

NL-NAU8325

User Manual

Evaluation Board for NAU8325

The information described in this document is the exclusive intellectual property of Nuvoton Technology Corporation and shall not be reproduced without permission from Nuvoton.

Nuvoton is providing this document only for reference purposes of NuMicro microcontroller and microprocessor based system design. Nuvoton assumes no responsibility for errors or omissions.

All data and specifications are subject to change without notice.

For additional information or questions, please contact: Nuvoton Technology Corporation.

www.nuvoton.com

Table of Contents

1 OVERVIEW	5
2 HARDWARE CONFIGURATION	6
2.1 NL-NAU8325 Front View	6
2.2 NL-NAU8325 Connectors	7
2.3 NU-NAUSB2I2C USB Control Board View	9
2.4 Hardware Check and Connection.....	10
2.5 Power Supply on NU-NAUSB2I2C to Assist Demonstration.....	12
3 SOFTWARE CONFIGURATION.....	13
3.1 NuvotonAudioGUI Installation.....	13
3.2 NuvotonAudioGUI Operating Instructions.....	16
3.3 NuvotonAudioGUI Basic Page Introduction.....	18
3.3.1 Start Page and DemoSequence	18
3.3.2 Register Map.....	19
4 SCHEMATICS.....	20
4.1 NL-NAU8325 Schematic	20
4.2 NL-NAU8325 PCB Layout.....	21
5 REVISION HISTORY	22

List of Figures

Figure 1-1 NL-NAU8325 Evaluation Board	5
Figure 2-1 Front View of NL-NAU8325	6
Figure 2-2 NU-NAUSB2I2C.....	9
Figure 2-3 PIN Status of NU-NAUSB2I2C SW2.....	10
Figure 2-4 NU-NAUSB2I2C Connection	10
Figure 2-5 Signal Path of NU-NAUSB2I2C and NL-NAU8325.....	11
Figure 2-6 PC Audio Device Setting	11
Figure 2-7 NU-NAUSB2I2C Supplying DC 5V Hardware Configuration.....	12
Figure 3-1 NuvotonAudioGUI Installation Step (1)	13
Figure 3-2 NuvotonAudioGUI Installation Step (2)	14
Figure 3-3 NuvotonAudioGUI Installation Step (3)	15
Figure 3-4 NuvotonAudioGUI Operating Step (1).....	16
Figure 3-5 NuvotonAudioGUI Operating Step (2).....	16
Figure 3-6 NuvotonAudioGUI Operating Step (3).....	17
Figure 3-7 NuvotonAudioGUI Operating Step (4).....	17
Figure 3-8 Start Page on NuvotonAudioGUI	18
Figure 3-9 Register Map Page on NuvotonAudioGUI.....	19
Figure 4-1 NL-NAU8325 Circuit.....	20
Figure 4-2 NL-NAU8325 Layout	21

List of Tables

Table 2-1 NL-NAU8325 Extension Connectors..... 8

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-NAUSB2I2C, which provides I²C control interface and digital audio interface signals. Along with the software NuvotonAudioGUI, users can quickly set up and use NL-NAU8325 on their PCs.

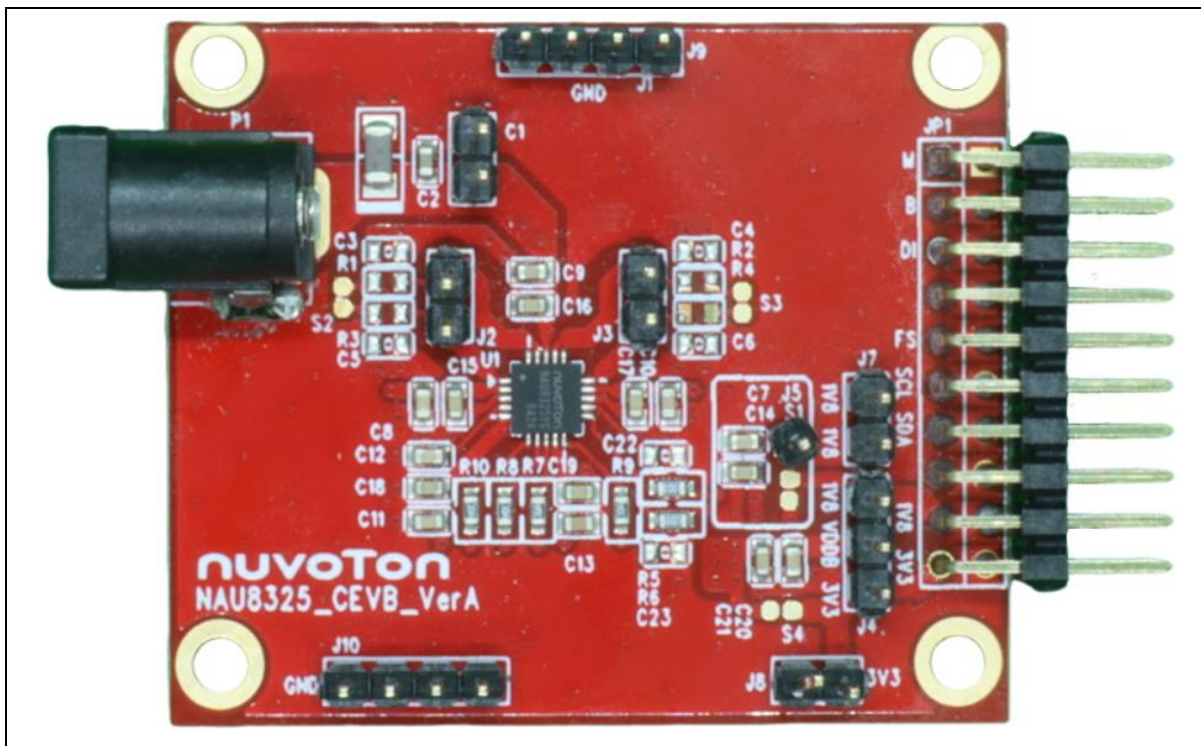


Figure 1-1 NL-NAU8325 Evaluation Board

NL-NAU8325 compatible ICs:

- NAU8325YG
- NAU83U25YG
- NAU83R25YG

2 HARDWARE CONFIGURATION

2.1 NL-NAU8325 Front View

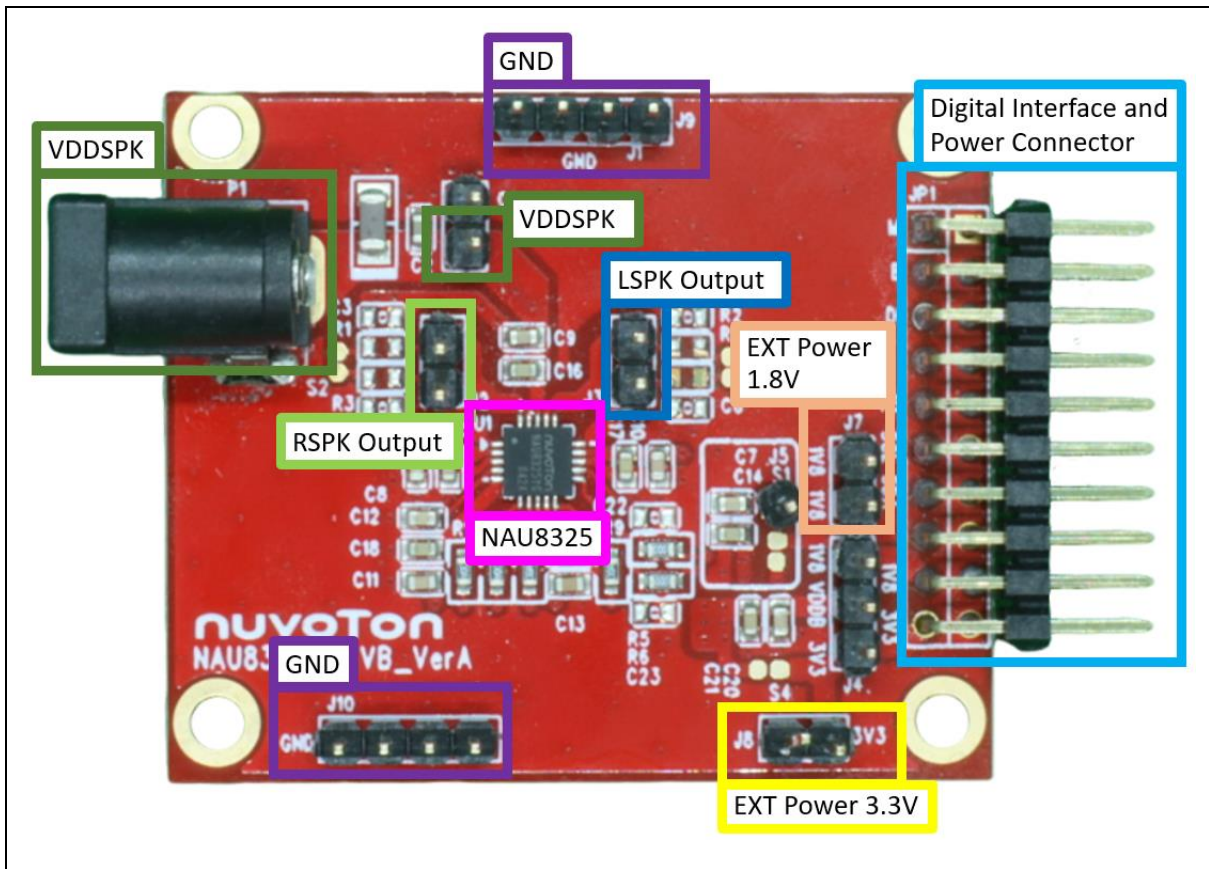


Figure 2-1 Front View of NL-NAU8325

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 ² S / PCM Data
	JP1.4	GND	GND
	JP1.5	DACIN	Serial Audio Data Input for I ² S / PCM Data
	JP1.6	GND	GND
	JP1.7	ADCOUT	Serial Audio Data Output for I ² S / PCM Data
	JP1.8	GND	GND
	JP1.9	FSYNC	Frame Sync Input / Output for I ² S / PCM Data
	JP1.10	GND	GND
	JP1.11	SCL	Serial Data Clock for I ² C
	JP1.12	GND	GND
	JP1.13	SDA	Serial Data for I ² 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
J2	J2.1	SPK_RN	Right Speaker Negative Output
	J2.2	SPK_RP	Right Speaker Positive Output
J3	J3.1	SPK_LN	Left Speaker Negative Output
	J3.2	SPK_LP	Left Speaker Positive Output
J7	J7.1	1V8	1.8V External Power Supply
	J7.2		
J8	J8.1	3V3	3.3V External Power Supply
	J8.2		
J9	J9.1	GND	GND
	J9.2		
	J9.3		
	J9.4		
J10	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 I²C 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*.

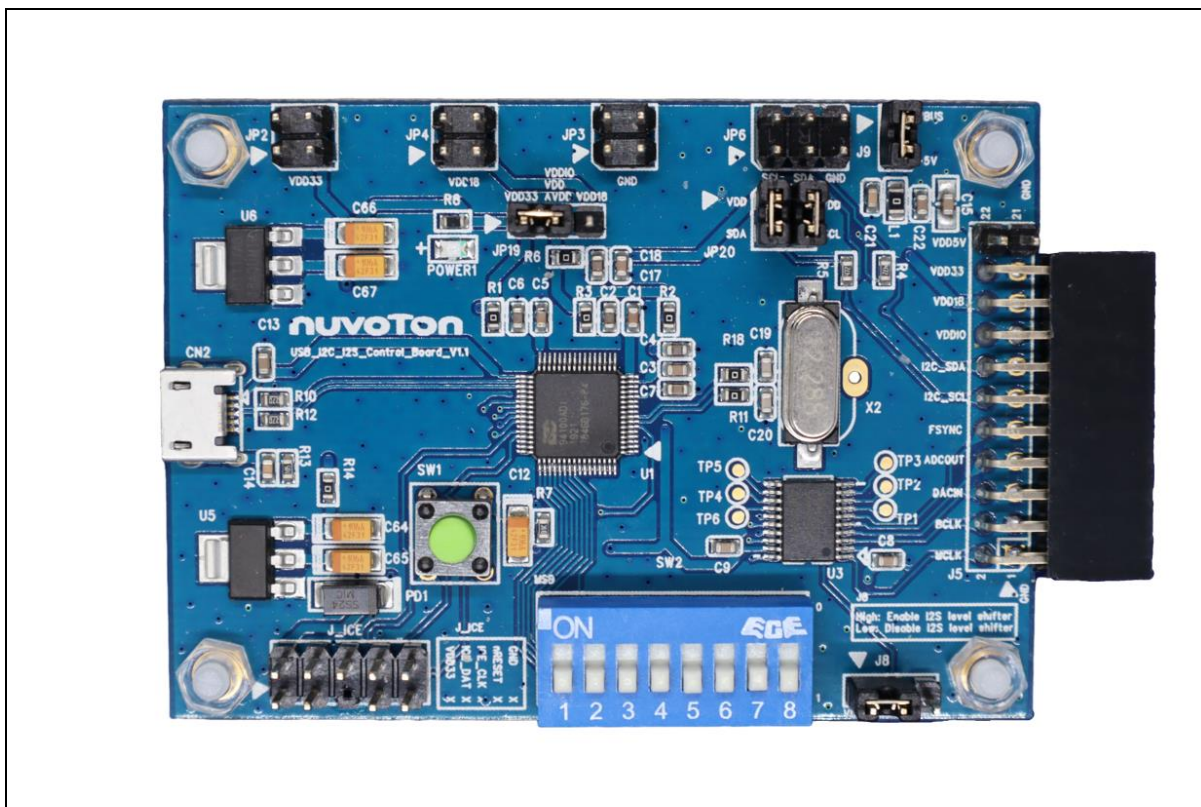


Figure 2-2 NU-NAUSB2I2C

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-NAUSB2I2C is high and the rest are low level, as shown in Figure 2-3.

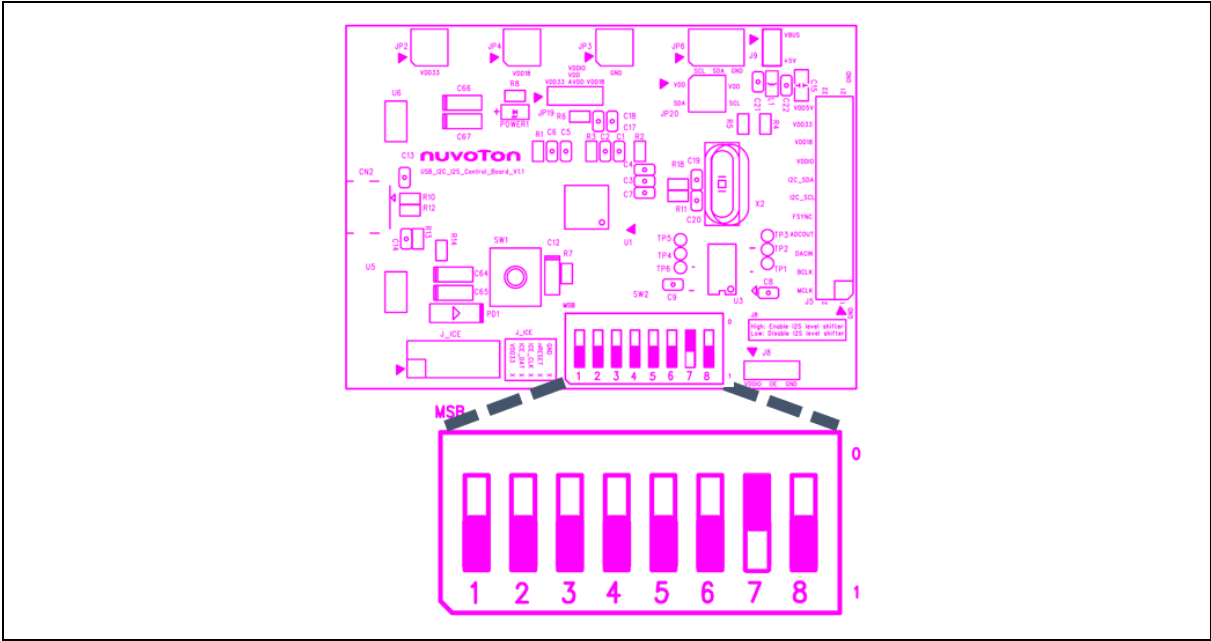


Figure 2-3 PIN Status of NU-NAUSB2I2C SW2

- 2. Connect J5 of NU-NAUSB2I2C to JP1 of NL-NAU8325. Figure 2-4 is the diagram after two boards are connected to each other.

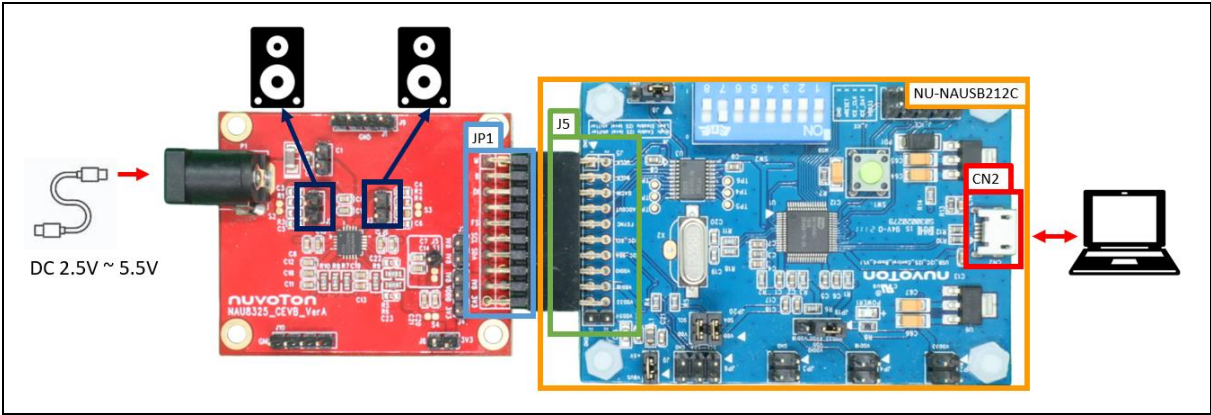


Figure 2-4 NU-NAUSB2I2C Connection

3. CN2 of NU-NAUSB2I2C 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.

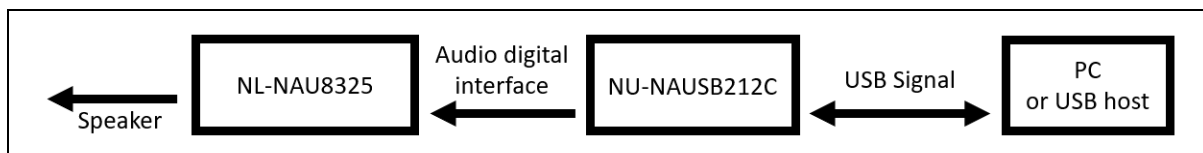


Figure 2-5 Signal Path of NU-NAUSB2I2C and NL-NAU8325

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.

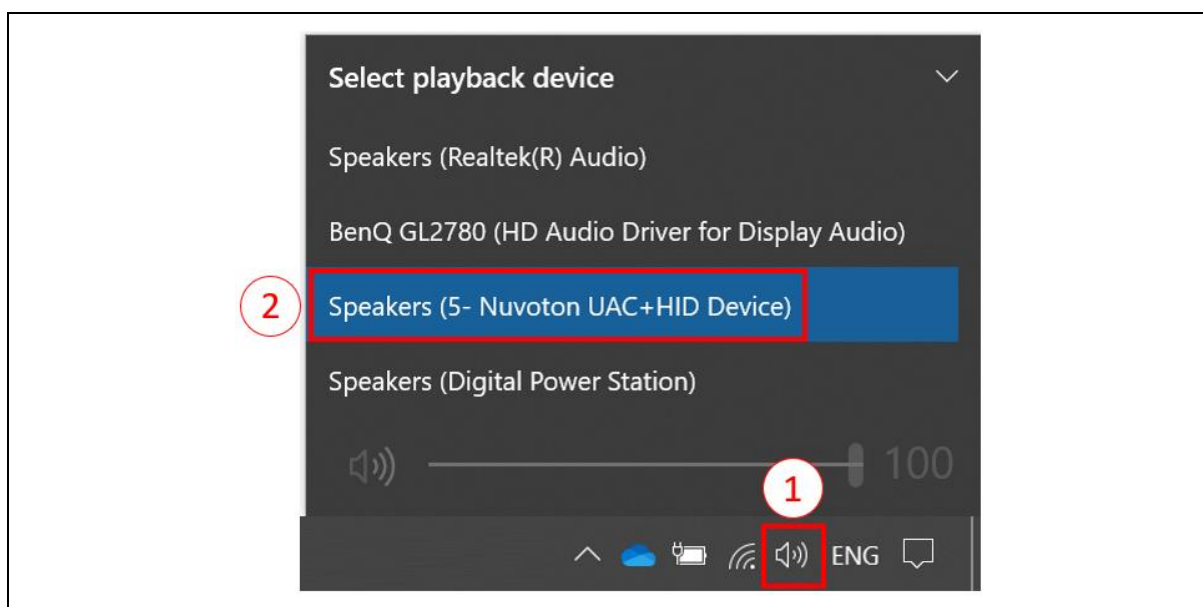


Figure 2-6 PC Audio Device Setting

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-NAUSB2I2C to Assist Demonstration

The NU-NAUSB2I2C can provide basic power (5V, 3.3V, and 1.8V) when connected to PC. This document provides a method to use the NU-NAUSB2I2C 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-NAUSB2I2C to each other.
2. Connect JP1.22 of the NU-NAUSB2I2C to J1.1 of the NL-NAU8325.

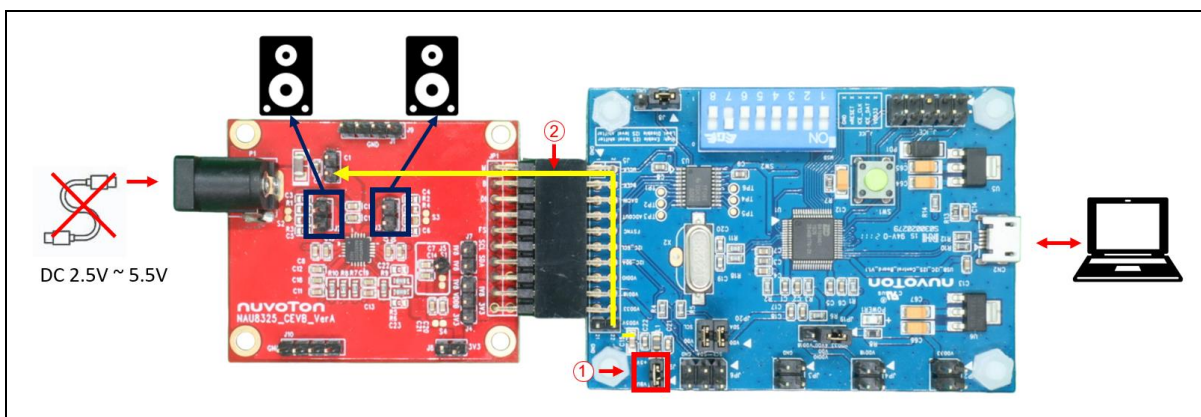


Figure 2-7 NU-NAUSB2I2C Supplying DC 5V Hardware Configuration

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/>

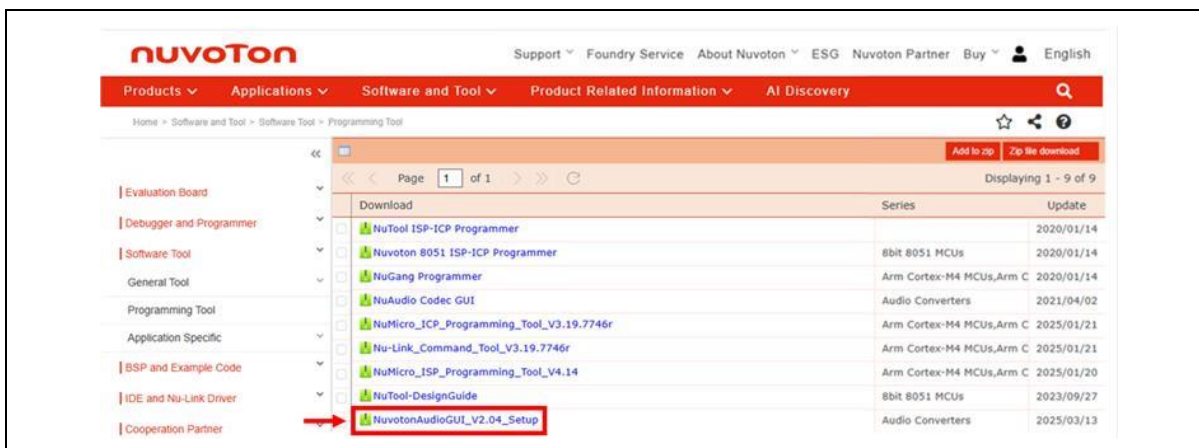


Figure 3-1 NuvotonAudioGUI Installation Step (1)

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

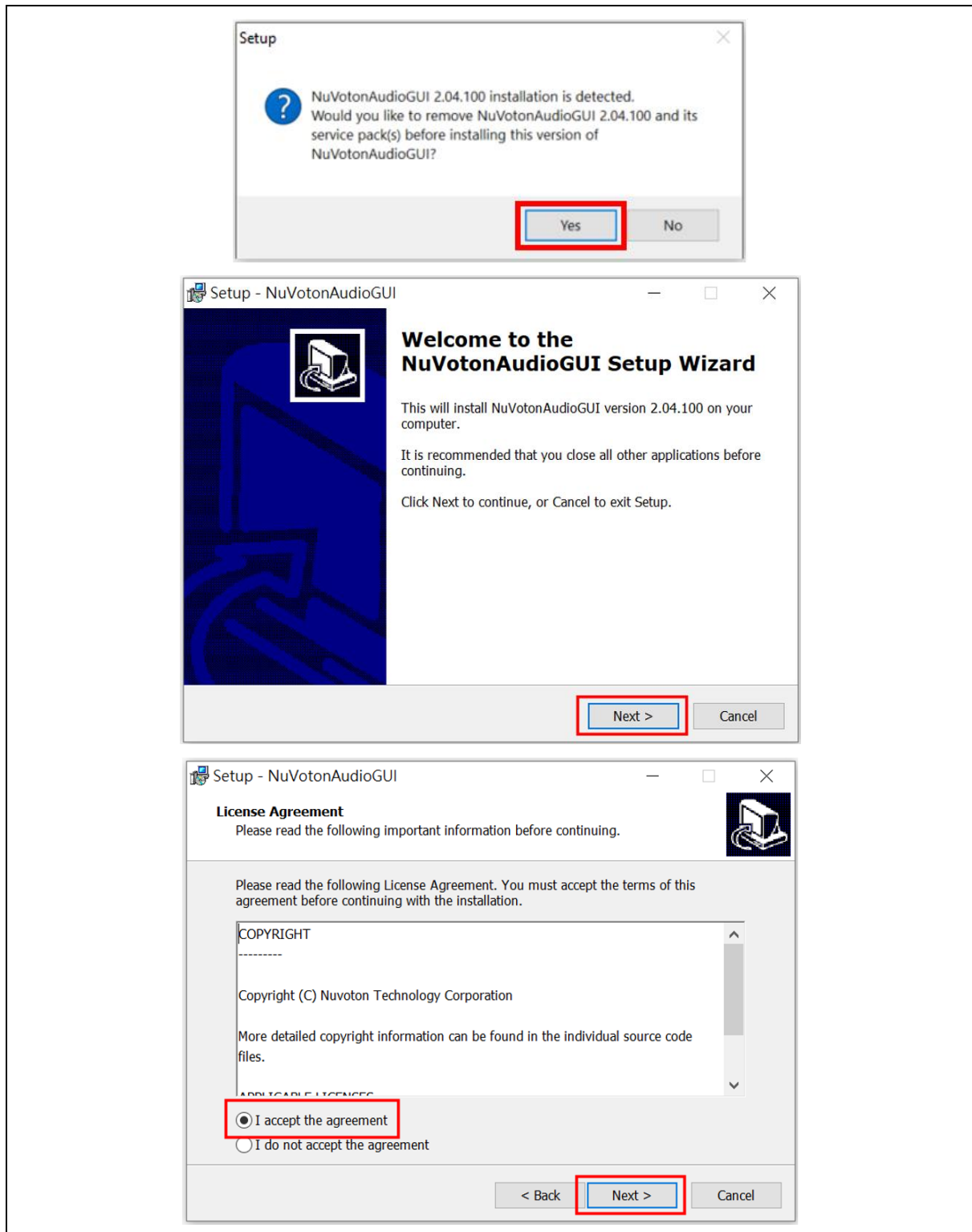


Figure 3-2 NuvotonAudioGUI Installation Step (2)

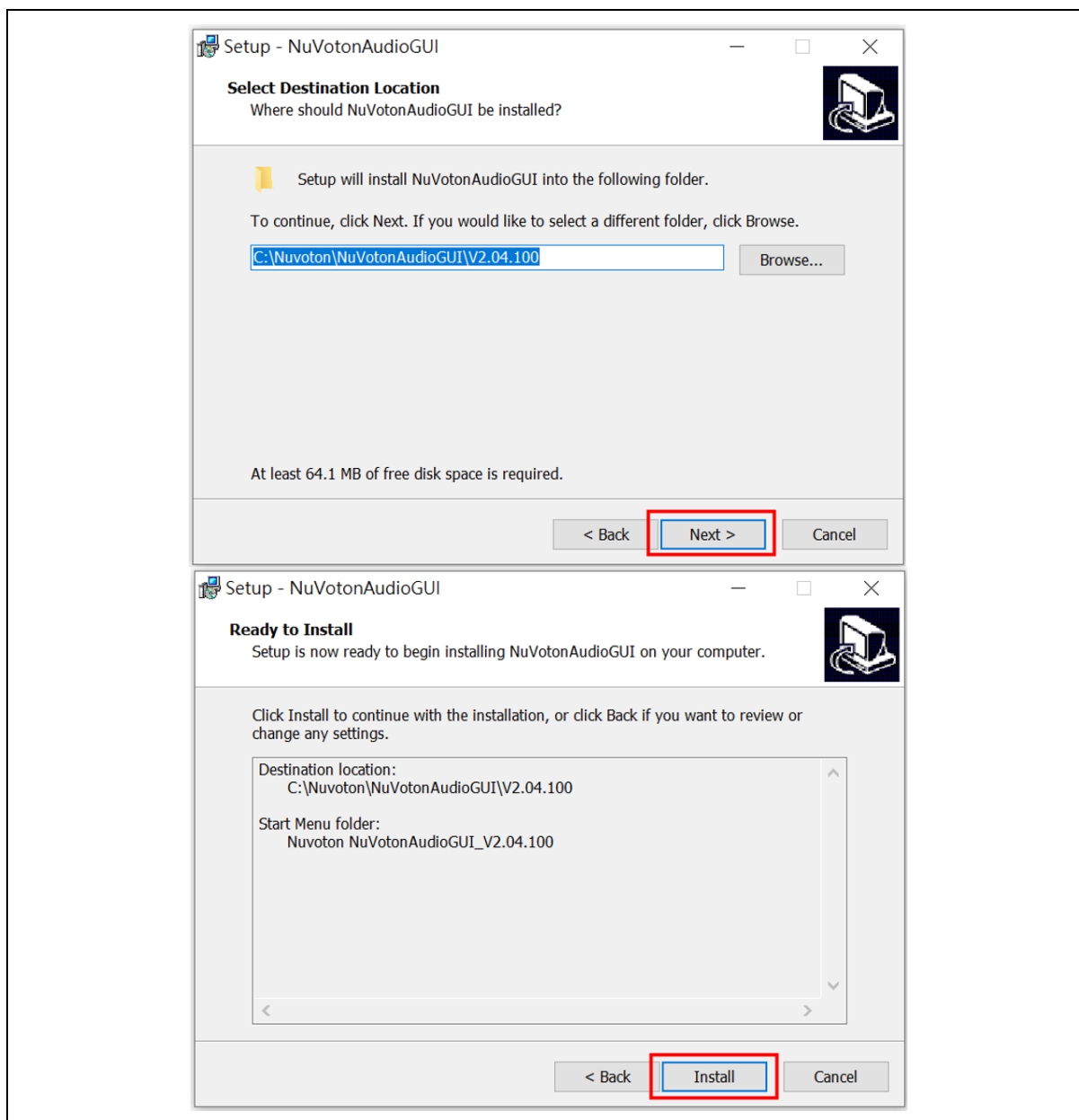


Figure 3-3 NuvotonAudioGUI Installation Step (3)

3.2 NuvotonAudioGUI Operating Instructions

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

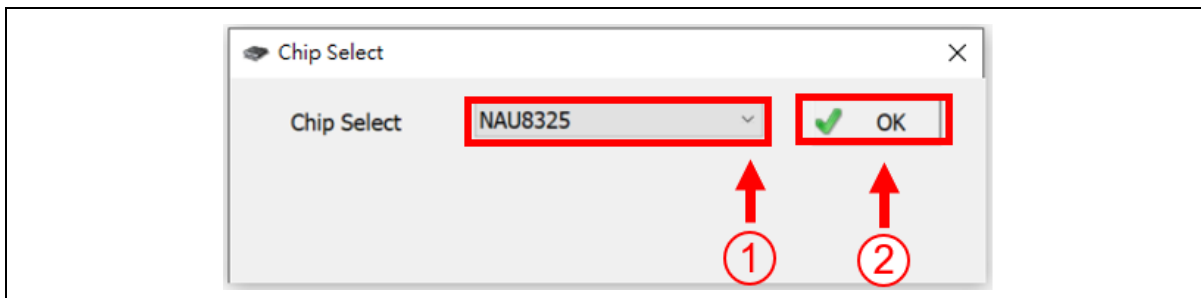


Figure 3-4 NuvotonAudioGUI Operating Step (1)

2. After clicking [OK], NuvotonAudioGUI will automatically read the connection status and verify the firmware version of the NU-NAUSB2I2C. 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 the [X] on the top-right corner.

For more firmware update process information, please refer to NU-NAUSB2I2C User Manual.

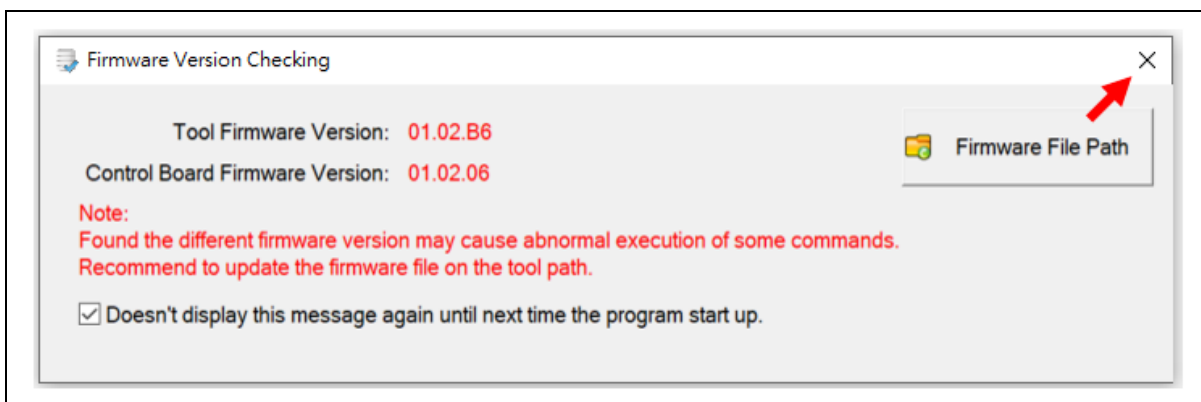


Figure 3-5 NuvotonAudioGUI Operating Step (2)

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 I²C commands through NuvotonAudioGUI to control NL-NAU8325.

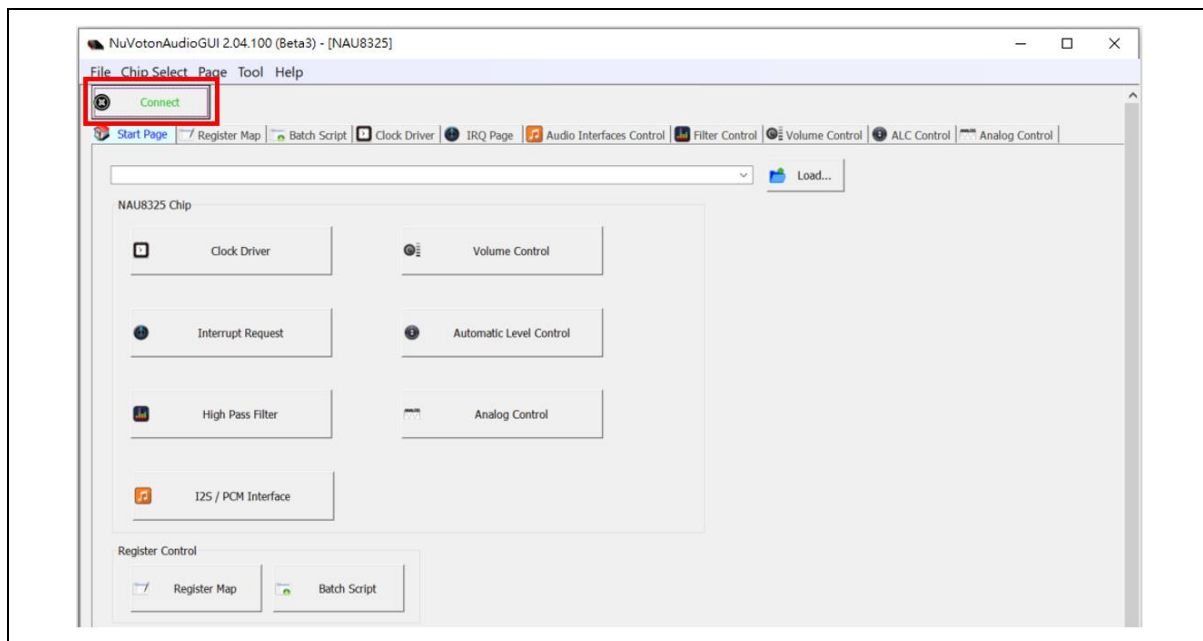


Figure 3-6 NuvotonAudioGUI Operating Step (3)

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.

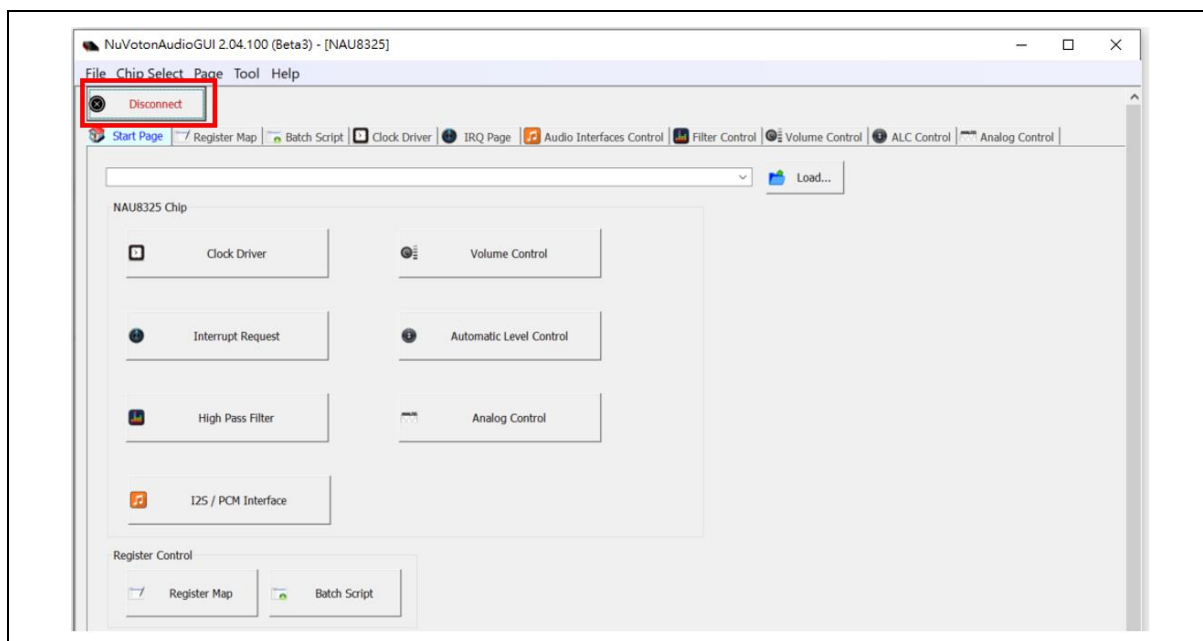


Figure 3-7 NuvotonAudioGUI Operating Step (4)

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.

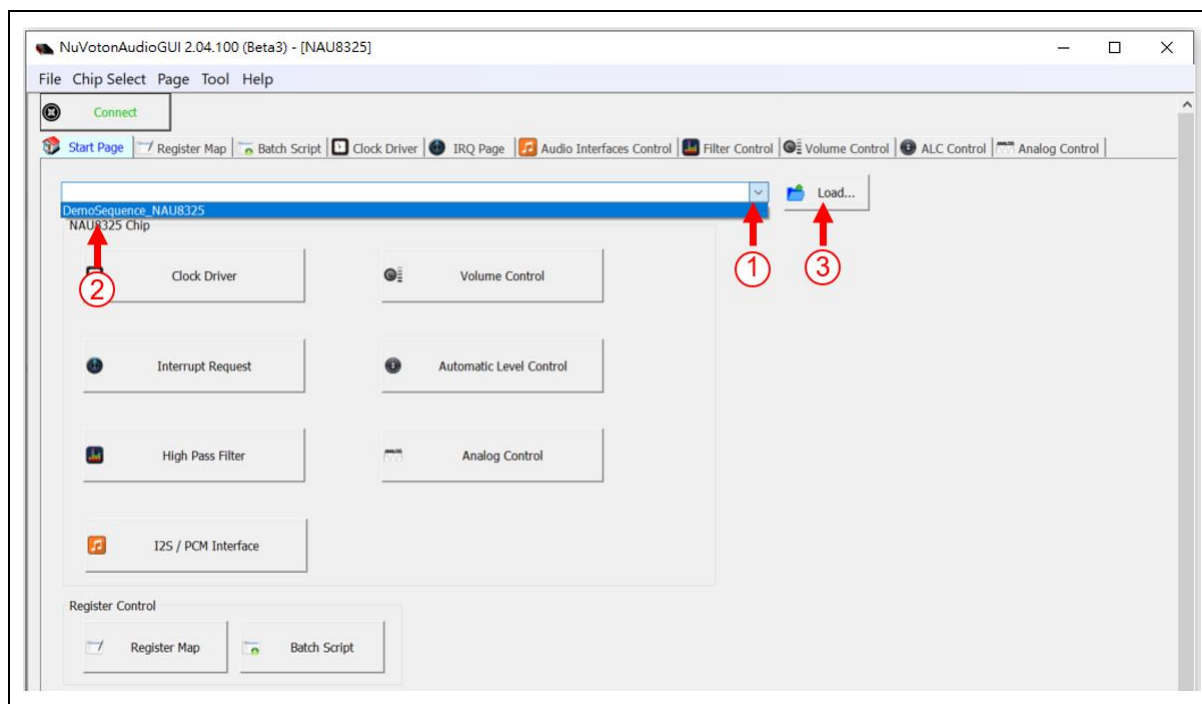


Figure 3-8 Start Page on NuvotonAudioGUI

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.

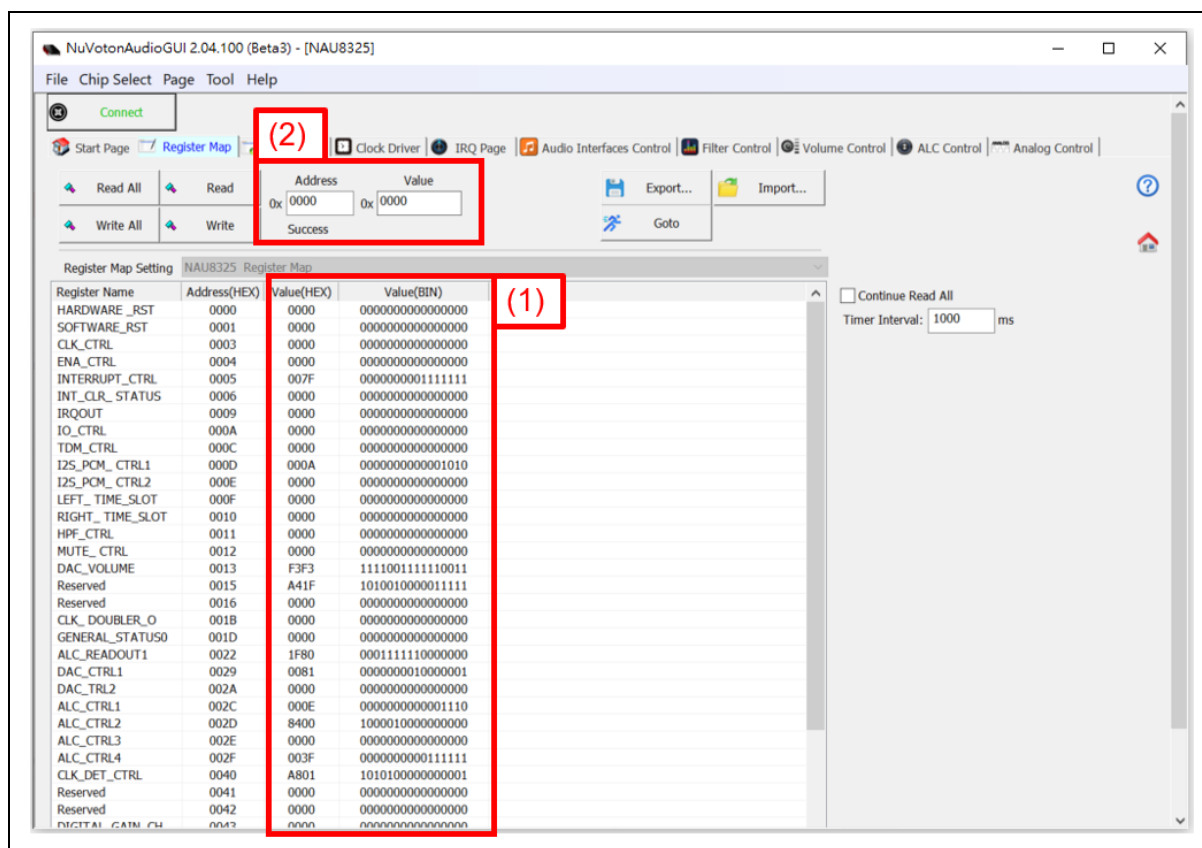


Figure 3-9 Register Map Page on NuvotonAudioGUI

4 SCHEMATICS

4.1 NL-NAU8325 Schematic

Figure 4-1 shows the NL-NAU8325 circuit.

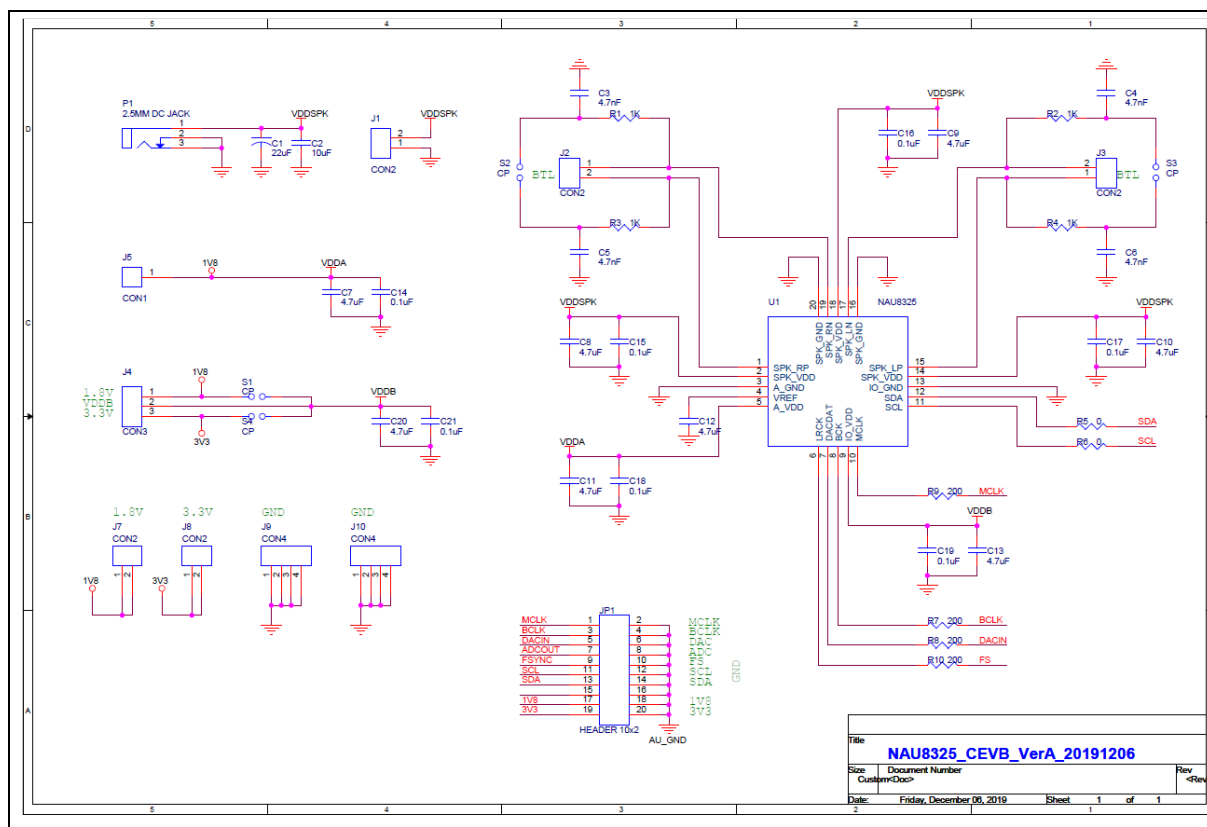


Figure 4-1 NL-NAU8325 Circuit

4.2 NL-NAU8325 PCB Layout

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

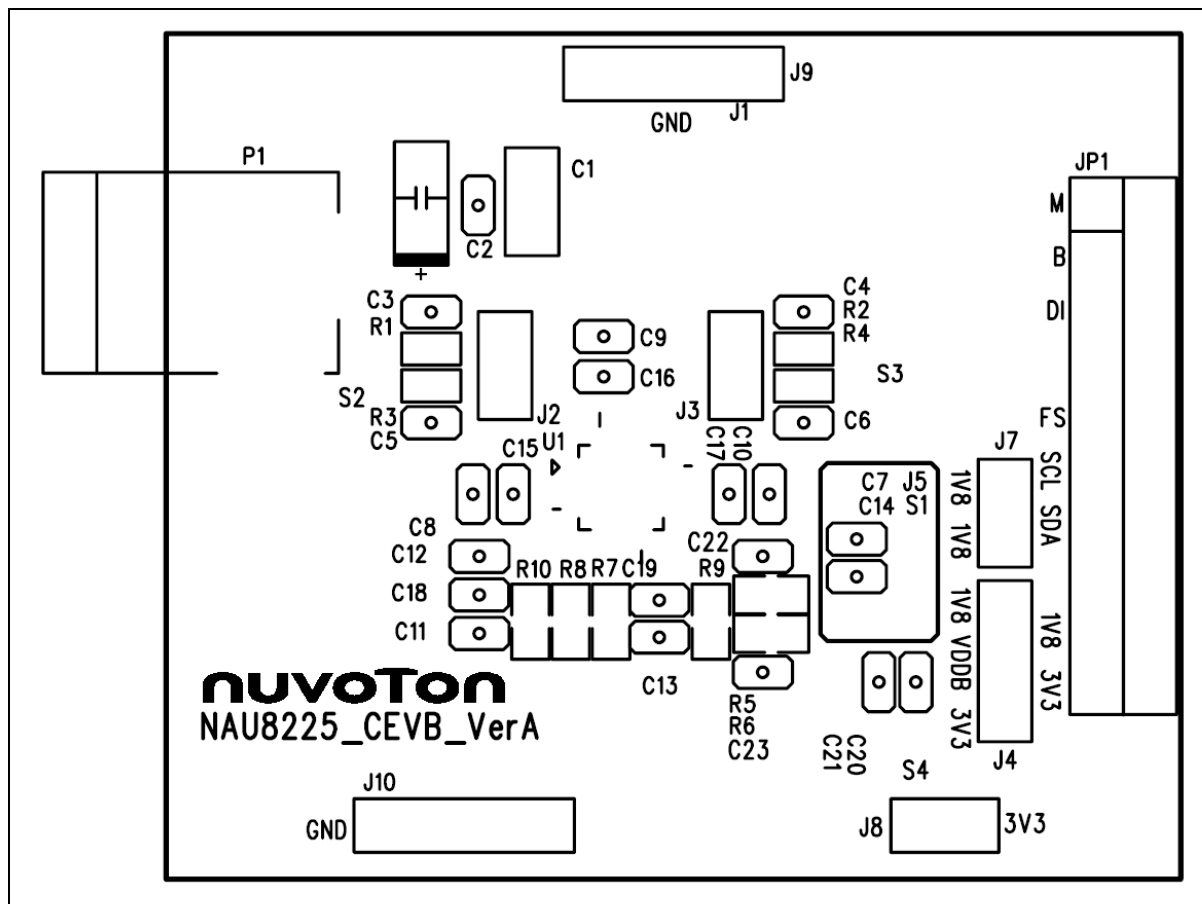


Figure 4-2 NL-NAU8325 Layout

5 REVISION HISTORY

REVISION	DATE	DESCRIPTION
1.0	Mar 17, 2025	Initial Release

IMPORTANT NOTICE

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

*Please note that all data and specifications are subject to change without notice.
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.*