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ISO ADC 2 Click

PID: MIKROE-4166

ISO ADC 2 Click is a compact add-on board that represents a completely isolated 12-bit, 300 kSPS data acquisition system. This board features the AD7091R, successive-approximation analog-to-digital converter (ADC) from Analog Devices. It uses the 3-wire SPI serial interface for data communication, achieving up to 1 MSPS throughput rate. This Click board™ also features the ADuM5401, isolated DC-DC converter used to isolate the logic signals, power, and feedback paths in the DC-DC converter resulting in total isolation solution. Many features such as high throughput rate with ultralow power consumption, wide input bandwidth, accuracy, and speed make it an ideal choice for a wide variety of industrial measurements, data acquisition systems, monitoring functions, and many more.

ISO ADC 2 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?

ISO ADC 2 Click is based on the AD7091R, a 12-bit successive-approximation analog-to-digital converter (ADC) with an isolated DC-DC converter, from Analog Devices. This Click board™ allows single-supply operation and consists of three Analog Devices active components: AD8616 a level shifting circuit, AD7091R an ADC stage and ADuM5401 an output isolation stage. The AD8616 is chosen for this application because of its low offset voltage, low bias current, and low noise. The output of the OpAmp is 0.1 V to 2.4 V which matches the input range of the ADC (0 V to 2.5 V) with a 100 mV safety margin to maintain linearity. A single-pole RC filter (R2/C9) follows the OpAmp output stage to reduce the out-of-band noise.

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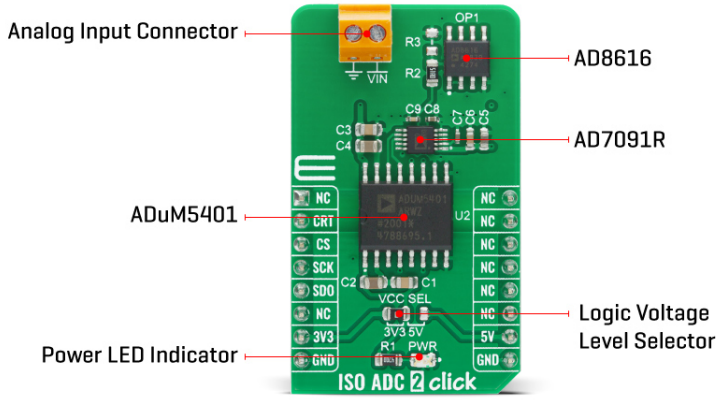

The next part of the circuit is the AD7091R, ADC that is chosen because of its ultralow power which is significantly lower than any competitive A/D converter. It features a power-down option, implemented across the serial interface to save power between conversions, described in the Modes of Operation section in the datasheet. After a successful conversion, the ADC sends the data to the MCU that goes through galvanic isolation provided by the ADuM5401 quad-channel digital isolator with an integrated DC-DC converter. The isolator has a secondary side controller architecture with isolated pulse-width modulation (PWM) feedback, and it works on the principle that is common to most switching power supplies.

The ISO ADC 2 Click communicates with MCU using the 3-wire SPI serial interface that operates at clock rates up to 50 MHz used for accessing data from the result register and controlling the modes of operation of the device. The CONVST signal of the AD7091R routed to the RST pin on the mikroBUS™ is used to initiate the conversion process, data acquisition, and to select the mode of operation. This ADC requires the user to initiate a software reset upon Power-Up, and it should be noted that failure to apply the correct software reset command may result in a device malfunction.

This Click Board™ uses the SPI communication interface with both 3.3V and 5V. The onboard SMD jumper labeled as VCC SEL allows voltage selection for interfacing with both 3.3V and 5V MCUs. More information about the AD7091R's functionality, electrical specifications, and typical performance can be found in the attached datasheet. However, the Click board™ comes equipped with a library that contains easy to use functions and a usage example that may be used as a reference for the development.

Specifications

Type	ADC,Isolators
Applications	Can be used for a wide variety of industrial measurements, data acquisition systems, monitoring functions, and many more.
On-board modules	ISO ADC 2 Click is based on the AD7091R, a 12-bit successive-approximation analog-to-digital converter (ADC) with an isolated DC-DC converter, from Analog Devices.
Key Features	Low power consumption, fast throughput rate, wide input bandwidth, and more.

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Interface	GPIO,SPI
Feature	No ClickID
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 ISO ADC 2 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
	NC	1	AN	PWM	16	NC	
Conversion Initialization	**CRT**	2	RST	INT	15	NC	
SPI Chip Select	**CS**	3	CS	RX	14	NC	
SPI Clock	**SCK**	4	SCK	TX	13	NC	
SPI Data OUT	**SDO**	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
Power Supply	**3.3V**	7	3.3V	5V	10	**5V**	Power Supply
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Power Supply Voltage Selection 3V3/5V: Left position 3V3, Right position 5V

ISO ADC 2 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Analog Input VIN	0	-	2.5	V
Resolution	12	-	-	bits

Software Support

We provide a library for the ISO ADC 2 Click on our LibStock page, as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika development boards.

Library Description

Key functions:

- uint16_t isoadc2_read_adc (void) - Function for reading 12bit ADC data

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- uint16_t isoadc2_get_mv (uint16_t adc_data) - Function for converting ADC to mV data

Examples description

The application is composed of three sections :

- System Initialization - Initialization of SPI module and additional pins
- Application Initialization - Maps GPIO and SPI for selected MIKROBUS
- Application Task - Every second reads ADC data, it to mV and logs result

The full application code, and ready to use projects can be found on our LibStock page.

Other mikroE Libraries used in the example:

- Conversion
- SPI
- UART

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

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

ISO ADC 2 click example on Libstock

ISO ADC 2 click 2D and 3D files

ISO ADC 2 click schematic

AD7091R datasheet

AD8616 datasheet

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ADUM5401 datasheet

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