Quick start guide for MERUS™ evaluation boards

EVAL_AUDIO_MA2304DNS_B and EVAL_AUDIO_MA2304PNS_B

About this document

Scope and purpose

This document provides step-by-step instructions on how to get the EVAL_AUDIO_MA2304xNS_B evaluation board to play audio quickly.

Intended audience

Design engineers, technicians, and developers of electronic systems.

Evaluation board

This board is to be used during the design-in process for evaluating and measuring characteristic curves, and for checking datasheet specifications.

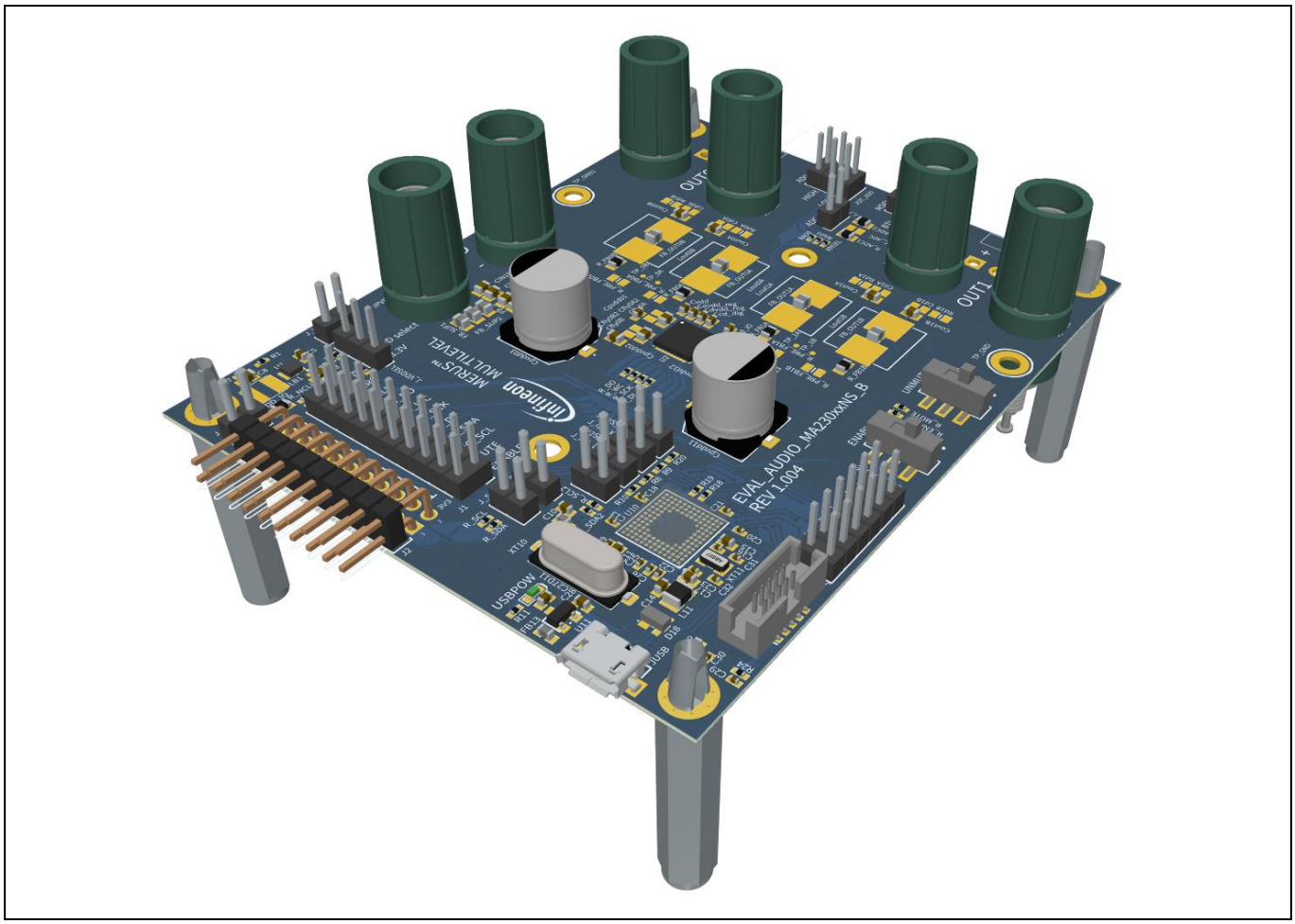

Figure 1 Overview of the EVAL_AUDIO_MA230xxNS_B evaluation board

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Safety precautions

Note: Please note the following warnings regarding the hazards associated with development systems.

Table 1 Safety precautions

	Caution: *The device surfaces of the evaluation or reference board may become hot during testing. Hence, necessary precautions are required while handling the board. Failure to comply may cause injury.*
	Caution: *The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.*

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1 Board overview

The demonstration board EVAL_AUDIO_MA2304xNS_B is an evaluation and demonstration board for MERUS™ audio's MA2304DNS and MA2304PNS amplifiers.

It contains digital input/output (I/O) and various output and setup/selection features. It also contains one onboard buck power supply generator (1.8 V/3.3 V selectable) so only one external power supply (PVDD) is necessary.

The board can be used for evaluating or demonstrating key features andadvantages of the MERUS™ technology:

- Energy efficiency
  - Power losses at typical audio listening levels
  - Idle power loss
- Adaptive power management system
- No output filter components
  - Solution cost and size reduction
- Audio performance
  - THD performance and audio quality

1.1 Board features and audio performance

• Number of audio channels	2 (BTL) or 1 (PBTL)
• Audio input format	Digital (I^2S, LJF, RJF or TDM)
• Typical supply voltage	18 V (PVDD)
• Output noise level	52 μV_{RMS} (high audio performance mode)
• Dynamic range	106 dB (high audio performance mode)
• Idle consumption at PVDD = 18 V	61 mW (low power consumption mode)
• Efficiency	
– 1 W, 8 Ω	More than 79 percent
– Full-scale, 8 Ω	More than 90 percent

Note: Idle consumption is the sum of the output stage (PVDD) current, VDD, and VDD_IO supply current. As all the supplies are tied to PVDD, the buck converters's efficiency should be considered when measuring idle current consumption directly from PVDD. Features on the EVK make it possible to break the input and output of the buck converters for these purposes. Please refer to the MA2304xNS device datasheet for the exact current figures.

Table 2 Typical audio and electrical specifications

Parameter	Description	Conditions	Typical	Unit
$P_{IPOUT,BTL}$	Instantaneous peak output power per channel (BTL)	THD + N = 1%, RL = 4 Ω, f = 1 kHz	60	W
$P_{RMSOUT,BTL}$	RMS output power per channel (BTL)	THD + N = 10%, RL = 4 Ω, f = 1 kHz	37	W
THD+N	THD + noise (N)	1 kHz, P_{OUT} = 5 W, RL = 4 Ω	0.05	%
η	Efficiency[2]	P_{OUT} = 2 × full-scale, 4 Ω	84	%
		P_{OUT} = 2 × full-scale, 8 Ω	90	%

[2] *Efficiency values do not consider the on-board buck converter power consumption.*

1.2 Board operating conditions

Table 3 Recommended operating conditions

Parameter	Minimum	Nominal	Maximum	Unit
P_{VDD}	10	18	20	V
V_{DD}	1.62	1.8	3.65	V
Maximum output current per channel (BTL)			6.0	A
Maximum output current (PBTL)			12.0	A

For in-depth information on the evaluation board itself, please refer to the EVAL_AUDIO_MA2304DNS_B or EVAL_AUDIO_MA2304PNS_B hardware user manual.

2 Quick start

This chapter describes how to configure, power, and start up the board for quick evaluation.

2.1 What's included

The evaluation kit box comes with:

- EVAL_AUDIO_MA2304xNS board
- Three interface boards (analog in, S/PDIF coax, and S/PDIF optical)
- Micro USB cable
- 22 µH power inductor for performance measurements (refer to the hardware user manual for details)

The following items are required, in addition to the items in the evaluation kit, for basic UI and DSP evaluation:

- DC power supply: 10 to 20 V DC/6 A for BTL mode or 10 to 20 V DC/12 A for PBTL mode
- Loudspeaker(s): 2 to 8 Ω speaker impedance
- (Optional): 2 to 8 Ω power resistor, class D filter and audio analyzer

2.2 Hardware setup

First, verify that the board jumpers are in the default position, as shown in Figure 2.

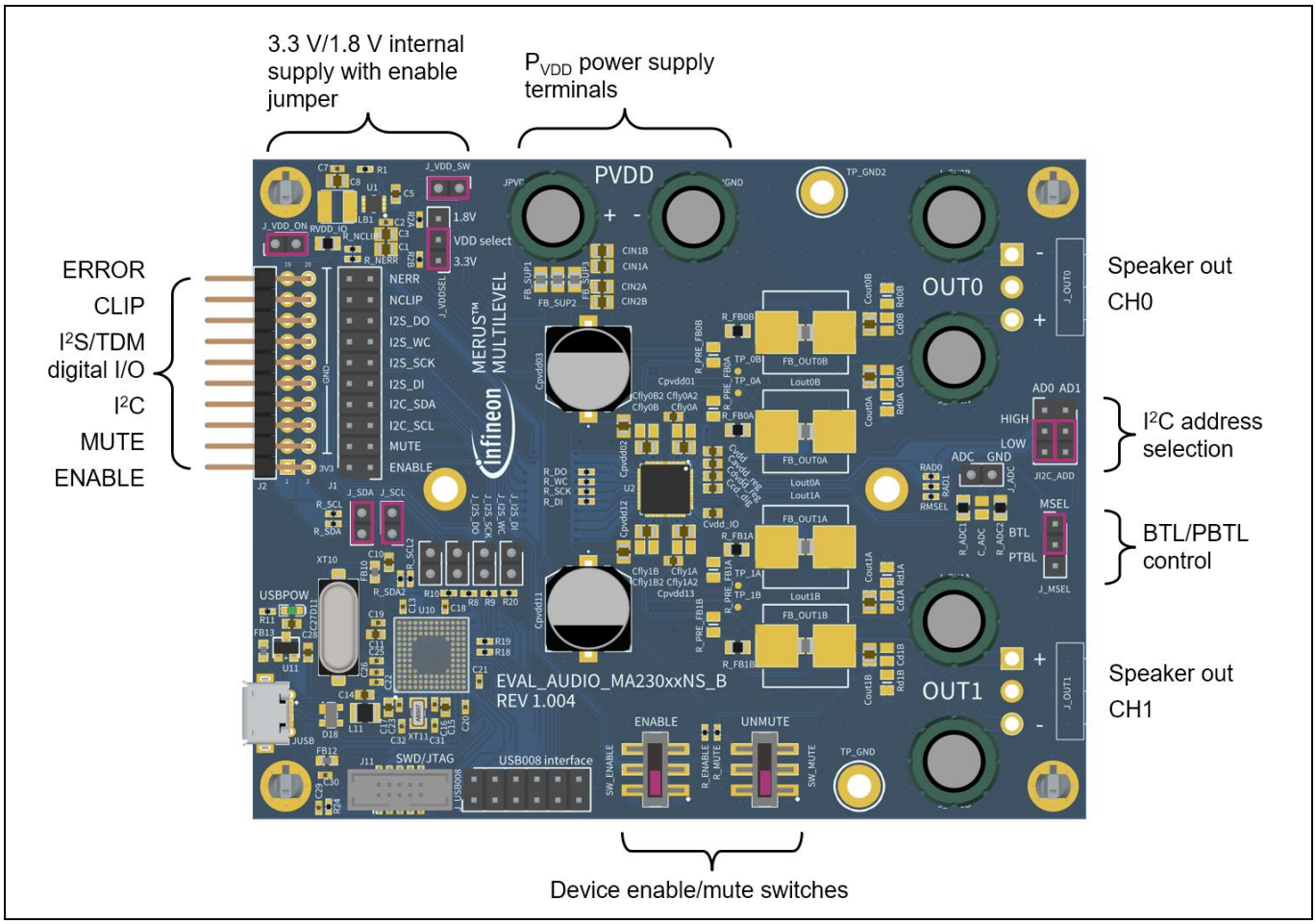

Figure 2 Default jumper settings for EVAL_AUDIO_MA230xxNS_B

For quick and easy evaluation, plug one of the interface boards into the J1 I/O header on top of the MA2304xNS board, as shown in Figure 3.

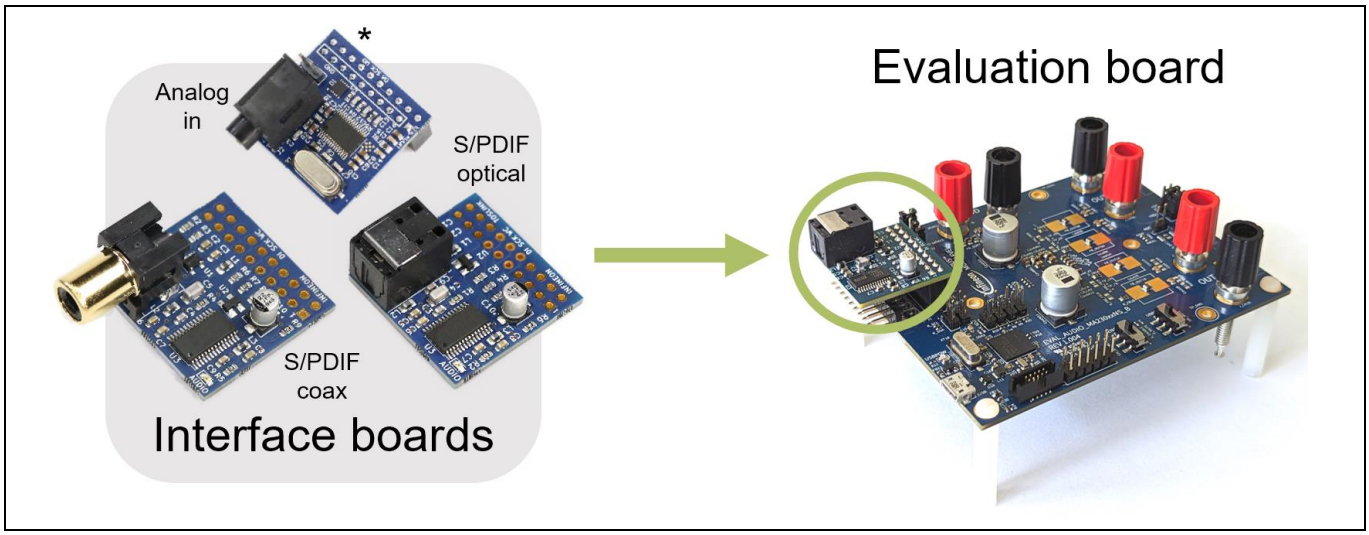

Figure 3 Interface boards and MA2304xNS evaluation board

An MA2304xNS evaluation setup with an interface board can play audio without software, as the interface board's digital audio output format matches the MA2304xNS device default.

The MA2304xNS board's jumper and switch settings are preconfigured for basic BTL operation as default before shipping.

2.3 Software installation

The MERUS™ audio amplifier configurator can be downloaded by visiting https://softwaretools.infineon.com/ and registering the board. Once registered, the software can be installed through the Infineon developer center launcher or downloaded as a separate installer file. This will also install all the necessary device drivers to communicate with the MA2304xNS evaluation board.

To install, search for "merus" under the Tools tab of the Infineon developer center website or launcher:

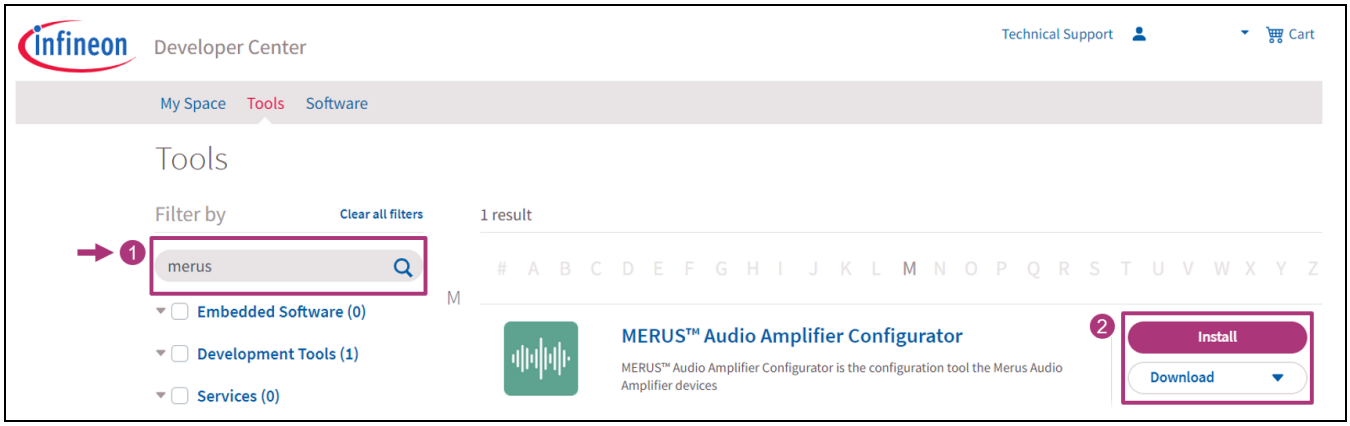

Figure 4 How to find the MERUS™ audio amplifier configurator

For proper operation, the software must be installed using administrative privileges, as shown in Figure 5.

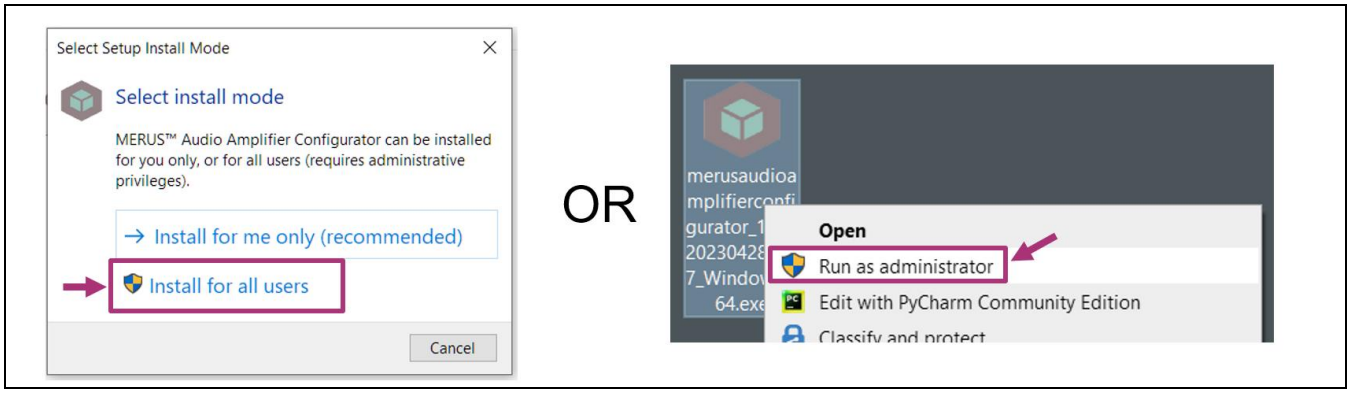

Figure 5 How to install the software using administrative privileges

This concludes the software installation.

2.4 Power and start-up procedure

The following steps describe the power-up procedure and device configuration using the GUI software tool.

1. First, connect all the sources and speaker/load cables as follows:

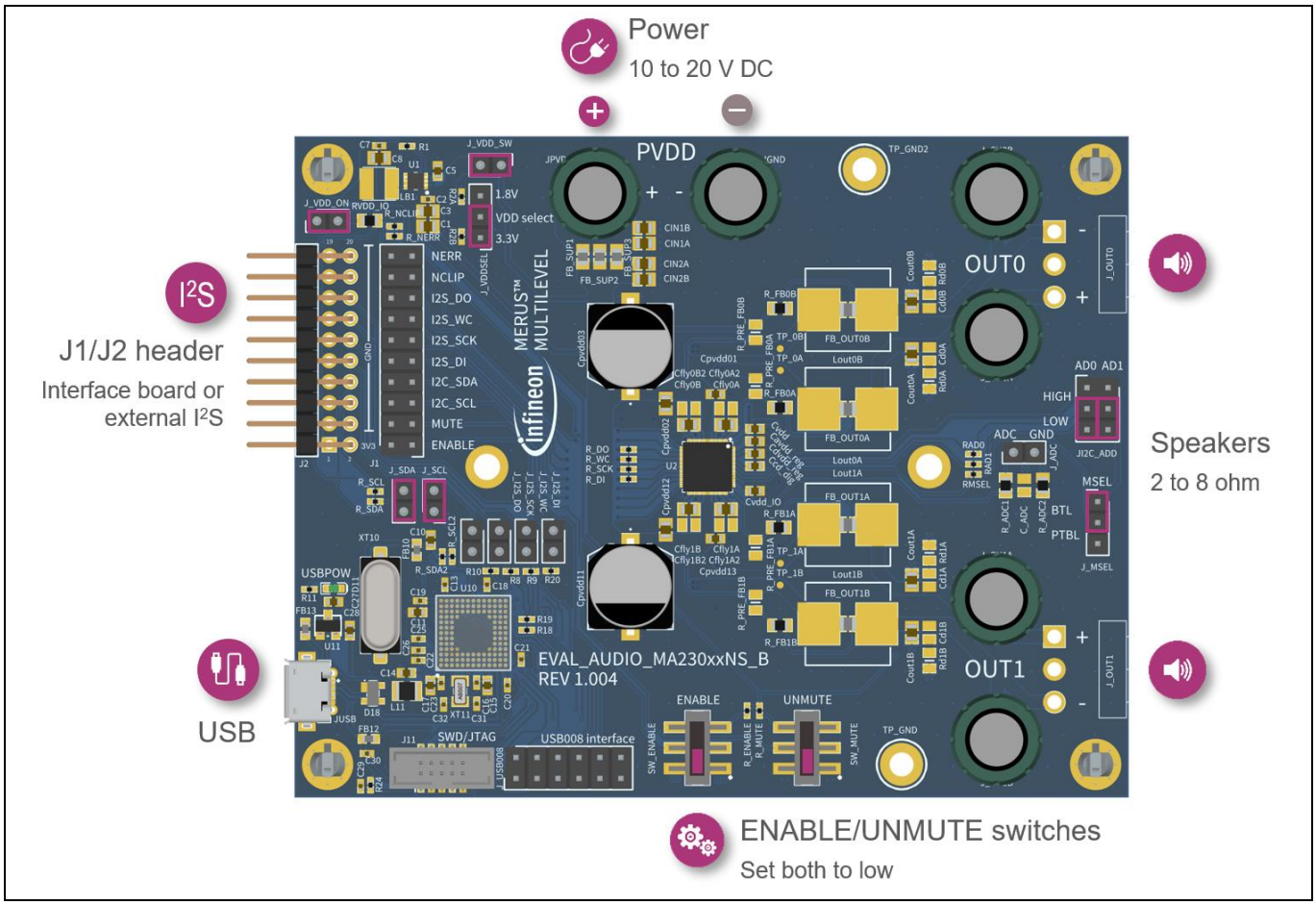

Figure 6 Default EVK configuration for audio playback

2. Prior to launching the software:
   a. Power up the $\mathbf{P_{VDD}}$ DC power supply. 18 V is recommended for typical evaluation.

b. Make sure the **Micro USB** cable from the computer is connected to the EVK board.
c. Mute and connect an external audio source to the **interface board** input (analog, S/PDIF coax, or optical).
d. Set the **SW_ENABLE** switch to **ON** and **SW_MUTE** to **UNMUTE**, as shown in Figure 7.

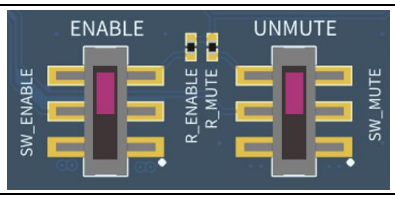

Figure 7 SW_ENABLE set to ENABLE; SW_MUTE set to UNMUTE

At this point, the MA2304xNS should be able to play audio. Set the audio source to a low volume and unmute it.

3. Once the hardware is configured, double-click the “Developer center launcher” or the “MERUS audio amplifier configurator” icon on your desktop to launch the application.

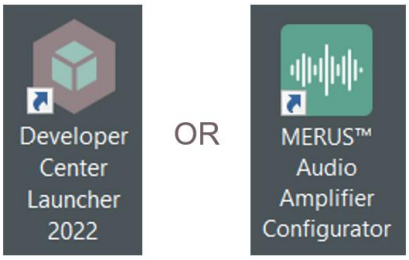

Figure 8 MERUS™ audio amplifier configurator

After a few seconds, the following screen should appear:

Figure 9 MERUS™ audio amplifier configurator

4. At this point, feel free to adjust the volume level or put the device on standby.

The Connected indicator means that the software can communicate with the MA2304xNS device.

5. To access advanced device features and DSP flows, click the Configuration button and select the **Configuration** option.

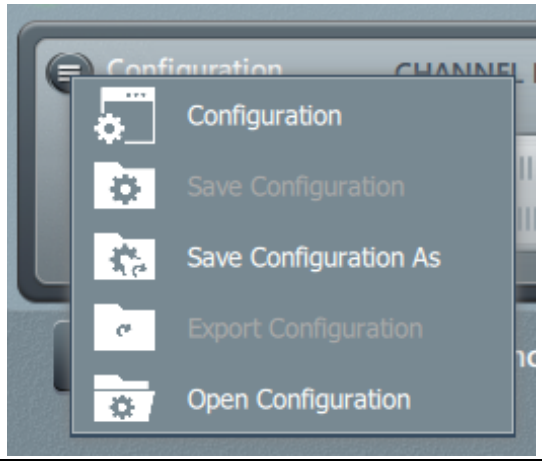

Figure 10 Configuration dropdown menu

The Configuration page should now appear. This page provides access to advanced device features, DSP flows, device registers, and status indicators.

Figure 11 Configuration page

Please refer to the evaluation board user manual for details on how to perform audio performance measurements as well as board schematics, layout views, and bill of materials (BOM).

Revision history

Document revision	Date	Description of changes
V 1.0	2023-09-15	Initial release

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