AD1 I/O Module Analog-to-Digital Function Module

12 A/D Channels (±1.25 to ±10.0 VDC FSR); 24-bit Sigma-Delta

Module AD1 features 12 channels with up to 24-bit Sigma-Delta A/D converters for each individual channel. The maximum programmable, expected full-scale range input for the AD1 module is ±1.25 to ±10 VDC. The A/D converters have programmable sample rates of up to 256 kHz.

The input range and gain is also field-programmable for each channel. The ability to set lower expected, full-scale voltage gain ranges assures the use of the full resolution. Each channel includes a fixed, second order, anti-aliasing filter and a digital post filter with a programmable breakpoint that enables users to field-adjust the filtering for each channel.

The extended A/D FIFO buffering capabilities of these modules supports greater storage/management of the incoming signal samples (data) for post-processing applications. Data samples can be stored in the buffer either at the maximum programmed base A/D sample rate or by an integer-divided sample rate. Programmable FIFO buffer thresholds maximize data flow control (movement in and out of the FIFO). Incremental relative time-stamping between samples also is provided as a programmable option.

All A/D channels are self-aligning and continuous Background Built-in-Test (BIT) status is provided for channel health and operation feedback. On a rotating basis, each channel is automatically trimmed/tested for optimal conversion and reliability to eliminate offset and gain errors throughout the entire operating envelope (temperature and drift control). Open inputs are sensed and flagged.
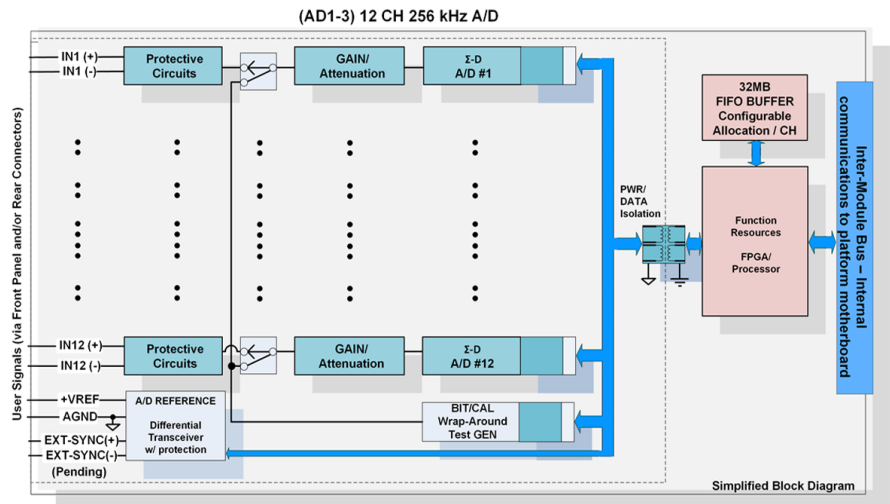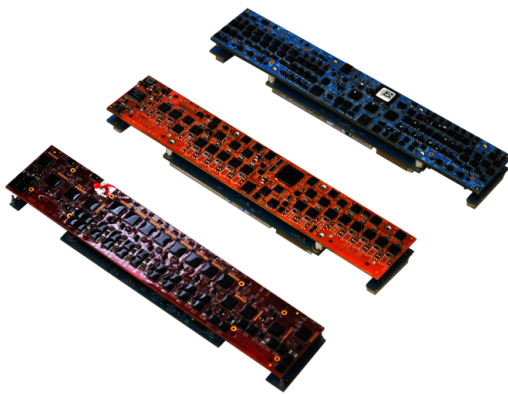
Features

- Number of Channels: 12
- ADC Type / Architecture: Σ-Δ / Individual
- Key Characteristics Range (max): ±10 V
- Effective Resolution Bits: 24
- Sampling Rate (max.): 256 kHz / Channel

AD1 Data Sheet
Rev A

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Specifications

Resolution	24-bit Sigma-Delta A/D converters. One per channel.
Input Format	Differential voltage (may be used as single-ended by grounding one input).
Input Scaling	Twelve (12) bipolar or unipolar channels (volts). Programmable, per channel, as Full Scale (FS) range inputs of 10.00, 5.00, 2.50 or 1.25 volts where range is -FS to +FS or 0 to FS VDC. The ability to set lower voltages for FS assures the utilization of the full resolution
Overvoltage Protection	No damage up to ±12 V continuous; ±30 V momentary.
Open Input Sense	This module will sense and report unconnected inputs.
Input Impedance	20 MΩ (Differential), 10 MΩ (Single -ended)
INL (Linearity)	±0.05% FS range over temperature (voltage), to 16-bits
Gain Error	±0.05% FS range
Offset Error	±0.02% FS range
Sampling Rate	256 kHz max. per channel, programmable
Data Buffering/Triggering	See Operations Manual for details.
Bandwidth	110 kHz per channel
Acquisition/Conversion Time	4.4 µs at 256 kHz sampling rate. See manual for conversion time at lower sample rates
Programmable Filter	Each channel incorporates a fixed second order anti-aliasing filter (110 kHz bandwidth) and a post filter that has a digitally adjustable break point programmable up to 115 kHz.
Common Mode Rejection	70 dB min. at 60 Hz. Roll off to 50 dB min. at 10 kHz.
Common Mode Voltage	Signal voltage plus Common mode voltage is 9.5 volts for the lowest range and 11.5V for higher ranges. Note: A/D differential inputs must not "float". Input source must have return path to ground.
Output Logic	Bipolar output in two's complement. Bipolar output range from FF80 0000 max. negative; 007F FFFF is max. positive (FS) Unipolar output range from 0 to 00FF FFFF (FS).
ESD Protection	Designed to meet the testing requirements of IEC 801-2 Level 2 (4 KV transient with a peak current of 7.5 A and a Tc of approximately 60 ns)
Power	5 VDC @ 600mA typ, +/-12 VDC @ 310mA (typ.)
Ground	Channel inputs are differential, referenced to isolated module AGND, isolated (250 V minimum peak isolation) from system power/ground.
Weight	1.5 oz. (42 g)
VREF Detail	VREF output @ 4.096 V (≤ 10 mA)
Signal- to- Noise Ratio (SNR)	Minimum of 60dB

Architected for Versatility

NAI's Configurable Open Systems Architecture™ (COSA®) offers a choice of over 100 smart I/O, communications, or Ethernet switch functions, providing the highest packaging density and greatest flexibility of ruggedized embedded product solutions in the industry. Preexisting, fully-tested functions can be combined in an unlimited number of ways quickly and easily.

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Eliminate man-months of integration with a configured, field-proven system from NAI. Specification to deployment is a seamless experience as all design, state-of-the-art manufacturing, assembly and test are performed - by one trusted source. All facilities are located within the U.S. and optimized for high-mix/low volume production runs and extended lifecycle support.

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From design to production and beyond, NAI's product lifecycle management strategy ensures the long-term availability of COTS products through configuration management, technology refresh and obsolescence component purchase and storage.