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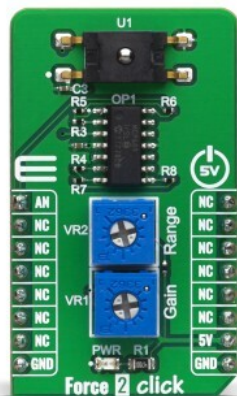Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
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Force 2 Click

PID: MIKROE-4046

Force 2 Click is a mikroBUS™ add-on board with circuitry for implementing Honeywell's FSS1500NGT Series force sensors into your projects (with a single zone force sensing resistor included with the click). This Click board™ utilizes FSS1500NGT force sensor which is designed to be one of the most reliable force sensor available as illustrated by 20 million Mean Cycles to Failure (MCTF) at 25 °C [77 °F] rating. This low profile Surface Mount Technology (SMT) sensor allows for automated assembly on a printed circuit board, often helping the customer to reduce assembly costs, while maintainging precise and reliable force sensing performance in a compact commercial-grade package.

Force 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?

The FSS1500NGT force sensor incorporates Honeywell sensing technology that uses a specialized piezoresistive micromachined silicon sensing element. The low power, unamplified, uncompensated Wheatstone bridge circuit design provides inherently stable mV output over the force range. The sensor package design incorporates patented modular construction. The use of innovative elastomeric technology and engineered molded plastics results in load excitation capacities up to 60 N (range dependent). The stainless steel ball provides excellent mechanical stability, and is suitable for a variety of potential medical and commercial applications.

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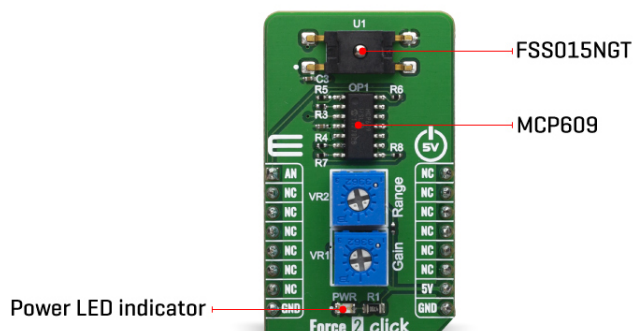
Force 2 Click also contains all the needed circuitry, required to get precise measurements from the sensor. It includes four operational amplifiers in total, forming one differential amplifier, with voltage adder, which can be used to set the measurement range. Gain setting is also available, in order to enable user to easily set this click board according to various needs. Range and gain are both set using the onboard multi-turn trimmers VR1 and VR2. That way, it is ensured that the precise setting can easily be done. The output of the differential amplifier is connected to the analog pin AN of mikroBUS™.

Force sensors operate on the principle that the resistance of silicon-implanted piezoresistors will change when the resistors flex under applied force. The sensor concentrates force from the applications, through the stainless steel ball, directly to the silicon-sensing element. The amount of resistance changes in proportion to the amount of force being applied. This change in circuit resistance results in a corresponding mV output level change. Low voltage supply allows for use in many battery powered applications.

Force 2 Click have FSS1500NGT force sensor on it and the force sensing range is 0-15N with overforce (the maximum force which may safely be applied to the product for it to remain in specification once force is returned to the operating force range) up to 45N.

The power supply is 5V and this allows only 5V MCUs to be interfaced with the Click boards™ directly.

Specifications

Type	Force
Applications	FSS1500NGT sensor is used in medical and industrial purposes, like infusionand ambulatory non-invasive pumps, kidney dialysis machines, load and compression sensing, variable tension control, robotic end-effector, etc.
On-board modules	FSS015NGT Honeywell's FSS-SMT Series force sensor
Key Features	FSS015NGT force sensor on it and the force sensing range is 0-15N with overforce up to 45N

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

Pinout diagram

This table shows how the pinout on Force 2 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin				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	NC	
	NC	6	MOSI	SDA	11	NC	
	NC	7	3.3V	5V	10	**5V**	Power Supply
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
VR1	Gain	-	Gain adustment potentiometer
VR2	Range	-	Range adustment potentiometer

Software Support

We provide a library for the Force 2 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 2 Click board.

Key functions:

- force2_adc_set_in_channel( ); - Function sets input channel.
- force2_adc_init( ); - Function initializes ADC.
- force2_adc_read( ); - Function reads ADC values.

Examples description

The application is composed of three sections :

- System Initialization - Initializes GPIO and LOG structures, set AN pin as input.
- Application Initialization - Initalizes ADC driver, sets ADC channel and makes an initial log.
- Application Task - (code snippet) This is an example that shows the capabilities of the Force 2 Click by taking measurements from the device and displaying it via USART terminal.

- force2_val_conv (uint32_t x, uint32_t in_max, uint32_t out_min, uint32_t out_max) - re-maps ADC value to force value in newton.
- force2_adc_set_in_channel( ); - Function sets input channel.
- force2_adc_init( ); - Function initializes ADC.
- force2_adc_read( ); - Function reads ADC values.

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

Other mikroE Libraries used in the example:

- ADC
- Conversions
- UART

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 2 click example on Libstock

Force 2 click 2D and 3D files

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Force 2 click schematic

FSS1500NGT datasheet

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