

# NL-NAU8325

## User Manual

***Evaluation Board for NAU8325***

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## 1 OVERVIEW

The NL-NAU8325 is the evaluation board for NAU8325 and its compatible ICs. This board is developed for users to quickly understand the characteristics of NAU8325. For development flexibility, this board has built-in additional expansion connectors that provide power, speaker outputs and digital interface. For development convenience, NL-NAU8325 can be connected with speakers or directly to customized system.

Nuvoton has also developed a USB control board, NU-NAUSB212C, which provides I<sup>2</sup>C control interface and digital audio interface signals. Along with the software NuvotonAudioGUI, users can quickly set up and use NL-NAU8325 on their PCs.

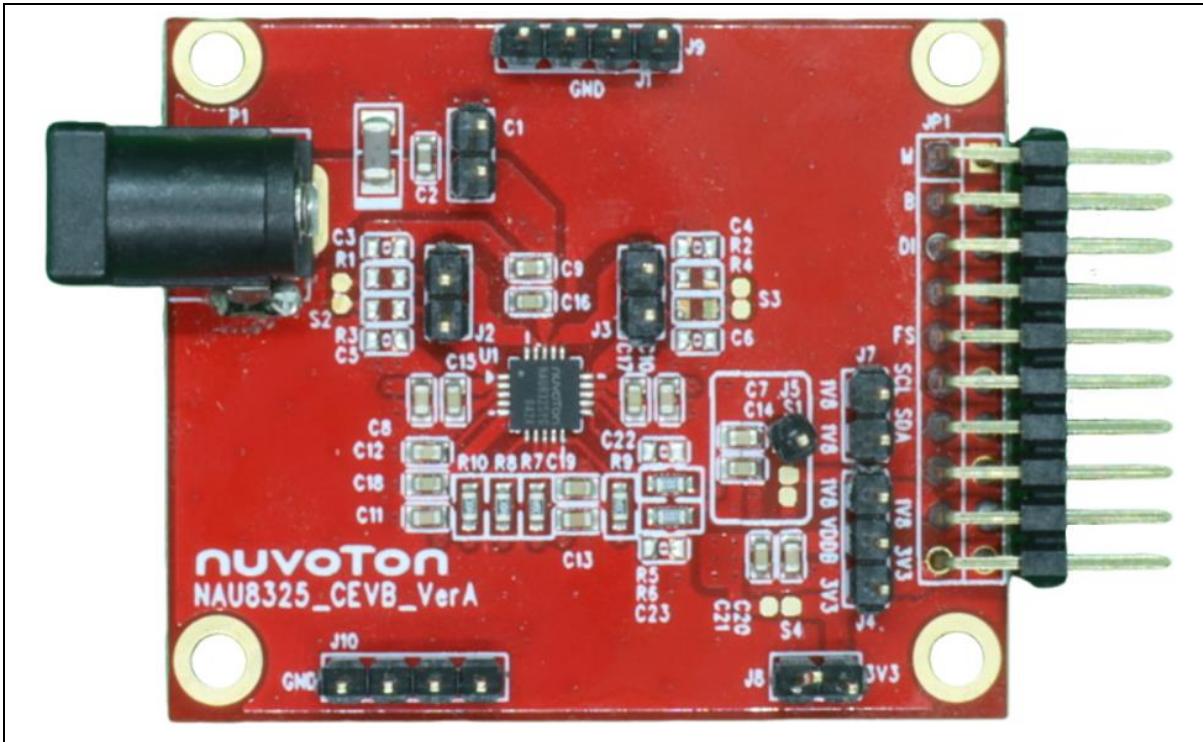


Figure 1-1 NL-NAU8325 Evaluation Board

NL-NAU8325 compatible ICs:

- NAU8325YG
- NAU83U25YG
- NAU83R25YG

## 2 HARDWARE CONFIGURATION

### 2.1 NL-NAU8325 Front View

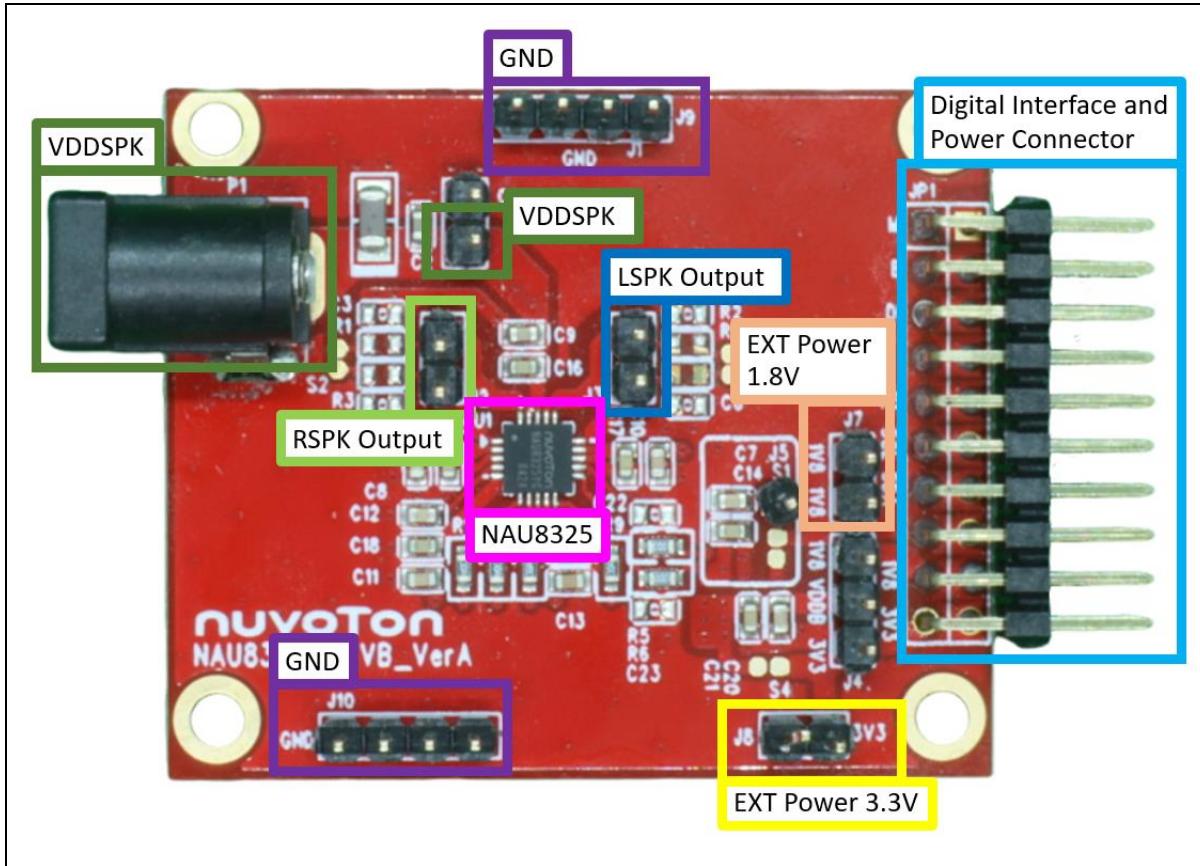


Figure 2-1 Front View of NL-NAU8325

Figure 2-1 shows the main components and connectors from the front side of NL-NAU8325 as the following list:

- Target Chip: NAU8325 (U1)
- VDDSPK 2.5MM DC Jack (P1)
- VDDSPK Extension Connector (J1.2)
- Left Channel Speaker(LSPK) Output Extension Connector (J3)
- Right Channel Speaker(LSPK) Output Extension Connector (J2)
- Digital Interface and Power Extension Connector (JP1)
- EXT Power 3.3V (J8)
- EXT Power 1.8V (J7)
- GND (J9, J10)

## 2.2 NL-NAU8325 Connectors

Table 2-1 describes the connectors on NL-NAU8325. Users can refer to Figure 2-1.

Header		NL-NAU8325	
		Net Name in Schematic	Description
JP1	JP1.1	MCLK	External Master Clock Source Input
	JP1.2	GND	GND
	JP1.3	BCLK	Serial Data Bit Clock Input / Output for I <sup>2</sup> S / PCM Data
	JP1.4	GND	GND
	JP1.5	DACIN	Serial Audio Data Input for I <sup>2</sup> S / PCM Data
	JP1.6	GND	GND
	JP1.7	ADCOUT	Serial Audio Data Output for I <sup>2</sup> S / PCM Data
	JP1.8	GND	GND
	JP1.9	FSYNC	Frame Sync Input / Output for I <sup>2</sup> S / PCM Data
	JP1.10	GND	GND
	JP1.11	SCL	Serial Data Clock for I <sup>2</sup> C
	JP1.12	GND	GND
	JP1.13	SDA	Serial Data for I <sup>2</sup> C
	JP1.14	GND	GND
	JP1.15	VDDIO	VDDIO
	JP1.16	GND	GND
	JP1.17	VDD1V8	1.8V Power Supply
	JP1.18	GND	GND
	JP1.19	VDD3V3	3.3V Power Supply
	JP1.20	GND	GND
P1		VDDSPK	VDDSPK Power Supply
J1	J1.1	GND	GND
	J1.2	VDDSPK	VDDSPK Power Supply

Header		NL-NAU8325	
		Net Name in Schematic	Description
<b>J2</b>	J2.1	SPK_RN	Right Speaker Negative Output
	J2.2	SPK_RP	Right Speaker Positive Output
<b>J3</b>	J3.1	SPK_LN	Left Speaker Negative Output
	J3.2	SPK_LP	Left Speaker Positive Output
<b>J7</b>	J7.1	1V8	1.8V External Power Supply
	J7.2		
<b>J8</b>	J8.1	3V3	3.3V External Power Supply
	J8.2		
<b>J9</b>	J9.1	GND	GND
	J9.2		
	J9.3		
	J9.4		
<b>J10</b>	J10.1	GND	GND
	J10.2		
	J10.3		
	J10.4		

Table 2-1 NL-NAU8325 Extension Connectors

### 2.3 NU-NAUSB2I2C USB Control Board View

The NU-NAUSB2I2C provides I<sup>2</sup>C control signals and common audio digital formats. With this board, users can quickly evaluate the functions and features of the NL-NAU8325 and perform basic operations on the NL-NAU8325 in conjunction with the content of this document. For more details of NU-NAUSB2I2C, please refer to *NU-NAUSB2I2C User Manual*.

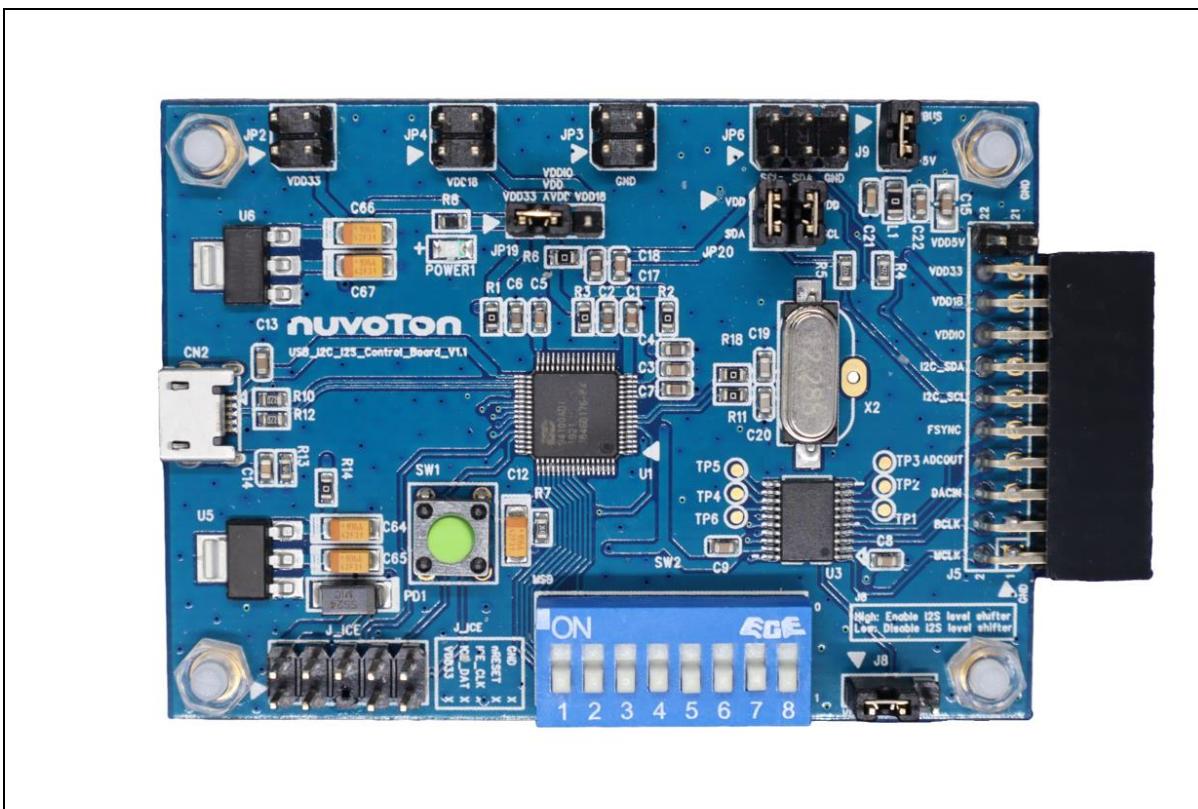


Figure 2-2 NU-NAUSB2I2C

## 2.4 Hardware Check and Connection

Before using NuvotonAudioGUI, please confirm the hardware configured as follows before connecting to a Windows based PC.

1. Confirm that pin 7 of SW2 of NU-NAUSB212C is high and the rest are low level, as shown in Figure 2-3.

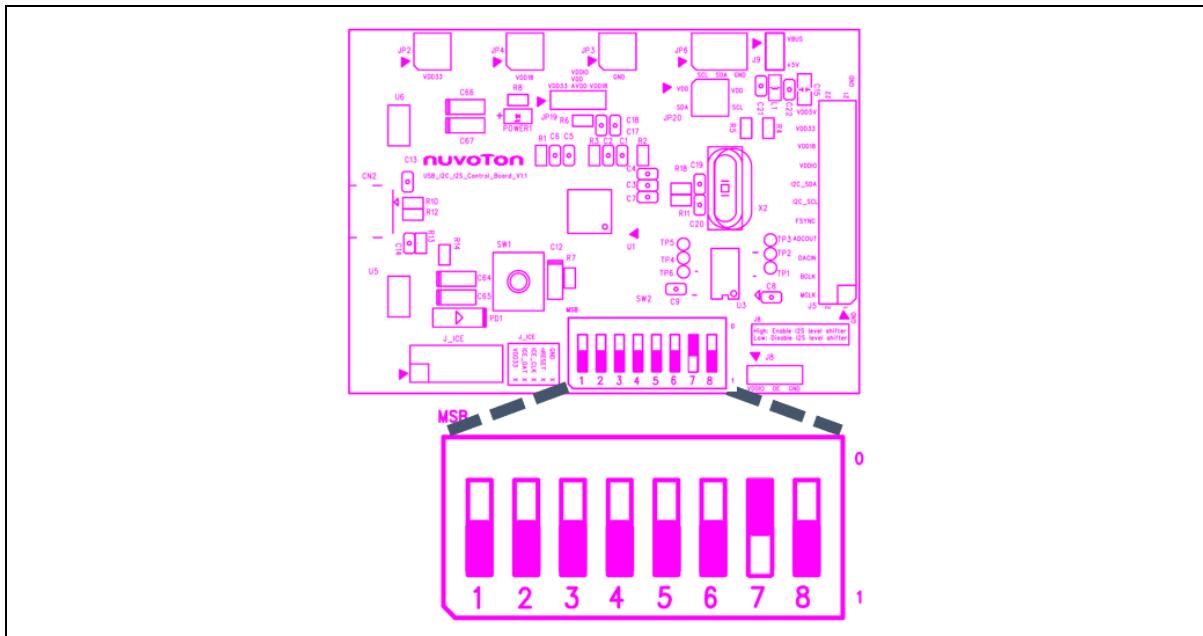


Figure 2-3 PIN Status of NU-NAUSB212C SW2

2. Connect J5 of NU-NAUSB212C to JP1 of NL-NAU8325. Figure 2-4 is the diagram after two boards are connected to each other.

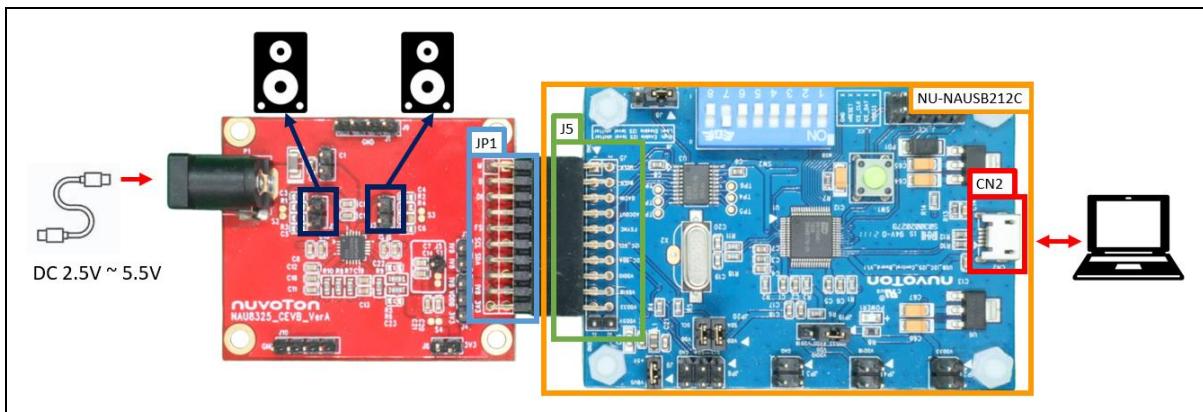


Figure 2-4 NU-NAUSB212C Connection

3. CN2 of NU-NAUSB212C uses USB Cable to connect to a PC under Windows system. (If possible, please do not connect to the PC through USB HUB). Figure 2-5 shows the audio signal path after the two boards are connected to each other.

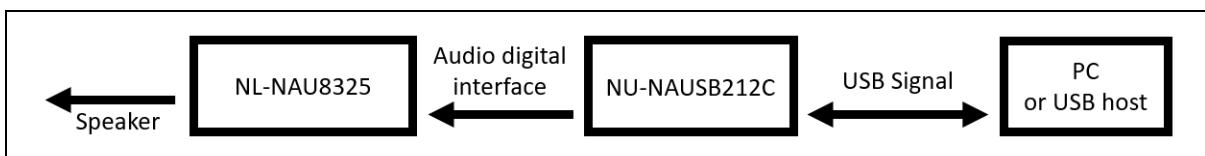


Figure 2-5 Signal Path of NU-NAUSB212C and NL-NAU8325

4. Select the audio device on the PC as "Nuvoton UAC+HID Device". For example, under Win10 system, users can click the speaker icon on the bottom-right corner of the desktop and choose the device "Nuvoton UAC+HID Device," as shown in Figure 2-6. This will select "Nuvoton UAC+HID Device" as current playback device.

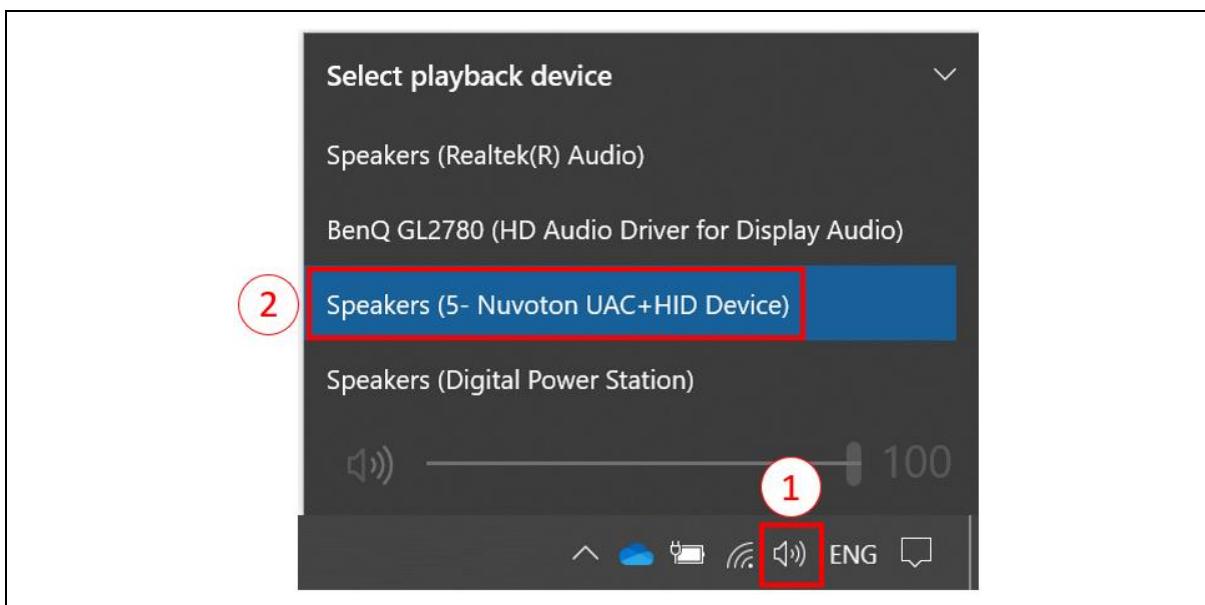


Figure 2-6 PC Audio Device Setting

5. When the relevant settings of the NL-NAU8325 are enabled, users can play audio files from the PC, and the sound will be output through the speakers with the NL-NAU8325.

## 2.5 Power Supply on NU-NAUSB212C to Assist Demonstration

The NU-NAUSB212C can provide basic power (5V, 3.3V, and 1.8V) when connected to PC. This document provides a method to use the NU-NAUSB212C to supply DC 5V to the NL-NAU8325, allowing the NL-NAU8325 to operate without the need for an additional power adapter, enabling a quick and convenient way to complete the demonstration.

**Note:** If the user intends to verify the power output of this IC, a professional power supply should be used.

Please refer to Figure 2-7 and the following instructions to complete the hardware connections.

1. Connect J9.1 and J9.2 of the NU-NAUSB212C to each other.
2. Connect JP1.22 of the NU-NAUSB212C to J1.1 of the NL-NAU8325.

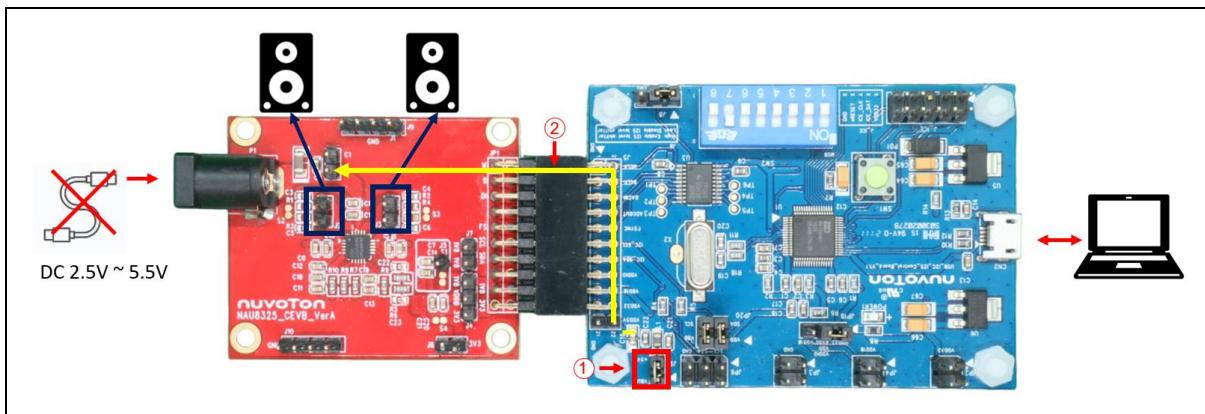


Figure 2-7 NU-NAUSB212C Supplying DC 5V Hardware Configuration

### 3 SOFTWARE CONFIGURATION

This document is compatible with NuvotonAudioGUI V2.04 or later.

Evaluation of NL-NAU8325 feature needs to install NuvotonAudioGUI.

#### 3.1 NuvotonAudioGUI Installation

1. Visit Nuvoton Website.

Download NuvotonAudioGUI software.

<https://www.nuvoton.com/tool-and-software/software-tool/programmer-tool/>

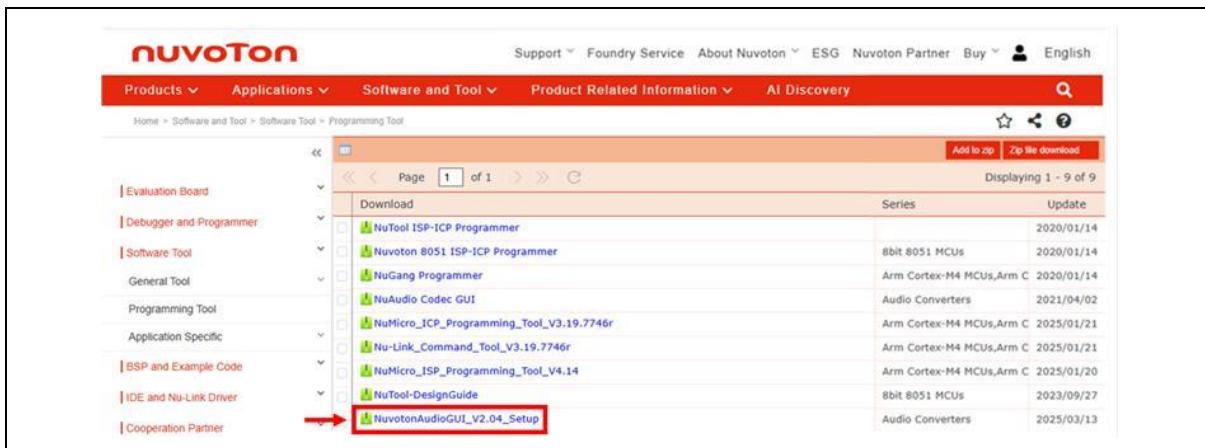


Figure 3-1 NuvotonAudioGUI Installation Step (1)

2. Install the NuvotonAudioGUI. The installation steps are shown in Figure 3-2 and Figure 3-3.

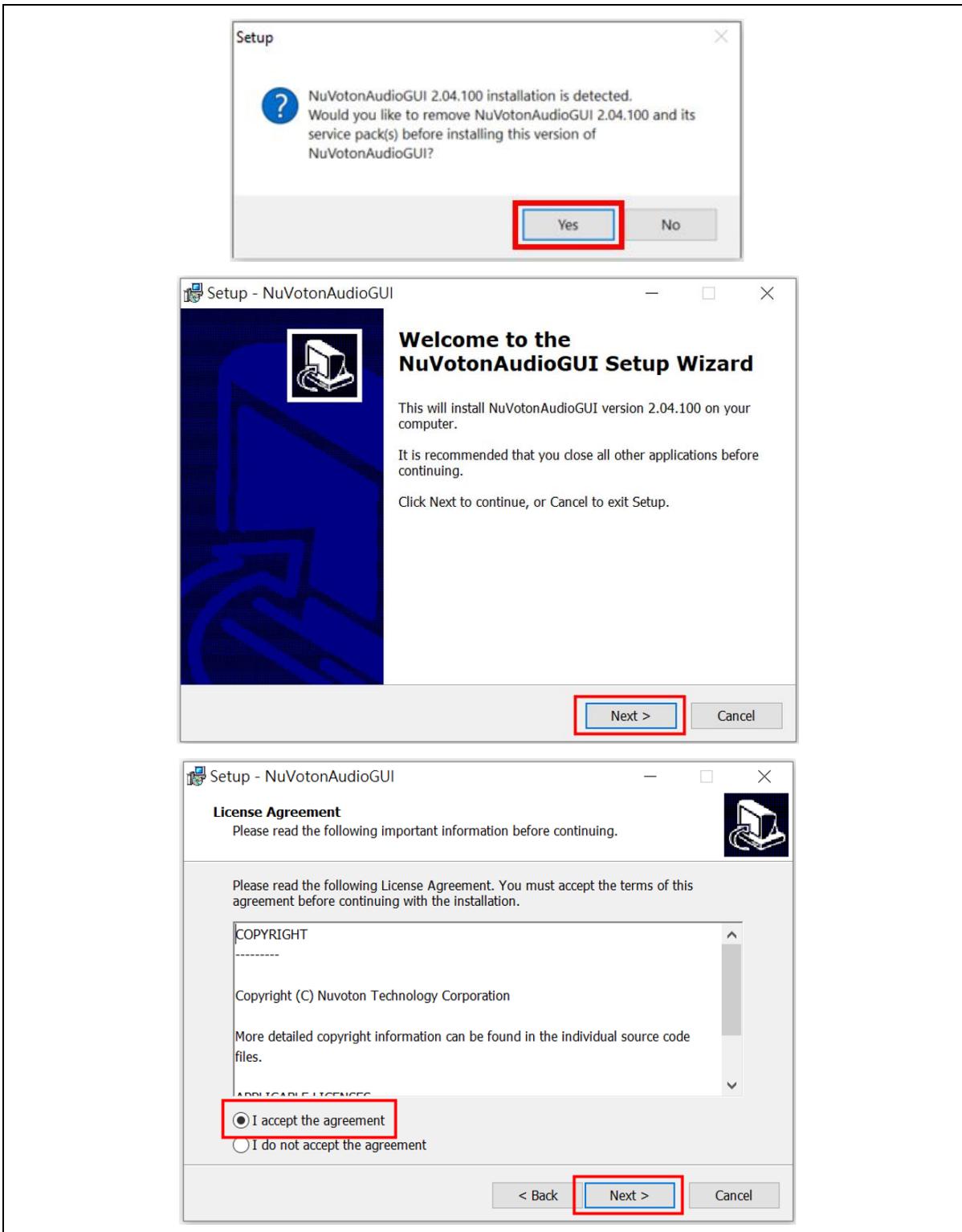


Figure 3-2 NuvotonAudioGUI Installation Step (2)

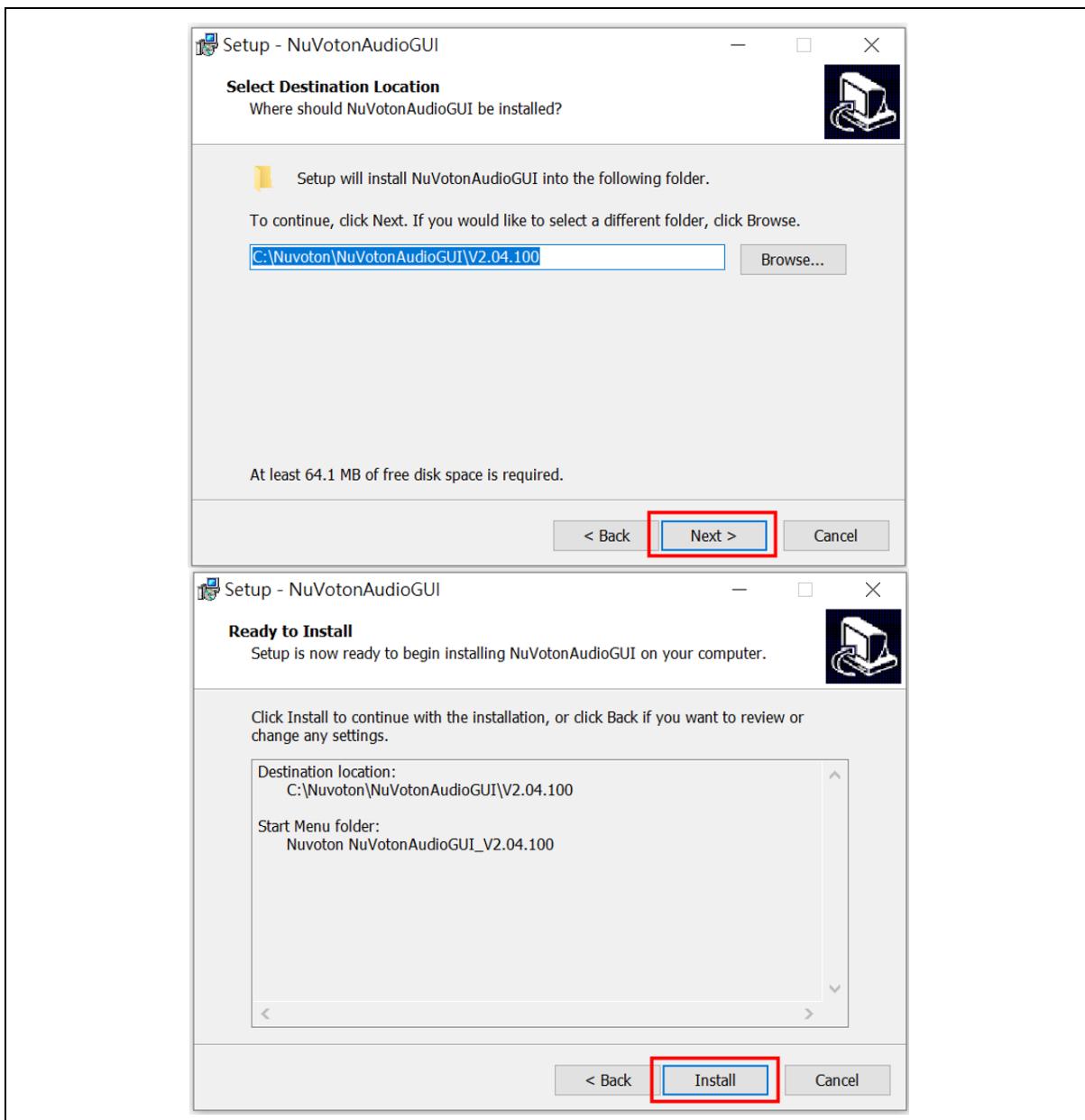


Figure 3-3 NuvotonAudioGUI Installation Step (3)

### 3.2 NuvotonAudioGUI Operating Instructions

1. Open NuvotonAudioGUI, choose the corresponding IC Part Number, and click [OK], as shown in Figure 3-4.

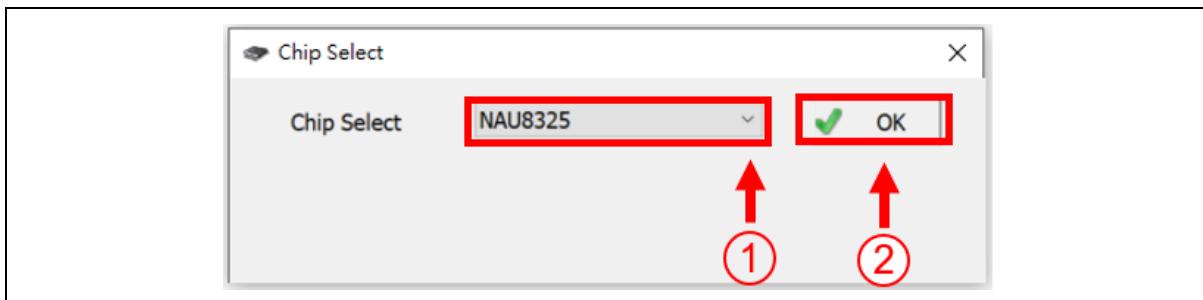


Figure 3-4 NuvotonAudioGUI Operating Step (1)

2. After clicking [OK], NuvotonAudioGUI will automatically read the connection status and verify the firmware version of the NU-NAUSB212C. If the firmware version is outdated, the version reminder window shown in Figure 3-5 will pop up. Users can ignore this message and continue operating NuvotonAudioGUI by clicking [X] on the top-right corner.

For more firmware update process information, please refer to NU-NAUSB212C User Manual.

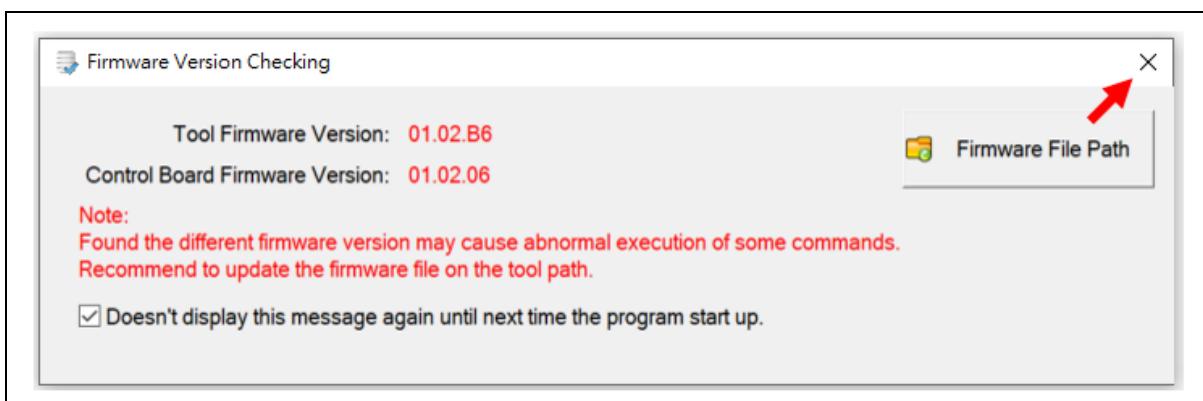


Figure 3-5 NuvotonAudioGUI Operating Step (2)

3. NuvotonAudioGUI will automatically read connection status. If the hardware and software are properly configured, a green [Connect] will appear on the upper left corner of the NuvotonAudioGUI window, as shown in Figure 3-6. Then users can issue I<sup>2</sup>C commands through NuvotonAudioGUI to control NL-NAU8325.

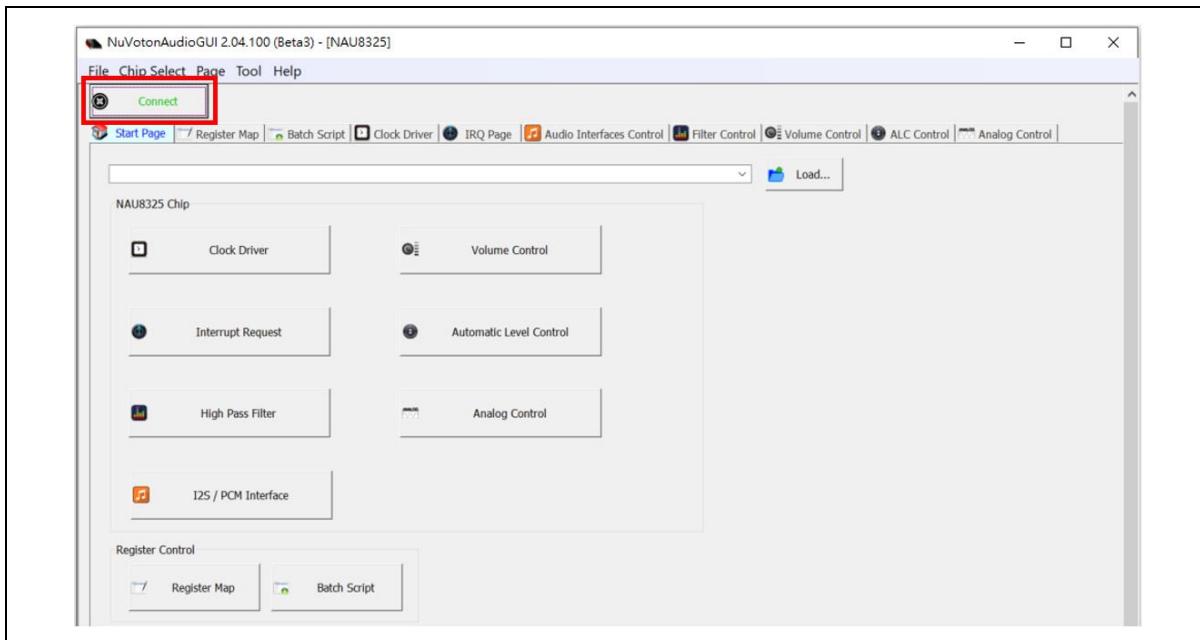


Figure 3-6 NuvotonAudioGUI Operating Step (3)

4. If the red [Disconnected] appears on the upper left corner of the NuvotonAudioGUI window, as shown Figure 3-7, check if the hardware configuration is correct.

For example: USB cable, whether your PC USB has read and write permissions, and whether Section 2.4 is executed correctly. If the problem still exists, please contact Nuvoton.

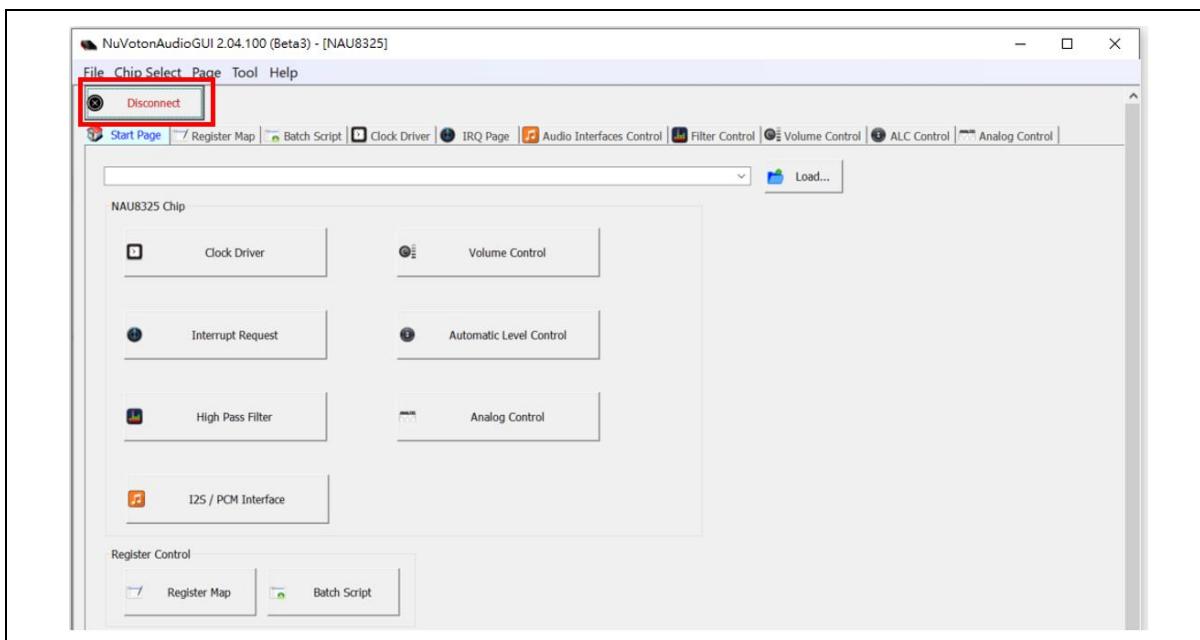


Figure 3-7 NuvotonAudioGUI Operating Step (4)

### 3.3 NuvotonAudioGUI Basic Page Introduction

NAU8325 function settings are divided into multiple pages in NuvotonAudioGUI. This document will take a few frequent-use pages as brief introduction.

#### 3.3.1 Start Page and DemoSequence

Start Page is the default view of NuvotonAudioGUI with links to all pages. Users can immediately enable the NL-NAU8325 function by this page and the NuvotonAudioGUI built-in demo sequences. Refer to Figure 3-8 and the following description to operate.

1. Click the drop-down menu on the start page.
2. Select the option description for the corresponding evaluation board.
3. Click the Load button.

NuvotonAudioGUI provides one set of: DemoSequence\_NAU8325.

- DemoSequence\_NAU8325:

This setting enables the SPK OUT (DAC function) functions of the NAU8325. Users can play their desired audio files using the playback device on the PC with the system playback device set to "Nuvoton UAC+HID Device". The audio will then be heard through the speakers connected on the NL-NAU8325.

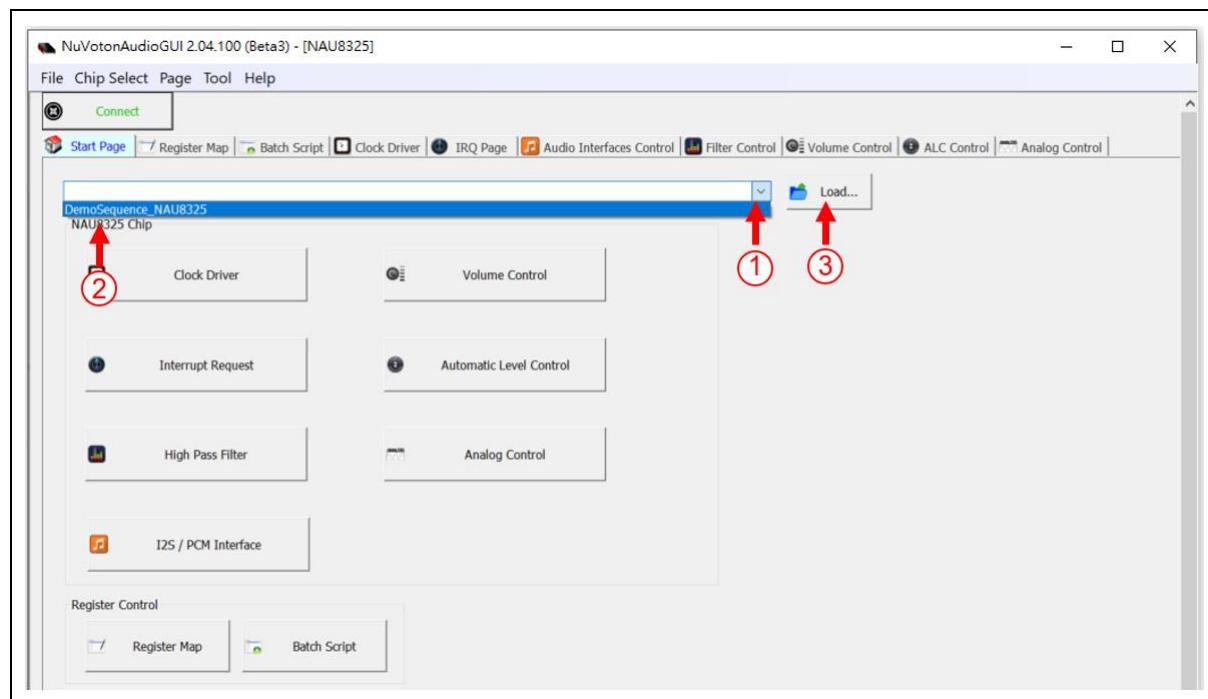


Figure 3-8 Start Page on NuvotonAudioGUI

### 3.3.2 Register Map

The Register map page can modify the target register value through NuvotonAudioGUI. The following explains two main modification methods.

- Users can directly key in desired register values into the "Value" field next to the corresponding address, as shown in Figure 3-9. ("Value" has hexadecimal and binary column respectively, just select one to modify.)
- If users want to read the specified address value, enter the address value in the "Address" field, as shown in Figure 3-9. After clicking the [Read] button on the left, the address value will be displayed in the "Value" field. If users want to modify the specified address value, enter the desired address and corresponding value in the "Address" and "Value" fields respectively, and click the [Write] button on the left to complete the modification.

There are two functions [Import] and [Export] on the Register page:

- [Export]: Export the currently set values into a text file.
- [Import]: Import external text files and set them to the target evaluation board.

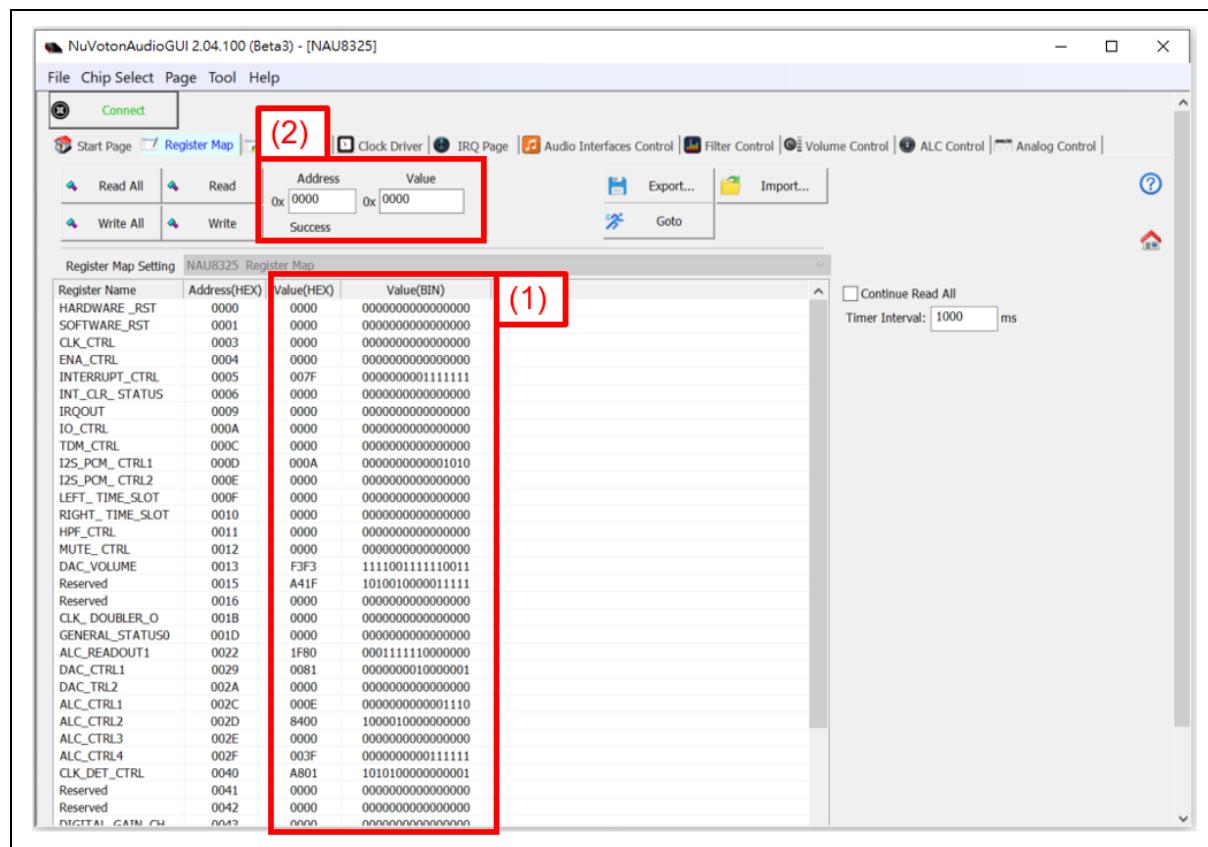


Figure 3-9 Register Map Page on NuvotonAudioGUI

## 4 SCHEMATICS

### 4.1 NL-NAU8325 Schematic

Figure 4-1 shows the NL-NAU8325 circuit.

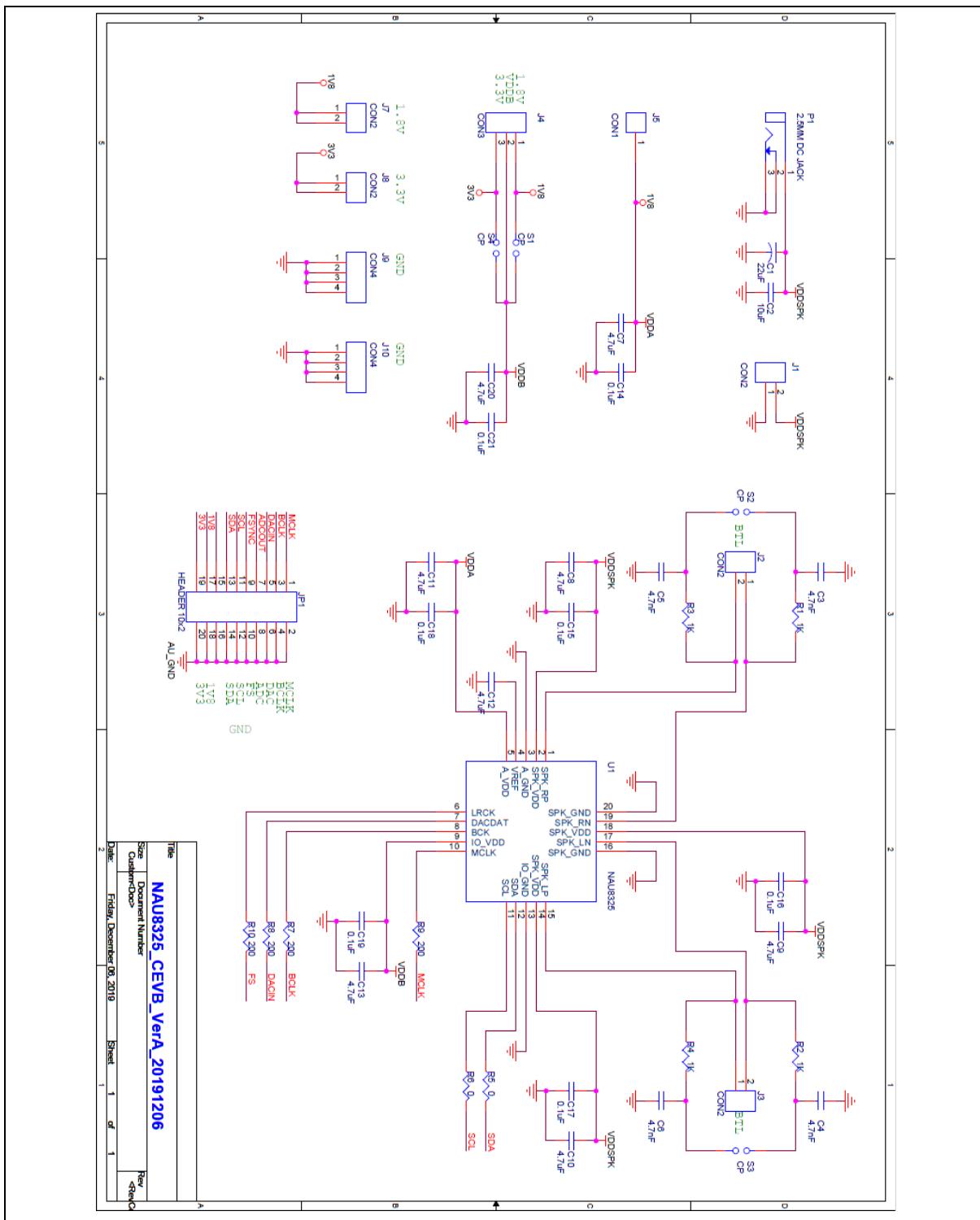


Figure 4-1 NL-NAU8325 Circuit

## 4.2 NL-NAU8325 PCB Layout

Figure 4-2 shows the placement of NL-NAU8325.

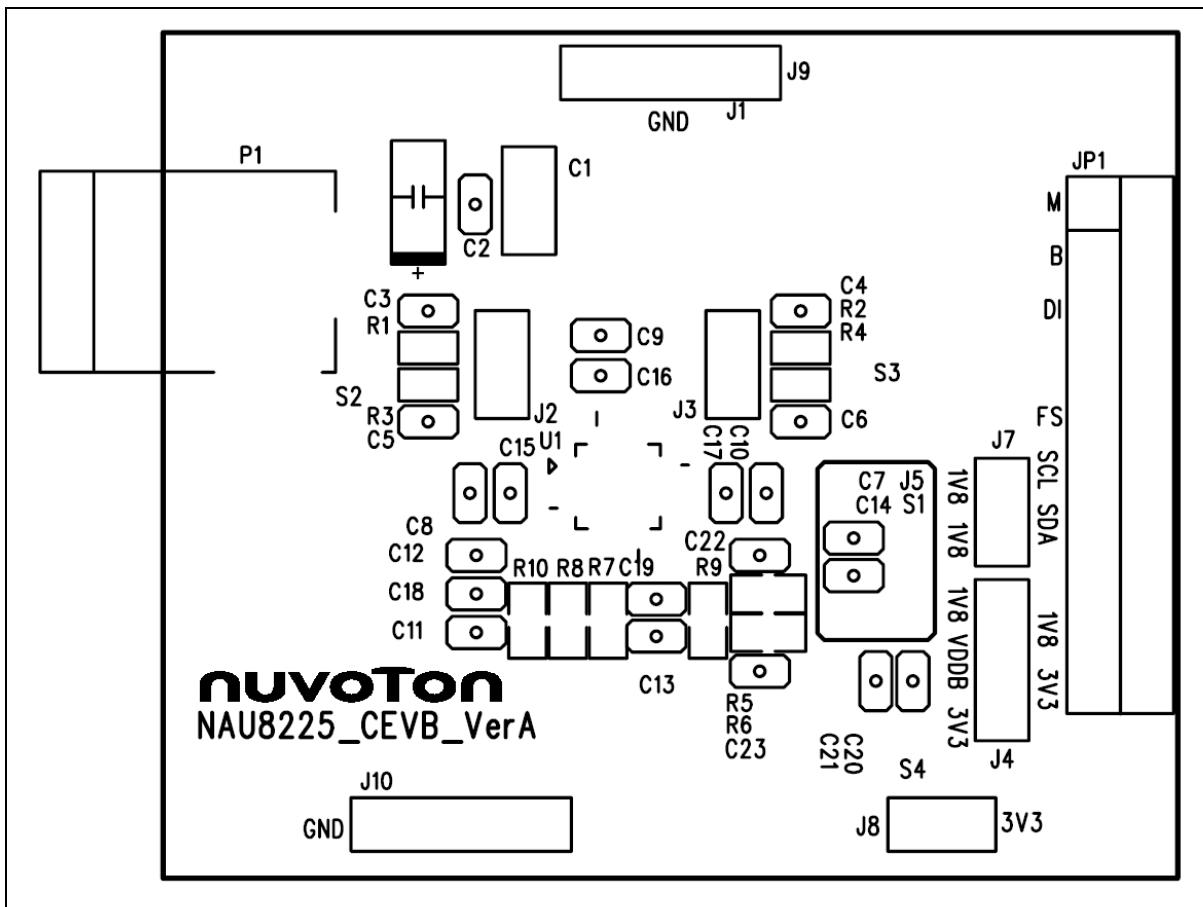


Figure 4-2 NL-NAU8325 Layout

## 5 REVISION HISTORY

REVISION	DATE	DESCRIPTION
1.0	Feb 18, 2025	Initial Release
1.1	Mar 17, 2025	Update 3.1 NuvotonAudioGUI Installation

## IMPORTANT NOTICE

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