

Time-saving embedded tools

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# Audio Xover Click





#### PID: MIKROE-4104

**Audio Xover Click** is an analog active crossover solution for two-way loudspeakers. The primary purpose of the crossover circuit in a loudspeaker is to split an incoming audio signal into frequency bands that are passed to the speaker or "driver" best suited. Audio Xover Click is based on <u>Microchip's MCP6H012</u> operational amplifier with rail-to-rail output operation, connected in configuration for 2nd order Butterworth filter for both low pass and high pass filters. With a frequency response independent of the dynamic changes in a driver's electrical characteristics and individual channel cutoff frequency selection it's great solution for crossover.

Audio Xover Click board<sup>™</sup> is supported by a mikroSDK compliant library, which includes functions that simplify software development. This Click board<sup>™</sup> comes as a fully tested product, ready to be used on a system equipped with the mikroBUS<sup>™</sup> socket.

## How does it work

Audio Xover Click is using three Butterworth filters (one for each speaker) with possibility of changing cutoff frequency between 120Hz, 90Hz and 70Hz. Butterworth filters are called maximally flat filters because, for a given order, they have the sharpest roll-off possible without inducing peaking in the Bode plot. The two-pole filter with a damping ratio of 0.707 is the second-order Butterworth filter.

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ISO 27001: 2013 certification of informational security management system. ISO 14001: 2015 certification of environmental management system. OHSAS 18001: 2008 certification of occupational health and safety management system.





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Audio crossovers are a type of electronic filter circuitry used in a range of audio applications, to split up an audio signal into two or more frequency ranges, so that the signals can be sent to drivers that are designed for different frequency ranges.

Active crossovers are distinguished from passive crossovers in that whereas passive crossovers split up an amplified signal coming from one power amplifier so that it can be sent to two or more drivers (e.g., a woofer and a very low frequency subwoofer, or a woofer and a tweeter), an active crossover splits up audio signal prior to amplification, so that it can be sent to two or more power amplifiers, each of which is connected to a separate driver type.

Active crossovers as Audio Xover Click don't care how powerful your amplifiers are because they process the signal before it enters the amplifier. Active crossovers are also not very sensitive to temperature variations, so they can be very accurate, all the time. If one of the amplifiers channels in an active crossover system clips, the distortion only affects that single channel.

# Specifications

Туре	Signal Processing
Applications	Audio crossover
On-board modules	МСР6Н012
Key Features	A frequency response independent of the dynamic changes in a driver's electrical characteristics, power amplifiers are directly connected to the speaker drivers, individual channel cutoff frequency selection
Interface	GPIO
ClickID	No
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	5V

# **Pinout diagram**

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This table shows how the pinout on Audio Xover Click corresponds to the pinout on the mikroBUS<sup>m</sup> 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	
Shutdown	SDN	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
	NC	7	3.3V	5V	10	5V	Power Supply
Ground	GND	8	GND	GND	9	GND	Ground

## **Onboard settings and indicators**

Label	Name	Default	Description
PWR	LED GREEN	-	Power LED Indicator
LHP	SL1	Left	Left channel high pass cutoff frequency selector; Left: 120Hz
SLP	SW1	Left	Subwoofer channel low pass cutoff frequency selector; Middle: 90Hz
RHP	SR1	Left	Right channel high pass cutoff frequency selector; Right: 70Hz

# Software Support

We provide a library for the Audio Xover Click on our <u>LibStock</u> page, as well as a demo application (example), developed using MikroElektronika <u>compilers</u>. The demo can run on all the main MikroElektronika <u>development boards</u>.

#### **Library Description**

Library contains function for enable and disable module.

Key functions:

 void audioxover\_set\_mode( uint8\_t state ) - This function set CS pin on 1 ( ENABLE ) and 0 ( DISABLE )

#### **Examples description**

The application is composed of three sections :

- System Initialization Initializes all necessary GPIO pins
- Application Initialization Initializes driver init
- Application Task Enable and disable module every one seconds.

#### The full application code, and ready to use projects can be found on our <u>LibStock</u> page. Mikroe produces entire development toolchains for all major microcontroller architectures.

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Other mikroE Libraries used in the example:

• LOG(UART) Library

## Additional notes and informations

Depending on the development board you are using, you may need <u>USB UART click</u>, <u>USB UART</u> <u>2 click</u> or <u>RS232 click</u> to connect to your PC, for development systems with no UART to USB interface available on the board. The terminal available in all MikroElektronika <u>compilers</u>, or any other terminal application of your choice, can be used to read the message.

# mikroSDK

This Click board<sup>m</sup> is supported with <u>mikroSDK</u> - MikroElektronika Software Development Kit. To ensure proper operation of mikroSDK compliant Click board<sup>m</sup> demo applications, mikroSDK should be downloaded from the <u>LibStock</u> and installed for the compiler you are using.

For more information about mikroSDK, visit the official page.

### Resources

<u>mikroBUS</u>™

<u>mikroSDK</u>

Click board<sup>™</sup> Catalog

Click Boards™

## Downloads

Audio Xover click example on Libstock

Audio Xover click 2D and 3D files

MCP6H01 datasheet

Audio Xover click schematic

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