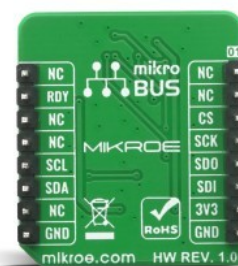# Pressure 10 Click

PID: MIKROE-4142

Pressure 10 Click features a digital interface barometric pressure sensor, based on piezoresistive bridge, labeled as HSPPAD042A, from ALPS Electric. It can use both SPI and I2C communication protocols, allowing it to be interfaced with a broad range of MCUs. Besides the pressure readings, this Click board™ also offers very accurate temperature reading, which is required for the pressure readings compensation and can be used in a wide range of battery-powered and portable applications thanks to its very low power consumption. In addition, this product supports averaging and filtering for lower noise, and FIFO function. All these features make the Pressure 10 Click an ideal solution for the development of portable weather station applications, indoor navigation, altitude control for drones, and similar applications that rely on barometric pressure measurements.

Pressure 10 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?

Pressure 10 Click uses the HSPPAD042A IC, a digital pressure sensor, from ALPS ELECTRIC. This sensor consists of a piezoresistive pressure sensing element and a mixed-signal ASIC which performs A/D conversions and provides the conversion results through a digital interface. MEMS technology, which this sensor element is made of, offers a high sensing precision with ±0.7hPa absolute and ±0.05hPa relative pressure accuracy and industry-lowest current consumption of 1.8µA in low power mode. The sensor is enclosed in a small LGA package and can operate in a range of 300 hPa to 1100 hPa but can withstand up to 30,000 hPa before the membrane breaks down.
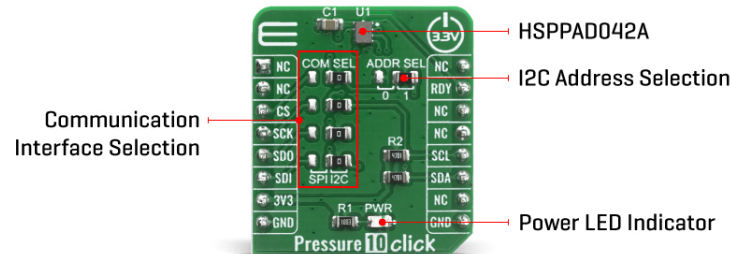
The HSPPAD042A offers a set of pressure and temperature measurement options. Several measurement modes can be set by CTL1.MODE bit in 0x0F register:

- Register Action Mode: Allows access to ACTL1 (Action Control) register and execute temperature and pressure measurements by setting TDET and PDET bits to "1". After measurements, the device goes to the standby state and minimizes current consumption waiting for the next command.
- Continuous Measurement Mode: Executes measurement with specified frequency. To move into this mode, PMES bit in CTL2 (Control) register must be set to "1". Measurement is started immediately after measurement mode transition and the following measurement is repeated.
- Command Action Mode: In this mode, several functions are performed by writing "1" at the same bit name in ACTL1 and ACTL2 registers (perform only pressure or temperature measurement, perform a software reset, or perform both pressure and temperature measurement).

After software reset command is detected, the digital regulator is disabled and all register values are reset and measurement mode is set to Register Action Mode. FIFO buffer allows for an optimization of the host firmware, reducing the data traffic through the communication interface. The interrupt is available over the RDY pin (Data Ready pin), and can be used to indicates measurement completion. Multiple flags can be set to the RDY pin. They are all OR output and the change will be effective immediately even during the measurement.

Pressure 10 Click offers a choice between two interfaces: I2C and SPI. The selection can be done by positioning SMD jumpers labeled as COMM SEL to an appropriate position. Note that all the jumpers must be placed to the same side, or else the Click board™ may become unresponsive. While the I2C interface is selected, the HSPPAD042A allows the choice of the least significant bit (LSB) of its I2C slave address. This can be done by using the SMD jumper labeled as ADDR SEL.

This Click Board™ uses both I2C and SPI communication interfaces. It is designed to be operated only with 3.3V logic levels. A proper logic voltage level conversion should be performed before the Click board™ is used with MCUs with logic levels of 5V. More information about the HSPPAD042A can be found in the attached datasheet. However, the Click board™ comes equipped with a library that contains easy to use functions and a usage example that may be used as a reference for the development.

Specifications

Type	Pressure
Applications	An ideal solution for the development of portable weather station applications, indoor navigation, altitude control for drones, and similar applications that rely on barometric pressure measurements.
On-board modules	Pressure 10 Click uses the HSPPAD042A IC, a digital pressure sensor, from ALPS ELECTRIC.
Key Features	Industry-lowest current consumption, 300 hPa to 1100 hPa range, temperature reading, averaging, noise filtering, FIFO function.
Interface	GPIO,I2C,SPI
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 Pressure 10 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	**RDY**	Data Ready 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-JP4	COM SEL	Right	Communication Interface Selection: Left position SPI, Right position I2C
JP5	ADDR SEL	Right	I2C Address Selection: Left position 0, Right position 1

Pressure 10 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-0.5	-	4.0	V
Maximum Load Pressure	-	-	30000	hPa
Operating Temperature Range	-40	-	+125	°C
Current consumption (Low power mode)	-	1.8	-	µA
Pressure absolute accuracy	-	±0.7	-	hPa
Pressure relative accuracy	-	±0.05	-	hPa

Software Support

We provide a library for the Pressure 10 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 contains basic functions for reading temperature and pressure. The user has the ability to set the configuration of the measurement module.

Key functions:

- float pressure10_get_temperature (void) - Get Temperature data in C
- float pressure10_get_pressure (void) - Get Pressure data in %RH
- void pressure10_control_cfg (uint8_t ctrl_reg, uint8_t wr_data) - Set the configuration in the control registers

Examples description

The application is composed of three sections :

- System Initialization - Initializes I2C or SPI module and all necessary GPIO pins
- Application Initialization - Initialization driver init, check communication and configuration module for measurement.
- Application Task - Reads pressure data and temperature data every 1500ms.

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

Other mikroE Libraries used in the example:

- I2C Library
- SPI Library
- 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

Pressure 10 click example on Libstock

Pressure 10 click 2D and 3D files

HSPPAD042A datasheet

Pressure 10 click schematic