

MR Angle Click



PID: MIKROE-4634

MR Angle Click is a compact add-on board that contains a magnetoresistive sensor with an integrated amplifier. This board features the KMZ60, a high precision sensor for magnetic angle measurement with single-ended cosine and sine outputs from [NXP Semiconductors](#). The MR sensor element comes with two Wheatstone bridges for cosine and sine signals, supports functions for control circuit and signal amplification, and enables angular measurements with high accuracy by an excellent linearity and temperature drift behavior. The KMZ60 is fully automotive qualified as well as applicable for industrial and consumer applications. This Click board™ is suitable for rotor position detection for BLDC motors and Electronic Power Steering (EPS) applications, steering angle measurement, window wiper position detection, and general contactless angular measurement (e.g., throttle valves or actuators).

MR Angle 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?

MR Angle Click as its foundation uses the KMZ60, a high precision sensor for magnetic angle measurement from NXP Semiconductors. The integrated MR sensor element, a sensitive magnetic field sensor, employs the MR effect of thin-film permalloy. The sensor contains two parallel supplied Wheatstone bridges, which enclose a sensitive angle of 45 degrees. A rotating magnetic field in the surface parallel to the chip (x-y plane) will deliver two independent sinusoidal output signals, one following a cosine and the second following a sine function. It also comes with a Power-Down mode to enable or disable the device and a possibility for the temperature coefficient of the sensor amplitude to be compensated.

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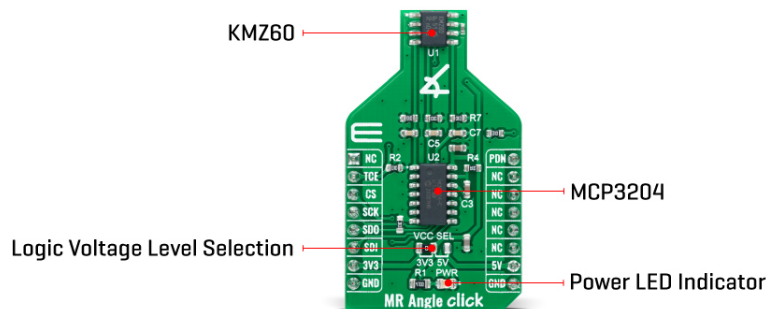
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MR Angle Click communicates with MCU through the SPI serial interface using the [MCP3204](#), a 12-bit 4-channel A/D converter from Microchip. The output sine and cosine signals from the KMZ60 are wired as pseudo-differential input signals to the MCP3204. The MCP3204 samples both channels of the sensor simultaneously using an SPI interface, allowing access to both channels on one data line. Besides, it possesses additional functionality routed on two GPIO pins, such as Power-Down mode and temperature compensation.

The KMZ60 can be used as specified with temperature compensation of the MR sensor signal. Pin TCE is used to enable the temperature compensation, routed on the RST pin of the mikroBUS™ socket (connected to the ground if no temperature compensation is required). The output signal amplitude will decrease with increasing temperature related to the temperature compensation of the MR sensor. The Power-Down feature labeled as PDN and routed on the PWM pin of the mikroBUS™ socket switches the device into Power-Down mode and sets the sine and cosine outputs in a high impedance state to avoid current consumption.

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

Specifications

Type	Magnetic
Applications	Can be used for rotor position detection for BLDC motors and Electronic Power Steering (EPS) applications, steering angle measurement, window wiper position detection, and general contactless angular measurement (e.g., throttle valves or actuators).
On-board modules	KMZ60 - high precision sensor for magnetic angle measurement from NXP Semiconductors
Key Features	High precision sensor for magnetic angle measurement, temperature compensated output signal amplitude, Power-Down mode to

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	enable or disable the device, integrated instrumentation amplifier, fully automotive qualified, and more.
Interface	SPI
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 MR Angle Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
	NC	1	AN	PWM	16	PDN	Power-Down Mode
Temperature Compensation	TCE	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	
SPI Data IN	SDI	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	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V

MR Angle Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Rotation Angle	0	-	360	deg
Resolution	-	12	-	bits
Operating Temperature Range	-40	+25	+85	°C

Software Support

We provide a library for the MR Angle 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

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Manager(recommended way), downloaded from our [LibStock™](#) or found on [mikroE github account](#).

Library Description

This library contains API for MR Angle Click driver.

Key functions:

- `mrangle_cfg_setup` - Config Object Initialization function.
- `mrangle_init` - Initialization function.
- `mrangle_default_cfg` - Click Default Configuration function.

Examples description

This library contains API for the MR Angle Click driver. This demo application shows an example of angle measurement.

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.MrAngle

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](#)

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[Click boards™](#)

Downloads

[MR Angle click 2D and 3D files](#)

[MCP3204 datasheet](#)

[KMZ60 datasheet](#)

[MR Angle click schematic](#)

[MR Angle click example on Libstock](#)

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