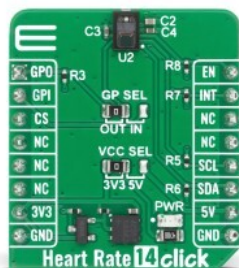


Heart Rate 14 Click



PID: MIKROE-7001

Heart Rate 14 Click is an optical sensing board for developing heart-rate, SpO2, and HRV monitoring applications in embedded systems. It features the [MAXM86161AEFD+](#) optical data-acquisition module from [Analog Devices](#), combining green, red, and infrared LEDs, a PIN photodiode, programmable LED drivers, and a 19-bit ADC. I2C communication enables configuration and data acquisition, while ambient light cancellation, digital filtering, proximity detection, sample averaging, and a 128-sample FIFO support low-power measurements. Selectable GPIO routing and 3.3V or 5V operation simplify integration. It is suitable for wearable health devices, in-ear monitors, fitness trackers, mobile instruments, connected wellness systems, and biometric research platforms.

For more information about **Heart Rate 14 Click** visit the official [product page](#).

How does it work?

Heart Rate 14 Click is a compact add-on board designed for developing reflective optical heart-rate, oxygen-saturation (SpO2), and heart-rate-variability (HRV) monitoring applications. It is based on the MAXM86161AEFD+ from Analog Devices, an ultra-low-power, single-channel optical data-acquisition module that integrates green, red, and infrared LEDs, a high-efficiency PIN photodiode, three programmable LED drivers, and a low-noise optical analog front end. During measurement, the selected LEDs illuminate the tissue while the photodiode detects variations in the reflected light caused by changes in blood volume. The resulting photoplethysmographic (PPG) waveform can be processed by the host application to calculate pulse-related parameters. Green-light measurements can be used for heart-rate monitoring, while the red and infrared channels support the development of SpO2 measurement systems.

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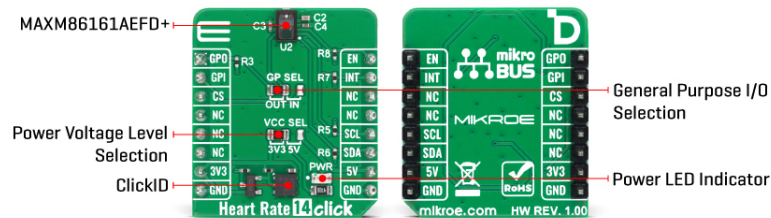
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The MAXM86161AEFD+ optical receive path combines ambient light cancellation, a proprietary discrete-time filter, and a high-resolution 19-bit ADC with programmable input ranges from 4 μ A to 32 μ A and sample rates from 8sps to 4096sps. Its ambient light cancellation circuitry enables operation under strong background illumination, while the digital filter suppresses 50Hz/60Hz interference and changing residual ambient light. A built-in picket-fence detect-and-replace algorithm identifies isolated measurement errors caused by rapid ambient-light transitions and substitutes an estimated value based on preceding samples. Three 8-bit LED current DACs provide programmable drive currents up to 124mA, while selectable pulse widths from 14.8 μ s to 117.3 μ s allow measurement quality and power consumption to be balanced according to the application. Acquired data is stored in a 128-sample FIFO with source tags, reducing the need for continuous host intervention. The device also supports proximity detection, autonomous operation, shutdown control, sample averaging, and dynamic power-down between samples for energy-efficient wearable and battery-powered designs.

Heart Rate 14 Click communicates with the host MCU through an I2C/SMBus-compatible two-wire interface operating at clock frequencies up to 400kHz. The SCL and SDA lines are routed to the corresponding mikroBUS™ pins and include pull-up resistors connected to the selected logic voltage, while the device uses a fixed 7-bit I2C address of 0x62. The active-low, open-drain interrupt output is routed to the INT pin and can signal events such as new data availability, FIFO almost-full status, ambient-light cancellation overflow, proximity detection, and LED compliance conditions. The EN pin, routed to the PWM pin of the mikroBUS™ socket, controls the internal LDO and is pulled high for normal operation. The multifunction GPIO can operate as an active-low open-drain output or as an input for sample triggering, exposure triggering, synchronization, and one-shot measurements. The CS pin is reserved for communication with the onboard ClickID circuitry.

The MAXM86161AEFD+ is positioned at the edge of the board to keep its optical window accessible for reflective measurements. The GP SEL jumper determines how the multifunction GPIO is routed: the OUT position connects it to the GPO pin mapped to the mikroBUS™ AN line, while the IN position connects it to the GPI pin mapped to the mikroBUS™ RST line. The VCC SEL jumper selects the board's operating voltage between 3.3V and 5V and is set to 3.3V by default. A green PWR LED provides a visual indication that the board is powered, while the onboard ClickID circuitry allows compatible MIKROE host systems to identify the board automatically.

Heart Rate 14 Click can operate with either 3.3V or 5V supply and logic levels selected through the VCC SEL jumper. The selected voltage powers the MAXM86161AEFD+ LED supply, control

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lines, and communication pull-ups, while its internal LDO generates the voltage required by the internal circuitry. The ClickID section is powered separately from the mikroBUS™ 3.3V rail. This Click board™ comes with a library containing easy-to-use functions and a ready-to-use code example that can be used as a reference for further development.

Specifications

Type	Biometrics, Heart Rate
Applications	Ideal for applications such as wearable health devices, in-ear monitors, fitness trackers, portable instruments, connected wellness systems, and biometric research platforms
On-board modules	MAXM86161AEFD+ - single-supply integrated optical module for heart-rate and SpO2 measurement from Analog Devices
Key Features	Reflective heart-rate, SpO2, and HRV monitoring, integrated green, red, and infrared LEDs, high-efficiency PIN photodiode, programmable LED drivers, 19-bit ADC, ambient light cancellation, digital filtering, 128-sample FIFO, proximity detection, low-power modes, I2C interface, selectable GPIO routing, 3.3V/5V operation, ClickID, and more
Interface	GPIO, I2C
Feature	ClickID
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 14 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
General Purpose Output	GPO	1	AN	PWM	16	EN	Enable
General Purpose Input	GPI	2	RST	INT	15	INT	Interrupt
Device Enable / ID COMM	CS	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
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LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Power/Logic Voltage Level Selection 3V3/5V: Left position 3V3, Right position 5V
JP2	GP SEL	Left	GPIO Input/Output Selection: Left position Input, Right position output

Heart Rate 14 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3, 5	-	V
ADC Resolution	-	19	-	bit
DAC Resolution	-	8	-	bit
Operating Temperature	-40	-	85	°C

Software Support

[Heart Rate 14 Click](#) demo application is developed using the [NECTO Studio](#), ensuring compatibility with [mikroSDK](#)'s open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a [mikroBUS™](#) socket.

Example Description

This example demonstrates the use of Heart Rate 14 Click board by reading and displaying PPG measurements which can be visualized on the SerialPlot application.

Key Functions

- `heartrate14_cfg_setup` This function initializes Click configuration structure to initial values.
- `heartrate14_init` This function initializes all necessary pins and peripherals used for this Click board.
- `heartrate14_default_cfg` This function executes a default configuration of Heart Rate 14 Click board.
- `heartrate14_flush_fifo` This function clears all data from the FIFO and resets its write/read pointers and data counter to zero.
- `heartrate14_wait_data_ready` This function waits until the INT pin goes LOW signaling that new data is ready to be read from the FIFO.
- `heartrate14_get_fifo_data` This function reads the FIFO whenever a new sample is ready.

Application Init

Initializes the driver and performs the Click default configuration for heart rate measurement.

Application Task

Waits for the data ready interrupt, then reads the PPG measurements and displays it on the USB UART (SerialPlot).

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Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following [this tutorial](#).
- UART Terminal - Monitor data via the UART Terminal using a [USB to UART converter](#). For detailed instructions, check out [this tutorial](#).

Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the [NECTO Studio](#). The application code can also be found on the MIKROE [GitHub](#) account.

Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click boards™](#)

[ClickID](#)

Downloads

[Heart Rate 14 Click example package](#)

[Heart Rate 14 Click 2D and 3D files v100](#)

[Heart Rate 14 Click schematic v100](#)

[MAXM86161AEFD+ datasheet](#)

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