

## 6DOF IMU 8 Click



PID: MIKROE-3447

**6DOF IMU 8 click** is an advanced 6-axis motion tracking Click board™, which utilizes the ISM330DLC, a high-performance System in Package (SiP), equipped with a 3-axis gyroscope, and a 3-axis accelerometer. A combination of the two most commonly used motion sensors allows for full 6D sensing. Tailored towards the industry application, the ISM330DLC is equipped with many smart features used to optimize the firmware and the power consumption. These features include a powerful interrupt engine capable of detecting several different events, 4K of FIFO buffer, configurable signal processing, and support for both I2C and SPI communication interfaces.

6DOF IMU 8 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.

The ISM330DLC is produced using well-proven microelectromechanical sensor (MEMS) manufacturing processes, along with the CMOS technologies that allow a high integration scale on a wafer level, providing good component matching and improved stability. These features allow 6DOF IMU 8 click to be used for development of different types of motion-based applications, including industrial, IoT, and connected devices, robotics, drones, antenna alignment applications, optical image stabilization, and similar Industry-related applications.

### How does it work?

6DOF IMU 8 click is based on the [ISM330DLC](#), a 3D accelerometer and 3D gyroscope with digital output for industrial applications, produced by [STMicroelectronics](#). It is an advanced inertial module from iNEMO series, featuring an integrated microelectromechanical gyroscope

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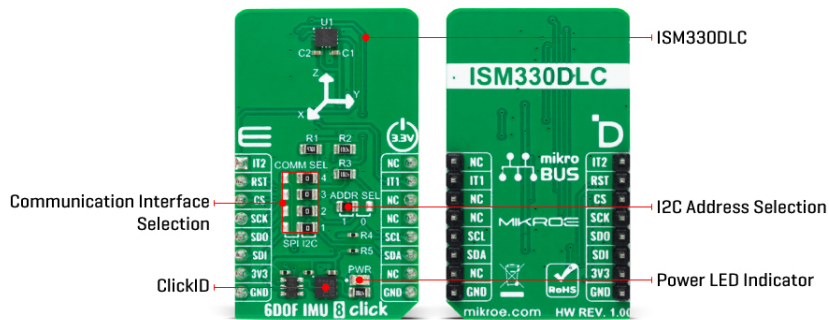


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and an accelerometer sensor (MEMS) within the same package. This device is designed with industry cases in mind, and produced using well-proven CMOS and MEMS fabrication processes, providing a high integration scale on a wafer level. This allows for a very good matching between the IC and the MEMS, offering very good robustness, mechanical shock immunity, and improved stability.



Three-axis gyroscope MEMS can be programmed to measure the rotation about each axis, in five different ranges of angular speed (degrees per angle, dps):  $\pm 125$ ,  $\pm 250$ ,  $\pm 500$ ,  $\pm 1000$ , and  $\pm 2000$ . Three-axis accelerometer MEMS can be programmed to measure the acceleration along each axis, in four different acceleration ranges:  $\pm 2g$ ,  $\pm 4g$ ,  $\pm 8g$ , and  $\pm 16g$ . The developer can select an optimal range for both properties, depending on the application requirements.

The ISM330DLC incorporates a powerful programmable interrupt engine with two dedicated interrupt pins. The interrupt engine can detect many different events, including free-fall, wakeup, 6D orientation, tap, and double-tap events, activity and inactivity recognition, as well as a tilt detection with two configurable event detection options: an average window and an average threshold. The function of these two interrupt pins is not limited to these events. They can also be used for FIFO buffer-related events, such as a buffer is full, the buffer is empty, watermark level is reached, and the buffer is overrun. Data Ready event can also be signaled for each of the two sensors (gyro and accel). The INT 1 pin is routed to the mikroBUS™ INT pin, while the INT 2 pin is routed to the mikroBUS™ AN pin. These pins are labeled as IT1 and IT2 on the Click board™, respectively.

A FIFO buffer helps to reduce the communication bus traffic, processing load, and the power consumption, offering temporary storage for the output data. The ISM330DLC features a smart FIFO buffer with the capacity of 4096 bytes, which can be set to work in five different modes. The FIFO buffer is highly configurable. It is possible to select the data to be stored from several sources (gyroscope, accelerometer, timestamp, temperature...). As already discussed, the FIFO buffer itself can trigger interrupt for several events, alerting the host MCU about its status.

6DOF IMU 8 click supports both SPI and I2C communication interfaces, allowing it to be used with a wide range of different MCUs. The communication interface can be selected by moving SMD jumpers grouped under the COM SEL to an appropriate position (SPI or I2C). The slave I2C address can also be configured by an SMD jumper when the Click board™ is operated in the I2C mode an SMD jumper labeled as ADD LSB is used to set the least significant bit (LSB) of the I2C address. When set to 1, the 7-bit I2C slave address becomes 0b1101011x. If set to 0, the address becomes 0b1101010x. The last digit (x) is the R/W bit.

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This Click Board™ uses both I2C and SPI communication interfaces. It is designed to be operated only with up to 3.3V logic levels. Proper conversion of logic voltage levels should be applied, before the Click board™ is used with MCUs operated at 5V.

## Specifications

Type	Motion
Applications	6DOF IMU 8 click can be used for development of different types of motion-based applications, including industrial, IoT, and connected devices, robotics, drones, antenna alignment applications, optical image stabilization, and similar Industry-related applications.
On-board modules	ISM330DLC, a 3D accelerometer and 3D gyroscope with digital output for industrial applications, produced by STMicroelectronics.
Key Features	Extensive interrupt engine that can be used to signal a number of recognizable events over two dedicated interrupt pins, high robustness and reliability suitable for industrial use, fully configurable options, two independent sensors allow full 6D sensing...
Interface	I2C,SPI
Feature	ClickID Manifest,No ClickID
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 **6DOF IMU 8 click** corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
Interrupt	<b>IT2</b>	1	AN	PWM	16	NC	
ID SEL	<b>RST</b>	2	RST	INT	15	<b>IT1</b>	Interrupt
SPI Select / ID COMM	<b>CS</b>	3	CS	RX	14	NC	
SPI Clock	<b>SCK</b>	4	SCK	TX	13	NC	
SPI Data OUT	<b>SDO</b>	5	MISO	SCL	12	<b>SCL</b>	I2C Clock
SPI Data IN	<b>SDI</b>	6	MOSI	SDA	11	<b>SDA</b>	I2C Data
Power Supply	<b>3.3V</b>	7	3.3V	5V	10	NC	
Ground	<b>GND</b>	8	GND	GND	9	<b>GND</b>	Ground

## Onboard settings and indicators

Label	Name	Default	Description
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LD1	PWR	-	Power LED indicator
JP1	ADD LSB	Left	Slave I2C address LSB selection: left position 1, right position 0
JP2-JP5	COM SEL	Right	Communication interface selection: left position SPI, right position I2C

## Software support

We provide a library for the **6DOF IMU 8 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 performs a control of the 6DOF IMU 8 Click board, which is able to measure the accelerometer, gyroscope, temperature and magnetometer axis data. The full scale range and data rate are adjustable for each measurement. 6DOF IMU 8 Click board has two serial interface, SPI and I2C. There is also a more others settings and configurations which the user can use to set a device for the desired operation mode. For more details check documentation.

Key functions:

- void c6dofimu8\_getData( T\_c6dofimu8\_axis \*accelOut, T\_c6dofimu8\_axis \*gyroOut, int8\_t \*tempOut ) - Function performs a data reading and all necessary calculations to get accelerometer, gyroscope and temperature data.
- T\_C6DOFIMU8\_RETVAL c6dofimu8\_setFSR( uint8\_t gyro\_fsr, uint8\_t accel\_fsr ) - Function selects a measurement full scale range.
- T\_C6DOFIMU8\_RETVAL c6dofimu8\_setODR( uint8\_t gyro\_odr, uint8\_t accel\_odr ) - Function selects a measurement output data rate.

## Examples description

The application is composed of the three sections :

- System Initialization - Initializes peripherals and pins.
- Application Initialization - Initializes SPI interface and performs a device software reset and configuration.
- Application Task - (code snippet) - Waits until any new data is entered to the data registers and then reads the accelerometer, gyroscope and temperature data which will be converted and calculated to the properly units every 300ms.

Additional Functions :

- floatCut - Makes to float values be rounded on two decimal places.
- logAxis - Logs a axis values for the desired measured data on the uart terminal.

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

Other mikroE Libraries used in the example:

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- I2C
- UART
- SPI

## 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

[6DOF IMU 8 click example on Libstock](#)

[6DOF IMU 8 click schematic v100](#)

[ISM330DLC datasheet](#)

[6DOF IMU 8 click 2D and 3D files v100](#)

[6DOF IMU 8 click 2D and 3D files v101](#)

[6DOF IMU 8 click schematic v101](#)

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