

NuMicro[®] Family
ARM926EJ-S[™]-based Microprocessor

NuMaker-HMI-N9H31-A1/A2
User Manual

Evaluation Board for NuMicro[®] N9H31 Series

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1 OVERVIEW

The NuMaker-HMI-N9H31-A1/A2 is an evaluation board for GUI application development. The NuMaker-HMI-N9H31-A1/A2 consists of two parts: a NuMaker-HMI-N9H31 main board and a NuMaker TFT-LCD5 extension board. The NuMaker-HMI-N9H31-A1/A2 is designed for project evaluation, prototype development and validation with HMI (Human Machine Interface) function.

The NuMaker-HMI-N9H31 integrates touchscreen display, voice input/output, rich serial port service and I/O interface.

The NuMaker-TFT-LCD5 can be plugged into the main board via the DIN_32x2 extension connector.

The NuMaker-TFT-LCD5 includes one 5" LCD which the resolution is 800x480 with RGB-24bit and embedded the 4-wire resistive or capacitive type touch panel.

1.1 NuMaker-HMI-N9H31 Board

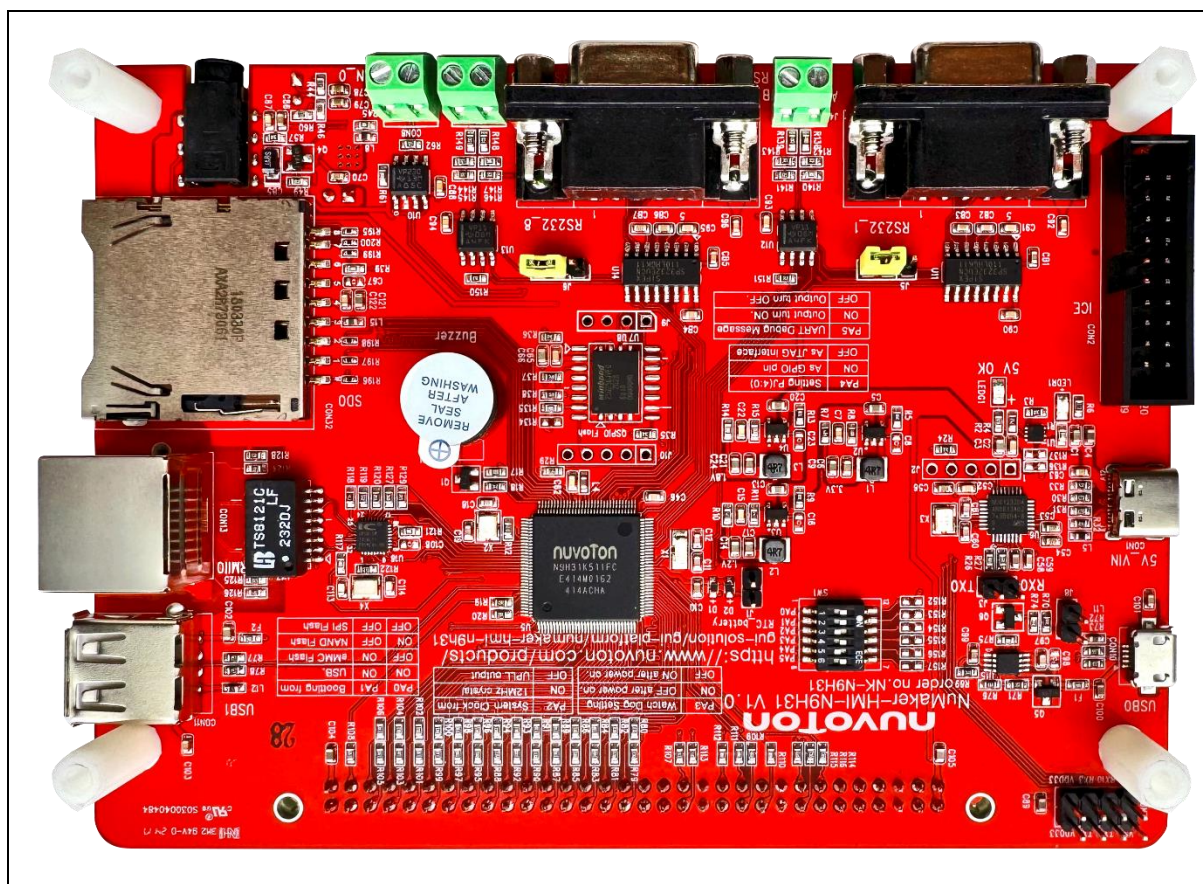


Figure 1-1 NuMaker-HMI-N9H31 Board

1.2 NuMaker TFT-LCD5 Board

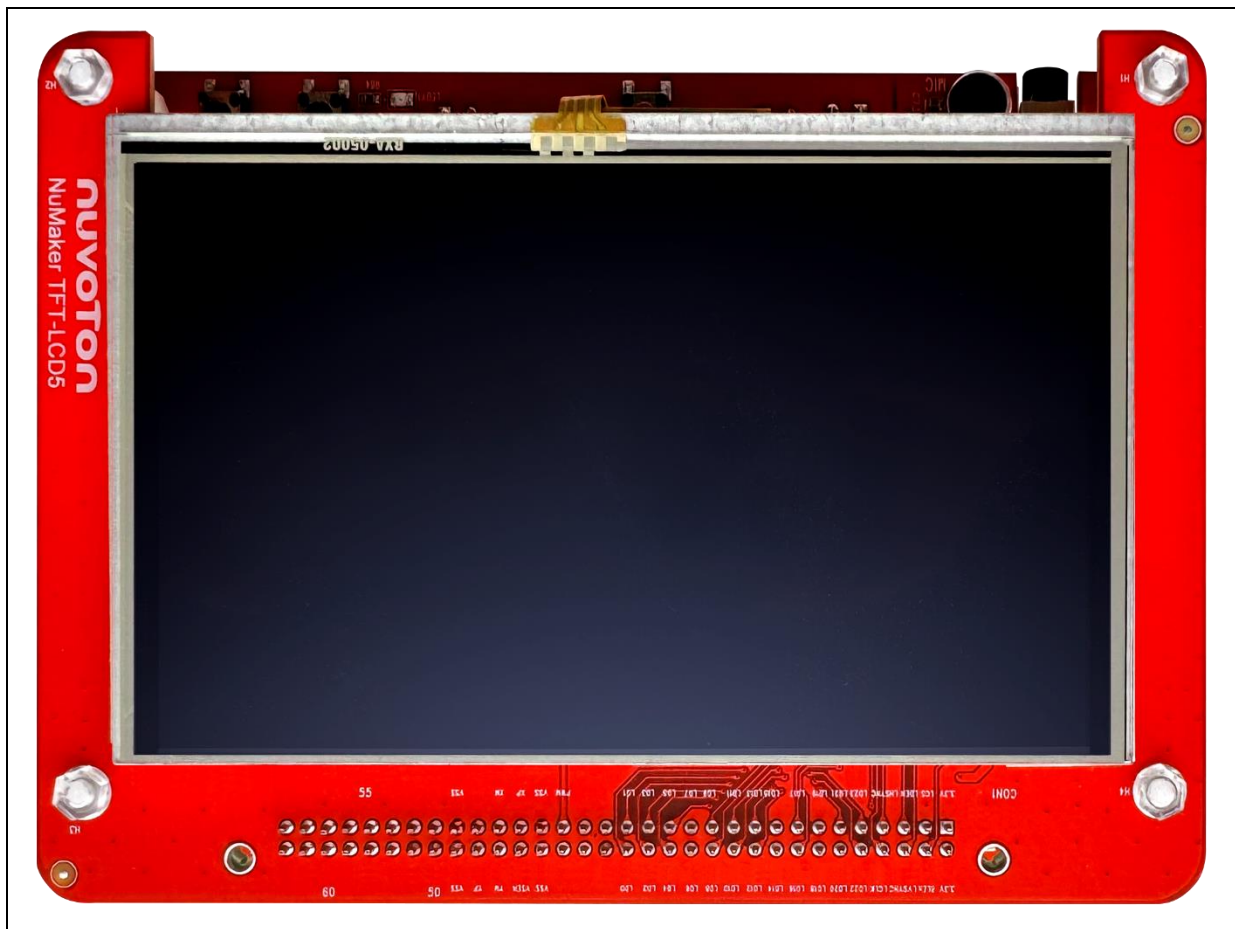


Figure 1-2 NuMaker TFT-LCD5 Board with RTP LCD

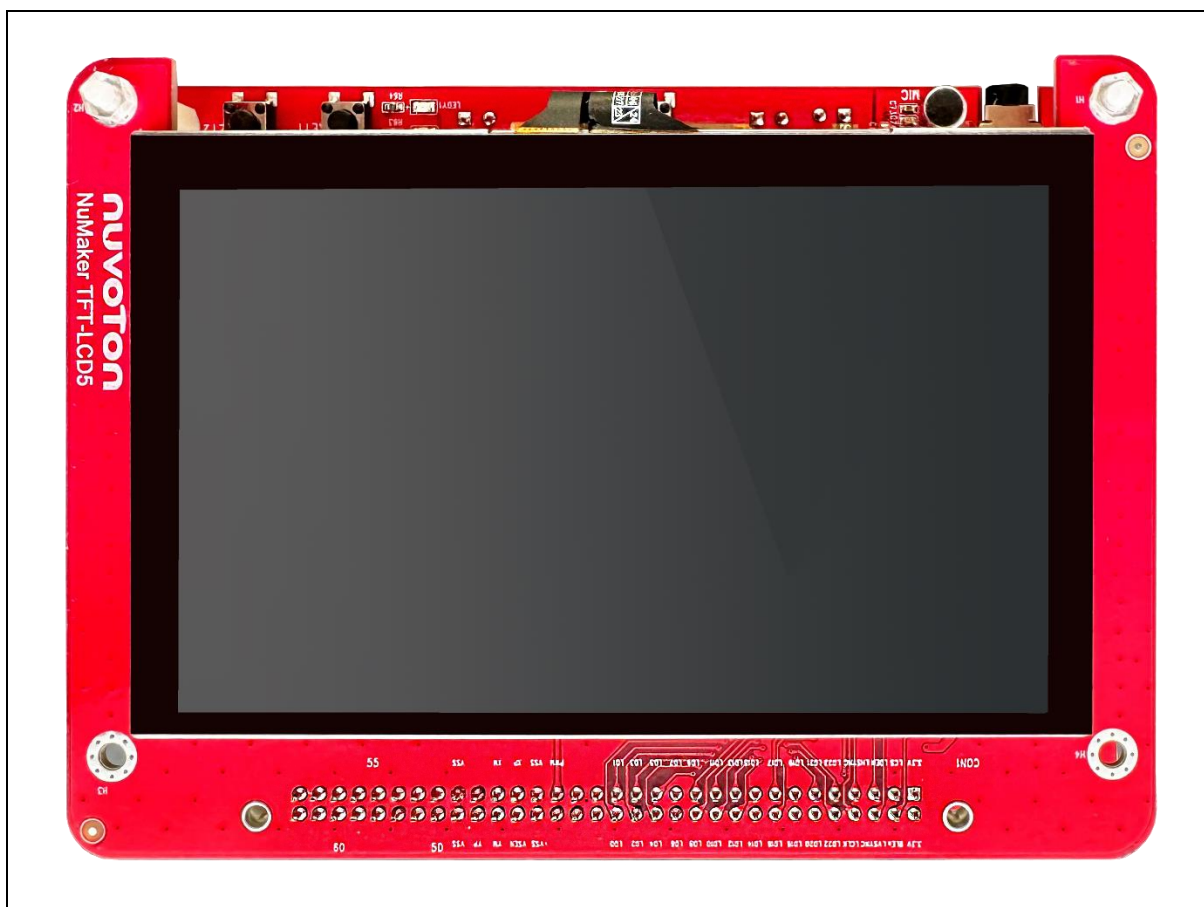


Figure 1-3 NuMaker TFT-LCD5 Board with CTP LCD

1.3 Order Number and Part Number of EVB

The following table lists the part number of this evaluation board (EVB) based on the microprocessor, and the PCB names of two parts: NuMaker-HMI-N9H31 board and NuMaker TFT-LCD5 board.

Order Number	Part Number of EVB	HMI Base Board	5" TFT LCD Daughter Board
NK-N9H31A1	NuMaker-HMI-N9H31-A1	NuMaker-HMI-N9H31	NuMaker TFT-LCD5 (RTP ^{*1})
NK-N9H31A2	NuMaker-HMI-N9H31-A2	NuMaker-HMI-N9H31	NuMaker TFT-LCD5 (CTP ^{*2})
Note ^{*1} : RTP (Resistive Touch Panel) ^{*2} : CTP (Capacitive Touch Panel)			

Table 1-1 Board Part Number and Information

2 FEATURES

2.1 NuMaker-HMI-N9H31 Board Features

- N9H31K51IFC chip: LQFP128 pin MCP package with DDR (32 MB)
- SPI Flash: SPI Flash using W25Q256JVEIQ (32 MB) booting with quad mode or storage memory
- SD0: User SD/eMMC memory card, data storage or SDIO (Wi-Fi) device
- UART0: Connected to Virtual COM port for system development, debug message output
- JTAG interface provided for software development
- RJ45 port with Ethernet 10/100 Mbps MAC (Ethernet0)
- Microphone input and Earphone/Speaker output with 24-bit stereo Audio Codec (NAU88C22) for I²S interface
- One set of CAN transceiver and header connector
- Two sets of RS232/RS485 transceiver and DB9/header connector
- Two LED for status indication
- Two user-configurable push buttons
- One Buzzer
- One LCM connector to connect with 5" 800x480 LCD daughter board
- USB_0 that can be used as Device/HOST and USB_1 that can be used as HOST supports pen drives, keyboards, mouse and printers
- Provides over-voltage and over current protection
- 3.3V I/O power, 1.8V Memory power and 1.2V core power

2.2 NuMaker TFT-LCD5 Board Features

- 5" LCD which the resolution is 800x480 with RGB-24bit and embedded the 4-wire resistive or capacitive type touch panel
- DIN_32x2 extension connector

3 HARDWARE CONFIGURATION

3.1 NuMaker-HMI-N9H31 Board

3.1.1 Front View

Figure 3-1 shows the main components and connectors from the front side of NuMaker-HMI-N9H31.

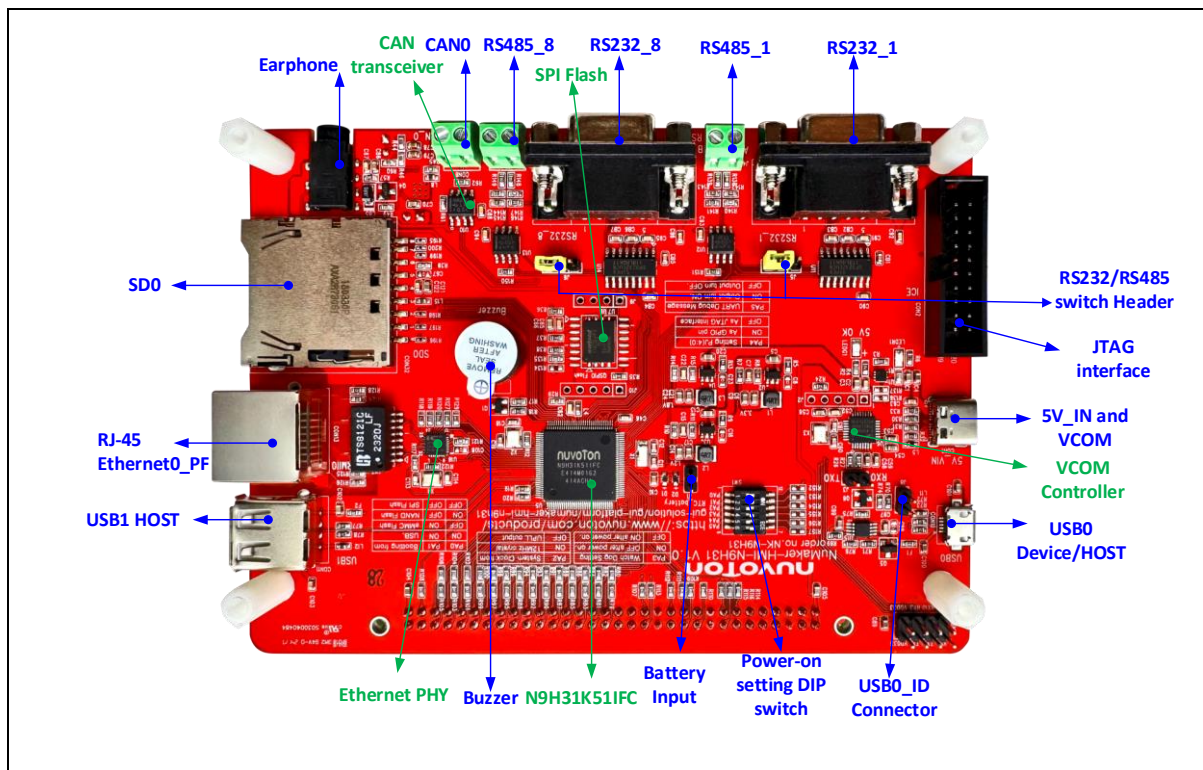


Figure 3-1 Front View of NuMaker-HMI-N9H31 Board

3.1.2 Rear View

Figure 3-2 shows the main components and connectors from the rear side of NuMaker-HMI-N9H31.

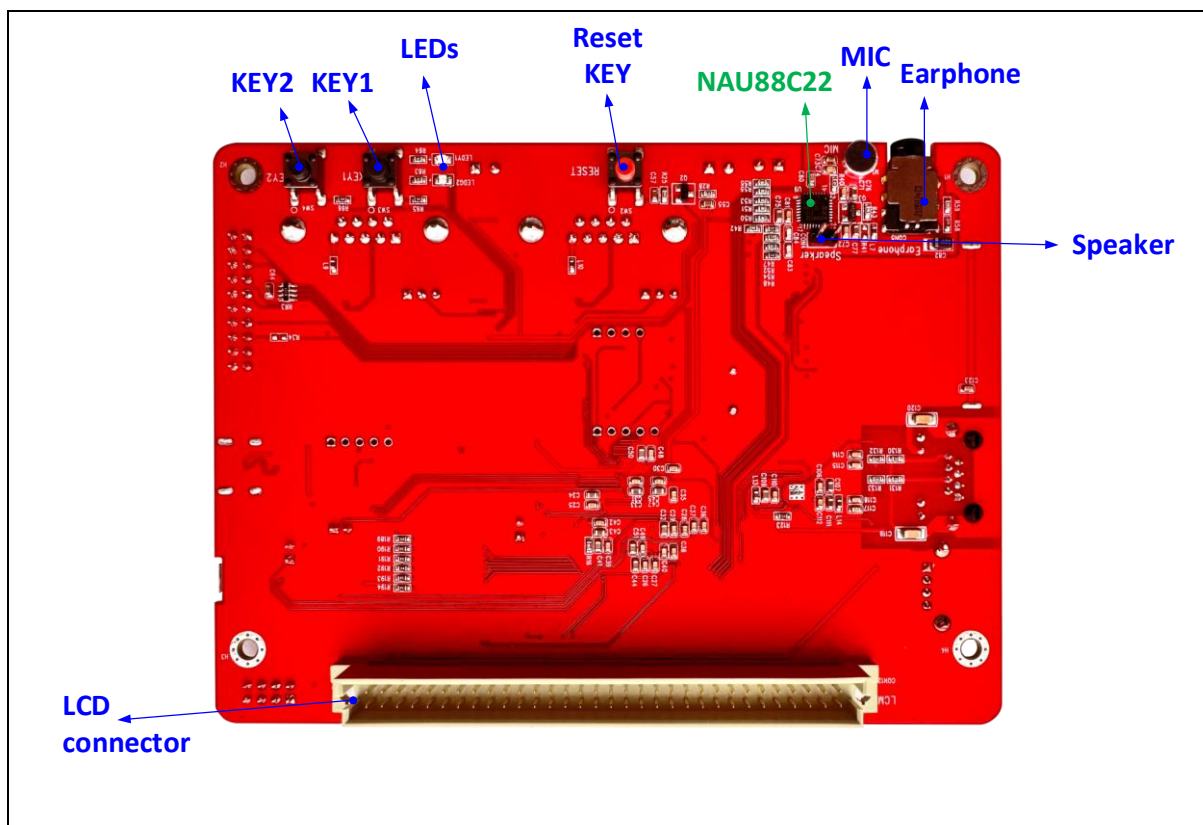


Figure 3-2 Rear View of NuMaker-HMI-N9H31 Board

3.1.3 Audio Codec

- Audio Codec Device (U9): Nuvoton NAU88C22 is audio codec device that integrates microphone input, speaker output and headphone output for audio application on this board.
- Headset Jack (CON5): A headset input jack that follows CTIA definition.
- Speaker Connector (CON4): To connect a speaker to output audio sound.
- Microphone (M1): An on-board microphone for audio sound input.

Function Name	GPIO Pin of N9H31	Default Connected R#
I2S_MCLK	PG10	R50
I2S_LRCK	PG14	R56
I2S_BCLK	PG13	R55
I2S_DI	PG12	R53
I2S_DO	PG11	R51

Table 3-1 I2S0 (U9) Pin Function

Function Name	GPIO Pin of N9H31	Default Connected R#
I2C0_SDA	PG1	R54

I2C0_SCL	PG0	R52
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Table 3-2 I2C0 (U9) Pin Function

3.1.4 RMII Megabit Ethernet

- RMII0 Megabit PHY (U16) and Transformer (U17): The RMII0 MAC of N9H31 series needs an external Megabit PHY (IP101GR) and a transformer (TS8121C) to connect with the Ethernet network.
- RMII0 RJ45 Connector (CON13): The Ethernet RMII0 RJ45 connector.

Pin Function	Pin of N9H31
RMII0_MDC	PF0
RMII0_MDIO	PF1
RMII0_TXEN	PF4
RMII0_TXD0	PF2
RMII0_TXD1	PF3
RMII0_REFCLK	PF5
RMII0_CRSDV	PF8
RMII0_RXD0	PF6
RMII0_RXD1	PF7
RMII0_RXERR	PF9

Table 3-3 RMII0 PHY (U16) Pin Function

3.1.5 SPI Flash

- SPI Flash (U8): Winbond SPI Flash (W25Q256JVEIQ, 32MB) for optional booting source, supporting dual / quad mode.

Pin No.	Pin Name	GPIO Pin of N9H31
1	SPI_CS0	PB6
2	SPIDi/D1	PB9
3	SPIWp/D2	PB10
4	VSS	-
5	SPIDo/D0	PB8
6	SPICLK	PB7
7	SPIHId/D3	PB11
8	VDD33	

Table 3-4 SPI0 Flash (U8) Pin Function

3.1.6 SD Card

- SD0 Standard SD Card Slot (CON32):

Pin No.	Pin Name	GPIO pin of N9H31
1	SD0_D3	PD5
2	SD0_CMD	PD0
3	VSS	-
4	VDD33	-
5	SD0_CLK	PD1
6	VSS	-
7	SD0_D0	PD2
8	SD0_D1	PD3
9	SD0_D2	PD4
10	SD0_nCD	PD6
11	-	-
12	VSS	-

Table 3-5 SD0 Standard SD Card Slot (CON32) Pin Function

3.1.7 USB Virtual COM (VCOM) Port

- VCOM Port and 5V Powered by USB Type-C (CON1): This USB Type-C needs to connect an external power (PC) to supply DC 5V for this board. The NUC123ZD4AN0 microcontroller (MCU) (U6) acts as an USB VCOM device to communicate data between the UART0 port of N9H31 series and USB host of PC. An USB cable should be connected with this USB Type-C connector (CON1) and should be plugged-in the PC host to display the debug messages on PC (Optional).
- VCOM Controller (U6): The NUC123ZD4AN0 microcontroller (U6) acts as an USB VCOM device to communicate data between the UART0 port of N9H31 series and USB host of PC.
- NUC123 ICE Interface (J2): The ICE interface of NUC123ZD4AN0 microcontroller (U6) for programming the internal Flash of NUC123 series MCU. The internal Flash of NUC123 series MCU had been programmed and acts as an USB VCOM device before the NuMaker-HMI-N9H31 board is delivered by Nuvoton.

Pin No.	Pin Name	Function
1	VDD33	DC 3.3V
2	ICE_DAT	SWD data pin of NUC123
3	ICE_CLK	SWD clock pin of NUC123
4	RES	Reset pin of NUC123
5	VSS	Ground

Table 3-6 NUC123 ICE Interface (J2) Pin Function

- UART0 Pin Header (J3):

Pin No.	Pin Name	Function
1	PE1	UR0_TX
2	PE0	UR0_RX

Table 3-7 UART0 Pin Header (J3) Pin Function

3.1.8 Power-on Setting

- Power-on Setting DIP Switch (SW1): The GPIO PA0, PA1, PA2, PA3, PA4, PA5 determine how to boot the evaluation environment on the NuMaker-HMI-N9H31 board.
- Options for booting source selection:

SW	State	Function
SW1.2 (PA1)/ SW1.1 (PA0)	ON/ON	Boot from USB
SW1.2 (PA1)/ SW1.1 (PA0)	ON/OFF	Boot from eMMC
SW1.2 (PA1)/ SW1.1 (PA0)	OFF/ON	Boot from NAND Flash
SW1.2 (PA1)/ SW1.1 (PA0)	OFF/OFF	Boot from SPI Flash

Table 3-8 Options for Booting Source

- Options for system clock source

SW	State	Function
SW1.3 (PA2)	ON	System clock from 12MHz crystal
SW1.3 (PA2)	OFF	System clock from UPLL output

Table 3-9 Options for System Clock Source

- Options for Watchdog Timer enable or disable

SW	State	Function
SW1.4 (PA3)	ON	Watchdog Timer Disable
SW1.4 (PA3)	OFF	Watchdog Timer Enable

Table 3-10 Options for Watchdog Timer

- Options for JTAG Interface

SW	State	Function
SW1.5 (PA4)	ON	GPJ[4:0] used as GPIO pins
SW1.5 (PA4)	OFF	GPJ[4:0] used as JTAG ICE interface

Table 3-11 Options for JTAG Interface

- Options for UART0 Debug Message

SW	State	Function
SW1.6 (PA5)	ON	UART0 debug message ON
SW1.6 (PA5)	OFF	UART0 debug message OFF

Table 3-12 Options for UART0 Debug Message

3.1.9 Reset

- Reset Button (SW2): Press this key to reset the N9H31K51IFC target chip on this NuMaker-HMI-N9H31 board.

3.1.10 TFT LCD Connector

- LCM Connector (CON12):

Pin No.	Pin Name	GPIO pin of N9H31	Default Connected R#
1	VDD33	-	-
2	VDD33	-	-
3	LCD_CS	PD7	R108
4	-	-	-
5	LCD_DEN	PG9	R106
6	LCD_VSYSNC	PG8	R105
7	LCD_HSYNC	PG7	R104
8	LCD_CLK	PG6	R103
9	LCD_D23	PD15	R102
10	LCD_D22	PD14	R101
11	LCD_D21	PD13	R100
12	LCD_D20	PD12	R99
13	LCD_D19	PD11	R98
14	LCD_D18	PD10	R97
15	LCD_D17	PD9	R96
16	LCD_D16	PD8	R95
17	LCD_D15	PA15	R94
18	LCD_D14	PA14	R88
19	LCD_D13	PA13	R93

20	LCD_D12	PA12	R92
21	LCD_D11	PA11	R91
22	LCD_D10	PA10	R90
23	LCD_D9	PA9	R89
24	LCD_D8	PA8	R87
25	LCD_D7	PA7	R86
26	LCD_D6	PA6	R85
27	LCD_D5	PA5	R84
28	LCD_D4	PA4	R83
29	LCD_D3	PA3	R82
30	LCD_D2	PA2	R81
31	LCD_D1	PA1	R80
32	LCD_D0	PA0	R79
33	-	-	-
34	-	-	-
35	-	-	-
36	-	-	-
37	LCD_PWM	PH2	R107
38	LCD_RST	PI11	R113
39	VSS	-	-
40	VSS	-	-
41	XP	ADC7	R112
42	-	-	-
43	XM	ADC6	R111
44	YM	ADC4	R109
45	-	-	-
46	YP	ADC5	R110
47	VSS	-	-
48	VSS	-	-
49	LCD_I2C0_SCL	PG0	R115
50	LCD_I2C0_SDA	PG1	R116

51	TOUCH_INT	PI1	R114
52	-	-	-
53	-	-	-
54	-	-	-
55	-	-	-
56	-	-	-
57	-	-	-
58	-	-	-
59	VSS	-	-
60	VSS	-	-
61	-	-	-
62	-	-	-
63	VDD5	-	-
64	VDD5	-	-

Table 3-13 LCM Connector (CON12) Pin Function

3.1.11 ICE

- JTAG Interface (CON2): Arm JTAG interface for tracing or debugging code.

Pin No.	Pin Name	GPIO pin of N9H31
1	VDD33	-
2	VDD33	-
3	nTRST	PJ4
4	VSS	-
5	TDI	PJ2
6	VSS	-
7	TMS	PJ1
8	VSS	-
9	TCK	PJ0
10	VSS	-
11	VSS	-
12	VSS	-
13	TDO	PJ3

14	VSS	-
15	SWJ_nRESET	nRESET(Need Short R34)
16	VSS	-
17	-	-
18	VSS	-
19	-	-
20	VSS	-

Table 3-14 JTAG Interface (CON2) Pin Function

3.1.12 USB 2.0 Connectors

- USB0_ID Header (J8): Optional to pull-down the ID pin of USB0 by a jumper to force USB0 to always act as an USB Host.
- USB0 Host/Device (CON10, USB Micro-AB Receptacle): USB0 can act as an USB 2.0 Host or Device that depends on the ID pin state of plugged-in USB cable or always acts as Host by connecting a jumper on the J8 connector to force the ID pin of USB0 at low state.
- USB1 Host (CON11, USB Type-A Receptacle): USB1 for USB 2.0 Host with Type-A connector.

3.1.13 RS232 or RS485

- RS232_1: The UART1 to RS232 transceiver (U11, SN75C3232EDR) and Connector (CON8).

Pin No.	Function Name
1	-
2	UR1_TX
3	UR1_RX
4	-
5	VSS
6	-
7	UR1_CT
8	UR1_RT
9	-
10	-
11	-

Table 3-15 RS232_1 Connector (CON8) Pin Function

- RS485_1: The UART1 to RS485 transceiver (U12, SN65HVD11DR) and Connector (J4).

Pin No.	Function Name
1	RS485_A1
2	RS485_B1

Table 3-16 RS485_6 Connector (J4) Pin Function

Note: UART1 can use J5 to switch functions (RS232 or RS485)

- RS232_8: The UART8 to RS232 transceiver (U14, SN75C3232EDR) and Connector (CON9).

Pin No.	Function Name
1	-
2	UR8_TX
3	UR8_RX
4	-
5	VSS
6	-
7	UR8_CT
8	UR8_RT
9	-
10	-
11	-

Table 3-17 RS232_8 Connector (CON9) Pin Function

- RS485_8: The UART6 to RS485 transceiver (U13, SN65HVD11DR) and Connector (J7).

Pin No.	Function Name
1	RS485_A8
2	RS485_B8

Table 3-18 RS485_16 Connector (J7) Pin Function

Note: UART8 can use J6 to switch functions (RS232 or RS485)

3.1.14 CAN

- CAN_0 :The CAN_0 transceiver (U10, SN65HVD230DR) and connector (CON6).

Pin No.	Function Name
1	CAN0_H
2	CAN0_L

Table 3-19 CAN_0 Header (CON6) Pin Function

3.1.15 Key Buttons and LEDs

- User-define Key Buttons (KEY_1, KEY_2):

KEY_#	SW#	GPIO pin of N9H31	Pull-up Power
KEY_1	SW3	PI9	VDD33
KEY_2	SW4	PH1	VDD33

Table 3-20 Key Buttons (KEY_1, KEY_2) Pin Function

- User Indication LEDs (LED_1, LED_2):

LED_#	Function / Color	GPIO pin of N9H31
LED_1	LEDG2 / Green	PI10
LED_2	LEDY1 / Yellow	PF10

Table 3-21 LEDs (LED_1, LED_2) Pin Function

3.1.16 Buzzer

- Buzzer (BZ1): Controlled by PH3 pin of N9H31

3.2 NuMaker TFT-LCD5 Board

3.2.1 Front View

Figure 3-3 shows the main components from the front side of NuMaker TFT-LCD5 board and an onboard 5" touch TFT LCD panel.

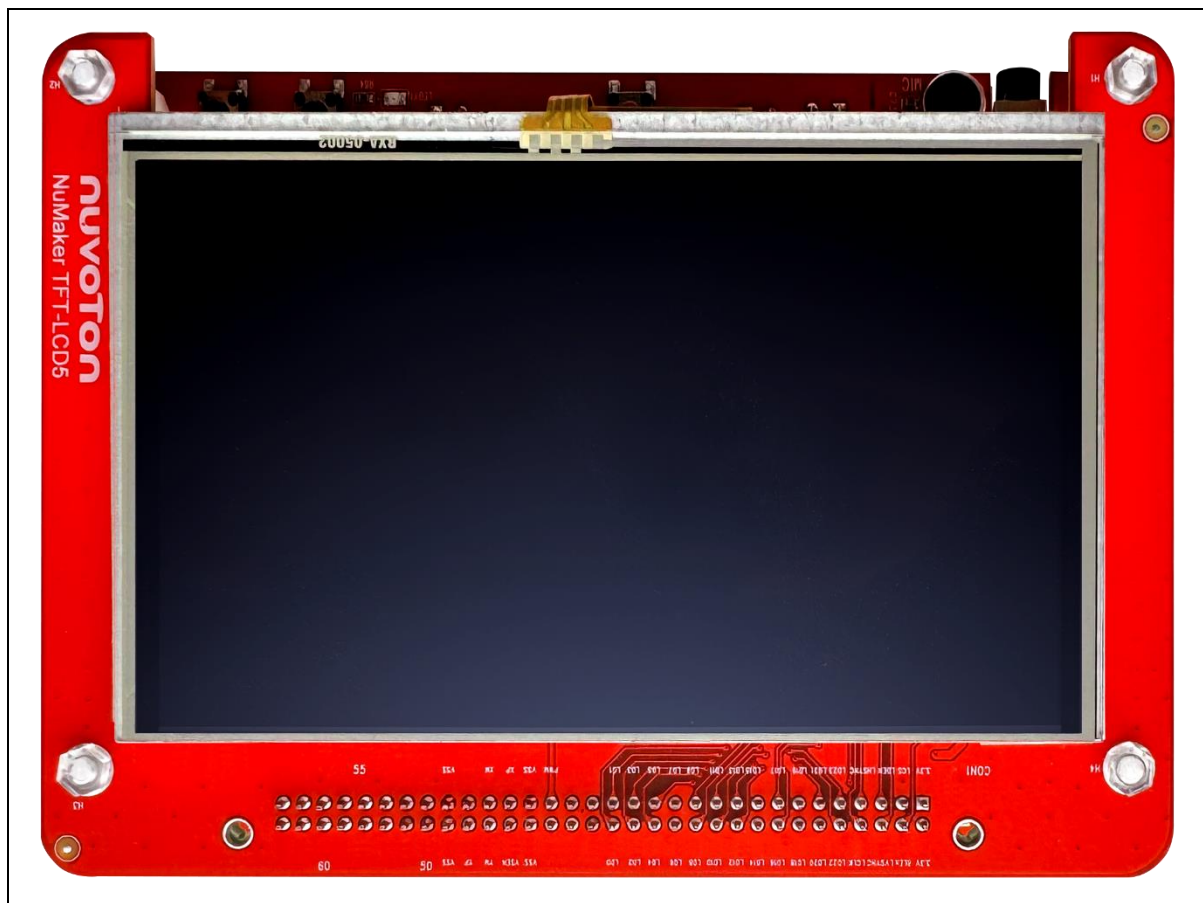


Figure 3-3 Front View of NuMaker TFT-LCD5 Board with RTP LCD

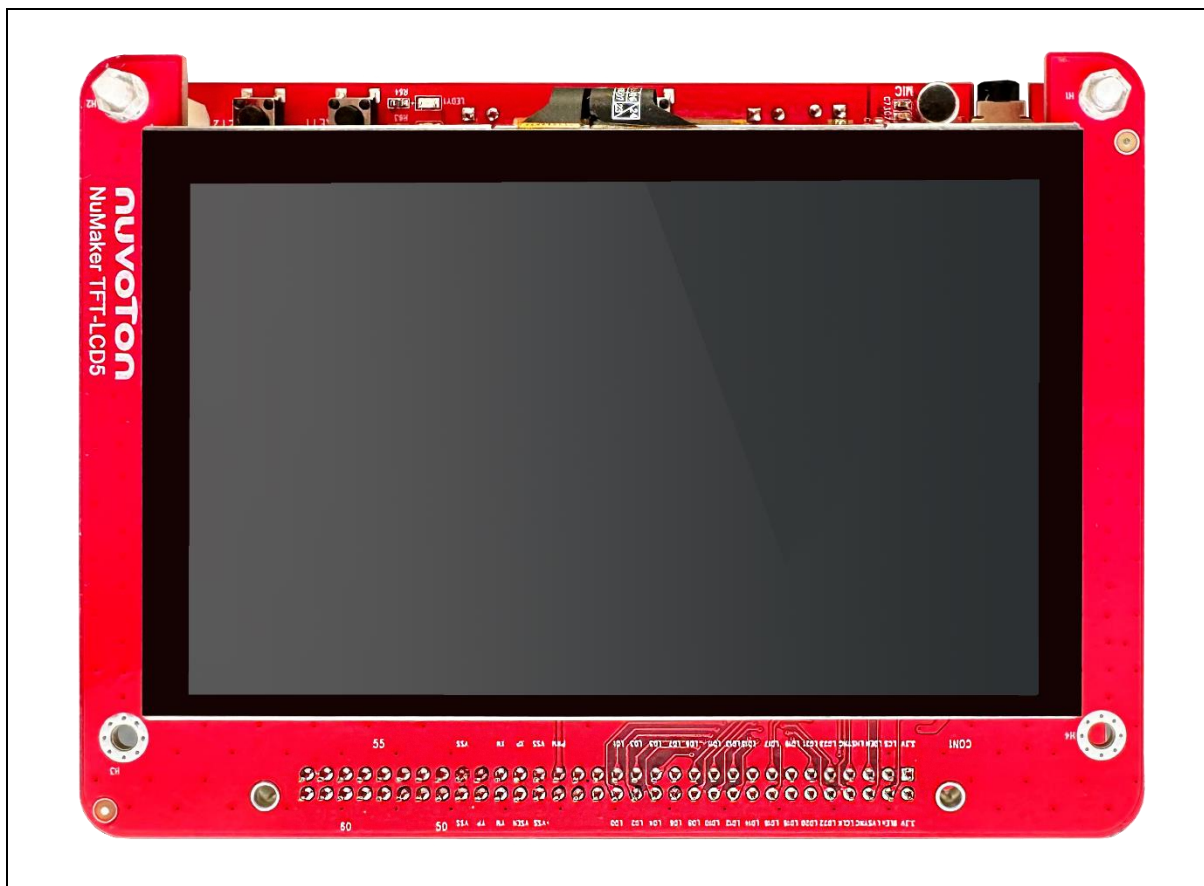


Figure 3-4 Front View of NuMaker TFT-LCD5 Board with CTP LCD

3.2.2 Rear View

Figure 3-5 shows the main components from the rear view of NuMaker TFT-LCD5 board.

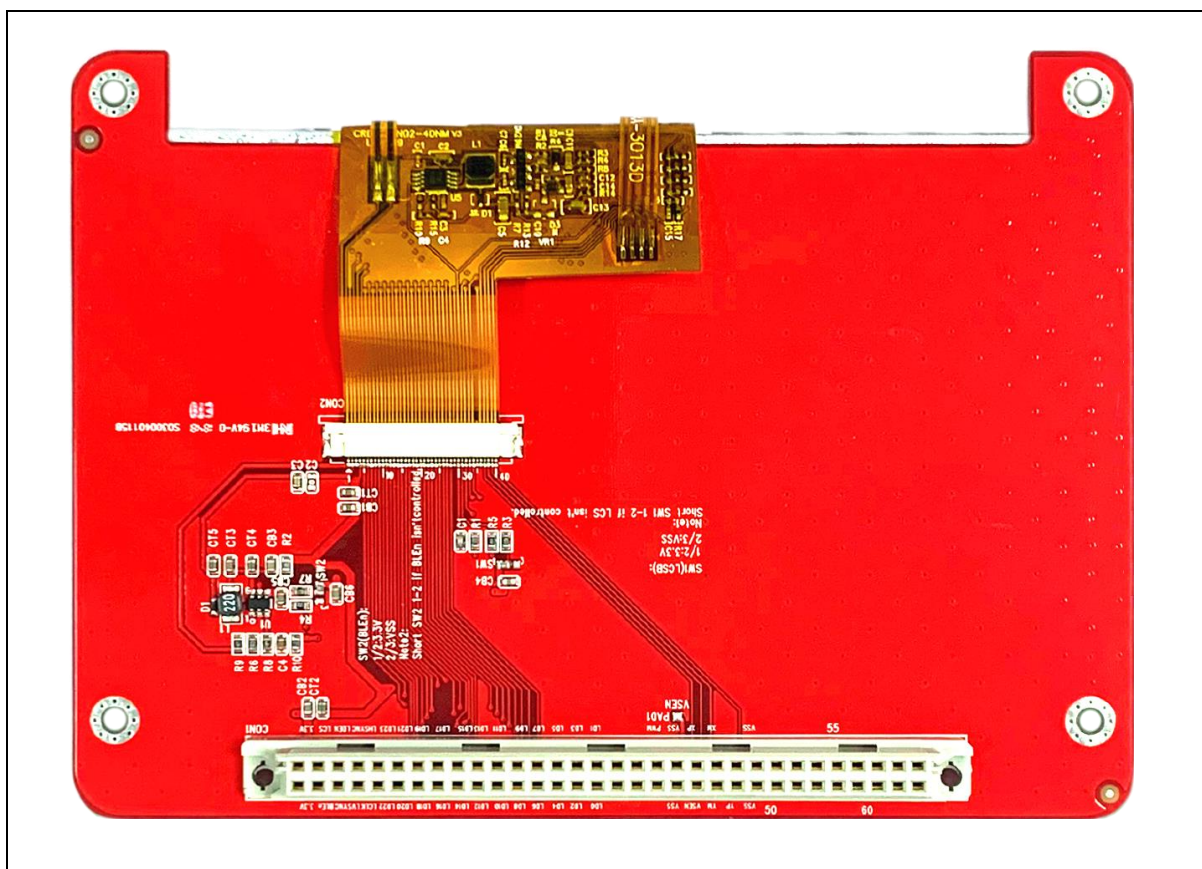


Figure 3-5 Rear View of NuMaker TFT-LCD5 Board

3.2.3 Connectors

- LCD Module Connector (CON2): FPC (pitch-0.5mm x 40) connector of TFT LCD module.
- LCM Connector (CON1): To connect with the LCM connector (CON12) of the NuMaker-HMI-N9H31 board.

4 QUICK START

This chapter guides users step by step to start the NuMicro N9H31 evaluation system based on the NuMaker-HMI-N9H31 board.

4.1 Nuvoton CDC Driver Installation

The USB serial port function is used to print some messages on PC API, such as SecureCRT, through the standard UART protocol to help user to debug program.

Download and install the latest Nuvoton CDC driver:

- https://www.nuvoton.com/resource-download.jsp?tp_GUID=SW1020160914071736

The installation is presented in Figure 4-1 and Figure 4-2.

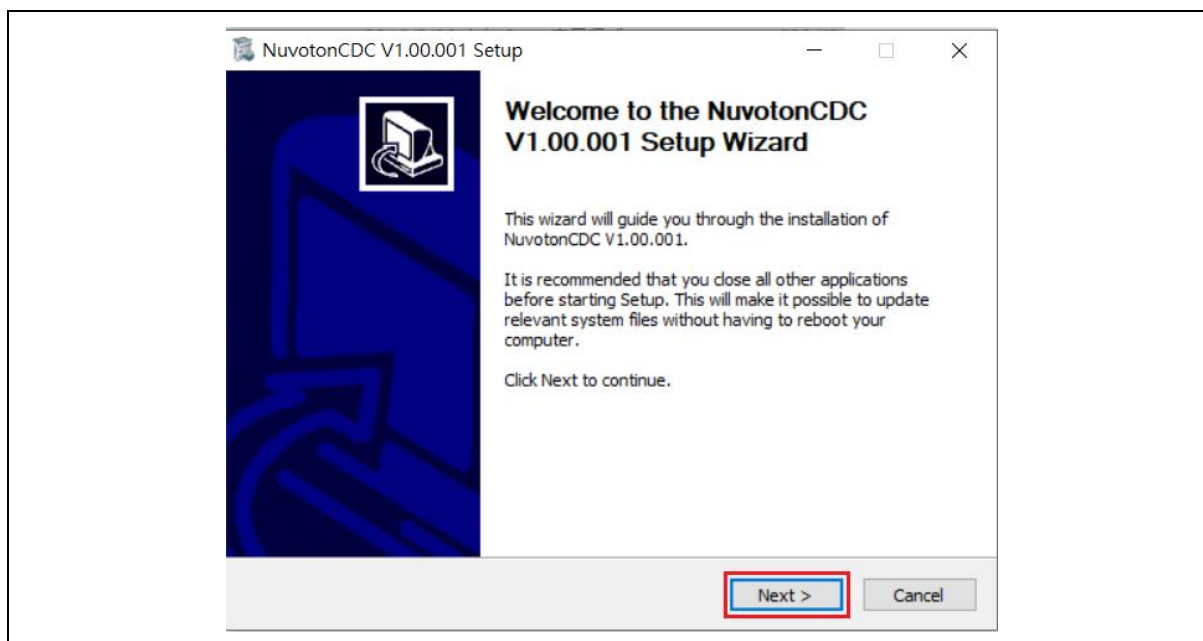


Figure 4-1 CDC Driver Installation Setup

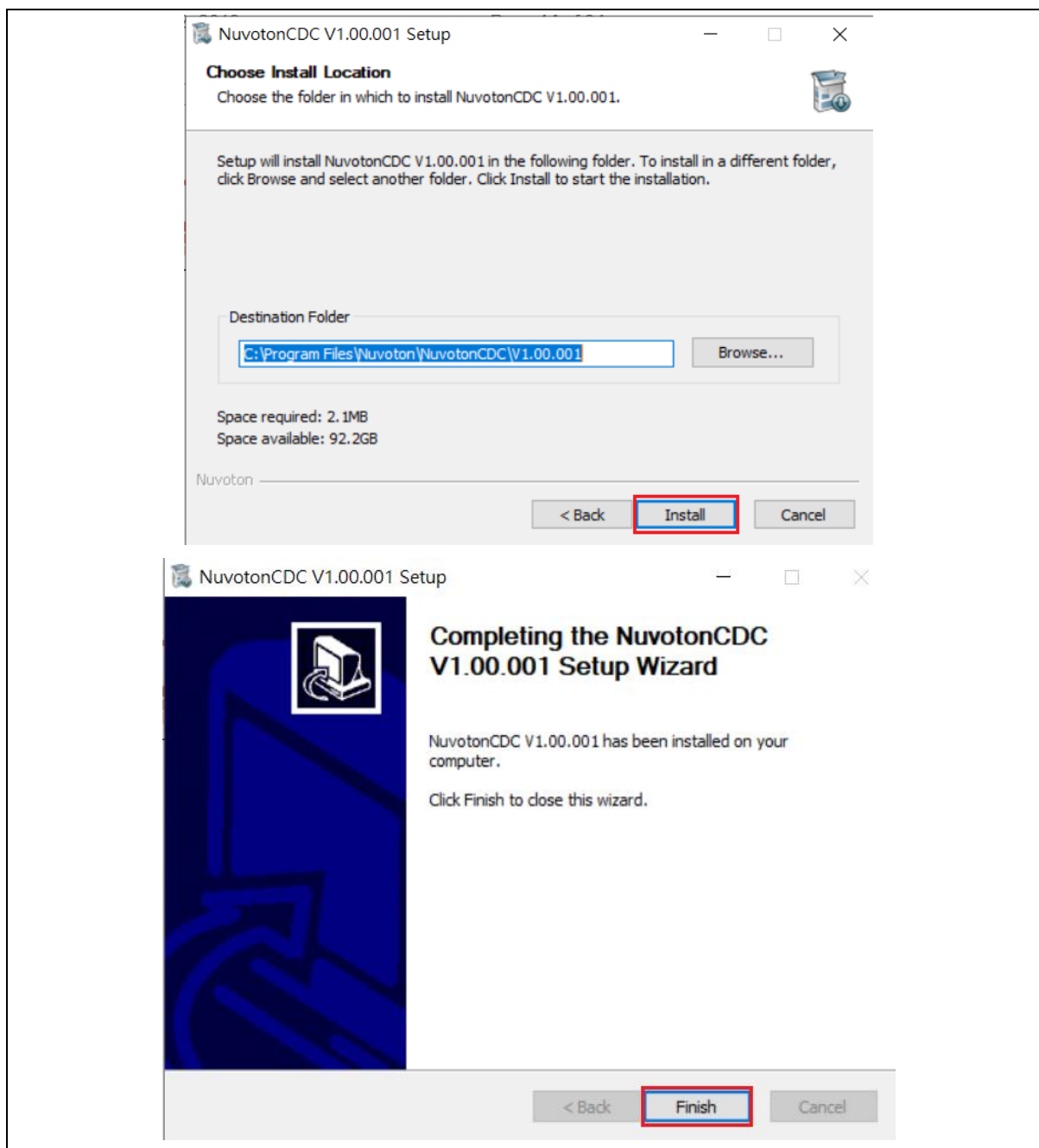


Figure 4-2 CDC Driver Installation

4.2 Nuvoton Virtual COM Driver Installation

The firmware programming tool **NuWriter** requires a NuWriter driver to be installed on PC first. Please follow the steps below to install the driver.

Download and install the latest Nuvoton Virtual COM driver:

- https://github.com/OpenNuvoton/NUC970_NuWriter/tree/master/Driver

The installation is presented in Figure 4-3 and Figure 4-4.

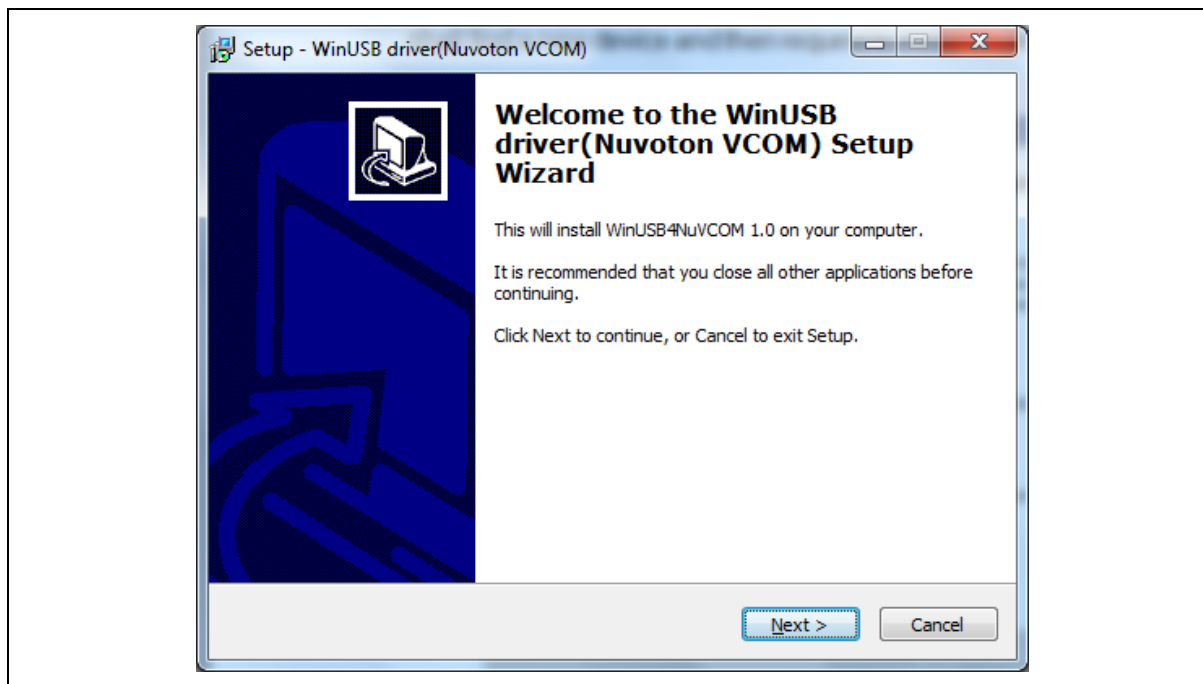
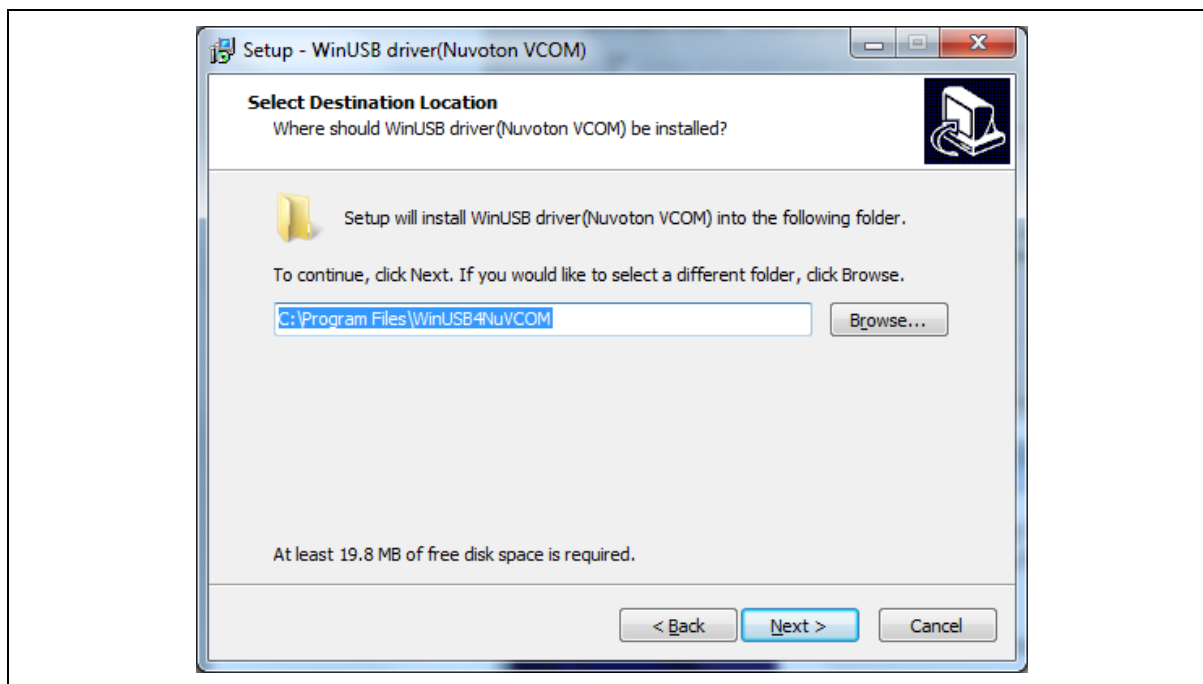
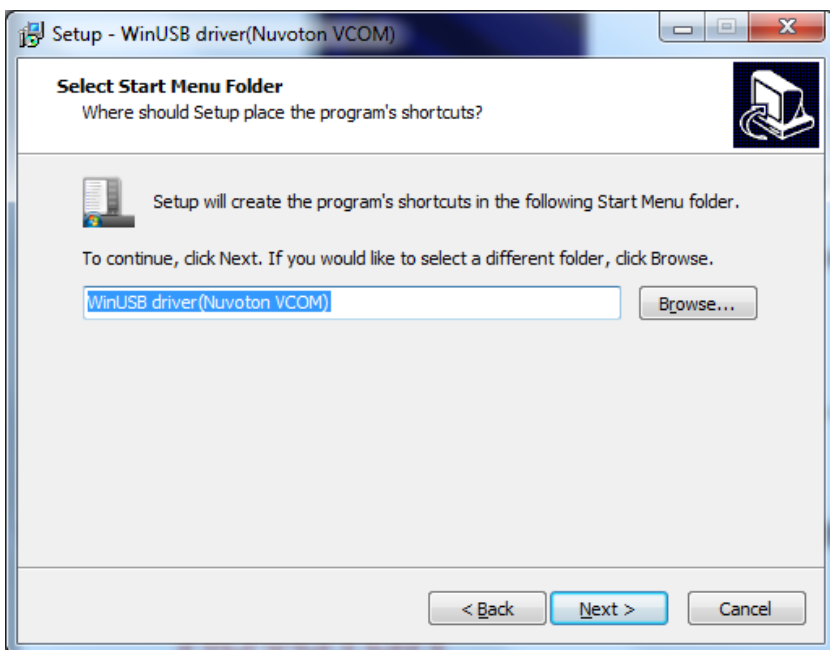
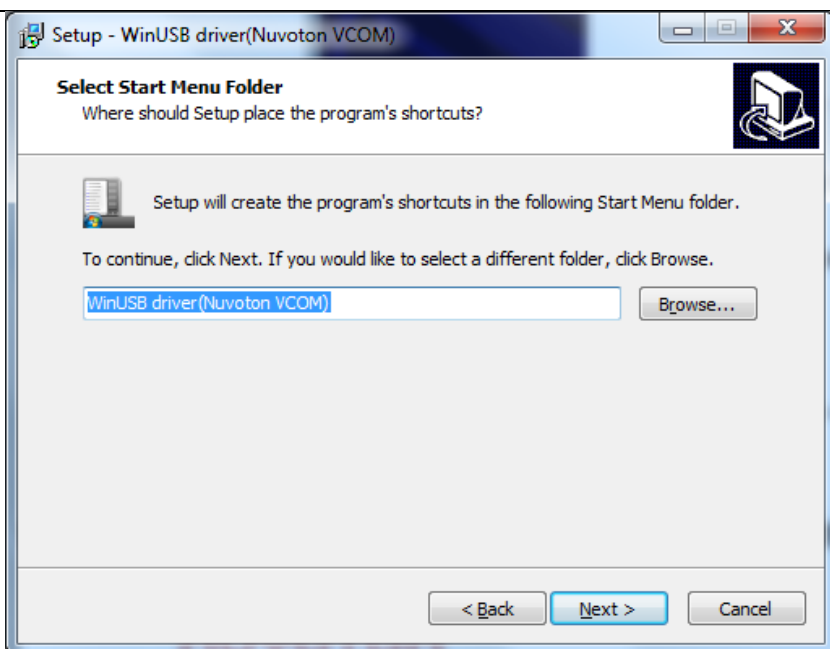


Figure 4-3 VCOM Driver Installation Setup





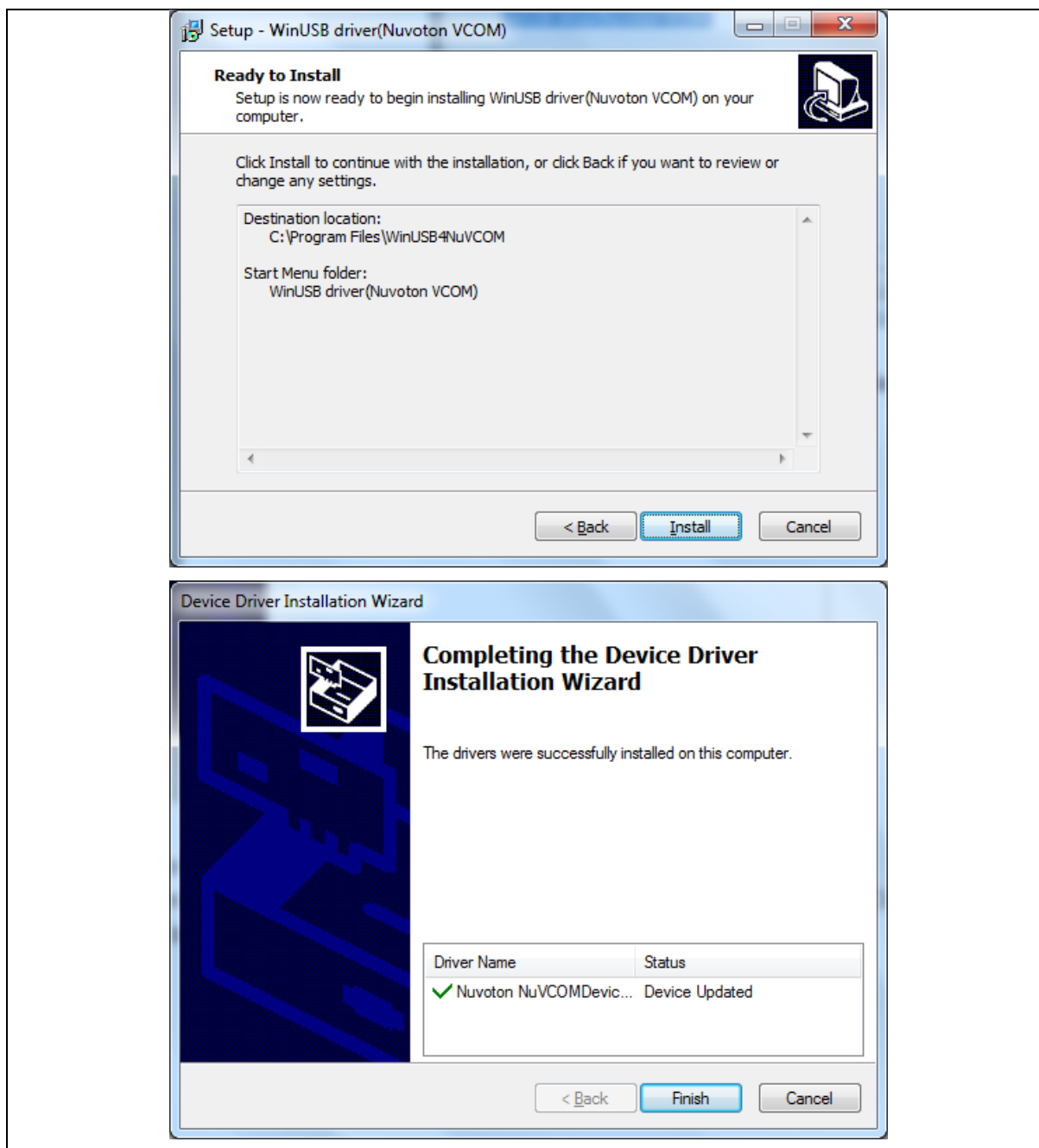


Figure 4-4 VCOM Driver Installation

4.3 Configuring Power-on Setting

The second step is to make sure the power-on setting for the booting source selection on the DIP Switch (SW1) followed the correct ON/OFF states shown the following Table 4-1.

After choosing the correct power-on setting on these DIP switches, the evaluation environment will boot from the image stored in the SPI Flash (SPI0) when power is supplied to the NuMaker-HMI-N9H31 board.

The NuMaker-HMI-N9H31-A1/A2 provides jumpers to select boot-up conditions. To select USB ISP mode, the statuses of SW1.1 and SW1.2 are ON. For other boot selections, refer to Figure 4-5 and Table 4-1.

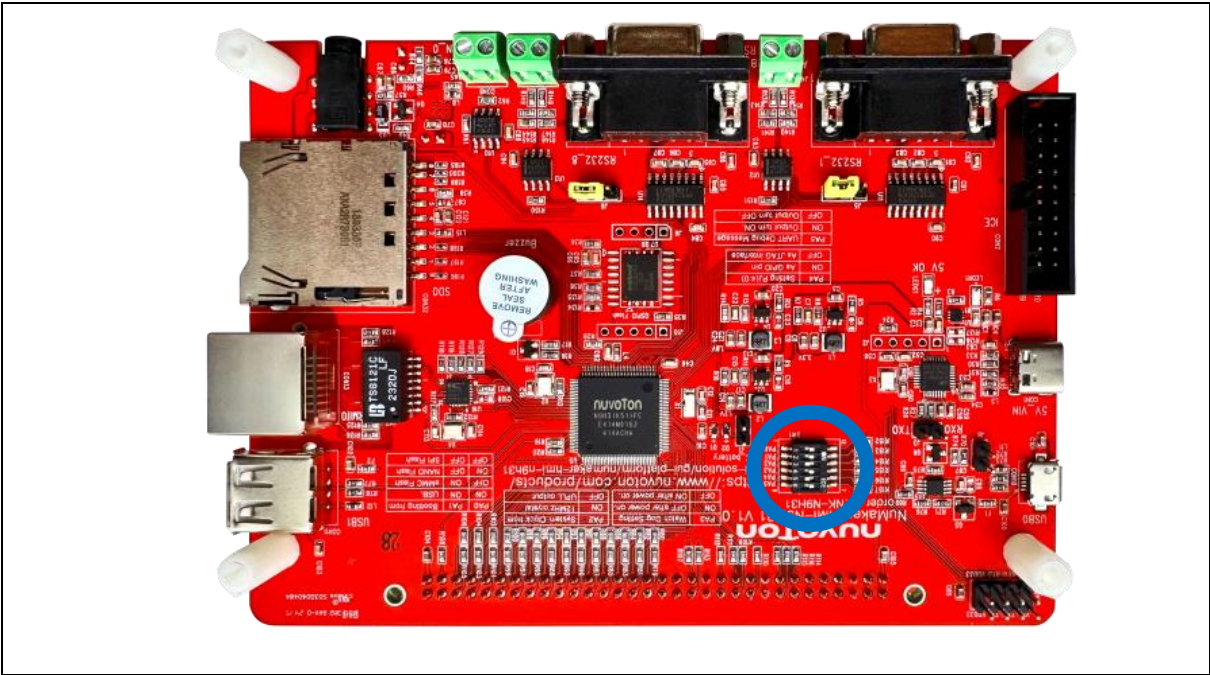


Figure 4-5 Boot Source Selection

Power-on setting	SW1.2/PA1	SW1.1/PA0
USB ISP	ON	ON
Boot from eMMC	ON	OFF
Boot from NAND	OFF	ON
Boot from SPI	OFF	OFF

Table 4-1 Boot Source Selection Table

The steps for using the debug console are as follows.

1. Connect USB-Serial connector shown in Figure 4-6 to the PC USB port through a USB Type C cable.

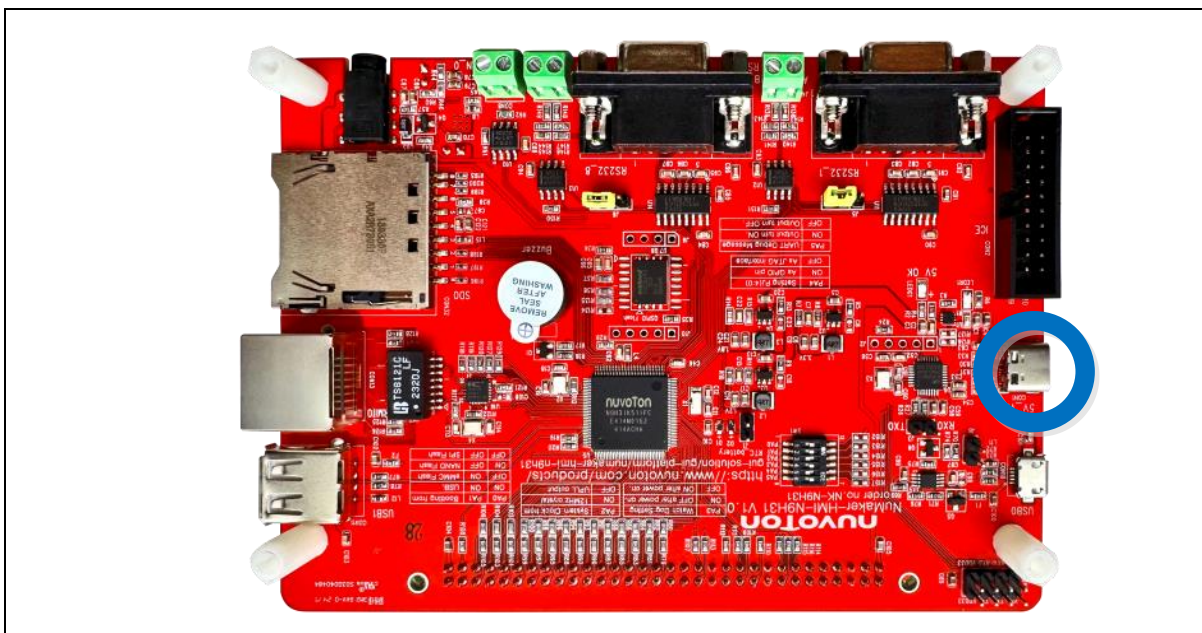


Figure 4-6 USB-Serial Debug Port

2. Find the “Nuvoton Virtual COM Port” on the Device Manger as Figure 4-7.

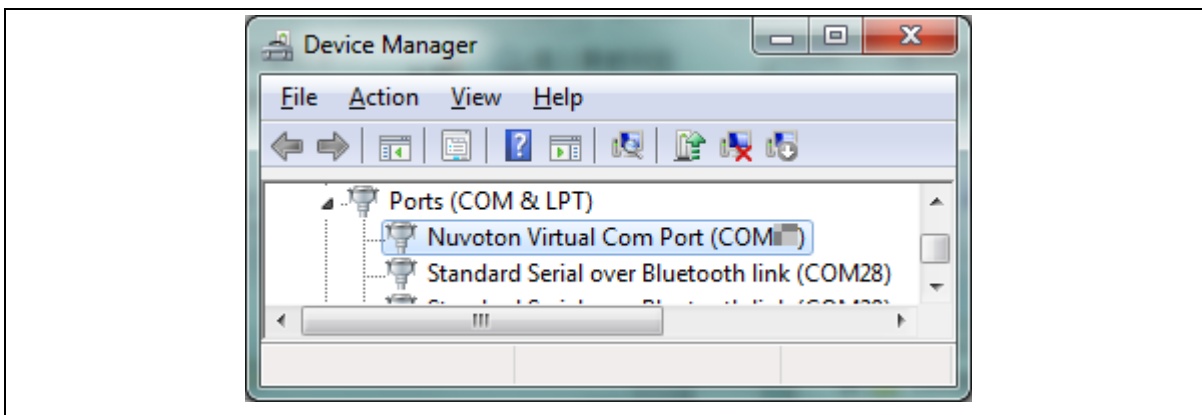


Figure 4-7 Device Manger (1)

3. Open a serial port terminal, PuTTY for example, to print out debug message. Set the baud rate to 115200.

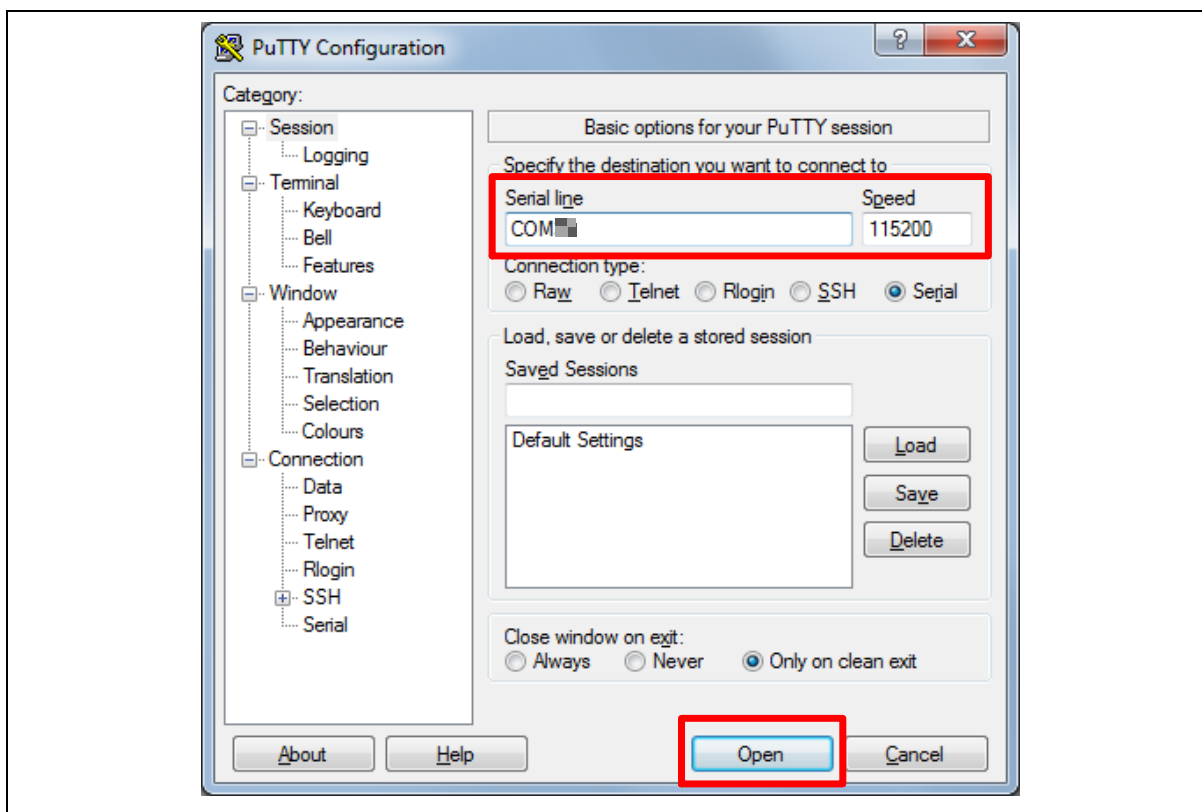


Figure 4-8 PuTTY Session Setting

4. Open a serial port terminal, PuTTY for example, to print out debug message. Set the speed to 115200.

4.4 NuWriter Tool

4.4.1 NuWriter Setup

1. Refer to section 5.2 to install NuWriter tool.
2. Connect USB connector to the PC USB port through a Micro USB cable.

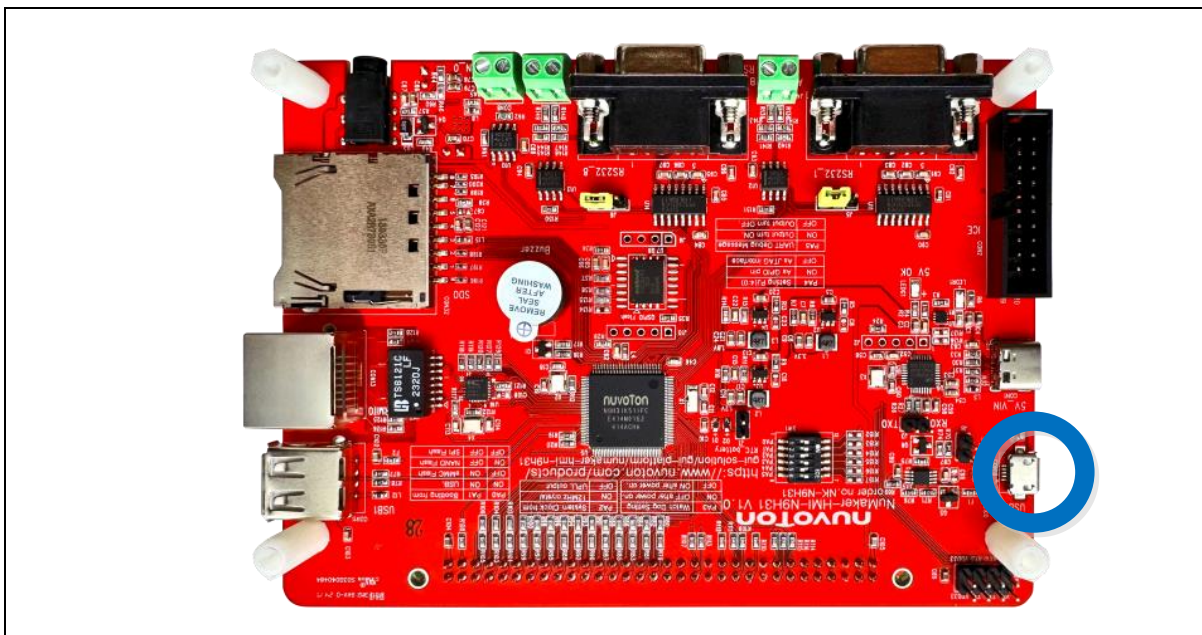


Figure 4-9 USB Port

3. Boot NuMaker-HMI-N9H31 from USB ISP mode.
4. Find the “WinUSB driver (Nuvoton VCOM)” on the Device Manager as Figure 4-10.

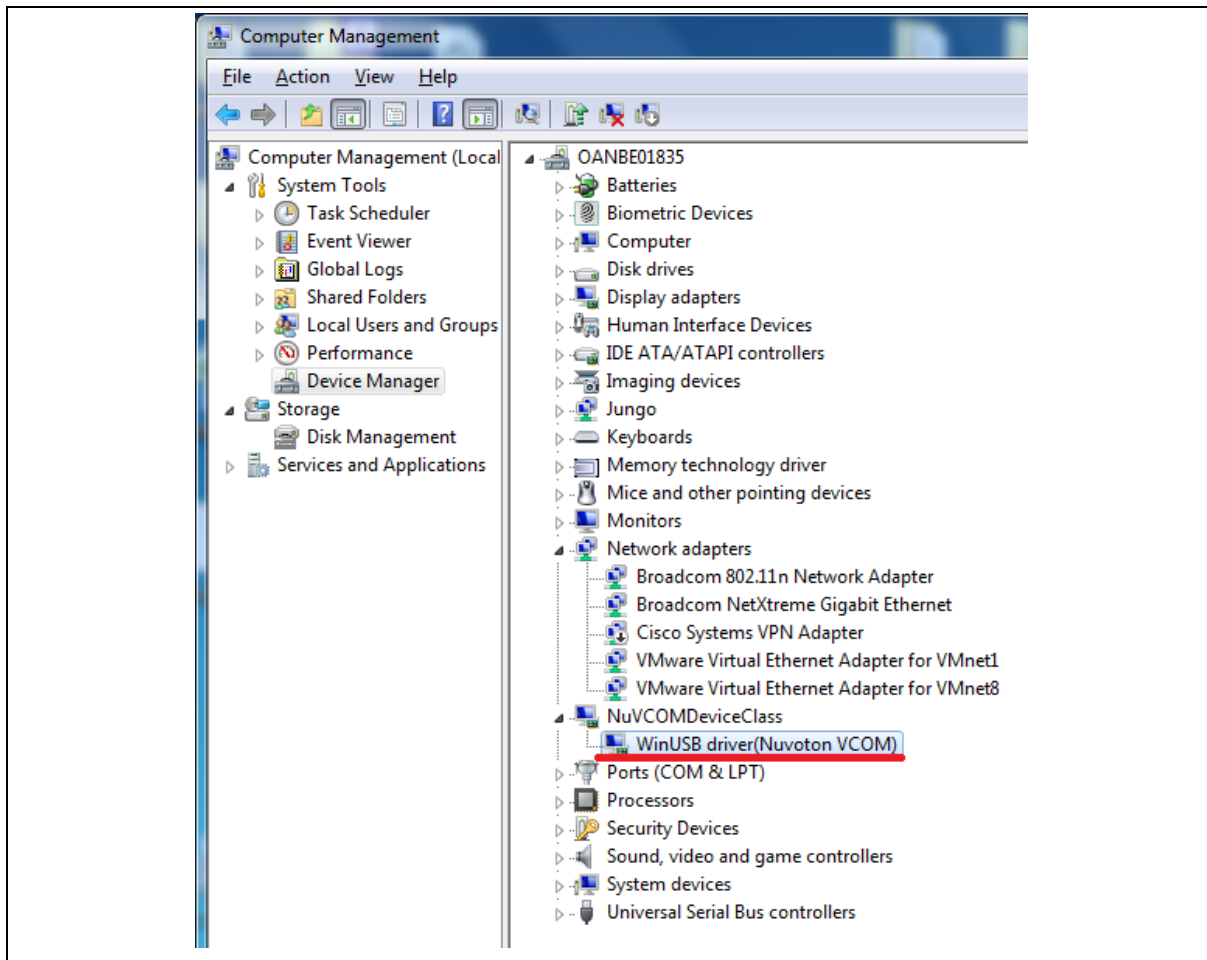


Figure 4-10 Device Manger (2)

Power on the NuMaker-HMI-N9H31, and then open the programming tool “*NuWriter.exe*” on the PC. Note that the tool cannot work if the “**WinUSB4NuVCOM**” driver is not found.

First, double-click “*NuWriter.exe*” on PC. NuWriter will start and a window appears. Select target chip as N9H31 series and select DDR parameter as DDR initial files.

DDR initial is available to set register values. For example, the default GPIO output mode is push-pull. If you want to switch to open-drain mode, it is helpful to set register values via DDR initial files.

After selecting DDR parameter, click “**Continue**” to use NuWriter tool.

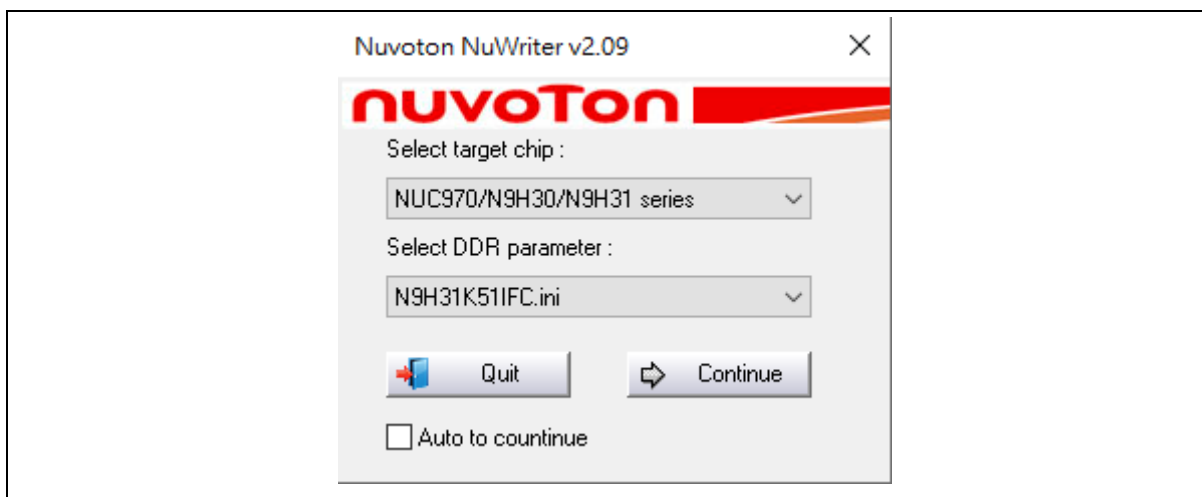


Figure 4-11 NuWriter Chip Setting

NuWriter provides 6 types of images to be downloaded including DDR/SRAM, SPI, NAND, eMMC/SD, PACK and Mass Production.

4.5 Embedded Demo

After the NuMaker-HMI-N9H31-A1/A2 board is successfully powered on, the TFT LCD screen will show the main screen as Figure 4-12.



Figure 4-12 Main Screen of Demonstration

5 SUPPORTING RESOURCES

5.1 Documents

For more details about N9H31 series documents, for example, Technical Reference Manual, Datasheet, Application Note and User Manual documents, please visit [Nuvoton website](https://www.nuvoton.com) and search for the Arm9 MPUs product line for the N9H series products from the “Products” menu on the [Nuvoton website](https://www.nuvoton.com) homepage.

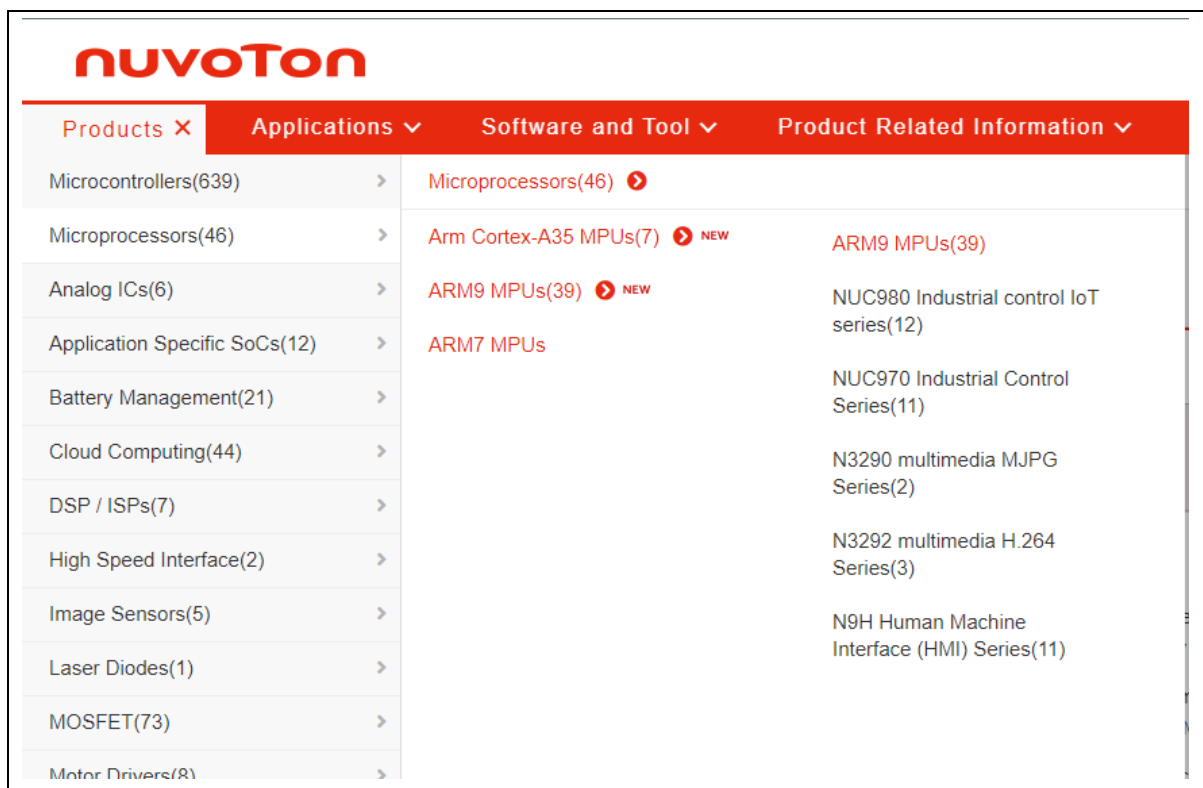


Figure 5-1 Nuvoton Website

5.2 Software

For more details about N9H31 series software, for example, BSP (Board Support Package), software NuWriter tool and example code, please visit GitHub's website: <https://github.com/OpenNuvoton/MPU-Family>

6 NUMAKER-HMI-N9H31-A1/A2 SCHEMATICS

6.1 NuMaker-HMI-N9H31 Schematic

6.1.1 Block Diagram Schematic

Figure 6-1 shows the Block Diagram of the NuMaker-HMI-N9H31 board.

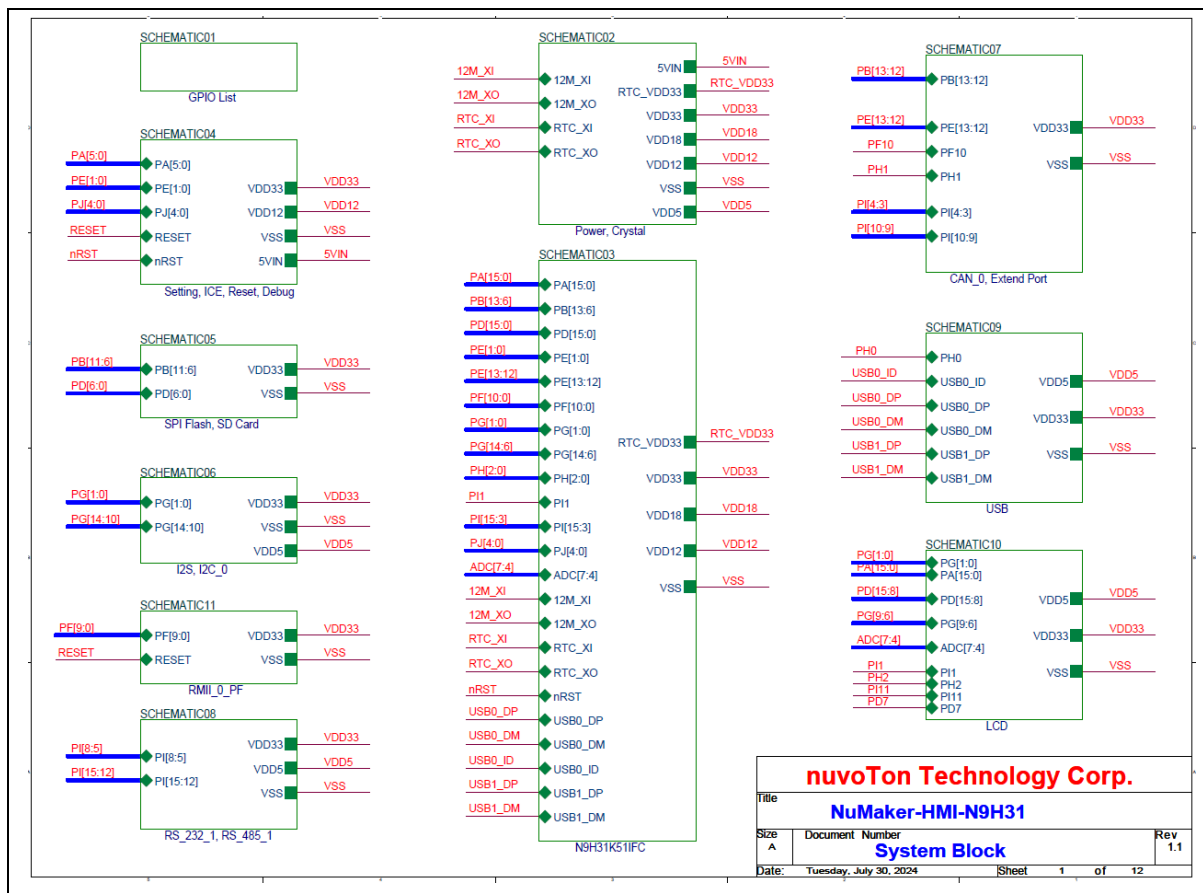


Figure 6-1 NuMaker-HMI-N9H31 Board Block Diagram

6.1.2 GPIO List

Figure 6-2 shows the GPIO List of the NuMaker-HMI-N9H31 board.

PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION
PA0	LCD_DATA0 PwrOnSet0	PB6	SPI0_SS0	PJ0	JTAG_TCK	PD0	SD0_CMD	PF0	RMII0_MDC	PI1	LCD_INT
PA1	LCD_DATA1 PwrOnSet1	PB7	SPI0_CLK	PJ1	JTAG_TMS	PD1	SD0_CLK	PF1	RMII0_MDIO	PI3	CAN0_RXD
PA2	LCD_DATA2 PwrOnSet2	PB8	SPI0_DO(DATA0)	PJ2	JTAG_TDI	PD2	SD0_DATA0	PF2	RMII0_TX0	PI4	CAN0_TXD
PA3	LCD_DATA3 PwrOnSet3	PB9	SPI0_DI(DATA1)	PJ3	JTAG_TDO	PD3	SD0_DATA1	PF3	RMII0_TX1	PI5	RS232_1_TXD RS485_1_TXD
PA4	LCD_DATA4 PwrOnSet4	PB10	SPI0_DATA2	PJ4	JTAG_NTRST	PD4	SD0_DATA2	PF4	RMII0_TXEN	PI6	RS232_1_RXD RS485_1_RXD
PA5	LCD_DATA5 PwrOnSet5	PB11	SPI0_DATA3			PD5	SD0_DATA3	PF5	RMII0_REFCLK	PI7	RS232_1_RTS RS485_1/RE
PA6	LCD_DATA6 PwrOnSet6	PB12	RS232_10_TXD	PIN	FUNCTION	PD6	SD0_CD	PF6	RMII0_RX0	PI8	RS232_1_CTS
PA7	LCD_DATA7 PwrOnSet7	PB13	RS232_10_RXD	PG0	I2C0_SCL	PD7	LCD_CS	PF7	RMII0_RX1	PI9	KEY1
PA8	LCD_DATA8 PwrOnSet8			PG1	I2C0_SDA	PD8	LCD_DATA16	PF8	RMII0_CRSDV	PI10	LED1
PA9	LCD_DATA9 PwrOnSet9	PIN	FUNCTION	PG6	LCD_CLK	PD9	LCD_DATA17	PF9	RMII0_RXERR	PI11	LCD_RST
PA10	LCD_DATA10	PH0	USB0_VBUSVLD	PG7	LCD_HSYNC	PD10	LCD_DATA18	PF10	LED2	PI12	RS232_8_TXD
PA11	LCD_DATA11	PH1	KEY2	PG8	LCD_VSYNC	PD11	LCD_DATA19			PI13	RS232_8_RXD
PA12	LCD_DATA12	PH2	LCD_PWM	PG9	LCD_DEN	PD12	LCD_DATA20	PIN	FUNCTION	PI14	RS232_8_RTS
PA13	LCD_DATA13	PH3	Buzzer	PG10	I2S_MCLK	PD13	LCD_DATA21	ADC4	TP_YM	PI15	RS232_8_CTS
PA14	LCD_DATA14			PG11	I2S_DO	PD14	LCD_DATA22	ADC5	TP_YP		
PA15	LCD_DATA15	PIN	FUNCTION	PG12	I2S_DI	PD15	LCD_DATA23	ADC6	TP_XM		
		PE0	RS232_0_TXD	PG13	I2S_BCLK			ADC7	TP_XP		
		PE1	RS232_0_RXD	PG14	I2S_LRCK						
		PE12	RS232_3_TXD								
		PE13	RS232_3_RXD								

nuvoTon Technology Corp.

Title
NuMaker-HMI-N9H31

Size A Document Number
GPIO List

Date: Friday, May 17, 2024 Sheet 2 of 12 Rev 1.1

Figure 6-2 GPIO List

6.1.3 Power

Figure 6-3 shows the power circuit of the NuMaker-HMI-N9H31 board.

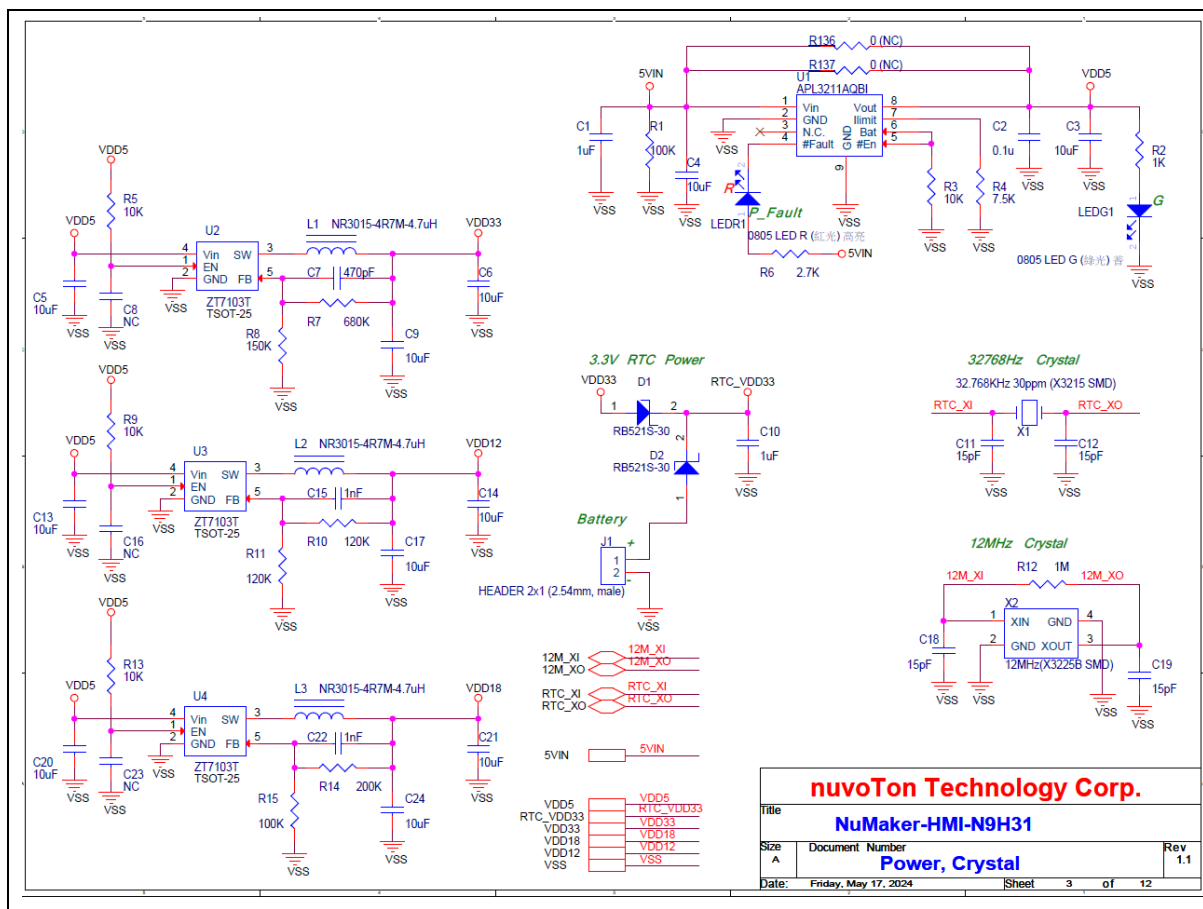


Figure 6-3 Power

6.1.4 N9H31K51IFC Circuit

Figure 6-4 shows the of the N9H31K51IFC circuit.

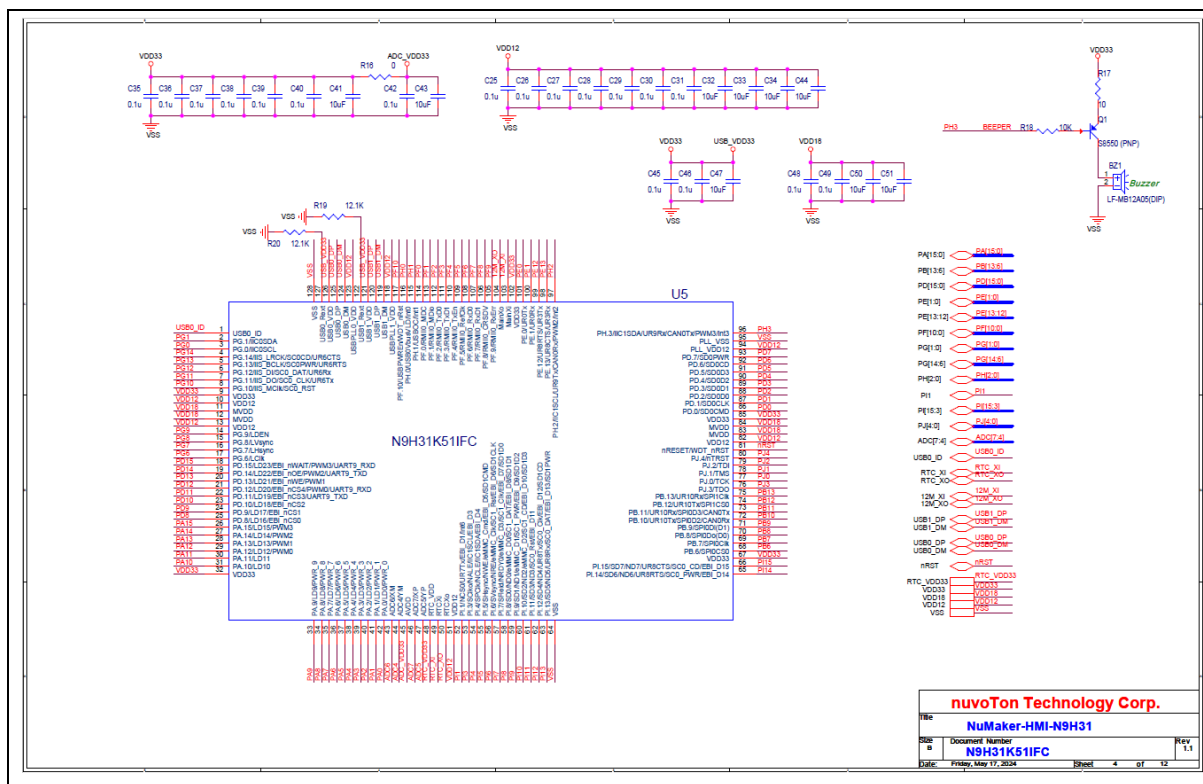


Figure 6-4 N9H31K51IFC Circuit

6.1.6 Memory

Figure 6-6 shows the SPI (only SPI Flash device mounted) and SD circuit of the NuMaker-HMI-N9H31 board.

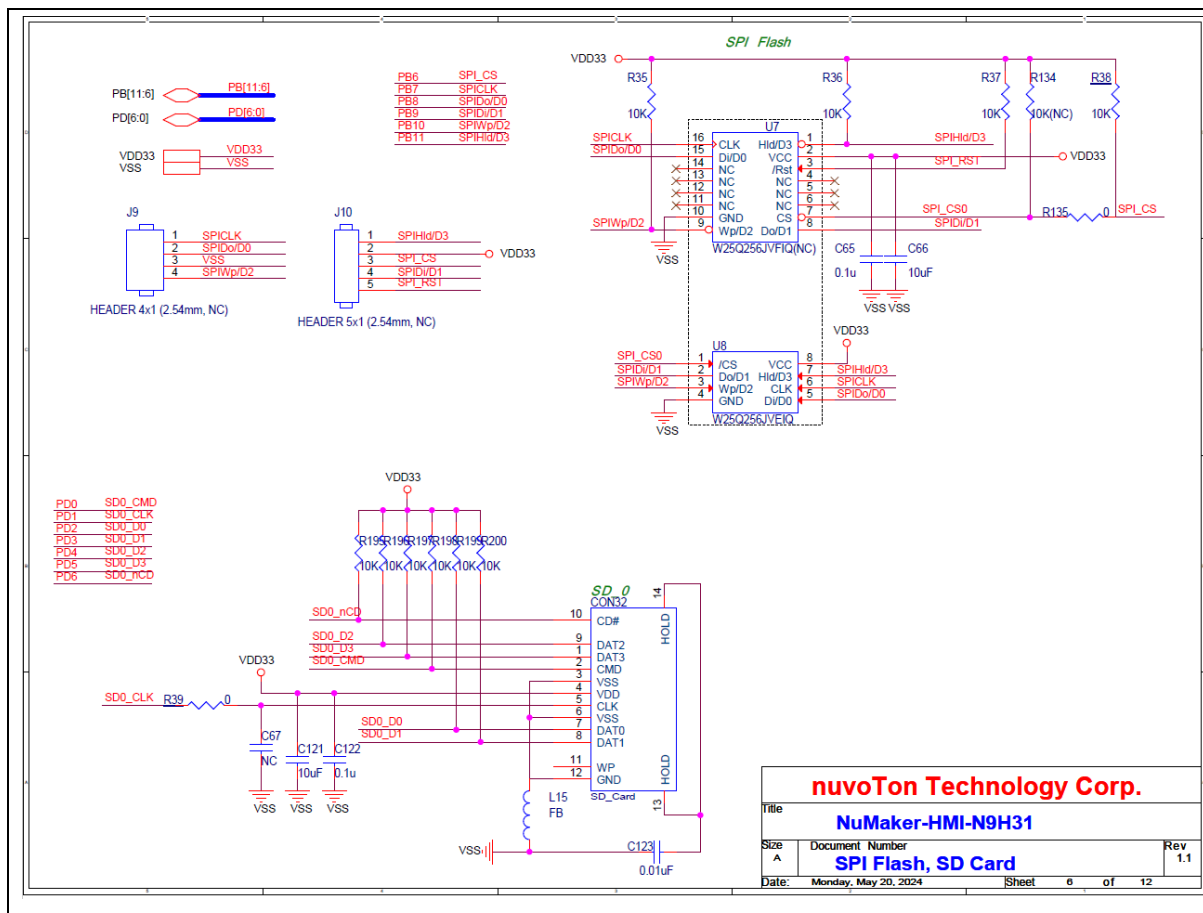


Figure 6-6 Memory

6.1.7 RMII_PF

Figure 6-7 shows the RMII_PF circuit of the NuMaker-HMI-N9H31 board.

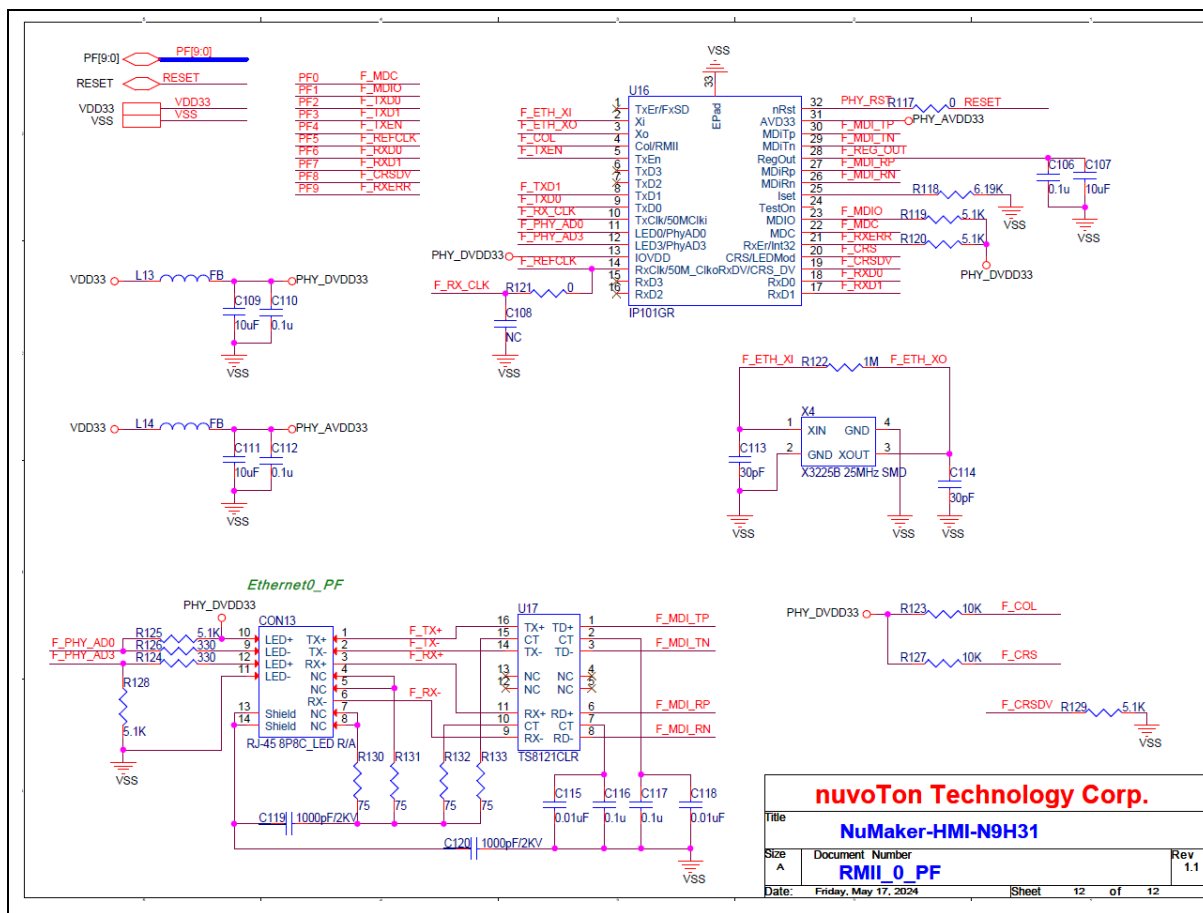


Figure 6-7 RMII_PF

6.1.9 CAN and Extend UART Port

Figure 6-9 shows the CAN and Extend UART Port of the NuMaker-HMI-N9H31 board.

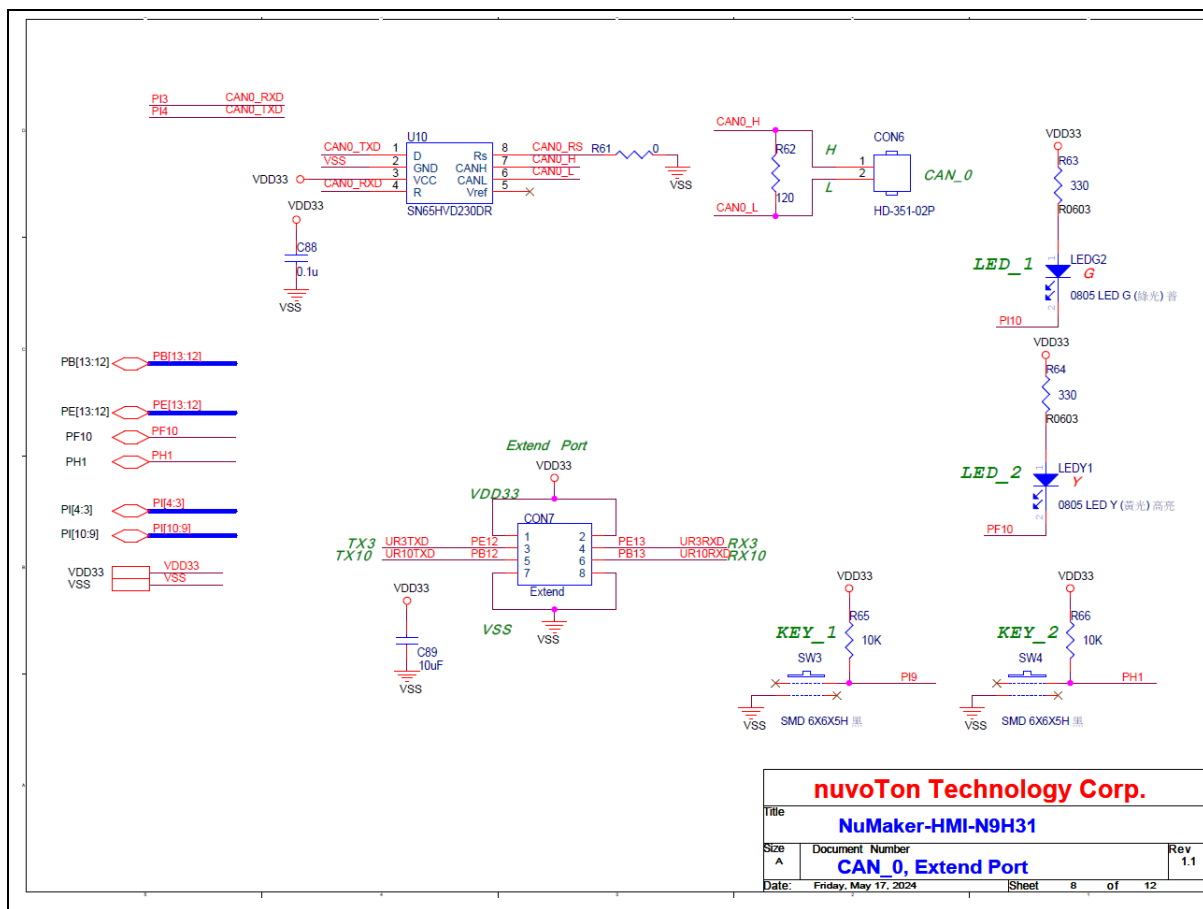


Figure 6-9 CAN and Extend UART Port Circuit

6.1.10 USB

Figure 6-10 shows the USB 0/1 circuit of the NuMaker-HMI-N9H31 board.

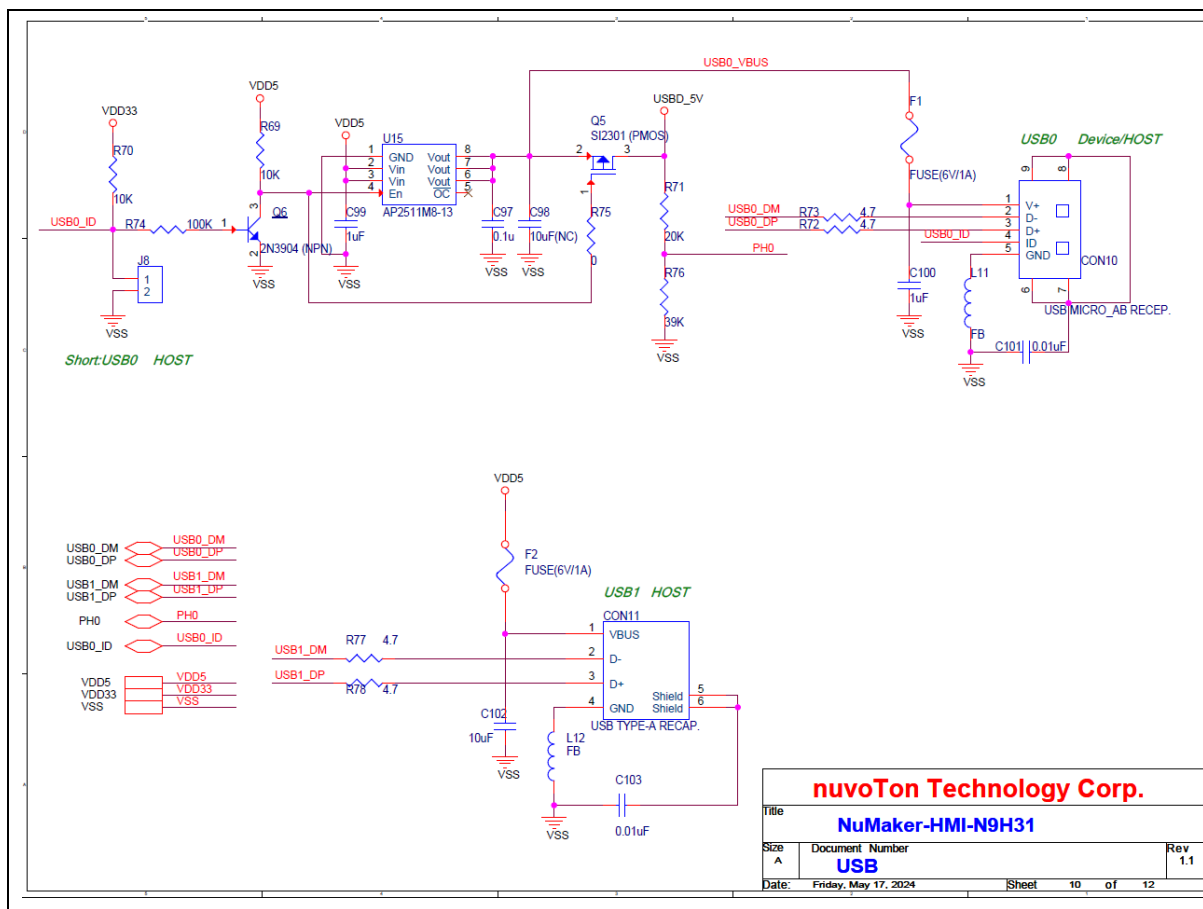


Figure 6-10 USB

6.1.11 RS-232 and RS-485 Circuit

Figure 6-11 shows the RS-232 and RS-485 circuit of the NuMaker-HMI-N9H31 board.

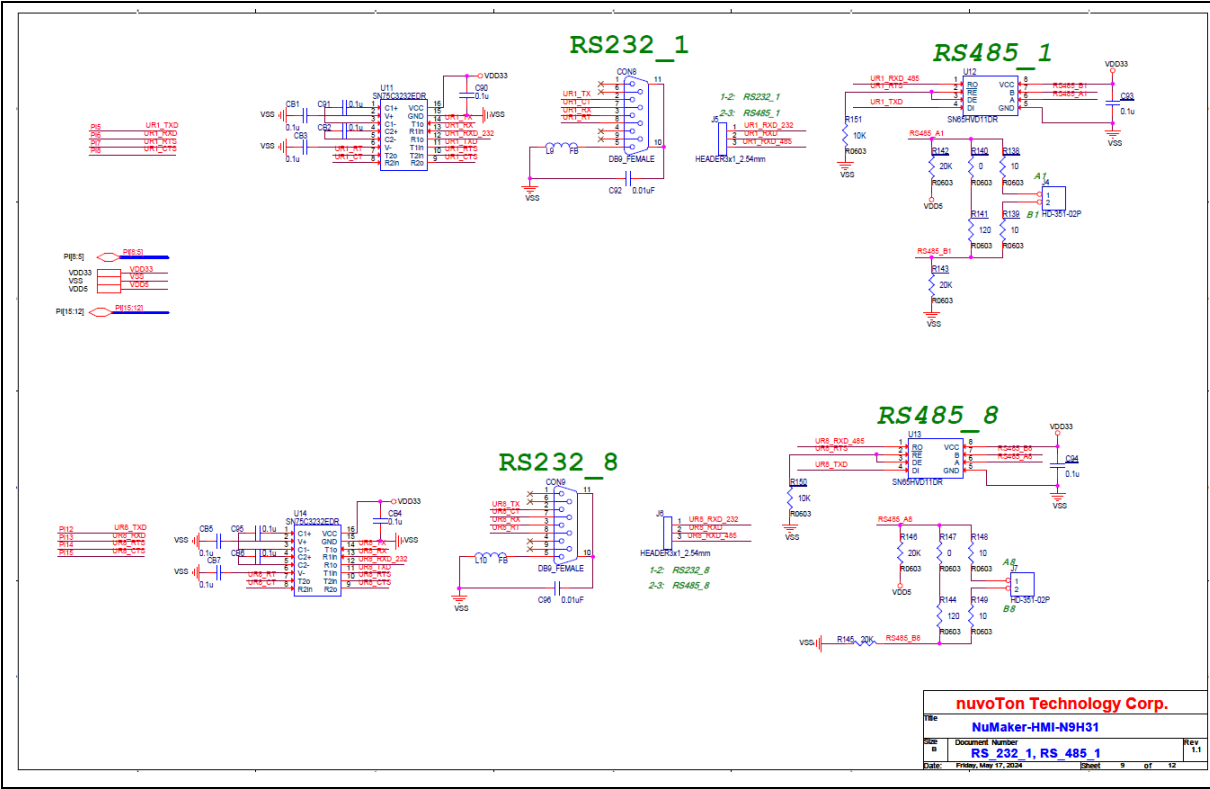


Figure 6-11 RS-232 and RS-485 Circuit

6.1.12 LCD Circuit

Figure 6-12 shows the LCD circuit of the NuMaker-HMI-N9H31 board.

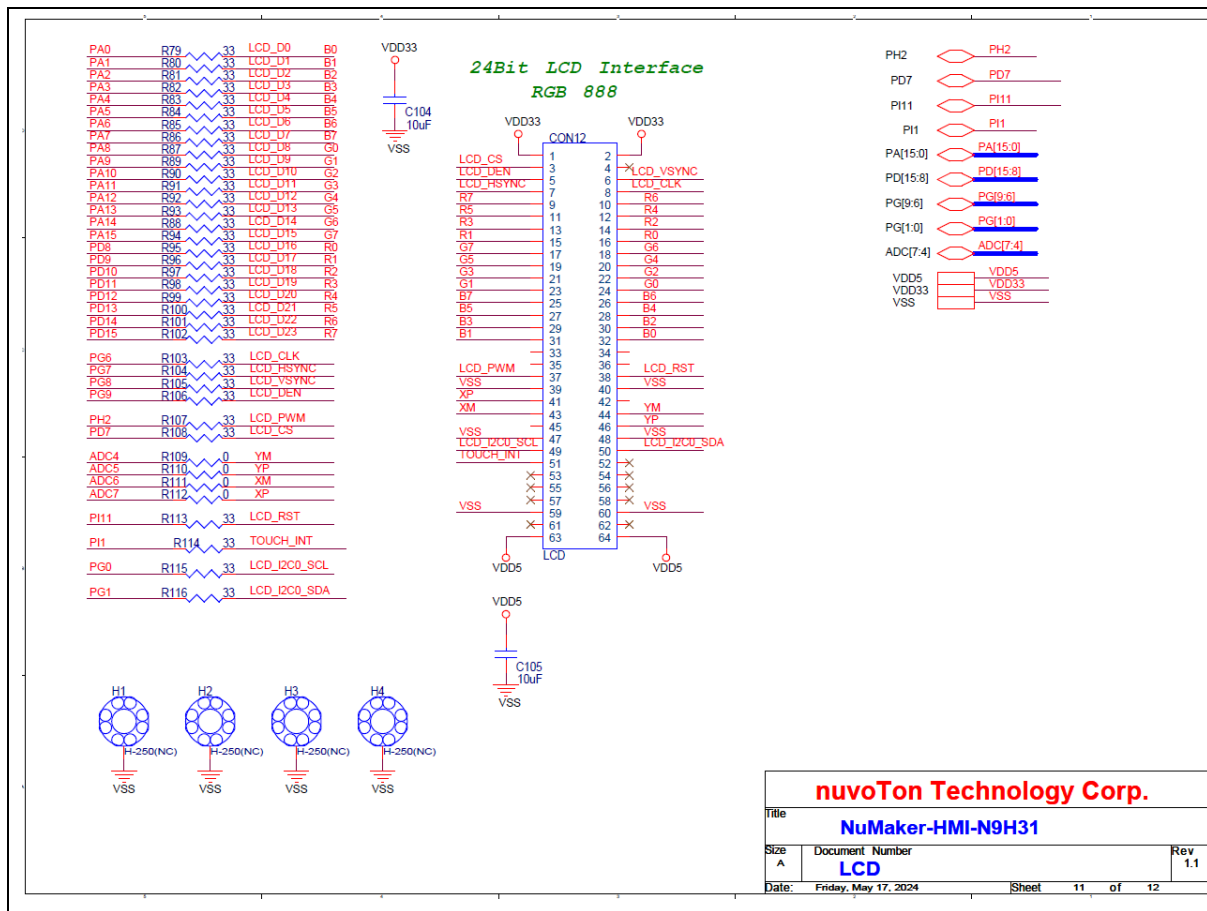


Figure 6-12 LCD Circuit

6.1.13 PCB Placement

Figure 6-13 and Figure 6-14 show the front and rear placement of NuMaker-HMI-N9H31 board.

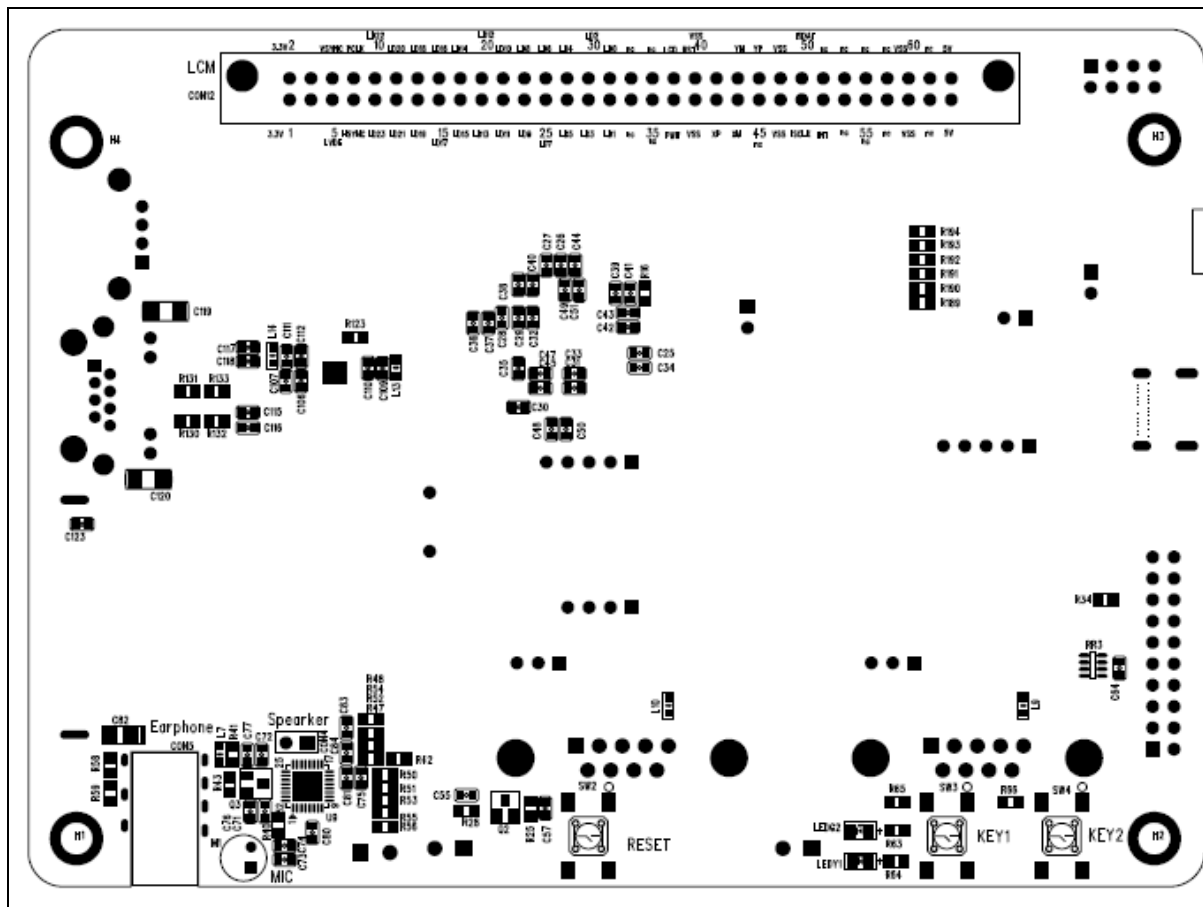


Figure 6-13 Front Placement of NuMaker-HMI-N9H31 Board

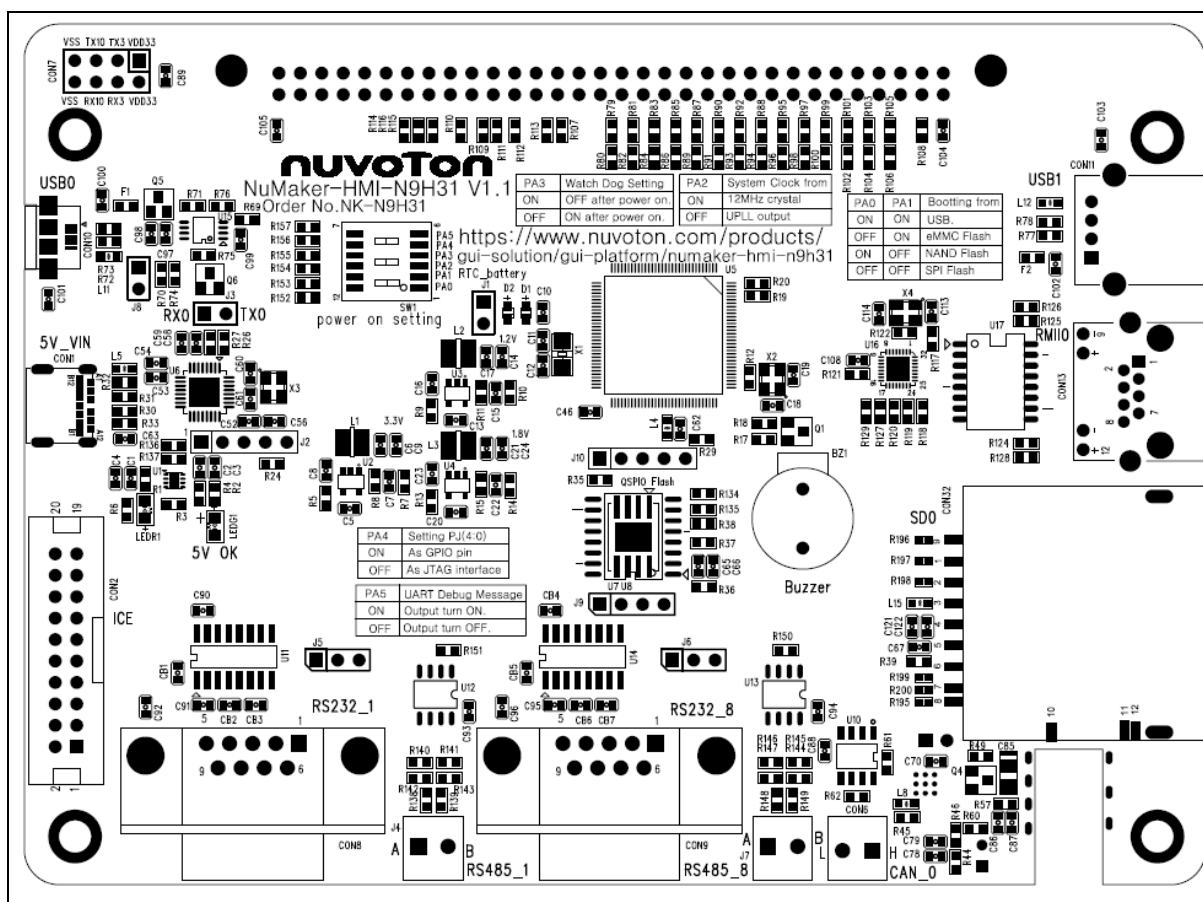


Figure 6-14 Rear Placement of NuMaker-HMI-N9H31 Board

6.2 NuMaker TFT-LCD5 Board Schematic

Figure 6-15 shows circuit of the NuMaker TFT-LCD5 board.

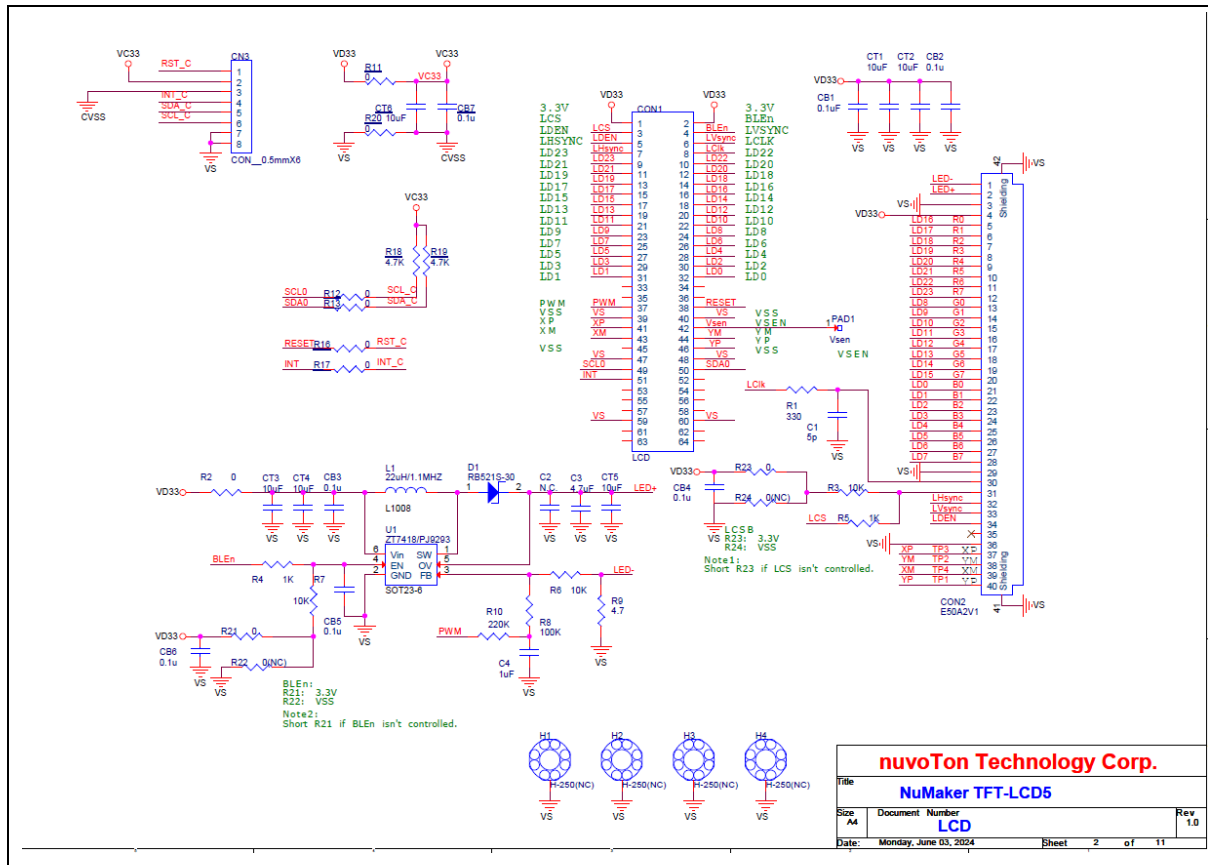


Figure 6-15 NuMaker TFT-LCD5 Board

6.2.1 PCB Placement

Figure 6-16 and Figure 6-17 show the front and rear placement of NuMaker TFT-LCD5 board.

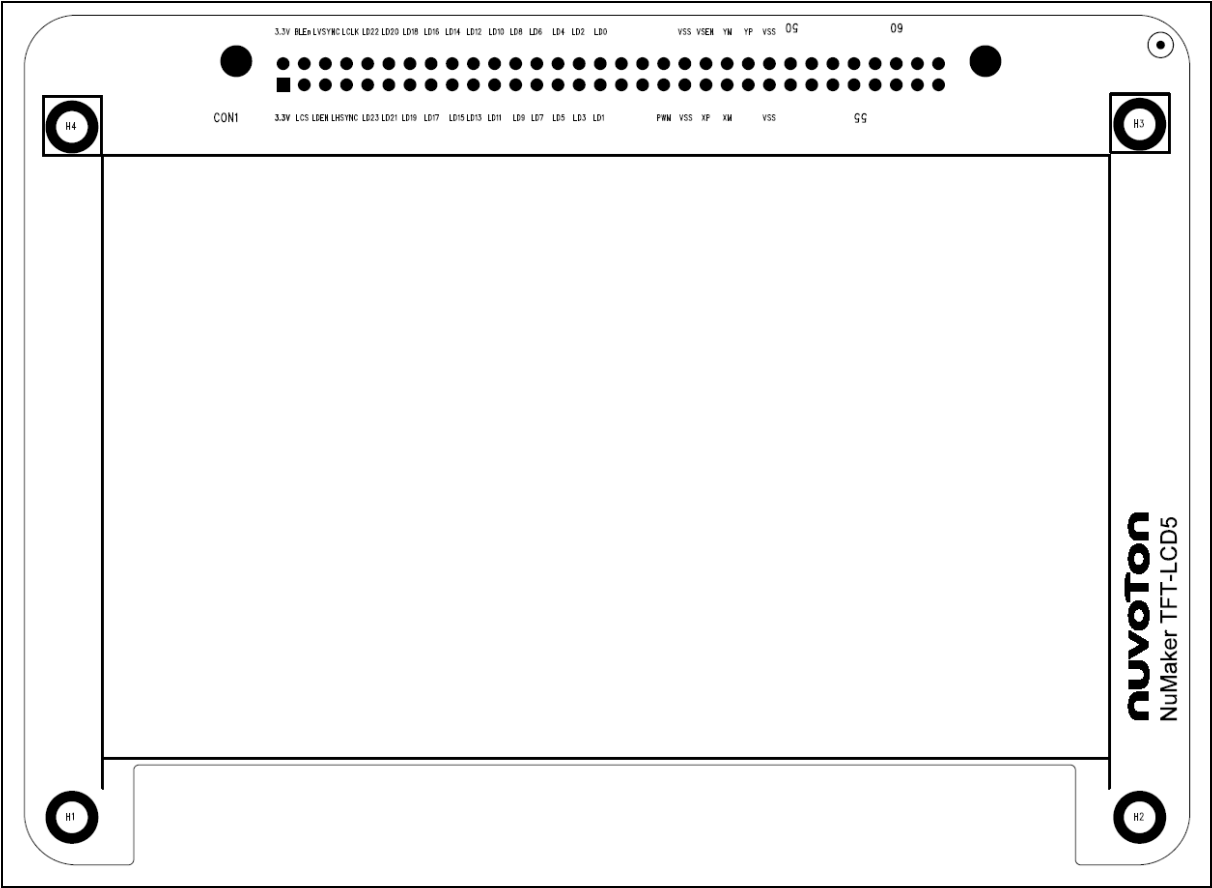


Figure 6-16 Front Placement of NuMaker TFT-LCD5 Board

Figure 6-17 Rear Placement of NuMaker TFT-LCD5 Board

7 REVISION HISTORY

Date	Revision	Description
2024.05.14	1.00	Initial version

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