

## DAC 8 Click



PID: MIKROE-4229

**DAC 8 Click** is a compact add-on board that contains a fully-featured, general-purpose voltage-output digital-to-analog converter. This board features the [DAC8554IPWR](#), a 16-bit QUAD channel voltage-output digital to analog converter from [Texas Instruments](#). It offers the low-power operation, good linearity, exceptionally low glitch, and supports a 3-wire SPI serial interface with a clock rate up to 50MHz. Requires an external reference voltage provided by I2C compatible [DAC60501MDGSR](#) to set the output range of each DAC channel. It has many features that make it attractive for various applications such as battery-operated equipment, digital gain and offset adjustment, programmable voltage and current sources, and many more.

DAC 8 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?

DAC 8 Click is based on the DAC8554IPWR, a 16-bit QUAD channel, ultra-low glitch, voltage-output digital to analog converter from Texas Instruments. It offers good linearity, exceptionally low glitch, and it has high precision output amplifier that allows rail-to-rail output swing over a wide range of supply voltage. What this component additionally has is a Power-On reset function, which ensures that DAC outputs power-up at zero-scale and remains there until a proper write operation occurs. Also, it provides a power-down feature that reduces the current consumption to 175nA per channel.

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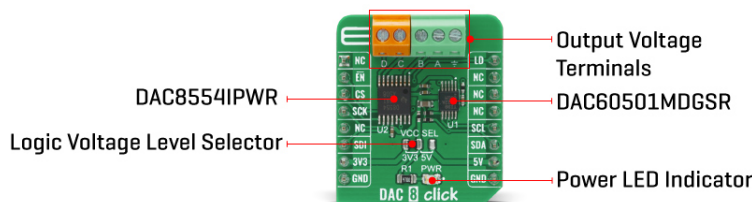
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To achieve a fully flexible range of the DAC8554IPWR, an external voltage reference is made user-programmable. For this purpose, the Click board™ uses another DAC, DAC60501MDGSR, 12-bit DAC from Texas Instruments, whose output is brought to the VREF pin of the DAC8554IPWR. That way, the reference voltage of the DAC8554IPWR can be set at any value between 0V and 5V, provides high precision and low power consumption as well. That makes the DAC 8 Click fully customizable solution, well suited for applications where the maximum precision from the output 16-bit DAC is needed. DAC60501MDGSR uses the I2C serial interface to communicate with the MCU and operates at clock rate up to 100kHz.

The DAC 6 Click communicates with MCU using the 3-Wire SPI serial interface that is compatible with standard SPI, QSPI™, MICROWIRE™ and operates at clock rates up to 50 MHz. Additional functionality such as software simultaneous update capability is implemented and routed at the PWM pin of the mikroBUS™, which allows when new data enter the device, all of DAC outputs can be updated simultaneously and synchronously with the clock. It also possesses enable function routed at CS pin of the mikroBUS™ that is used to connect the SPI interface to the serial port.

This Click Board™ is designed to be operated with both 3.3V and 5V logic levels. The onboard SMD jumper labeled as VCC SEL allows voltage selection for interfacing with both 3.3V and 5V MCUs. More information about the DAC8554IPWR's functionality, electrical specifications, and typical performance can be found in the attached datasheet. However, the Click board™ comes equipped with a library that contains easy-to-use functions, and a usage example that can be used as a reference for the development.

## Specifications

Type	DAC
Applications	Can be used in battery-operated equipment, digital gain and offset adjustment, programmable voltage and current sources, and many more.
On-board modules	DAC 8 Click is based on the DAC8554IPWR, a 16-bit QUAD channel, ultra-low glitch, voltage-output digital to analog converter from Texas Instruments.
Key Features	Low power consumption, high precision, ultra-

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	low glitch, rail-to-rail voltage output, accuracy, stability, and more.
Interface	GPIO,I2C,SPI
Feature	No 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 DAC Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
	NC	1	AN	PWM	16	<b>LD</b>	Software Update
SPI Enable	<b>EN</b>	2	RST	INT	15	NC	
SPI Chip Select	<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	<b>SCL</b>	I2C Clock
SPI Data IN	<b>SDI</b>	6	MOSI	SDA	11	<b>SDA</b>	I2C Data
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

## Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Power Supply Voltage Selection 3V3/5V: Left position 3V3, Right position 5V

## DAC 8 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-0.3	-	6	V
Maximum Current Consumption	-	-	208	µA
SPI Clock Frequency	-	-	50	MHz
Operating Temperature Range	-40	-	+105	°C

## Software Support

We provide a library for the DAC 8 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

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The library covers all the necessary functions to control the DAC 8 Click board. A library performs the communication with the DAC60501 via I2C and communication with DAC8554 the SPI interface.

Key functions:

- void dac8\_generic\_i2c\_write ( uint8\_t reg, uint16\_t tx\_data ) - Generic I2C ( DAC60501 ) write function.
- uint16\_t dac8\_generic\_i2c\_read ( uint8\_t reg ) - Generic I2C ( DAC60501 ) read function.
- void dac8\_generic\_spi\_write ( uint32\_t tx\_data ) - Generic SPI ( DAC8554 ) write function.

## Examples description

The application is composed of three sections :

- System Initialization - Initializes I2C and SPI and start to write log.
- Application Initialization - Initialization driver enables - I2C. Configure DAC60501: executes call software reset, disable sync and internal reference and disable Power-down mode, the set reference voltage is internally divided by a factor of 2, amplifier for corresponding DAC has a gain of 2. Initialization driver enables - SPI, enable DAC8554, also write log.
- Application Task - (code snippet) This is an example that demonstrates the use of the DAC 8 Click board. DAC 8 board changeing output values: Channel A ~ 2500 mV, Channel B ~ 1250 mV, Channel C ~ 625 mV, Channel D ~ 312 mV. All data logs write on USB uart changes every 5 sec.

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.

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

## Resources

[mikroBUS™](#)

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[mikroSDK](#)

[Click board™ Catalog](#)

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## Downloads

[DAC 8 click 2D and 3D files](#)

[DAC8554 datasheet](#)

[DAC60501 datasheet](#)

[DAC 8 click example on Libstock](#)

[DAC 8 click schematic](#)

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