



NO2 2 CLICK

PID: MIKROE-3700

Weight: 18 g

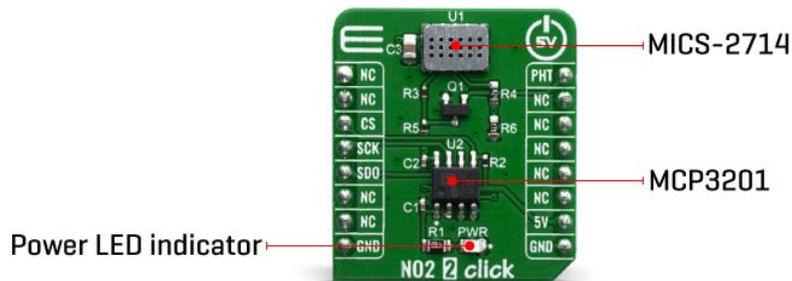
NO2 2 Click is a gas sensor Click board™, equipped with the MiCS-2714, a compact metal oxide (MOS) sensor. This sensor reacts to the presence of nitrogen dioxide (NO₂) and hydrogen (H₂). Its impedance changes as a result of a catalytic reaction, allowing it to be used in a voltage divider configuration. This voltage can be sampled by an accurate A/D converter (ADC), allowing data to be read directly over the I2C interface. The MiCS-2714 sensor itself is a robust sensor, which can be used in harsh environment for gas leakage detection, in breath checking applications, early fire detection, etc.

NO2 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.

This Click board™ contains the required resistances used to form a voltage divider with the sensor, as well as the accurate SAR type ADC with 12-bit resolution which allows the voltage to be converted, using 5V from the mikroBUS™ rail as a voltage reference. Featuring the MiCS-2714, a robust and reliable gas sensor which requires a minimal number of additional components, the MCP3201, an accurate 12-bit ADC by Microchip, proven in many Click board™ designs so far, NO2 2 click represents an ideal solution for a rapid development in all kinds of harsh environments of applications such as gas leakage applications, fire detection applications, CO detectors, and similar reducing gasses detecting applications.

HOW DOES IT WORK?

NO2 2 click is equipped with the MiCS-2714 sensor, a compact MOS sensor from SGX Sensortech. This sensor consists of a micromachined metal oxide semiconductor diaphragm, with an integrated heating resistor. The resistor produces heat which catalyzes the reaction, which in turn affects the electrical resistance of the oxide layer itself. The temperature of the heater is quite high: it is in the range from 350 °C to 550 °C. After the initial preheating period, the sensor can detect gas changes in time intervals below two seconds.



The resistance of the MiCS-2714 sensor does not change linearly with the gas concentration, so a proper calibration must be performed prior to using it for absolute gas concentration measurement applications. The impedance changes the most when used with low gas concentrations. As the atmosphere gets saturated with gas, the impedance changes slower.

The MiCS-2714 sensor is a simple device: it has only four connections. Two pins are the connections of the internal heating element, while the other two pins are the MOS sensor connections. The application is reduced to calculating a proper resistor for the voltage divider. The middle tap between the sensor (as a resistor) and the fixed resistance is used to provide an output voltage. It directly depends on the resistance of the sensor, allowing it to be used as the input into the MCP3201, a low-power 12-bit A/D converter with I2C interface, from Microchip. This ADC allows the output voltage to be translated into a digital information, which can be accessed over the I2C pins on the mikroBUS™ socket. By using the power supply voltage as the voltage reference for the conversion, this ADC further reduces the complexity of the design, still offering a good conversion quality, thanks to its low noise input. Due to the sensor's inert nature, this ADC is more than fast enough, although it can provide up to 22.3 ksp/s when operated in the I2C Fast mode.

This Click Board™ is designed to be operated only with 5V logic level. A proper logic voltage level conversion should be performed before the Click board™ is used with MCUs with logic levels of 3.3V.

SPECIFICATIONS

Type	Gas
Applications	It can be used for various applications, such as gas leakage applications, fire detection applications, CO detectors, and similar reducing gasses detecting applications.
On-board modules	MiCS-2714 - a compact metal oxide (MOS) sensor from SGX Sensortech
Key Features	Robust and reliable MOS sensor, a high-quality 12-bit ADC from Microchip onboard, can detect a range of different redux gasses, ideal for a various application development, etc
Interface	SPI
Click board size	S (28.6 x 25.4 mm)
Input Voltage	5V

PINOUT DIAGRAM

This table shows how the pinout on NO2 2 click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
	NC	1	AN	PWM	16	PHT	Preheating
	NC	2	RST	INT	15	NC	
Chip Select	CS	3	CS	RX	14	NC	

SPI Clock	SCK	4	SCK	TX	13	NC	
SPI Data Out	SDO	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

NO2 2 CLICK ELECTRICAL SPECIFICATIONS

Description	Min	Typ	Max	Unit
Measurement range	0	-	10	ppm
Response time	-	200	-	s
Operating Temperature Range (recommended)	-30	-	85	°C
Operating Humidity Range (non-condensing)	5	-	95	% RH

SOFTWARE SUPPORT

We provide a library for the NO2 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 includes functions for reading ADC value from device via SPI module. Function for converting ADC value to ppb and control over pht pin.

Key functions:

- `uint16_t no22_read_data (void)` - Reads ADC value from device
- `float no22_get_ppb (void)` - Converts ADC value to ppb
- `uint8_t no22_set_pht_state (uint8_t state)` - Sets state of pht pin

Examples description

The application is composed of three sections :

- System Initialization - SPI and GPIO modules init
- Application Initialization - Driver init
- Application Task - Measures in span of 1 second ppb of NO2

```
void applicationTask()
{
    uint16_t temp_data_read;
    float data_ppb;

    mikrobus_logWrite( "ADC : ", _LOG_TEXT );
    temp_data_read = no22_read_data( );
    WordToStr( temp_data_read, demo_text );
    mikrobus_logWrite( demo_text, _LOG_LINE );

    mikrobus_logWrite( "PPB : ", _LOG_TEXT );
    data_ppb = no22_get_ppb( );
    FloatToStr( data_ppb, demo_text );
    mikrobus_logWrite( demo_text, _LOG_LINE );

    mikrobus_logWrite( " _____", _LOG_LINE );

    Delay_ms( 1000 );
}
```

```
}
```

The full application code, and ready to use projects can be found on our LibStock page. Other mikroE Libraries used in the example:

- SPI
- 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.



<https://www.mikroe.com/no2-2-click/10-15-19>