

ARM® Cortex®-M4
32-bit Microcontroller

I94124_NAU88C22 User Manual
I94100 Series

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 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
1.1	I94124_NAU88C22_MB Features	6
1.2	I94124_MB_NAU85L40_NR Features	6
1.3	I94124_MB_DMIC Features	6
2	I94124_NAU88C22_MB Board Overview	7
2.1	Front View	7
2.2	Rear View	8
2.3	Power System	9
2.4	Pin Assignment for IO Extension Connectors	10
2.5	System Configuration	13
2.5.1	Power Source	13
2.5.2	3.3V LDO	13
2.5.3	USB Connector	13
2.5.4	IO Extension Connectors	13
2.5.5	Push-Buttons	13
2.5.6	LED	13
2.5.7	Power Connectors	13
2.5.8	Clock Source	14
2.5.9	Nu-Link Interface	14
2.5.10	SPI Flash interface	14
2.5.11	Others	14
2.6	Components Placement	15
3	I94124ADI EVB Schematics	17
3.1	I94124_NAU88C22_MB	17
3.2	I94124_MB_NAU85L40_NR	19
3.3	I94124_MB_DMIC	20
4	REVISION HISTORY	21

List of Figures

Figure 1.1-1 I94124_NAU88C22_MB with AMIC/DMIC extension boards.....	5
Figure 2.1-1 Front View of I94124_NAU88C22_MB.....	7
Figure 2.2-1 Rear View of I94124_NAU88C22_MB	8
Figure 2.3-1 Power Supply Block Diagram	9
Figure 2.4-1 I94124ADI IO Extension Connectors.....	10
Figure 2.6-1 I94124_NAU88C22_MB Front Placement	15
Figure 2.6-2 I94124_NAU88C22_MB Rear Placement	15
Figure 2.6-3 I94124_MB_NAU85L40_NR Front Placement.....	16
Figure 2.6-4 I94124_MB_NAU85L40_NR Rear Placement	16
Figure 2.6-5 I94124_MB_DMIC Front Placement.....	16
Figure 2.6-6 I94124_MB_DMIC Rear Placement	16
Figure 3.1-1 I94124_NAU88C22_MB circuit (1/2) I94124 part.....	17
Figure 3.1-2 I94124_NAU88C22_MB circuit (2/2) NAU88C22 part.....	18
Figure 3.2-1 I94124_MB_NAU85L40_NR Circuit	19
Figure 3.3-1 I94124_MB_DMIC Circuit.....	20

List of Tables

Table 2-1 I94124ADI IO Extension Interface Connector J8..... 11

Table 2-2 I94124ADI IO Extension Interface Connector J5..... 11

Table 2-3 I94124ADI IO Extension Interface Connector J4..... 12

Table 2-4 I94124ADI IO Extension Interface Connector J7..... 12

1 OVERVIEW

I94124_NAU88C22_MB board is the specific development tool for I94100 series with NAU88C22 to support MIC, AUXIN and headphone on one board. User can use it to develop and verify the audio application program easily.

To support more microphone, it can connect with I94124_MB_NAU85L40_NR (NAU85L40+AMIC) and I94124_MB_DMIC (DMIC Daughter board). The connection is as the below figure.

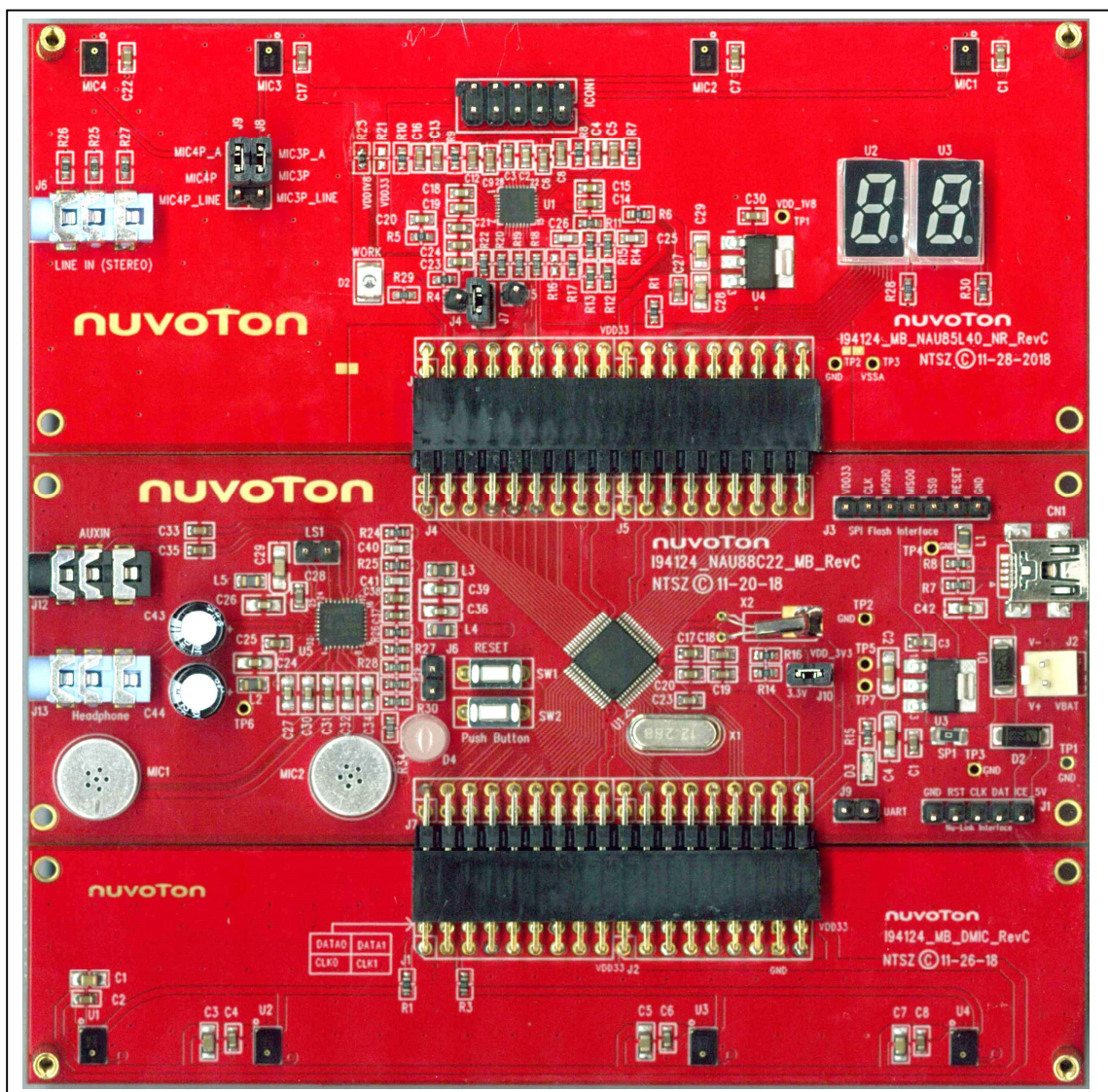


Figure 1.1-1 I94124_NAU88C22_MB with AMIC/DMIC extension boards

1.1 I94124_NAU88C22_MB Features

- Nu-Link ICE interface connector.
- Audio board extension interface connectors.
- USB 1.1 Full-Speed Device.
- Two push-buttons: one is for reset and the other one is for user-defined.
- Two LEDs: one is for power indication, the other one is for user-defined.
- Two MIC and two AUXIN input through NAU88C22.
- Speaker and headphone output through NAU88C22.

1.2 I94124_MB_NAU85L40_NR Features

- Maximum 4 channel AMIC supported
- Stereo line-in with 2 MIC channels
- Two sets of 7-segments LED display by IO control

1.3 I94124_MB_DMIC Features

- Maximum 4 channel DMIC channel connection with I94124

2 I94124_NAU88C22_MB BOARD OVERVIEW

2.1 Front View

Figure 2.1-1 shows the main components and connectors from the front side of EVB-I94124ADI board.

The following lists components and connectors from the front view:

- Target Chip: I94124ADI (U1)
- Nu-Link interface (J1)
- I94124ADI IO extension interface connectors (J4, J5, J6 and J7)
- USB: USB connector (CN1)
- Push-buttons (SW1, SW2)
- LED: POWER LED (D3, green), User Application LED (D4, red)
- Power connectors (J1, J2, CN1)

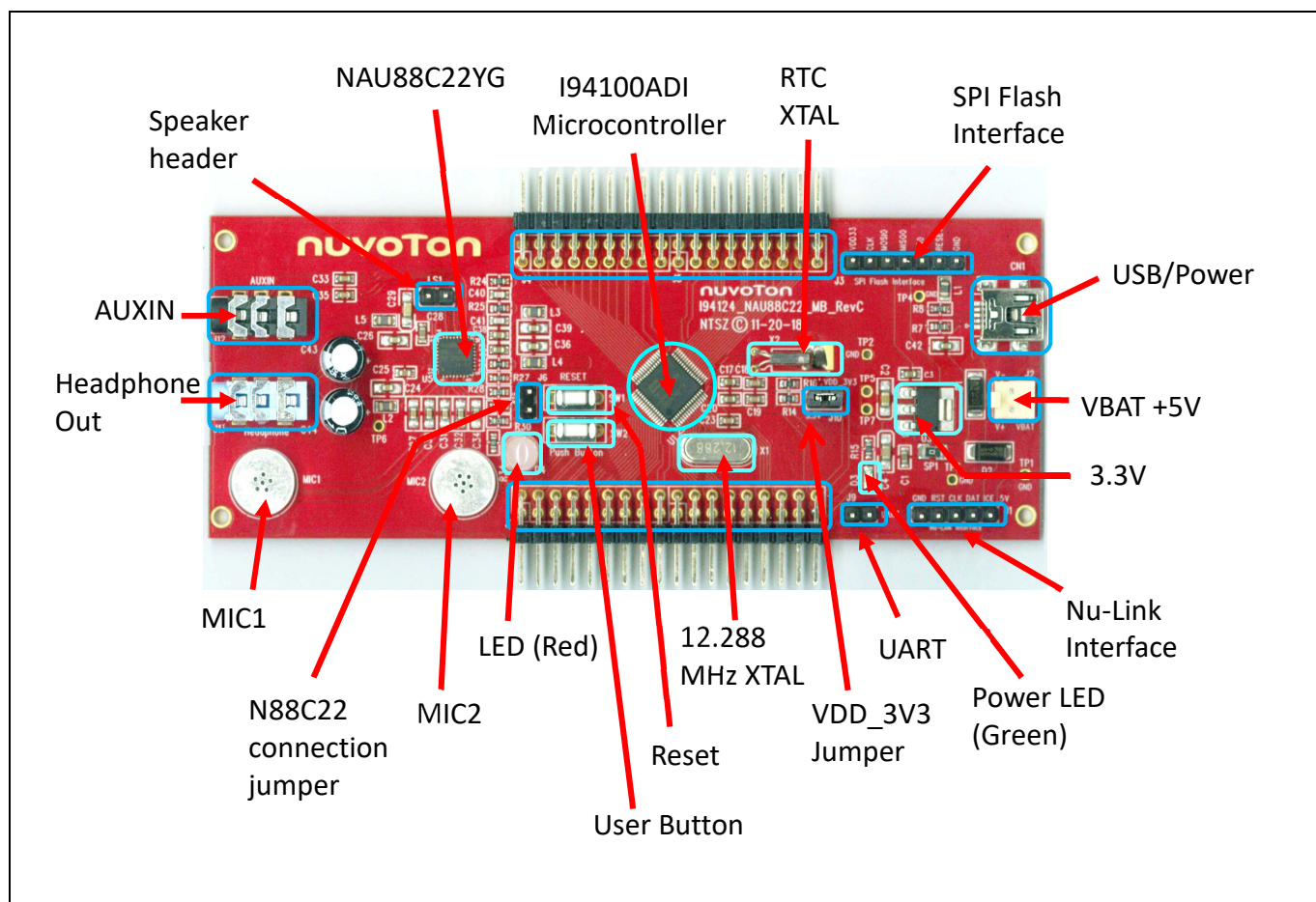


Figure 2.1-1 Front View of I94124_NAU88C22_MB

2.2 Rear View

Figure 2.2-1 shows the rear side of I94124_NAU88C22_MB board.

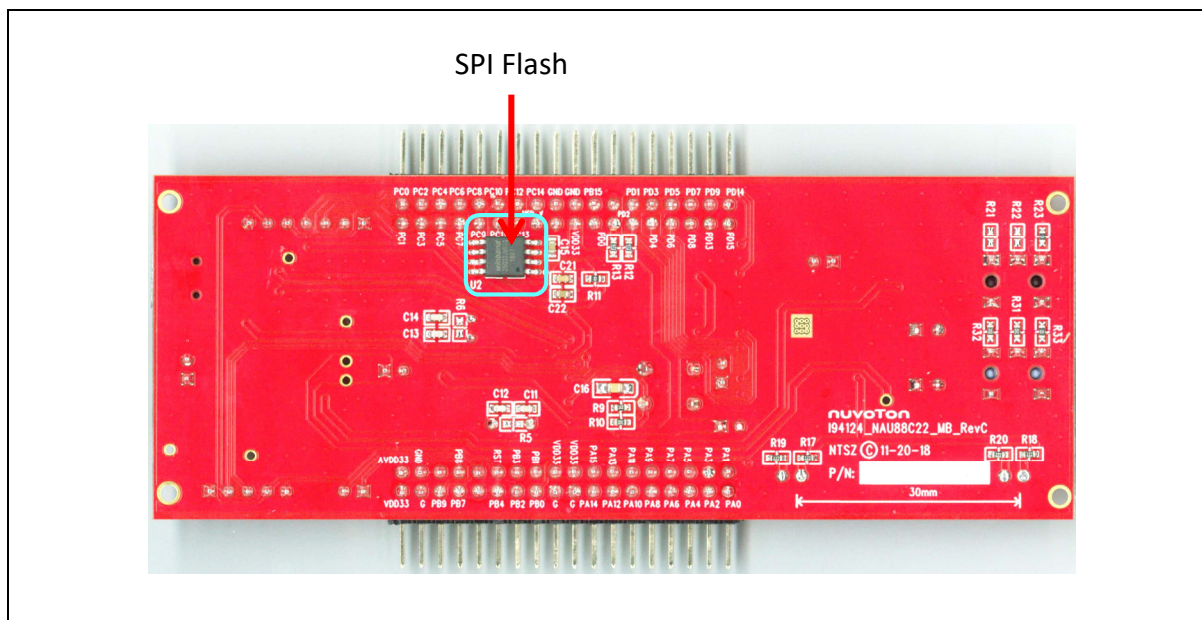


Figure 2.2-1 Rear View of I94124_NAU88C22_MB

2.3 Power System

The I94124_NAU88C22_MB supplied by an external 5V USB power connected to Micro USB connectors (CN1 or J1) or 4.5 Volt to 5.0 Volt DC power supply connected to VCC Pin Header (J2). On-board reversed 2 current protection diodes will ensure power can be provided through both USB connectors at the same time safely. If the board is powered from USB connector, it is not recommended to apply an additional DC power supply to VCC pin header (J2), because there is no protection against reverse current into the DC power supply. Figure 2.3-1 shows I94124_NAU88C22_MB power supply concept.

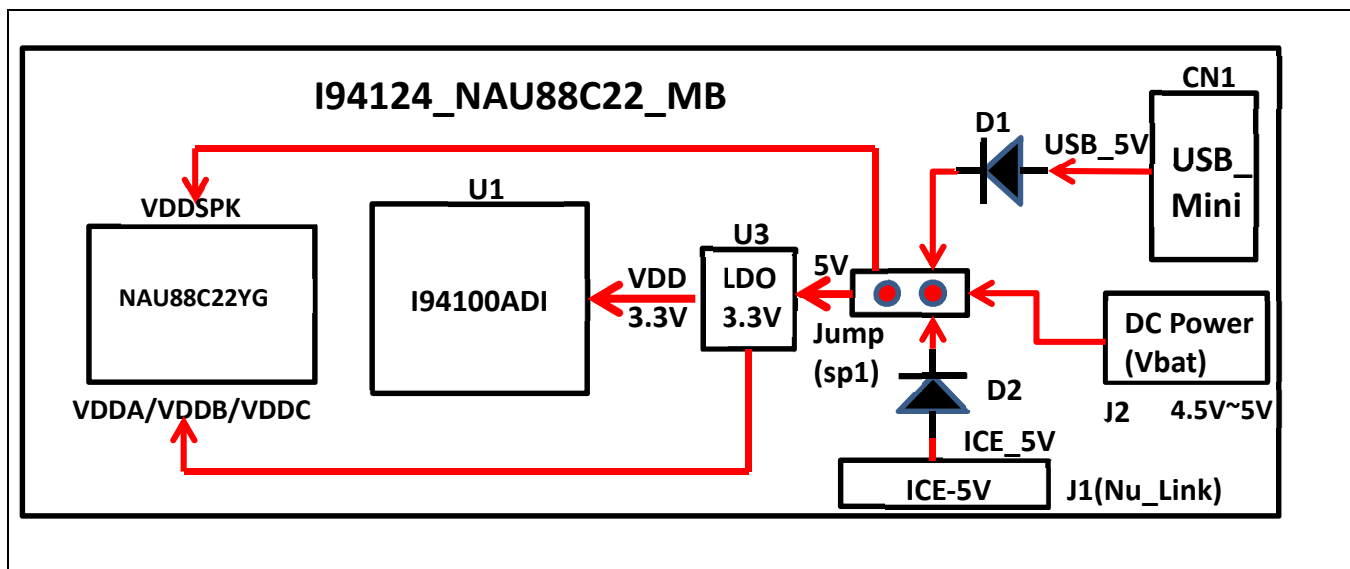


Figure 2.3-1 Power Supply Block Diagram

2.4 Pin Assignment for IO Extension Connectors

Most of IO pins of the I94124ADI are pin out to the connectors J4, J5, J7 and J8 for extension. The Figure 2.4-1 shows the I94124ADI extended IO pins on connectors.

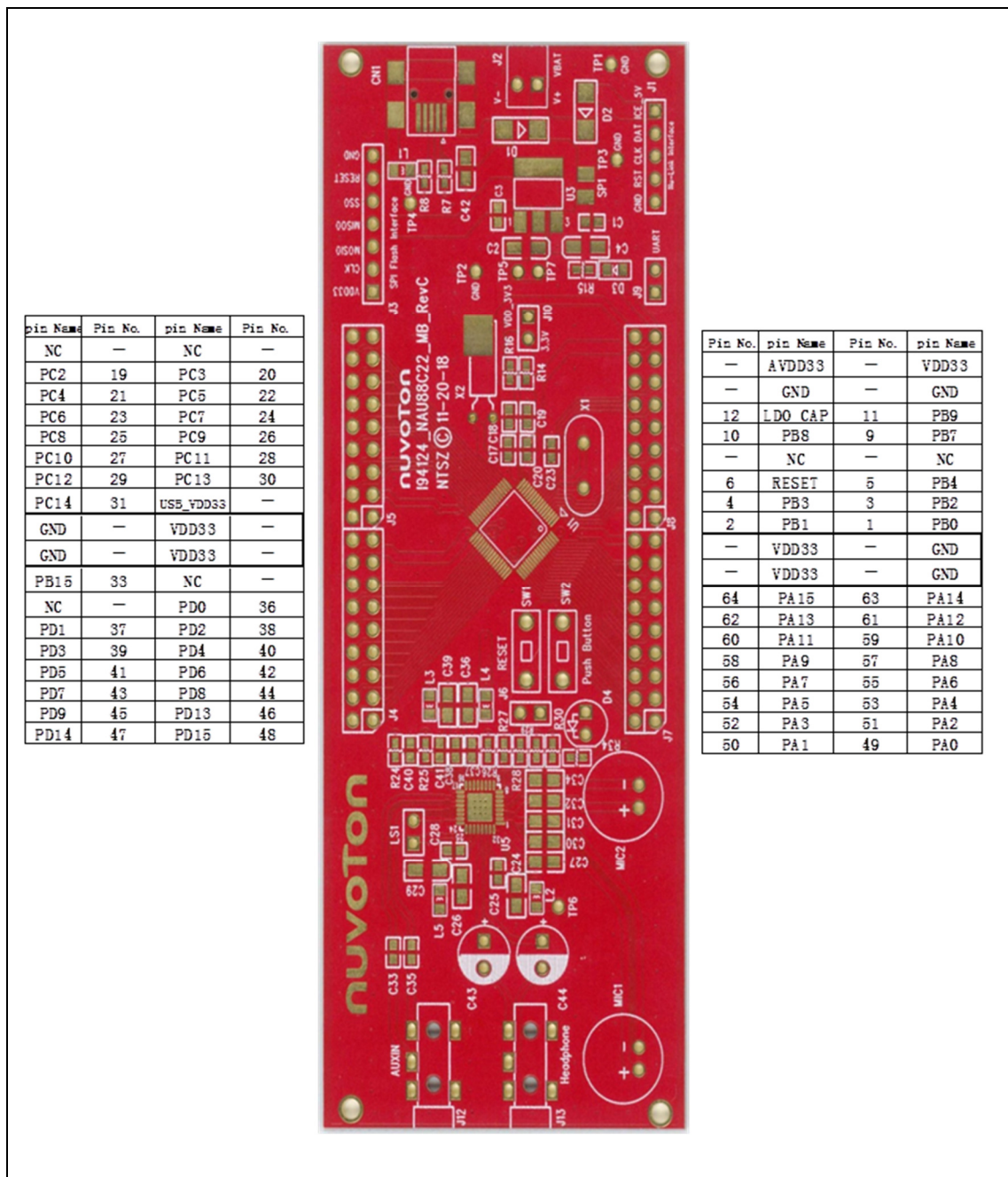


Figure 2.4-1 I94124ADI IO Extension Connectors

Table 2-1 I94124ADI IO Extension Interface Connector J8

Header		I94100ADI		Header		I94100ADI	
		Pin No.	Pin Name			Pin No	Pin Name
J8	J8.1	-	GND	J8	J8.2	-	VDD33
	J8.3	1	PB.0		J8.4	2	PB.1
	J8.5	3	PB.2		J8.6	4	PB.3
	J8.7	5	PB.4		J8.8	6	nRESET
	J8.9	-	NC		J8.10	-	NC
	J8.11	9	PB.7		J8.12	10	PB.8
	J8.13	11	PB.9		J8.14	12	LDO_CAP
	J8.15	13	VSS		J8.16	14	AVSS
	J8.17	15	VDD33		J8.18	16	AVDD

Table 2-2 I94124ADI IO Extension Interface Connector J5

Header		I94100ADI		Header		I94100ADI	
		Pin No.	Pin Name			Pin No	Pin Name
J5	J5.18	-	NC	J5	J5.17	-	NC
	J5.16	19	PC.2		J5.15	20	PC.3
	J5.14	21	PC.4		J5.13	22	PC.5
	J5.12	23	PC.6		J5.11	24	PC.7
	J5.10	25	PC.8		J5.9	26	PC.9
	J5.8	27	PC.10		J5.7	28	PC.11
	J5.6	29	PC.12		J5.5	30	PC.13
	J5.4	31	PC.14		J5.3	32	USB_VDD33
	J5.2	-	GND		J5.1	-	VDD33

Table 2-3 I94124ADI IO Extension Interface Connector J4

Header		I94124ADI		Header		I94124ADI	
		Pin No.	Pin Name			Pin No	Pin Name
J4	J4.18	-	GND	J4	J4.17	-	VDD33
	J4.16	33	PB.15		J4.15	-	NC
	J4.14	-	NC		J4.13	36	PD.0
	J4.12	37	PD.1		J4.11	38	PD.2
	J4.10	39	PD.3		J4.9	40	PD.4
	J4.8	41	PD.5		J4.7	42	PD.6
	J4.6	43	PD.7		J4.5	44	PD.8
	J4.4	45	PD.9		J4.3	46	PD.13
	J4.2	47	PD.14		J4.1	48	PD.15

Table 2-4 I94124ADI IO Extension Interface Connector J7

Header		I94124ADI		Header		I94124ADI	
		Pin No.	Pin Name			Pin No	Pin Name
J7	J7.1	49	PA.0	J7	J7.2	50	PA.1
	J7.3	51	PA.2		J7.4	52	PA.3
	J7.5	53	PA.4		J7.6	54	PA.5
	J7.7	55	PA.6		J7.8	56	PA.7
	J7.9	57	PA.8		J7.10	58	PA.9
	J7.11	59	PA.10		J7.12	60	PA.11
	J7.13	61	PA.12		J7.14	62	PA.13
	J7.15	63	PA.14		J7.16	64	PA.15
	J7.17	-	GND		J7.18	-	VCC

2.5 System Configuration

2.5.1 Power Source

- **J1**: NuLink interface.
- **CN1**: USB interface with VBUS power.
- **J2**: power jack for DC IN(VBAT), requires 4.5V~5.0V.

Power Source	Component	Comment
ICE_5V	J1	Power pin on J1 for the power from Nu-Link (this board requires 5V)
USB_5V	CN1	Power pin on CN1 to supply 5V power from PC Host VBUS.
DC IN(VBAT)	J2	Power pin of J2 for DC or battery power input

2.5.2 3.3V LDO

- **U3**: The voltage regular converts the 5V source to 3.3V and supplies it to I94100 and NAU88C22 on board.

Power Source	Component	Comment
VDD_3V3	U3	LDO output 3.3V to supply I94100ADI platform board.

2.5.3 USB Connector

- **CN1**: USB interface connector.

2.5.4 IO Extension Connectors

- **J4, J5, J7 and J8**: IO extension connectors.

2.5.5 Push-Buttons

- **SW1**: Reset button to reset I94100ADI.
- **SW2**: Button for user definition.

2.5.6 LED

- **D3**: Indicates I94124_NAU88C22_MB board powered up.
- **D4**: For user application.

2.5.7 Power Connectors

- **SP1**: Jumper for providing the power from J1/J2/CN1 to LDO.

2.5.8 Clock Source

- **X1:** 12.288 MHz crystal.
- **X2:** 32.768 kHz crystal.

2.5.9 Nu-Link Interface

- **J1:** Nu-Link interface for I94124.

2.5.10 SPI Flash interface

- **J3:** SPI Flash Interface.

2.5.11 Others

- **J9:** UART Interface of I94124ADI
- **J6:** Jumper to allow I2S data out from NAU88C22 to I94124.
- **LS1:** NAU88C22 Speaker out.
- **J12:** AUXIN of NAU88C22YG.
- **J13:** NAU88C22YG headphone out.

2.6 Components Placement

and show the front and rear placement of I94124_NAU88C22_MB board.

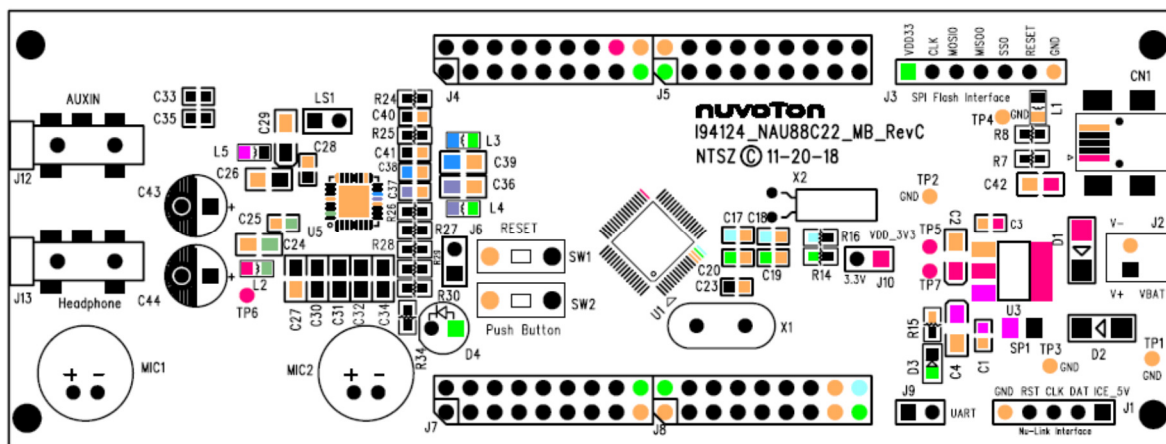


Figure 2.6-1 I94124 NAU88C22 MB Front Placement

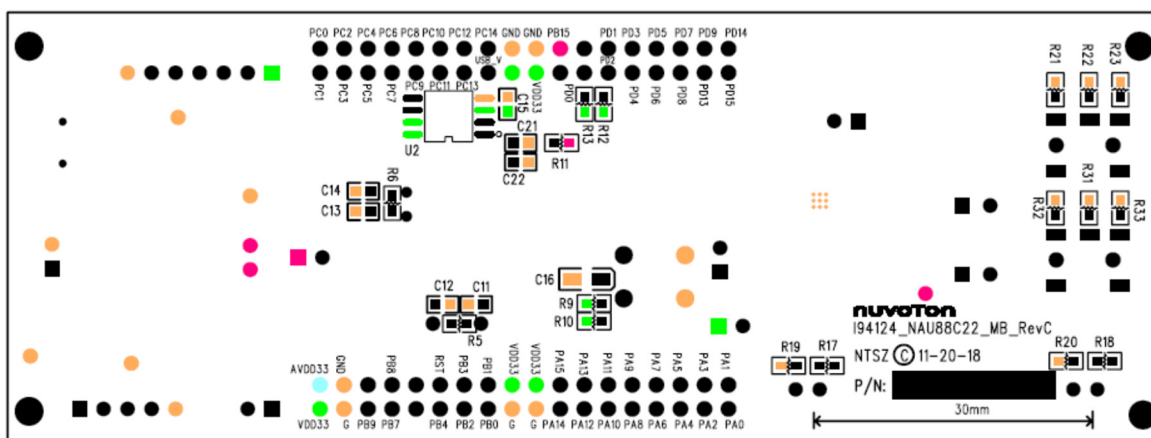


Figure 2.6-2 I94124_NAU88C22_MB Rear Placement

and show the front and rear placement of I94124_MB_NAU85L40_NR board.

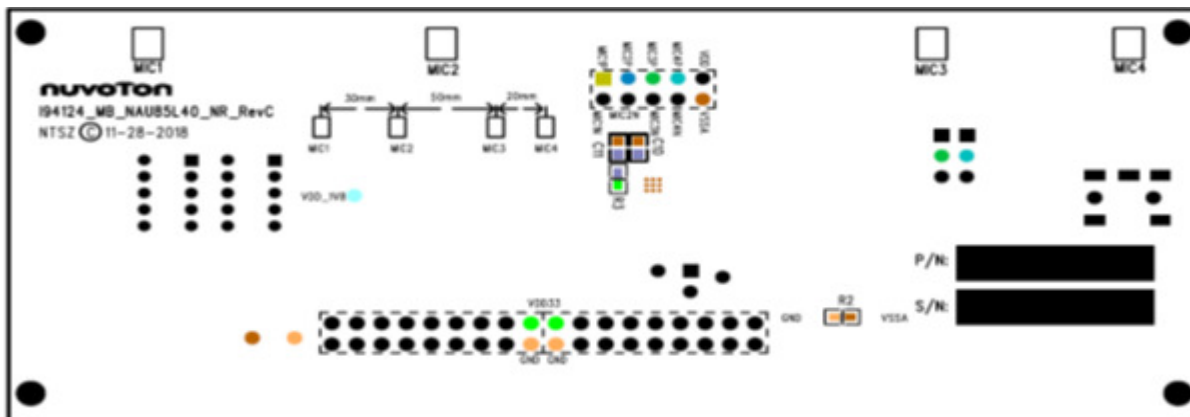


Figure 2.6-3 I94124_MB_NAU85L40_NR Front Placement

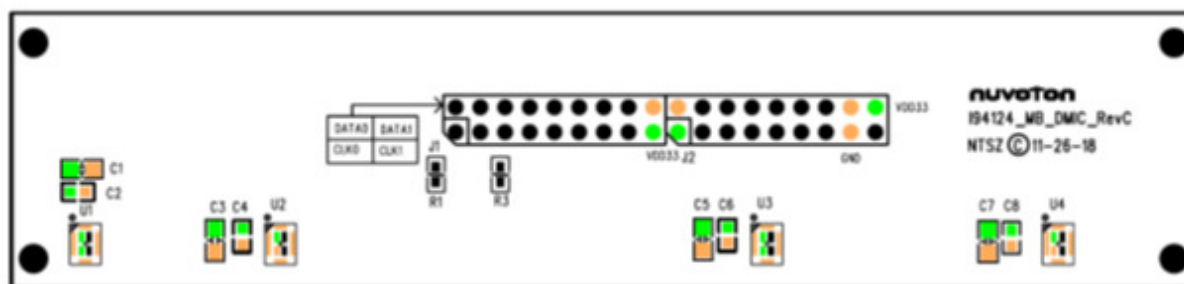


Figure 2.6-4 I94124_MB_NAU85L40_NR Rear Placement

Figure 2.6-5 and Figure 2.6-6 show the front and rear placement of I94124_MB_DMIC board.

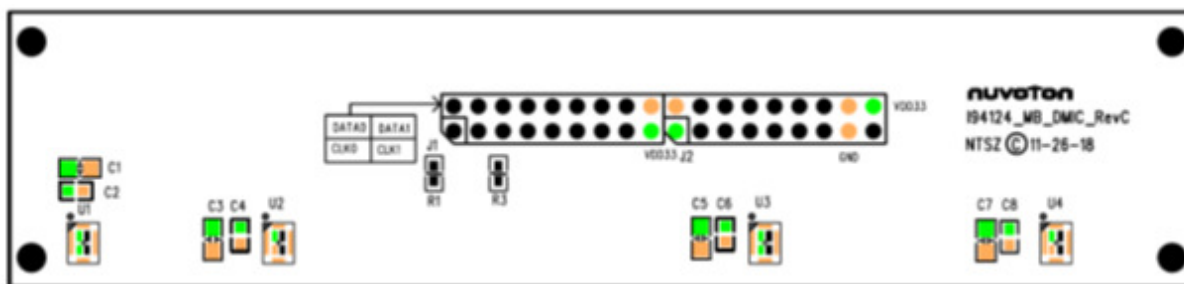


Figure 2.6-5 I94124_MB_DMIC Front Placement

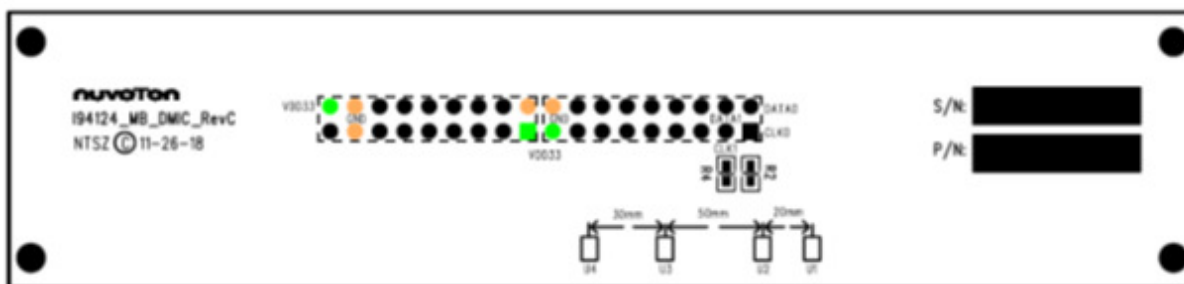


Figure 2.6-6 I94124_MB_DMIC Rear Placement

3 I94124ADI EVB SCHEMATICS

This chapter contains the schematics for I94124_NAU88C22_MB (I94124ADI+NAU88C22YG Main board) and I94124_MB_NAU85L40_NR (NAU85L40+MEMS AMIC Daughter card) & I94124_MB_DMIC (I94124ADI MEMS DMIC Daughter card)

3.1 I94124_NAU88C22_MB

Figure 3.1-1 shows the I94124ADI, Pin Headers, Buttons and LED.

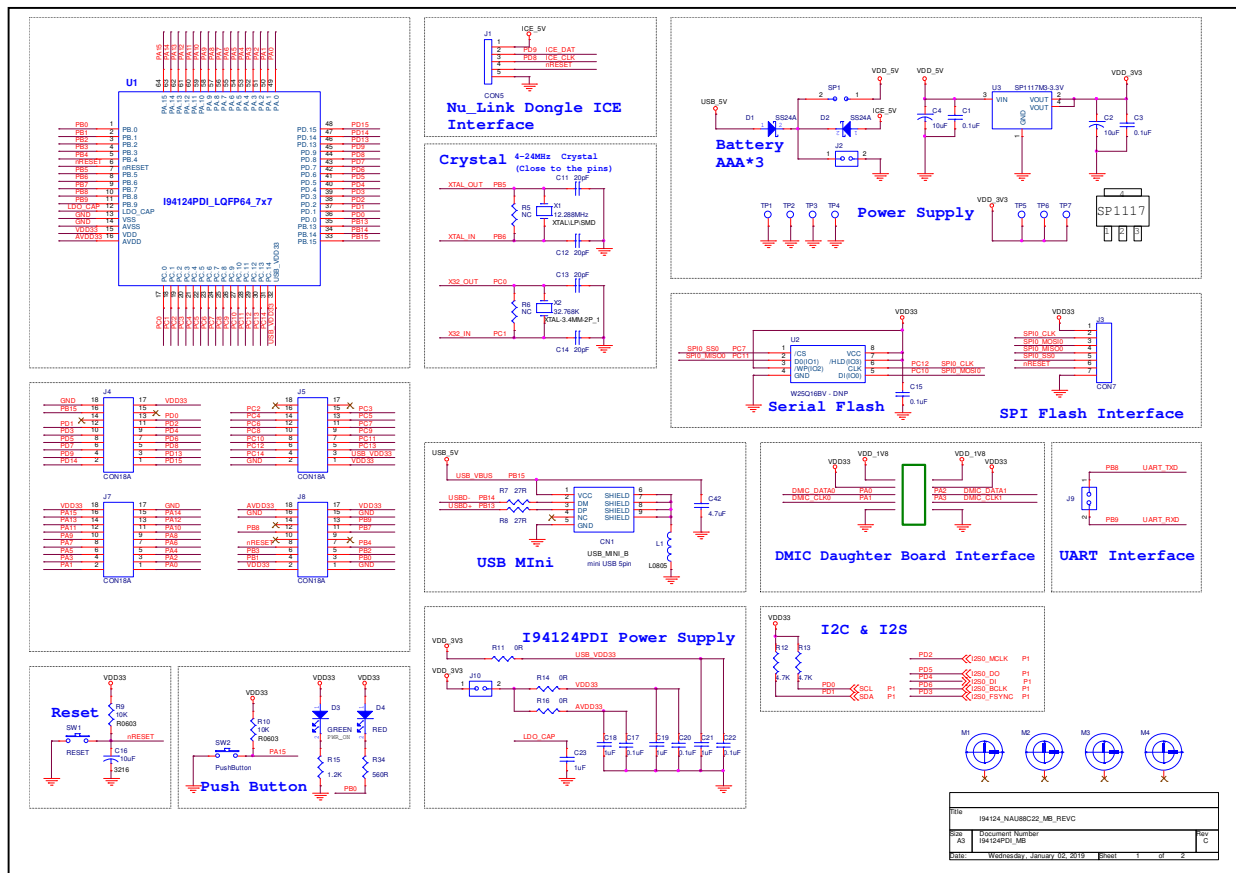


Figure 3.1-1 I94124_NAU88C22_MB circuit (1/2) I94124 part

Figure 3.1-2 shows the NAU88C22 related circuit

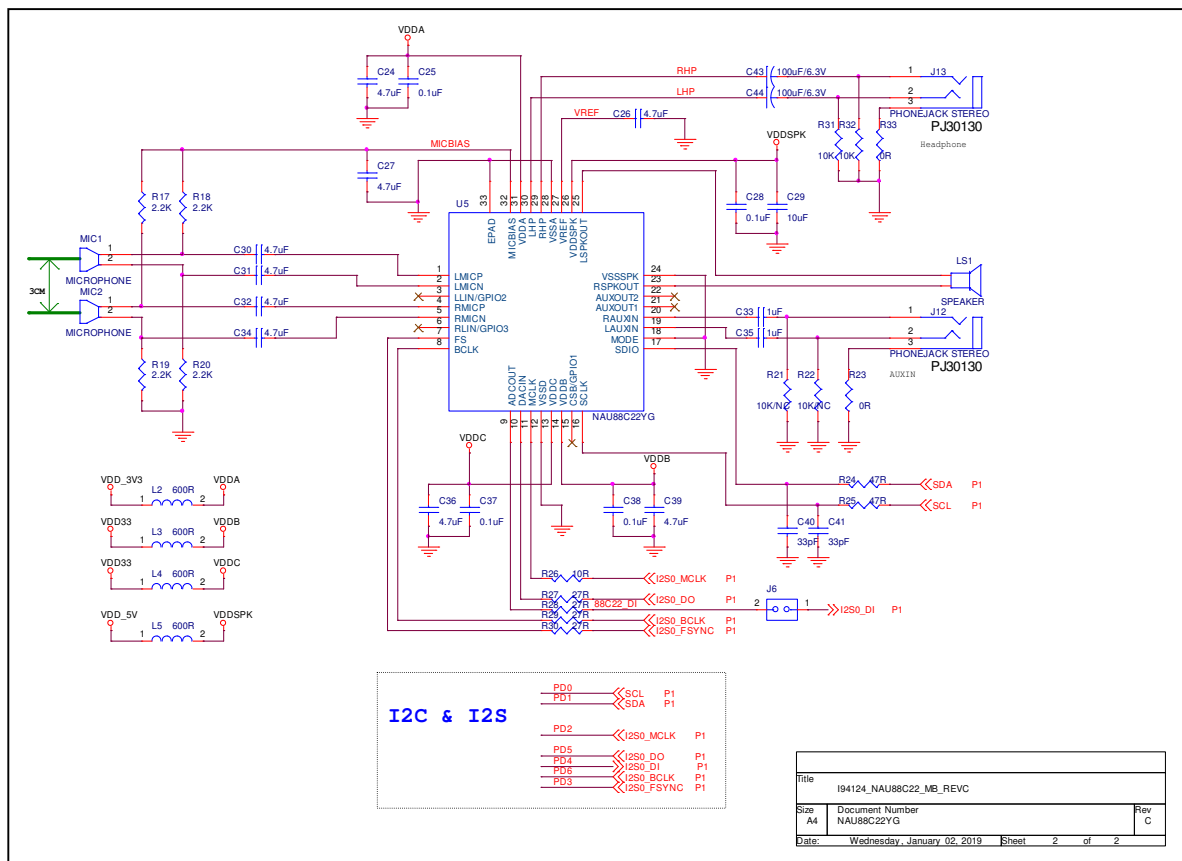


Figure 3.1-2 I94124_NAU88C22_MB circuit (2/2) NAU88C22 part

3.2 I94124_MB_NAU85L40_NR

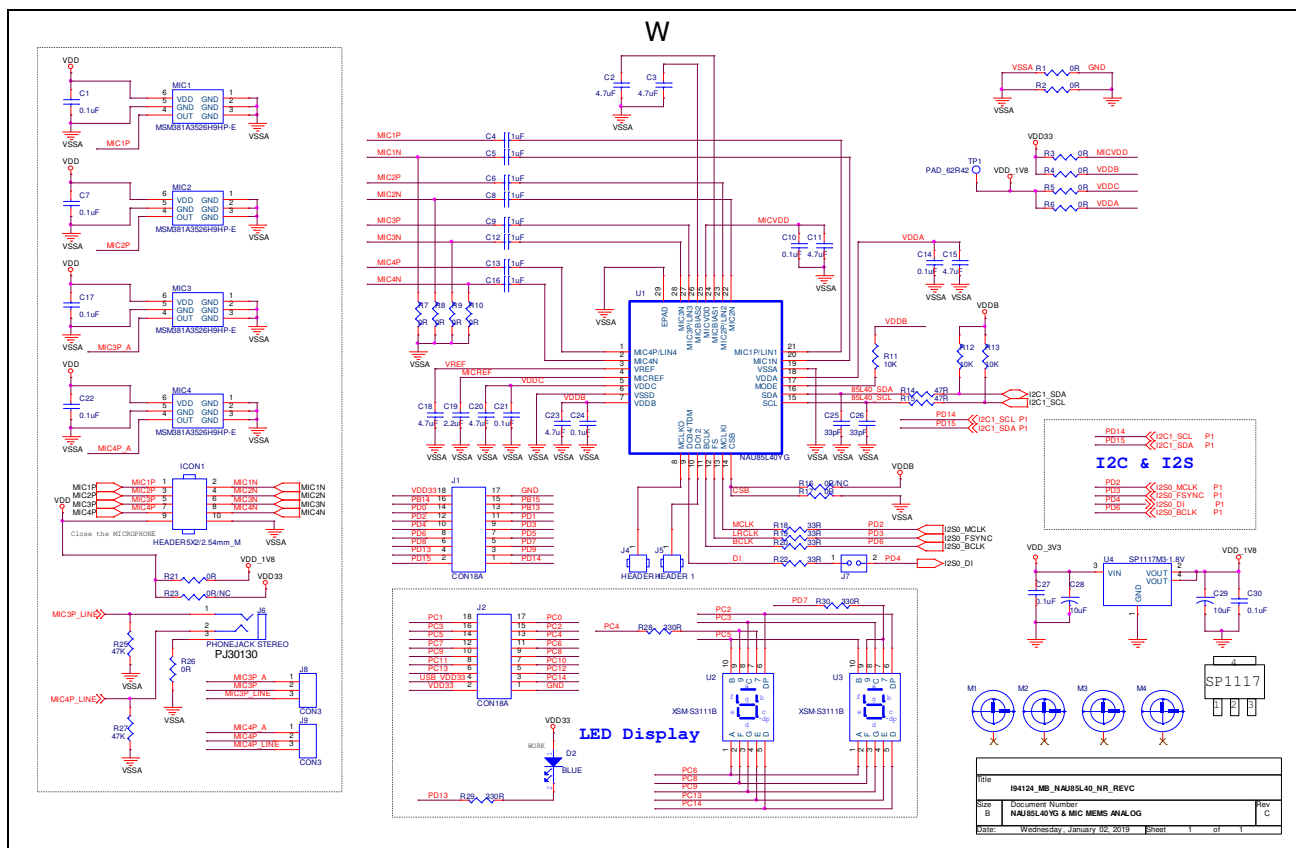


Figure 3.2-1 I94124_MB_NAU85L40_NR Circuit

3.3 I94124_MB_DMIC

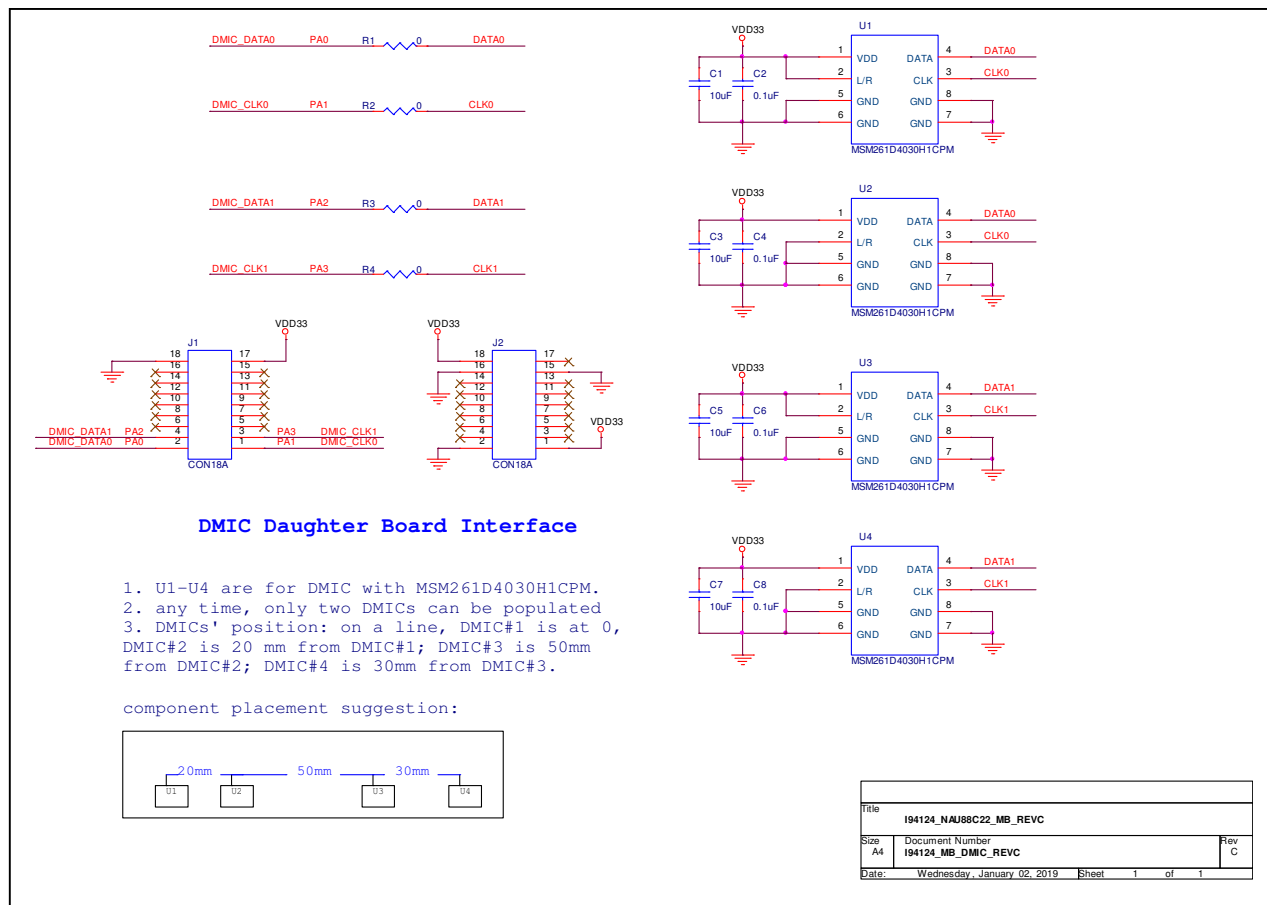


Figure 3.3-1 I94124_MB_DMIC Circuit

4 REVISION HISTORY

Date	Revision	Description
2020.07.30	1.0	1. Initially issued.

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.*