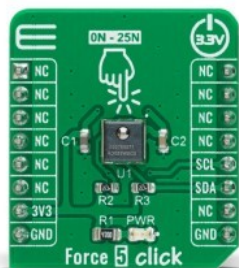# Force 5 Click

PID: MIKROE-4305

Force 5 Click is a compact add-on board that contains a stable and flexible compensated/amplified micro force sensor. This board features the FMAMSDXX025WC2C3, a piezoresistive-based force sensors offering a digital output for reading force over the specified full-scale force span and a temperature range from Honeywell Sensing and Productivity Solutions. The very stable digital output that is directly proportional to the force applied to the mechanically-coupled sphere, enhanced accuracy, and reduced total error band that enhances system performance are just some of the good features that this sensor has. This Click board™ is suitable for industrial applications such as force/grip measuring equipment, load and compression sensing, robotics, and more.

Force 5 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?

Force 5 Click is based on the FMAMSDXX025WC2C3, a piezoresistive-based force sensor offering a digital output for reading force over the specified full-scale force span and a temperature range from Honeywell Sensing and Productivity Solutions. This sensor belongs to the group the FMA Series designed to meet the user's need for a compensated, amplified force sensor which provides digital outputs, a variety of force sensing ranges, a small, cost-effective format, and enhanced durability and accuracy.

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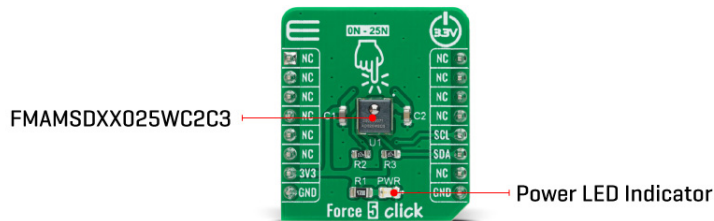
The flexible design of the FMAMSDXX025WC2C3 operates over a wide operating temperature range. It has a force range of 25 newtons that maximizes sensitivity and improve system resolution/performance, enhanced accuracy which includes all errors due to force non-linearity and non-repeatability, and diagnostic functions which allow the user to determine if the sensor is working correctly by detecting if electrical paths are broken or shorted inside the sensor. This Click board™ offers a very stable digital output that is directly proportional to the force applied to the mechanically-coupled sphere that enhances performance through reduced conversion requirements and the convenience of a direct interface to MCU.

Force 5 Click communicates with MCU using the standard I2C 2-Wire interface with a maximum frequency of 400kHz. This Click board™ is easy to program because it does not require an overly demanding configuration. The code example that MikroE provides to its users consists of calibrating the sensor and displaying the diagnostic status (whether the sensor is in Normal operation, Command mode, or Stale mode). After successful calibration, the force and temperature are measured, after which the digital output data are displayed every 500 ms.

This Click board™ is designed to be operated only with a 3.3V logic voltage level. A proper logic voltage level conversion should be performed before the Click board™ is used with MCUs with different logic levels. However, the Click board™ comes equipped with a library that contains easy to use functions and an example code that can be used as a reference for further development.

Specifications

Type	Force
Applications	Can be used for industrial applications such as force/grip measuring equipment, load and compression sensing, robotics, and more.
On-board modules	Force 5 is based on the FMAMSDXX025WC2C3, a piezoresistive-based force sensor offering a digital output for reading force over the specified full-scale force span and a temperature range from Honeywell Sensing and Productivity Solutions.
Key Features	Low power consumption, stable digital output, enhanced durability and accuracy, reduced

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	total error band, and more.
Interface	I2C
Feature	No 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 Force 5 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	NC	
	NC	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	**SCL**	I2C Clock
	NC	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

Force 5 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3	3.3	3.6	V
Force Range	0	-	2.5	N
Output Resolution	12	-	-	bits
Accuracy	-	±2	-	%FSS
Operating Temperature Range	-40	-	+85	°C

Software Support

We provide a library for the Force 5 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 to control Force 5 Click board. Library performs a standard I2C interface communication.

Key functions:

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- void force5_read_all_data (force5_data_t *force_data) - Read all data function.
- float force5_get_force (force5_calibration_t calib_data) - Get force function.
- float force5_get_temperature (void) - Get temperature function.

Examples description

The application is composed of three sections :

- The application is composed of three sections :
- Application Initialization - Initialization driver enables - I2C, calibration the device, display diagnostic states and temperature.
- Application Task - (code snippet) This is an example that demonstrates the use of the Force 5 Click board. Force 5 Click board can be used to measure digital output force (N). All data logs write on USB uart changes every 500 milliseconds.

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

Other mikroE Libraries used in the example:

- I2C
- 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

Force 5 click 2D and 3D files

FMAMSDXX025WC2C3 datasheet

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[Force 5 click example on Libstock](#)

[Force 5 click schematic](#)

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