

Time-saving embedded tools

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







PID: MIKROE-4193

**Force 4 Click** is based on <u>HSFPAR003A</u> piezoresistive force sensor from <u>Alpsalpine</u>. This product is a force sensor using the effect of a piezoresistive bridge circuit formed on silicon diaphragm. Piezoresistive force sensors achieve higher linearity than other force sensors. To help with stability and accuracy Force 4 Click also includes MCP1101-33 a high precision buffered voltage reference as a power supply to a force sensor that allows high stability and accuracy of output voltage readings.

Force 4 Click board<sup>m</sup> is supported by a mikroSDK compliant library, which includes functions that simplify software development. This Click board<sup>m</sup> comes as a fully tested product, ready to be used on a system equipped with the mikroBUS<sup>m</sup> socket.

## How does it work?

Force 4 Click work in the same way as our air (atmospheric) pressure sensors, using the piezoresistive method. They detect loads (force) with a piezoresistive element manufactured using MEMS processes. Force sensors differ from air pressure sensors in that they have a thicker diaphragm, allowing detection of only relatively large changes in pressure, like from loads, while very subtle fluctuations, such as changes in air pressure, do not affect the output.

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.





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



Force 4 Click utilizes an additional IC. It uses the MCP3221, a 12-bit successive approximation A/D converter (ADC) with I2C Interface, from Microchip. It is used to sample the output voltage from the sensor, providing data for the microcontroller (MCU) or some other device capable of communicating over the I2C bus. The voltage is sampled to a 12-bit value using the MCP1101-33 as the voltage reference.

If analog voltage is preferred to be red directly by the MCU, it can be easily done by adding 0 ohm resistor on J1 marked position on PCB, and the sensor output voltage will be available for reading on AN pin of mikroBUS<sup>TM</sup>.



Force 4 Click features the smallest force sensors in the industry with dimensions compact enough which makes it a perfect solution for developing a fine-diameter stylus pen.

# Specifications

Туре	Force
Applications	Fine-diameter stylus pen evelopment, load and compression sensing, variable tension control and many more
On-board modules	HSFPAR003A
Key Features	High sensitivity and good linearity, precisely detect micro force less than 0.01 N. no characteristics change after 1 million cycles
Interface	Analog,I2C

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.





Time-saving embedded tools

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

Feature	No ClickID
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Input Voltage	3.3V,5V

# **Pinout diagram**

This table shows how the pinout on Force 4 Click corresponds to the pinout on the mikroBUS<sup>m</sup> socket (the latter shown in the two middle columns).

Notes	Pin	● ● mikro™ ● ● ● BUS			n <del>u</del>	Pin	Notes
Analog	AN	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	5V	Power Supply
Ground	GND	8	GND	GND	9	GND	Ground

## **Onboard settings and indicators**

Label	Name	Default	Description
PWR	LD1	-	Power LED Indicator
J1	-	NP	Jumper for direct analog voltage reading from sensor

## Software Support

We provide a library for the Force 4 Click on our <u>LibStock</u> page, as well as a demo application (example), developed using MikroElektronika <u>compilers</u>. The demo can run on all the main MikroElektronika <u>development boards</u>.

#### Library Description

Library provides function for reading raw ADC data from device.

Key functions:

• uint16\_t force4\_read\_adc( void ) - Reading raw 12 bit ADC data

#### **Examples description**

The application is composed of three sections :

- System Initialization Initialization of I2C communication
- Application Initialization Mapping pins on selected MIKROBUS

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.





Time-saving embedded tools

• Application Task - Every 100ms read 12bit adc value from dev

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

Other mikroE Libraries used in the example:

- Conversions
- I2C
- UART

#### Additional notes and informations

Depending on the development board you are using, you may need <u>USB UART click</u>, <u>USB UART</u> <u>2 click</u> or <u>RS232 click</u> to connect to your PC, for development systems with no UART to USB interface available on the board. The terminal available in all MikroElektronika <u>compilers</u>, or any other terminal application of your choice, can be used to read the message.

## mikroSDK

This Click board<sup>m</sup> is supported with <u>mikroSDK</u> - MikroElektronika Software Development Kit. To ensure proper operation of mikroSDK compliant Click board<sup>m</sup> demo applications, mikroSDK should be downloaded from the <u>LibStock</u> and installed for the compiler you are using.

For more information about mikroSDK, visit the official page.

#### Resources

<u>mikroBUS</u>™

**mikroSDK** 

Click board<sup>™</sup> Catalog

Click boards<sup>™</sup>

## **Downloads**

Force 4 click 2D and 3D files

HSFPAR003A datasheet

Force 4 click schematic

Force 4 click example on Libstock

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.



# **Mouser Electronics**

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Mikroe:

MIKROE-4193