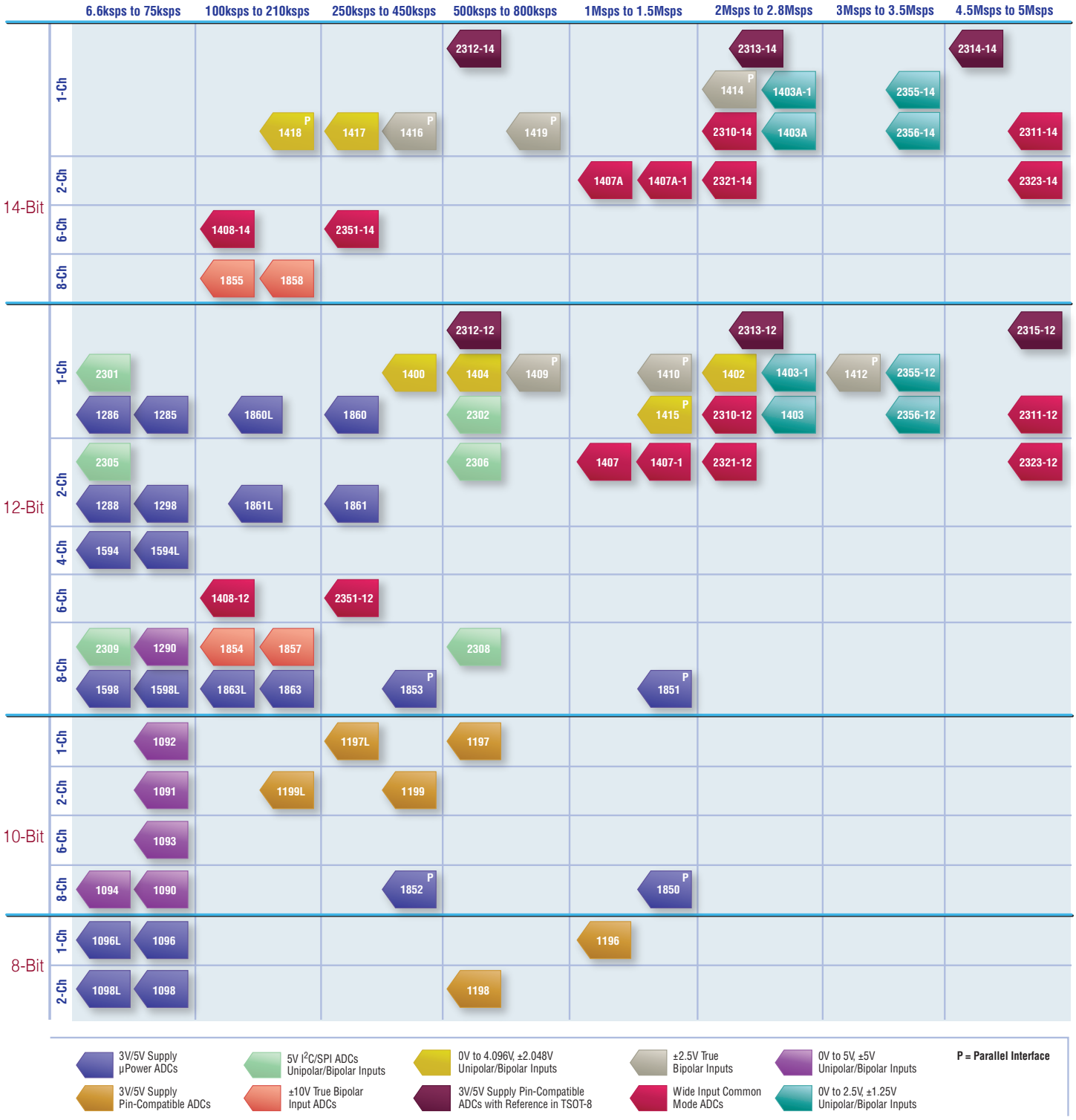


Built-In Reference



General Purpose SAR ADCs

8-Bit to 14-Bit Resolution, 6ksps to 5Msps



www.linear.com/precisionadc ▪ 1-800-4-LINEAR

LINEAR TECHNOLOGY