NEW

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RTD 2 CLICK

PID: MIKROE-4282

Weight: 19 g

RTD 2 Click is a compact add-on board used for applications with resistive elements that change resistance over temperature. This board features the ADS1247, 24-bit analog-to-digital converter with a programmable gain amplifier (PGA) for sensor measurement applications from Texas Instruments. It features a precision delta-sigma (ΔΣ) ADC with a single-cycle settling digital filter, and an internal oscillator, but also provides a low-drift voltage reference, and two matched programmable excitation current sources (IDACs). It also integrates sensor burn-out detection, voltage bias for thermocouples, system monitoring, and digital GPIOs. This Click board™ is suitable for temperature sensor measurements such as RTDs, thermocouples and thermistors, for pressure measurements, process control, and many more.

RTD 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.

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HOW DOES IT WORK?

RTD 2 Click is based on the ADS1247, a highly integrated 24-bit data converters with a programmable gain amplifier (PGA) for sensor measurement applications from Texas Instruments. The ADS1247 includes a delta-sigma (ΔΣ) ADC with an adjustable single-cycle settling digital filter, an internal oscillator, and an SPI-compatible serial interface. It also has a flexible input multiplexer with system monitoring capability and general-purpose I/O settings, a very low-drift voltage reference, and two matched current sources for sensor excitation. The ADS1247 provides a system monitor function. This function can measure the analog power supply, digital power supply, external voltage reference, or ambient temperature. Note that the system monitor function provides
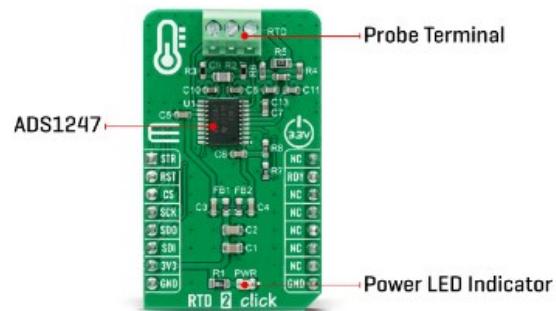
The two IDAC current sources integrated in the ADS1247 are used to implement the lead-wire compensation. One IDAC current source (IDAC1) provides excitation to the RTD element. The other current source (IDAC2) has the same current setting, providing cancellation of lead-wire resistance by generating a voltage drop across lead-wire resistance R2 equal to the voltage drop across R1 resistor (9.09k). Because the voltage across the RTD is measured differentially at ADC pins AIN1 and AIN2 of the ADS1247, the voltages across the lead-wire resistances cancel. The ADC reference voltage (pins REFP0 and REFN0) is derived from the voltage across R5 resistor with the currents from IDAC1 and IDAC2, providing ratiometric cancellation of current-source drift. R5 also level shifts the RTD signal to within the ADC specified common-mode input range.

The RTD 2 Click communicates with MCU using the standard SPI serial interface with additional data ready signal routed on the INT pin of the mikroBUS™ socket labeled as RDY. Data Ready signal is used to indicate when a new conversion is complete, and the conversion result is stored in the conversion result buffer. It also has an active-low Reset signal routed on the RST pin of the mikroBUS™ used to reset the device, and precise conversion control signal routed on the AN pin of the mikroBUS™ socket labeled as STR. The ADS1247 stays in Reset Mode as long as the RST pin stays low. When the RST pin goes high, the ADC comes out of Reset Mode and can convert data.

This Click board™ can work only with 3-wire probe types that Mikroe has in its offer such as the PT100 type Platinum Probe, a type of RTD probe used to measure temperatures up to 250°C. Platinum is an excellent choice since they are very stable and reusable, and are resistant to corrosion or oxidation. The measurement probe is connected to the RTD 2 Click by using the screw terminal on the top of the board, and it has wires that can be 1m long, which makes it possible to measure high temperatures from a safe distance.

This Click board™ is designed to be operated only with a 3.3V logic voltage level. A proper logic voltage level conversion should be performed before the Click board™ is used with MCUs with different logic levels. However, the Click board™ comes equipped with a library that contains easy to use functions and an example code that can be used as a reference for further development.

SPECIFICATIONS

Type	Temperature & humidity
Applications	Can be used for temperature sensor measurements such as RTDs, thermocouples, and thermistors, for pressure measurements, flow meters, factory automation, and process control, and many more.
On-board modules	RTD 2 Click is based on the ADS1247, a highly integrated 24-bit data converters with a programmable gain amplifier (PGA) for sensor measurement applications from Texas Instruments.
Key Features	Programmable Data Rates, 50/60 Hz rejection, excitation current sources (iDACs), GPIO, PGA, internal temperature sensor, self and system calibration, and more.
Interface	SPI
Compatibility	mikroBUS
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V

PINOUT DIAGRAM

This table shows how the pinout on RTD 2 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS		Pin	Notes
Conversion Start	**STR**	1	AN	PWM	16	NC	
Reset	**RST**	2	RST	INT	15	**RDY**	Data-Ready
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	
SPI Data IN	**SDI**	6	MOSI	SDA	11	NC	
Power Supply	**3.3V**	7	3.3V	5V	10	NC	
Ground	**GND**	8	GND	GND	9	**GND**	Ground

ONBOARD SETTINGS AND INDICATORS

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator

RTD 2 CLICK ELECTRICAL SPECIFICATIONS

Description	Min	Typ	Max	Unit
Supply Voltage	-0.3	3.3	5.5	V
Power Consumption	-	2.3	-	mW
Sample Rate	-	-	2	kSPS
Resolution	-	24	-	bit
Operating Temperature Range	-40	-	+105	°C

SOFTWARE SUPPORT

We provide a library for the RTD 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

The library covers all the necessary functions to control RTD 2 Click board. A library performs the communication with the 4ADS1247 24-Bit, 2-kSPS, Analog-To-Digital Converters With Programmable Gain Amplifier (PGA) For Sensor Measurement via I2C interface.

Key functions:

- `void rtd2_hw_reset ( void )` - Hardware reset function.

- `void rtd2_default_config ( void )` - Set default configuration function.

- `float rtd2_get_temperature ( void )` - Get temperature function.

Examples description

The application is composed of three sections :

- System Initialization - Initializes SPI, sets AN, RST and CS pins as output, INT pin as input and start to write log.

- Application Initialization - Initialization driver enables - SPI, hardware reset the device and set default configuration and start the measurement, also write log.

- Application Task - (code snippet) This is an example that demonstrates the use of RTD 2 Click board. RTD 2 Click board can be used to measure ambient temperature from the PT100 3-wire temperature probe wired to the 4ADS1247 24-Bit, 2-kSPS, Analog-To-Digital Converters With Programmable Gain Amplifier (PGA) For Sensor Measurement on the RTD 2 click board All data logs write on USB uart changes for every 1 sec.

```
void application_task ( )
{
    if ( rtd2_check_new_data_ready( ) == RTD2_NEW_DATA_IS_READY )
    {
        temperature = rtd2_get_temperature( );
        FloatToStr( temperature, log_text );
        mikrobus_logWrite( " Temperature : ", _LOG_TEXT );
        mikrobus_logWrite( log_text, _LOG_TEXT );
        mikrobus_logWrite( " C", _LOG_LINE );
        mikrobus_logWrite( "-------------------------", _LOG_LINE );
```

```
        Delay_ms( 1000 );
    }
    else
    {
        rtd2_enable_start( RTD2_START_CONVERSION_DISABLE );
        Delay_ms( 1000 );
    }
}
```

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

Other mikroE Libraries used in the example:

- SPI
- UART
- Conversions

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

⊕ Click boards™ Standard Page

⊕ mikroBUS™ Standard specification

⊕ LibStock: mikroSDK

⊕ Click board catalog

DOWNLOADS

⊕ RTD 2 click example on Libstock

⊕ RTD 2 click 2D and 3D files

⊕ RTD 2 click schematic

⊕ ADS1247 datasheet

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