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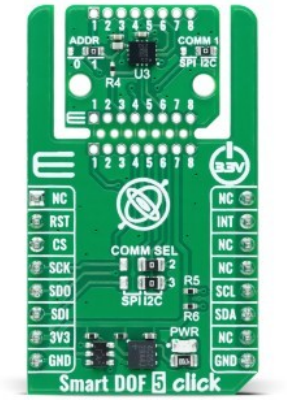
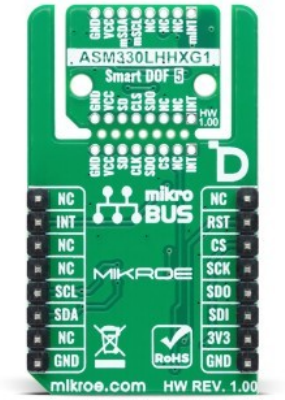
Smart DOF 5 Click





PID: MIKROE-6398

Smart DOF 5 Click is a compact add-on board designed for precise motion and orientation detection in automotive applications. This board features the ASM330LHHXG1, a high-accuracy 6-axis inertial measurement unit (IMU) from STMicroelectronics. It features a 3-axis accelerometer and a 3-axis gyroscope and supports dual operating modes (high-performance and low-power) with flexible communication options through SPI or I2C interfaces. Additionally, it includes the Click Snap format, enabling the autonomous use of the Snap section and integration of external sensors via the I2C Master interface. Ideal application cases include dead reckoning, vehicle telematics, antitheft systems, and motion-activated functionalities.

How does it work?

Smart DOF 5 Click is based on the ASM330LHHXG1, a high-accuracy 6-axis inertial measurement unit (IMU) from STMicroelectronics, designed for precise motion and orientation detection in automotive applications. Built to meet the AEC-Q100 standards, the ASM330LHHXG1 features a 3-axis digital accelerometer and a 3-axis digital gyroscope. It uses ST's proprietary micromachining technology for its sensing elements and CMOS technology for the IC interfaces. This combination ensures precise circuit matching with the sensor's characteristics, improving performance. The sensor supports dual operating modes, high-performance and low-power, catering to different use cases depending on power efficiency and data precision needs.

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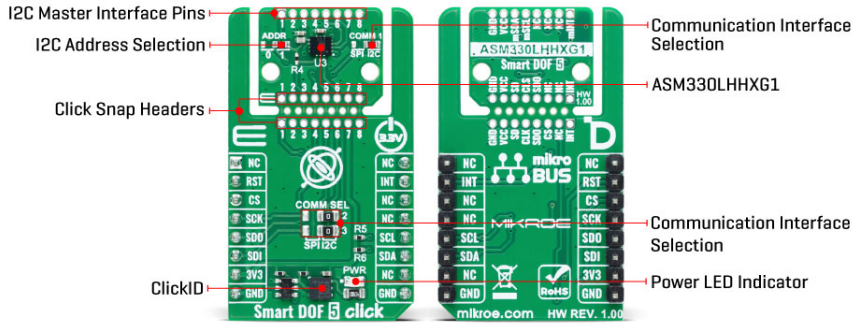

The ASM330LHHXG1 offers a flexible full-scale acceleration range of ±2/±4/±8/±16g and an extensive angular rate range of ±125/±250/±500/±1000/±2000/±4000dps. This flexibility allows the sensor to perform well in various automotive applications, including dead reckoning, telematics, vehicle-to-everything (V2X), antitheft systems, and motion-activated functionalities. The sensor is also designed for superior output stability, featuring extremely low noise and full data synchronization.

This Click board™ is designed in a unique format supporting the newly introduced MIKROE feature called "Click Snap." Unlike the standardized version of Click boards, this feature allows the main sensor area to become movable by breaking the PCB, opening up many new possibilities for implementation. Thanks to the Snap feature, the ASM330LHHXG1 can operate autonomously by accessing its signals directly on the pins marked 1-8. Additionally, the Snap part includes a specified and fixed screw hole position, enabling users to secure the Snap board in their desired location.

This board supports communication with the host MCU through either SPI (maximum clock frequency of 10MHz) or I2C (maximum clock frequency of 400kHz) interfaces, with I2C being the default option. The communication interface is selected by adjusting the COMM SEL jumper to the desired position. To enhance flexibility, particularly with the detachable Snap section of the Click Snap format, an additional COMM 1 jumper is available. This jumper functions similarly to the COMM SEL, allowing for independent communication interface selection when the Snap section is used independently. To ensure proper functionality, all COMM jumpers must be set to the same interface. For those using the I2C interface, the board also provides an ADDR jumper, enabling users to configure the I2C address as needed for their specific application.

Beyond communication, this board is also equipped with an INT pin, which acts as an event-detection interrupt, essential for reliable motion-activated features. These include hardware recognition of events such as free-fall, 6D orientation, activity and inactivity states, and wake-up triggers. In addition to the previously mentioned features, the Snap section also includes an unpopulated 8-pin header, which allows users to use the ASM330LHHXG1's I2C Master interface for controlling external sensors. This provides added flexibility by enabling the integration of additional sensor modules, making it easier to expand the board's functionality for more complex applications.

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

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levels. Also, it comes equipped with a library containing functions and an example code that can be used as a reference for further development.

Click Snap

Click Snap is an innovative feature of our standardized Click add-on boards, introducing a new level of flexibility and ease of use. This feature allows for easy detachment of the main sensor area by simply snapping the PCB along designated lines, enabling various implementation possibilities. For detailed information about Click Snap, please visit the official page dedicated to this feature.

Specifications

Type	Motion
Applications	Ideal for dead reckoning, vehicle telematics, antitheft systems, and motion-activated functionalities
On-board modules	ASM330LHHXG1 - high-accuracy 6-axis inertial measurement unit (IMU) from STMicroelectronics
Key Features	6-axis IMU, AEC-Q100 qualified, embedded machine learning core, dual operating modes, selectable communication interface, additional I2C Master interface for external sensor control, event detection, and more
Interface	I2C
Feature	Click Snap,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 Smart DOF 5 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS™				Pin	Notes
	NC	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

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Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	COMM 1	Right	Communication Interface Selection SPI/I2C: Left position SPI, Right position I2C
JP2-JP3	COMM SEL	Right	Communication Interface Selection SPI/I2C: Left position SPI, Right position I2C
JP4	ADDR SEL	Right	I2C Address Selection 0/1: Left position 0, Right position 1

Smart DOF 5 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Acceleration Measurement Range	±2	-	±16	g
Angular Rate Measurement Range	±125	-	±4000	dps
Acceleration Sensitivity	0.061	-	0.488	mg/LSB
Angular Rate Sensitivity	4.37	-	140	mdps/LSB

Software Support

We provide a library for the Smart DOF 5 Click as well as a demo application (example), developed using MIKROE compilers. The demo can run on all the main MIKROE development boards.

Package can be downloaded/installed directly from NECTO Studio Package Manager (recommended), downloaded from our LibStock™ or found on MIKROE github account.

Library Description

This library contains API for Smart DOF 5 Click driver.

Key functions

- smartdof5_get_int_pin This function returns the interrupt 1 pin logic state.
- smartdof5_get_data This function reads the accelerometer, gyroscope, and temperature measurement data.
- smartdof5_set_accel_fsr This function sets the accel measurement full scale range.

Example Description

This example demonstrates the use of Smart DOF 5 Click by reading and displaying the accelerometer and gyroscope data (X, Y, and Z axis) as well as a temperature measurement in

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degrees Celsius.

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager (recommended), downloaded from our LibStock™ or found on MIKROE github account.

Other MIKROE Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.SmartDOF5

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. UART terminal is available in all MIKROE compilers.

mikroSDK

This Click board™ is supported with mikroSDK - MIKROE 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™

ClickID

Downloads

Smart DOF 5 click example on Libstock

Smart DOF 5 click 2D and 3D files v100

ASM330LHHXG1 datasheet

Smart DOF 5 click schematic v100

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