

Inclinometer Click



PID: MIKROE-4753

Inclinometer Click is a compact add-on board that offers best-in-class characteristics for inclination measurements. This board features the SCL3300, a high-performance inclinometer sensor component from Murata. The SCL3300 is a three-axis inclinometer sensor designed and manufactured for high stability, reliability, and quality requirements with angle output based on Murata's proven capacitive 3D-MEMS technology. Signal processing is performed in a mixed-signal ASIC with a flexible SPI digital interface. This Click board™ is suitable for applications demanding high stability with demanding environmental requirements such as tilt sensing, machine control, inertial measurement units, positioning and guidance systems, and many more.

Inclinometer 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?

Inclinometer Click as its foundation uses the SCL3300, a high-performance best-in-class inclinometer sensor component from Murata. The SCL3300 includes an acceleration sensing element that consists of four acceleration-sensitive masses and an Application-Specific Integrated Circuit (ASIC). The sensing elements are manufactured using the Murata proprietary High Aspect Ratio (HAR) 3D-MEMS process, making extraordinarily stable and low noise capacitive sensors. Acceleration causes capacitance change that is converted into a voltage change in the signal conditioning ASIC. The SCL3300 has extremely stable output over a wide range of temperatures and vibrations.

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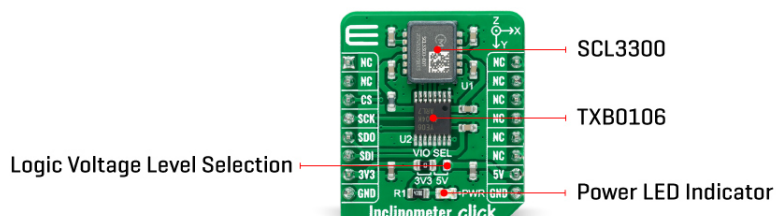
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Inclination measurement of SCL3300 is based on the angle measurements between the component and the gravity vector in a static environment. Note that no other accelerations should be present to measure angles correctly. The SCL3300 has four user-selectable measurement modes for sensor performance optimization for different applications and their requirements. Suppose the whole 360° operation is needed. In that case, the user should select either Mode 1 or Mode 2, where the limitations regarding the maximum inclination angle don't exist (inclination ranges are limited in Mode 3 and Mode 4 to maximum $\pm 10^\circ$ inclination).

The SCL3300 communicates with MCU using the standard SPI serial interface with a maximum frequency of 4MHz, and a proper logic voltage level conversion performed by the appropriate voltage level translator. The VIO logic level provides a needed reference voltage for one side of the [TXB0106](#), a 6-bit bidirectional level shifting, and a voltage translator with automatic direction sensing from Texas Instruments. On another side of the level shifter, the reference voltage is taken from the 3.3V mikroBUS™ power rail.

This Click board™ can operate with both 3.3V and 5V logic voltage levels selected via the VIO SEL jumper. This way, it is allowed for both 3.3V and 5V capable MCUs to use the SPI communication lines properly. 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	Motion
Applications	Can be used for applications demanding high stability with demanding environmental requirements such as tilt sensing, machine control, inertial measurement units, positioning and guidance systems, and many more
On-board modules	SCL3300 - high-performance best-in-class inclinometer sensor component from Murata
Key Features	Low power consumption, 3-axis inclinometer, selectable measurement modes, ultra-low noise density, excellent offset stability, high accuracy, and more

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Interface	SPI
ClickID	No
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Input Voltage	3.3V or 5V

Pinout diagram

This table shows how the pinout on Inclinator 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	
	NC	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

Inclinometer Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Measurement Range (Mode 1-2/3-4)	±90 / ±10			deg
Operating Temperature Range	-40	+25	+125	°C

Software Support

We provide a library for the Inclinator 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 Inclinator Click driver.

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Key functions:

- inclinometer_cfg_setup - Config Object Initialization function.
- inclinometer_init - Initialization function.
- inclinometer_default_cfg - Click Default Configuration function.

Examples description

This example showcases ability of device to configure it for resolution and read Axis/Angle/Temperature data.

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.Inclinometer

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

[SCL3300 datasheet](#)

[Inclinometer click 2D and 3D files](#)

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[Inclinometer click schematic](#)

[TXB0106 datasheet](#)

[Inclinometer click example on Libstock](#)

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