

Ozone 3 Click



PID: MIKROE-4654

Ozone 3 Click is a compact add-on board suitable for ozone concentration detection and monitoring. This board features the 110-407, a high-performance ultra-thin electrochemical gas sensor from SPEC Sensors supported by the LMP91000, a high-precision integrated analog front-end IC (AFE) ideal for this sensing application. It provides the reference voltage required by the sensor and offers a choice between the analog output from the AFE IC buffered with the low noise Op-Amp and digital output from the 12-bit SAR A/D converter. This Click board™ represents an ideal choice for health, environmental, industrial, and residential monitoring.

Ozone 3 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?

Ozone 3 Click as its foundation uses the 3SP-O3-20 (110-407), a high-performance ultra-thin electrochemical gas sensor that can sense ozone concentration up to 20ppm from SPEC Sensors. An electrochemical sensor like this one generates a current proportional to the volumetric fraction of the gas. This current is converted and transformed into the voltage by the analog front-end (AFE), so it can be sampled by the MCU or converted with the external A/D converting circuit.

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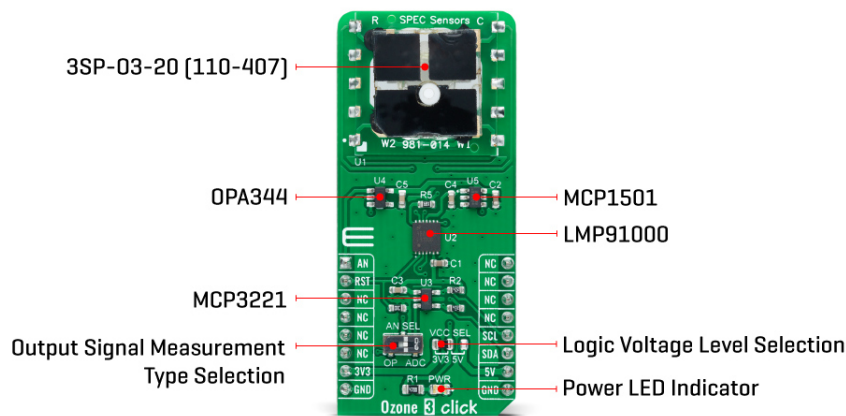
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The sensor has very high sensitivity and short response time; however, the longer it is exposed to a particular gas, the more accurate data it can provide, especially true when calibration is performed. It is advised to protect the sensor when used in critical applications. In ideal conditions, the lifetime of this sensor is indefinite, but in real-life applications, the expected working life is more than five years (10 years at $23 \pm 3^\circ\text{C}$; $40 \pm 10\% \text{RH}$).

Ozone 3 Click communicates with the MCU through the I2C serial interface using the LMP91000, a configurable AFE IC for low-power chemical sensing applications from Texas Instruments that generates the output voltage proportional the sensor current. The voltage between the referent electrode (RE) and the working electrode (WE) of the 110-407 is held constant, with the bias set by the variable bias circuitry. This type of sensor performs best when a fixed bias voltage is applied. Also, this Click board™ has two additional ICs onboard. The first one is the MCP3221, a 12-bit successive approximation register A/D converter from Microchip, and the second is the [OPA344](#), a single supply, rail to rail operational amplifier from Texas Instruments.

The RST pin of the mikroBUS™ socket, routed to the MEMB pin of the LMP91000, represents the enable feature of the I2C interface. When it is driven to a LOW logic level, the I2C communication is enabled, and the host MCU can issue a START condition. Note that the RST pin should stay at a LOW state during the communication.

Besides that, it is possible to use an onboard switch labeled as AN SEL to select the IC to which the VOUT pin from the LMP91000 AFE is routed. If the switch is in the position marked as ADC, the VOUT pin will be routed to the input of the MCP3221 ADC. This allows the voltage at the VOUT pin to be read via the I2C interface as digital information. When the switch is in the AN position, the VOUT pin of the LMP91000 is routed to the input of the OPA344. The output of the OPA344 Op-Amp has a stable unity gain, acting as a buffer so that the host MCU can sample the voltage at the VOUT pin of the AFE via the AN pin of the mikroBUS™ socket.

This Click board™ can operate with both 3.3V and 5V logic voltage levels selected via the VCC SEL jumper. This way, it is allowed for both 3.3V and 5V capable MCUs to properly use the I2C communication lines. However, the Click board™ comes equipped with a library containing easy-to-use functions and an example code that can be used, as a reference, for further development.

Specifications

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Type	Gas,Ozone
Applications	Can be used for ozone concentration detection and monitoring
On-board modules	3SP-O3-20 - high-performance ultra-thin electrochemical gas sensor that can sense ozone concentration up to 20ppm from SPEC Sensors LMP91000 - configurable AFE IC for low-power chemical sensing applications from Texas Instruments
Key Features	Low power consumption, high performance, long life, fast response, high sensitivity, and more.
Interface	Analog,I2C
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V or 5V

Pinout diagram

This table shows how the pinout on Ozone 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
Analog Signal	AN	1	AN	PWM	16	NC	
Module Enable	RST	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
LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
SW1	AN SEL	Right	Output Signal Measurement Type Selection OP/ADC: Left position OP, Right position ADC

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Ozone 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Measurement Range	0	-	20	ppm
Response Time	-	15	-	sec
Operating Humidity Range	15	-	95	%RH
Operating Temperature Range	-20	+25	+4	°C

Software Support

We provide a library for the Ozone 3 Click as well as a demo application (example), developed using MikroElektronika [compilers](#). The demo can run on all the main MikroElektronika [development boards](#).

Package can be downloaded/installed directly from NECTO Studio Package Manager(recommended way), downloaded from our [LibStock™](#) or found on [mikroE github account](#).

Library Description

This library contains API for Ozone 3 Click driver.

Key functions:

- ozone3_cfg_setup - Config Object Initialization function.
- ozone3_init - Initialization function.
- ozone3_default_cfg - Click Default Configuration function.

Examples description

This library contains API for the Ozone 3 click driver. This demo application shows an example of the O3 ppm data measurement.

The demo application is composed of two sections :

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager(recommended way), downloaded from our [LibStock™](#) or found on [mikroE github account](#).

Other mikroE Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.Ozone3

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.

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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

[Ozone 3 click 2D and 3D files](#)

[OPA344 datasheet](#)

[LMP91000 datasheet](#)

[3SP-03-20 datasheet](#)

[Ozone 3 click example on Libstock](#)

[Ozone 3 click schematic](#)

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