



Example: Optical Motor Encoder Block Diagram

Design Considerations

- [Improving Response Time and Accuracy in Autonomous Robots With Wideband SAR-ADCs](#)
- [Adjusting the Input Common-Mode Voltage for SAR ADCs to Avoid Amplifier Output Swing Limitations](#)
- [Optimizing Sensor Measurement: Driving a SAR ADC Input Without a Driver Amplifier](#)

What are the Key Specifications for Analog-to-Digital Converters (ADCs) in Motor Encoders?

- Resolution: Higher resolution ADCs improve the position sensing accuracy in absolute and incremental encoders.
- Sampling rate: The signal-chain bandwidth required by the encoder is determined by the resolution (periods per revolution) and speed (revolutions per minute) of the motor. In typical applications, the signal-chain bandwidth needed is ≥ 500 kHz, so the precision ADC must have a sampling rate ≥ 1 MSPS.
- Size: Encoders are typically located on a PCB mounted on the motor; therefore, a small form factor ADC is required.

Need additional assistance? Ask our engineers a question on the TI [E2E™ Data Converters Support Forum](#).

Recommended Parts

Part Number	Resolution	Sampling Rate (MSPS)	Channel Count	Input Type	Reference	Analog Supply	Package
Group 1 ⁽¹⁾							
ADS7042	12	1	1	Single-ended	External	3.3 V	1.5 mm × 1.5 mm X2QFN
ADS7044				Differential			
ADS7046	12	3		Single-ended			
ADS7047				Differential			
ADS7052	14	1		Single-ended			
ADS7054				Differential			
ADS7056	14	2.5		Single-ended			
ADS7057				Differential			
Group 2 ⁽¹⁾							
ADS7253	12	1	2	Single-ended	Internal and External	5 V	3 mm × 3 mm WQFN
ADS7254				Differential			
ADS7853	14	1		Single-ended			
ADS7854				Differential			
ADS8353	16	0.6		Single-ended			
ADS8354				Differential			
Group 3 ⁽¹⁾							
ADS7223	12	1	8 SE 4 DIFF	Single-ended, Differential	Internal and External	5 V	5 mm × 5 mm VQFN
ADS7263	14	1					
ADS8363	16	1					
Group 4 ⁽¹⁾							
ADS9234R	14	3.5	2	Differential	Internal and External	5 V	5 mm × 5 mm VQFN
ADS9224R	16	3					
Group 5							
ADS9218	18	10	2	Differential	External	5 V	6 mm × 6 mm VQFN

(1) The devices that are grouped together are pin-to-pin compatible.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2023, Texas Instruments Incorporated