MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
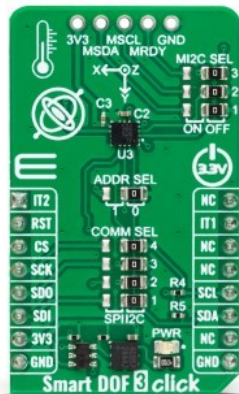www.mikroe.com

Smart DOF 3 Click

PID: MIKROE-5734

Smart DOF 3 Click is a compact add-on board with a highly advanced integrated system-in-package (SIP) accelerometer and gyroscope sensors. This board features the ISM330IS, an iNEMO inertial module from STMicroelectronics. The inertial module consists of an always-on 3-axis accelerometer and 3-axis gyroscope with ISPU (intelligent sensor processing unit). In addition, the ISM330IS can be configured to allow connection with external I2C sensors. This Click board™ makes the perfect solution for the development of industrial robots, asset tracking, anomaly detection and condition monitoring, event detection in alarms and smart homes, and more.

Smart DOF 3 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 3 Click is based on the ISM330IS, an iNEMO inertial module from STMicroelectronics. There are three modes of operation in which both the accelerometer and gyroscope can be turned on/off independently of each other and are allowed to have different ODRs and power modes. It has a full-scale 3-axis selectable acceleration in a range of ±2/±4/±8/±16g. There are also self-test modes, both angular and linear, for acceleration. The 3-axis gyroscope comes in a selectable full-scale rate range of ±125/±250/±500/±1000/±2000dps. In addition to those two sensors, the third one is an embedded temperature sensor, which values are used for calibration purposes.

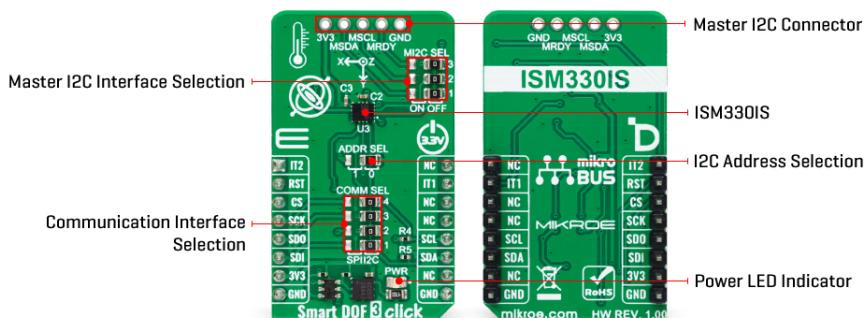Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.

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

The ISPU core executes signal processing and AI algorithms on edge, and its main benefits are C programming and an enhanced ecosystem with libraries and third-party tools/IDE. The ISPU has 32KB of program RAM, 8KB of data RAM, and an FPU supporting addition, subtraction, and multiplication. It also features programmable interrupts and an embedded sensor hub, which, besides an accelerometer and gyroscope, includes four more external sensors that can be connected directly to the ISM330IS and its internal master I2C lines. This I2C interface can connect over the 5-pin top header, which includes master SDA, SCL, and Ready pins (MSDA, MSCL, MRDY). To use this I2C interface, you must set all three MI2C SEL jumpers in the ON position (OFF set by default).

Smart DOF 3 Click can communicate with the host MCU by selecting one between the I2C and SPI interfaces over the COMM SEL jumper, where the I2C is selected by default. All four jumpers must be set into the appropriate position for this Click board™ to work properly. The standard 2-Wire I2C interface supports fast mode (400KHz) and fast mode plus (1MHz) clock frequencies. The I2C address can be selected over the ADDR SEL jumper, where 0 is set by default. If your choice is the SPI, this Click board™ supports both 3- and 4-Wire SPI serial interfaces with clock frequencies up to 100MHz.

This Click board™ can be reset over the RST pin. There are also two programmable interrupt pins, IT1 and IT2. The IT2 is a shared pin with the master I2C interface, so this interrupt pin will not be available if you use an external sensor. You can assign one of the interrupts to a different sensor so you know which sensor detected the movement.

Depending on the usage of the ISM330IS, there are two mode connections. Both Mode 1 and Mode 2 can work in all supported types of communication between the IC and the host MCU. Mode 1 is the scene when only this IC and the host MCU are in communication connection. Mode 2 is the scene where in addition to the Mode 1 connection, there are external sensors connected over the master I2C to the ISM330IS.

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. This 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

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Applications	Can be used for the development of industrial robots, asset tracking, anomaly detection and condition monitoring, event detection in alarms and smart homes, and more
On-board modules	ISM330IS - iNEMO inertial module from STMicroelectronics
Key Features	3-axis accelerometer, 3-axis gyroscope, temperature sensor, up to four external sensors over the master I2C interface, low power consumption, intelligent sensor processor unit (ISPU), sensor hub, low noise, 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 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikro™ BUS				Pin	Notes
Interrupt 2	IT2	1	AN	PWM	16	NC	
Reset	RST	2	RST	INT	15	INT1	Interrupt 1
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-JP3	MI2C SEL	Right	Master I2C interface Selection ON/OFF: Left position ON, Right position OFF
JP4-JP7	COMM SEL	Right	Communication Interface Selection SPI/I2C: Left position SPI, Right position I2C
JP8	ADDR SEL	Right	I2C Address Selection 1/0: Left position 1, Right position 0

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Smart DOF 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Acceleration Range	±2	-	±16	g
Angular Rate	±125	-	±2000	dps
Angular Rate Sensitivity	4.375	-	70	mdps/LSB
Linear Acceleration Sensitivity	0.061	-	0.188	mg/LSB

Software Support

We provide a library for the Smart DOF 3 Click as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika 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 3 Click driver.

Key functions

- smartdof3_get_acc_axis Smart DOF 3 get the accel sensor axes function.

- smartdof3_get_gyro_axis Smart DOF 3 get the gyro sensor axes function.

- smartdof3_get_temperature Smart DOF 3 get the temperature function.

Example Description

This library contains API for Smart DOF 3 Click driver. The library initializes and defines the I2C and SPI bus drivers to write and read data from registers, as well as the default configuration for reading accelerator and gyroscope data.

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.SmartDOF3

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

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interface available on the board. UART terminal is available in all MikroElektronika compilers.

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™

ClickID

Downloads

Smart DOF 3 click example on Libstock

Smart DOF 3 click 2D and 3D files

ISM330IS datasheet

Smart DOF 3 click schematic