

NuMicro[®] Family**Arm[®] Cortex-A35-based Microprocessor**

NuMaker-HMI-MA35D1-A1

User Manual

Evaluation Board for NuMicro[®] MA35D1 Series

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Table of Contents

1 OVERVIEW	7
1.1 NuMaker-HMI-MA35D16AJ2 Board	9
1.2 7" TFT LCD Daughter Board	10
1.3 Board Part Number and Information	11
2 FEATURES	12
2.1 NuMaker-HMI-MA35D16AJ2 Features	12
2.2 7" TFT LCD Daughter Board Features	12
3 HARDWARE CONFIGURATION	14
3.1 NuMaker-HMI-MA35D16AJ2 Board	14
3.1.1 Front View.....	14
3.1.2 Rear View	14
3.1.3 RTC Wake-up Control.....	15
3.1.4 PMIC.....	16
3.1.5 eMMC NAND Flash.....	17
3.1.6 RGMII Gigabit PHY	17
3.1.7 QSPI Flash	19
3.1.8 NAND Flash	19
3.1.9 SD Card Slot	20
3.1.10 HS USB2.0 Connectors.....	20
3.1.11 Power-on Setting	21
3.1.12 Gigabit Ethernet Transformers and RJ45 Ports.....	23
3.1.13 CMOS Sensor Capture Connectors	23
3.1.14 EADC Header	24
3.1.15 UART	25
3.1.16 RS485	26
3.1.17 CAN FD.....	27
3.1.18 SWJ, SWD and ETM	27
3.1.19 USB Virtual COM (VCOM) Port.....	28
3.1.20 Reset and RTC Wake-up Key Buttons.....	28
3.1.21 TFT LCD Connector.....	28
3.1.22 Audio Codec.....	30
3.1.23 Key Buttons, LEDs, Buzzer and Fan Control	31
3.2 7" TFT LCD Daughter Board	33
3.2.1 Front View.....	33
3.2.2 Rear View	33
3.2.3 Connectors	34
4 QUICK START	35
4.1 Hardware Setup and Power On	35

4.1.1	Configure Power-on Setting.....	35
4.1.2	Power On the NuMaker-HMI-MA35D16AJ2 Board.....	36
4.1.3	VCOM Port (Optional).....	37
4.2	Demo Image.....	38
4.2.1	EV Charging Station UI	39
4.2.2	Industrial Control UI	40
4.2.3	Coffee Machine UI.....	41
4.2.4	Speed Meter UI.....	42
5	SUPPORTING RESOURCES	43
5.1	Documents	43
5.2	Software	43
6	HARDWARE SCHEMATICS.....	45
6.1	NuMaker-HMI-MA35D16AJ2 Schematics	45
6.1.1	System Block	45
6.1.2	PMIC, Crystal and Power Filter	46
6.1.3	Power Group 1.....	47
6.1.4	Power Group 0, 2 and 5	48
6.1.5	Power Group 3 (eMMC1_PJ)	49
6.1.6	Power Group 4 (LCM).....	50
6.1.7	Power Group 6 (SD0)	51
6.1.8	Power Group 7 and EAD0.....	52
6.1.9	Power Group 8 (RGMII0_PE).....	53
6.1.10	Power Group 9 (RGMII1_PF).....	54
6.1.11	HSUSB 0/1	55
6.1.12	NAND Flash and QSPI0 Flash	56
6.1.13	NAU88C22 Audio Codec.....	57
6.1.14	CCAP0 Connector.....	58
6.1.15	RS232 and RS485	59
6.1.16	CAN FD.....	60
6.1.17	Key Buttons, LEDs, Buzzer, Fan Control and SPI Connector	61
6.1.18	SWJ Connector.....	62
6.1.19	NUC123 VCOM	63
6.1.20	PCB Placement	64
6.2	7" TFT LCD Daughter Board Schematic.....	66
7	REVISION HISTORY	67

List of Figures

Figure 1-1 NuMaker-HMI-MA35D1-A1 Board from IC Side.....	8
Figure 1-2 NuMaker-HMI-MA35D1-A1 Board from TFT LCD Side	8
Figure 1-3 NuMaker-HMI-MA35D16AJ2 Board	9
Figure 1-4 7" TFT LCD Daughter Board	10
Figure 3-1 Front View of NuMaker-HMI-MA35D16AJ2.....	14
Figure 3-2 Rear View of NuMaker-HMI-MA35D16AJ2	15
Figure 3-3 Front View of 7" TFT LCD Daughter Board.....	33
Figure 3-4 Rear View of 7" TFT LCD Daughter Board	34
Figure 4-1 Power-on Setting DIP Switch (SW3)	35
Figure 4-2 Power Connector (CON35)	36
Figure 4-3 USB VCOM Port (CON21)	37
Figure 5-1 Nuvoton Website	43
Figure 5-2 MA35D1 GitHub Resources	44
Figure 6-1 System Block	45
Figure 6-2 PMIC, Crystal and Power Filter Schematic	46
Figure 6-3 Power Group 1 Schematic.....	47
Figure 6-4 Power Group 0, 2 and 5 Schematic.....	48
Figure 6-5 Power Group 3 (eMMC1_PJ) Schematic	49
Figure 6-6 Power Group 4 (LCM) Schematic.....	50
Figure 6-7 Power Group 6 (SD0) Schematic	51
Figure 6-8 Power Group 7 and EADC0 Schematic.....	52
Figure 6-9 Power Group 8 (RGMII0_PE) Schematic	53
Figure 6-10 Power Group 9 (RGMII1_PF) Schematic	54
Figure 6-11 HSUSB 0/1 Schematic	55
Figure 6-12 NAND Flash and QSPI0 Flash Schematic	56
Figure 6-13 NAU88C22 Audio Codec Schematic	57
Figure 6-14 CCAPO Connector Schematic	58
Figure 6-15 RS232 and RS485 Schematic.....	59
Figure 6-16 CAN FD Schematic.....	60
Figure 6-17 Key Buttons, LEDs, Buzzer, Fan Control and SPI Connector Schematic.....	61
Figure 6-18 SWJ Connector Schematic.....	62
Figure 6-19 NUC123 VCOM Schematic	63
Figure 6-20 Front PCB Placement of NuMaker-HMI-MA35D16AJ2 Board	64
Figure 6-21 Rear PCB Placement of NuMaker-HMI-MA35D16AJ2 Board.....	65
Figure 6-22 7" TFT LCD Daughter Board Schematic	66

List of Tables

Table 1-1 Board Part Number and Information.....	11
Table 3-1 RTC Power Control Pins of MA35D1.....	16
Table 3-2 PMIC (U2) Output Voltage.....	16
Table 3-3 PMIC (U2) Control Pins	17
Table 3-4 eMMC1 NAND Flash Device (U3) Pin Function	17
Table 3-5 RGMII0 PHY (U4) Pin Function	18
Table 3-6 RGMII1 PHY (U5) Pin Function	18
Table 3-7 QSPI0 Flash (U17) Pin Function	19
Table 3-8 NAND Flash (U43) Pin Function.....	20
Table 3-9 SD0 Standard-SD Card Slot (CON28) Pin Function	20
Table 3-10 Secure Boot Options.....	21
Table 3-11 Booting Source QSPI0 and SD/eMMC I/O Voltage Options	21
Table 3-12 Booting Source Options.....	21
Table 3-13 Page Size Options for NAND Flash Booting Source	22
Table 3-14 ECC Options for NAND Flash Booting Source	22
Table 3-15 Options for SD Card 0/1 or eMMC 0/1 NAND Flash Device Booting Source.....	22
Table 3-16 4/8-bit Options for eMMC NAND Flash Device Booting Source.....	22
Table 3-17 1-bit Options for QSPI0 NAND/NOR Flash Booting Source.....	22
Table 3-18 Options for USB0 or USBH Booting Source	23
Table 3-19 USBH Port 0/1 Options for USBH Booting Source.....	23
Table 3-20 Over-current High/Low-active Detect Options for USBH Booting Source	23
Table 3-21 CCA0 Connector (CON7) Pin Function.....	24
Table 3-22 EADC0 Header (J6) Pin Function.....	25
Table 3-23 UART0, Tamper Pin, CAN1_H/L and CAN3_H/L Header (J1) Pin Function.....	25
Table 3-24 UART11 (U21, CON13) Pin Function	26
Table 3-25 UART16 (U35, CON14) Pin Function	26
Table 3-26 UART12 (U22, CON15) Pin Function	26
Table 3-27 UART14 (U23, CON16) Pin Function	26
Table 3-28 RS485 Transceiver A/B I/O and Ground VSS Header (J12) Pin Function.....	27
Table 3-29 CAN1 (U25, CON17) Pin Function	27
Table 3-30 CAN3 (U26, CON18) Pin Function	27
Table 3-31 SWJ Interface (J49) Pin Function	27
Table 3-32 NUC123 ICE Interface (J9) Pin Function.....	28
Table 3-33 LCM Connector (CON12) Pin Function	30
Table 3-34 I2S0 (U18) Pin Function	31
Table 3-35 I2C2 (U18) Pin Function	31

Table 3-36 Audio Codec (U18) Control Pin Function	31
Table 3-37 Key Buttons (KEY_1, KEY_2 and KEY_3) Pin Function	31
Table 3-38 LEDs (LED_0 and LED_1) Pin Function	32
Table 3-39 Fan Control (FAN_EN, FAN_PWM and FAN_SP) Pin Function	32
Table 3-40 2-pin Fan Connector (J10) Pin Function	32
Table 3-41 4-pin Fan Connector (J11) Pin Function	32
Table 4-1 Secure Boot Disable Configuration	35
Table 4-2 eMMC1 Boot Source I/O Voltage Configuration	36
Table 4-3 SD/eMMC Boot Source Configuration	36
Table 4-4 eMMC1 Boot Source Configuration	36
Table 4-5 eMMC1 NAND Flash Device Boot Source eMMC 8-bit Configuration	36
Table 4-6 HMI Demo Application Table	38
Table 4-7 EV Charging Station UI Pagination Instructions Table	39
Table 4-8 Industrial Control UI Pagination Instructions Table	40
Table 4-9 Coffee Machine UI Pagination Instructions Table	41
Table 4-10 Speed Meter UI Pagination Instructions Table	42

1 OVERVIEW

The NuMaker-HMI-MA35D1-A1 is an evaluation board for Nuvoton NuMicro MA35D1 series microprocessors, and consists of two parts: a NuMaker-HMI-MA35D16AJ2 board and a 7" TFT-LCD daughter board. The NuMaker-HMI-MA35D1-A1 board integrates core components to simplify the system design, based on MA35D16AJ87C (BGA 312-Ball package, and stacking a 512 MB DDR), PMIC power solution, a 16 GB eMMC Flash, and two Gigabit Ethernet PHY. The NuMaker-HMI-MA35D1-A1 has rich peripherals such as two sets of Gigabit Ethernet, USB2.0 high-speed host and device, two sets of CAN FD, and SPI, I²C, UART, RS-485 serial communication ports for users to facilitate the evaluation in HMI and industrial control, home appliances, 2-wheel cluster, medical device, new energy applications, ML (Machine Learning) or your creative applications.

The NuMicro MA35D1 series is a heterogeneous multi-core microprocessor targeted to high-end edge IIoT gateway. It is based on dual 64-bit Arm Cortex-A35 cores with speed up to 800 MHz, and one 180 MHz Arm Cortex-M4 core. Based on the high-performance cores, the MA35D1 series facilitates the tiny AI/ML for edge computing.

The MA35D1 supports 16-bit DDR2 and DDR3/DDR3L SDRAM. For an easy system design and manufacture, the MA35D1 series also offers LQFP and BGA packages stacked with the DDR2/DDR3L SDRAM and density up to 512 MB, which significantly reduces PCB layer, size and electromagnetic interference (EMI).

The MA35D1 series is a trusted system for IoT products' security requirements. It includes several advanced security mechanisms such as Nuvoton Trusted Secure Island (TSI) an isolated secure hardware unit, TrustZone, secure boot, tamper-detection, built-in cryptographic accelerators, and a TRNG, as well as Key Store and OTP memory. All the security operations are performed in the TSI to protect sensitive and high-value data. The features also satisfy customers in IEC 62443 certification requirements.

For high-end edge IIoT gateway requirements, the MA35D1 series provides multiple advanced and high-speed connection interfaces, such as Gigabit Ethernet, SDIO3.0, USB 2.0 HS, and CAN FD, for edge gateway and new energy applications.

For HMI applications, the MA35D1 series provides an LCD display controller with the resolution up to 1920x1080 at 60 FPS, a 2D graphic engine, a JPEG and a H.264 decoder integrated for better graphical HMI effects and video playback.

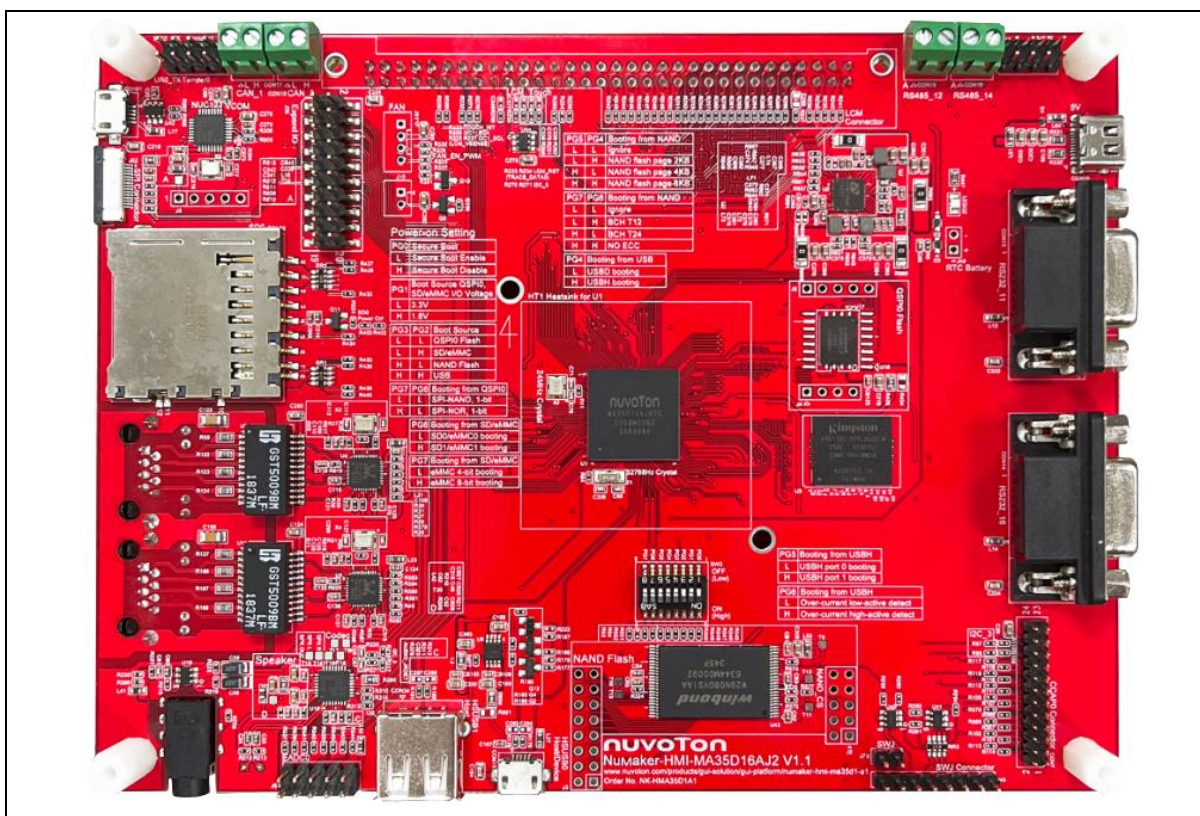


Figure 1-1 NuMaker-HMI-MA35D1-A1 Board from IC Side



Figure 1-2 NuMaker-HMI-MA35D1-A1 Board from TFT LCD Side

1.1 NuMaker-HMI-MA35D16AJ2 Board

The NuMaker-HMI-MA35D16AJ2 board contains an on-board target chip MA35D16AJ87C packaged in a MCP type with internal DDR3L 512 MB SDRAM, a PMIC device APW7704FQBI to supply the powers to the target chip MA35D16AJ87C and dedicated peripherals on this board, a NAND Flash, eMMC, SPI Flash (SPI NOR/SPI NAND) memory devices, a Standard-SD memory card slot, two Gigabit Ethernet (RGMII) PHY devices, two Gigabit Ethernet transformer devices and two RJ45 port connectors, a battery input header and a PMIC reset key button, two High Speed USB ports (Host/Device and Host), an audio codec with microphone and headset jack, a 24-bit RGB LCD with touch connector, one CMOS sensor input connectors, eight channels of ADC input, two RS232 COM ports, two RS485 connectors, two CAN FD connectors, three user key buttons and two user LEDs.

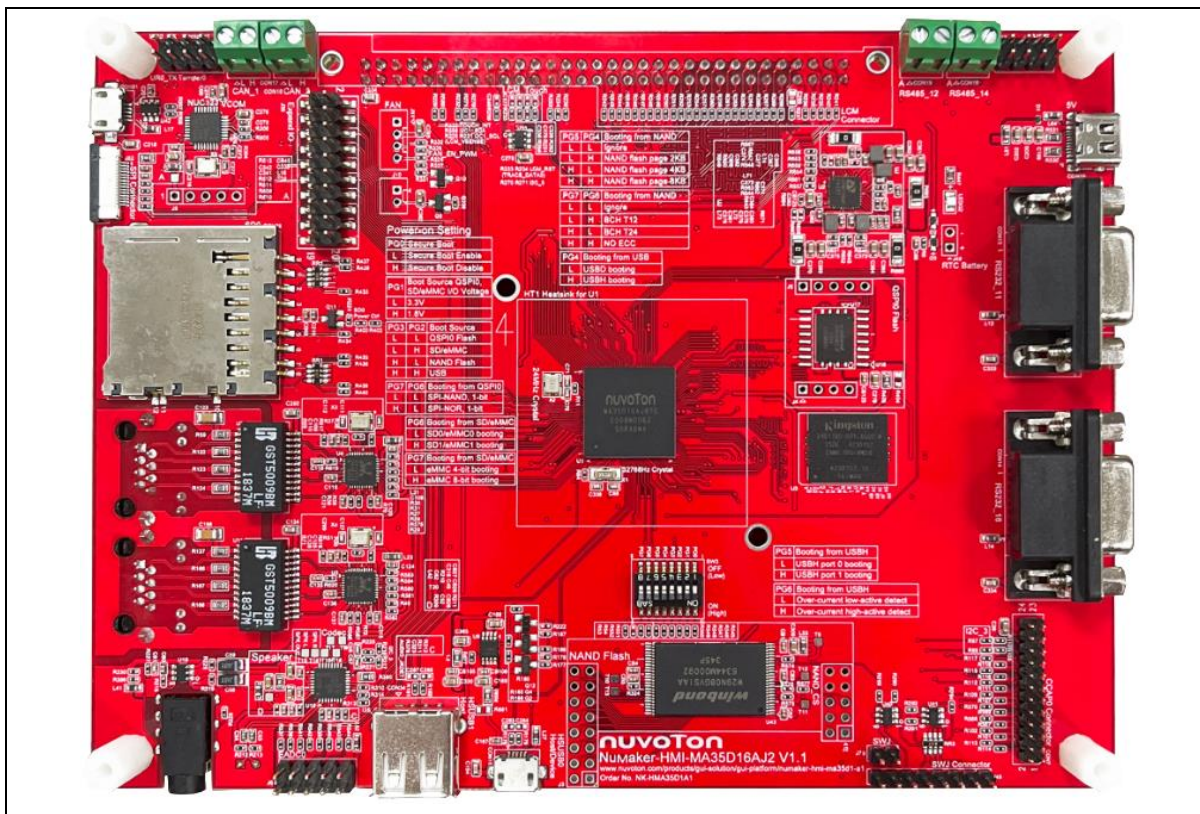


Figure 1-3 NuMaker-HMI-MA35D16AJ2 Board

1.2 7" TFT LCD Daughter Board

This daughter board contains a 7" 4-wire resistive touch TFT LCD panel with pixel resolution of 1024x600. (TH0701024600NYR50L1 + AN-3748A)

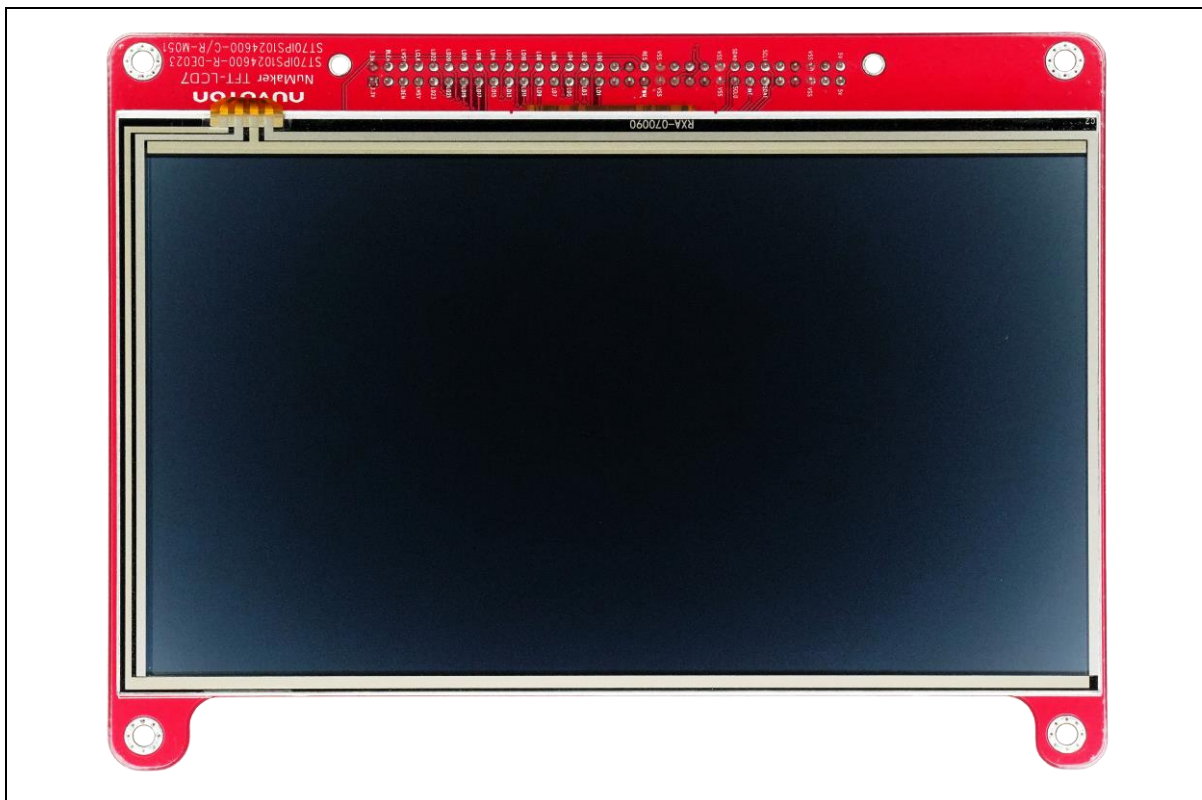


Figure 1-4 7" TFT LCD Daughter Board

1.3 Board Part Number and Information

The following table lists the part number of this evaluation board (EVB) based on the MA35D16AJ87C microprocessors, and the PCB names of two parts: NuMaker-HMI-MA35D16AJ2 board and 7" TFT-LCD daughter board.

Part Number of EVB	Main Board	7" TFT LCD Daughter Board
NuMaker-HMI-MA35D1-A1	NuMaker-HMI-MA35D16AJ2	NuMaker TFT-LCD7

Table 1-1 Board Part Number and Information

2 FEATURES

2.1 NuMaker-HMI-MA35D16AJ2 Features

- Target Chip: MA35D16AJ87C (BGA 312-Ball) MCP package with DDR3L (512 MB), which can run up to 800 MHz
- Power
 - 5V powered by USB Type-C
 - PMIC APW7704FQBI:
 - ◆ Four DC/DC: To supply 1.2V Core power, 1.25V CPU power, 1.35V DDR3L Memory power and 3.3V I/O power
 - ◆ Three LDO: To supply 3.0V RTC power, 1.8V I/O power, 2.5V PLL power
 - Battery input header (J48): Independent DC 3.3V input to V_{BAT} for RTC power (Optional)
- Debug:
 - UART0 debug port: USB Virtual COM (VCOM) port
 - Debug ports: SWJ (JTAG+SWD) connectors
- Memory Devices
 - On-board eMMC NAND Flash memory device (16 GB)
 - On-board NAND Flash device (1 GB)
 - On-board Quad SPI NAND Flash device (512 MB)
 - Standard-SD (SD2.0) memory card slot
- One PMIC reset key button
- One power-on setting DIP-Switch for evaluation booting source selection
- Two sets of Gigabit Ethernet ports: Two Gigabit Ethernet (RGMII) PHY devices, two Gigabit Ethernet transformers and two RJ45 port connectors
- Two sets of high speed USB ports: One Host/Device port and one Host port
- One camera capture (CMOS sensor) header connectors
- One LCM connector to connect with 7" 1024x600 LCD daughter board
- One audio codec with microphone input and speaker output
- Two sets of RS232 transceivers and DB9 connectors
- Two sets of RS485 transceivers and header connectors
- Two sets of CAN FD transceivers and header connectors
- One 8-channel EADC header connector
- Three user key buttons
- Two user LEDs
- One set of buzzer pads
- One fan connector

2.2 7" TFT LCD Daughter Board Features

- One LCD FPC connector to connect with 7" 1024x600 TFT LCD panel

- One 4-wire resistive touch FPC connector
- One connector to connect with NuMaker-HMI-MA35D16AJ2 board

3 HARDWARE CONFIGURATION

3.1 NuMaker-HMI-MA35D16AJ2 Board

3.1.1 Front View

Figure 3-1 shows the main components and connectors from the front side of NuMaker-HMI-MA35D16AJ2 board.

- Target Chip (U1): MA35D16AJ87C (BGA 312-Ball) MCP package with DDR3L (512 MB).

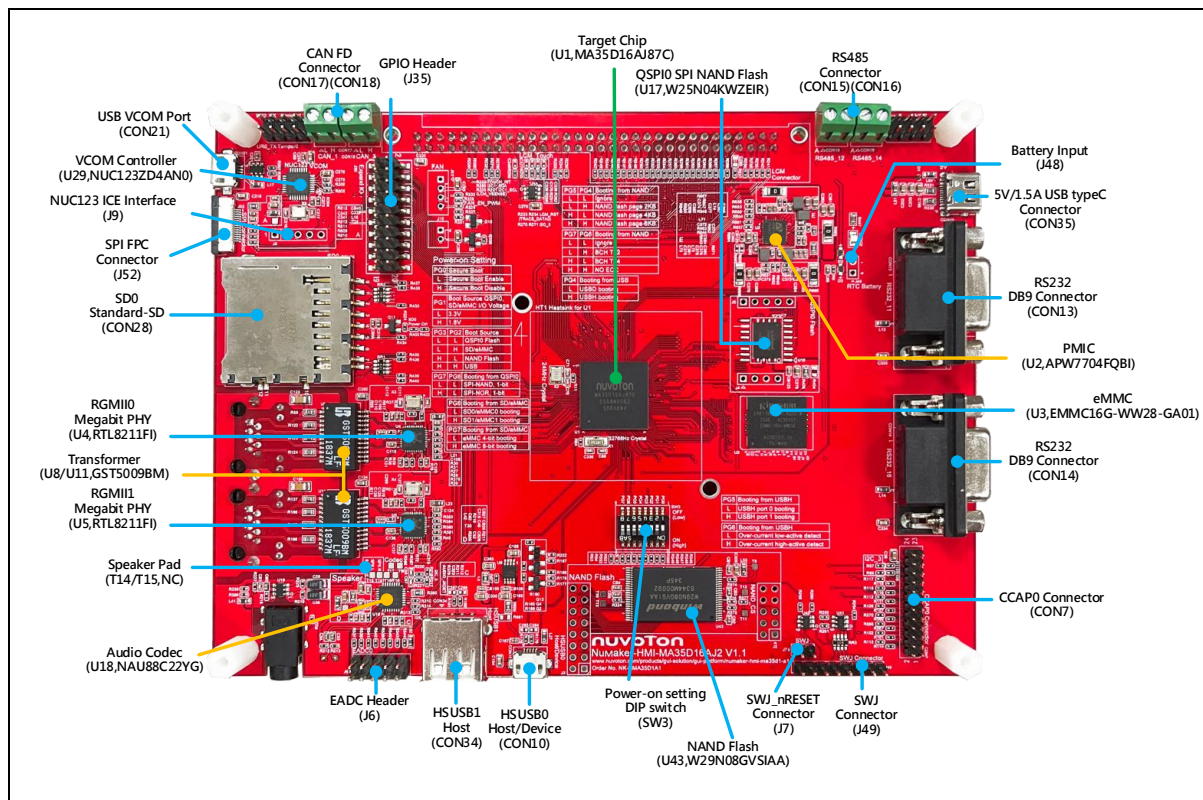


Figure 3-1 Front View of NuMaker-HMI-MA35D16AJ2

3.1.2 Rear View

Figure 3-2 shows the main components and connectors from the rear side of NuMaker-HMI-MA35D16AJ2 board.

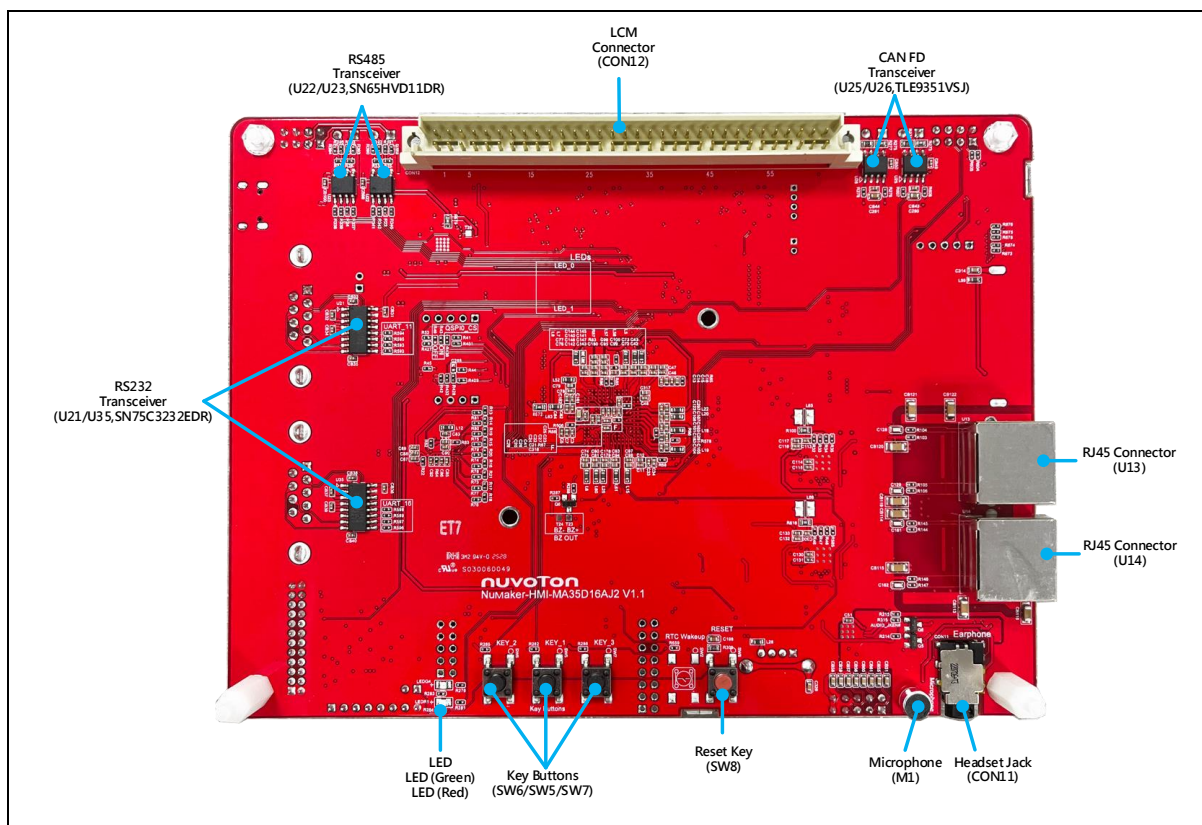


Figure 3-2 Rear View of NuMaker-HMI-MA35D16AJ2

3.1.3 RTC Wake-up Control

- Battery Input Connector (J48): DC 3V battery input connector to provide an additional optional power to keep the RTC power from the V_{BAT} pin of MA35D1 when the system is power off.
- RTC Wake-up Control Pins: The RTC_RPWR and RTC_nRWAKE pins of MA35D1 are the RTC wake-up control pins to control the related DC/DC power whether output voltages or not. (This function is reserved due to both R661 and R659 resistors are mounted on board by default)

Pin No.	Pin Name of MA35D1	Function Description
U1.E7	RTC_RPWR*1	RTC wake-up output pin for external DC/DC (for example, the PMIC device APW7704FQBI (U2) on this NuMaker-HMI-MA35D16AJ2 board) enable pin control.
U1.G5	RTC_nRWAKE*2*3	RTC wake-up interrupt input with internal pull-high

Note *1: This RTC_RPWR output pin of MA35D1 is not wired directly to the EN input pin (pin 3) of PMIC device APW7704FQBI (U2) on this NuMaker-HMI-MA35D16AJ2 board by default. (The R661 resistor is mounted on board but R657 resistor is NC by default)

Note *2: This RTC_nRWAKE input pin is wired directly to the RTC Wakeup key button (SW2, SW2 is not mounted on board in) on NuMaker-HMI-MA35D16AJ2 board and the R659 resistor is mounted on board by default.

Note *3: This RTC_nRWAKE pin is internal pull-high. If user does not use the RTC wake-up interrupt function, please pull this pin to low (the R659 is mounted on board by default). In this condition, user also needs to disable the PWRST bit (RTC_PWRCTL[6]) of the RTC Power Control Register by

clearing it for saving the RTC power consumption.

Table 3-1 RTC Power Control Pins of MA35D1

3.1.4 PMIC

- PMIC (U2): After system power-on and pull the EN (pin 3) of the PMIC device APW7704FQBI (U2) to high, the PMIC will follow the configured power-on sequence to supply all necessary and different voltages to the target chip MA35D16AJ87C and dedicated peripherals on this NuMaker-HMI-MA35D16AJ2 board, and release the nRESET signal from low to high at the last one sequence step.

U2.#	Pin Name	Output Voltage / MAX. Current
U2.28	LX_DC1	DC 1.2V / 2.5A
U2.19	LX_DC2	DC 1.2V ~ 1.34V / 1.5A
U2.30	LX_DC3*1	DC 1.35V or 1.8V / 1A
U2.14	LX_DC4	DC 3.3V / 2A
U2.33	RTCLDO0	DC 3.05V / 10mA
U2.24	LDO1	DC 2.5V / 150mA
U2.22	LDO2	DC 1.8V / 300mA

Note *1: The output voltage of LX_DC3 depends on the status of U2.30 pin and to supply the voltage to the internal DDR memory and DDR PHY of the target chip MA35D16AJ87C (MCP package with DDR3L SDRAM memory).

Table 3-2 PMIC (U2) Output Voltage

U2.#	Pin Name	GPIO Function / Pin Name of MA35D1
U2.39	SDA	I2C0_SDA / PD6*1
U2.40	SCL	I2C0_SCL / PD7*2
U2.38	nIRQ	PMIC_nIRQ / PA15*3
U2.3	EN*4	RTC_RPWR*5*6

Note *1: This PD6 pin is dedicated as I2C0_SDA function for controlling external PMIC by default.

Note *2: This PD7 pin is dedicated as I2C0_SCL function for controlling external PMIC by default.

Note *3: This PA15 pin is dedicated as PMIC_nIRQ input function from external PMIC by default.

Note *4: This EN input pin of PMIC device APW7704FQBI (U2) can be controlled by RTC_RPWR output of MA35D1, but this EN pin is pulled-up on this NuMaker-HMI-MA35D16AJ2 board by default and it is not controllable by MA35D1 chip. (The R661 resistor is mounted on board but R657 resistor is NC by default)

Note *5: This RTC_RPWR output pin state of MA35D1 is controlled by RTC internal logic and the RTC_nRWAKE input pin state of the target chip MA35D16AJ87C. The RTC_nRWAKE input pin is pulled-down directly on this NuMaker-HMI-MA35D16AJ2 board. (The R659 resistor is mounted on board by default)

Note *6: Although the RTC_nRWAKE input pin is wired directly to the RTC Wake-up key (SW2) on NuMaker-HMI-MA35D16AJ2 board, but it does not need to press the SW2 key button to pull RTC_nRWAKE pin to low after supplied power to this NuMaker-HMI-MA35D16AJ2 board. (SW2 is NC)

Table 3-3 PMIC (U2) Control Pins

3.1.5 eMMC NAND Flash

- eMMC1 NAND Flash Memory Device (U3): An on-board eMMC NAND Flash memory device (PTE7A0MI-16GI, 16 GB) for optional booting source. The booting source depends on the Power-on Setting by the status of DIP Switch (SW3) on the NuMaker-HMI-MA35D16AJ2 board.

Function Name	GPIO pin of MA35D1
eMMC1_DAT4	PJ0
eMMC1_DAT5	PJ1
eMMC1_DAT6	PJ2
eMMC1_DAT7	PJ3
-	PJ4*1
-	PJ5*1*2
eMMC1_CMD	PJ6
eMMC1_CLK	PJ7
eMMC1_DAT0	PJ8
eMMC1_DAT1	PJ9
eMMC1_DAT2	PJ10
eMMC1_DAT3	PJ11

Note *1: No connection (NC) by default.

Note *2: It is necessary to pull the PJ5 pin (SD1_nCD) to low when these PJ0~PJ3 and PJ6~PJ11 pins (eMMC1_xxx) are used to connect with eMMC device and act as the booting source.

Table 3-4 eMMC1 NAND Flash Device (U3) Pin Function

3.1.6 RGMII Gigabit PHY

- RGMII0 Gigabit PHY (U4): The RGMII0 MAC of MA35D1 needs an external Gigabit PHY (RTL8211FDI) and a transformer connect with the Ethernet network.

Function Name	GPIO pin of MA35D1
RGMII0_MDC	PE0
RGMII0_MDIO	PE1
RGMII0_TXCTL	PE2
RGMII0_TXD0	PE3

RGMIIO_TXD1	PE4
RGMIIO_RXCLK	PE5
RGMIIO_RXCTL	PE6
RGMIIO_RXD0	PE7
RGMIIO_RXD1	PE8
RGMIIO_RXD2	PE9
RGMIIO_RXD3	PE10
RGMIIO_TXCLK	PE11
RGMIIO_TXD2	PE12
RGMIIO_TXD3	PE13

Table 3-5 RGMII0 PHY (U4) Pin Function

- RGMII1 Gigabit PHY (U5): The RGMII1 MAC of MA35D1 needs an external Gigabit PHY (RTL8211FDI) and a transformer connect with the Ethernet network.

Function Name	GPIO pin of MA35D1
RGMI11_MDC	PF0
RGMI11_MDIO	PF1
RGMI11_TXCTL	PF2
RGMI11_TXD0	PF3
RGMI11_TXD1	PF4
RGMI11_RXCLK	PF5
RGMI11_RXCTL	PF6
RGMI11_RXD0	PF7
RGMI11_RXD1	PF8
RGMI11_RXD2	PF9
RGMI11_RXD3	PF10
RGMI11_TXCLK	PF11
RGMI11_TXD2	PF12
RGMI11_TXD3	PF13

Table 3-6 RGMII1 PHY (U5) Pin Function

3.1.7 QSPI Flash

- QSPI0 Flash (U17): Winbond SPI NAND Flash (W25N04KWZEIR, 512 MB) for optional booting source, supporting dual / quad mode.

Pin No.	Pin Name	GPIO pin of MA35D1
1	QSPI0_SS0	PD0
2	QSPI0_MISO0	PD3
3	QSPI0_MOSI1	PD4
4	VSS	-
5	QSPI0_MOSI0	PD2
6	QSPI0_CLK	PD1
7	QSPI0_MISO1	PD5
8	QSPI0_VDD*	

Note *: The power group of these GPIO PD0~PD5 belongs to the VDDIO5 power domain of MA35D1 series, the default voltage of VDDIO5 (power input VDD_QSPI0) is VDD1V8 (DC 1.8V) on the NuMaker-HMI-MA35D16AJ2 board. Please make sure the power group voltage of these GPIO PD0~PD5 pins is set at the equal voltage 1.8V on both NuMaker-HMI-MA35D16AJ2 board and NuMaker-HMI-MA35D16AJ2 board.

Table 3-7 QSPI0 Flash (U17) Pin Function

3.1.8 NAND Flash

- NAND Flash (U43): Winbond NAND Flash (W29N08GVSI AA, 1 GB) for optional booting source.

Function Name	GPIO pin of MA35D1
NAND_DATA0	PA0
NAND_DATA1	PA1
NAND_DATA2	PA2
NAND_DATA3	PA3
NAND_DATA4	PA4
NAND_DATA5	PA5
NAND_DATA6	PA6
NAND_DATA7	PA7
NAND_RDY	PA8
NAND_nRE	PA9
NAND_nWE	PA10
NAND_CLE	PA11

NAND_ALE	PA12
NAND_nCS	PA13
NAND_nWP	PA14

Table 3-8 NAND Flash (U43) Pin Function

3.1.9 SD Card Slot

- SD0 Standard-SD Card Slot (CON28): Support SD0 (SD2.0) for optional booting source.

Pin No.	Pin Name	GPIO pin of MA35D1	Note
1	SD0_DTA3	PC5	
2	SD0_CMD	PC0	
3	VSS	-	
4	VDD3V3	-	
5	SD0_CLK	PC1	
6	VSS	-	
7	SD0_DAT0	PC2	
8	SD0_DAT1	PC3	
9	SD0_DTA2	PC4	
10	SD0_nCD	PC6*3	
11	SD0_WP	PC7	
12	VSS	-	
13	HOLD	-	-
14	HOLD	-	-
15*1	SD0_PWR_CTRL#	PD14	R400*2

Note *1: This pin does not belong to the SD0 Standard-SD card slot.

Note *2: Optional GPIO PD14 can control the power of SD0 Standard-SD card slot, but this function is disabled (R400 is NC, No Connection) by default, the power of SD0 Standard-SD card slot is always ON.

Note *3: It is necessary to pull the PC6 pin (SD0_nCD) to low when these PC0~PC5 pins (eMMC0_xxx) are used to connect with eMMC device and act as the booting source.

Table 3-9 SD0 Standard-SD Card Slot (CON28) Pin Function

3.1.10 HS USB2.0 Connectors

- HSUSB0 Host/Device (CON10, USB Micro-AB Receptacle): HSUSB0 can act as an USB Host or Device that depends on the ID pin state of plugged-in USB cable or always acts as Host by shorting with a 0-ohm resistor on the R222 (NC by default) to force the ID pin of HSUSB0 at low state.
- HSUSB1 Host (CON34, USB Type-A Receptacle): HSUSB1 for USB Host with type-A connector.

- USB0_ID Resistor (R222): Optional to pull-down the ID pin of HSUSB0 by mounting a resistor (R222) to force HSUSB0 to always act as an USB Host.

3.1.11 Power-on Setting

- Power-on Setting DIP Switch (SW3): The GPIO PG0, PG1, PG2, PG3, PG4, PG5, PG6 and PG7 determine how to boot the evaluation environment on the NuMaker-HMI-MA35D16AJ2 board. These GPIO pins are internal weakly pull-down.
- Options for enabling or disabling secure booting:

SW3.1 / PG0*	Secure Booting
Low	Enable
High	Disable
Note *: The GPIO PG0 is internal weakly pull-down.	

Table 3-10 Secure Boot Options

- Options for booting source QSPI0 and SD/eMMC I/O voltage selection:

SW3.2 / PG1*	Booting Source QSPI0 and SD/eMMC I/O Voltage
Low	3.3V
High	1.8V
Note *: The GPIO PG1 is internal weakly pull-down.	

Table 3-11 Booting Source QSPI0 and SD/eMMC I/O Voltage Options

- Options for booting source selection:

SW3.4 / PG3* ¹	SW3.3 / PG2* ¹	Booting Source
Low	Low	QSPI0 Flash
Low	High	SD/eMMC* ²
High	Low	NAND Flash
High	High	USB
Note * ¹ : These GPIO PG2 and PG3 are internal weakly pull-down.		
Note * ² : The eMMC1 NAND Flash memory device is on the NuMaker-HMI-MA35D16AJ2 board.		

Table 3-12 Booting Source Options

- Options for booting from NAND Flash device:

SW3.6 / PG5*	SW3.5 / PG4*	Boot from NAND Flash
Low	Low	Ignore
Low	High	NAND Page = 2 KB
High	Low	NAND Page = 4 KB

High	High	NAND Page = 8 KB
Note *: These GPIO PG4 and PG5 are internal weakly pull-down.		

Table 3-13 Page Size Options for NAND Flash Booting Source

SW3.8 / PG7*	SW3.7 / PG6*	Boot from NAND Flash
Low	Low	Ignore
Low	High	BCH T12
High	Low	BCH T24
High	High	NO ECC
Note *: These GPIO PG6 and PG7 are internal weakly pull-down.		

Table 3-14 ECC Options for NAND Flash Booting Source

- Options for booting from SD0/1 card or eMMC0/1 NAND Flash memory device:

SW3.7 / PG6* ¹	Boot from SD/eMMC
Low	SD0/eMMC0 Boot
High	SD1/eMMC1 Boot* ²
Note * ¹ : The GPIO PG6 is internal weakly pull-down.	
Note * ² : The eMMC1 NAND Flash memory device is on the NuMaker-HMI-MA35D16AJ2 board.	

Table 3-15 Options for SD Card 0/1 or eMMC 0/1 NAND Flash Device Booting Source

SW3.8 / PG7* ¹	Boot from SD/eMMC
Low	eMMC 4-bit Booting* ²
High	eMMC 8-bit Booting* ²
Note * ¹ : The GPIO PG7 is internal weakly pull-down.	
Note * ² : The eMMC1 NAND Flash memory device is on the NuMaker-HMI-MA35D16AJ2 board.	

Table 3-16 4/8-bit Options for eMMC NAND Flash Device Booting Source

- Options for booting from QSPI0 Flash device:

SW3.8 / PG7* ¹	SW3.7 / PG6* ¹	Boot from QSPI0 Flash
Low	Low	SPI NAND 1-bit* ²
High	Low	SPI NOR 1-bit* ²
Note * ¹ : These GPIO PG6 and PG7 are internal weakly pull-down.		
Note * ² : SPI NAND Flash memory device (U17, default) is on this NuMaker-HMI-MA35D16AJ2 board.		

Table 3-17 1-bit Options for QSPI0 NAND/NOR Flash Booting Source

- Options for booting from USB or USBH:

SW3.5 / PG4* ¹	Boot from USB
Low	USB Device Booting
High	USB Host Booting* ²
Note * ¹ : The GPIO PG4 is internal weakly pull-down.	
Note * ² : It does not support the USB Host booting source on this NuMaker-HMI-MA35D1-A1 board.	

Table 3-18 Options for USB or USBH Booting Source

SW3.6 / PG5* ¹	Boot from USBH* ²
Low	USBH Port 0 Booting
High	USBH Port 1 Booting
Note * ¹ : The GPIO PG5 is internal weakly pull-down.	
Note * ² : It does not support the USB Host booting source on this NuMaker-HMI-MA35D1-A1 board.	

Table 3-19 USBH Port 0/1 Options for USBH Booting Source

SW3.7 / PG6* ¹	Boot from USBH* ²
Low	Over-current Low-active Detect
High	Over-current High-active Detect
Note * ¹ : The GPIO PG6 is internal weakly pull-down.	
Note * ² : It does not support the USB Host booting source on this NuMaker-HMI-MA35D1-A1 board.	

Table 3-20 Over-current High/Low-active Detect Options for USBH Booting Source

3.1.12 Gigabit Ethernet Transformers and RJ45 Ports

- RGMII0 Gigabit Ethernet Transformer (U8): Gigabit Ethernet transformer (GST5009BM) to isolate the differential signals from the Gigabit PHY device on the NuMaker-HMI-MA35D16AJ2 board and pass these signals to the Ethernet network through the RJ45 connector (U13).
- RGMII1 Gigabit Ethernet Transformer (U11): Gigabit Ethernet transformer (GST5009BM) to isolate the differential signals from the Gigabit PHY device on the NuMaker-HMI-MA35D16AJ2 board and pass these signals to the Ethernet network through the RJ45 connector (U14).
- RGMII0 RJ45 Connector (U13): The Gigabit Ethernet RGMII0 RJ45 connector.
- RGMII1 RJ45 Connector (U14): The Gigabit Ethernet RGMII1 RJ45 connector.

3.1.13 CMOS Sensor Capture Connectors

- CCAP0 Connector (CON7): This connector is used to connect CMOS sensor for image capture application through the CCAP0 (Camera Capture 0) interface.

Pin No.	Pin Name	GPIO pin of MA35D1	Default Connected R#	Note
1	VSS	-	-	-

2	VSS	-	-	-
3	CCAP0_PIXCLK	PK10	R114	-
4	CCAP0_SCLK	PK9	R113	-
5	CCAP0_DATA0	PM2	R101	-
6	CCAP0_DATA1	PM3	R102	-
7	CCAP0_DATA2	PM4	R567	-
8	CCAP0_DATA3	PM5	R568	-
9	CCAP0_DATA4	PM6	R569	-
10	CCAP0_DATA5	PM7	R570	-
11	CCAP0_DATA6	PM8	R107	-
12	CCAP0_DATA7	PM9	R109	-
13	CCAP0_DATA8	PM10	R111	-
14	CCAP0_DATA9	PM11	R112	-
15	CCAP0_VSYNC	PM0	R116	-
16	CCAP0_HSYNC	PK11	R115	-
17	CCAP0_PWDN	PK8	R118	-
18	CCAP0_nRST	PM1	R117	-
19	CCAP0_I2C3_SCL	PM15	R99	
20	CCAP0_I2C3_SDA	PM14	R97	
21	VDD3V3	-	-	-
22	VDD3V3	-	-	-
23	VSS	-	-	-
24	VSS	-	-	-
Note *: No connection (NC) by default.				

Table 3-21 CCAP0 Connector (CON7) Pin Function

3.1.14 EADC Header

- EADC0 Header (J6): The EADC0 analog channel input header.

Pin No.	Pin Name	Pin Name of MA35D1	Default Connected R#
1	ECH0	EADC0_CH0	R537
2	ECH2	EADC0_CH2	R541
3	ECH4	EADC0_CH4	R538

4	ECH6	EADC0_CH6	R542
5	ECH1	EADC0_CH1	R539
6	ECH3	EADC0_CH3	R543
7	ECH5	EADC0_CH5	R540
8	ECH7	EADC0_CH7	R544
9	AVSS_E*	-	-
10	AVSS_E*	-	-
Note *: AVSS_E is the EADC0 analog ground.			

Table 3-22 EADC0 Header (J6) Pin Function

3.1.15 UART

- UART0 Port, Tamper Pin, CAN1_H/L and CAN3_H/L Header (J1): This header includes the TXD/RXD pins of UART0, the tamper pins (TAMPER0, TAMPER1), CAN1_H/L pins and CAN3_H/L pins.

Pin No.	Pin Name	GPIO pin of MA35D1
1	UART0_TX	PE14
2	UART0_RX	PE15*
3	TAMPER0	PH8
4	TAMPER1	PH9
5	CAN1_H	-
6	CAN3_H	-
7	CAN1_L	-
8	CAN3_L	-
Note *: The GPIO PE15 (UART0_RXD) pin must be pulled to high level through an external resistor or an internal pull-up resistor in the external device (such as a transceiver or MCU).		

Table 3-23 UART0, Tamper Pin, CAN1_H/L and CAN3_H/L Header (J1) Pin Function

- RS232 Transceiver (U21) and DB9 Connector (CON13): The UART11 transceiver (SN75C3232EDR) and DB9 connector.

Function Name	GPIO pin of MA35D1	Default Connected R#
UR11_nCTS	PL0	R592
UR11_nRTS	PL1	R593
UR11_RXD	PL2	R594
UR11_TXD	PL3	R595

Table 3-24 UART11 (U21, CON13) Pin Function

- RS232 Transceiver (U35) and DB9 Connector (CON14): The UART16 transceiver (SN75C3232EDR) and DB9 connector.

Function Name	GPIO pin of MA35D1	Default Connected R#
UR16_nCTS	PK0	R596
UR16_nRTS	PK1	R597
UR16_RXD	PK2	R598
UR16_TXD	PK3	R599
Note *: No connection (NC) by default.		

Table 3-25 UART16 (U35, CON14) Pin Function

3.1.16 RS485

- RS485 Transceiver (U22) and Connector (CON15): The UART12 transceiver (SN65HVD11DR) and connector.

Function Name	GPIO pin of MA35D1	Default Connected R#
UR12_nRTS	PI1	R342
UR12_RXD	PI2	R341
UR12_TXD	PI3	R340
Note *: No connection (NC) by default.		

Table 3-26 UART12 (U22, CON15) Pin Function

- RS485 Transceiver (U23) and Connector (CON16): The UART14 transceiver (SN65HVD11DR) and connector.

Function Name	GPIO pin of MA35D1	Default Connected R#
UR14_nRTS	PI5	R339
UR14_RXD	PI6	R338
UR14_TXD	PI7	R337
Note *: No connection (NC) by default.		

Table 3-27 UART14 (U23, CON16) Pin Function

- RS485 Transceiver A/B I/O and Ground VSS Header (J12): This header includes the RS485 transceiver I/O pins A3_1, B3_1, A3_2, B3_2, and Ground VSS pins.

Pin No.	Pin Name	Pin No.	Pin Name
1	B3_1	2	B3_2

3	A3_1	4	A3_2
5	VSS	6	VSS
7	VSS	8	VSS

Table 3-28 RS485 Transceiver A/B I/O and Ground VSS Header (J12) Pin Function

3.1.17 CAN FD

- CAN Transceiver (U25) and Connector (CON17): The CAN1 transceiver (TLE9351VSJR) and connector.

Function Name	GPIO Pin of MA35D1
CAN1_RXD	PL14
CAN1_TXD	PL15

Table 3-29 CAN1 (U25, CON17) Pin Function

- CAN Transceiver (U26) and Connector (CON18): The CAN3 transceiver (TLE9351VSJR) and connector.

Function Name	GPIO pin of MA35D1
CAN3_RXD	PL10
CAN3_TXD	PL11

Table 3-30 CAN3 (U26, CON18) Pin Function

3.1.18 SWJ, SWD and ETM

- SWJ_nRESET Connector (J7): A jumper is needed if SWJ_nRESET should be connected with nRESET signal.
- SWJ Interface (J49): Arm JTAG and SWD interface for tracing or debugging code.

Pin No.	Pin Name	GPIO pin of MA35D1	Default Connected R#
1	VDD3V3	-	-
2	JTAG_nTRST	PG15	R294
3	JTAG_TDI	PG14	R292
4	JTAG_TMS_SW_DIO	PG13	R291
5	JTAG_TCK_SW_CLK	PG12	R290
6	JTAG_TDO	PG11	R289
7	SWJ_nRESET	nRESET	J7
8	VSS	-	--

Note *: No connection (NC) by default.

Table 3-31 SWJ Interface (J49) Pin Function

3.1.19 USB Virtual COM (VCOM) Port

- USB VCOM Port (CON21, USB Micro-AB Receptacle): The microcontroller NUC123ZD4AN0 (U29) acts as an USB VCOM device to communicate data between the UART0 port of MA35D1 series and USB host of PC. An USB cable should be connected with this micro-B connector (CON21) and should be plugged-in the PC host to display the debug messages on PC. (Optional)

Note: The GPIO PE15 (UART0_RXD) pin must be pulled to high level through an external resistor or an internal pull-up resistor in the external device (such as a transceiver or MCU).

- VCOM Controller (U29): The microcontroller NUC123ZD4AN0 (U29) acts as an USB VCOM device to communicate data between the UART0 port of MA35D1 chip and USB host of PC.
- NUC123 ICE Interface (J9): The ICE interface of NUC123ZD4AN0 microcontroller (U29) for programming the internal Flash of NUC123 MCU. The internal Flash of NUC123 MCU had been programmed and acts as an USB VCOM device before this NuMaker-HMI-MA35D16AJ2 board be delivered by Nuvoton.

Pin No.	Pin Name	Functions
1	VCOM_3.3V	DC 3.3V
2	N123_ICE_DAT	SWD data pin of NUC123
3	N123_ICE_CLK	SWD clock pin of NUC123
4	N123_nRST	Reset pin of NUC123
5	VSS	Ground

Table 3-32 NUC123 ICE Interface (J9) Pin Function

3.1.20 Reset and RTC Wake-up Key Buttons

- Reset Key Button (SW8): Press this key to reset the MA35D1 target chip on the NuMaker-HMI-MA35D16AJ2 board.
- RTC Wake-up Key Button (SW2): Press ths key to wake up the MA35D1 target chip on the NuMaker-HMI-MA35D16AJ2 board from standby state. (This funtion is reserved and the SW2 key button is not mounted on board)

3.1.21 TFT LCD Connector

- LCM Connector (CON12):

Pin No.	Pin Name	GPIO pin of MA35D1	Default Connected R#	Conflict Function / R#
1	VDD3V3	-	-	-
2	VDD3V3	-	-	-
3	LCM_CS	PK6	R240	-
4	LCM_BLEn	PK7	R241	-
5	LCM_DEN	PK4	R238	-
6	LCM_VSYSNC	PG8	R235	-
7	LCM_HSYNC	PG9	R236	-

8	LCM_CLK	PG10	R237	-
9	LCM_DATA23	PH15	R268	-
10	LCM_DATA22	PH14	R269	-
11	LCM_DATA21	PH13	R267	-
12	LCM_DATA20	PH12	R266	-
13	LCM_DATA19	PC15	R264	-
14	LCM_DATA18	PC14	R265	-
15	LCM_DATA17	PC13	R263	-
16	LCM_DATA16	PC12	R261	-
17	LCM_DATA15	PH7	R258	-
18	LCM_DATA14	PH6	R260	-
19	LCM_DATA13	PH5	R257	-
20	LCM_DATA12	PH4	R254	-
21	LCM_DATA11	PH3	R253	-
22	LCM_DATA10	PH2	R252	-
23	LCM_DATA9	PH1	R251	-
24	LCM_DATA8	PH0	R250	-
25	LCM_DATA7	PI15	R249	-
26	LCM_DATA6	PI14	R248	-
27	LCM_DATA5	PI13	R247	-
28	LCM_DATA4	PI12	R246	-
29	LCM_DATA3	PI11	R245	-
30	LCM_DATA2	PI10	R244	-
31	LCM_DATA1	PI9	R243	-
32	LCM_DATA0	PI8	R242	-
33	-	-	-	-
34	-	-	-	-
35	-	-	-	-
36	-	-	-	-
37	LCM_PWM	PK5	R239	
38	LCM_RST	PM12	R233	nRESET / R234*

39	VSS	-	-	-
40	VSS	-	-	-
41	LCM_XP	PB15	R262	-
42	LCM_VSENSE	PB11	R231*	I2C1_SCL / R229
43	LCM_XM	PB14	R259	-
44	LCM_YM	PB12	R255	-
45	-	-	-	-
46	LCM_YP	PB13	R256	-
47	VSS	-	-	-
48	VSS	-	-	-
49	LCM_I2C5_SCL	PJ13	R270	
50	LCM_I2C5_SDA	PJ12	R271	
51	TOUCH_INT	PD12	R232	
52	-	-	-	
53	I2C1_SDA	PB10	R589	
54	I2C1_SCL	PB11	R229	LCM_VSENSE / R231*
55	-	-	-	-
56	-	-	-	-
57	-	-	-	-
58	-	-	-	-
59	VSS	-	-	-
60	VSS	-	-	-
61	-	-	-	-
62	-	-	-	-
63	VDD5V	-	-	-
64	VDD5V	-	-	-
Note *: No connection (NC) by default.				

Table 3-33 LCM Connector (CON12) Pin Function

3.1.22 Audio Codec

- Speaker Pads (T14 and T15): To connect a speaker to output audio sound.
- Microphone (M1): An on-board microphone for audio sound input.

- Headset Jack (CON11): A headset input jack that follows CTIA definition.
- Audio Codec Device (U18): Nuvoton NAU88C22YG is audio codec device that integrates microphone input, speaker output and headphone output for audio application on this NuMaker-HMI-MA35D16AJ2 board.

Function Name	GPIO pin of MA35D1
I2S0_MCLK	PN15
I2S0_LRCK	PK12
I2S0_BCLK	PK13
I2S0_DI	PK14
I2S0_DO	PK15

Table 3-34 I2S0 (U18) Pin Function

Function Name	GPIO pin of MA35D1
I2S_I2C2_SDA	PB8
I2S_I2C2_SCL	PB9

Table 3-35 I2C2 (U18) Pin Function

Function Name	GPIO pin of MA35D1
AUDIO_JKEN#	PD13
AUDIO_JKDET	PI0
Note *: No connection (NC) by default.	

Table 3-36 Audio Codec (U18) Control Pin Function

3.1.23 Key Buttons, LEDs, Buzzer and Fan Control

- User-defined Key Buttons (KEY_1, KEY_2 and KEY_3):

KEY_#	SW#	GPIO pin of MA35D1	Pull-up Power
KEY_1	SW5	PD8	DC 3.3V
KEY_2	SW6	PD9	DC 3.3V
KEY_3	SW7	PF14	DC 1.8V*
Note *: The power group of this GPIO PF14 pin belongs to the VDDIO9 power domain of MA35D1 series, the default voltage of VDDIO9 (power input F_VDDIO) is VDD1V8 (DC 1.8V) on the NuMaker-HMI-MA35D16AJ2 board. Please make sure the power group voltage of this GPIO PF14 pin is set at the equal voltage 1.8V on both NuMaker-HMI-MA35D16AJ2 board.			

Table 3-37 Key Buttons (KEY_1, KEY_2 and KEY_3) Pin Function

- User Indication LEDs (LED_0 and LED_1):

LED_#	Function / Color	GPIO pin of MA35D1
LED_0	LEDG4 / Green	PJ14
LED_1	LEDR1 / Red	PJ15

Table 3-38 LEDs (LED_0 and LED_1) Pin Function

- Buzzer Pads (T23 and T24): To connect a buzzer to output sound.
- Fan Control (FAN_EN, FAN_PWM and FAN_SP): To turn on or turn off the fan by FAN_EN (PI4) pin high or low state.

Function Name	GPIO pin of MA35D1	Default Connected R#	Conflict Function / R#
FAN_EN	PI4	R327	FAN_PWM / R328*
FAN_PWM	PI4	R328*	FAN_EN / R327
FAN_SP	PL7	R329	
Note *: No connection (NC) by default.			

Table 3-39 Fan Control (FAN_EN, FAN_PWM and FAN_SP) Pin Function

- 2-pin Fan Connector (J10):

Pin No.	Pin Name	Function	GPIO pin of MA35D1	Type
1	VSS	GND	-	Power
2	VDD5V	Controlled DC 5V by FAN_EN	PI4	Output

Table 3-40 2-pin Fan Connector (J10) Pin Function

- 4-pin Fan Connector (J11): This connector is NC by default.

Pin No.	Pin Name	Function	GPIO pin of MA35D1	Type
1	VSS	GND	-	Power
2	VDD5V	Fixed DC 5V	-	Power
3	FAN_SP	Fan speed signal	PL7	Input
4	FAN_PWM	Fan PWM signal	PI4	Output

Table 3-41 4-pin Fan Connector (J11) Pin Function

3.2 7" TFT LCD Daughter Board

3.2.1 Front View

Figure 3-3 shows the main components from the front view of 7" TFT LCD daughter board and an on-board 7" 4-wire resistive touch TFT LCD panel.

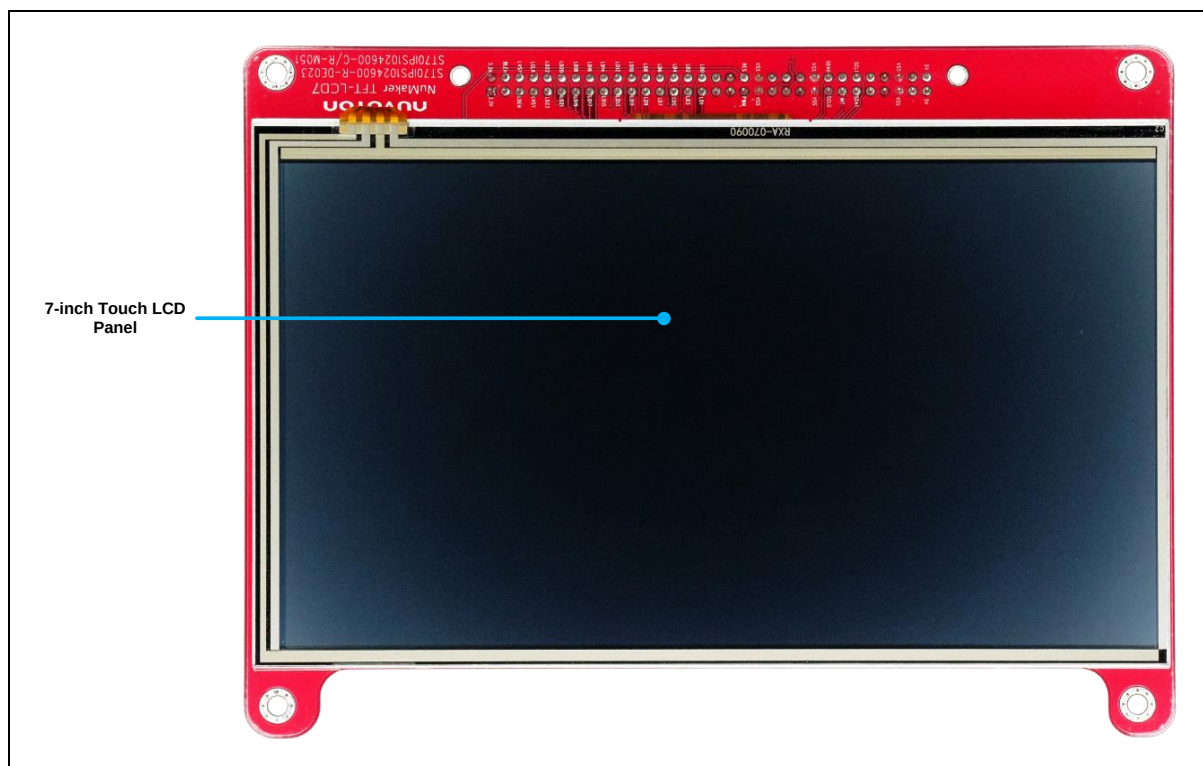


Figure 3-3 Front View of 7" TFT LCD Daughter Board

3.2.2 Rear View

Figure 3-4 shows the main components from the rear view of 7" TFT LCD daughter board.

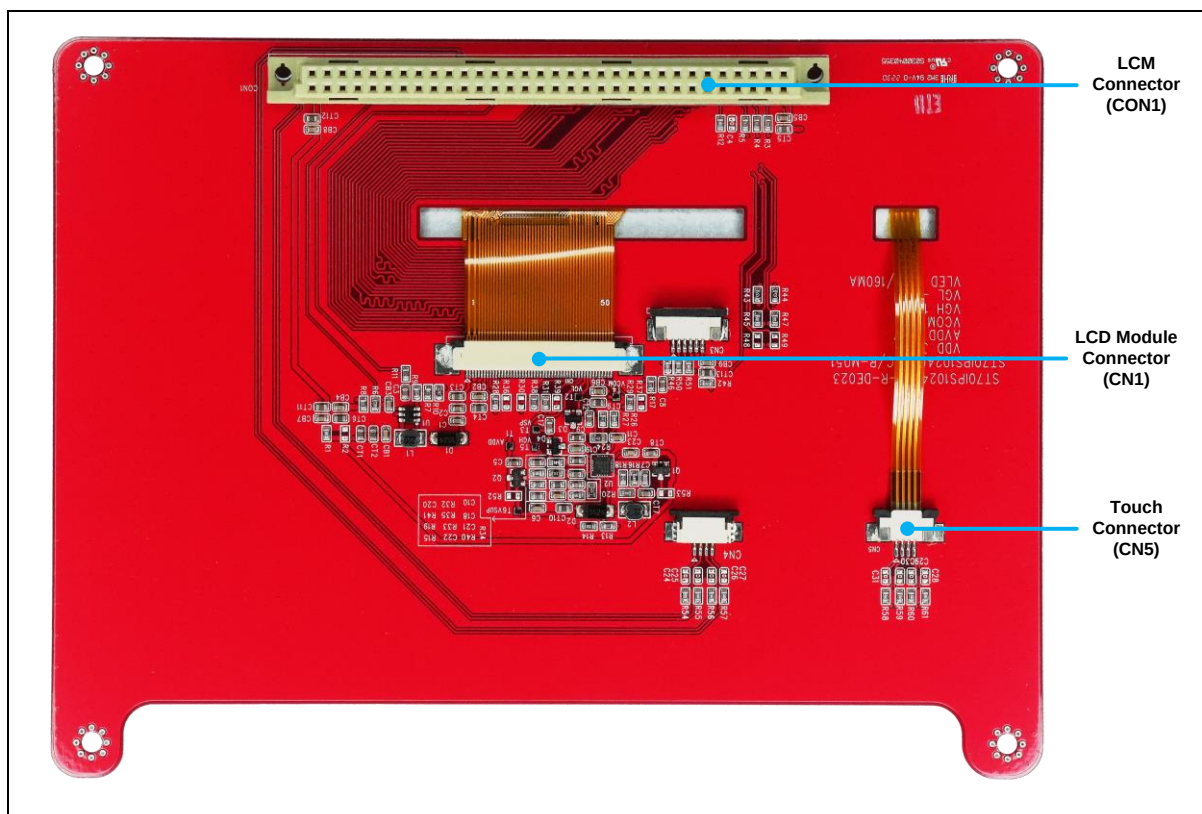


Figure 3-4 Rear View of 7" TFT LCD Daughter Board

3.2.3 Connectors

- LCD Module Connector (CN1): FPC (pitch-0.5mm x 50) connector of TFT LCD module.
- LCM Connector (CON1): To connect with the LCM connector (CON9) of the NuMaker-HMI-MA35D16AJ2 board.
- Touch Connector (CN5): 4-wire resistive-touch connector of TFT LCD touch screen.

4 QUICK START

This chapter guides users step by step to start the NuMicro NuMaker-HMI-MA35D1-A1 evaluation environment based on the assembled boards: NuMaker-HMI-MA35D16AJ2 board, NuMaker-HMI-MA35D16AJ2 board and TFT LCD daughter board. After the steps are completed successfully, users can see the demonstration on the LCD screen and try to operate the demonstration on the LCD screen by finger touch. For more detailed information and description about the board hardware setting and configuration of NuMaker-HMI-MA35D16AJ2 board and NuMaker-HMI-MA35D16AJ2 board, please see the Hardware Configuration chapter.

4.1 Hardware Setup and Power On

4.1.1 Configure Power-on Setting

The first step is to make sure the power-on setting for the booting source selection on the DIP Switch (SW3) that followed the correct ON/OFF states as shown in Table 4-3 and Table 4-4.

After choosing the correct power-on setting on these DIP switches, the evaluation environment will boot from the image stored in the eMMC1 NAND Flash memory device mounted on the NuMaker-HMI-MA35D16AJ2 board when power is supplied to the NuMaker-HMI-MA35D16AJ2 board.

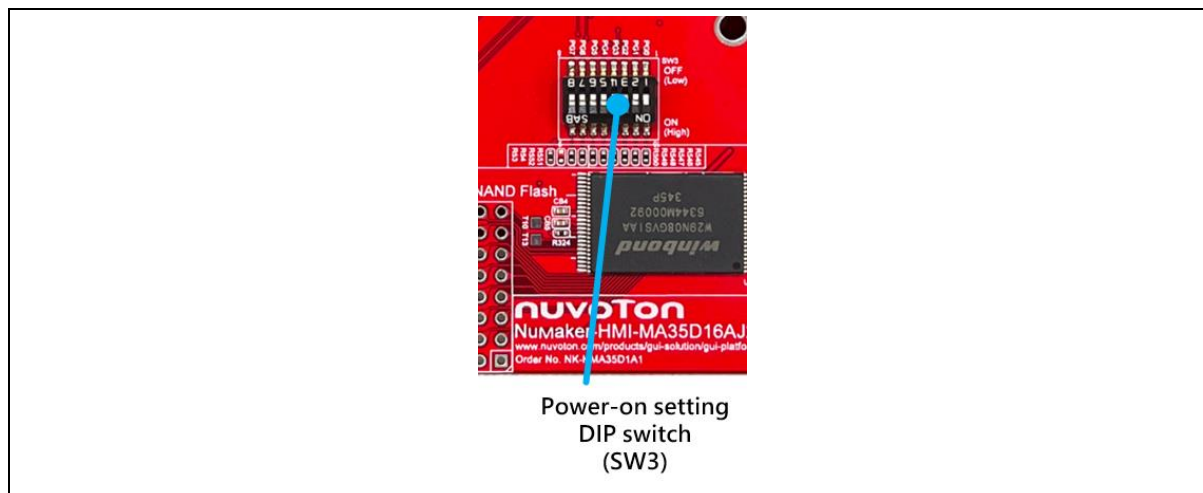


Figure 4-1 Power-on Setting DIP Switch (SW3)

- Options for secure boot enable or disable:

SW3.1 / PG0*	Secure Booting
Low	Enable
High (ON)	Disable
Note *: The GPIO PG0 is internal weakly pull-down.	

Table 4-1 Secure Boot Disable Configuration

- Options for booting source QSPI0 and SD/eMMC I/O voltage selection:

SW3.1 / PG1*	Boot Source QSPI0 and SD/eMMC I/O Voltage
Low	3.3V
High (ON)	1.8V

Note *: The GPIO PG1 is internal weakly pull-down.

Table 4-2 eMMC1 Boot Source I/O Voltage Configuration

- Options for booting source selection:

SW3.4 / PG3*	SW3.3 / PG2*	Boot Source
Low	Low	QSPI0 Flash
Low (OFF)	High (ON)	SD/eMMC
High	Low	NAND Flash
High	High	USB
Note *: These GPIO PG2 and PG3 are internal weakly pull-down.		

Table 4-3 SD/eMMC Boot Source Configuration

- Options for booting from eMMC1 NAND Flash memory device:

SW3.7 / PG6* ¹	Boot from SD/eMMC
Low (OFF)	SD0/eMMC0 Boot
High (ON)	SD1/eMMC1 Boot*²
Note * ¹ : The GPIO PG6 is internal weakly pull-down.	
Note * ² : The eMMC1 NAND Flash memory device is on the NuMaker-HMI-MA35D16AJ2 board.	

Table 4-4 eMMC1 Boot Source Configuration

SW3.8 / PG7* ¹	Boot from SD/eMMC
Low	eMMC 4-bit Booting* ²
High	eMMC 8-bit Booting*²
Note * ¹ : The GPIO PG7 is internal weakly pull-down.	
Note * ² : The eMMC1 NAND Flash memory device is on the NuMaker-HMI-MA35D16AJ2 board.	

Table 4-5 eMMC1 NAND Flash Device Boot Source eMMC 8-bit Configuration

4.1.2 Power On the NuMaker-HMI-MA35D16AJ2 Board

The third step is to insert the USB Type-C power cable that can supply 5V/1.5A power into the power connector (CON35) on the NuMaker-HMI-MA35D16AJ2 board.

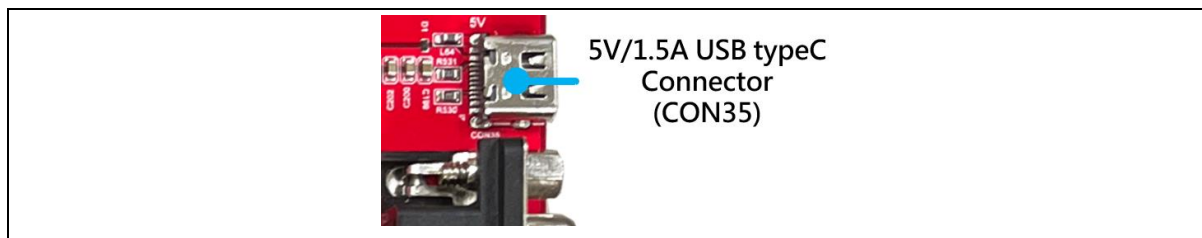


Figure 4-2 Power Connector (CON35)

4.1.3 VCOM Port (Optional)

User can connect the USB micro-B connector (CON21) and plug-in to the PC host with an USB cable to display the messages on PC when the evaluation environment is booting or CPU is running in the Linux kernel. User also needs to select the right serial COM port on the PC and setup the serial port at 115200 Baud rate, 8-bit Data, none Parity bit, 1-bit Stop bit and none Flow Control.

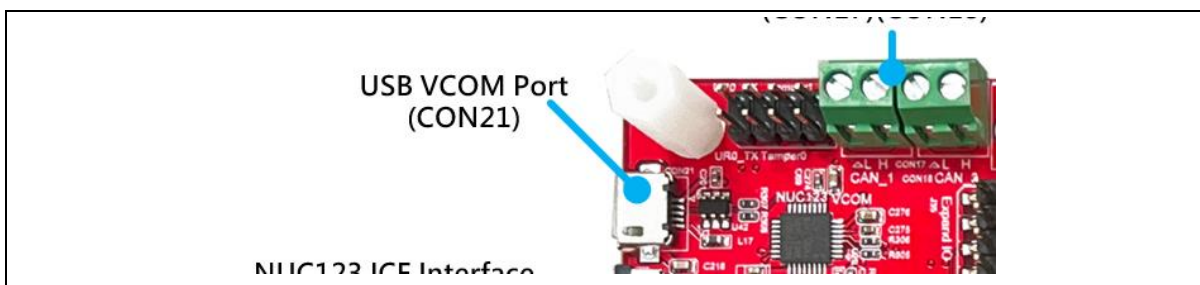


Figure 4-3 USB VCOM Port (CON21)

4.2 Demo Image

The NuMaker-HMI-MA35D1-A1 launches the HMI demo application automatically when the EVB powers up. The HMI demo image can be downloaded from the [Nuvoton Web Resources](#).

The demo application comprises four distinct applications: EV Charging Station UI, Industrial Control UI, Coffee Machine UI, and Speed Meter UI. The demo application architecture is shown in Table 4-6.

HMI Demo Application	Description
	The Demo Application UI This is the homepage of the HMI. The homepage includes four buttons corresponding to four different applications. This demonstration showcases four industrial HMI designs. Users can swipe and select the application UI to display.
	EV Charging Station Button This UI is designed by the Qt Library. It showcases three pages: an advertisement display, a random price calculation page, and a charging page. The demonstration includes video playback and audio playback functions.
	Industrial Control Button This UI is designed by emWin AppWizard. It showcases a single page data collection station with a variety of button functionalities integrated with an alarm monitoring feature.
	Coffee Machine Button This UI is designed by emWin AppWizard. The smart home appliance UI demonstrates quick multilingual switching and smooth page transitions.
	Speed Meter Button This UI is designed by emWin AppWizard. It features a fast response time for electric scooter UI, displaying vehicle status information in real-time.

Table 4-6 HMI Demo Application Table

4.2.1 EV Charging Station UI

The application takes the charging interface as an example to show the charging process procedure. There are three pages: the Home Page, Price Calculation Page, and Charging Page. The structure is detailed in Table 4-7

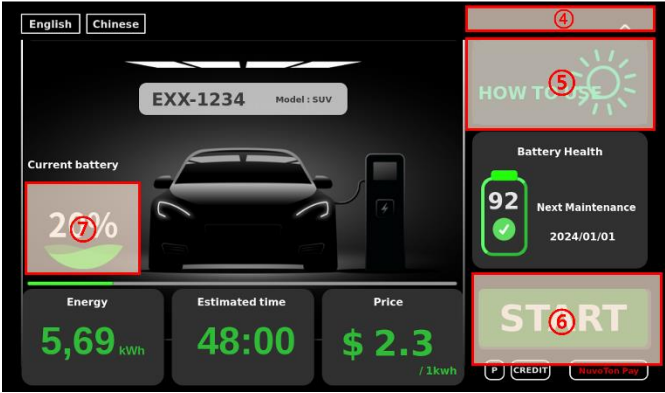
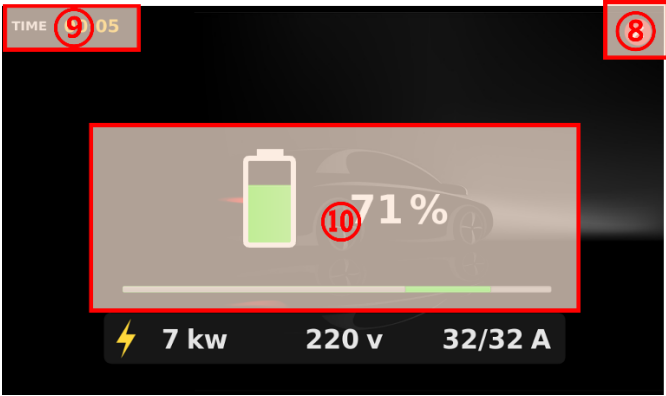
EV Charging Station UI	Description
 Home Page	①. Exit application demo ②. Click to jump to Price Calculation Page ③. Ad carousel display ④. Return to Home Page ⑤. Play video ⑥. Click to jump to Charging Page
 Price Calculation Page	⑦. Current battery capacity ⑧. Return to Home Page ⑨. Accumulated charging time ⑩. Current charging progress bar
 Charging Page	

Table 4-7 EV Charging Station UI Pagination Instructions Table

4.2.2 Industrial Control UI

The application takes industrial controllers as an example to show diverse elements. There are two pages: the Home Page and the Control Page. Users can refer to Table 4-8 for pagination operation instructions.

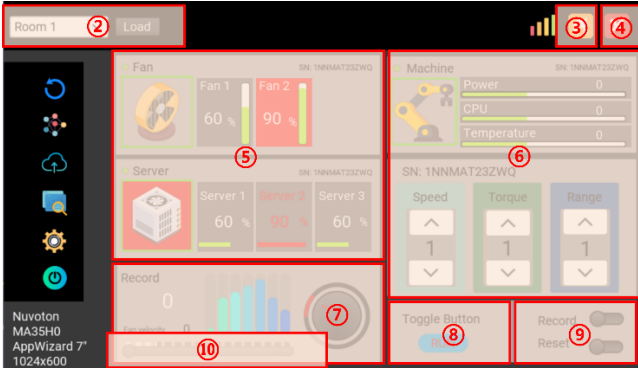
Industrial Control UI	Description
 Home Page	①. Home page Jump to the Control Page after 3 seconds ②. Drop-down menu ③. Return to Home Page ④. Exit Application Demo ⑤. Machine status bar and alarm display ⑥. Machine control buttons ⑦. Rotary switch ⑧. Automatic operation ⑨. Switch object ⑩. Slider object
 Control Page	

Table 4-8 Industrial Control UI Pagination Instructions Table

4.2.3 Coffee Machine UI

The application takes smart home appliances as an example to demonstrate the rapid switching of multiple languages. There are three pages: Home Page, Coffee Page, and Waiting Page. Users can refer to Table 4-9 for pagination operation instructions.

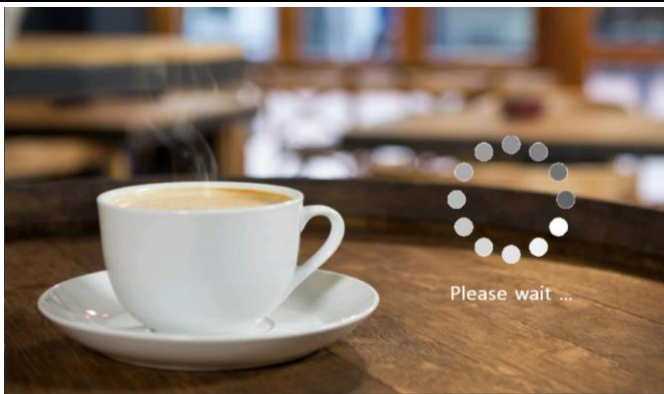
Coffee Machine UI	Description
 Home Page	①. Init page ②. Switch between multiple languages (EN = English, TC = Traditional Chinese, JP = Japanese Language, KR = Korean Language) ③. Click to select coffee item ④. Click to jump to another Coffee Page ⑤. Return to Home Page ⑥. Exit Application Demo
 Coffee Page	
 Waiting Page	

Table 4-9 Coffee Machine UI Pagination Instructions Table

4.2.4 Speed Meter UI

The application takes smart meter appliances as an example to demonstrate instant refresh effect without delay. There is only one page: Meter Page. Users can refer to Table 4-10 for pagination operation instructions.

Speed Meter UI	Description
 Meter Page	①. Exit Application Demo ②. Current speed meter ③. Left and right turn signal buttons ④. Mode switching ⑤. Current status display ⑥. Sub-Display window ⑦. Fault display

Table 4-10 Speed Meter UI Pagination Instructions Table

5 SUPPORTING RESOURCES

5.1 Documents

For more details about MA35D1 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 Arm Cortex-A35 MPUs product line for the MA35D1 series products from the “Products” menu on the [Nuvoton website](https://www.nuvoton.com) homepage.

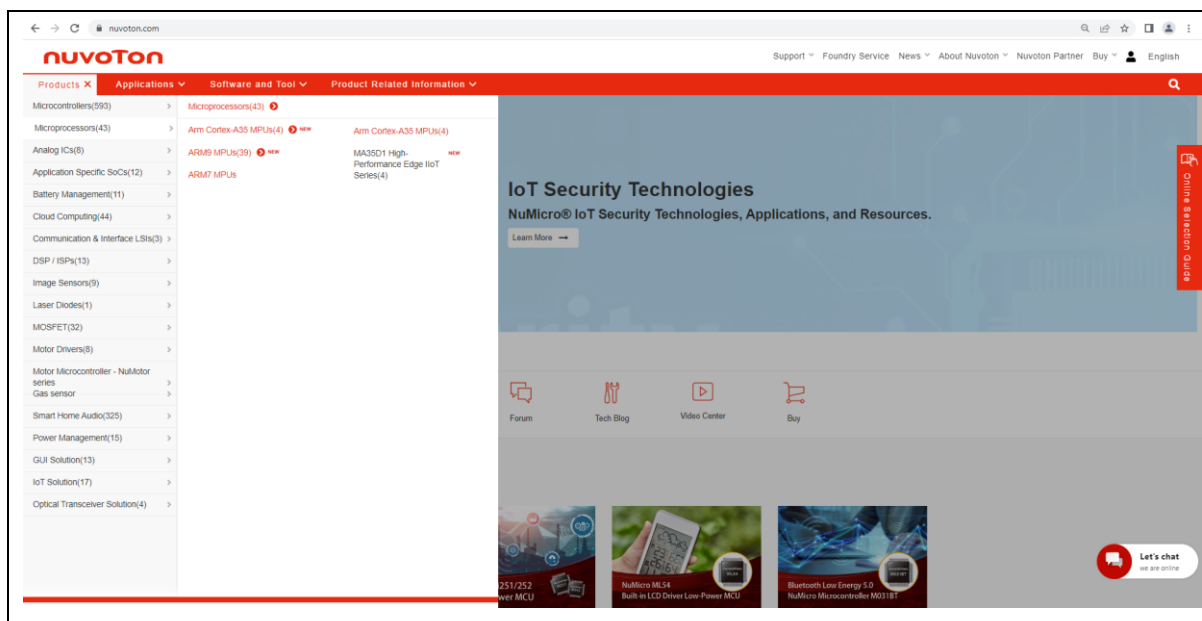


Figure 5-1 Nuvoton Website

5.2 Software

For more details about MA35D1 series software, for example, BSP (Board Support Package), Yocto, Buildroot, U-Boot, Linux, software NuWriter tool and example code, please visit [GitHub's website](https://github.com). The related Github resources are listed and shown as Figure 5-2.

9. MA35D1

- [Yocto](#)
- [Buildroot](#)
- [TF-A](#)
- [OP-TEE](#)
- [U-Boot](#)
- [Linux-5.10.y](#)
- [Linux Applications](#)
- [RTP](#)
- [OpenWrt](#)
- [NuWriter](#)
- [Docker](#)
- [VMWare Linux develop environment](#)
 - username: user
 - password: user

Figure 5-2 MA35D1 GitHub Resources

6 HARDWARE SCHEMATICS

6.1 NuMaker-HMI-MA35D16AJ2 Schematics

6.1.1 System Block

Figure 6-1 shows the system block of the NuMaker-HMI-MA35D16AJ2 board.

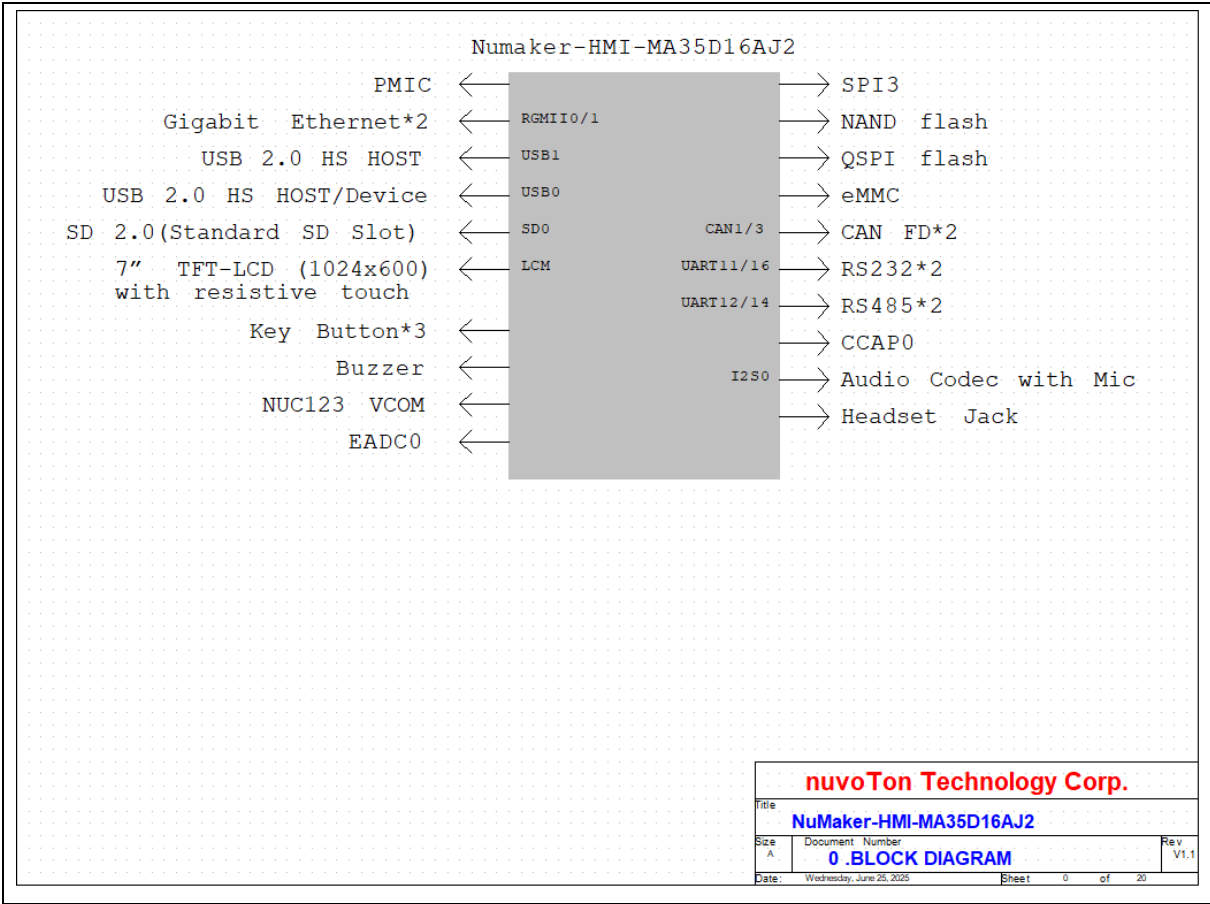


Figure 6-1 System Block

Figure 6-2 shows the PMIC, crystal and power filter circuit of the NuMaker-HMI-MA35D16AJ2 board.

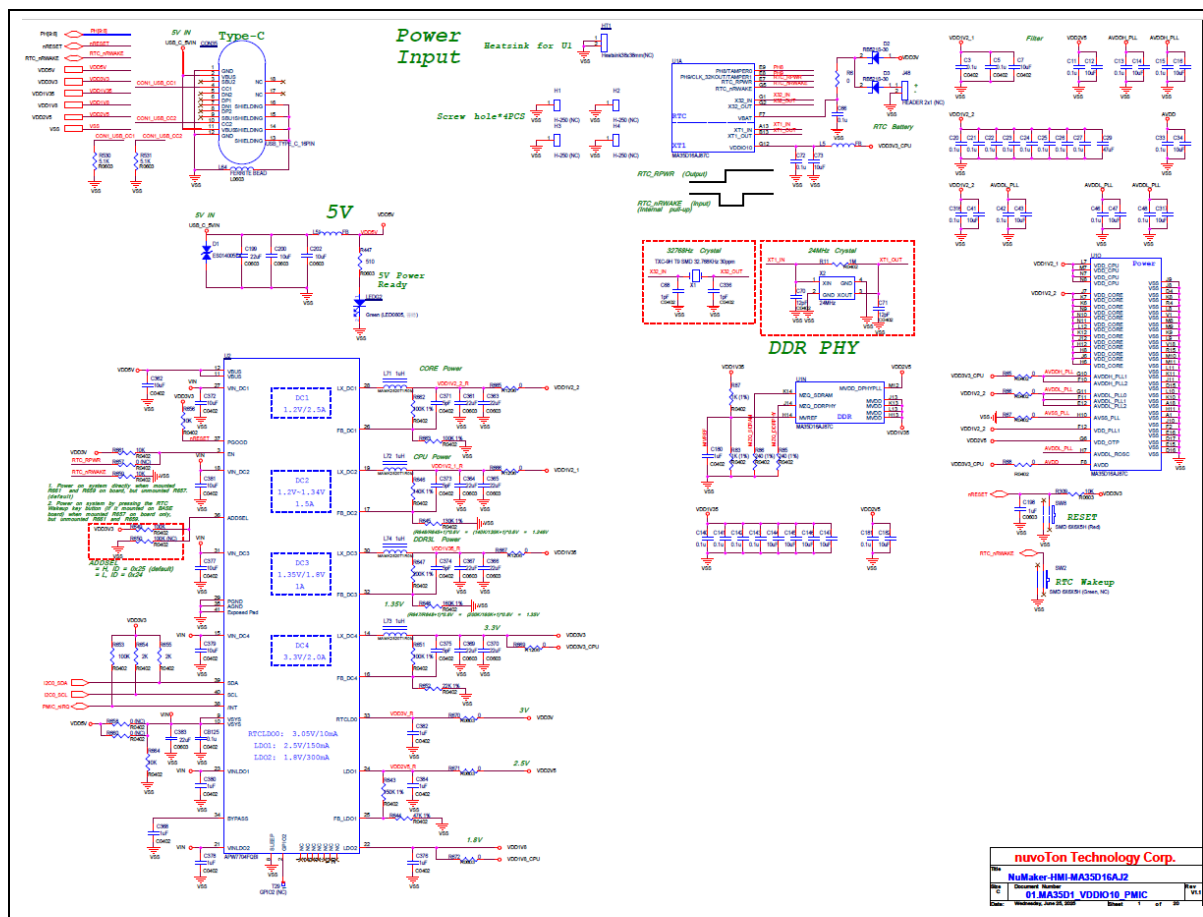


Figure 6-2 PMIC, Crystal and Power Filter Schematic

6.1.3 Power Group 1

Figure 6-3 shows the power group 1 circuit of the NuMaker-HMI-MA35D16AJ2 board.

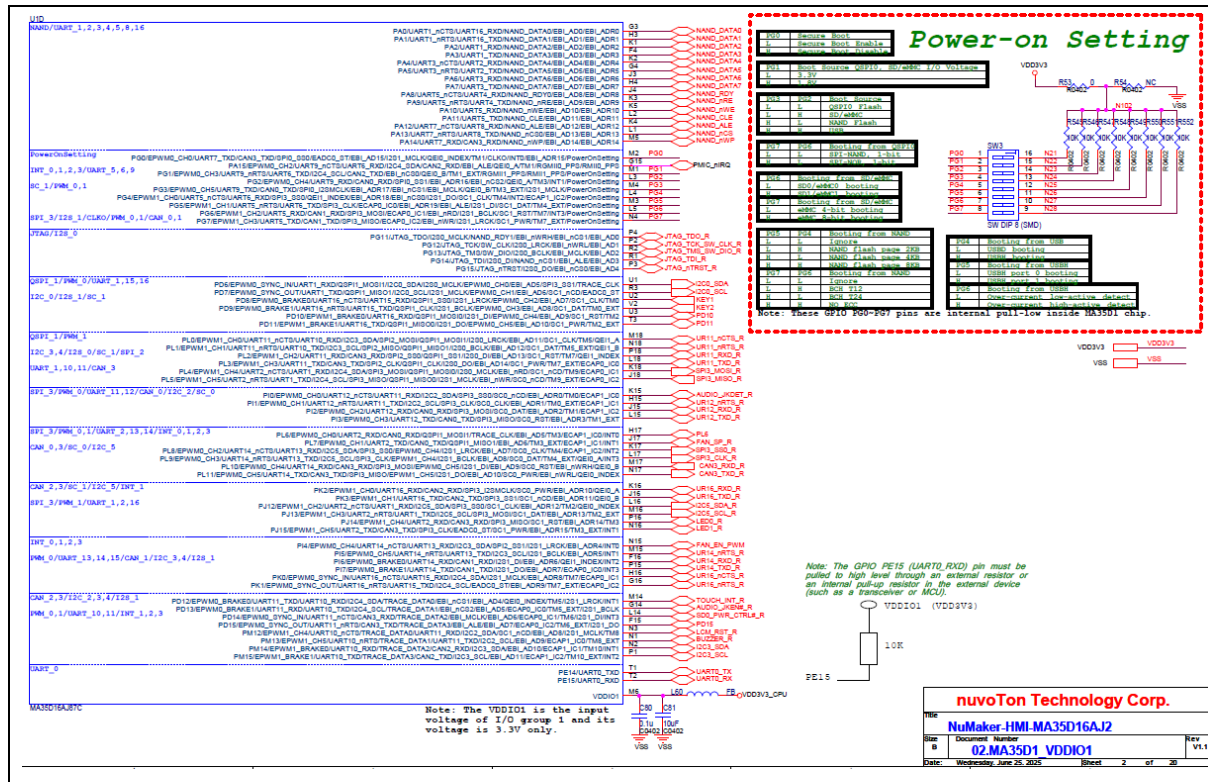


Figure 6-3 Power Group 1 Schematic

6.1.4 Power Group 0, 2 and 5

Figure 6-4 shows the power group 0, 2 and 5 circuit of the NuMaker-HMI-MA35D16AJ2 board.

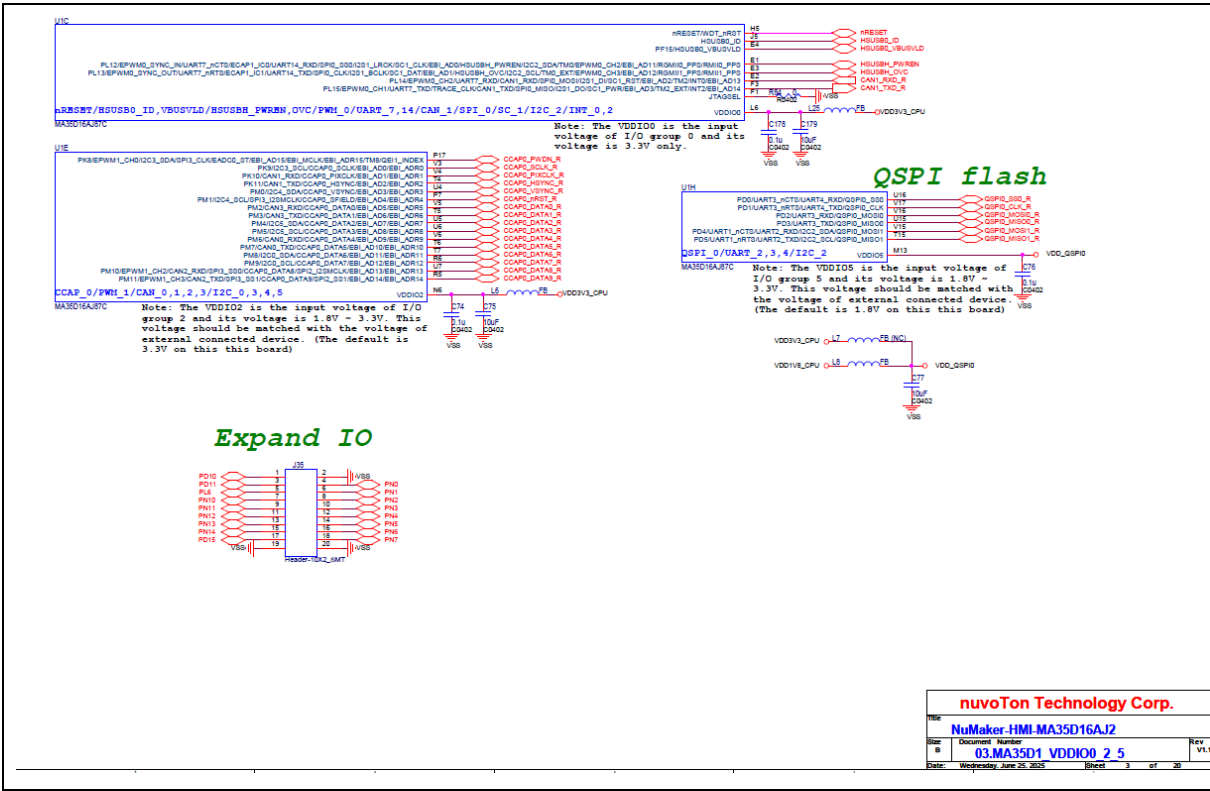


Figure 6-4 Power Group 0, 2 and 5 Schematic

6.1.5 Power Group 3 (eMMC1_PJ)

Figure 6-5 shows the power group 3 (SD1/eMMC1 on PJ port) dedicated for the on-board eMMC NAND Flash memory device circuit of the NuMaker-HMI-MA35D16AJ2 board.

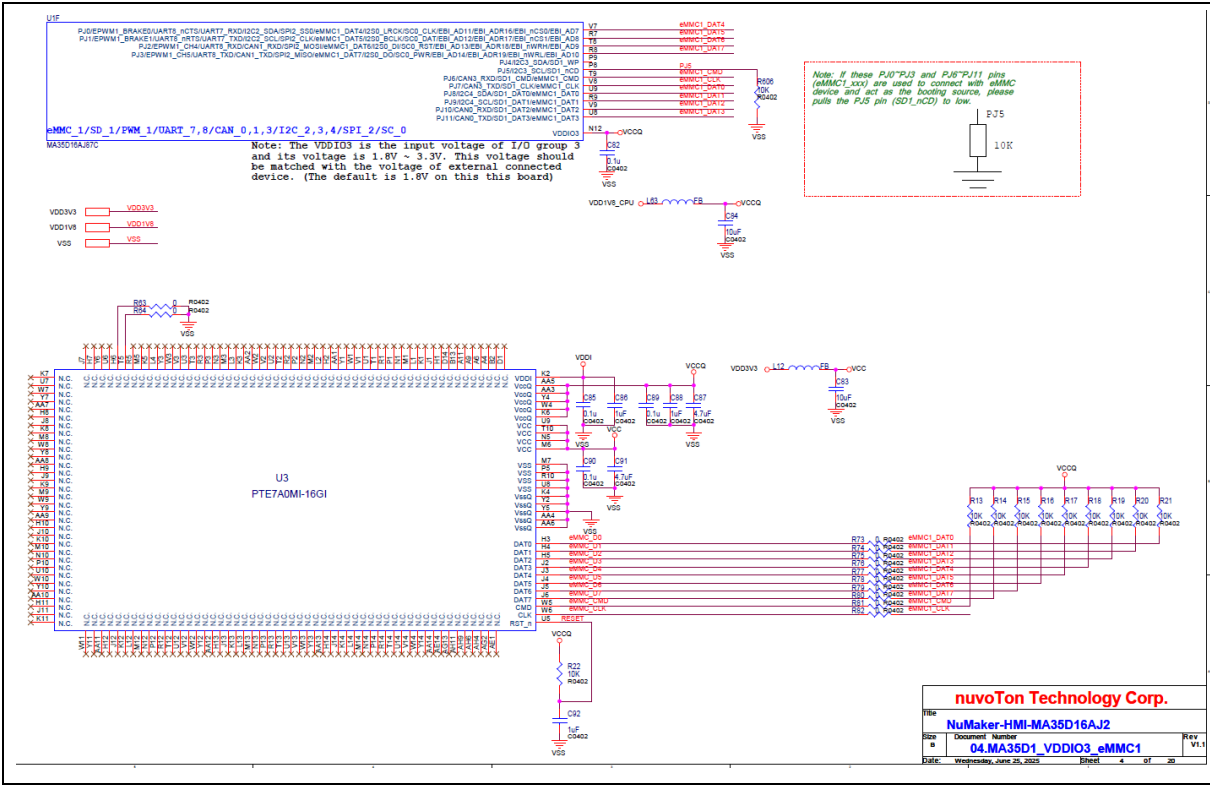


Figure 6-5 Power Group 3 (eMMC1_PJ) Schematic

6.1.6 Power Group 4 (LCM)

Figure 6-6 shows the power group 4 and LCM connector circuit of the NuMaker-HMI-MA35D16AJ2 board.

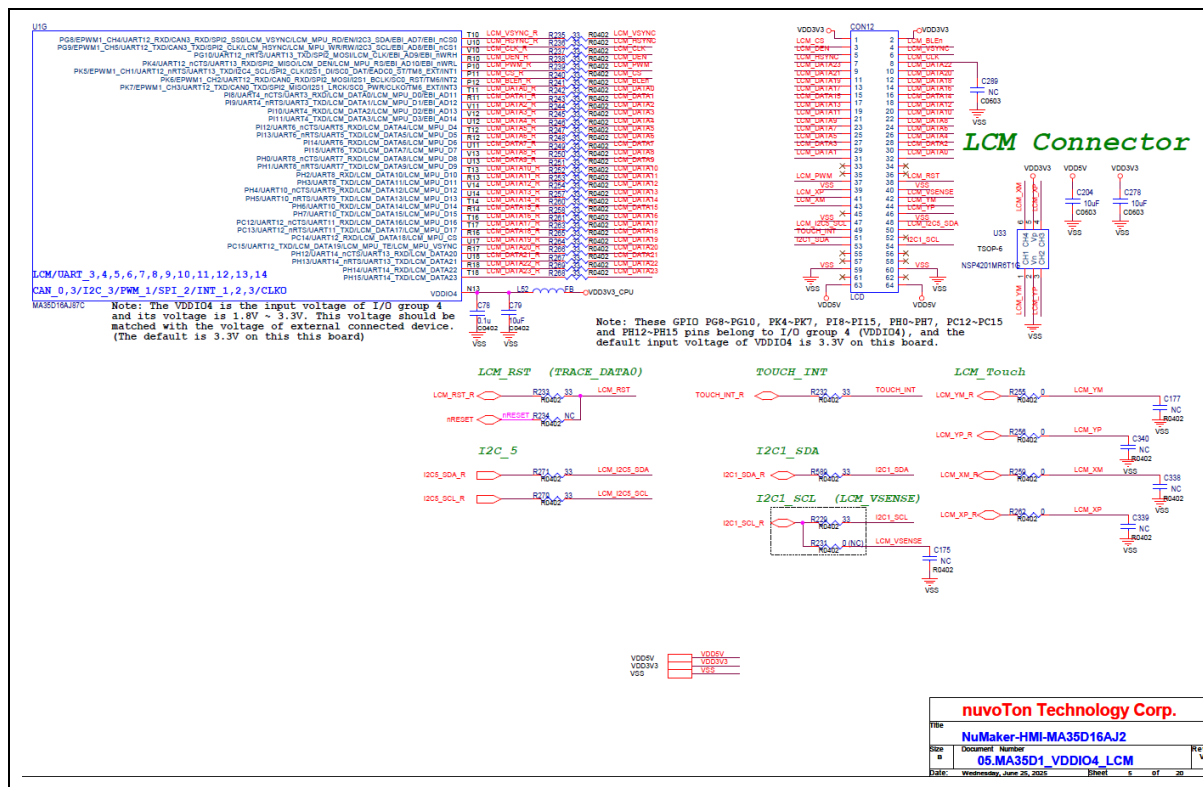


Figure 6-6 Power Group 4 (LCM) Schematic

6.1.7 Power Group 6 (SD0)

Figure 6-7 shows the power group 6 and SD0 card slot circuit of the NuMaker-HMI-MA35D16AJ2 board.

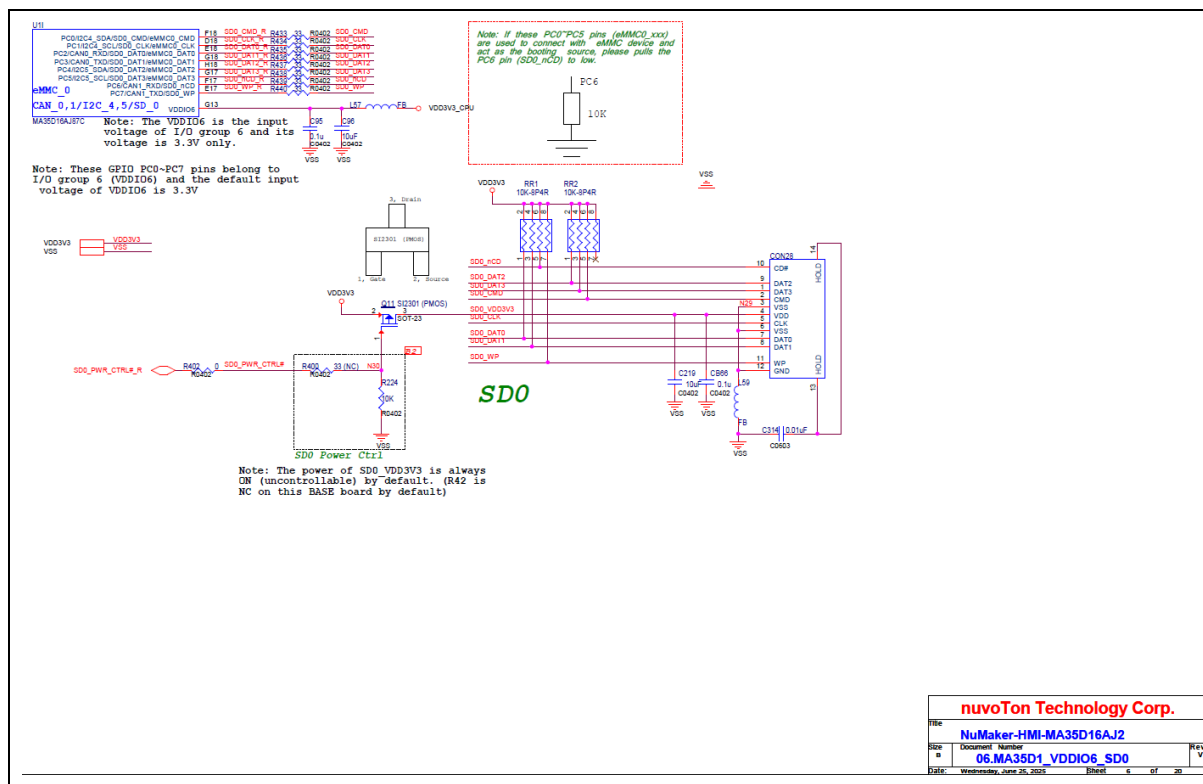


Figure 6-7 Power Group 6 (SD0) Schematic

6.1.8 Power Group 7 and EAD0

Figure 6-8 shows the power group 7 and EADC0 circuit of the NuMaker-HMI-MA35D16AJ2 board.

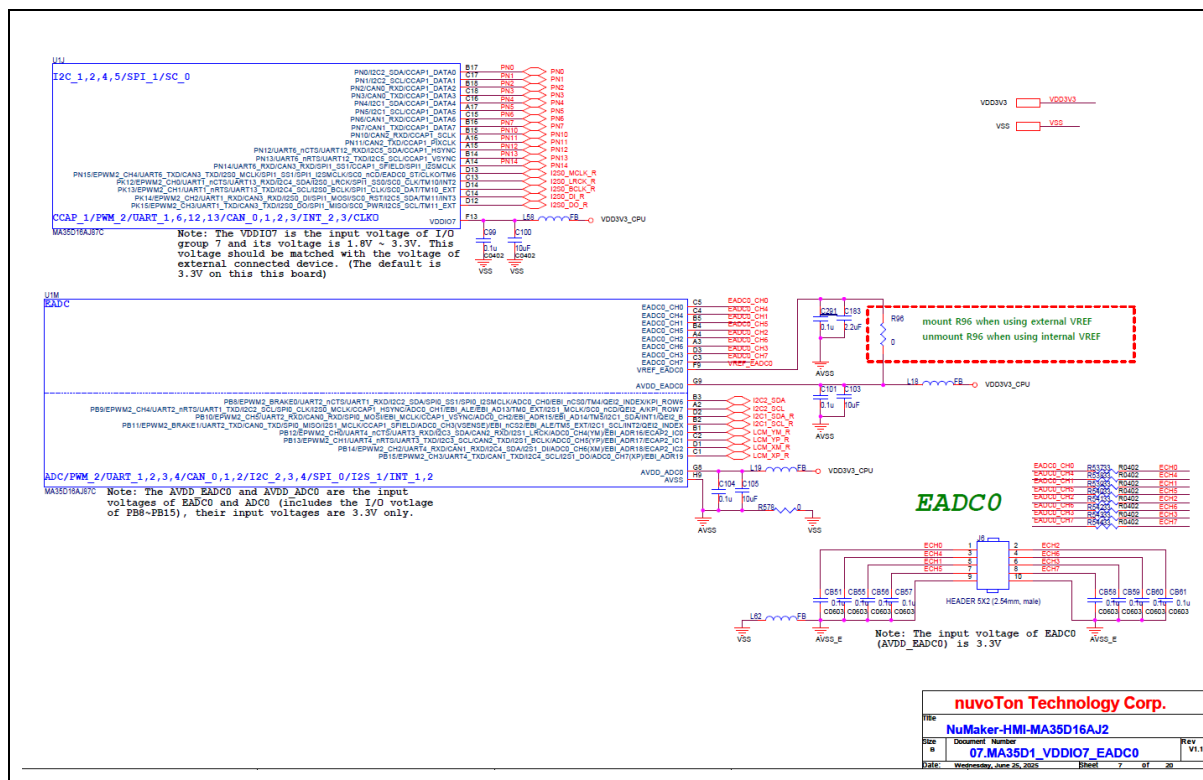


Figure 6-8 Power Group 7 and EADC0 Schematic

6.1.9 Power Group 8 (RGMII0_PE)

Figure 6-9 shows the power group 8 dedicated for the RGMII0 (PE port) circuit of the NuMaker-HMI-MA35D16AJ2 board.

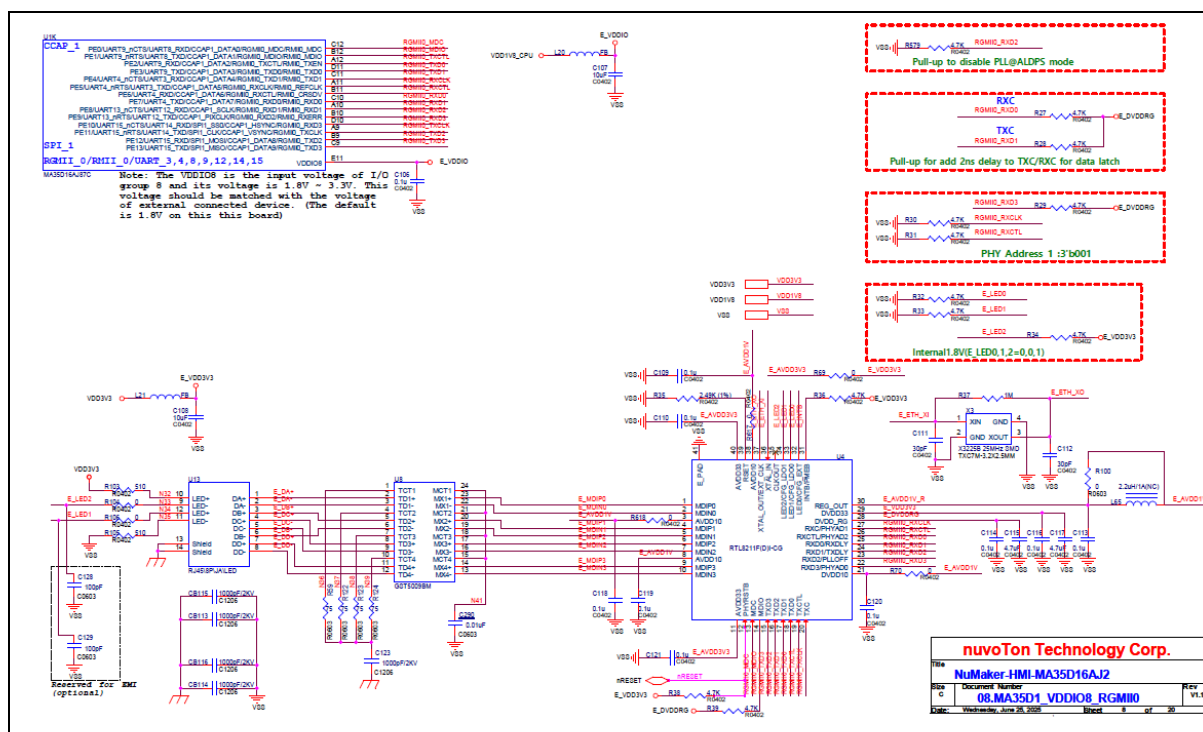


Figure 6-9 Power Group 8 (RGMII0_PE) Schematic

Figure 6-10 shows the power group 9 dedicated for the RGMII1 (PF port) circuit of the NuMaker-HMI-MA35D16AJ2 board.



Figure 6-10 Power Group 9 (RGMII1 PF) Schematic

6.1.11 HSUSB 0/1

Figure 6-11 shows the HS (high speed) USB 0/1 circuit of the NuMaker-HMI-MA35D16AJ2 board.

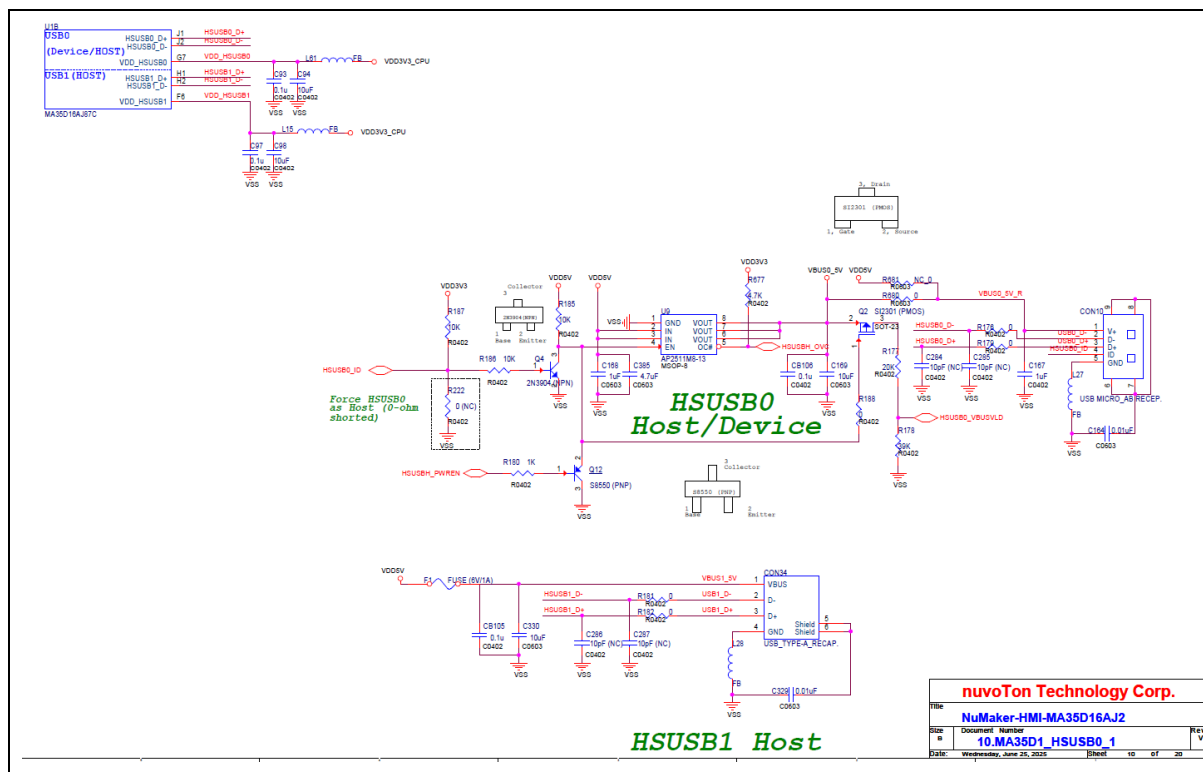


Figure 6-11 HSUSB 0/1 Schematic

6.1.12 NAND Flash and QSPI0 Flash

Figure 6-12 shows the NAND Flash device and QSPI0 NOR/NAND Flash device circuit of the NuMaker-HMI-MA35D16AJ2 board.

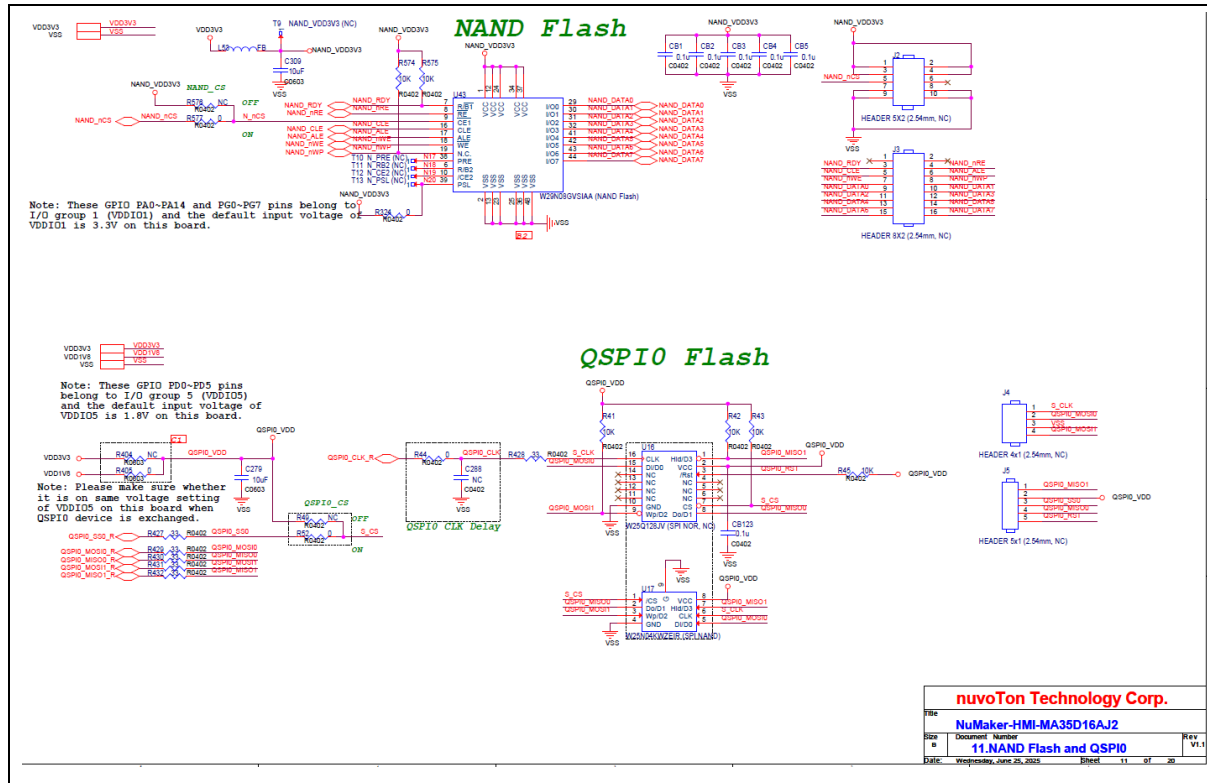


Figure 6-12 NAND Flash and QSPI0 Flash Schematic

Figure 6-13 shows the NAU88C22 audio codec circuit of the NuMaker-HMI-MA35D16AJ2 board.



Figure 6-13 NAU88C22 Audio Codec Schematic

6.1.14 CCAP0 Connector

Figure 6-14 shows the CCAP0 connector circuit of the NuMaker-HMI-MA35D16AJ2 board.

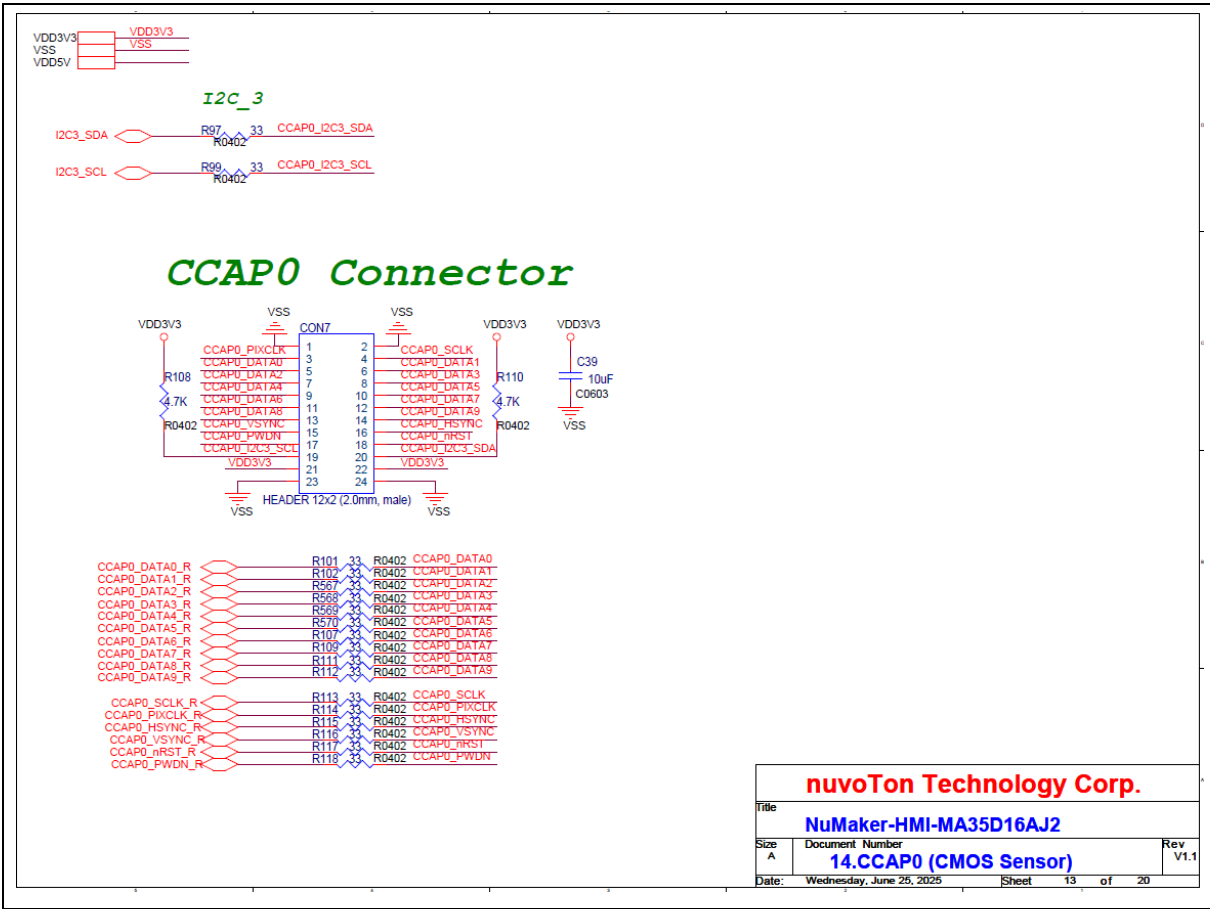


Figure 6-14 CCAP0 Connector Schematic

6.1.15 RS232 and RS485

Figure 6-15 shows the RS232 and RS485 circuit of the NuMaker-HMI-MA35D16AJ2 board.

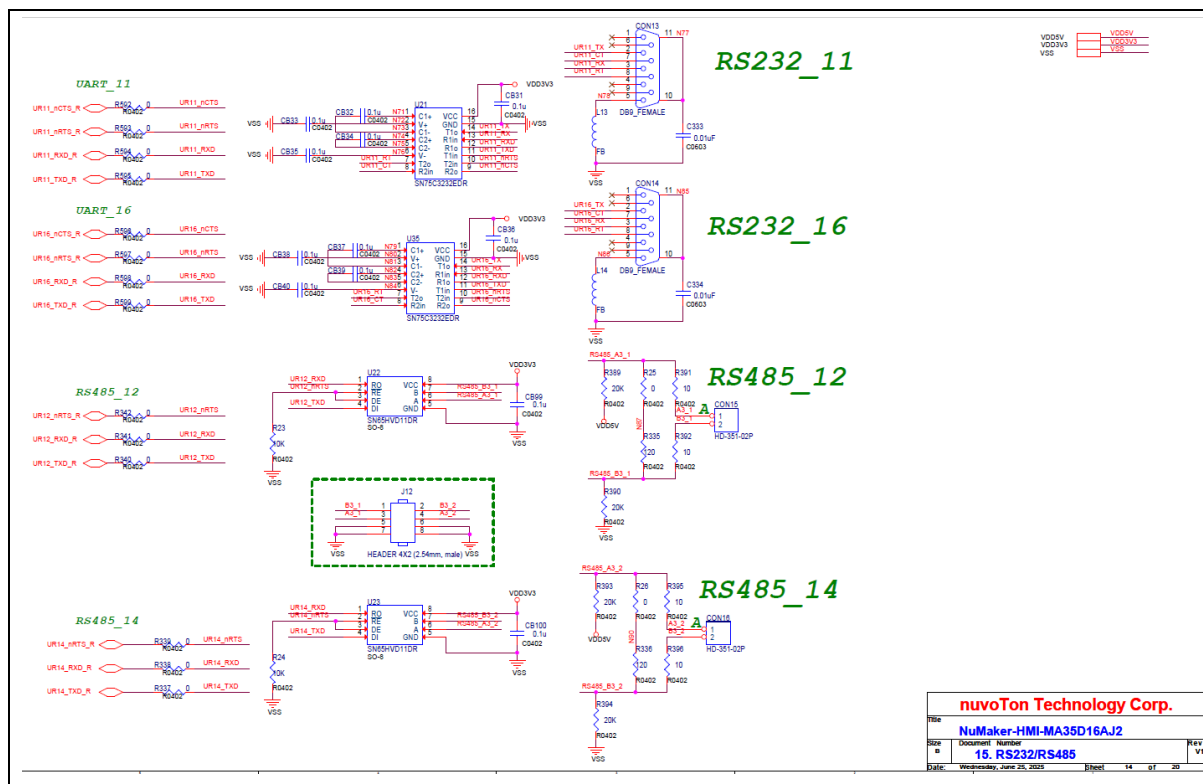


Figure 6-15 RS232 and RS485 Schematic

6.1.16 CAN FD

Figure 6-16 shows the CAN FD circuit of the NuMaker-HMI-MA35D16AJ2 board.

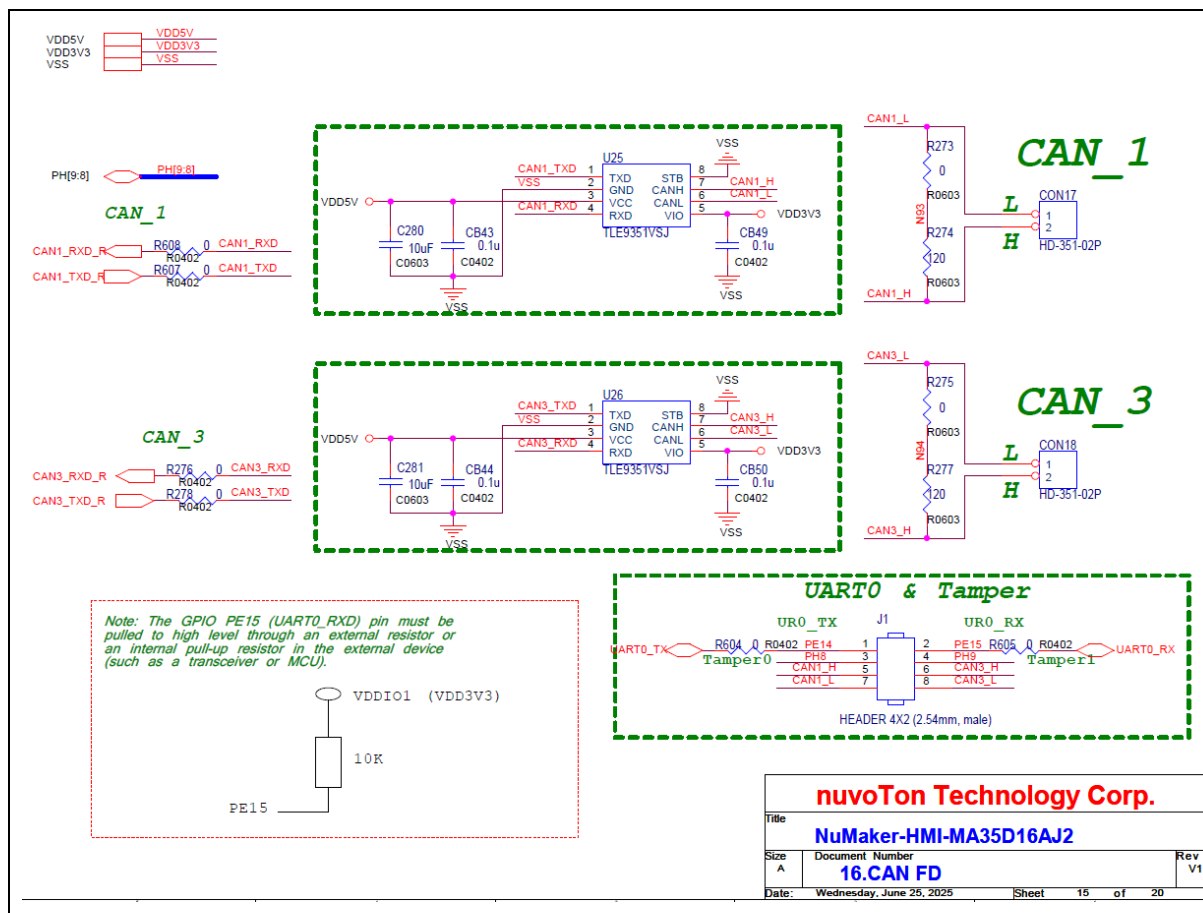


Figure 6-16 CAN FD Schematic

6.1.17 Key Buttons, LEDs, Buzzer, Fan Control and SPI Connector

Figure 6-17 shows the key buttons, LEDs, buzzer, fan control and SPI connector circuit of the NuMaker-HMI-MA35D16AJ2 board.

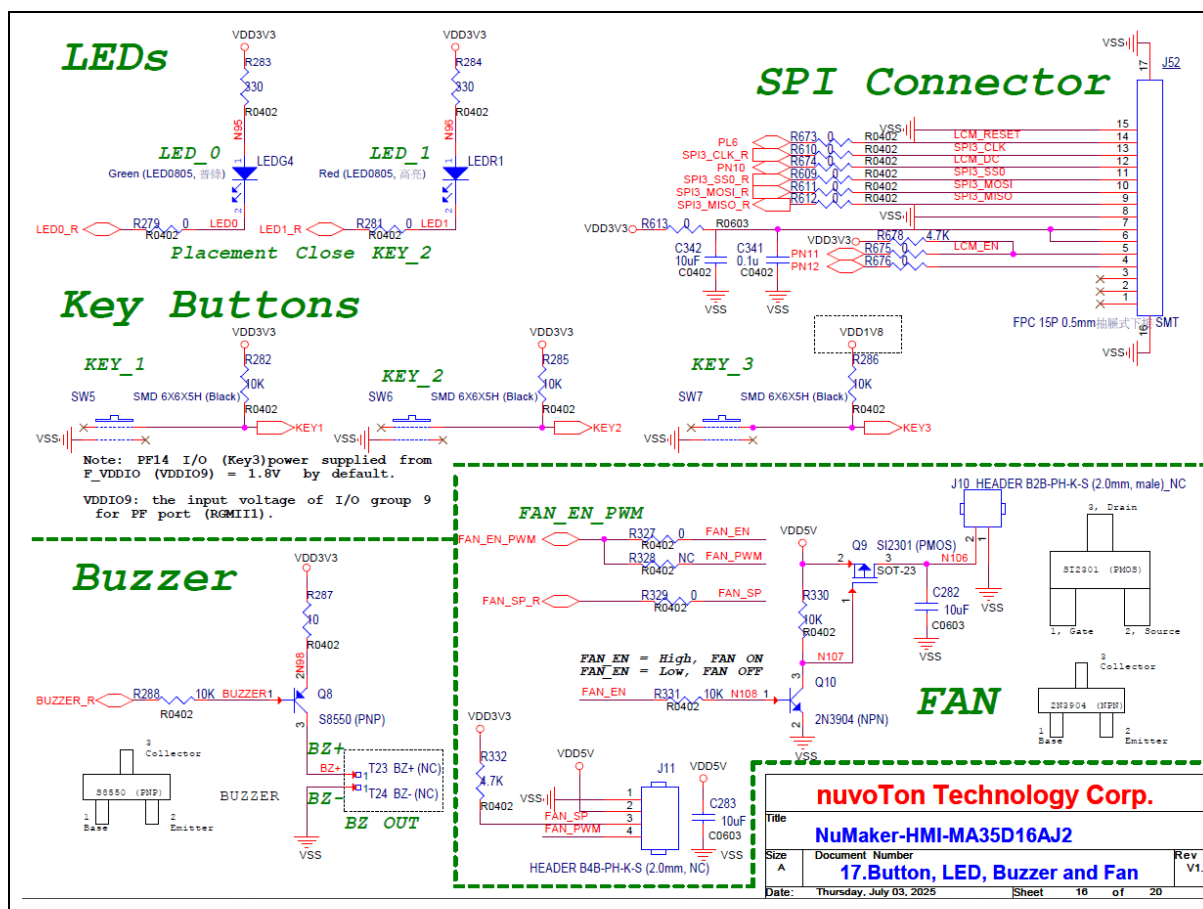


Figure 6-17 Key Buttons, LEDs, Buzzer, Fan Control and SPI Connector Schematic

6.1.18 SWJ Connector

Figure 6-18 shows the SWJ connector circuit of the NuMaker-HMI-MA35D16AJ2 board.

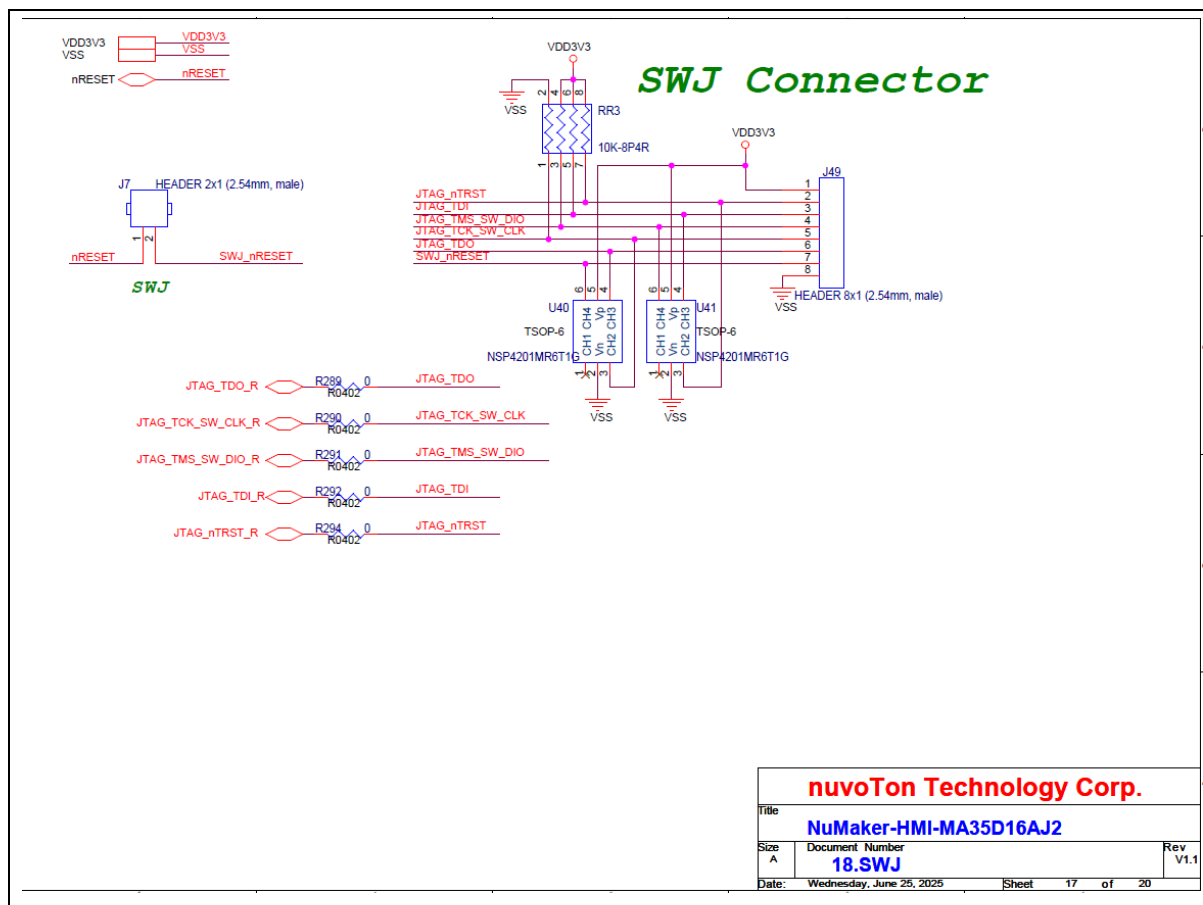


Figure 6-18 SWJ Connector Schematic

Figure 6-19 shows the NUC123 VCOM circuit of the NuMaker-HMI-MA35D16AJ2 board.

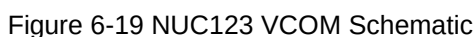


Figure 6-20 and Figure 6-21 show the front and rear PCB component placement of the NuMaker-HMI-MA35D16AJ2 board.



Figure 6-20 Front PCB Placement of NuMaker-HMI-MA35D16AJ2 Board

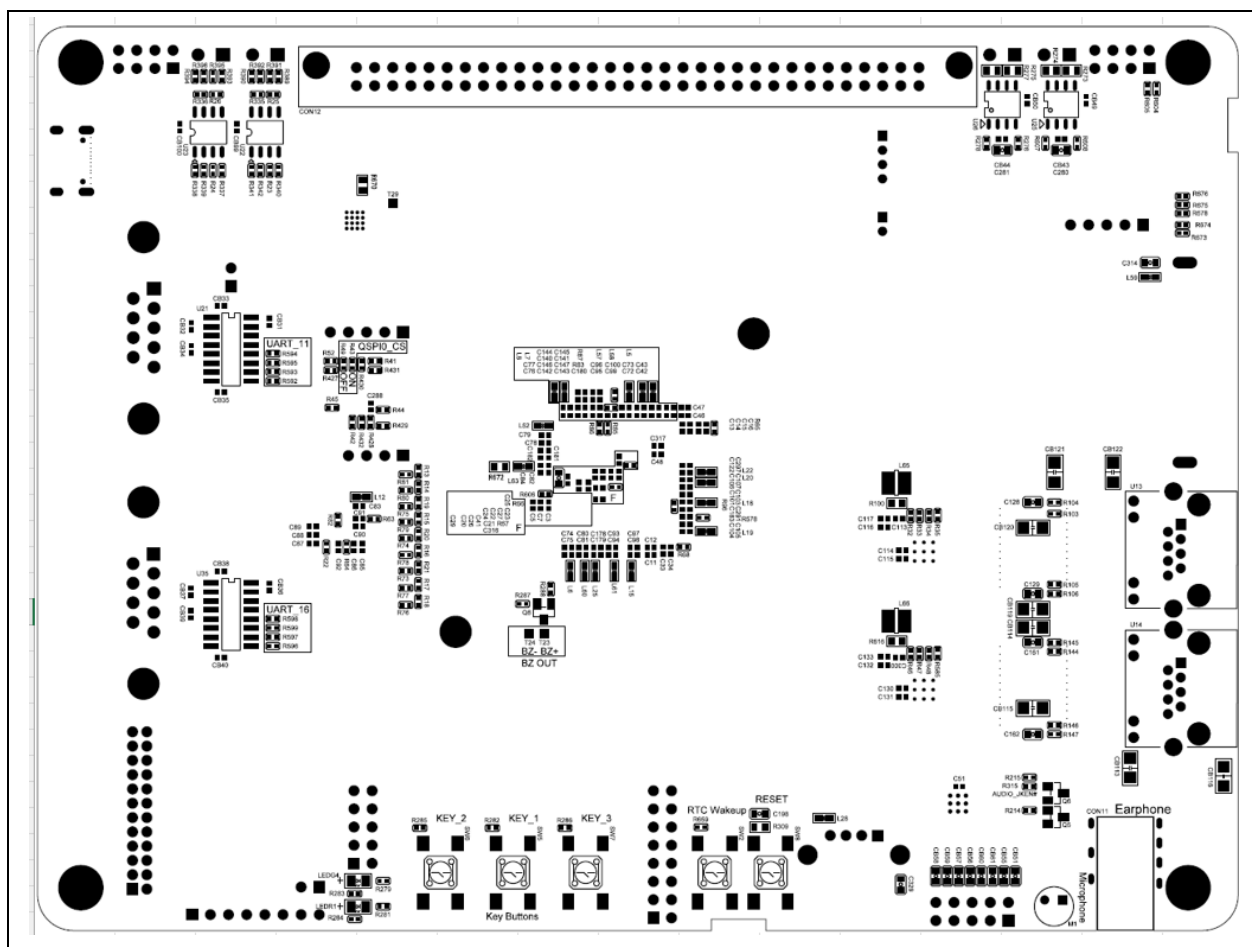


Figure 6-21 Rear PCB Placement of NuMaker-HMI-MA35D16AJ2 Board

6.2 7" TFT LCD Daughter Board Schematic

Figure 6-22 shows the circuit of the 7" TFT LCD daughter board.

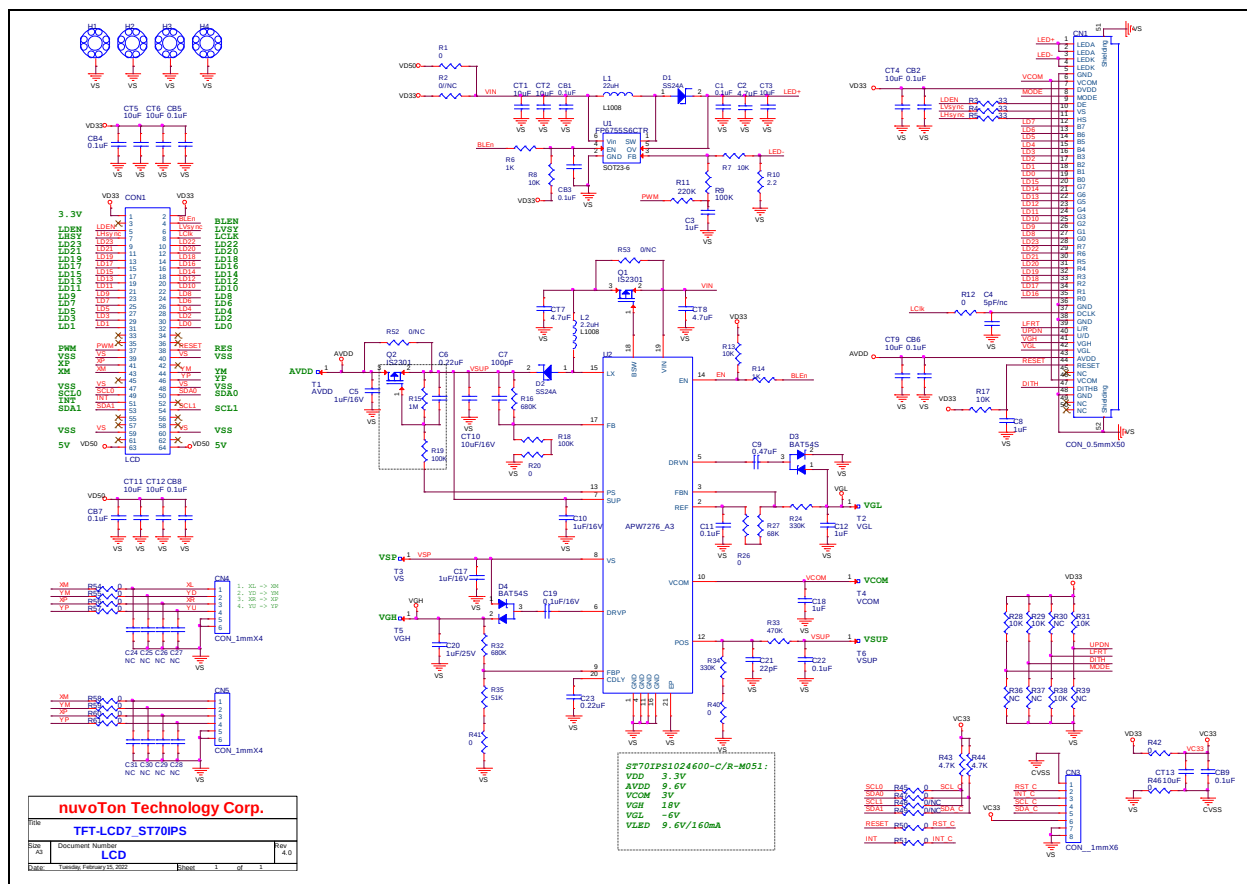


Figure 6-22 7" TFT LCD Daughter Board Schematic

7 REVISION HISTORY

Date	Revision	Description
2025.08.29	1.00	Initial version.

Important Notice

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