UM12340

FRDM-IMX8MPLUS Board User Manual

Rev. 1.0 — 24 June 2025 **User manual**

Document information

Information	Content
Keywords	UM12340, FRDM-IMX8MPLUS, i.MX 8M Plus applications processor, FRDM-IMX8MPLUS board, block diagram, board interfaces
Abstract	The FRDM i.MX 8M Plus development board (FRDM-IMX8MPLUS board) is a low-cost hardware platform designed to show the most commonly used features of the i.MX 8M Plus applications processor.

1 FRDM-IMX8MPLUS overview

The FRDM i.MX 8M Plus development board (also known as the FRDM-IMX8MPLUS board) is an entry-level development board. The board showcases the most commonly used features of the i.MX 8M Plus Applications Processor in a small and low-cost package. It helps developers to get familiar with the processor before investing many resources in more specific designs.

This document includes system setup and configurations, and provides detailed information on the overall design and usage of the FRDM-IMX8MPLUS board from a hardware system perspective.

1.1 Block diagram

Figure 1 shows the FRDM-IMX8MPLUS board block diagram.

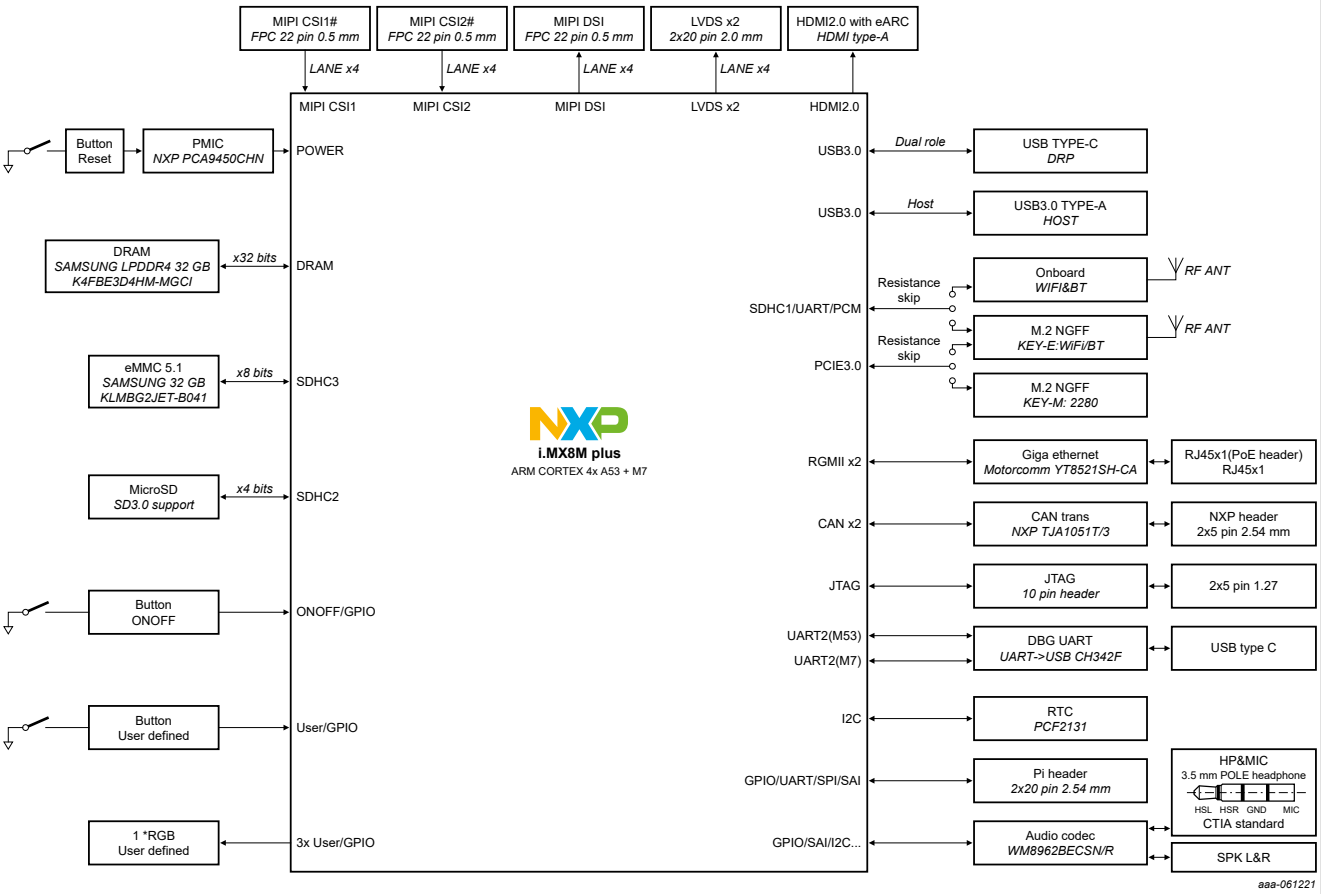

Figure 1. FRDM-IMX8MPLUS board block diagram

1.2 Board features

Table 1 lists the features of the FRDM-IMX8MPLUS board.

Table 1. FRDM-IMX8MPLUS features

Board feature	Target processor feature used	Description
Applications processor		The i.MX 8M Plus applications processor features a quad Arm Cortex-A53 up to 1.8 GHz and an Arm Cortex-M7 core up to 800 MHz. It also includes a neural processing unit (NPU) of 2.3 Tera operations per second (TOPS) ***Note:*** *For more details on the i.MX 8M Plus processor, refer to the i.MX 8M Plus Applications Processor Reference Manual.*
USB interface	USB 3.0 super-speed host and device controller	• x1 USB 3.0 Type C connector • x1 USB 3.0 Type A connector
DRAM memory	DRAM controller and PHY	4 GB LPDDR4 (Micron MT53D1024M32D4DT-046)
Mass storage	uSDHC	• 32 GB eMMC5.1 (KLMBG2JETD-B041) • MicroSD card connector (SD3.0 supported)
Boot configuration		• The default boot mode is single boot from the eMMC device • The board also supports SD card boot
Camera interface	MIPI CSI	• 2x MIPI-CSI (x4 data lane) interface • FPC cable connector (J13, J14)
Display interface	MIPI DSI	• 1x MIPI-DSI (x4 data lane) interface • FPC cable connector (J15)
	HDMI	One HDMI 2.0 interface with Type A connector (J16)
	LVDS	Two LVDS (x4 data lane) interface with two 40-pin headers (J8 and J9)
Ethernet interface	Two ENET controllers	• Two 10/100/1000 Mbit/s RGMII Ethernet RJ45 connectors (J5 and J7) with external PHY, YT8521
I/O expanders	CAN, I2C, RST, ONOFF	One 10-pin 2x5 2.54 mm connector J27 provides: • One high-speed CAN transceiver TJA1051T/3 connection • 3-pin header for I2C expansion • System reset and onoff
Tri-radio module	SDIO, UART, SPI, SAI	U-blox MAYA-W276-00B module supporting Wi-Fi 6, Bluetooth 5.4, and IEEE 802.15.4
M.2 interface	USB, SDIO, SAI, UART, I2C, and GPIO	One M.2/NGFF Key E 2230 connector, J24, supporting USB, SDIO, SAI, UART, I2C, and vendor-defined SPI interfaces ***Note:*** *By default, these signals are connected with the onboard tri-radio module, however, to use this M.2 slot, you must rework resistors (refer to the board schematic for details).*
	PCIE	One M.2/NGFF Key M 2280 connector, J23, supporting the PCIE interface, which can be connected to an M.2 SSD.
Audio	SAI	On board audio codec WM8962 with a headphone jack and a 4-pin speaker header
Debug interface		• USB-to-UART device, CH342F • One USB 2.0 Type-C connector (J19) of CH342F provides two COM ports: – The first COM port is used for Cortex A53 system debug – The second COM port is used for Cortex M7 system debug

Table 1. FRDM-IMX8MPLUS features*...continued*

Board feature	Target processor feature used	Description
		– JTAG 10-pin header, J20
Expansion port		One 40-pin dual-row pin header (J18) for I2S, UART, I2C, and GPIO expansion
Power		• One USB 2.0 Type-C connector for power delivery only • PCA9450CHN PMIC • Discrete DCDC/LDO
PCB		FRDM-IMX8MPLUS: 130 mm × 120 mm, 6-layer
Orderable part number		FRDM-IMX8MPLUS

1.3 Board kit contents

Table 2 lists the items included in the FRDM-IMX8MPLUS board kit.

Table 2. Board kit contents

Item description	Quantity
FRDM-IMX8MPLUS board	1
USB 3.0 Type-C Male to Type-A Male assembly cable	1
USB 3.0 Type-C Male to Type-C Male assembly cable	1
FRDM-IMX8MPLUS Quick Start Guide	1

1.4 Board pictures

This section shows the top and bottom view pictures of the FRDM-IMX8MPLUS board.

Figure 2 shows the connectors, switches, and buttons available on the top side of the FRDM-IMX8MPLUS board.

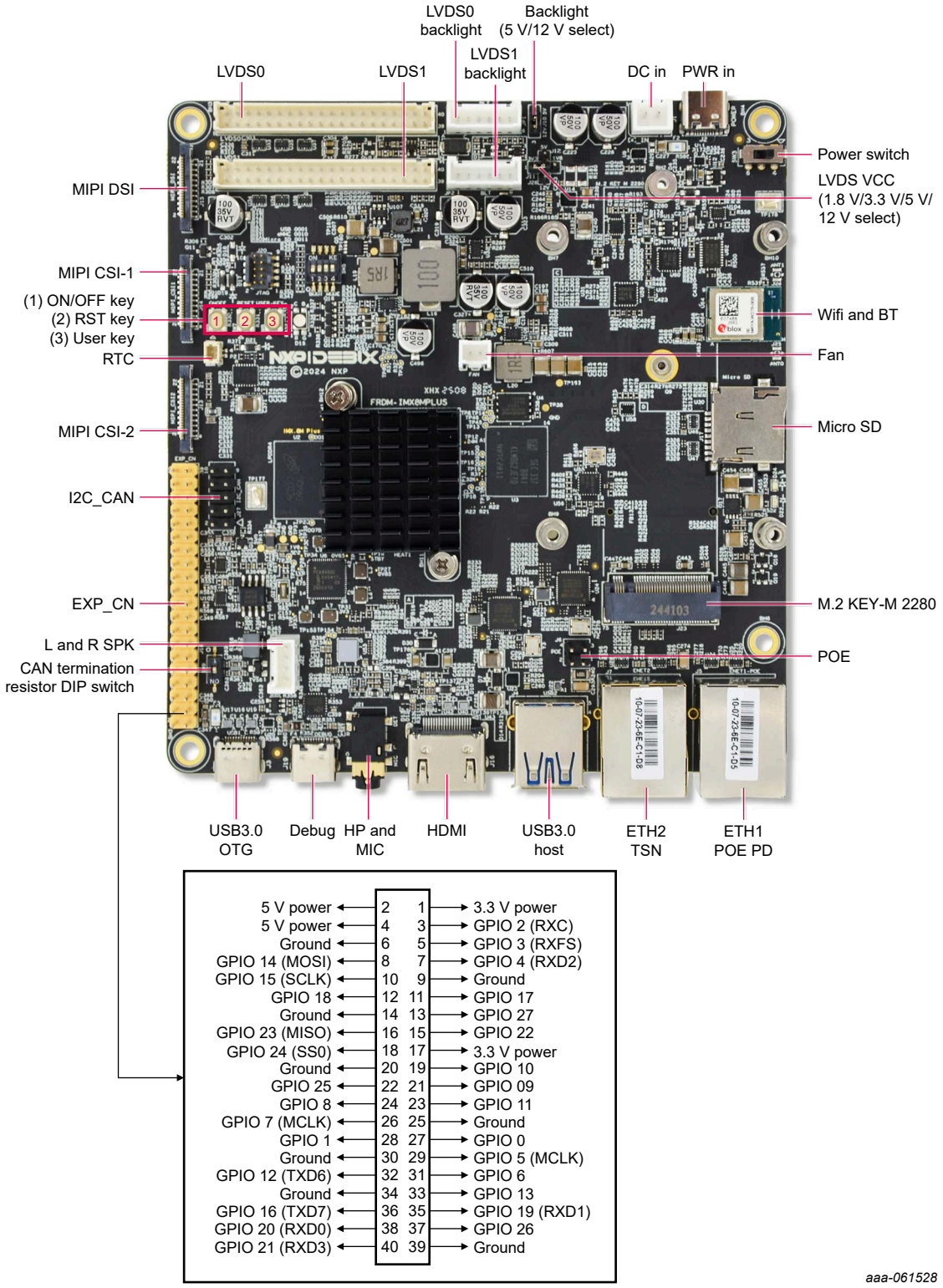

Figure 2. FRDM-IMX8MPLUS board connectors, switches, and buttons

Figure 3 shows the board bottom-side view. It also highlights the connectors available on the bottom side of the FRDM-IMX8MPLUS board.

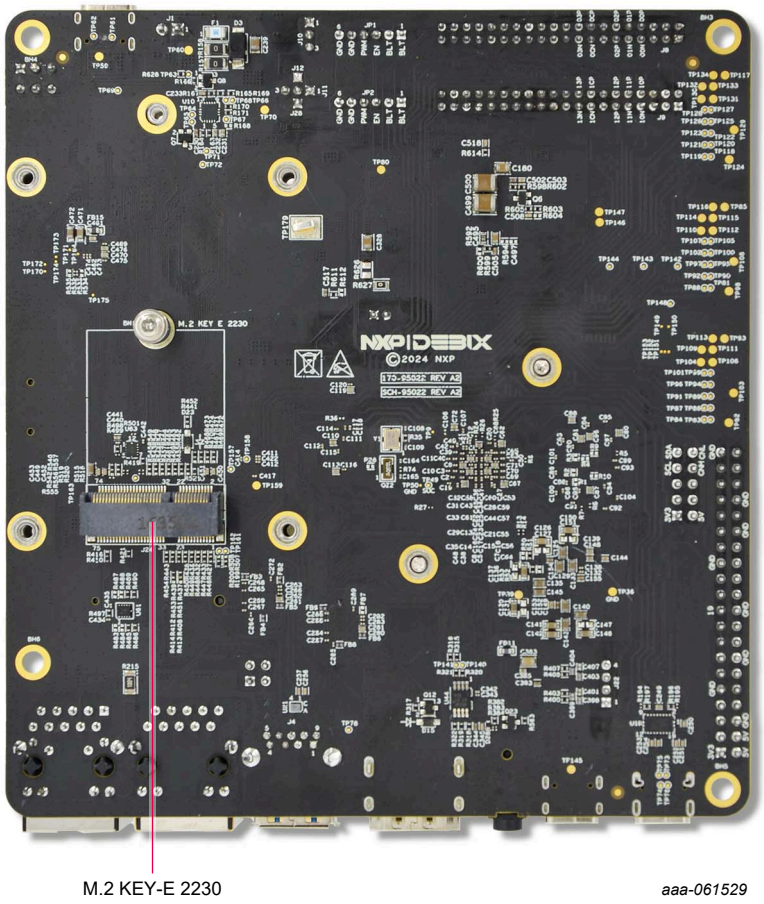

Figure 3. FRDM-IMX8MPLUS bottom-side view

1.5 Connectors

Figure 2 shows the position of connectors on the FRDM-IMX8MPLUS board. Table 3 describes the FRDM-IMX8MPLUS board connectors.

Table 3. FRDM-IMX8MPLUS connectors

Part identifier	Connector type	Description	Reference section
J1	2-pin 2.54 mm connector	Auxiliary DC power input	Section 2.2
J2, J3, J19	USB Type C	USB connector	Section 2.10
J4	USB Type A	USB connector	
J5, J7	RJ45 jack	Ethernet connectors	Section 2.15
J16	HDMI A connector	HDMI connector	Section 2.14
J13, J14	22-pin FPC connector	MIPI CSI FPC connector	Section 2.11
J15	22-pin FPC connector	MIPI DSI FPC connector	Section 2.12
J8, J9	2x20-pin connector	LVDS connector	Section 2.13
J23	75-pin connector	M.2 socket KEY-M	Section 2.7
J24	75-pin connector	M.2 socket KEY-E	
J18	2x20-pin connector	GPIO expansion	Section 2.16
J27	2x5-pin connector	I/O connector	Section 2.3
J17	MicroSD push-push connector	MicroSD 3.0	Section 2.6
J20	2x5-pin 1.27 mm connector	JTAG connector	Section 3.1
J21	3.5 mm headphone jack	Audio codec connector	Section 2.5
J22	1x4-pin plug	Speaker connector	
P2	JST_SH_2P	RTC battery connector	For details, refer to the board schematic.

1.6 Push buttons

Figure 2 shows the push buttons available on the board. Table 4 describes these push buttons.

Table 4. FRDM-IMX8MPLUS push buttons

Part identifier	Switch name	Description
SW6	ON/OFF button	The i.MX 8M Plus applications processor supports the use of a button input signal to request main SoC power state changes (that is, ON or OFF) from the PMIC. The ON/OFF button is connected to the ONOFF pin of the i.MX 8M Plus processor. • In the ON state: – If the ON/OFF button is held longer than the debounce time, the power off interrupt is generated – If the button is held longer than the defined max timeout (approx. 5 s), the state will transit from ON to OFF, and send PMIC_ON_ REQ signal to turn off the powers of PMIC • In the OFF state: – If the ON/OFF button is held longer than the OFF-to- ON time, the state will transit from OFF to ON, and send PMIC_ON_REQ signal to turn on the powers of PMIC
SW7	RESET button	The button is directly connected to the PMIC PCA9450CHN. Holding the RESET button forces a reset of the PMIC power outputs on the board. The i.MX 8M Plus processor is immediately turned off and reinitiates a boot cycle from the OFF state.
SW8	User button	The User button is kept for customized use cases.

1.7 DIP switch

The following DIP switches are used on the FRDM-IMX8MPLUS board.

- 4-bit DIP switch – SW5
- 1-bit DIP switch – SW9 If a DIP switch pin is:
- OFF – pin value is 0
- ON – pin value is 1

The following list describes the description and configuration of the DIP switches available on the board.

- SW5 – Provides control for boot mode configuration. For details, see Table 5.
- SW9 – Provides control for enabling or disabling the CAN split termination RC filter.

Table 5. Switch SW9 configuration

Switch	Signal	Description
SW9[1]		• ON (default setting): Enables RC termination filter (60.4 Ω + 56 pF) and configures CAN bus for normal operation. • OFF: Disables RC termination filter for test mode.

1.8 User LEDs

The FRDM-IMX8MPLUS board has RGB light-emitting diodes (LED) that user application can use for debugging purposes.

Table 6 describes the FRDM-IMX8MPLUS LEDs.

Table 6. FRDM-IMX8MPLUS LEDs

Part identifier	LED color	LED name	Description (When LED in ON)
D16	Red / Green / Blue	RGB_LED	User application LEDs. Each of these LEDs can be controlled through a user application. The LEDs are connected to an I/O expander chip PCAL6416AHF. The i.MX 8M Plus processor controls the I/O expander chip through the I2C1 interface.

1.9 Jumpers

Figure 2 shows the jumpers position on the board.

Table 7 describes these jumpers.

Table 7. FRDM-IMX8MPLUS jumpers

Part identifier	Description	Jumper type
J10	Used for the LVDS LCD backlight power source selection through 2.0 mm jumper. • Pin 1-2 shorted: BLT_VCC connects with VDD_5V power supply • Pin 2-3 shorted: BLT_VCC connects with VDD_12V power supply (default setting)	3-pin header
J11, J12, J28	Used for LVDS LCD power source selection through 2.0 mm jumper. LVDS_VCC connect with VDD_3V3 by default.	5-pin header

2 FRDM-IMX8MPLUS functional description

This chapter describes the main features, interfaces, and functions of the FRDM-IMX8MPLUS board.

Note: *For details of the i.MX 8M Plus MPU features, refer to i.MX 8M Plus Applications Processor Reference Manual. See Section 8*

2.1 Processor

The i.MX 8M Plus processor showcases the latest achievements in machine learning, vision systems, advanced multimedia, and industrial automation focused products that NXP Semiconductors develops. These products offer high-performance processing along with a high degree of functional integration. The products target the growing market of Smart Home, Building, City, Industry 4.0 and Consumer applications.

The i.MX 8M Plus processor uses the quad Arm® Cortex® and Arm Cortex-M7 cores allowing speeds up to 1.8 GHz, a Neural Processing Unit (NPU) of 2.3 TOPS, and an HDR-capable Image Signal Processor (ISP). Each processor provides a 32-bit DDR4/LPDDR4 memory interface and other interfaces. These interfaces can be used for connecting peripherals such as MIPI LCD, MIPI Camera, HDMI, LVDS, WLAN, Bluetooth™, PCIe, USB3.0, uSDHC, and Ethernet.

For more detailed information about the processor, refer to the URL:

https://www.nxp.com/products/IMX8MPLUS

Also see Section 8.

2.2 Power supply

The primary power supply to the FRDM-IMX8MPLUS board is VBUS_IN (12 V - 20 V) through USB Type-C PD connector (J2). The maximum output power of the USB PD charger must not be less than 45 W (preferably 65 W). Use a Type-C to Type-C cable (provided with the board kit) to connect the charger to the board.

Note: *The board kit does not include a USB PD charger.*

The system power slider switch, SW3, can be used to switch ON or OFF the VBUS_IN supply on the board.

Four DC buck switching regulators are used:

- MP8759GD (U105) switches the VBUS_IN (12 V) supply to DCDC_5V (5 V) power supply. The DCDC_5V supply is the input power supply for PCA9450CHNY PMIC (U6) and other discrete devices on the board.
- MP8759GD (U106) switches VBUS_IN supply to VCC_EXT_3V3 (3.3 V) for MIPI CSI, MIPI DSI, LVDS and M.2/NGFF module.
- REF8320 (U107) switches the DCDC_5V supply to VCC_EXT_1V8 (1.8 V) for the onboard WIFI/BT module and LVDS.
- MP2263 (U32) switches the VBUS_IN supply to VDD_12V (12 V) for LVDS.
  Note: *The J1 connector is reserved for power input test. When the USB PD charger is not in use, user can provide 12 V power on J1 to power up the system (for test purpose only).*
  For further details on the power sequence needed by the i.MX 8M Plus, refer to section "Power sequence" in the *i.MX 8M Plus Reference Manual*.

2.3 I2C interface

The i.MX 8M Plus processor supports a low-power inter-integrated circuit (I2C) module that supports an efficient interface to an I2C-bus as a master. The I2C provides a method of communication between a number of devices available on the FRDM-IMX8MPLUS board.

One 10-pin 2x5 2.54 mm connector J27 is provided on the board to support I2C and CAN connections. The developers can use the port for some specific application development.

2.4 Boot mode and boot device configuration

The i.MX 8M Plus processor offers multiple boot configurations. These options can be configured by using the switch SW5 on the FRDM-IMX8MPLUS board or from the boot configuration stored on the internal eFUSE of the processor. In addition, the i.MX 8M Plus can download a program image from a USB connection when configured in serial download mode. The four dedicated BOOT MODE pins are used to select the various boot modes.

Figure 4 shows the boot mode selection switch.

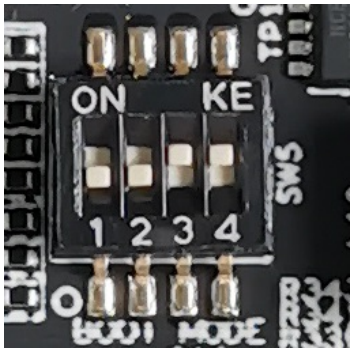

Figure 4. Boot mode selection switch

Table 8 describes the SW5 values used in different boot modes.

Table 8. Boot mode settings

BOOT DEVICE	SW5-1	SW5-2	SW5-3	SW5-4
From internal fuses	0	0	0	0
USB Serial Download	0	0	0	1
uSDHC3 (eMMC boot only, SD3 8-bit)	**0**	**0**	**1**	**0**
uSDHC2 (SD boot only, SD2)	0	0	1	1
NAND 8-bit single device 256 page	0	1	0	0
NAND 8-bit single device 512 page	0	1	0	1
QSPI 3B Read	0	1	1	0
QSPI Hyperflash 3.3 V	0	1	1	1
ecSPI Boot	1	0	0	0

On the FRDM-IMX8MPLUS board, the default boot mode is from the eMMC device. The other boot device is the microSD connector.

- Set SW5[1:4] as 0010 to select uSDHC3 (eMMC) as the boot device.
- Set 0011 to select uSDHC2 (SD) as the boot device.
- Set 0001 to enter USB serial download mode.

Note: *For more information about the boot modes and boot device configuration, see chapter "System Boot" in the i.MX 8M Plus Applications Processor Reference Manual See Section 8.*

2.5 Audio interface

The i.MX 8M Plus processor's synchronous audio interface (SAI) supports an audio codec (WM8962B) on FRDM-IMX8MPLUS. The audio codec used for encoding/decoding of audio data can support 24-bit I2S data and 48 kHz sampling rate.

The audio codec is connected to an audio jack (J21) for audio input/output and to a 4-pin header (J22) for the speaker. The J21 connector is a 3.5 mm 4-pole CTIA standard audio jack.

2.6 SD card interface

The target processor has three ultra secured digital host controller (uSDHC) modules for SD/eMMC interface support. The uSDHC2 interface of the i.MX 8M Plus processor connects to the MicroSD card slot (J17) on the FRDM-IMX8MPLUS board. This connector supports one 4-bit SD3.0 MicroSD card. To select it as the boot device of the board, refer to Section 2.4.

2.7 M.2 interface

The FRDM-IMX8MPLUS board supports one M.2/NGFF key E 2230 connector (J24) and one M.2/NGFF key M 2280 connector. The key E connector supports USB, SDIO, SAI, UART, I2C, and GPIO connection. By default, the signals are connected with the onboard tri-radio MAYA-W276-00B module. However, to use this M.2 slot, the resistors must be reworked as shown in Table 9.

Table 9. Resistors rework required for M.2 key E slot usage

Resistors that should be made DNP	Resistors that must be installed
R446, R447, R448, R449, R450, R451, R452, R453, R454	R427, R433, R432, R436, R438, R437, R441, R439, R443
R462, R463, R464, R465	R455, R459, R457, R461
R471, R472, R473, R474	R467, R469, R468, R470
R546, R547, R548, R549, R557	R542, R544, R543, R545, R556
R621, R622	R620, R623

The M.2 key E connector can be used for using the Wi-Fi / Bluetooth card, IEEE802.15.4 Radio, or 3G / 4G cards. The M.2 key M connector supports PCIE, I2C and GPIO connection. It can be used for M.2 SSD. For further details about i.MX 8M Plus interfaces, see *i.MX 8M Plus Applications Processor Reference Manual*. See Section 8

2.8 Tri-radio module interface

The FRDM-IMX8MPLUS board features a Tri-radio module supporting the Wi-Fi 6, Bluetooth 5.4, and IEEE 802.15.4 protocols. The module interfaces with the SD2, UART5, SAI1, and SPI3 controller of the target processor.

Table 10. Tri-radio module

Part identifier	Manufacturing part number	Description
U64	MAYA-W276-00B (u-blox)	Host-based Wi-Fi 6, Bluetooth 5.4, and IEEE 802.15.4 tri-radio module for IoT applications

The two antenna pins (RF_ANT0 and RF_ANT1) of the module connect to U.FL connectors J25 and J26 (DNP by default). The module is supplied with VCC_EXT_3V3, VCC_EXT_1V8, and VDD_1V8 power supplies.

The MAYA-W276-00B module and the M.2 connector share several interface lines on the FRDM-IMX8MPLUS board. Zero-ohm resistors enable signal selection between these components.

SD1 interface

The SD1 interface lines are shared between the MAYA-W276-00B module and the M.2 connector. Zero-ohm resistors select either the MAYA-W276-00B module (default setting) or the M.2 connector.

UART1 interface

Similarly, the UART1 interface lines are shared between the MAYA-W276-00B module and the M.2 connector. Zero-ohm resistors select either the MAYA-W276-00B module (default setting) or the M.2 connector.

SAI2 interface

The SAI2 interface lines are shared between the MAYA-W276-00B module and the M.2 connector. Zero-ohm resistors select either the MAYA-W276-00B module (default setting) or the M.2 connector.

SPI2 interface

The SPI2 signals (CLK, MOSI, MISO, and CS0) are multiplexed with GPIO_IO[08, 09, 10, 11] signals respectively. The MAYA-W276-00B module and the M.2 connector share these SPI2 signals. Zero-ohm resistors select either the MAYA-W276-00B module (default setting) or the M.2 connector for 1.8 V translated signals, generated using the 74AVC4TD245GU bidirectional voltage translator (U98).

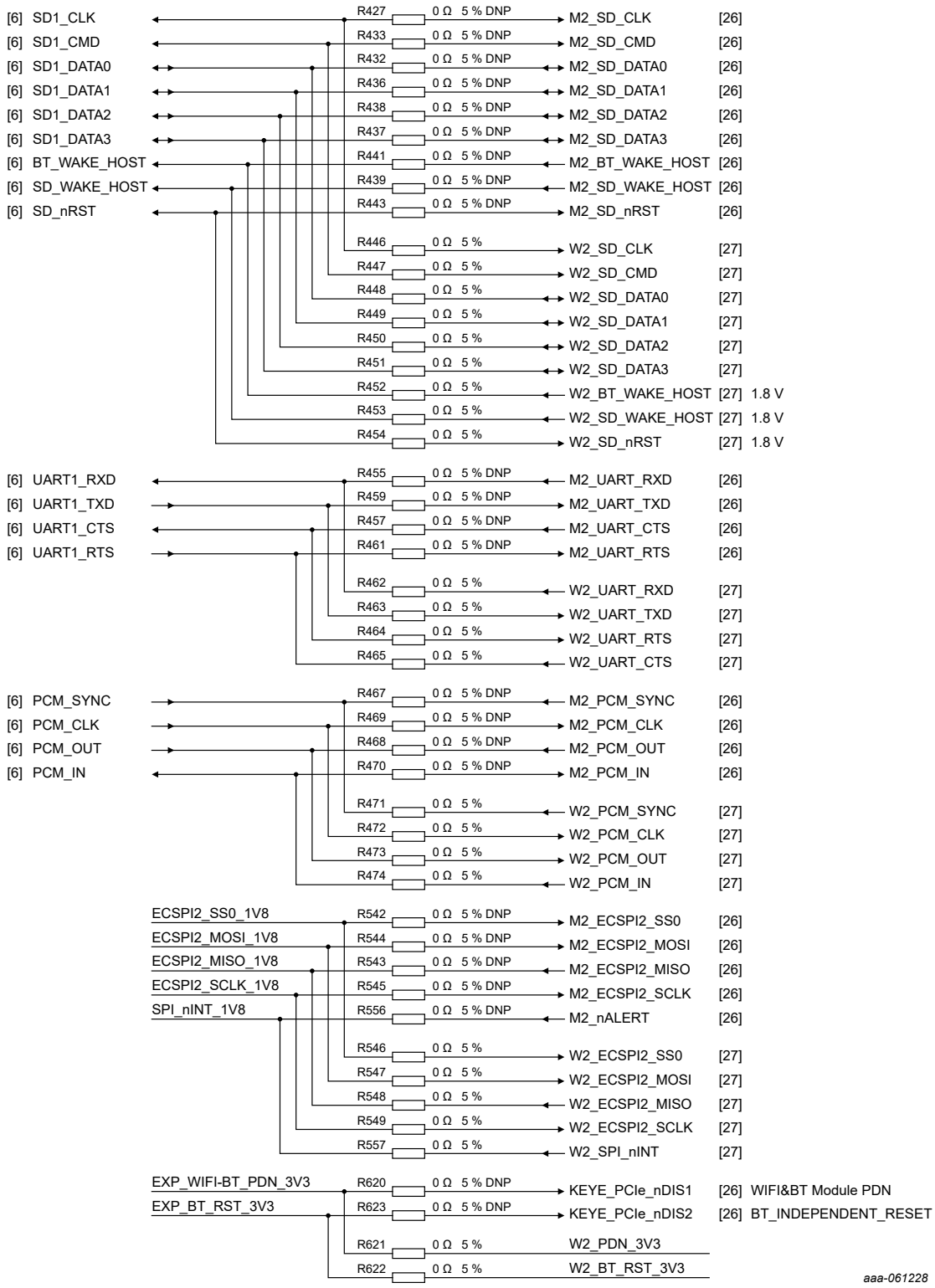

Figure 5. Resistors configuration for SD1, SAI2, UART1, and SPI2

2.9 CAN interface

The i.MX 8M Plus processor supports a controller area network (CAN) module and two CAN FD controllers. The CAN module is a communication controller implementing the CAN protocol according to the CAN with flexible data rate (CAN FD) protocol and the CAN 2.0B protocol specification.

On the FRDM-IMX8MPLUS board, one of the controllers is connected to the high-speed CAN transceiver TJA1051T/3. The high-speed CAN transceiver drives CAN signals between the target processor and a 10-pin 2x5 2.54 mm header (J27) to its physical two-wire CAN bus.

The CAN_STBY signal from the IO expander PCAL6416AHF (U59, P0_4, I2C address: 20) enables or disables the CAN standby mode.

The CAN interface circuit includes the split termination RC filter (60.4 Ω + 56 pF) for noise rejection and signal integrity. The switch SW9 is provided for enabling/disabling the RC filter.

The HS-CAN transceiver and header are described in Table 11.

Table 11. High-speed CAN transceiver and header

Part identifier	Manufacturing part number	Description
U59	TJA1051T/3	High-speed CAN transceiver. Provides an interface between a CAN protocol controller and the physical two-wire CAN bus.
J27	Not applicable	10-pin 2x5 2.54 mm connector (J27). It is connected to the CAN bus and allows external connection with the bus.

Note: *For details about TJA1051, see TJA1051 data sheet at https://www.nxp.com/.*

2.10 USB interface

The i.MX 8M Plus applications processor features two USB 3.0 controllers, with two integrated USB PHYs. On the FRDM-IMX8MPLUS board, one is used for the USB3.0 Type-C Port (J3) and the other is used for USB3.0 Type-A Port (J4).

Table 12 describes the USB ports available on the board.

Table 12. USB ports

Part identifier	USB Port Type	Description
J2	USB3.0 Type-C	Connects to super-speed USB host and device controller (USB 1) of the target processor. It can operate as a device or host. The USB1_VBUS_3V3 signal controls the VBUS drive for the USB port.
J3	USB3.0 Type-A	Connects to super-speed USB host and device controller (USB 2) of the target processor. It can operate as a device or host. The USB2_VBUS_3V3 signal controls the VBUS drive for the USB port. The USB2_DP and USB2_DN signals from the USB2 controller of the target processor connect to USB2 Type-A port (J3) by default. These signals can be connected to M.2 key E card connecter (J24) by solder/DNP R507, R508, R199, R200.
J2	USB Type-C PD	It is used for power only. It does not support USB data transfer. It is the only power supply port. Therefore, it must always be supplied for system power.
J19	USB Type-C	It is used for system debug purpose. For details, refer Section 3.

2.11 Camera interface

The i.MX 8M Plus processor includes two mobile industry processor interfaces (MIPI) camera serial interface 2 (CSI-2) receiver that handles image sensor data from camera modules and supports up to four data lanes. The MIPI CSI-2 signals are connected to two FPC connectors to which the RPI-CAM-MIPI accessory card can be plugged in.

2.12 MIPI DSI inteface

The i.MX 8M Plus processor supports the MIPI display serial interface (DSI) that supports up to four lanes and the resolution can be up to 1080p60 or 1920x1200p60.

The MIPI DSI data and clock signals from the target processor are connected to one 22-pin FPC connector (J15).

2.13 LVDS interface

The i.MX 8M Plus processor supports two 4-lane LVDS TX displays with resolution up to 1366x768p60 or 1280x800p60 for each channel. These signals are connected to two 2x20 2.0 mm header connectors (J8 and J9). An LCD panel can be connected to either connector. By default, the display signals are output on LVDS0 (J8).

2.14 HDMI interface

The i.MX 8M Plus processor supports the HDMI 2.0a display output specification along with eARC audio input. The 8M Plus supports ARC over SPDIF_RX which is muxed behind the I2C5_SDA pin on the board. The FRDM-IMX8MPLUS board has a Type-A HDMI connector, the resolution can be up to 4Kp30. The connector is shown in Figure 2.

2.15 Ethernet

The i.MX 8M Plus processor supports two Gigabit Ethernet controllers (capable of simultaneous operation) with support for Energy-Efficient Ethernet (EEE), Ethernet AVB, and IEEE 1588.

The Ethernet subsystem of the board is provided by the Motorcomm YT8521SH-CA Ethernet transceivers (U24 and U27). These transceivers support RGMII and connect to the RJ45 connectors (J5 and J7). The Ethernet transceivers (or PHYs) receive standard RGMII Ethernet signals from i.MX 8M Plus MPU. The RJ45 connectors integrate Magnetic transformers inside, so they can be directly connected to the Ethernet transceivers (or PHYs).

Each Ethernet port has a unique MAC address, which is fused into i.MX 8M Plus processor. The MAC address is labeled on each connector very clearly.

2.16 Expansion connector

One 40-pin dual-row pin connector (J18) is provided on the FRDM-IMX8MPLUS board to support I2S, UART, I2C, and GPIO connections. The header can be used to access various pins or to plug in accessory cards, such as the 8MIC-RPI-MX8 card.

2.17 Board errata

No board errata.

3 Debug interface

The FRDM-IMX8MPLUS board has two independent debug interfaces:

- JTAG header
- USB-to-Dual UART debug port

3.1 JTAG interface

The i.MX 8M Plus applications processor has four JTAG signals on dedicated pins, and one HW reset input signal POR_B. Those signals are directly connected to the standard 10-pin 1.27 mm JTAG connector J20. The four JTAG signals used by the processor are:

• JTAG_TCK TAP Clock

• JTAG_TMS TAP Machine State

• JTAG_TDI TAP Data In

• JTAG_TDO TAP Data Out

The JTAG connector J20 is shown in Figure 2.

3.2 USB debug interface

The i.MX 8M Plus applications processor has four independent UART ports (UART1 – UART4). On the FRDM-IMX8MPLUS board, UART2 is used for Cortex-A53 core and UART4 is used for Cortex-M7 core. A single chip USB to dual UART is used for debug purpose. The part number is CH342F. You can download the driver from WCH Website.

After installing the CH342F driver, the PC / USB host enumerates two COM ports connected to the J19 connector through a USB cable:

- COM Port 1: Cortex-A53 system debugging
- COM Port 2: Cortex-M7 system debugging

Use the following terminal tools for debugging purposes:

- Putty
- Tera Term
- Xshell
- Minicom>=2.9

To debug under Linux, make sure that the CH342F Linux driver is installed. Table 13 describes the required settings.

Table 13. Terminal setting parameters

Parameter	Value
Data rate	115,200 Baud
Data bits	8
Parity	None
Stop bits	1

The USB debug connector J19 is shown in Figure 2.

4 Working with accessories

This section describes how a connection can be established between with the FRDM-IMX8MPLUS board and compatible accessory boards.

4.1 7-inch Waveshare LCD

This section describes how to connect the FRDM-IMX8MPLUS board with a 7-inch Waveshare LCD using the MIPI DSI and I2C interfaces. It also specifies the changes required in the software configuration to support Waveshare LCD.

4.1.1 Connection of the MIPI DSI interface

Figure 6 shows the connection between a 7-inch Waveshare LCD and the FRDM-IMX8MPLUS board through the MIPI DSI interface. To make a connection, ensure the following:

At LCD side:

- FPC cable orientation: the conductive side is up and the stiffener side is down.
- Insert the FPC cable into the LCD's FPC connector.

At FRDM-IMX8MPLUS board side:

- FPC cable orientation: the conductive side is right and stiffener side is at left.
- Insert the FPC cable into the board's FPC connector (J15).

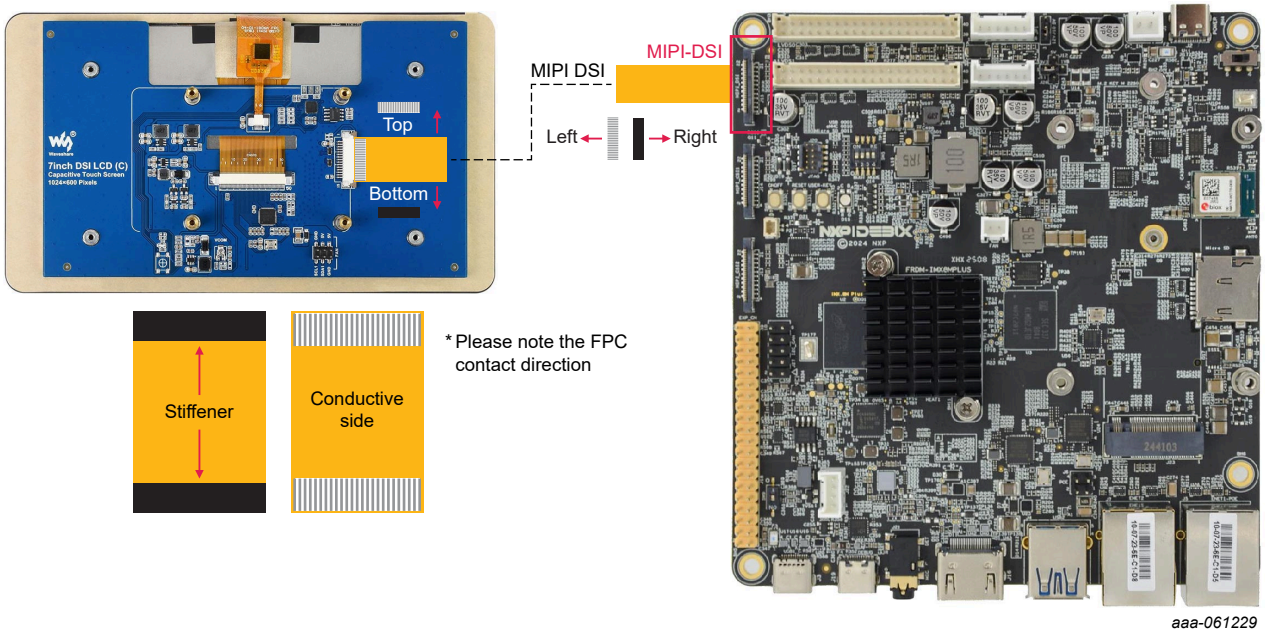

Figure 6. FPC cable connection between 7-Inch Waveshare LCD and FRDM-IMX8MPLUS

4.1.2 I2C signal connections

Figure 7 shows the connection of I2C signal wires between the 7-inch Waveshare LCD and the FRDM-IMX8MPLUS board.

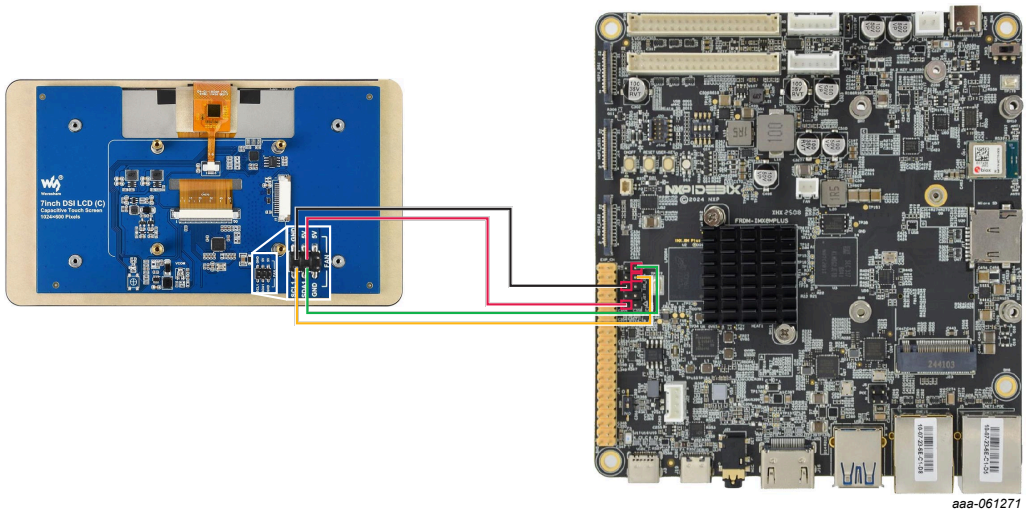

Figure 7. I2C connection between 7-Inch Waveshare LCD and FRDM-IMX8MPLUS

4.1.3 Software configuration update

The following steps specify how to replace the default `dtb` file with a custom dtb (`imx8mp-frdm-waveshare.dtb`) file that supports Waveshare LCD.

1. Stop at U-Boot
2. Use the below commands to replace the default dtb:

```
$setenv fdtfile imx8mp-frdm-waveshare.dtb
$saveenv
$boot
```

4.2 Camera module (RPI-CAM-MIPI)

The RPI-CAM-MIPI accessory board is a MIPI-CSI camera module adapter. The adapter is based on the AR0144 CMOS image sensor with ONSEMI IAS interface by default, which features a 1/4-inch 1.0 Mp with an active-pixel array of 1280 (H) x 800 (V). The bypassable onboard ISP chip allows it to be used with a wide range of SoCs. This accessory board connects to the FRDM-IMX8MPLUS board through the 22-pin / 0.5 mm pitch FPC cable.

4.2.1 Connection between RPI-CAM-MIPI and FRDM-IMX8MPLUS

Figure 8 shows the FPC cable connection between RPI-CAM-MIPI and FRDM-IMX8MPLUS. At the RPI-CAM-MIPI side:

- FPC cable orientation: Stiffener side up and conductive side down
- Insert FPC cable into RPI-CAM-MIPI FPC connector At FRDM-IMX8MPLUS board side:
- FPC cable orientation: Conductive side left and stiffener side right
- Insert the FPC cable into the FPC connector (J14) of the board

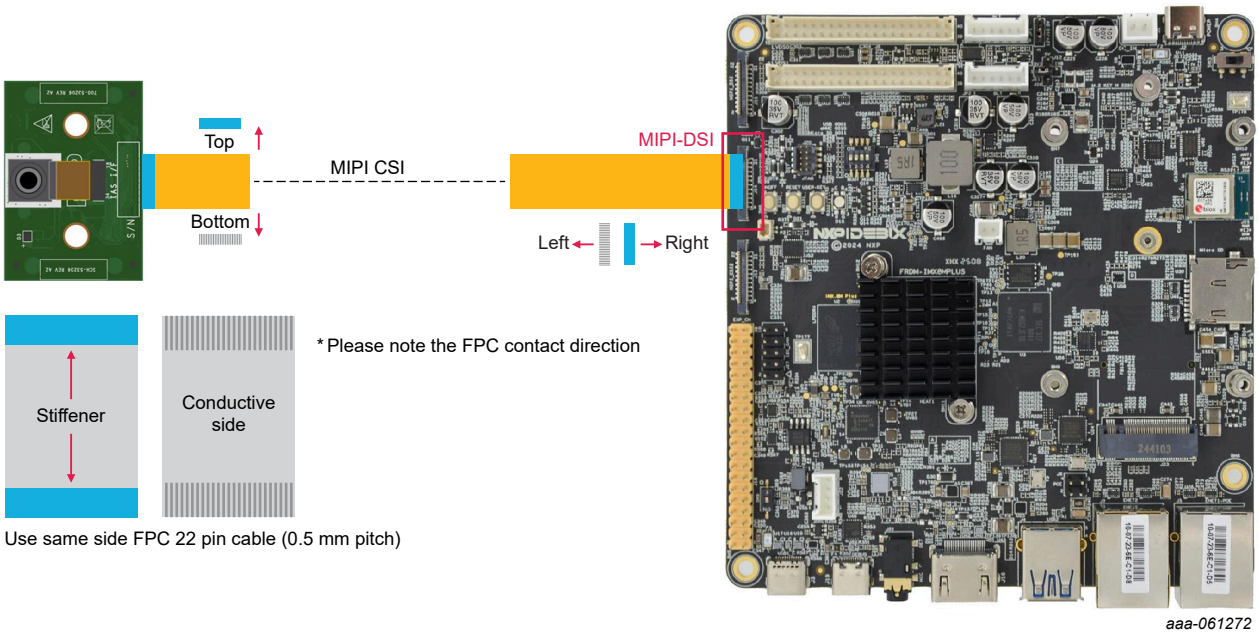

Figure 8. FPC connection between RPI-CAM-MIPI and FRDM-IMX8MPLUS

4.2.2 Software configuration update

In the default BSP, FRDM-IMX8MPLUS supports ap1302 + ar0144. For the first time use, follow the below steps:

- Download ap1302 firmware from ONSEMI github, and rename it as `ap1302.fw`.
- Copy `ap1302.fw` to the target board under the path `/lib/firmware/imx/camera/`. If the folder does not exist, create it.
- The default dtb file already supports single and dual ap1302+ar0144 firmware.

```
$setenv fdtfile imx8mp-frdm.dtb
$saveenv
$boot
```

- Check whether the camera can be probed.

```
root@imx93frdm:~# dmesg | grep ap1302 [2.565423]ap1302 mipi2-003c:AP1302 Chip ID is
 0x265
[2.577072]ap1302 mipi 2-003c: AP1302 is found
[7.477363]mx8-img-md: Registered sensor subdevice: ap1302 mipi 2-003c (1)
[7.513503]mx8-img-md: created link
[ap1302 mipi 2-003c]=> [mxc-mipi-csi2.0]7.988932]ap1302 mipi 2-003c: Load firmware
 successfully.
```

4.3 8MIC-RPI-MX8 accessory board

The FRDM-IMX8MPLUS can also work with the 8MIC-RPI-MX8 board through a 40-pin expansion interface (EXPI). To use this board, check the schematic and layout to determine the direction of the connection between FRDM-IMX8MPLUS and the accessory board in advance. Also, choose the right dtb file in the U-Boot stage.

4.4 Software configuration update

- To use the 8MIC-RPI-MX8 board, run the following commands at U-Boot to replace the default dtb:

```
$setenv fdtfile imx8mp-frdm-8mic.dtb
$saveenv
$boot
```

5 PCB information

The FRDM-IMX8MPLUS is made with standard 6-layer technology. The material is FR-4, and the PCB stack-up information is described in Table 14.

Table 14. FRDM-IMX8MPLUS board stack up information

Layer	Description	Copper (mil)	Generic	Er	Dielectric thickness (mil)
1	TOP	0.7+Plating	-	-	-
-	Dielectric	-			2.8
2	GND_1	1.4	-	-	-
-	Dielectric	-			3
3	IN1	1.4	-	-	-
-	Dielectric	-			42.9
4	PWR	1.4	-	-	-
-	Dielectric	-			3
5	GND_2	1.4	-	-	-
-	Dielectric	-			2.8
6	BOTTOM	0.7+Plating	-	-	-
Finished:	1.6 mm				
Designed:	62.1 mil			1.577 mm	
Material:	FR-4				

6 European Union regulatory compliance

The following information is provided per Article 10.8 of the Radio Equipment Directive 2014/53/EU:

- Frequency bands in which the equipment operates.
- The maximum RF power transmitted.

Table 15 lists these values.

Table 15. EU regulatory compliance

Part Number	RF Technology	(a) Freq Ranges (EU)	(b) Max Transmitted Power
FRDM-IMX8MPLUS	WLAN 2.4GHz Mode 802.11b/g/n/ax	2400MHz – 2500MHz	18dBm
	WLAN 5GHz Mode 802.11a/n/ac/ax	4900MHz – 5895MHz	18dBm
	BLE	2402MHz – 2480MHz	19dBm
	BT BR/EDR	2402MHz – 2480MHz	19dBm
	IEEE 802.15.4	2405 MHz - 2480 MHz	19dBm

EUROPEAN DECLARATION OF CONFORMITY (Simplified DoC per Article 10.9 of the Radio Equipment Directive 2014/53/EU):

This apparatus, namely FRDM-IMX8MPLUS, conforms to the Radio Equipment Directive 2014/53/EU. The full EU Declaration of Conformity for this apparatus can be found at this location: http://www.nxp.com/frdm-imx8mp.

7 Acronyms

Table 16 lists the acronyms used in this document.

Table 16. Acronyms

Acronym	Description
BSP	Board support package
CAN	Controller area network
CSI	Camera serial interface
DNP	Do not populate / do not place
DRAM	Dynamic random access memory
DSI	Display serial interface
EMMC	Embedded multi-media card
HDMI	High-Definition Multimedia Interface
I2C	Inter-integrated circuit
IoT	Internet of Things
ISP	Image Signal Processor
JTAG	Joint test action group
LDO	Low-dropout regulator
LED	Light-emitting diode
MPU	Microprocessor unit
MIPI	Mobile Industry Processor Interface
NPU	Neural Processing Unit
PD	Power Delivery
RTC	Real-time clock
SRAM	Static-random access memory
SWD	Serial wire debug
TOPS	Tera operations per second
USB	Universal serial bus

8 Related documentation

Table 17 lists and explains the additional documents and resources that you can refer to for more information about the FRDM-IMX8MPLUS board. Some of the documents listed below may be available only under a nondisclosure agreement (NDA). To request access to these documents, contact your local field applications engineer (FAE) or sales representative.

Table 17. Reference documentation

Document	Description	Link / how to access
i.MX 8M Plus Applications Processor Reference Manual	Intended for system software and hardware developers and application programmers who want to develop products with i.MX 8M Plus MPU	IMX8MPRM
i.MX 8M Plus Industrial Application Processors Data Sheet	Provides information about electrical characteristics, hardware design considerations, and ordering information	IMX8MPIEC
i.MX 8M Plus Hardware Design Guide	This document aims to help hardware engineers design and to test their i.MX 8M Plus processor-based designs. It provides information about board layout recommendations and design checklists to ensure first-pass success and avoidance of board bring-up problems.	IMX8MPHDG

For additional documents, refer to the URL: https://www.nxp.com/products/IMX8MPLUS#documentation

9 Note about the source code in the document

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10 Revision history

Table 18 summarizes the revisions to this document.

Table 18. Document revision history

Document ID	Release date	Description
UM12340 v.1.0	24 June 2025	Initial public release

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