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TMR mix-sens click

PID: MIKROE-4106

The **TMR mix-sens Click** is an add-on board equipped with the TMR digital push-pull and analog magnetic sensors, as well as intensity of magnetic field indicator. The TMR mix-sens Click has three types of magnetic field sensors: Two digital and one analog sensor. The digital sensors are the RR121-1A23-311 which has an omnipolar polarity response, and the RR121-3C63-311 which has a bipolar polarity response. The analog sensor is the RR111-1DC2-331, which outputs a voltage that is proportional to magnetic field. The board also has an LM3914 voltage level indicator, which takes the output voltage of the RR111-1DC2-331 sensor and uses it to light a series of LEDs to indicate the level of magnetic field seen by the sensor. All sensor outputs can be accessed through mikroBUS I/O or analog pins, also they are visually represented over on-board LED's. This board can be used for evaluation of the TMR sensors as well as for testing applications which are requiring low power wake up functionality.

TMR mix-sens 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.

TMR mix-sens Click provides three different Coto Technology RedRock™ TMR magnetic sensors that can be operated with supplied magnets and provide instantaneous visual feedback through LED's that indicate sensor output. These sensors utilize tunneling Magnetoresistance (TMR) technology that provides the lowest power consumption and highest magnetic sensitivity of any available magnetic sensor. With the board you will also receive cylindrical magnets for performing out of the box testing. To get started, you'll need to supply 3.3V and 5V to the corresponding pins (see image below).

How does it work?

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.
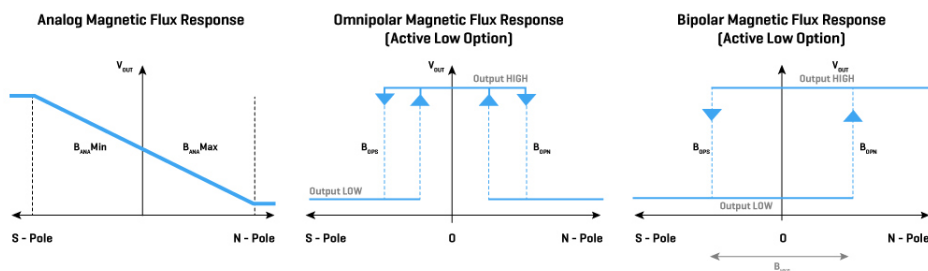
ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.

ISO 9001: 2015 certification of quality management system (QMS).

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The first sensor on this Click board, a Coto Technology RedRock RR121-1A23-311 is an ominpolar, 9 Gauss operate, 10Hz sensing frequency, push pull output sensor that consumes an average of only 240nA. This sensor is often used for proximity detection or as a means to signal a battery operated device to wake up or power on. The second sensor on this Click board is an RR121-3C63-311 which is a bi-polar, 10 Gauss operate/-10 Gauss release, 500Hz sensing frequency, push pull output sensor that consumes an average of 1.7uA. This sensor is often used for rotation counting. The third sensor on this Click board is an RR111-1DC2-331 which provides a linear voltage output that is proportional to a magnetic field strength between -10 and 10 Gauss with a sensitivity of -20 mv/V/G and 1.5mA average supply current. This sensor is typically used in level or distance sensing applications and can provide a distance resolution of 1mm.
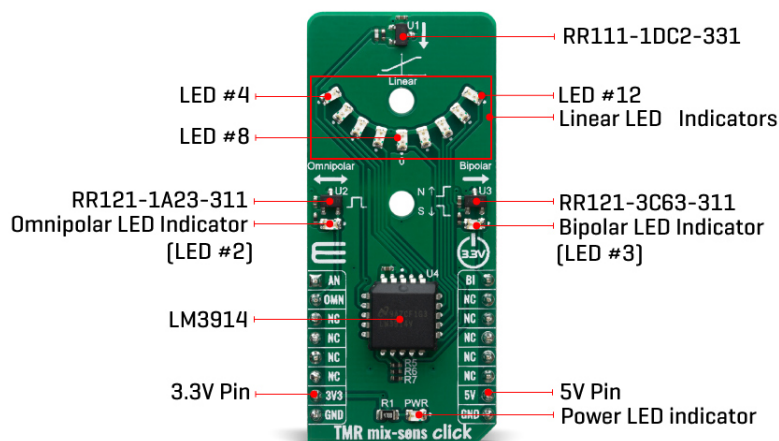
In addition to being able to access the outputs of the three sensors through the mikroBUS and get information to the host MCU, a visual confirmation of the activation and deactivation of each sensor is provided by means of LEDs placed next to each of the sensors on the board. When operating these sensors with the supplied magnets or magnets of your choosing, the LED's associated with each sensor will activate to visually indicate the sensing of a magnetic field. The LED2 for the RR121-1A23-311 lights up when the operate field strength of 9 Gauss is reached and subsequently turns off when the release field strength of 5 Gauss is reached, providing a hysteresis of 4 Gauss. This can demonstrated by moving the North or South pole of magnet towards the sensor in the direction of the arrow.   The LED3 for the RR121-3C63-311 lights up when a South pole field with a magnitude of 10 Gauss or greater is sensed and will stay lit until a North pole of 10 Gauss or higher is sensed. This can be demonstrated by bring in a magnet with one polarity and then reversing it. It can also be demonstrated by rotating the supplied ring magnet in the hole adjacent to the sensor.

The semi-circular array of nine LEDs (LED4-LED12) on the top of the board are used for the RR111-1DC2-331 sensor. Please refer to the image above for the LED numbering. These will light to indicate when the sensor sees a North field, a South field or no field, and the magnitude for each polarity. The middle LED (LD8) will light to indicate no magnetic field (voltage output of Vdd/2). An LM3914 is used for indicating strength of linear output of RR111-1DC2-331 sensor. The operation of this sensor can be demonstrated by moving the North of South pole of the magnet towards the sensor in the direction of the magnet. Alternatively, it can be demonstrated by rotating the ring magnet in the hole adjacent to the sensor.

Holes on the TMR mix-sens Click can be used to ease the installation of rotatable magnet holders.

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A diagram showing the output response of all three sensors can be seen in the image below:

Specifications

Type	Magnetic
Applications	Applications like proximity sensing, rotary sensing, level and linearly proportional detection in medical, industrial, automotive and consumer applications
On-board modules	RR111-1DC2-331, RR121-1A23-311, RR121-3C63-311 and LM3914
Key Features	Magnetic field multi sensors and indicators low power consumption
Interface	Analog,GPIO
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V,5V

Pinout diagram

This table shows how the pinout on TMR mix-sens Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikro™ BUS			Pin	Notes
Liner Output	AN	1	AN	PWM	16	BI	Digital Bipolar Output
Digital Omnipolar Output	OMN	2	RST	INT	15	NC	
	NC	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	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

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Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
LD2	-	-	Magnetic Field Digital Omnipolar LED Indicator
LD3	-	-	Magnetic Field Digital Bipolar LED Indicator
LD4-12	-	-	Magnetic Field Linear LEDs Indicators

Software Support

We provide a library for the TMR mixsens 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 TMR mix-sens click board.

Key functions:

- uint8_t tmrmixsens_get_omnipolar (void) - Get state of the omnipolar (OMN) pin function.
- uint8_t tmrmixsens_get_bipolar (void) - Get state of the bipolar (BI) pin function.

Examples description

The application is composed of three sections :

- System Initialization - Initializes GPIO, sets RTS and CS pins as input and start to write log.
- Application Initialization - Initialization driver enables - GPIO, initializes ADC and set ADC channel.
- Application Task - (code snippet) This is a example which demonstrates the use of TMR mix-sens Click board. This examples respond to changes north or south magnetic pole and display ADC data value. Results are being sent to the Usart Terminal where you can track their changes. All data logs on usb uart for aproximetly every 1 sec.

The full application code, and ready to use projects can be found on our [LibStock](#) page.

Other mikroE Libraries used in the example:

- ADC
- 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

mikroBUS™

mikroSDK

Click board™ Catalog

Click Boards™

Downloads

TMR mix-sens click example on Libstock

LM3914 datasheet

RR111TMR datasheet

RR121TMR datasheet

TMR mix-sens click schematic