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# Clock Gen 4 Click

PID: MIKROE-4300

**Clock Gen 4 Click** is a compact add-on board that contains both a clock generator and a multiplier/jitter reduced clock frequency synthesizer. This board features the CS2200-CP, an analog PLL architecture comprised of a Delta-Sigma fractional-N frequency synthesizer from Cirrus Logic. This clocking device utilizes a programmable phase lock loop and allows frequency synthesis and clock generation from a stable reference clock. It generates a low-jitter PLL clock from an external crystal, supports both I²C and SPI for full software control, and also has configurable auxiliary clock output. This Click board™ is suitable for MCU clock source, or in applications like digital effects processors, digital mixing consoles, and many more.

Clock Gen 4 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?

Clock Gen 4 Click is based on the CS2200-CP, an analog PLL architecture comprised of a Delta-Sigma fractional-N frequency synthesizer from Cirrus Logic. The Delta-Sigma fractional-N frequency synthesizer has a very high resolution for Input/Output clock ratios, low phase noise, a wide range of output frequencies, and the ability to quickly tune to a new frequency. This synthesizer multiplies the timing reference clock by the value of N to generate a stable and low-jitter PLL clock available on the connector labeled as PLL Clock. This Click board™ also has another connector marked as AUX Clock that outputs a buffered version of one of the input/output clocks, or a status signal, depending on register configuration.

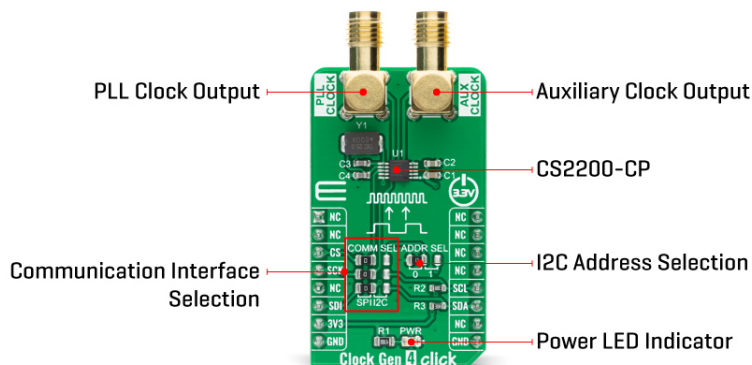Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISO 27001: 2013 certification of informational security management system.
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The analog PLL based frequency synthesizer uses a low-jitter timing reference clock as time and phase reference for the internal voltage controlled oscillator (VCO). The phase comparator compares the fractional-N divided clock with the original timing reference and generates a control signal that is filtered by the internal loop filter to generate the VCO's control voltage that sets its output frequency. The Delta-Sigma modulator modulates the loop integer divide ratio to get the desired fractional ratio between the reference clock and the VCO output. This allows fast lock times for a wide range of output frequencies without the need for external filter components.

Clock Gen 4 Click provides the possibility of using both I2C and SPI interfaces with a maximum frequency of 100 kHz for I2C and 6 MHz for SPI communication. The selection can be performed by positioning SMD jumpers labeled as COMM SEL to an appropriate position. Note that all the jumpers must be placed to the same side, or else the Click board™ may become unresponsive. While the I2C interface is selected, the CS2200-CP allows the choice of the least significant bit (LSB) of its I2C slave address. This can be done by using the SMD jumper labeled as ADDR SEL.

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, the Click board™ comes equipped with a library that contains easy to use functions and an example code that can be used as a reference for further development.

## Specifications

| Type | Clock generator |
|---|---|
| Applications | Can be used as an MCU clock source, or in applications like digital effects processors, digital mixing consoles, and many more. |
| On-board modules | Clock Gen 4 Click is based on the CS2200-CP, an analog PLL architecture comprised of a Delta-Sigma fractional-N frequency synthesizer from Cirrus Logic. |
| Key Features | High-performance analog/digital phase locked loop, clock generation/frequency synthesis and multiplier/jitter reduction, flexible control options, configurable auxiliary output, and |

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| | more. |
|---|---|
| Interface | I2C,SPI |
| Feature | No ClickID |
| Compatibility | mikroBUS™ |
| Click board size | M (42.9 x 25.4 mm) |
| Input Voltage | 3.3V |

## Pinout diagram

This table shows how the pinout on Clock Gen 4 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 | NC | |
| SPI Chip Select | CS | 3 | CS | RX | 14 | NC | |
| SPI Clock | SCK | 4 | SCK | TX | 13 | NC | |
| SPI Data OUT | SDO | 5 | MISO | SCL | 12 | SCL | I2C Clock |
| SPI Data IN | SDI | 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 |
| JP1-JP3 | COMM SEL | Left | Communication Interface Selection: Left position SPI, Right position I2C |
| JP4 | ADDR SEL | Left | I2C Address Selection: Left position 0, Right position 1 |
| CN1 | PLL | - | PLL Clock Output SMA Connector |
| CN2 | AUX | - | Auxiliary Clock Output SMA Connector |

## Clock Gen 4 Click electrical specifications

| Description | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Supply Voltage | 3.1 | 3.3 | 3.5 | V |
| PLL Clock Output Frequency | 6 | - | 75 | MHz |
| Output Frequency Synthesis Resolution | 0 | - | ±0.5 | ppm |
| Operating Temperature Range | -10 | - | +70 | °C |

## Software Support

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We provide a library for the Clock Gen 4 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 covers all the necessary functions to control the Clock Gen 4 Click board. User can use functions that allow writting to different registers in order to apply different settings or the ratio between the output signal and the input clock, or to read data using I2C communication exclusively.

Key functions:

- void clockgen4_dev_ctl ( uint8_t dev_ctl ); - Function is used to write to Device Control register in order to apply settings.
- void clockgen4_dev_cfg ( uint8_t dev_cfg ); - Function is used to write to Device Configuration 1 register in order to apply settings.
- uint32_t clockgen4_set_ratio ( float ratio ); - Function is used to set the ratio between the output signal and the input clock.

**Examples description**

The application is composed of three sections :

- System Initialization - Initializes I2C and SPI , sets CS pin as output and start to write log.
- Application Initialization - Initalizes SPI or I2C driver, applies default settings and adjusted ratio to obtain a frequency
- Application Task - Demonstrates use of Clock Gen 4 click board by changeing output channel every two seconds.

The full application code, and ready to use projects can be found on our LibStock page.

Other mikroE Libraries used in the example:

- I2C
- 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.

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For more information about mikroSDK, visit the [official page](#).

## Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click boards™](#)

## Downloads

[Clock Gen 4 click 2D and 3D files](#)

[CS2200-CP datasheet](#)

[Clock Gen 4 schematic](#)

[Clock Gen 4 click example on Libstock](#)

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