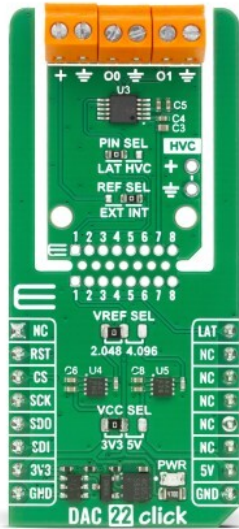


## DAC 22 Click



PID: MIKROE-6946

**DAC 22 Click** is a compact add-on board for dual-channel voltage output generation and nonvolatile digital-to-analog conversion in embedded analog control applications. It is based on the [MPC48CMD22](#), a 12-bit dual voltage output DAC from [Microchip](#). This device features 4096-step resolution, an SPI-compatible serial interface, integrated Multi-Time Programmable memory for storing configuration parameters and power-up settings, and excellent linearity with a typical INL of 1 LSB. The board also includes selectable onboard reference voltage options of 2.048V and 4.096V, support for an external reference voltage input, Click Snap for flexible standalone implementation, and compatibility with both 3.3V and 5V logic levels. It is well suited for set point and offset trimming, sensor calibration, low-power portable instrumentation, PC peripherals, and data acquisition systems.

For more information about **DAC 22 Click** visit the official [product page](#).

### How does it work?

DAC 22 Click is based on the MPC48CMD22, a 12-bit nonvolatile (4096 steps) dual voltage output DAC from Microchip that incorporates an SPI-compatible serial interface, and integrated MTP memory for storing configuration parameters. The MPC48CMD22 delivers excellent linearity with a typical integral non-linearity of just 1 LSB, ensuring high-quality analog output and minimal deviation across the full conversion range. The DAC 22 Click is suitable for real-time adjustment tasks such as set point and offset trimming, sensor calibration, low-power portable instrumentation, PC peripherals, and data acquisition systems.

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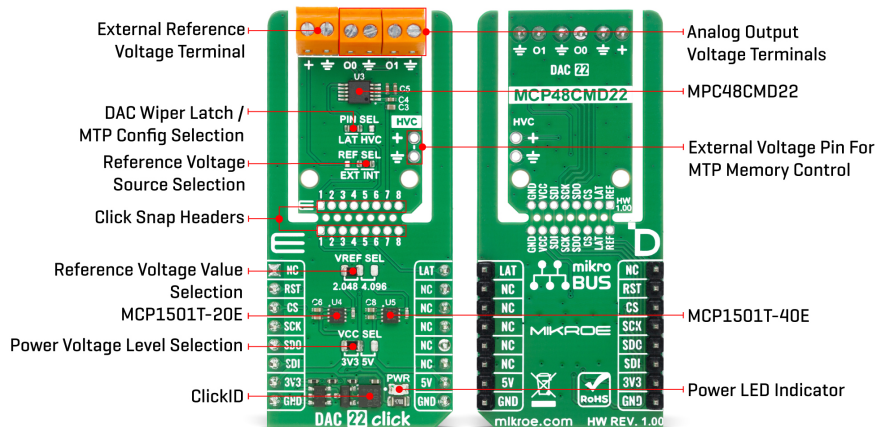
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For DAC 22 Click, the reference voltage configuration the board uses an onboard two MCP1501 precision voltage reference to generate the reference voltage directly on the board. Two selectable reference levels are supported, 2.048V or 4.096V, and the desired option is chosen using the VREF SEL jumper. This selection corresponds to the specific [MCP1501](#) variant populated on the board, with the MCP1501T-20 providing a precise 2.048V reference and the MCP1501T-40 providing a precise 4.096V reference. Also, an external reference voltage can be applied to the + terminal on the board, in which case the reference voltage source is selected by setting the REF SEL jumper to the appropriate position: EXT or INT, for choosing the external or internal reference voltage source.

This Click board™ is designed in a unique format supporting the newly introduced MIKROE feature called "Click Snap." Unlike the standardized version of Click boards, this feature allows the main sensor/IC/module area to become movable by breaking the PCB, opening many new possibilities for implementation. Thanks to the Snap feature, the MPC48CMD22 can operate autonomously by accessing its signals directly on the pins marked 1-8. Additionally, the Snap part includes a specified and fixed screw hole position, enabling users to secure the Snap board in their desired location.

The board uses a four-wire SPI-compatible serial interface with speeds up to 50MHz for write and 25MHz for read operations, ensuring fast communication with the host MCU. The MPC48CMD22 integrates a Multi-Time Programmable (MTP) memory system that allows each register to be written up to 32 times, providing non-volatile storage for power-up output values, device configuration settings, and general-purpose data locations. To successfully program any MTP location, the device requires a dedicated high-voltage programming signal typically 7.5V with a minimum current capability of 6.4mA, supplied through the HVC pin on the board.

Access to the MTP memory is enabled by positioning the PIN SEL jumper to the HVC position, which routes the necessary control signals for high-voltage programming. Alternatively, this jumper can be placed in the LAT position, enabling control of the DAC Wiper Register Latch via the LAT pin on the mikroBUS socket. The DAC output value update event can be controlled and synchronized using the LAT pin, for one or both channels (O0 and O1), on single or different devices.

This Click board™ can operate with either 3.3V or 5V logic voltage levels selected via the VCC SEL jumper. This way, both 3.3V and 5V capable MCUs can use the communication lines properly. Also, this 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.

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## Click Snap

**Click Snap** is an innovative feature of our standardized Click add-on boards, designed to bring greater flexibility and optimize your prototypes. By simply snapping the PCB along predefined lines, you can easily detach the main sensor/IC/module area, reducing the overall size, weight, and power consumption - ideal for the final phase of prototyping. For more details about Click Snap, visit the [official page](#) dedicated to this feature.

## Specifications

|                  |   |
|------------------|---|
| Type             | DAC   |
| Applications     | Ideal for set point and offset trimming, sensor calibration, low-power portable instrumentation, PC peripherals, and data acquisition systems   |
| On-board modules | MPC48CMD22 - 12-bit nonvolatile DAC with SPI interface from Microchip   |
| Key Features     | 12-bit dual voltage output DAC, 4096-step resolution, nonvolatile operation, SPI-compatible serial interface, integrated Multi-Time Programmable memory with up to 32 writes per register, selectable onboard reference voltage of 2.048V or 4.096V, external reference voltage support, Click Snap feature, and more |
| Interface        | SPI   |
| Feature          | Click Snap, ClickID   |
| Compatibility    | mikroBUS™   |
| Click board size | L (57.15 x 25.4 mm)   |
| Input Voltage    | 3.3V or 5V, External  |

## Pinout diagram

This table shows how the pinout on DAC 22 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 | <b>LAT</b> | DAC Wiper Register Latch |
| ID SEL               | <b>RST</b>  | 2        | RST  | INT | 15 | NC         |                          |
| SPI Select / ID COMM | <b>CS</b>   | 3        | CS   | RX  | 14 | NC         |                          |
| SPI Clock            | <b>SCK</b>  | 4        | SCK  | TX  | 13 | NC         |                          |
| SPI Data OUT         | <b>SDO</b>  | 5        | MISO | SCL | 12 | NC         |                          |
| SPI Data IN          | <b>SDI</b>  | 6        | MOSI | SDA | 11 | NC         |                          |
| Power Supply         | <b>3.3V</b> | 7        | 3.3V | 5V  | 10 | <b>5V</b>  | Power Supply             |
| Ground               | <b>GND</b>  | 8        | GND  | GND | 9  | <b>GND</b> | Ground                   |

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## Onboard settings and indicators

| Label | Name     | Default | Description  |
|-------|----------|---------|--|
| LD1   | PWR      | -       | Power LED Indicator  |
| JP1   | VCC SEL  | Left    | Power Voltage Level Selection 3V3/5V: Left position 3V3, Right position 5V               |
| JP2   | PIN SEL  | Left    | DAC Wiper Latch / MTP Config Selection LAT/HVC: Left position LAT, Right position HVC    |
| JP3   | REF SEL  | Right   | Reference Voltage Source Selection EXT/INT: Left position EXT, Right position INT        |
| JP4   | VREF SEL | Left    | Reference Voltage Value Selection 2.048/4.096: Left position 2.048, Right position 4.096 |

## DAC 22 Click electrical specifications

| Description                | Min | Typ | Max | Unit |
|----------------------------|-----|-----|-----|------|
| Supply Voltage             | 3.3 | -   | 5   | V    |
| External Reference Voltage | 0   | -   | 5   | V    |
| DAC Resolution             | -   | 12  | -   | bit  |

## Software Support

[DAC 22 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 control of DAC output voltage using the DAC 22 Click board. The application sequentially increases the DAC output voltage on both channels in equal steps.

## Key Functions

- `dac22_cfg_setup` This function initializes Click configuration structure to initial values.
- `dac22_init` This function initializes all necessary pins and peripherals used for this Click board.
- `dac22_default_cfg` This function executes a default configuration of DAC 22 Click board.
- `dac22_set_dac_value` This function writes the 12-bit DAC code value to one or more channels and latches the output values by toggling the LAT pin.
- `dac22_set_dac_voltage` This function sets the output voltage for one or more channels by converting it to a corresponding DAC code and updating the device.

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## Application Init

Initializes the driver and performs the Click default configuration.

## Application Task

Gradually increases the DAC output voltage on both channels in equal steps every 2 seconds.

## 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

[DAC 22 click example package](#)

[DAC 22 click 2D and 3D files v100](#)

[MPC48CMD22 datasheet](#)

[DAC 22 click schematic v100](#)

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