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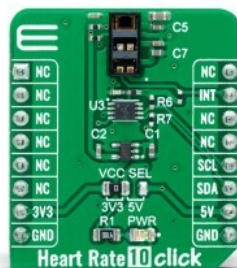www.mikroe.com

Heart Rate 10 Click

PID: MIKROE-4724

Heart Rate 10 Click is a compact add-on board suitable for heart rate monitoring applications. This board features the MAX86916, an integrated optical sensor with applications in bio-sensing, proximity, and color from Analog Devices. The module includes internal LEDs, photodetectors, and low-noise electronics with ambient-light-rejection circuitry and establishes communication to and from the module entirely through a standard I2C compatible interface. It operates on a 1.8V supply voltage with a possibility to be shut down through software with a near-zero standby current, allowing the power rails to remain powered at all times. This Click board™ is suitable for optical pulse oximetry and heart-rate detection applications.

Heart Rate 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?

Heart Rate 10 Click as its foundation uses the MAX86916, a multipurpose optical sensor with applications in Heart Rate (HR) monitoring and as a medical-grade pulse oximeter from Analog Devices. The MAX86916 integrates four LED drivers and BLUE, GREEN, RED, and INFRARED LEDs. The LED current can be programmed from 0mA to 150mA, and pulse width can be programmed from 70µs to 420µs to allow the algorithm to optimize data acquisition accuracy and power consumption based on use cases. Also, the MAX86916 includes a proximity function to save power and reduce visible light emission when the user's finger is not on the sensor.

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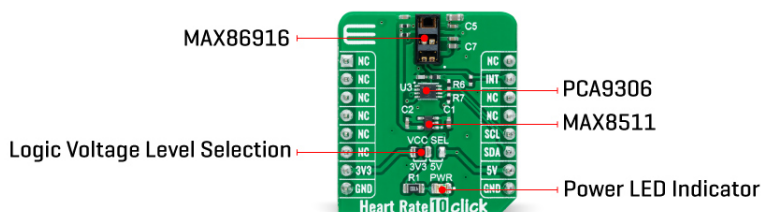
The receive path in the MAX86916 is composed of an ambient-light-cancellation (ALC) circuit, a continuous-time sigma-delta ADC, and a proprietary digital filter that rejects slow-changing ambient light including 100Hz/120Hz interference from artificial lights. The ALC is designed to cancel ambient-light-generated photodiode current up to 200µA, allowing the sensor to work in high ambient light conditions. When the ambient light cancellation function reaches its maximum limit, due to overflow from strong ambient light, the output of the ADC is affected, and the Ambient Light Cancellation Overflow interrupt, labeled as INT and routed on the INT pin of the mikroBUS™ socket, is generated to detect this condition.

The MAX86916 does not require a specific Power-Up sequence but requires a supply voltage of 1.8V to work correctly. Therefore, a small regulating LDO is used, the MAX8511 from Analog Devices, providing a 1.8V out of both 5V and 3.3V mikroBUS™ rails.

Heart Rate 10 Click communicates with MCU using the standard I2C 2-Wire interface with a maximum clock frequency of up to 400kHz. It is fully adjustable through software registers, and the digital output data is stored in a 32-deep FIFO within the device. Since the sensor for operation requires a power supply of 1.8V, this Click board™ also features the PCA9306 voltage-level translator from Texas Instruments. The I2C interface bus lines are routed to the dual bidirectional voltage-level translator, allowing this Click board™ to work with both 3.3V and 5V MCUs properly.

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 use the I2C communication lines properly. 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

Type	Biometrics,Heart Rate
Applications	Can be used for optical pulse oximetry and heart-rate detection applications.
On-board modules	MAX86916 - multipurpose optical sensor with applications in Heart Rate (HR) monitoring and as a medical-grade pulse oximeter from Maxim Integrated

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Key Features	Low power consumption, ultra-low shutdoen current, optical-grade glass for long-term performance, reflective heart rate monitor, medical-grade pulse oximeter, bio-optical sensor platform, and more.
Interface	I2C
ClickID	No
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Input Voltage	3.3V or 5V

Pinout diagram

This table shows how the pinout on Heart Rate 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	**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	**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

Heart Rate 10 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
IR LED Wavelenght	930	-	950	nm
RED LED Wavelenght	655	-	663	nm
GREEN LED Wavelenght	520	-	535	nm
BLUE LED Wavelenght	455	-	466	nm
Operating Temperature Range	-40	+25	+85	°C

Software Support

We provide a library for the Heart Rate 10 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 Heart Rate 10 Click driver.

Key functions:

- heartrate10_cfg_setup - Config Object Initialization function.
- heartrate10_init - Initialization function.
- heartrate10_default_cfg - Click Default Configuration function.

Examples description

This example showcases ability for device to read Heart Rate with 4 different diodes. There is IR, Red, Green and Blue. You can control every one of them individualy, and change theirs sequence in FIFO register. All leds data is read from FIFO register, it's 19bit data for every led.

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.HeartRate10

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

Heart Rate 10 click 2D and 3D files

PCA9306 datasheet

MAX86916 datasheet

Heart Rate 10 click schematic

Heart Rate 10 click example on Libstock