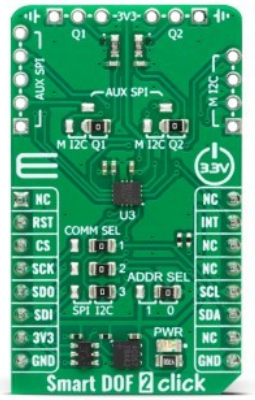
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Smart DOF 2 Click





PID: MIKROE-5672

Smart DOF 2 Click is a compact add-on board with a highly advanced integrated 6-axis IMU measurement unit. This board features the LSM6DSV16XTR, a high-performance 6-axis IMU with sensor fusion, ASC, MLC, Qvar, and OIS/EIS paths from STMicroelectronics. The IMU unit features an accelerometer and gyroscope that can be turned off independently of each other, still allowed to have different ODRs and power modes. The unit can be configured as a finite state machine (FSM), machine learning core (MLC), and Qvar sensing. This Click board™ makes the perfect solution for the development of motion tracking, and gesture detection, augmented reality, indoor navigation, IoT devices, EIS, and OIS for camera applications, and more.

Smart DOF 2 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?

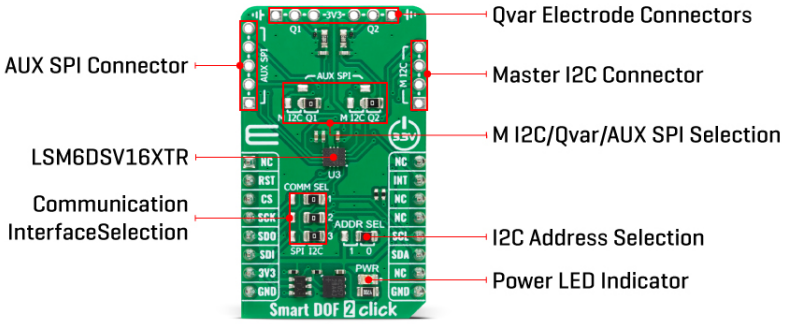
Smart DOF 2 Click is based on the LSM6DSV16XTR, a high-performance 6-axis IMU with sensor fusion, ASC, MLC, Qvar, and OIS/EIS paths from STMicroelectronics. It features a 3-axis digital accelerometer (±2/±4/±8/±16 g full scale) and a 3-axis digital gyroscope (±125/±250/±500/±1000/±2000/±4000 dps full scale) with a triple core for processing acceleration and angular rate data on three separate channels (user interface, OIS, and EIS) with dedicated configuration, processing, and filtering. It also enables processes in edge computing, thus allowing advanced features, such as FSM and MLC, as AI features for IoT applications. The list continues with embedded temperature sensors, advanced pedometers, step detection, and tilt detection, thus making this sensor a truly smart device.

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The LSM6DSV16XTR operates in several modes. Accelerometer power modes consist of five different modes that affect the unit's performance. Accelerometer dual-channel mode can work with two different scales simultaneously. Gyroscope power modes consist of five modes too, which lets you choose between high performance, high accuracy, and sleep. The list continues with ODR-triggered mode, analog hub functionality, Qvar functionality, enhanced EIS, OIS, and more. The unit also is equipped with embedded 1.5KB of data in FIFO, with up to 4.5KB with the compression feature enabled. The FIFO allows you to store data about the gyroscope, accelerometer, external sensors, sleep counter, temperature, and more.

Smart DOF 2 Click allows selection between I2C or SPI interface at a maximum frequency of 1MHz for I2C and 10MHz for SPI communication. Selection is made by positioning the three SMD jumpers labeled COMM SEL to the appropriate position, with I2C selected by default. The I2C address can be selected via the ADDR SEL jumper, with the jumper positioned on 0 by default. The INT pin on the mikroBUS™ socket is a programmable interrupt pin that generates an interrupt on status events, such as free fall, wake-up, 6D orientation, click or double-click, motion, and more.

The LSM6DSV16XTR also offers flexible connection pins with three modes of functionality. Using two three-position jumpers, you can choose between Qvar, Master I2C, and Aux SPI functionalities. The unit has an interface for two Qvar (electrostatic sensor) electrodes for user interface functions, such as tap, double tap, triple tap, long press, swipe, and more. Those two electrodes can be attached to Q1 and Q2 headers, positioned at the top of the board. On the left from the three-position jumpers is an AUX SPI header allowing accelerometer and gyroscope data to be available for OIS applications (camera module, for example). On the right side of the board, there is an M I2C header for connecting external sensors (up to 4), with an additional interrupt INT2 pin, besides standard 2-Wire interface lines SCL, SDA, and GND.

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

Specifications

Type	Acceleration,Gyroscope,Motion
Applications	Can be used for the development of motion tracking, and gesture detection, augmented

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	reality, indoor navigation, IoT devices, EIS, and OIS for camera applications, and more
On-board modules	LSM6DSV16XTR - high-performance 6-axis IMU from STMicroelectronics
Key Features	Triple core for UI, EIS, and OIS data processing, power consumption for both accelerometer and gyroscope, smart FIFO up to 4.5KB, selectable interface, auxiliary SPI for OIS data output for gyroscope and accelerometer, machine learning core with exportable features and filters for AI applications, embedded sensor fusion, ASC, MLC, Qvar, OIS/EIS paths, and more
Interface	I2C,SPI
ClickID	Yes
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 2 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	
	NC	2	RST	INT	15	**INT**	Interrupt
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	**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, JP2	M I2C/Q1,Q2/AUX SPI	Right	M I2C/Qvar/AUX SPI Functionality Selection: Left position M I2C, Right position Qvar, Upper position AUX SPI
COMM SEL 1-3	COMM SEL	Right	Communication Interface Selection SPI/I2C: Left position SPI, Right position I2C

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JP3	ADDR SEL	Left	I2C Address Selection 1/0: Left position 1, Right position 0

Smart DOF 2 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Acceleration Range	±2	-	±16	g
Angular Rate	±125	-	±4000	dps
Acceleration Sensitivity	0.061	-	0.488	mg/LSB
Angular Sensitivity	4.375	-	140	mdps/LSB
Qvar Gain	-	75	-	LSB/mV

Software Support

We provide a library for the Smart DOF 2 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 2 Click driver.

Key functions

- smartdof2_get_acc_axis Smart DOF 2 get accel sensor axes function.
- smartdof2_get_gyro_axis Smart DOF 2 get gyro sensor axes function.
- smartdof2_get_temperature Smart DOF 2 get temperature function.

Example Description

This library contains API for Smart DOF 2 Click driver. The library initializes and defines the I2C or SPI bus drivers to write and read data from registers. The library also includes a function for reading accelerometer and gyroscope X-axis, Y-axis, and Z-axis data and the temperature in 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.SmartDOF2

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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 2 click example on Libstock

Smart DOF 2 click 2D and 3D files

Smart DOF 2 click schematic

LSM6DSV16X datasheet

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