

## Volume 3 Click



PID: MIKROE-6818

**Volume 3 Click** is a compact add-on board for digitally controlled analog volume adjustment for professional and high-end consumer audio systems. It is based on the [PGA2311](#), a high-performance stereo digital volume control IC from [Texas Instruments](#), widely used in applications that require low distortion and fine gain resolution. The board features two independent audio channels controlled via a 16-bit serial interface, allowing separate left and right channel gain settings with 0.5dB step resolution across a wide range from +31.5dB gain to -95.5dB attenuation. Volume 3 Click includes locally generated low-noise symmetrical  $\pm 5V$  analog supply rails, hardware and software mute support, zero-crossing detection to minimize audible artifacts, and SPI communication interface. This Click board™ is well suited for audio mixers, preamplifiers, home audio equipment, professional sound systems, and digitally controlled analog audio interfaces.

For more information about **Volume 3 Click** visit the official [product page](#).

### How does it work?

Volume 3 Click is based on the PGA2311, a complete stereo digital volume control from Texas Instruments designed for professional and high-end consumer audio systems. The PGA2311 is fabricated in a sub-micron CMOS process and features a 16-bit serial interface that controls two independent, low distortion audio channels. The left and right levels of the analog input channels are set by a 16-bit serial data word (8 bits each for the left and right channel gain settings). The PGA2311 is commonly used as a digitally controlled analog volume control. Analog volume is controlled through a serial interface in 0.5dB steps, ranging from a gain of +31.5dB down to an attenuation of -95.5dB.

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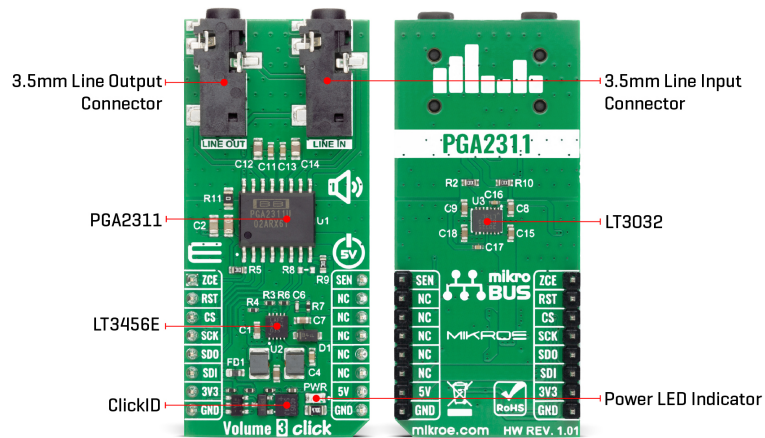
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The PGA2311 operates from a single 5V digital supply and symmetrical  $\pm 5V$  analog supplies, which are generated locally on the board to ensure stable and low-noise operation. The power conversion chain starts from the 5V mikroBUS™ power rail, which is first routed to the [LT3456](#) DC/DC converter. This high-efficiency switching regulator generates intermediate  $\pm 5.7V$  supply rails. These voltages are then fed into the [LT3032](#), a dual positive and negative low-noise low-dropout linear regulator from Analog Devices, capable of delivering up to 150mA per rail with very low quiescent current. The LT3032 regulates the  $\pm 5.7V$  inputs down to clean and well-controlled  $\pm 5V$  outputs, which are used exclusively as the analog supply rails for the PGA2311.

Volume 3 Click communicates with MCU using the standard 4-wire SPI serial interface with two additional pins that accept 16-bit data and enables the user to read the current volume setting. These two GPIO pins, ZCE and SEN pins, are used for Zero Crossing Enable and Hardware MUTE functions. Once in operation, the PGA2311 can be set to a muted state by either hardware or software control. Hardware muting is accomplished with the SEN pin, and software muting by loading all zeroes into the volume control register. MUTE function also initiates an internal offset calibration.

A volume control change occurs after the CS pin latches the data in the volume control data register, and two zero crossings are detected. The zero-crossing enable pin, labeled as ZCE routed on the default AN pin on the mikroBUS™ socket, enables or disables the zero-crossing detection function. The zero-crossing detection takes effect with a change in gain setting for a corresponding channel. The new gain setting is not implemented until either a positive slope zero crossing is detected, or a time-out period of 16ms has elapsed. In the case of a time-out, the new gain setting takes effect with no attempt to minimize audible artifacts.

This Click board™ can operate with either 3.3V or 5V logic voltage levels. 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.

## Specifications

Type	Signal Processing
Applications	Ideal for audio mixers, preamplifiers, home audio equipment, professional sound systems, and digitally controlled analog audio interfaces

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On-board modules	PGA2311 - stereo digital volume control from Texas Instruments
Key Features	Digitally controlled stereo analog volume control with independent left and right channels, 16-bit serial control interface with 0.5dB gain step resolution, wide gain and attenuation range, locally generated low-noise symmetrical $\pm 5V$ analog power supplies, zero-crossing detection for artifact-free volume transitions, hardware and software mute functionality, and more
Interface	SPI
Feature	ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V,5V

## Pinout diagram

This table shows how the pinout on Volume 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
Zero Crossing Control	<b>ZCE</b>	1	AN	PWM	16	<b>SEN</b>	Mute Control
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

## Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator

## Volume 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Gain Range	-95.5	-	+31.5	dB
Gain Step Size	-	0.5	-	dB

## Software Support

[Volume 3 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

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featuring a [mikroBUS™](#) socket.

## Example Description

This example demonstrates control of the Volume 3 Click stereo attenuator. The app enables zero-crossing and audio output, then sweeps left and right volumes in opposite directions while logging their levels.

## Key Functions

- `volume3_cfg_setup` This function initializes Click configuration structure to initial values.
- `volume3_init` This function initializes all necessary pins and peripherals used for this Click board.
- `volume3_set_volume` This function sets the left and right channel volume levels in percents.
- `volume3_set_gain` This function sets the left and right channel gain in dB.
- `volume3_sound_enable` This function enables the audio output by setting the SEN pin high.

## Application Init

Initializes the logger, configures the driver, and enables output with zero-crossing.

## Application Task

Gradually changes left and right volume in opposite directions, printing their values to the log.

## 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](#)

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## Downloads

[Volume 3 click example package](#)

[Volume 3 click 2D and 3D files v101](#)

[PGA2311 datasheet](#)

[Volume 3 click schematic v101](#)

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