

NuMicro[®] Family
Arm[®] ARM926EJ-S Based**NuMaker-HMI-N9H30**
User Manual
Evaluation Board for NuMicro[®] N9H30 Series

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1 OVERVIEW

The NuMaker-HMI-N9H30 is an evaluation board for GUI application development. The NuMaker-HMI-N9H30 consists of two parts: a NuMaker-N9H30 main board and a NuDesign-TFT-LCD7 extension board. The NuMaker-HMI-N9H30 is designed for project evaluation, prototype development and validation with HMI (Human Machine Interface) function.

The NuMaker-HMI-N9H30 integrates touchscreen display, voice input/output, rich serial port service and I/O interface, providing multiple external storage methods.

The NuDesign-TFT-LCD7 can be plugged into the main board via the DIN_32x2 extension connector. The NuDesign-TFT-LCD7 includes one 7" LCD which the resolution is 800x480 with RGB-24bits and embedded the 4-wires resistive type touch panel.

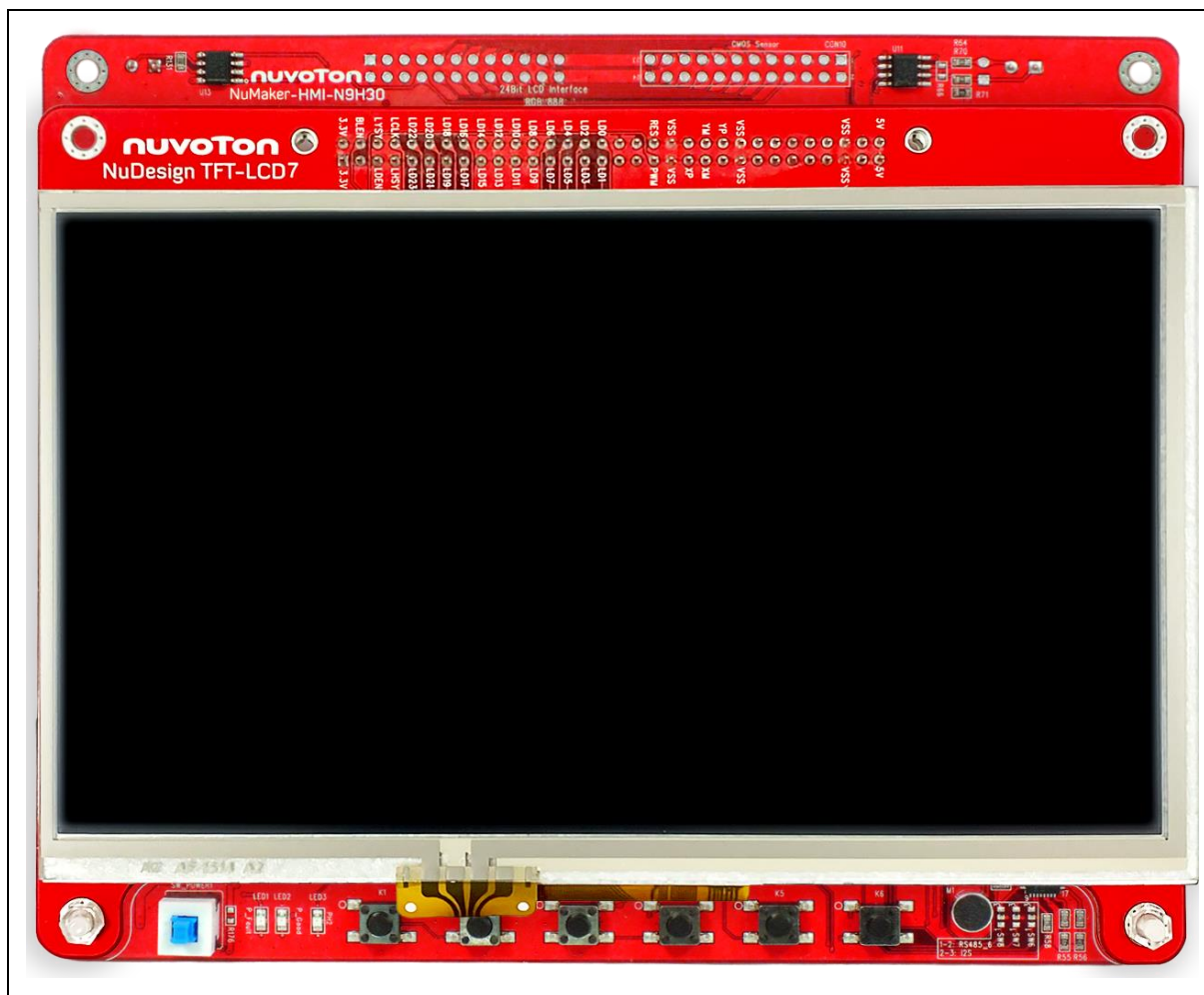


Figure 1-1 Front View of NuMaker-HMI-N9H30 Evaluation Board

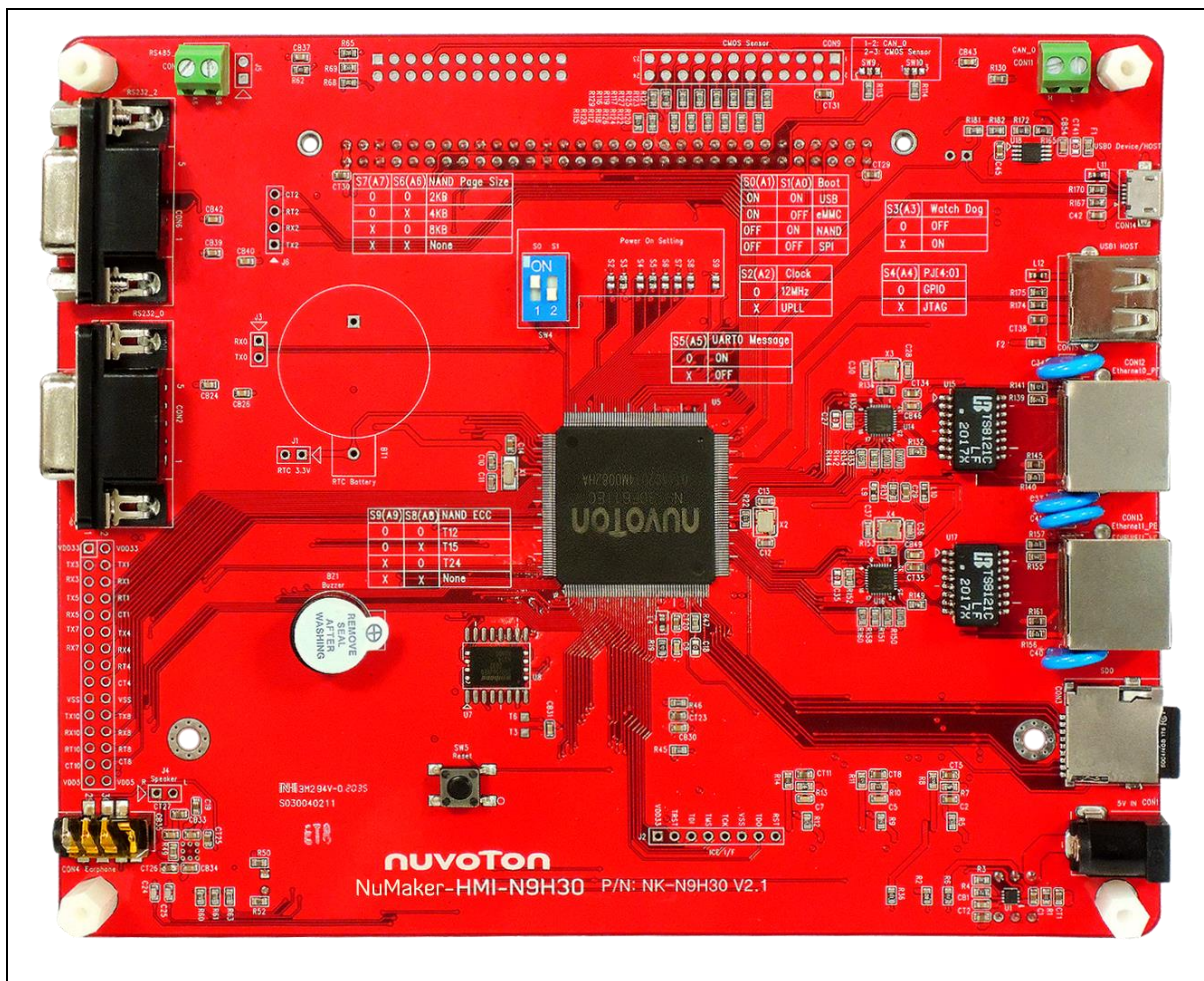


Figure 1-2 Rear View of NuMaker-HMI-N9H30 Evaluation Board

1.1 Features

1.1.1 NuMaker-N9H30 Main Board Features

- N9H30F61IEC chip: LQFP216 pin MCP package with DDR (64 MB)
- SPI Flash using W25Q256JVEQ (32 MB) booting with quad mode or storage memory
- NAND Flash using W29N01HVSINA (128 MB) booting or storage memory
- One Micro-SD/TF card slot served either as a SD memory card for data storage or SDIO (Wi-Fi) device
- Two sets of COM ports:
 - One DB9 RS-232 port with UART_0 used 75C3232E transceiver chip can be served for function debug and system development.
 - One DB9 RS-232 port with UART_2 used 75C3232E transceiver chip for user application
- 22 GPIO expansion ports, including seven sets of UART functions
- JTAG interface provided for software development
- Microphone input and Earphone/Speaker output with 24-bit stereo audio codec (NAU88C22) for I²S interfaces
- Six sets of user-configurable push button keys
- Three sets of LEDs for status indication
- Provides SN65HVD230 transceiver chip for CAN bus communication
- Provides MAX3485 transceiver chip for RS-485 device connection
- One buzzer device for program application
- Two sets of RJ45 ports with Ethernet 10/100 Mbps MAC used IP101GR PHY chip
- 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 used APL3211A chip
- Retain RTC battery socket for CR2032 type and ADC0 detect battery voltage
- System power could be supplied by DC-5V adaptor or USB VBUS

1.1.2 NuDesign-TFT-LCD7 Extension Board Features

- 7" resolution 800x480 4-wire resistive touch panel for 24-bits RGB888 interface
- DIN_32x2 extension connector

1.2 Supporting Resources

For sample codes and introduction about NuMaker-N9H30, please refer to N9H30 BSP:

<https://www.nuvoton.com/products/gui-solution/gui-platform/numaker-hmi-n9h30/?group=Software&tab=2>

Visit NuForum for further discussion about the NuMaker-HMI-N9H30:

<http://forum.nuvoton.com/viewforum.php?f=31>

2 NUMAKER-HMI-N9H30 HARDWARE CONFIGURATION

2.1 NuMaker-N9H30 Board – Front View

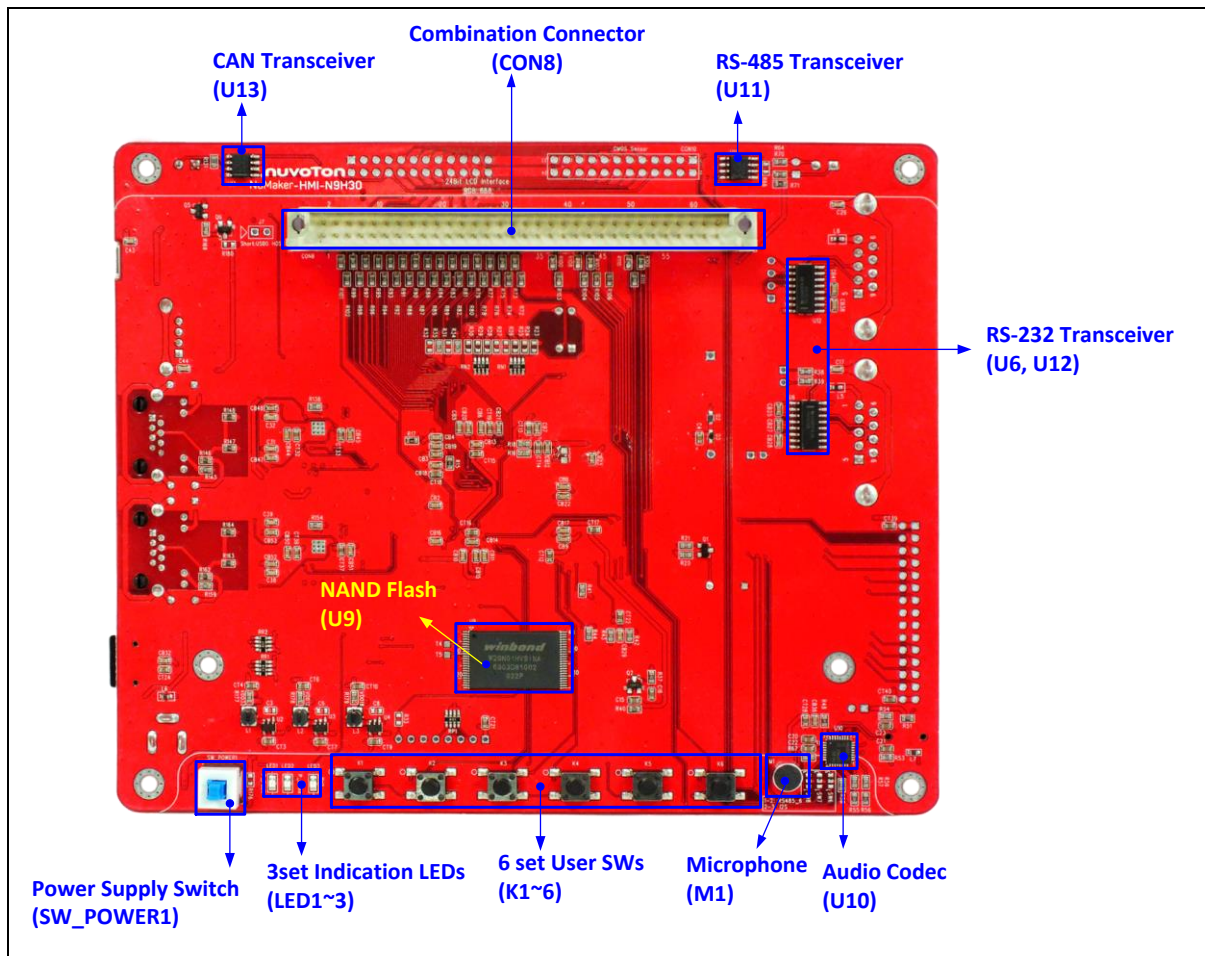


Figure 2-1 Front View of NuMaker-N9H30 Board

Figure 2-1 shows the main components and connectors from the front side of NuMaker-N9H30 board. The following lists components and connectors from the front view:

- NuMaker-N9H30 board and NuDesign-TFT-LCD7 board combination connector (CON8).
This panel connector supports 4-/5-wire resistive touch or capacitance touch panel for 24-bits RGB888 interface.

Connector	GPIO pin of N9H30	Function
CON8.1	-	Power 3.3V
CON8.2	-	Power 3.3V
CON8.3	GPD7	LCD_CS
CON8.4	GPH3	LCD_BLEN
CON8.5	GPG9	LCD_DEN
CON8.6	GPG8	LCD_VSYNC

CON8.7	GPG7	LCD_HSYNC
CON8.8	GPG6	LCD_CLK
CON8.9	GPD15	LCD_D23(R7)
CON8.10	GPD14	LCD_D22(R6)
CON8.11	GPD13	LCD_D21(R5)
CON8.12	GPD12	LCD_D20(R4)
CON8.13	GPD11	LCD_D19(R3)
CON8.14	GPD10	LCD_D18(R2)
CON8.15	GPD9	LCD_D17(R1)
CON8.16	GPD8	LCD_D16(R0)
CON8.17	GPA15	LCD_D15(G7)
CON8.18	GPA14	LCD_D14(G6)
CON8.19	GPA13	LCD_D13(G5)
CON8.20	GPA12	LCD_D12(G4)
CON8.21	GPA11	LCD_D11(G3)
CON8.22	GPA10	LCD_D10(G2)
CON8.23	GPA9	LCD_D9(G1)
CON8.24	GPA8	LCD_D8(G0)
CON8.25	GPA7	LCD_D7(B7)
CON8.26	GPA6	LCD_D6(B6)
CON8.27	GPA5	LCD_D5(B5)
CON8.28	GPA4	LCD_D4(B4)
CON8.29	GPA3	LCD_D3(B3)
CON8.30	GPA2	LCD_D2(B2)
CON8.31	GPA1	LCD_D1(B1)
CON8.32	GPA0	LCD_D0(B0)
CON8.33	-	-
CON8.34	-	-
CON8.35	-	-
CON8.36	-	-
CON8.37	GPB2	LCD_PWM
CON8.38	GPG4	LCD_RST

CON8.39	-	VSS
CON8.40	-	VSS
CON8.41	ADC7	XP
CON8.42	ADC3	Vsen
CON8.43	ADC6	XM
CON8.44	ADC4	YM
CON8.45	-	-
CON8.46	ADC5	YP
CON8.47	-	VSS
CON8.48	-	VSS
CON8.49	GPG0	I2C0_C
CON8.50	GPG1	I2C0_D
CON8.51	GPG5	TOUCH_INT
CON8.52	-	-
CON8.53	-	-
CON8.54	-	-
CON8.55	-	-
CON8.56	-	-
CON8.57	-	-
CON8.58	-	-
CON8.59	-	VSS
CON8.60	-	VSS
CON8.61	-	-
CON8.62	-	-
CON8.63	-	Power 5V
CON8.64	-	Power 5V

Table 2-1 LCD Panel Combination Connector (CON8) Pin Function

- Power supply switch (SW_POWER1): System will be powered on if the SW_POWER1 button is pressed
- Three sets of indication LEDs:

LED	Color	Descriptions
LED1	Red	The system power will be terminated and LED1 lighting

		when the input voltage exceeds 5.7V or the current exceeds 2A.
LED2	Green	Power normal state.
LED3	Green	Controlled by GPH2 pin

Table 2-2 Three Sets of Indication LED Functions

- Six sets of user SW, Key Matrix for user definition

Key	GPIO pin of N9H30	Function
K1	GPF10	Row0
	GPB4	Col0
K2	GPF10	Row0
	GPB5	Col1
K3	GPE15	Row1
	GPB4	Col0
K4	GPE15	Row1
	GPB5	Col1
K5	GPE14	Row2
	GPB4	Col0
K6	GPE14	Row2
	GPB5	Col1

Table 2-3 Six Sets of User SW, Key Matrix Functions

- NAND Flash (128 MB) with Winbond W29N01HVS1NA (U9)
- Microphone (M1): Through Nuvoton NAU88C22 chip sound input
- Audio CODEC chip (U10): Nuvoton NAU88C22 chip connected to N9H30 using I²S interface
 - SW6/SW7/SW8: 1-2 short for RS-485_6 function and connected to 2P terminal (CON5 and J5)
 - SW6/SW7/SW8: 2-3 short for I²S function and connected to NAU88C22 (U10).
- CMOS Sensor connector (CON10, SW9~10)
 - SW9~10: 1-2 short for CAN_0 function and connected to 2P terminal (CON11)
 - SW9~10: 2-3 short for CMOS sensor function and connected to CMOS sensor connector (CON10)

Connector	GPIO pin of N9H30	Function
CON10.1	-	VSS
CON10.2	-	VSS

CON10.3	-	Power 3.3V
CON10.4	-	Power 3.3V
CON10.5	-	-
CON10.6	-	-
CON10.7	GPI4	S_PCLK
CON10.8	GPI3	S_CLK
CON10.9	GPI8	S_D0
CON10.10	GPI9	S_D1
CON10.11	GPI10	S_D2
CON10.12	GPI11	S_D3
CON10.13	GPI12	S_D4
CON10.14	GPI13	S_D5
CON10.15	GPI14	S_D6
CON10.16	GPI15	S_D7
CON10.17	GPI6	S_VSYNC
CON10.18	GPI5	S_HSYNC
CON10.19	GPI0	S_PWDN
CON10.20	GPI7	S_nRST
CON10.21	GPG2	I2C1_C
CON10.22	GPG3	I2C1_D
CON10.23	-	VSS
CON10.24	-	VSS

Table 2-4 CMOS Sensor Connector (CON10) Function

2.2 NuMaker-N9H30 Board – Rear View

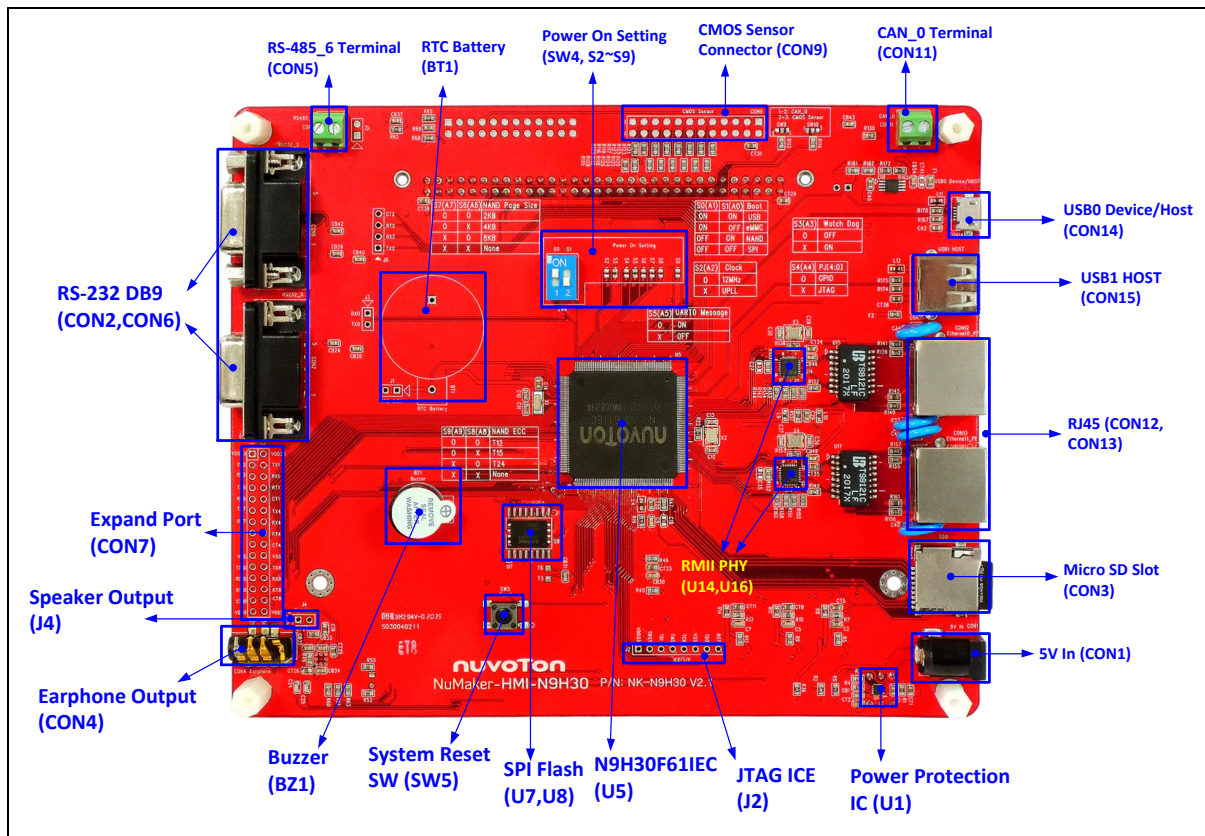


Figure 2-2 Rear View of NuMaker-N9H30 Board

Figure 2-2 shows the main components and connectors from the rear side of NuMaker-N9H30 board. The following lists components and connectors from the rear view:

- +5V In (CON1): Power adaptor 5V input
- JTAG ICE interface (J2)

Connector	GPIO pin of N9H30	Function
J2.1	-	Power 3.3V
J2.2	GPJ4	nTRST
J2.3	GPJ2	TDI
J2.4	GPJ1	TMS
J2.5	GPJ0	TCK
J2.6	-	VSS
J2.7	GPJ3	TD0
J2.8	-	RESET

Table 2-5 JTAG ICE Interface (J2) Function

- SPI Flash (32 MB) with Winbond W25Q256JVEQ (U7); only one (U7 or U8) SPI Flash

can be used

- System Reset (SW5): System will be reset if the SW5 button is pressed
- Buzzer (BZ1): Control by GPB3 pin of N9H30
- Speaker output (J4): Through the NAU88C22 chip sound output
- Earphone output (CON4): Through the NAU88C22 chip sound output
- Expand port for user use (CON7):

Connector	GPIO pin of N9H30	Function
CON7.1	-	Power 3.3V
CON7.2	-	Power 3.3V
CON7.3	GPE12	UART3_TXD
CON7.4	GPH4	UART1_TXD
CON7.5	GPE13	UART3_RXD
CON7.6	GPH5	UART1_RXD
CON7.7	GPB0	UART5_TXD
CON7.8	GPH6	UART1_RTS
CON7.9	GPB1	UART5_RXD
CON7.10	GPH7	UART1_CTS
CON7.11	GPI1	UART7_TXD
CON7.12	GPH8	UART4_TXD
CON7.13	GPI2	UART7_RXD
CON7.14	GPH9	UART4_RXD
CON7.15	-	-
CON7.16	GPH10	UART4_RTS
CON7.17	-	-
CON7.18	GPH11	UART4_CTS
CON7.19	-	VSS
CON7.20	-	VSS
CON7.21	GPB12	UART10_TXD
CON7.22	GPH12	UART8_TXD
CON7.23	GPB13	UART10_RXD
CON7.24	GPH13	UART8_RXD
CON7.25	GPB14	UART10_RTS

CON7.26	GPH14	UART8_RTS
CON7.27	GPB15	UART10_CTS
CON7.28	GPH15	UART8_CTS
CON7.29	-	Power 5V
CON7.30	-	Power 5V

Table 2-6 Expand Port (CON7) Function

- UART0 selection (CON2, J3):
 - RS-232_0 function and connected to DB9 female (CON2) for debug message output.
 - GPE0/GPE1 connected to 2P terminal (J3).

Connector	GPIO pin of N9H30	Function
J3.1	GPE1	UART0_RXD
J3.2	GPE0	UART0_TXD

Table 2-7 UART0 (J3) Function

- UART2 selection (CON6, J6):
 - RS-232_2 function and connected to DB9 female (CON6) for debug message output
 - GPF11~14 connected to 4P terminal (J6)

Connector	GPIO pin of N9H30	Function
J6.1	GPF11	UART2_TXD
J6.2	GPF12	UART2_RXD
J6.3	GPF13	UART2_RTS
J6.4	GPF14	UART2_CTS

Table 2-8 UART2 (J6) Function

- RS-485_6 selection (CON5, J5, SW6~8):
 - SW6~8: 1-2 short for RS-485_6 function and connected to 2P terminal (CON5 and J5)
 - SW6~8: 2-3 short for I²S function and connected to NAU88C22 (U10)

Connector	GPIO pin of N9H30	Function
SW6:1-2 short	GPG11	RS-485_6_DI
SW6:2-3 short		I2S_DO
SW7:1-2 short	GPG12	RS-485_6_RO
SW7:2-3 short		I2S_DI
SW8:1-2 short	GPG13	RS-485_6_ENB
SW8:2-3 short		I2S_BCLK

Table 2-9 RS-485_6 (SW6~8) Function

- Power on setting (SW4, S2~9).

SW	State	Function
SW4.2/SW4.1	ON/ON	Boot from USB
SW4.2/SW4.1	ON/OFF	Boot from eMMC
SW4.2/SW4.1	OFF/ON	Boot from NAND Flash
SW4.2/SW4.1	OFF/OFF	Boot from SPI Flash

Table 2-10 Power on Setting (SW4) Function

SW	State	Function
S2	Short	System clock from 12MHz crystal
S2	Open	System clock from UPLL output

Table 2-11 Power on Setting (S2) Function

SW	State	Function
S3	Short	Watchdog Timer OFF
S3	Open	Watchdog Timer ON

Table 2-12 Power on Setting (S3) Function

SW	State	Function
S4	Short	GPJ[4:0] used as GPIO pin
S4	Open	GPJ[4:0] used as JTAG ICE interface

Table 2-13 Power on Setting (S4) Function

SW	State	Function
S5	Short	UART0 debug message ON
S5	Open	UART0 debug message OFF

Table 2-14 Power on Setting (S5) Function

SW	State	Function
S7/S6	Short/Short	NAND Flash page size 2KB
S7/S6	Short/Open	NAND Flash page size 4KB
S7/S6	Open/Short	NAND Flash page size 8KB

S7/S6	Open/Open	Ignore
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Table 2-15 Power on Setting (S7/S6) Function

SW	State	Function
S9/S8	Short/Short	NAND Flash ECC type BCH T12
S9/S8	Short/Open	NAND Flash ECC type BCH T15
S9/S8	Open/Short	NAND Flash ECC type BCH T24
S9/S8	Open/Open	Ignore

Table 2-16 Power on Setting (S9/S8) Function

- CMOS Sensor connector (CON9, SW9~10)
 - SW9~10: 1-2 short for CAN_0 function and connected to 2P terminal (CON11).
 - SW9~10: 2-3 short for CMOS sensor function and connected to CMOS sensor connector (CON9).

Connector	GPIO pin of N9H30	Function
CON9.1	-	VSS
CON9.2	-	VSS
CON9.3	-	Power 3.3V
CON9.4	-	Power 3.3V
CON9.5	-	-
CON9.6	-	-
CON9.7	GPI4	S_PCLK
CON9.8	GPI3	S_CLK
CON9.9	GPI8	S_D0
CON9.10	GPI9	S_D1
CON9.11	GPI10	S_D2
CON9.12	GPI11	S_D3
CON9.13	GPI12	S_D4
CON9.14	GPI13	S_D5
CON9.15	GPI14	S_D6
CON9.16	GPI15	S_D7
CON9.17	GPI6	S_VSYNC
CON9.18	GPI5	S_HSYNC
CON9.19	GPI0	S_PWDN

CON9.20	GPI7	S_nRST
CON9.21	GPG2	I2C1_C
CON9.22	GPG3	I2C1_D
CON9.23	-	VSS
CON9.24	-	VSS

Table 2-17 CMOS Sensor Connector (CON9) Function

- CAN_0 Selection (CON11, SW9~10):
 - SW9~10: 1-2 short for CAN_0 function and connected to 2P terminal (CON11)
 - SW9~10: 2-3 short for CMOS sensor function and connected to CMOS sensor connector (CON9, CON10)

SW	GPIO pin of N9H30	Function
SW9:1-2 short	GPI3	CAN_0_RXD
SW9:2-3 short		S_CLK
SW10:1-2 short	GPI4	CAN_0_TXD
SW10:2-3 short		S_PCLK

Table 2-18 CAN_0 (SW9~10) Function

- USB0 Device/HOST Micro-AB connector (CON14), where CON14 pin4 ID=1 is Device, ID=0 is HOST
- USB1 for USB HOST with Type-A connector (CON15)
- RJ45_0 connector with LED indicator (CON12), RMII PHY with IP101GR (U14)
- RJ45_1 connector with LED indicator (CON13), RMII PHY with IP101GR (U16)
- Micro-SD/TF card slot (CON3)
- SOC CPU: Nuvoton N9H30F61IEC (U5)
- Battery power for RTC 3.3V powered (BT1, J1), can detect voltage by ADC0
- RTC power has 3 sources:
 - Share with 3.3V I/O power
 - Battery socket for CR2032 (BT1)
 - External connector (J1)
- Board version 2.1

2.3 NuDesign-TFT-LCD7 – Front View



Figure 2-3 Front View of NuDesign-TFT-LCD7 Board

Figure 2-3 shows the main components and connectors from the Front side of NuDesign-TFT-LCD7 board.

- 7" resolution 800x480 4-W resistive touch panel for 24-bits RGB888 interface

2.4 NuDesign-TFT-LCD7 – Rear View

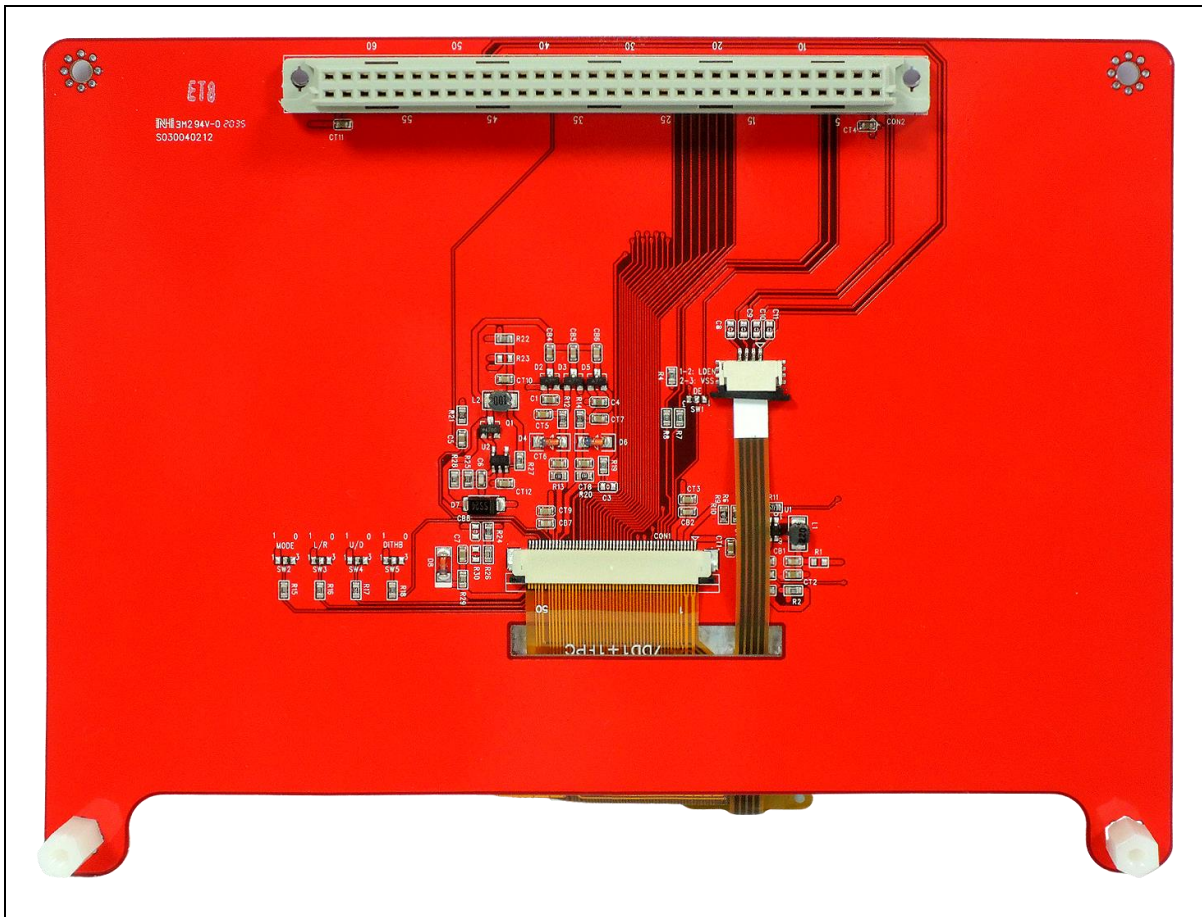


Figure 2-4 Rear View of NuDesign-TFT-LCD7 Board

Figure 2-4 shows the main components and connectors from the rear side of NuDesign-TFT-LCD7 board.

- NuMaker-N9H30 and NuDesign-TFT-LCD7 combination connector (CON1).

2.5 NuMaker-N9H30 and NuDesign-TFT-LCD7 PCB Placement

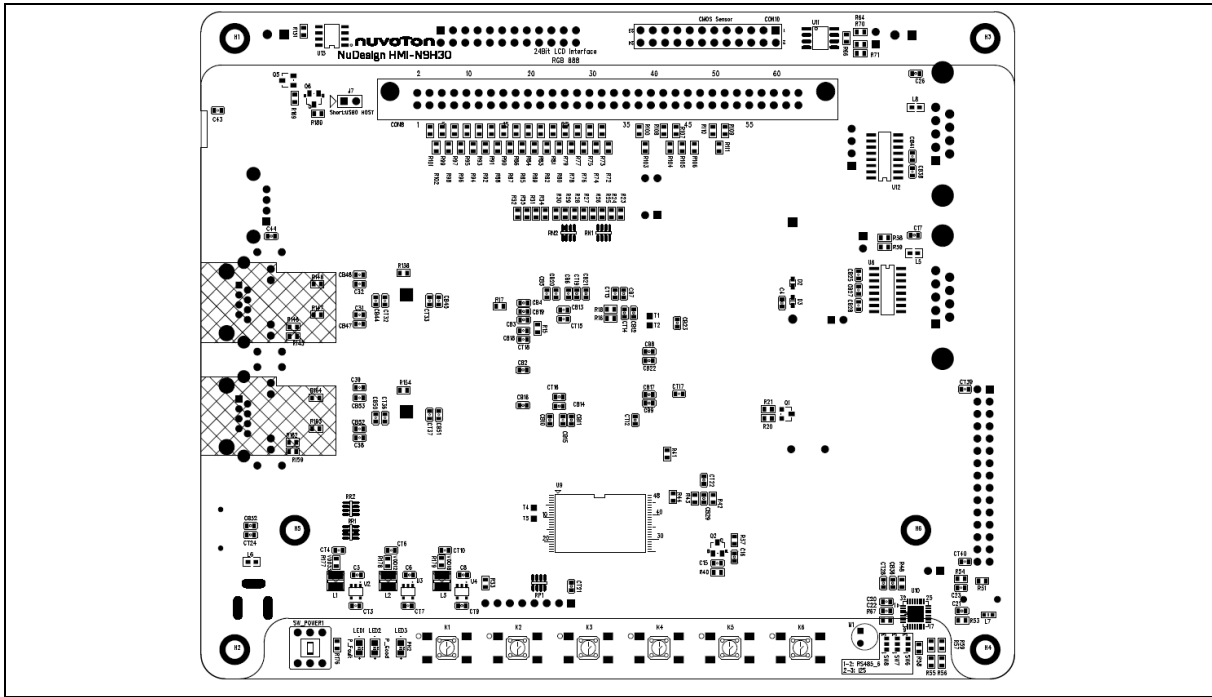


Figure 2-5 Front View of NuMaker-N9H30 PCB Placement

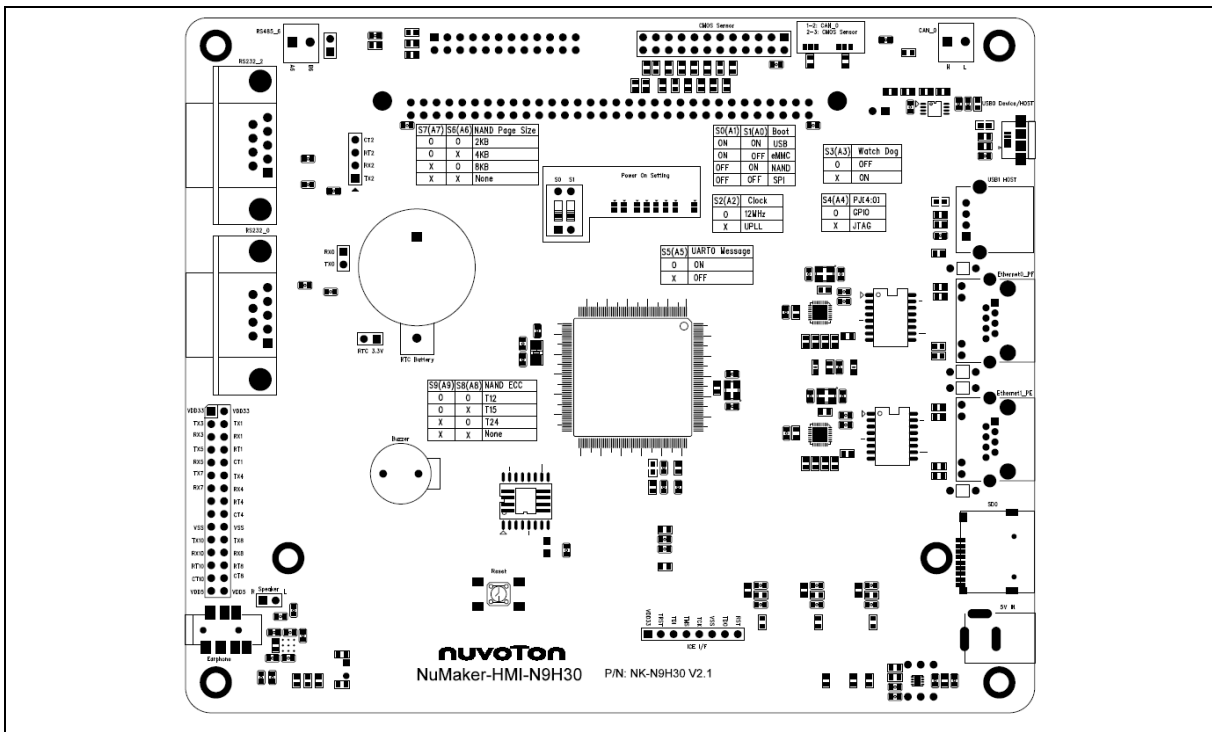


Figure 2-6 Rear View of NuMaker-N9H30 PCB Placement

3.2 NuMaker-N9H30 – System Block Circuit

Figure 3-2 shows the System Block Circuit.

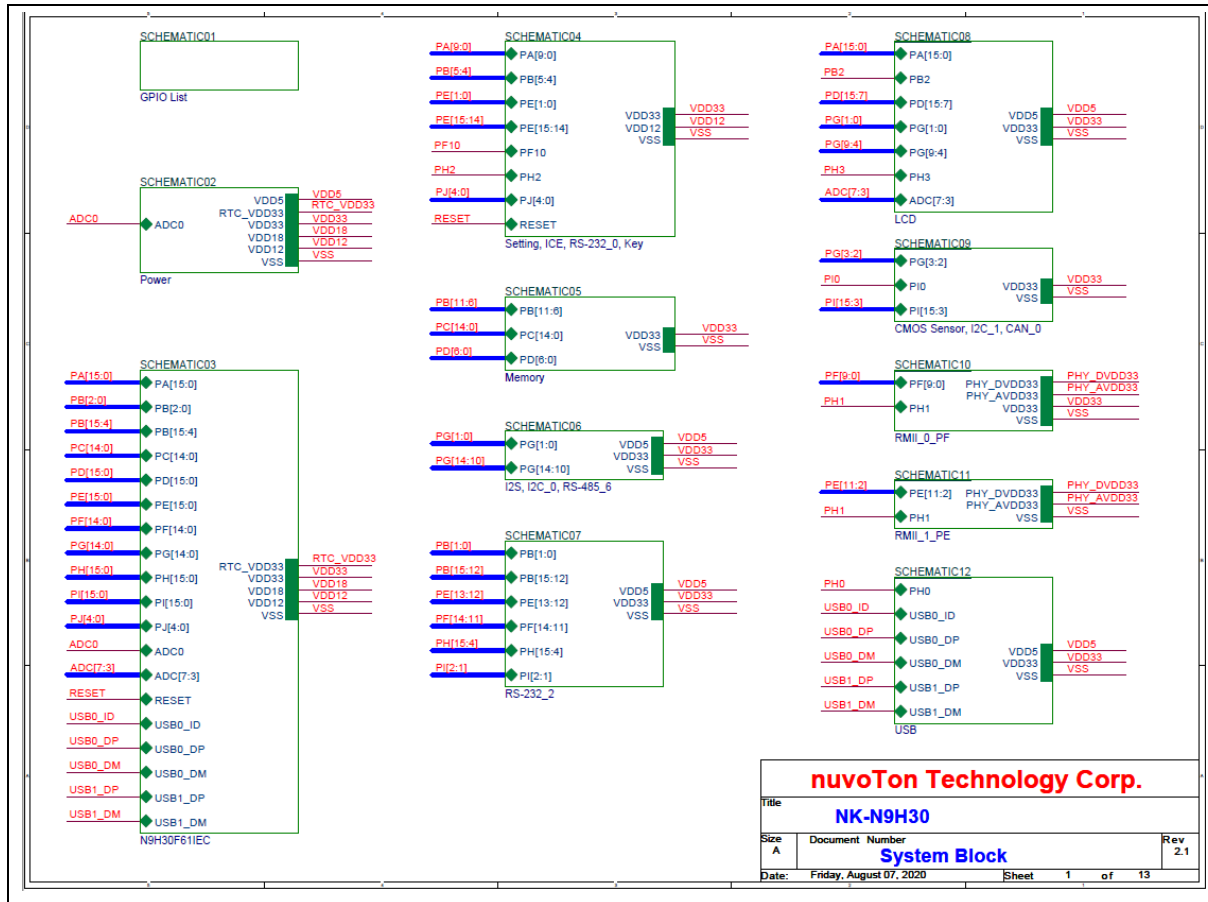


Figure 3-2 System Block Circuit

3.3 NuMaker-N9H30 – Power Circuit

Figure 3-3 shows the Power Circuit.

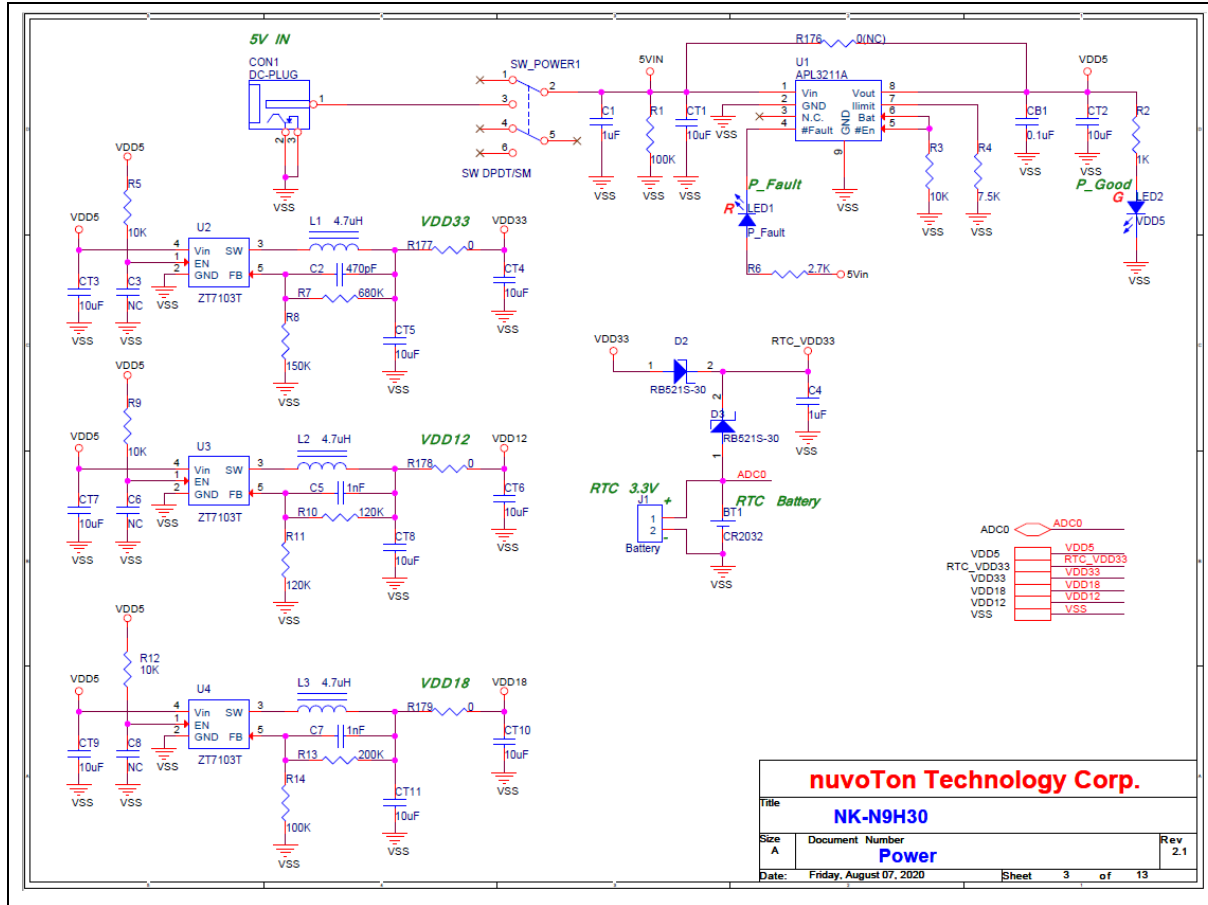


Figure 3-3 Power Circuit

3.4 NuMaker-N9H30 – N9H30F61IEC Circuit

Figure 3-4 shows the N9H30F61IEC Circuit.

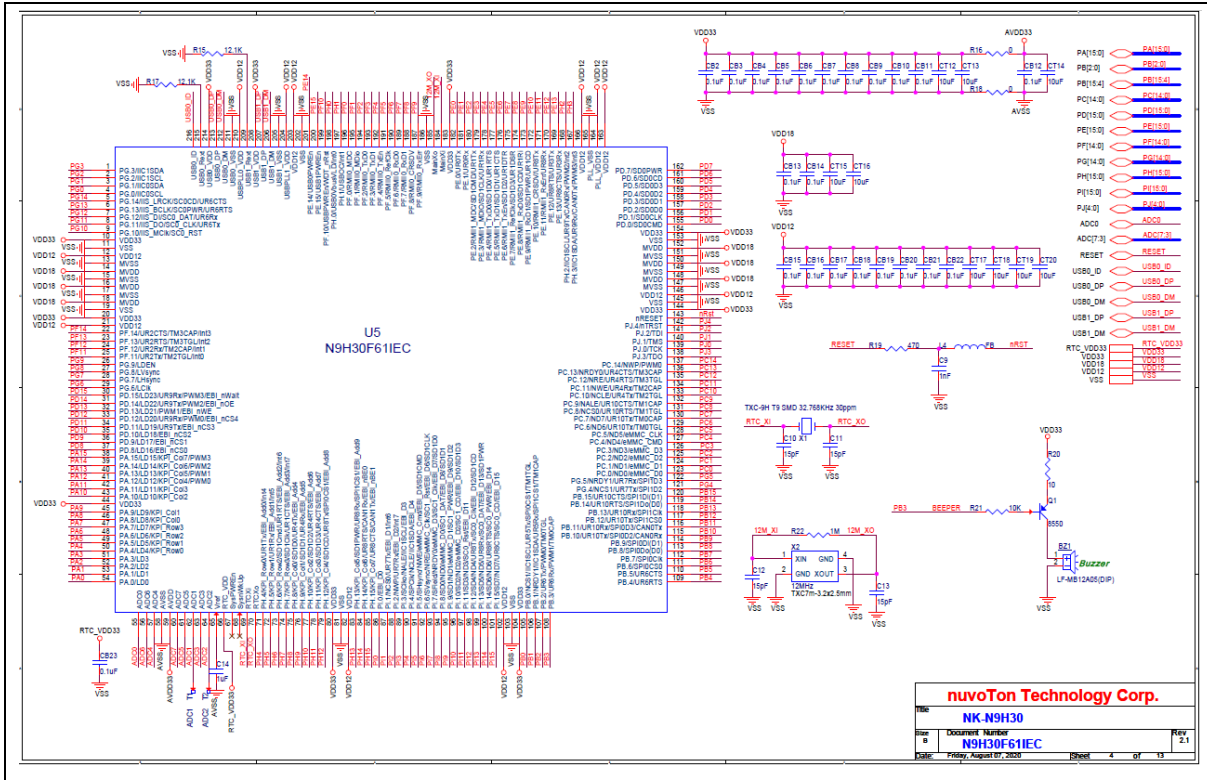


Figure 3-4 N9H30F61IEC Circuit

3.5 NuMaker-N9H30 – Setting, ICE, RS-232_0, Key Circuit

Figure 3-5 shows the Setting, ICE, RS-232_0, Key Circuit.

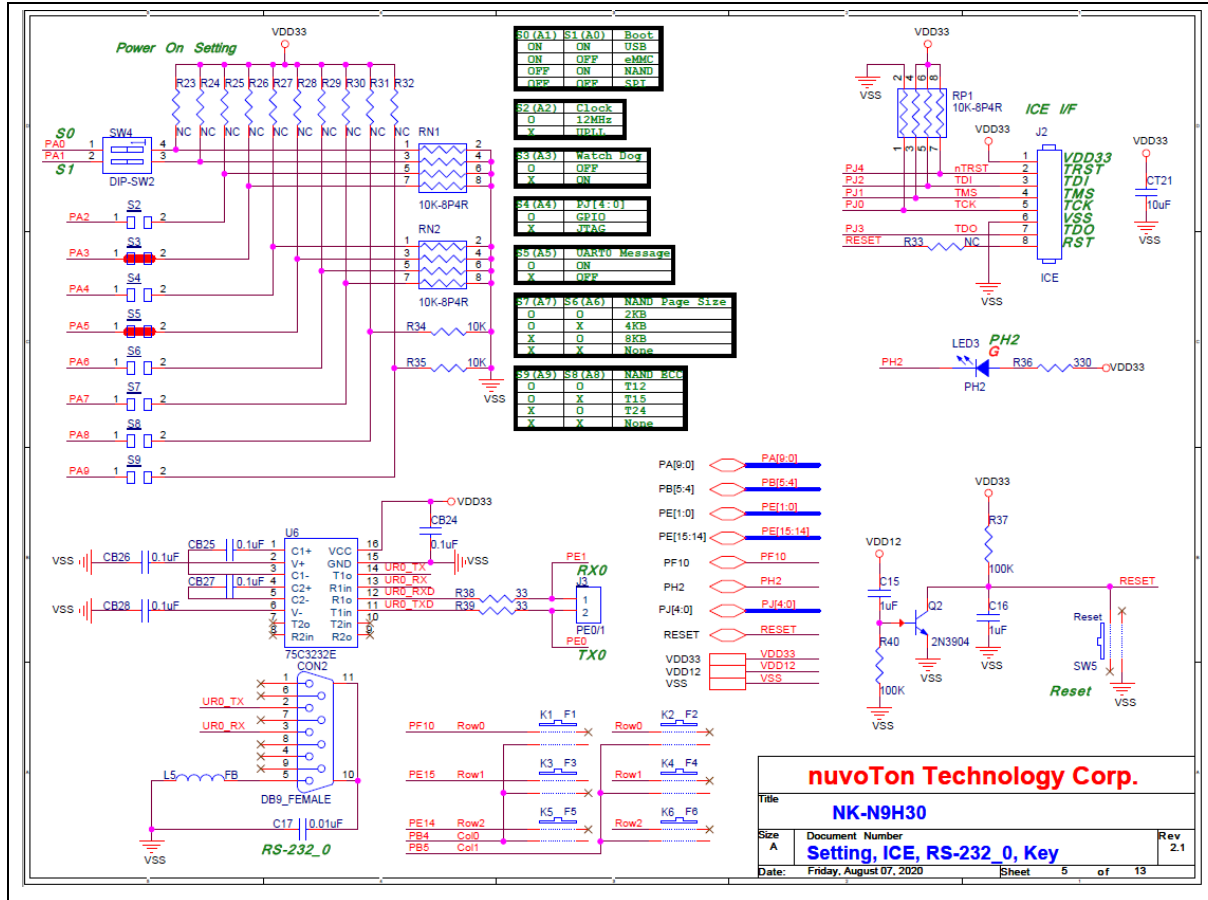


Figure 3-5 Setting, ICE, RS-232_0, Key Circuit

3.6 NuMaker-N9H30 – Memory Circuit

Figure 3-6 shows the Memory Circuit.

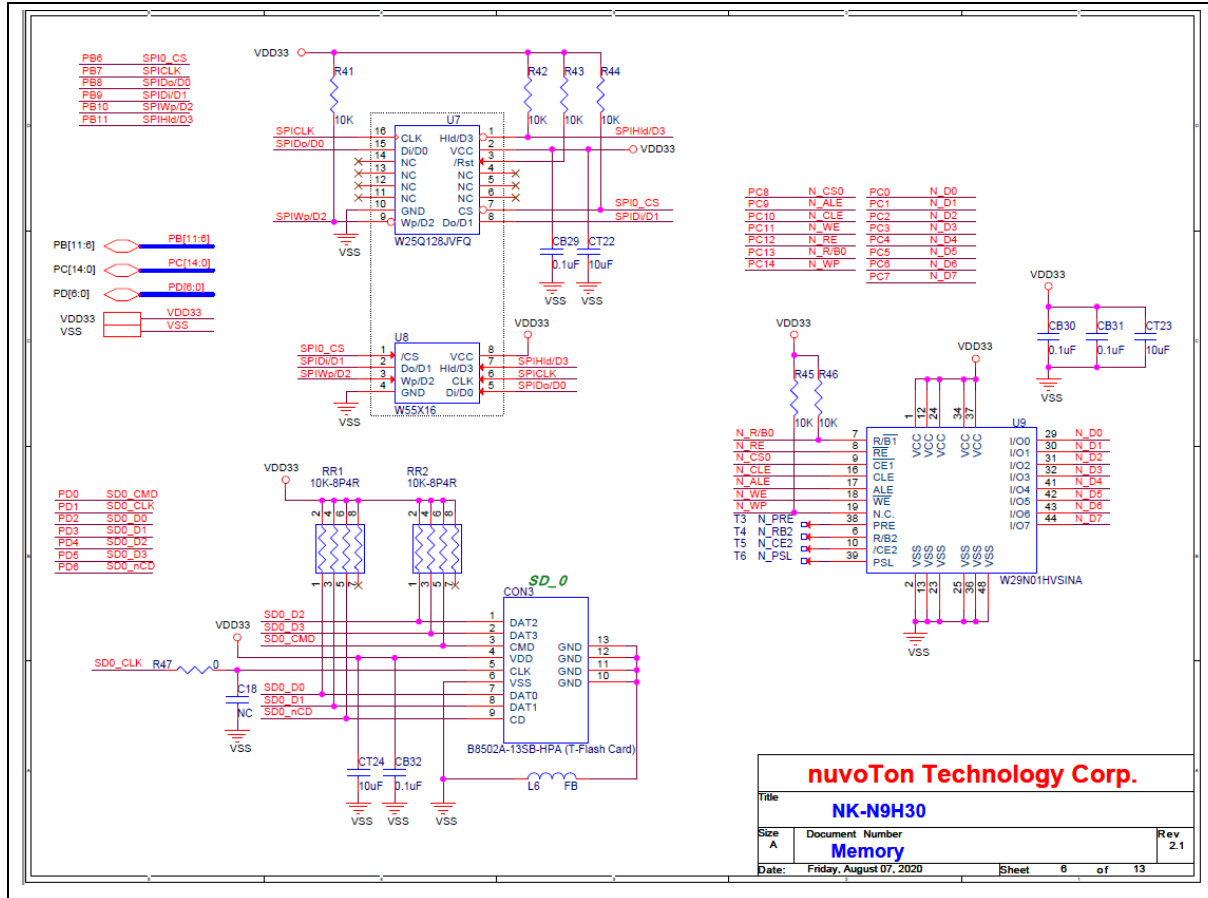


Figure 3-6 Memory Circuit

3.7 NuMaker-N9H30 – I²S, I2C_0, RS-485_6 Circuit

Figure 3-7 shows the I²S, I2C_0, RS-485_6 Circuit.

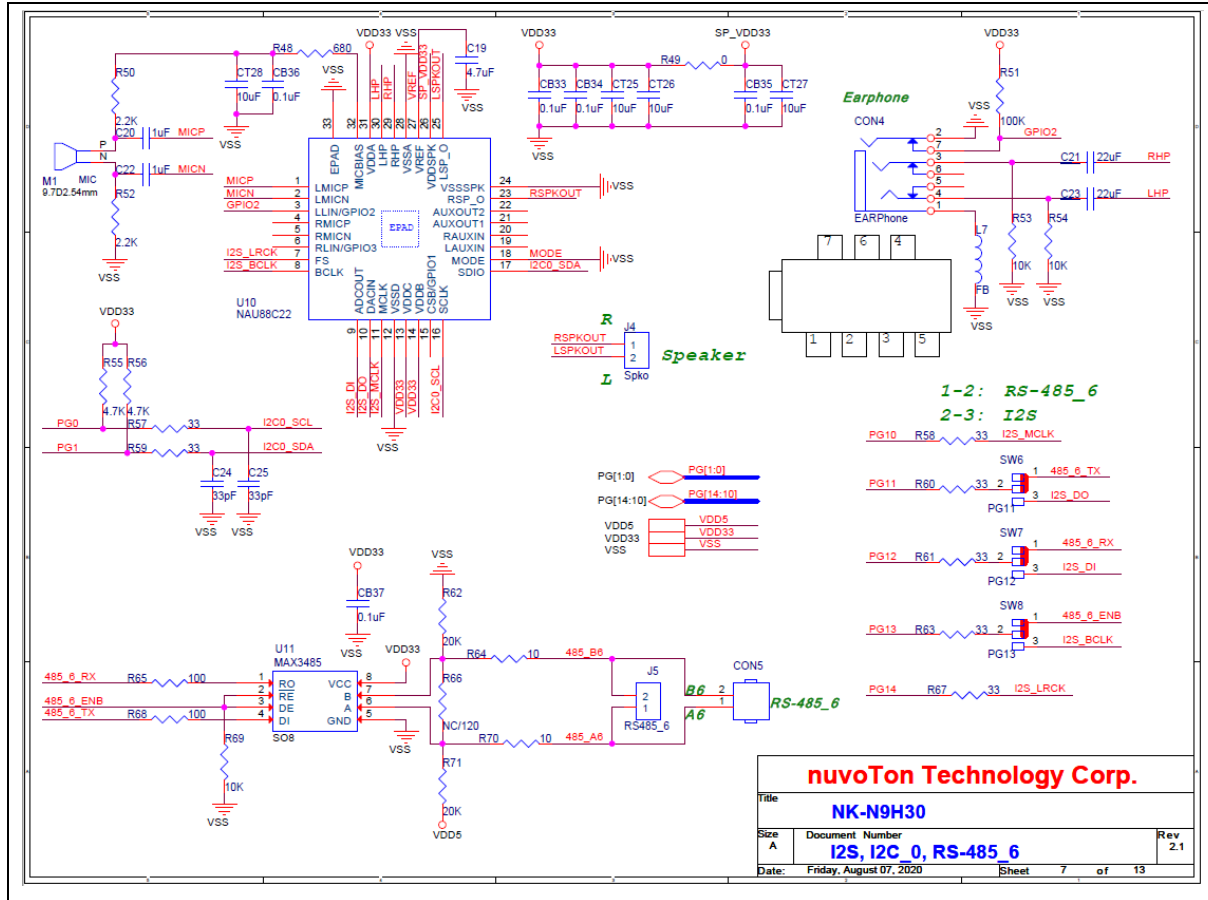


Figure 3-7 I²S, I2C_0, RS-485_6 Circuit

3.8 NuMaker-N9H30 – RS-232_2 Circuit

Figure 3-8 shows the RS-232_2 Circuit.

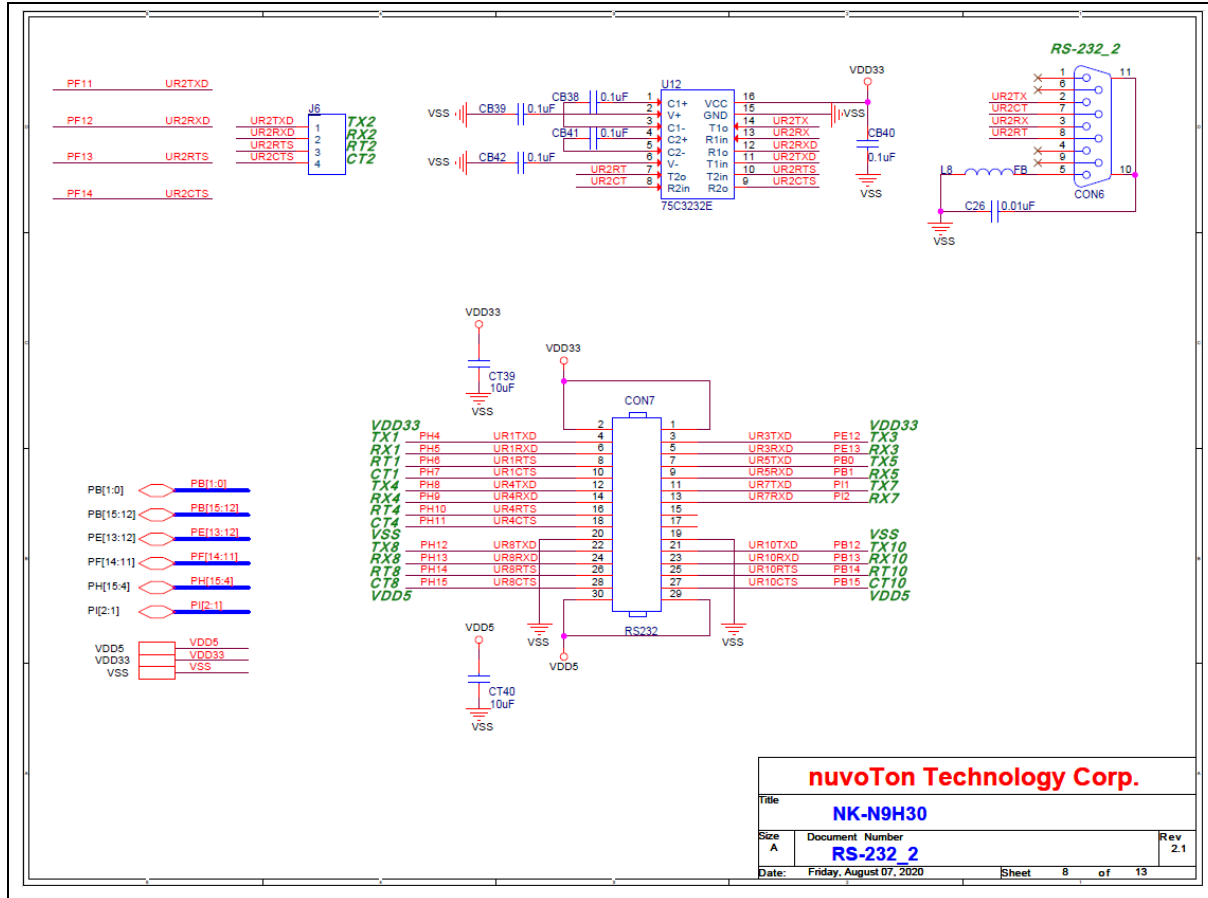


Figure 3-8 RS-232_2 Circuit

3.9 NuMaker-N9H30 – LCD Circuit

Figure 3-9 shows the LCD Circuit.

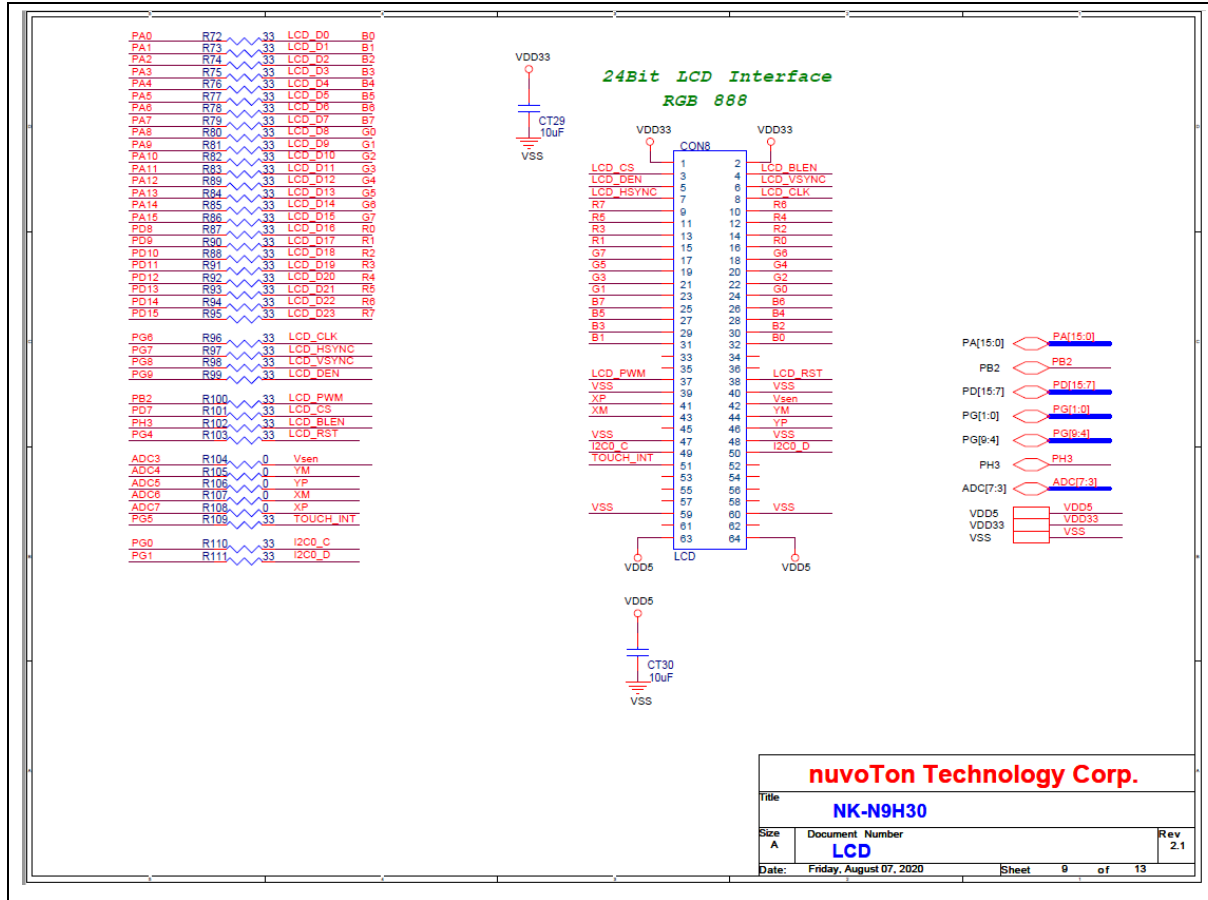


Figure 3-9 LCD Circuit

3.10 NuMaker-N9H30 – CMOS Sensor, I2C_1, CAN_0 Circuit

Figure 3-10 shows the CMOS Sensor, I2C_1, CAN_0 Circuit.

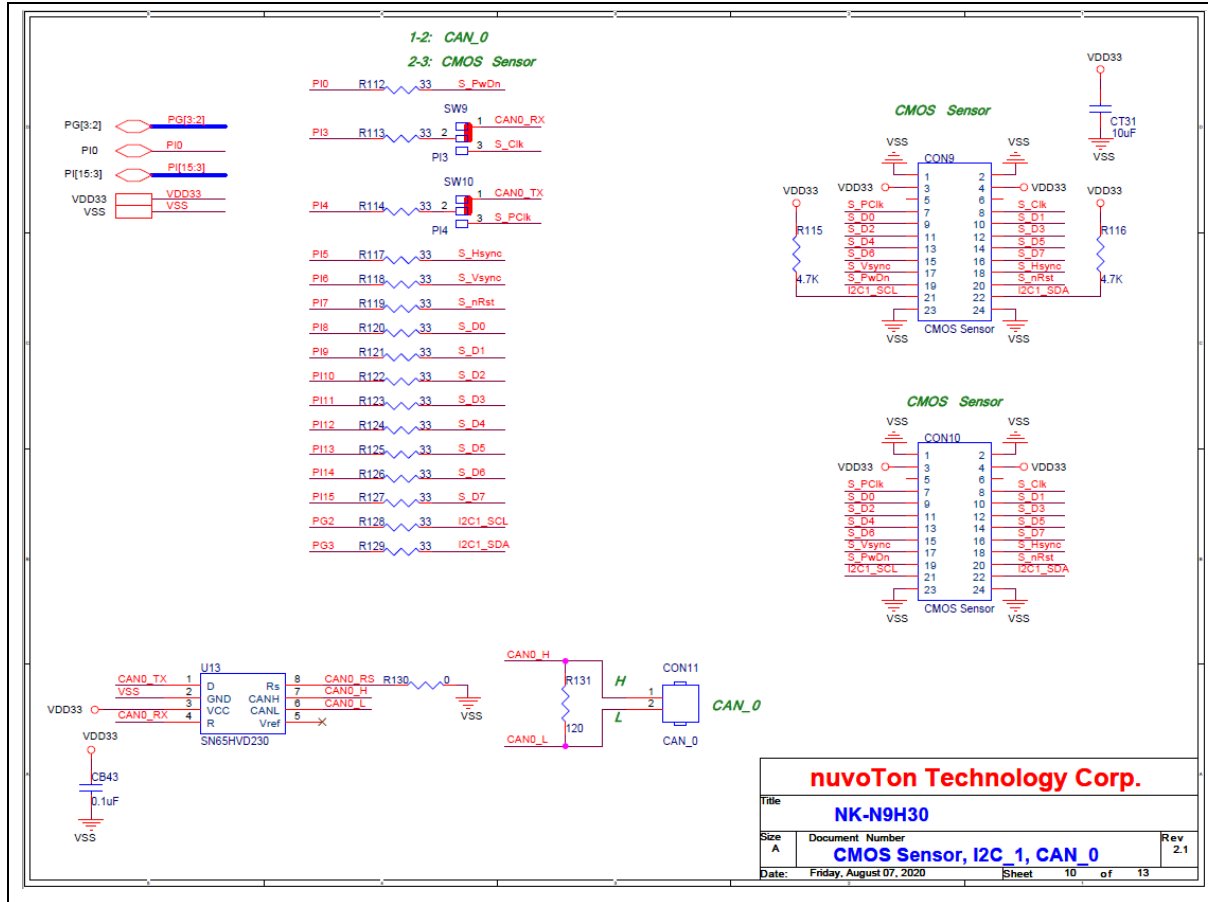


Figure 3-10 CMOS Sensor, I2C_1, CAN_0 Circuit

3.12 NuMaker-N9H30 – RMI1_1_PE Circuit

Figure 3-12 shows the RMI1_1_PE Circuit.

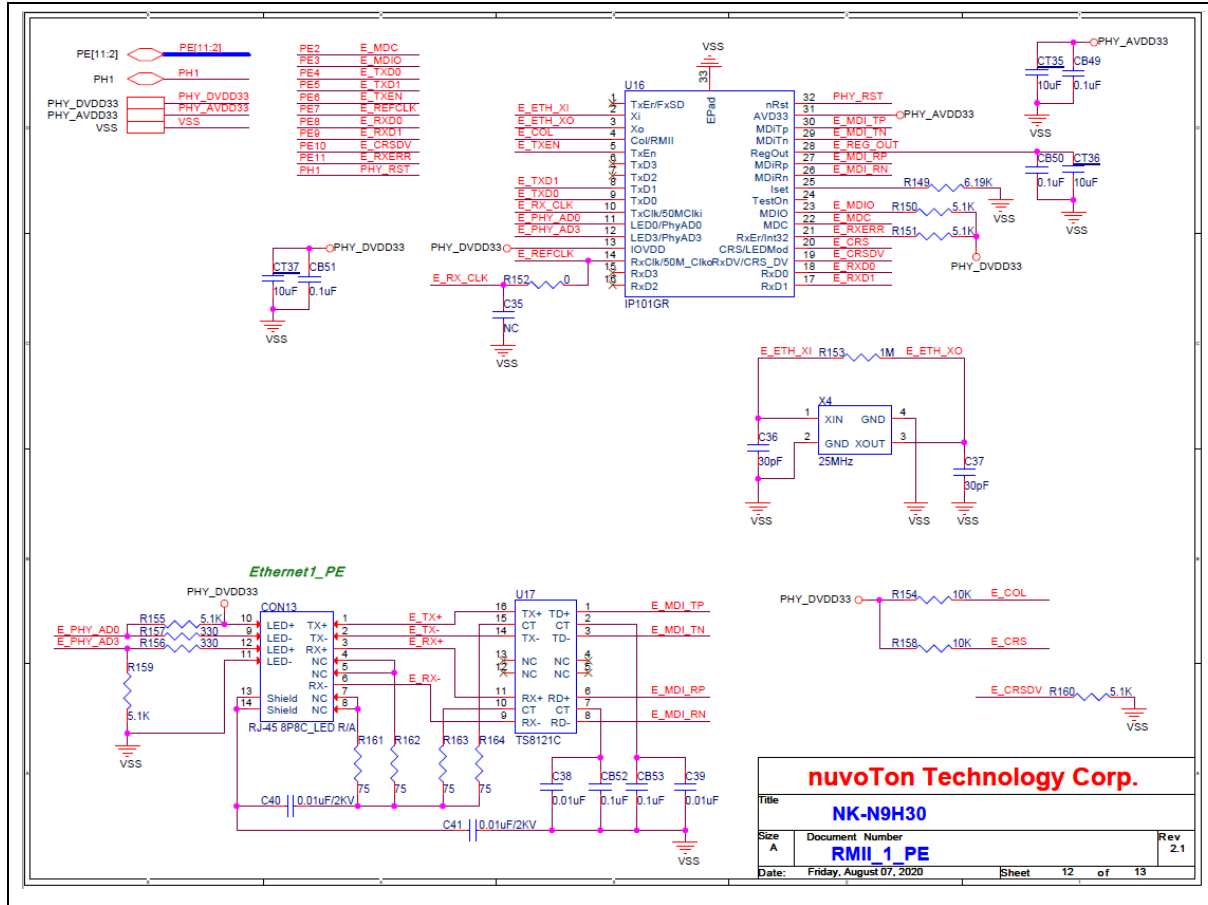


Figure 3-12 RMII_1_PE Circuit

3.13 NuMaker-N9H30 – USB Circuit

Figure 3-13 shows the USB Circuit.

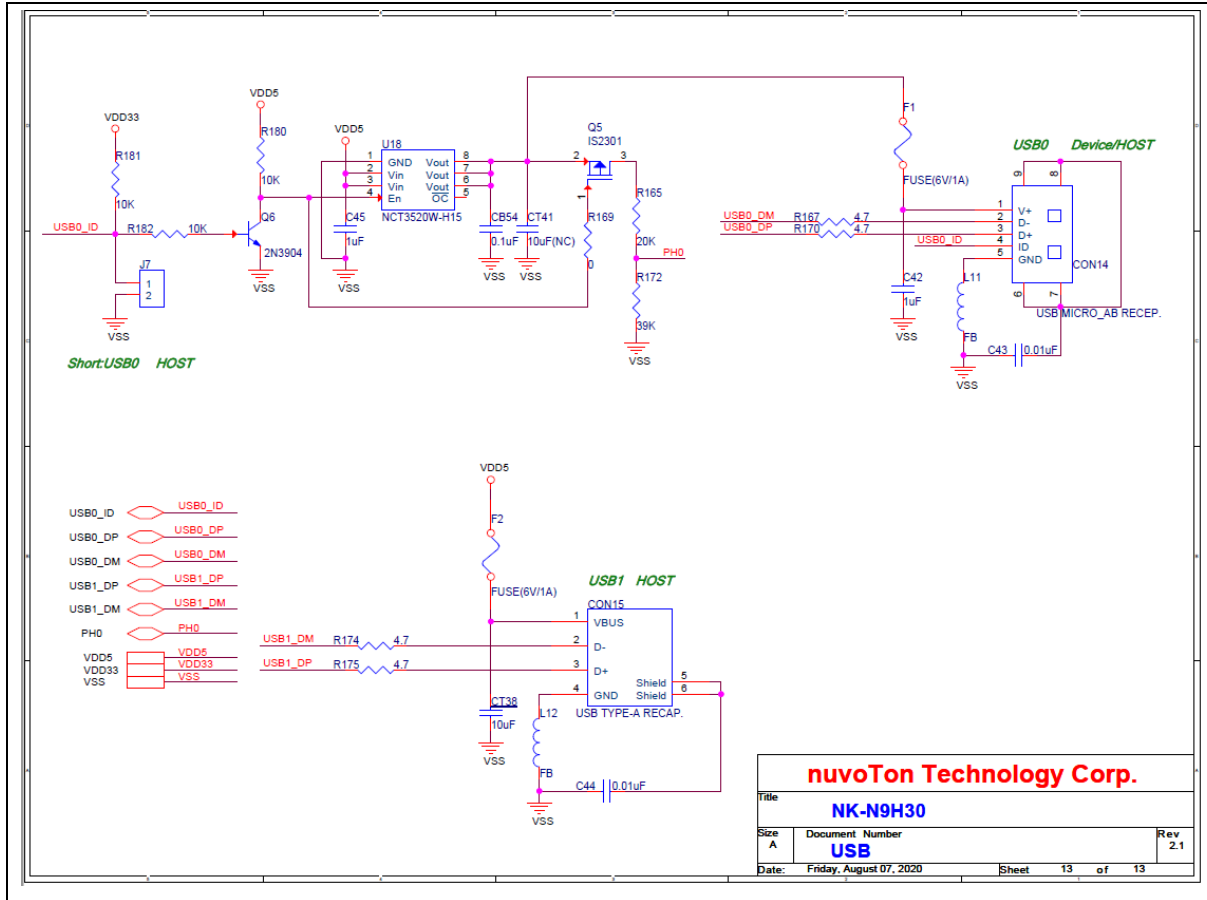


Figure 3-13 USB Circuit

3.14 NuDesign-TFT-LCD7 – TFT-LCD7 Circuit

Figure 3-14 shows the TFT-LCD7 Circuit.

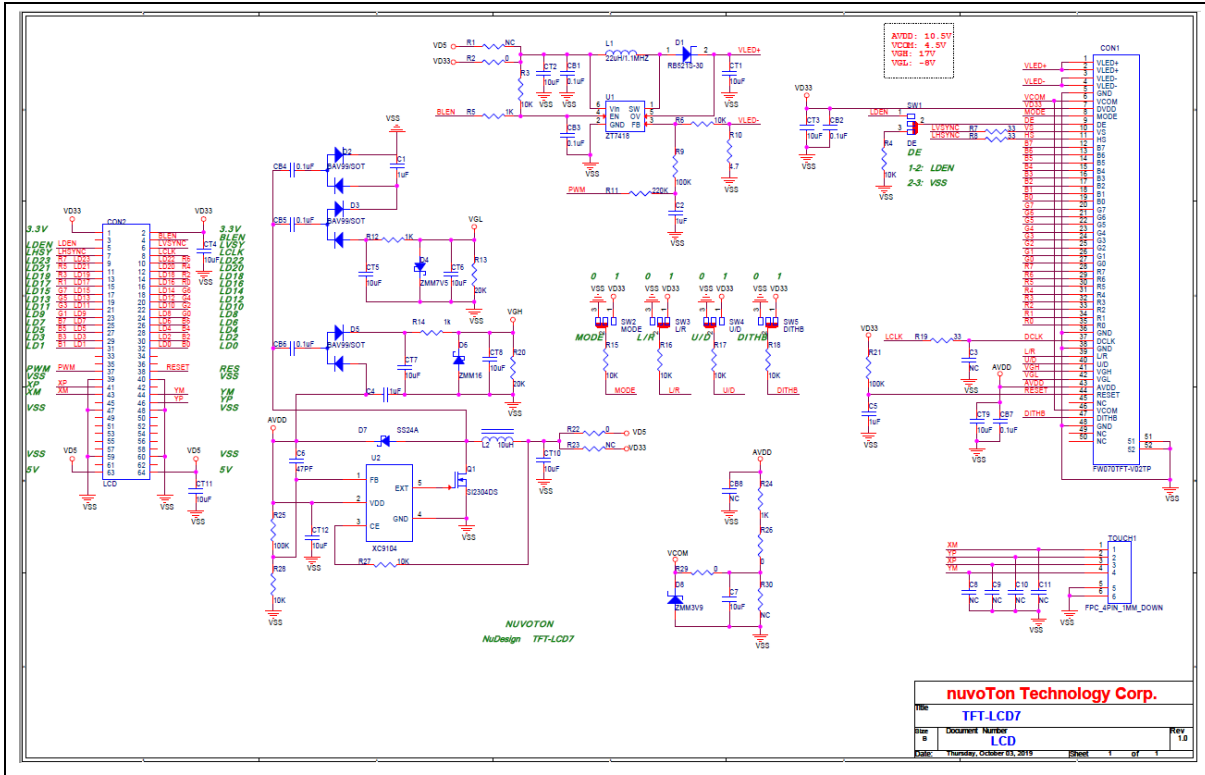


Figure 3-14 TFT-LCD7 Circuit

4 REVISION HISTORY

Date	Revision	Description
2022.03.24	1.00	• Initial version

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