

## 6DOF IMU 6 Click



PID: MIKROE-4044

**6DOF IMU 6 Click** features a 6-axis MotionTracking device that combines a 3-axis gyroscope, a 3-axis accelerometer, and a Digital Motion Processor™ (DMP) labeled as ICM-20689. The [ICM-20689](#) from company [TDK InvenSense](#) includes on-chip 16-bit ADCs, programmable digital filters, an embedded temperature sensor, and programmable interrupts. The gyroscope and accelerometer are full-scale range, user-programmable sensors with factory-calibrated initial sensitivity for reduced production-line calibration requirements.

6DOF IMU 6 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?

The 6DOF IMU 6 click uses ICM-20689, a 6-axis MotionTracking device that combines a 3-axis gyroscope, a 3-axis accelerometer, and a Digital Motion Processor™ (DMP) in a small 4x4x0.9mm (24-pin QFN) package. It also features a 4 Kbyte FIFO that can lower the traffic on the serial bus interface, and reduce power consumption by allowing the system processor to burst read sensor data and then go into a low-power mode. The ICM-20689, with its 6-axis integration, on-chip DMP, and run-time calibration firmware, enables manufacturers to eliminate the costly and complex selection, qualification, and system level integration of discrete devices, guaranteeing optimal motion performance.

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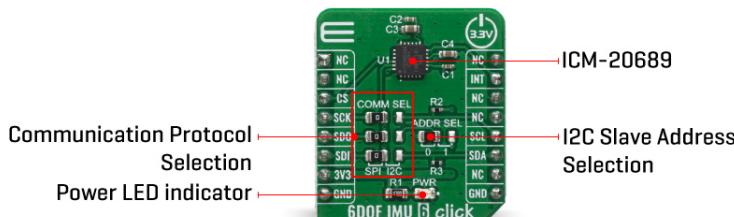
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The gyroscope has a programmable full-scale of  $\pm 250$ ,  $\pm 500$ ,  $\pm 1000$ , and  $\pm 2000$  degrees/sec. The accelerometer has a user-programmable accelerometer full-scale range of  $\pm 2g$ ,  $\pm 4g$ ,  $\pm 8g$ , and  $\pm 16g$ . Factory-calibrated initial sensitivity of both sensors reduces production-line calibration requirements. Other industry-leading features include on-chip 16-bit ADCs, programmable digital filters, an embedded temperature sensor, and programmable interrupts. The device provides high robustness by supporting 10,000g shock reliability.

The device features I2C and SPI serial interfaces, wide operating voltage range (VDD) and separate digital IO supply (VDDIO) from 1.71V to 3.45V. Communication with all registers of the device can be performed using either I2C at 400kHz or SPI at 8MHz.

6DOF IMU 6 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 SEL is used to set the least significant bit (LSB) of the I2C address.

Excellent choices for applications include mobile phones, tablets, drones, handset and portable gaming, motion-based game controllers, wearable sensors for health, fitness and sports and 3D remote controls for internet-connected DTVs and set-top boxes and 3D mice.

## Specifications

Type	Acceleration,Gyroscope,Motion
Applications	Excellent choices for applications include mobile phones, tablets, drones, handset and portable gaming, motion-based game controllers, wearable sensors for health, fitness and sports and 3D remote controls for internet-connected DTVs and set-top boxes and 3D mice
On-board modules	ICM-20689, a 6-axis MotionTracking device that combines a 3-axis gyroscope, a 3-axis accelerometer, and a Digital Motion Processor™ (DMP), from TDK InvenSense

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

Key Features	Includes on-chip 16-bit ADCs, programmable digital filters, an embedded temperature sensor, and programmable interrupts.
Interface	I2C,SPI
ClickID	No
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Input Voltage	3.3V

## Pinout diagram

This table shows how the pinout on 6DOF IMU 6 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	<b>INT</b>	Interrupt
SPI Chip Select	<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
LD1	PWR	-	Power LED Indicator
JP1-JP3	COM SEL	Left	Communication interface selection: left position SPI, right position I2C
JP4	ADD SEL	Left	Slave address LSB selection: left position 0, right position 1

## Software Support

We provide a library for the 6DOF IMU 6 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 that enables the usage of the 6DOF IMU 6 Click board. It initializes and defines the SPI and I2C bus drivers and drivers that offer a plethora of settings. The library also offers functions that allow reading of accelerometer, gyroscope and temperature, as well as generic read and write function that offer reading( and writing ) of different lenghts of data.

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## Key functions:

- float \*z\_ang\_rte ); - Function is used to calculate angular rate.
- float \*z\_accel\_rte ); - Function is used to calculate acceleration rate.
- void c6dofimu6\_def\_settings ( ); - Function is used to apply the default settings to the device.

## Examples description

The application is composed of three sections :

- System Initialization - Initializes SPI and I2C modules, LOG and GPIO structures, sets INT pin as input.
- Application Initialization - Initializes SPI and I2C drivers, performs safety check, applies default and barometer setups and writes an initial log.
- Application Task - (code snippet) Demonstrates use of 6DOF IMU 6 click board by reading angular rate, acceleration rate and displaying data via USART terminal.

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

Other mikroE Libraries used in the example:

- I2C
- 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

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click Boards™](#)

## Downloads

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[6DOF IMU 6 click example on Libstock](#)[ICM-20689 datasheet](#)[6DOF IMU 6 click 2D and 3D files](#)[6DOF IMU 6 click schematic](#)

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