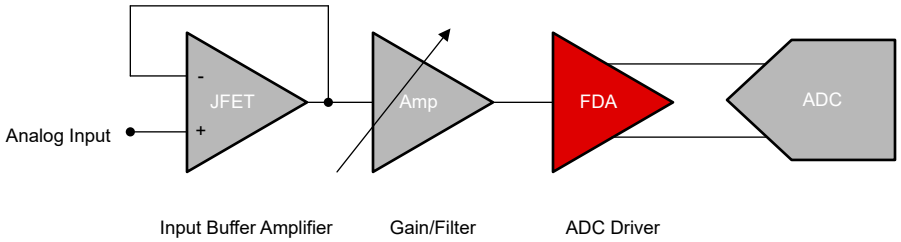
Product Overview

Pairing ADC Drivers With Fully-Differential Input ADCs for Wide Bandwidth Data Acquisition

When designing the fully-differential input ADC driver circuit for > 14-bit ADCs ranging from 500kSPS to < 1GSPS for data acquisition systems (DAQ), you want the ADC driver to minimally affect the ADC performance. This is done by selecting an ADC driver with specifications that exceed the performance of the ADC with enough margin to add minimal impact. Fully-differential amplifiers (FDA) are used to convert single-ended signals to differential signals and drive fully-differential input ADCs. The following image shows where FDAs are used in the last stage of the analog front end driving a differential input ADC.



Fully-Differential Amplifier Driving ADC in Example DAQ Front End

Design Considerations

- FDAs bandwidth matching ADC sampling rate for accurate signal reproduction
- Power consumption balance between performance and power efficiency or *power consumption for battery-operated or thermal-sensitive systems*
- Low input referred noise to minimize interference and maximum ADC dynamic range measurement
- Output voltage swing to provide the necessary dynamic range and cover the full-scale range of the ADC without clipping or distortion
- Input and output impedance matching to prevent signal reflections or loading effects
- Settling time within ½ LSB of ADC acquisition time
- Device pin layout optimized for smaller design size and minimized stray capacitance
- Learn about additional design considerations with the *Driving High-Speed Analog-to-Digital Converters: Circuit Topologies and System-Level Parameters* application brief
- Ask questions on the *TI E2E™* forum

Recommended Parts

Parameter	THS4531A	THS4561	THS4551	THS4541	THS4509
ADC Pairing	> 14-bit, 500kSPS–1MSPS	> 14-bit, 1–2MSPS	> 16-bit, 1–4MSPS	> 10MSPS	> 100MSPS
Common ADC	ADS8922B	ADS1602	ADS127L11	ADC354[1, 2, 4], ADC364[1, 2, 4]	ADC3544 ADC3664
Gain Bandwidth Product (MHz)	36	68	135	850	3000
Quiescent Current, I_Q (TYP) (mA)	0.25	0.775	1.37	10.1	37.7
e_{noise} (nV/√HZ) (1/f corner frequency)	10 (45Hz)	4 (8Hz)	3.3 (150Hz)	2.2 (30kHz)	1.9 (10kHz)
Slew Rate (V/µs)	200	230	220	1500	6600
V_{OS} (25°C, MAX) (µV)	400	250	175	450	4
V_{OS} drift (TYP) (µV/°C)	3	0.5	1.8	0.5	2.6

Parameter	THS4531A	THS4561	THS4551	THS4541	THS4509
THD (dB), V_{OUT} = 2 V_{PP} at 100kHz	–102	–117	–128	–93 (at 5MHz)	–104 (at 10MHz)
Output Voltage Swing (V)	$V_{S–}$ + 0.2, V_{S+} – 0.11	$V_{S–}$ + 0.25, V_{S+} – 0.1	$V_{S–}$ + 0.2, V_{S+} – 0.2	$V_{S–}$ + 0.2, V_{S+} – 0.2	$V_{S–}$ + 1.1, V_{S+} – 1.1
Differential Output Impedance (Ω) (f = 100kHz, G = 1)	0.25	0.06	0.02	0.1	0.3
Settling Time (G = 1, 0.1%, V_{OUT} = 2V step) (ns)	60	40	30	8 (G = 2)	10
Temperature Range (°C)	–40 to 125	–40 to 125	–40 to 125	–40 to 125	–40 to 125
Features	Low I_Q	Feedback Pin	Feedback Pin	Bare Die Option Feedback Pin	Shutdown

For more devices, browse through the *online parametric tool* where you can sort by desired supply voltage, channel count, noise, and other features.

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