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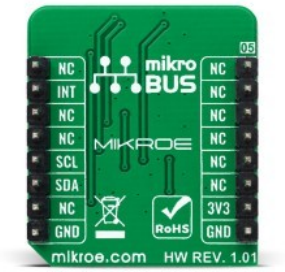
Oximeter 2 Click



PID: MIKROE-4292

Oximeter 2 Click is a compact add-on board suitable for measuring blood oxygen saturation. This board features the ADPD144RI, a PPG optical sensor for photoplethysmography detection of blood oxygenation from Analog Devices. It combines LED emitters and sensitive 4-channel photodiodes with a custom ASIC that provides optical isolation between the integrated LED emitters and the detection photodiodes to improve the signal-to-noise ratio (SNR). PPG detection of blood oxygenation is achieved by synchronous detection in red and infrared wavelengths. Synchronous measurement allows rejection of both DC and AC ambient light interference with low power consumption. This Click board™ makes it an excellent choice for applications such as optical pulse oximetry and health monitoring.

Oximeter 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?

Oximeter 2 Click is based on the ADPD144RI, a highly integrated, photometric front end optimized for photoplethysmography (PPG) detection of blood oxygenation from Analog Devices. It combines highly efficient, red and infrared LED emitters, with 660nm red and 880nm IR wavelengths, and a sensitive 4-channel photodiode with a custom ASIC that provides optical isolation between the integrated LED emitters and the detection photodiodes to improve the signal-to-noise ratio. It uses synchronous detection of optical pulses to enhance the rejection of ambient light in addition to low power consumption.

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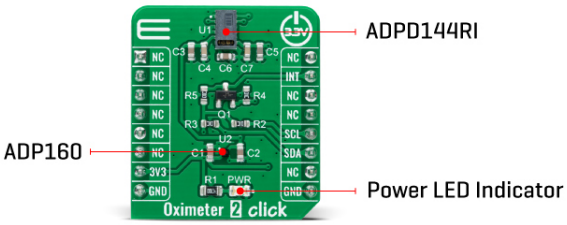

The Oximeter 2 Click is designed for ultralow direct optical reflections, with independent AFE settings per channel and I2C control interface. The integrated LED emitters produce light pulses synchronous with the active sampling period of the AFE, which consisting of a programmable TIA, a band-pass filter, and an integrator. The processed analog signals are digitized by a 14-bit ADC and summed by the 20-bit burst accumulator. Four simultaneous sampling channels are matrixed into two independent time slots (one for each LED wavelength). An adjustable number of pulses per sample, accumulation, and averaging can be applied to multiple samples to increase the dynamic range to 27 bits.

Oximeter 2 Click communicates with MCU using the standard I2C 2-Wire interface, with a typical clock frequency of 400kHz. A high-speed I2C interface allows data to be read from output registers directly or through a FIFO buffer. All register writes are single word only and require 16 bits of data. It also comes with a programmable interrupt line, labeled as INT and routed on the INT pin of the mikroBUS™ socket that simplifies timely data access. The ADPD144RI does not require a specific Power-Up sequence but requires a supply voltage of 1.8V in order to work properly. Therefore, a small regulating LDO is used, the ADP160 from Analog Devices, providing a 1.8V out of 3.3V mikroBUS™ rail.

This Click board™ is designed to be operated only with a 3.3V logic voltage level. A proper logic voltage level conversion should be performed before the Click board™ is used with MCUs with different logic levels. However, Mikroe equipped its users with a library that contains functions and an example code that can be used, as a reference, for further development.

Specifications

Type	Biometrics
Applications	Can be used for applications such as optical pulse oximetry and health monitoring.
On-board modules	ADPD144RI - highly integrated photometric front end optimized for photoplethysmography (PPG) detection of blood oxygenation from Analog Devices ADP160 - ultralow quiescent current linear regulator from Analog Devices
Key Features	Integrated optical components, fully integrated AFE, ADC, LED drivers, and timing core, low power consumption, designed for

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	ultralow direct optical reflections, and more.
Interface	I2C
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 Oximeter 2 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS™				Pin	Notes
	NC	1	AN	PWM	16	NC	
	NC	2	RST	INT	15	**INT**	Interrupt
	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	NC	
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator

Oximeter 2 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Red LED Wavelenght	-	660	-	nm
Infrared LED Wavelenght	-	880	-	nm
ADC Resolution	-	14	-	bits
Operating Temperature Range	-40	+25	+85	°C

Software Support

We provide a library for the Oximeter 2 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 form compilers IDE(recommended way), or downloaded from our LibStock, or found on mikroE github account.

Library Description

This library contains API for Oximeter 2 Click driver.

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Key functions:

- void oximeter2_cfg_setup (oximeter2_cfg_t *cfg); - Config Object Initialization function.
- OXIMETER2_RETVAL oximeter2_init (oximeter2_t *ctx, oximeter2_cfg_t *cfg); - Initialization function.

Examples description

This application collects data from the sensor, calculates it and then logs the result.

The demo application is composed of two sections :

The full application code, and ready to use projects can be installed directly form compilers IDE(recommneded) or found on LibStock page or mikroE GitHub accaunt.

Other mikroE Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.Oximeter2

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

Oximeter 2 click 2D and 3D files

Oximeter 2 click schematic

ADPD144RI datasheet

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[ADP160 datasheet]

[Oximeter 2 click example on Libstock]

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