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Waveform 3 Click





PID: MIKROE-4432

Waveform 3 Click is a compact add-on board that represents a high-performance signal generator. This board features the AD9837, a low-power programmable waveform generator capable of producing sine, triangular, and square wave outputs from Analog Devices. This direct digital synthesizer creates arbitrary analog waveforms from a fixed-frequency reference clock. It has software programmable output frequency and phase via a 3-wire SPI serial interface and is compatible with DSP standards. This Click board™ is suitable for waveform generation required in various sensing, actuation, and time domain reflectometry (TDR) applications.

Waveform 3 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?

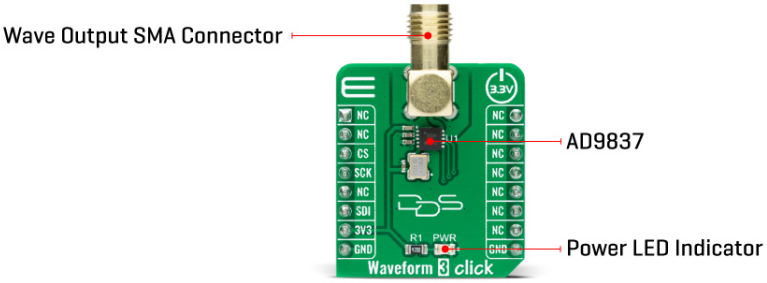
Waveform 3 Click, as its foundation, uses the AD9837, a fully integrated direct digital synthesis (DDS) device capable of producing high-performance sine and triangular wave outputs from Analog Devices. It also has an internal comparator that allows the creation of a square wave for clock generation. With 28-bits wide frequency registers, the output frequency and phase are software programmable allowing easy tuning. The AD9837 is fully capable of a broad range of complex and straightforward modulation schemes fully implemented in the digital domain, allowing the accurate and precise realization of complex modulation algorithms using DSP techniques.

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The internal circuitry of the AD9837 consists of a numerically controlled oscillator (NCO), frequency and phase modulators, SIN ROM, a DAC, a comparator, and a regulator. Also, it has a high-performance, onboard 16MHz trimmed general oscillator that can serve as the master clock for the AD9837 achieving a resolution of 0.06Hz.

The AD9837 offers a variety of outputs available from an onboard output SMA connector. The various output options (sine, triangular, and square wave) available from the AD9837 make this Click board™ suitable for a wide variety of applications, including modulation applications. It is also ideal for signal generator applications, and with its low current consumption, it is also suitable for applications in which it can serve as a local oscillator.

The Waveform 3 Click communicates with MCU using the 3-Wire SPI serial interface compatible with standard SPI, QSPI™, MICROWIRE™, DSP interface standards, and operates at clock rates up to 40MHz. Besides, it possesses additional functionality such as a programmable Sleep function that allows external control of the Power-Down mode and Reset function, which resets the appropriate internal registers to 0 to provide an analog output of mid-scale. It is essential to remind that the reset function does not reset the phase, frequency, or control registers.

This Click board™ can be operated only with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before use with MCUs with different logic levels. However, the Click board™ comes equipped with a library containing functions and an example code that can be used, as a reference, for further development.

Specifications

Type	Clock generator
Applications	Can be used for waveform generation required in various sensing, actuation, and time domain reflectometry (TDR) applications.
On-board modules	AD9837 - low-power programmable waveform generator capable of producing sine, triangular, and square wave outputs from Analog Devices
Key Features	Low power consumption, high precission, digitally programmable frequency and phase, sinusoidal, triangular, and square wave

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	outputs, power-down option, and more.
Interface	SPI
ClickID	No
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on Waveform 3 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	NC	
	NC	2	RST	INT	15	NC	
SPI Chip Select	**CS**	3	CS	RX	14	NC	
SPI Clock	**SCK**	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	NC	
SPI Data IN	**SDI**	6	MOSI	SDA	11	NC	
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

Waveform 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Maximum Output Voltage	-	0.645	-	V
Master fclk	-	16	-	MHz
Signal-to-Noise Ratio (SNR)	-	-64	-	dB
Resolution	-	10	-	bits
Operating Temperature Range	-40	+25	+125	°C

Software Support

We provide a library for the Waveform 3 Click as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika development boards.

Package can be downloaded/installed directly from NECTO Studio Package Manager(recommended way), downloaded from our LibStock™ or found on mikroE github account.

Library Description

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This library contains API for Waveform 3 Click driver.

Key functions:

- waveform3_cfg_setup - Config Object Initialization function.
- waveform3_init - Initialization function.
- waveform3_default_cfg - Click Default Configuration function.

Examples description

This demo app shows the basic capabilities of Waveform 3 Click board™. First, the sinusoidal wave is incremented to targeted frequency for visually pleasing introduction after which it changes between 4 modes of output.

The demo application is composed of two sections :

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager(recommended way), downloaded from our LibStock™ or found on mikroE github account.

Other mikroE Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.Waveform3

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™

mikroSDK

Click board™ Catalog

Click Boards™

Downloads

Waveform 3 click 2D and 3D files

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Waveform 3 click schematic

AD9837 datasheet

Waveform 3 click example on Libstock

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