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6DOF IMU 24 Click

PID: MIKROE-6420

6DOF IMU 24 Click is a compact add-on board for inertial measurement in drones, robotics, and IoT applications. This board features the ICM-40609-D, a high-performance 6-axis MEMS MotionTracking™ sensor from TDK InvenSense. This sensor integrates a 3-axis gyroscope and a 3-axis accelerometer, featuring an extended accelerometer full-scale range of ±32g, a maximum Output Data Rate (ODR) of 32kHz, and a 2KB FIFO buffer for optimized data processing and reduced power consumption. The board supports I2C and SPI communication, offers configurable interrupt signals for system event monitoring, and operates at a 3.3V logic level. With its high precision, stability across temperature variations, and efficient motion tracking capabilities, 6DOF IMU 24 Click is ideal for drones and flight controllers, robotics, and IoT solutions requiring accurate motion sensing and real-time data acquisition.

For more information about **6DOF IMU 24 Click** visit the official product page.

How does it work?

6DOF IMU 24 Click is based on the ICM-40609-D sensor from TDK InvenSense, specifically designed for high-performance applications in the drone market. This 6-axis MEMS MotionTracking™ device integrates a 3-axis gyroscope and a 3-axis accelerometer, offering exceptional precision and reliability even under demanding conditions. Its sophisticated architecture significantly enhances overall IMU performance, maintaining accuracy across a wide temperature range. This makes it particularly well-suited for drones and flight controllers, robotics, and IoT solutions, ensuring stability and precise control throughout extended flight durations, even when exposed to fluctuating temperatures.

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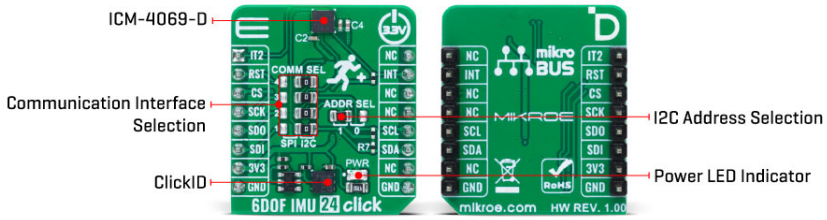

A key advantage of the ICM-40609-D is its integrated 2KB FIFO buffer, which optimizes data processing by reducing serial interface traffic. This not only minimizes power consumption but also allows the system processor to operate in low-power mode while periodically retrieving burst data. The gyroscope offers eight programmable full-scale range settings, ranging from ±15.625dps to ±2000dps, providing flexibility for different motion tracking requirements. Additionally, the accelerometer supports four full-scale ranges, spanning from ±4g to an extended ±32g, enabling precise detection of both subtle and high-impact movements.

With an impressive maximum Output Data Rate (ODR) of 32kHz, this sensor delivers the highest sampling rate available in consumer-grade devices. Such a high ODR ensures that any anomalies or inconsistencies in movement can be detected and analyzed efficiently, making it a powerful tool for flight control and navigation systems. Further emphasizing its precision, the ICM-40609-D features a gyro noise level of just 4.5mdps/√Hz, a gyro offset stability temperature coefficient of ±10mdps/°C, and an exceptionally low gyro sensitivity error of ±0.5%. The accelerometer is equally precise, with an accel noise level of 100µg/√Hz, an offset stability temperature coefficient of ±0.15mg/°C, and an accel sensitivity error of just ±0.5%.

Motion data are accessed through the I2C or SPI interface, with a maximum frequency of 1MHz for I2C and 24MHz for SPI communication. The selection is made by positioning SMD jumpers labeled COMM SEL appropriately. Note that all the jumpers' positions must be on the same side, or the Click board™ may become unresponsive. While the I2C interface is selected, the ICM-40609-D allows the least significant bit (LSB) of its I2C address to be chosen using the SMD jumper labeled ADDR SEL.

This board also possesses two interrupts, INT and IT2 entirely programmed by the user through a serial interface. These interrupt signals provide notifications about key system events, such as the clock generator locking to a new reference oscillator when switching clock sources, the availability of new data to be read from the FIFO and data registers, accelerometer event interrupts, the FIFO reaching a predefined watermark level, and FIFO overflow.

This Click board™ can be operated only with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before using MCUs with different logic levels. It also comes equipped with a library containing functions and example code that can be used as a reference for further development.

Specifications

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Type	Motion
Applications	Ideal for drones and flight controllers, robotics, and IoT solutions
On-board modules	ICM-40609-D - 6-axis MEMS MotionTracking™ device from TDK InvenSense
Key Features	Programmable 3-axis gyroscope and a 3-axis accelerometer, maximum Output Data Rate (ODR) of 32kHz, 2KB FIFO buffer for optimized data processing and reduced power consumption, I2C and SPI communication, configurable interrupt signals, enhanced accuracy over temperature variations, and more
Interface	I2C,SPI
Feature	ClickID
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 24 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

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

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	ADDR SEL	Left	I2C Address Selection 1/0: Left position 1, Right position 0
JP2-JP5	COMM SEL	Right	Communication Interface Selection SPI/I2C: Left position SPI, Right position I2C

6DOF IMU 24 Click electrical specifications

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Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Gyroscope Full-Scale Range	±15.625	-	±2000	º/s
Gyroscope Sensitivity	16.4	-	2097.2	LSB/(º/s)
Accelerometer Full-Scale Range	±4	-	±32	g
Accelerometer Sensitivity	1.024	-	8.192	LSB/g

Software Support

6DOF IMU 24 Click demo application is developed using the NECTO Studio, ensuring compatibility with mikroSDK's open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a mikroBUS™ socket.

Example Description

This example demonstrates the use of 6DOF IMU 24 Click board by reading and displaying the accelerometer and gyroscope data (X, Y, and Z axis) as well as a temperature measurement in degrees Celsius.

Key Functions

- c6dofimu24_cfg_setup Config Object Initialization function.
- c6dofimu24_init Initialization function.
- c6dofimu24_default_cfg Click Default Configuration function.
- c6dofimu24_get_int1_pin This function returns the INT1 pin logic state.
- c6dofimu24_clear_data_ready This function clears the data ready interrupt by reading the INT_STATUS register.
- c6dofimu24_read_data This function reads the accelerometer, gyroscope, and temperature measurement data.

Application Init

Initializes the driver and performs the Click default configuration.

Application Task

Waits for a data ready indication and then reads the accelerometer, gyroscope, and temperature measurements. The results are displayed on the USB UART every 80ms as per the accel and gyro output data rate which is set to 12.5 Hz.

Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following this tutorial.
- UART Terminal - Monitor data via the UART Terminal using a USB to UART converter. For detailed instructions, check out this tutorial.

Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO

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Studio Package Manager for direct installation in the NECTO Studio. The application code can also be found on the MIKROE GitHub account.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

ClickID

Downloads

6DOF IMU 24 click example package

6DOF IMU 24 click 2D and 3D files v100

ICM-40609-D datasheet

6DOF IMU 24 click schematic v100