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BT Audio Click

PID: MIKROE-2399

BT Audio Click is a compact add-on board with high-performing voice and audio post-processing capabilities for Bluetooth audio applications. This board features the RN52, a Bluetooth audio module from Microchip. It combines a class 2 Bluetooth 3.0 radio and an embedded DSP processor, controlled and configured by simple ASCII commands. The module comes with SBC, AAC, aptX audio decoders, microphone input, and stereo speaker output for the highest-quality audio. This Click board™ makes the perfect solution for the development of wireless audio docking stations, wireless speakers and headphones, smart medical devices, VoIP handsets, intercom push-to-talk audio connections, and more.

BT Audio 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?

BT Audio Click is based on the RN52, a Bluetooth audio module from Microchip. This Bluetooth 3.0 module integrates an RF radio and a baseband controller making it a complete Bluetooth subsystem. It supports A2DP, AVRCHP, HFP, SPP, and iAP profiles in a Bluetooth slave role and A2DP, AVRCP, and HFP in a Bluetooth master role. For implementing the iAP profile, the host MCU uses the RN52 as a data pipe to transfer the data over Bluetooth. This wireless profile advertising is discoverable by iOS devices.

The RN52 module has an integrated amplifier for driving 16 ohms speakers over the onboard 3.5mm audio connector. The TPA6112, a stereo audio power amplifier from Texas Instruments, features differential inputs, pop reduction circuitry, thermal and short-circuit protection, and

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more. Differential architecture in the analog path results in a low noise sensitivity and good power supply rejection while effectively doubling the signal amplitude. In addition to the audio output, this Click board™ is equipped with a 3.5mm audio connector for connecting a microphone. An analog and digital programmable gain stage can be optimized for different microphones.

The supported audio resolution is 24-bit with a maximum channel size of 32-bit. The module's analog-to-digital converter (ADC) supports sample rates of 8KHz, 32KHz, 44.1KHz, and 48KHz. The same sample rates are supported by two DACs, one for each speaker. The host MCU can configure both the sample rate and audio resolution. The RN52 module uses a printed antenna for Bluetooth wireless communication. BT Audio click has a 10m range in open space. The range is shorter indoors but still enough to cover a few rooms.

The DSP, or digital signal processor, makes this module special because it can stream audio – it converts and compresses the radio waves sent from your phone or computer into digital data, then sends it to your speakers or headphones. The module supports aptX, an audio codec for high-quality stereo audio streaming over Bluetooth. So, the sound quality is not something you must compromise on, as aptX encodes a CD-quality (16-bit / 44.1kHz) audio stream. HSP/HFP stands for Hands-Free Profile and Headset Profile for an audio connection between Bluetooth on your phone and the headset.

BT Audio Click uses a UART interface to communicate with the host MCU, with commonly used UART RX and TX, supporting baud rates of 9600 up to 115200. The baud rate is set to 9600 by default via the pull-down resistor and can be set to 115200 with a logic HIGH on the BAUD pin. The RN52's UART is set to Command mode by pulling the CMD pin to a logic HIGH; otherwise, the UART enters the Data mode. While in Command mode, the user can configure the module with the ASCII commands. In Data mode, the module is processing the data. There are two additional pins, RST and FRS, representing the general-purpose reset and factory reset functions that allow users to reset the module to factory defaults. The PWR pin power up the module with the HIGH logic state.

There are two LEDs on this Click board™, red and blue. While both are flashing, the BT Audio Click is discoverable. If red is only flashing, the module is connected; if blue is only flashing, the module is connectable.

This Click board™ can only be operated with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before using 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	BT/BLE
Applications	Can be used for the development of wireless audio docking stations, wireless speakers and headphones, smart medical devices, VoIP handsets, intercom push-to-talk audio connections, and more
On-board modules	RN52 - Bluetooth audio module from Microchip TPA6112 - stereo audio power amplifier from Texas Instruments

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Key Features	Audio decoders: SBC, AAC, aptX; embedded Bluetooth profiles: A2DP, AVRCP, HFP/HSP, and SPP, an integrated amplifier for driving 16ohms speakers, audio stereo 3.5mm connector, microphone 3.5mm connector, Bluetooth 3.0, and more
Interface	GPIO,UART
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

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

Notes	Pin	mikroBUS™				Pin	Notes
Baud Rate Selection	**BAUD**	1	AN	PWM	16	**CMD**	Command/Data mode
Reset	**RST**	2	RST	INT	15	**FRS**	Factory Reset
Module Power-Up	**PWR**	3	CS	RX	14	**TX**	UART TX
	NC	4	SCK	TX	13	**RX**	UART RX
	NC	5	MISO	SCL	12	NC	
	NC	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
-	PWR	-	Power LED Indicator
LD1-LD2	LD1-LD2	-	Status LED Indicator

BT Audio Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Operating Frequency Range	2.4	-	2.48	GHz
Maximum Data Rate	-	-	3	Mbps
Operational Range	-	-	10	m
RF TX Power	-	-	4	dBm

Software Support

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

Package can be downloaded/installed directly from NECTO Studio Package Manager

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(recommended), downloaded from our LibStock™ or found on Mikroe github account.

Library Description

This library contains API for BT Audio Click driver.

Key functions

- Play next track function
- Increase volume function
- Decrease volume function

Example Description

This example reads and processes data from BT Audio clicks.

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

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.BtAudio

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. UART terminal is available in all MIKROE compilers.

mikroSDK

This Click board™ is supported with mikroSDK - MIKROE 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™

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Downloads

BT Audio click example on Libstock

BT Audio click schematic

BT Audio click 2D and 3D files

TPA6112A2 datasheet

RN52 datasheet

BT audio module command