

## ADC 10 Click



PID: MIKROE-4488

ADC 10 Click is a compact add-on board that contains a high-performance data converter. This board features the ADS122U04, a 24-bit precision  $\Delta\Sigma$  analog-to-digital converter with UART compatible interface from Texas Instruments. It features two differential or four single-ended inputs through a flexible input multiplexer, a programmable gain amplifier up to 128, two programmable excitation current sources, a voltage reference, an oscillator, and a temperature sensor. The ADS122U04 offers conversions at data rates up to 2000 samples-per-second with single-cycle settling. This Click board™ is suitable for measuring small sensor signals, such as resistance temperature detectors (RTDs), thermocouples, thermistors, and resistive bridge sensors.

ADC 10 Click is supported by a [mikroSDK](#) compliant library, which includes functions that simplify software development. This [Click board™](#) comes as a fully tested product, ready to be used on a system equipped with the [mikroBUS™](#) socket.

### How does it work?

ADC 10 Click is based on the ADS122U04, a 24-bit precision  $\Delta\Sigma$  analog-to-digital converter with UART compatible interface from Texas Instruments. In addition to the  $\Delta\Sigma$  ADC and single-cycle settling digital filter, the ADS122U04 offers a low-noise, high input impedance, programmable gain amplifier up to 128, an internal 2.048V voltage reference, and a clock oscillator. It also integrates a highly linear and accurate temperature sensor, and two matched programmable current sources for sensor excitation. The ADS122U04 is fully configured through five registers through the UART interface and can perform conversions at data rates up to 2000 samples-per-second with single-cycle settling.

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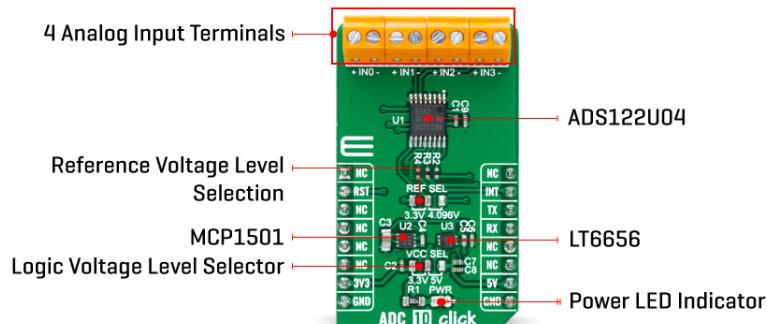
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The A/D converter measures a differential signal brought to its input terminals, which represents the difference in voltage between the + and - nodes of the input terminal. The ADS122U04 has two available conversion modes: Single-Shot conversion and Continuous conversion Mode. In Single-Shot conversion Mode, the ADC performs one conversion of the input signal upon request, stores the value in an internal data buffer, and then enters a low-power state to save power. While in Continuous conversion Mode, the ADC automatically begins the conversion as soon as the previous conversion is completed.

ADC 10 Click communicates with MCU using the UART interface at 115200bps with commonly used RX and TX pins for the data transfer. The interrupt pin routed on the INT pin of the mikroBUS™ socket is utilized by ADS122U04 to indicates when a new conversion result is ready for retrieval or can be additionally configured as a GPIO pin. Alongside this feature, this Click board™ also has a Reset function routed on the RST pin of the mikroBUS™ socket that will put the ADS122U04 into the reset state by driving the RST pin HIGH. When a Reset occurs, the configuration registers reset to the default values, and the device enters a low-power state.

Besides its internal 2.048V reference, the ADS122U04 can use additional reference voltage values for applications that require a different reference voltage or a ratiometric measurement approach. The reference voltage level can be selected by positioning the SMD jumper labeled as REF SEL to an appropriate position choosing between 3.3V provided by the [MCP1501](#) or 4.096V provided by [LT6656](#). Those voltages may be used as the reference input that results in accuracy and stability.

This Click board™ is designed to operate with both 3.3V and 5V logic voltage levels selected via the VCC SEL jumper. It allows for both 3.3V and 5V capable MCUs to use the UART communication lines properly. However, the Click board™ comes equipped with a library that contains functions and an example code that can be used, as a reference, for further development.

## Specifications

Type	ADC
Applications	Can be used for measuring small sensor signals, such as resistance temperature detectors (RTDs), thermocouples, thermistors, and resistive bridge sensors.

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On-board modules	ADS122U04 - 24-bit precision $\Delta\Sigma$ analog-to-digital converter with UART compatible interface from Texas Instruments MCP1501 - high-precision voltage reference from Microchip LT6656 - high-precision voltage reference from Analog Devices
Key Features	Low power consumption, programmable gain and data rates, two differential or four single-ended inputs, internal and external voltage references, internal temperature sensor, and more
Interface	UART
ClickID	No
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V or 5V

## Pinout diagram

This table shows how the pinout on ADC 10 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikro™ BUS				Pin	Notes
	NC	1	AN	PWM	16	NC	
Reset	<b>RST</b>	2	RST	INT	15	<b>INT</b>	Interrupt
	NC	3	CS	RX	14	<b>TX</b>	UART TX
	NC	4	SCK	TX	13	<b>RX</b>	UART RX
	NC	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
Power Supply	<b>3.3V</b>	7	3.3V	5V	10	<b>5V</b>	Power Supply
Ground	<b>GND</b>	8	GND	GND	9	<b>GND</b>	Ground

## Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP3	VCC SEL	Left	Logic Level Voltage Selection 3.3V/5V: Left position 3.3V, Right position 5V
JP1	REF SEL	Left	Reference Level Voltage Selection 3.3V/4.096V: Left position 3V3, Right position 4.096V

## ADC 10 Click electrical specifications

Description	Min	Typ	Max	Unit
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Supply Voltage	3.3	-	5	V
Analog Input Supply Voltage	3.3	-	5	V
Resolution	24	-	-	bits
Gain	1	-	128	
Data Rates	-	-	2000	SPS
Operating Temperature Range	-40	+25	+125	°C

## Software Support

We provide a library for the ADC 10 Click as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika [development boards](#).

Package can be downloaded/installed directly from NECTO Studio Package Manager(recommended way), downloaded from our [LibStock™](#) or found on [mikroE github account](#).

## Library Description

This library contains API for ADC 10 Click driver.

Key functions:

- void adc10\_cfg\_setup ( adc10\_cfg\_t \*cfg ); - Config Object Initialization function.
- ADC10\_RETVAL adc10\_init ( adc10\_t \*ctx, adc10\_cfg\_t \*cfg ); - Initialization function.
- void adc10\_default\_cfg ( adc10\_t \*ctx ); - Click Default Configuration function.

## Examples description

This is an example that demonstrates the use of the ADC 10 Click board™.

The demo application is composed of two sections :

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager(recommended way), downloaded from our [LibStock™](#) or found on [mikroE github account](#).

Other mikroE Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.Adc10

## Additional notes and informations

Depending on the development board you are using, you may need [USB UART click](#), [USB UART 2 click](#) or [RS232 click](#) to connect to your PC, for development systems with no UART to USB interface available on the board. The terminal available in all MikroElektronika [compilers](#), or any other terminal application of your choice, can be used to read the message.

## mikroSDK

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This Click board™ is supported with [mikroSDK](#) - MikroElektronika Software Development Kit. To ensure proper operation of mikroSDK compliant Click board™ demo applications, mikroSDK should be downloaded from the [LibStock](#) and installed for the compiler you are using.

For more information about mikroSDK, visit the [official page](#).

## Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click boards™](#)

## Downloads

[ADC 10 click 2D and 3D files](#)

[ADC 10 click schematic](#)

[ADS122U04 datasheet](#)

[ADC 10 click example on Libstock](#)

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