

**NuMicro<sup>®</sup> Family**  
**Low-Noise 24-bit Delta-Sigma ADC**

**NADC24 Series**  
**Product Brief**

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## 1 GENERAL DESCRIPTION

NADC24, which stands for NuMicro 24-bit Analog-to-Digital Converter (ADC), is an integrated 24-bit delta-sigma ( $\Delta\Sigma$ ) analog-to-digital converter. Designed to deliver excellent precision and speed, the NADC24 series achieves outstanding low-noise performance with up to 22-bit Effective-Number-of-Bits (ENOB). This makes it an ideal choice for demanding applications where high-precision analog signal conversion is essential for optimal performance.

The key components of NADC24 include a low-noise programmable gain amplifier (PGA), an internal voltage reference of 1.2V or 2.4V, a delta-sigma modulator, a digital filter and a 49.152 MHz oscillator. The characteristics of these key components ensure NADC24's high precision signal conversion. Furthermore, in order to achieve higher performance and integration, the NADC24 series integrates an input multiplexer with up to 8 single-ended channels, a 12-bit Digital-to-Analog Converter (optional in its portfolio), a temperature sensor and an SPI interface. These integrated features effectively facilitate a compact PCB design and reduce component costs. The NADC24's operating voltage ranges from 2.7 V to 3.6 V while its operating temperature ranges from -40 °C to 105 °C. The NADC24 series offers NADC24D003FA with TSSP20 package and NADC24D004TA with QFN32 package.

As a highly integrated precision ADC, the NADC24 series brings significant values in following applications including:

- Utility meters
- Pressure sensors
- Gas sensors
- Oximeters
- Glucose meters
- Temperature controllers
- Programmable logic controllers (PLC)

## 2 FEATURES

- Operating Characteristics
  - Voltage range: 2.7 V to 3.6 V
  - Temperature range: -40 °C to 105 °C
  - EFT  $\pm 4.4$  KV
  - ESD HBM  $\pm 4$  KV
- Clocks
  - Internal 49.152 MHz HIRC oscillator with a variation of  $\pm 2$  % across all temperature ranges
- Analog
  - Up to 4 differential or 8 single-ended multiplexed input channels
  - One internal differential channel for internal temperature sensor
  - One external common mode voltage input for single-ended input mode (only with NADC24D004TA)
  - One internal single-end channel for internal DAC (only with NADC24D004TA)
  - Low-Noise PGA with programmable gains of 1, 2, 4, 8, 16, 32, 64 and 128
  - Configurable output data rates: 15.625 SPS to 96 KSPS
  - Internal voltage reference: 1.2 V or 2.4 V, 100 ppm/°C drift
  - Internal temperature sensor with accuracy up to  $\pm 2$  °C accuracy
- Communication
  - One set of SPI interface for external communication
- Package
  - Package is Halogen-free, RoHS-compliant and TSCA-compliant.

Part No.	NADC24D003FA	NADC24D004TA
Pin Count	20	32
Type	TSSOP	QFN
Lead Pitch	0.65	0.4
Dimension (mm)	4.4x6.5	4x4

3 BLOCK DIAGRAM

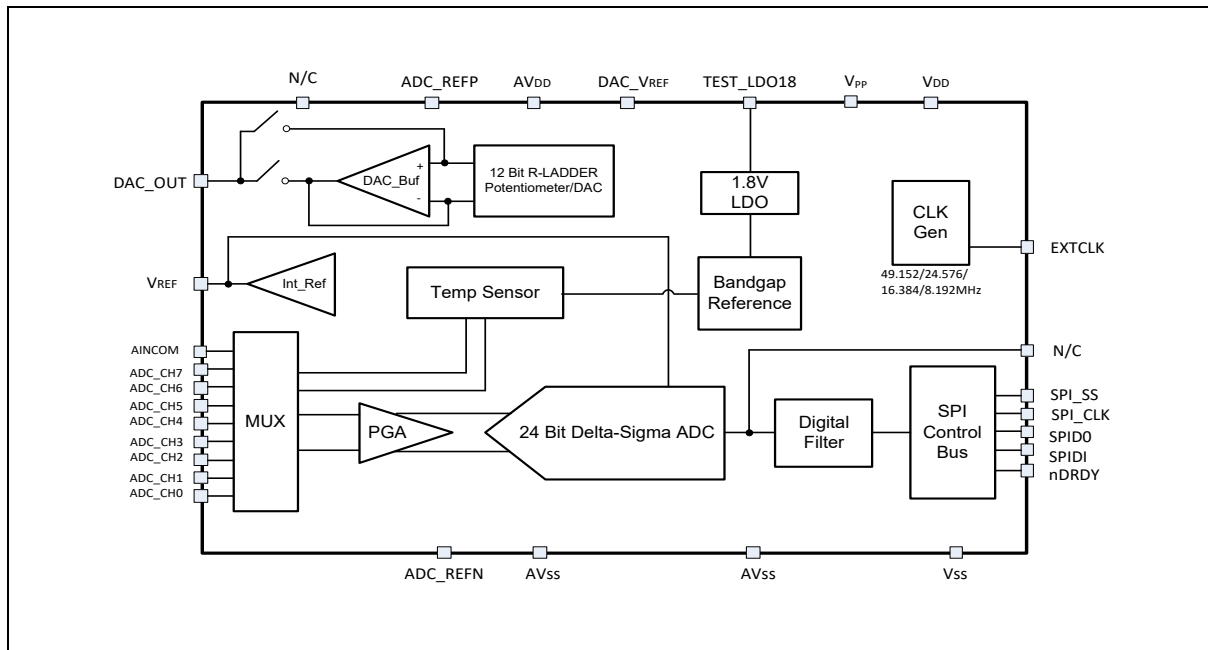


Figure 3-1 NADC24 Block Diagram

**4 PARTS INFORMATION**

**4.1 NADC24 Series Naming Rule**

<b>NADC</b>	<b>24</b>	<b>D</b>	<b>0</b>	<b>03</b>	<b>F</b>	<b>A</b>
<b>Prefix</b>	<b>Resolution</b>	<b>Architecture</b>	<b>Line</b>	<b>Differential Channels</b>	<b>Package</b>	<b>Version</b>
NADC	24: 24-bit	D: Delta-sigma	0: Reserved	03: 3 Ch 04: 4 Ch	F: TSSOP20 (4.4x6.5 mm) T: QFN32 (4x4 mm)	A

4.2 NADC24 Series Selection Guide

Part Number	NADC24D003FA	NADC24D004TA
V <sub>DD</sub>	2.7 V ~ 3.6 V	2.7 V ~ 3.6 V
Multi-channel configuration	Multiplexed	Multiplexed
Input Channels (differential)	3	4
ENOB (Bit)	Up to 22	Up to 22
Output Data Rate (SPS)	15.625 ~ 96,000	15.625 ~ 96,000
Sampling Frequency ( MHz)	1	1
12-bit DAC	-	1
Temperature Sensor	√	√
Internal V <sub>REF</sub>	1.2 V or 2.4 V	1.2 V or 2.4 V
1.8V LDO	√	√
SPI	1	1
Package	TSSOP20	QFN32

**5 REVISION HISTORY**

Date	Revision	Description
2023.10.02	1.00	<ul style="list-style-type: none"> <li>Initial version.</li> </ul>

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