

IMXWQSG

i.MX Windows 10 IoT Quick Start Guide

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User guide

Document Information

Information	Content
Keywords	i.MX, Windows 10 IoT
Abstract	This document guides you through the process of downloading and running this release package. It only explains how to download and run the default release image with the default configuration. For details on using the release package, see the Windows 10 IoT User's Guide (IMXWUG) included in this release package.



1 Overview

This document guides you through the process of downloading and running this release package. It explains how to download and run the default release image with the default configuration. For details on using the release package, see the Windows 10 IoT User's Guide (IMXWUG) included in this release package.

2 Hardware requirements

The hardware requirements for using this release package are as follows:

Supported evaluation boards (for more information supported board revisions, see Release Notes):

- i.MX 8M Mini EVK
- i.MX 8M Nano EVK
- i.MX 8M Plus EVK
- i.MX 8M Quad EVK
- i.MX 8QuadXPlus MEK (Silicon Revision C0)
- i.MX 93 EVK

Additional equipment:

- microSD card (minimum 8 GB)
- i.MX Mini SAS cable with IMX-MIPI-HDMI adapter (MIPI-DSI to HDMI converter) or IMX-LVDS-HDMI adapter (LVDS to HDMI converter), depending on the evaluation board/SoC capability. For more information, see the specific board chapter.

3 Software requirements

- Binary drivers and firmware (either downloaded from nxp.com)
- Windows IoT operating system. There are two options:
 - Visual Studio Subscription portal my.visualstudio.com
 - At the portal, click *Downloads* -> *Windows 10* -> Search for “Windows 10 IoT Enterprise LTSC 2021” or “Windows 10 IoT Enterprise 2021”
 - The default architecture is set to x64, click the dropdown menu to change it to Arm64 and download the DVD
 - Through microsoftoem.com facilitated by a Windows IoT OS distributor
 - To find a distributor, visit aka.ms/iotdistributorlist
- Windows [ADK for Windows 10](#) and Windows PE add-on for ADK, version 2004.

3.1 Serial logging setup

To help troubleshoot issues during boot, use the USB micro-B port on i.MX EVK boards to output U-Boot and the UEFI firmware serial debug logs to a host PC. The USB micro-B port on the EVK presents a virtual serial port to the host PC that can be read by the common Windows serial terminal applications such as HyperTerminal, Tera Term, or PuTTY.

1. Connect the target and the PC using the cable mentioned above.
2. Open the Device Manager on the PC, locate the Enhanced Virtual serial device and note the COM port number.
3. Open the terminal on the PC. Configure the Enhanced Virtual serial/COM port to 921600 baud/s, 8-bit, one-stop bit.

For the Host PC to recognize the i.MX device's virtual serial port, you might need to download and install drivers for the i.MX's USB to serial converter.

The i.MX 8M EVK uses the CP210x USB to serial bridge. The CP210x driver can be found [here](#).

The i.MX 8M Mini EVK uses the FT2232D USB to serial bridge. The FT2232D driver can be found [here](#).

Note: The order in which serial/COM ports appear in Windows can differ depending on the board and Windows host.

3.2 Windows driver debugging over serial cable

According to <https://learn.microsoft.com/en-us/windows-hardware/drivers/debugger/setting-up-a-null-modem-cable-connection> the target board debug port can be configured by:

```
bcdedit /dbgsettings serial debugport:n baudrate:rate
```

In this BSPs, the serial port number and baud rate is not influenced by this command and must be configured as described below.

Target board serial port used for debugging is defined in the ACPI Dbg2.aslc (`\win10-iot-bsp\mu_platform_nxp\Silicon\ARM\NXP\iMX8Pkg\AcpiTables\Dbg2.aslc`) and can be changed in the `\win10-iot-bsp\mu_platform_nxp\NXP\iMX8M_PLUS_EVK\iMX8M_PLUS_EVK.dsc` file, parameter `PcdKdUartInstance`.

It is supposed that this serial port is fully initialized by U-Boot. The baud rate can be changed in the U-Boot configuration file (for example, `\win10-iot-bsp\uboot-imx\configs\imx8mq_evk_nt_uuu_defconfig`, parameter `CONFIG_BAUDRATE`) BSP must be rebuilt after changes in the source code. Use `buildme64.sh -b <BOARD_NAME> -t all -c` to be sure that all changes are applied.

The default debug port baud rate is set in U-Boot is 921600. Baud rates higher than 115200 may not work correctly with newer versions of the Host operating system.

3.3 References

For more information about Windows 10 IoT Enterprise, see [Microsoft online documentation](#).

The following quick start guides available on the [NXP website](#) contain basic information on the board and setting it up:

- [i.MX 8M Quad Evaluation Kit Quick Start Guide](#)
- [i.MX 8M Mini Evaluation Kit Quick Start Guide](#)
- [i.MX 8M Nano Evaluation Kit Quick Start Guide](#)
- [i.MX 8M Plus Evaluation Kit Quick Start Guide](#)
- [i.MX 8QuadXPlus Multisensory Enablement Kit Quick Start Guide](#)
- [i.MX 93 Evaluation Kit Quick Start Guide](#)

4 Working with the i.MX 8M Mini EVK Board

4.1 Board hardware

The figures below show different components of the i.MX 8M Mini EVK LPDDR4 board.

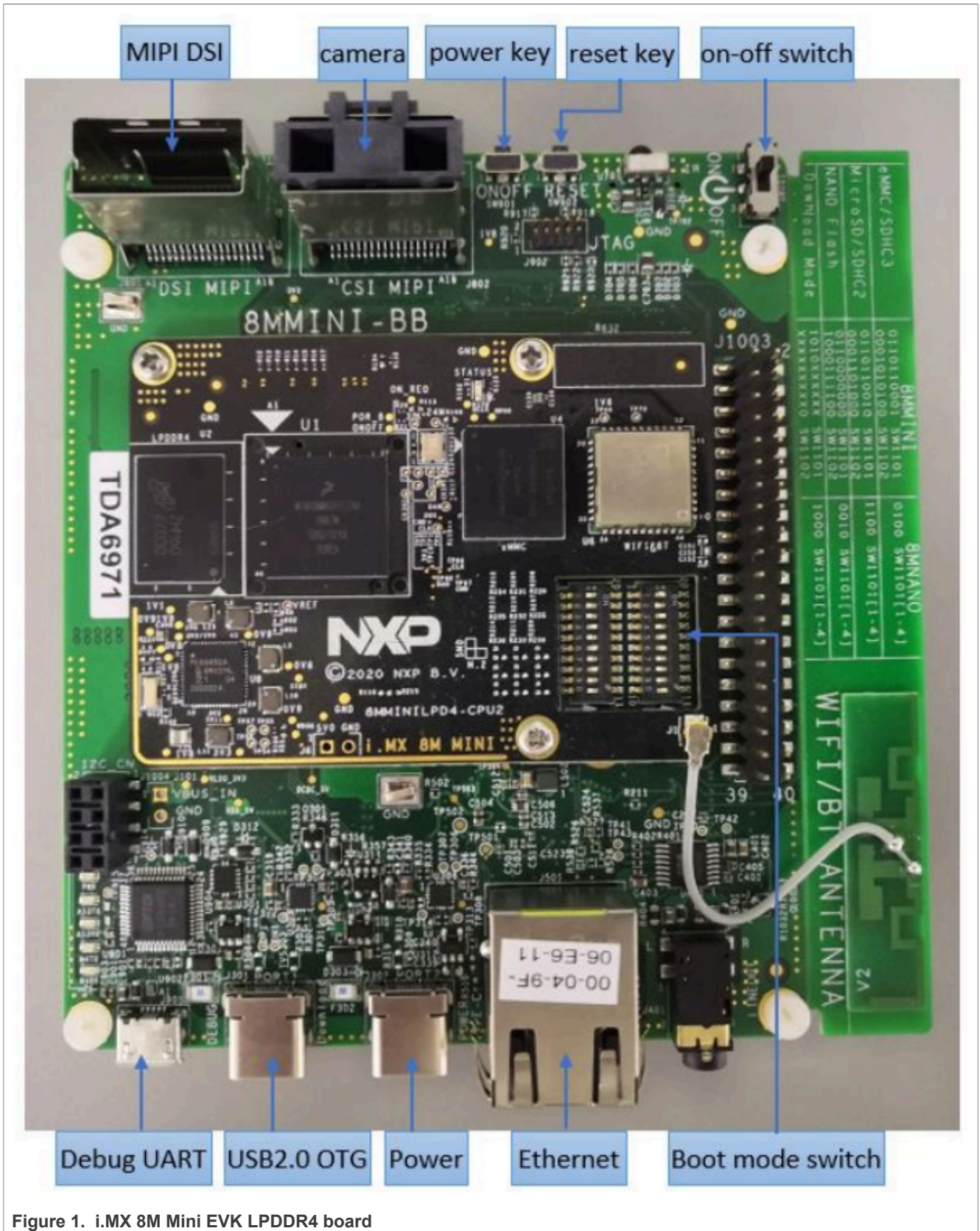


Figure 1. i.MX 8M Mini EVK LPDDR4 board



Figure 2. i.MX Mini SAS cable with DSI-to-HDMI adapter IMX-MIPI-HDMI



Figure 3. OV5640 CSI MIPI camera

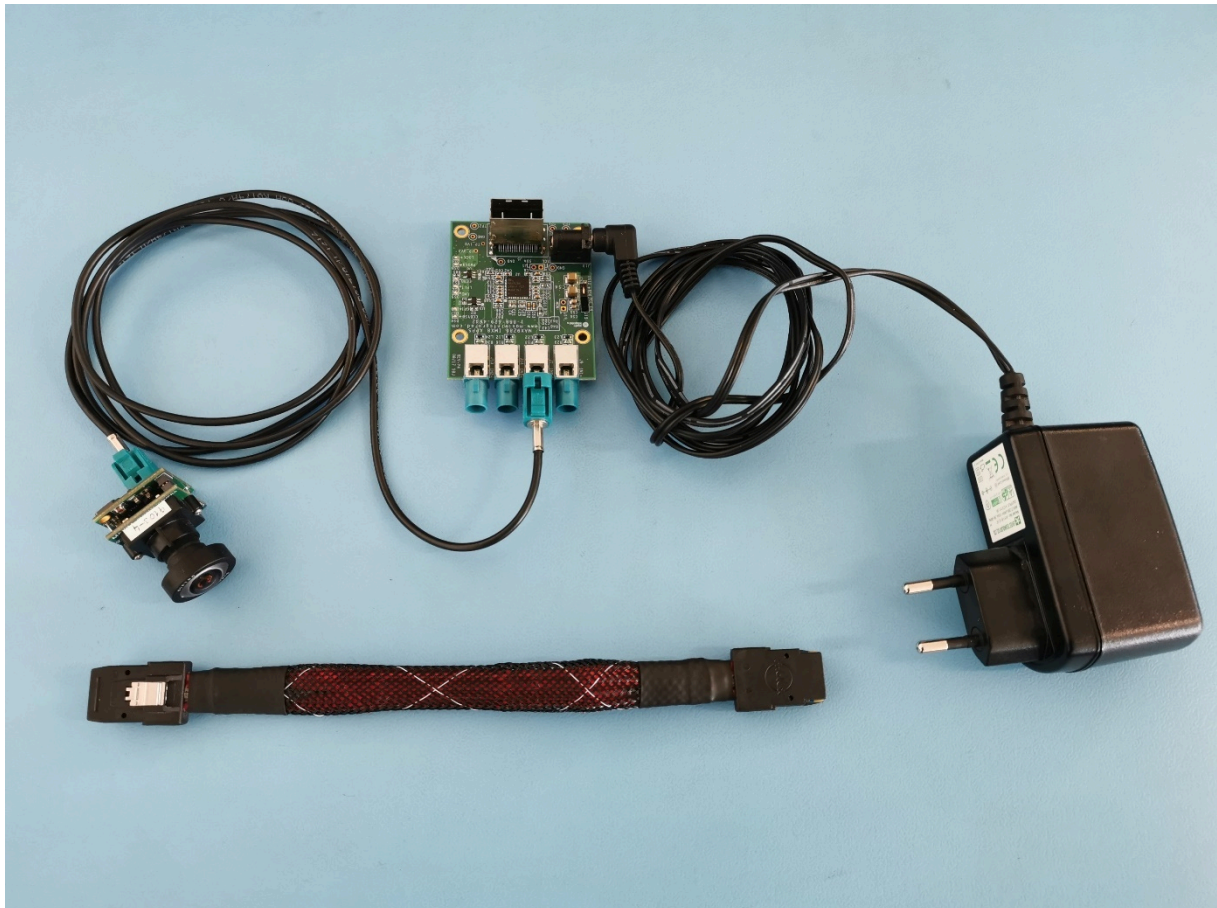


Figure 4. OV10635 Camera set

4.2 Display interface support

The MIPI-DSI to HDMI converter IMX-MIPI-HDMI is supported. The converter is connected to the MIPI-DSI display interface on the EVK board (see [Figure 1](#)) with a mini-SAS cable (see [Figure 2](#)). Use a standard HDMI cable to connect an HDMI compatible display.

5 Working with the i.MX 8M Nano EVK Board

5.1 Board hardware

The figures below show different components of the i.MX 8M Nano EVK board.

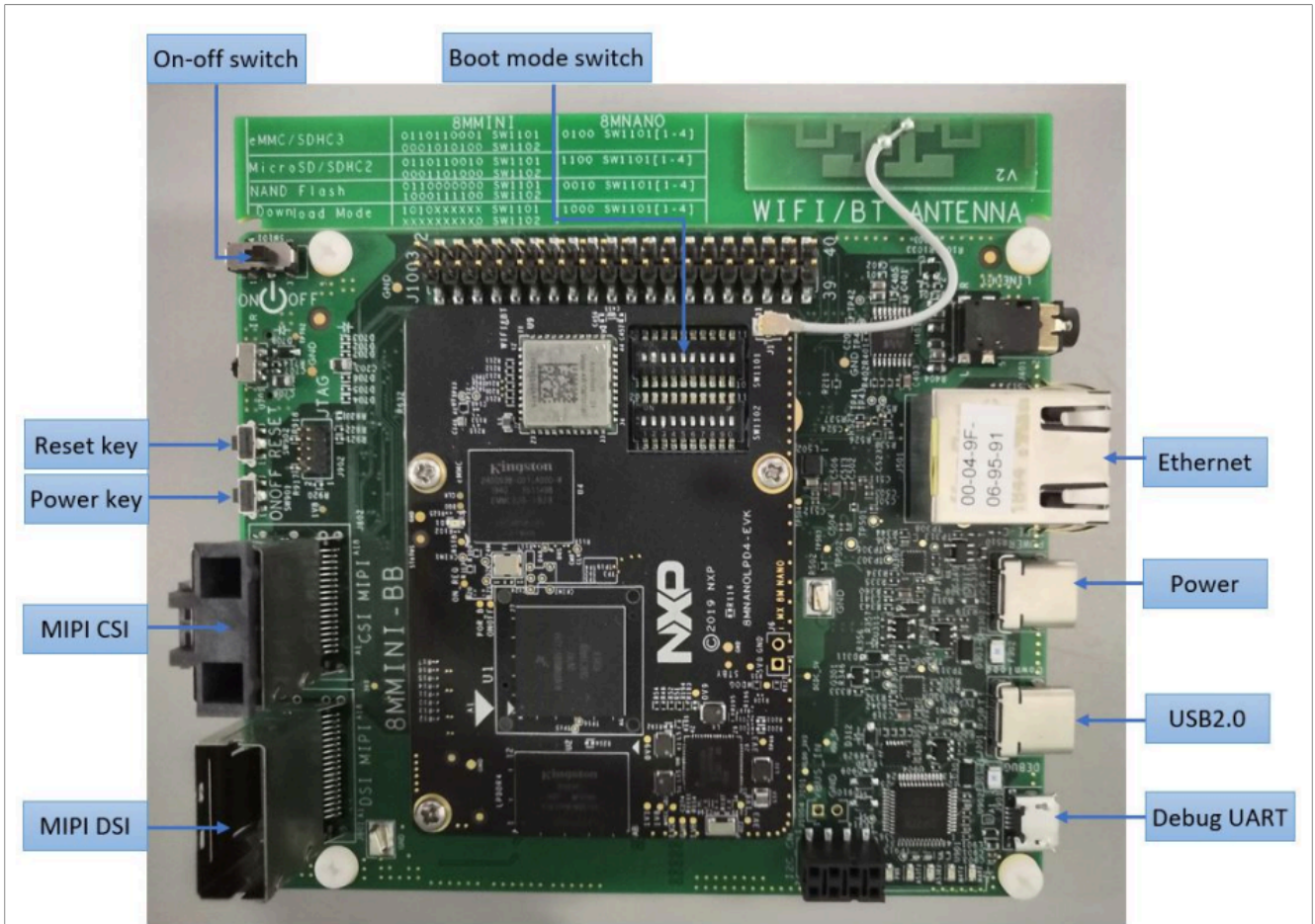


Figure 5. i.MX 8M Nano EVK board



Figure 6. i.MX Mini SAS cable with DSI-to-HDMI adapter IMX-MIPI-HDMI



Figure 7. OV5640 CSI MIPI camera

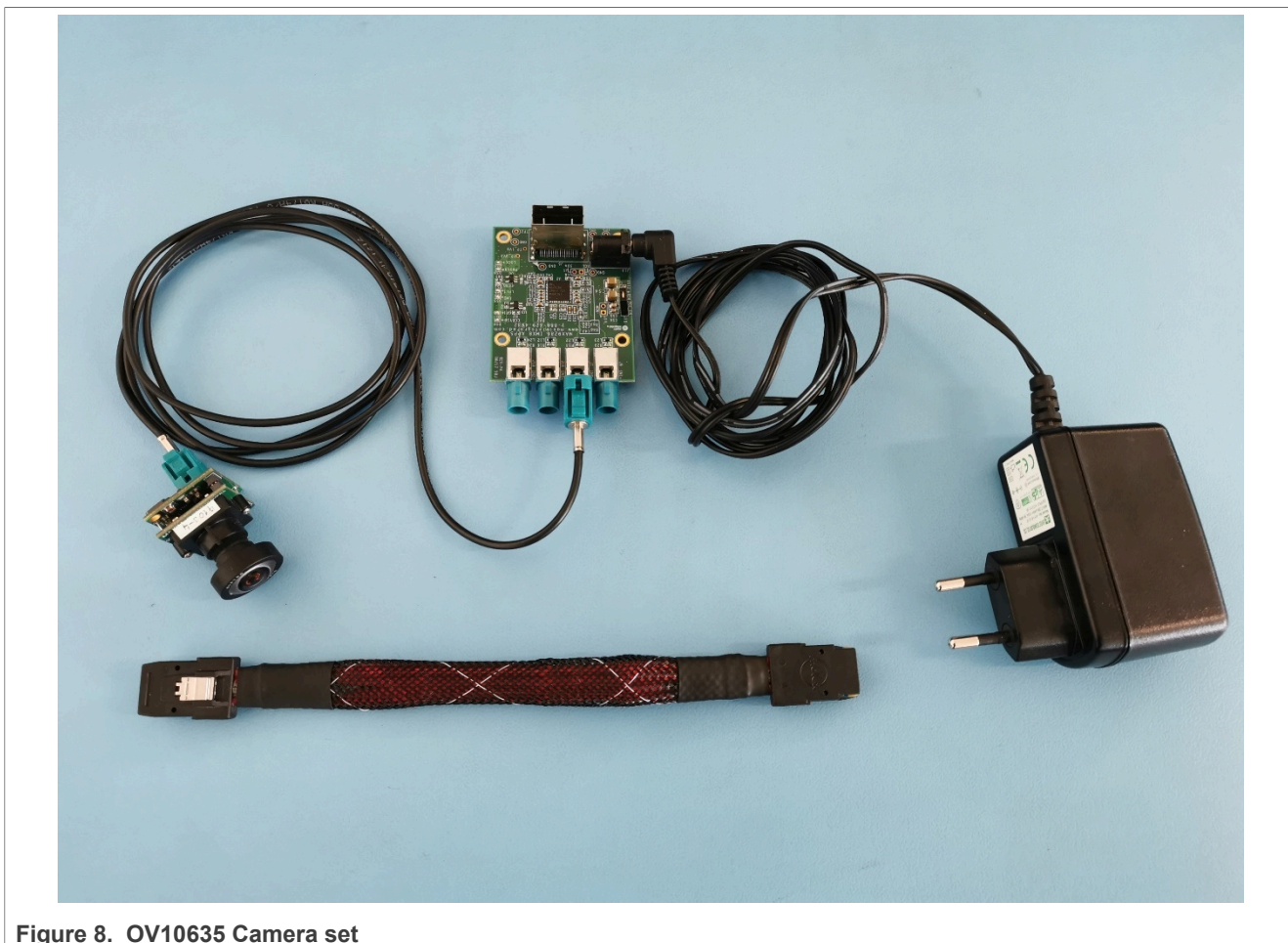


Figure 8. OV10635 Camera set

5.2 Display interface support

The MIPI-DSI to HDMI converter IMX-MIPI-HDMI is supported. The converter is connected to the MIPI-DSI display interface on the EVK board (see [Figure 5](#)) with a mini-SAS cable (see [Figure 6](#)). Use a standard HDMI cable to connect an HDMI compatible display.

6 Working with the i.MX 8M Plus EVK Board

6.1 Board hardware

The figures below show different components of the i.MX 8M Plus EVK board.

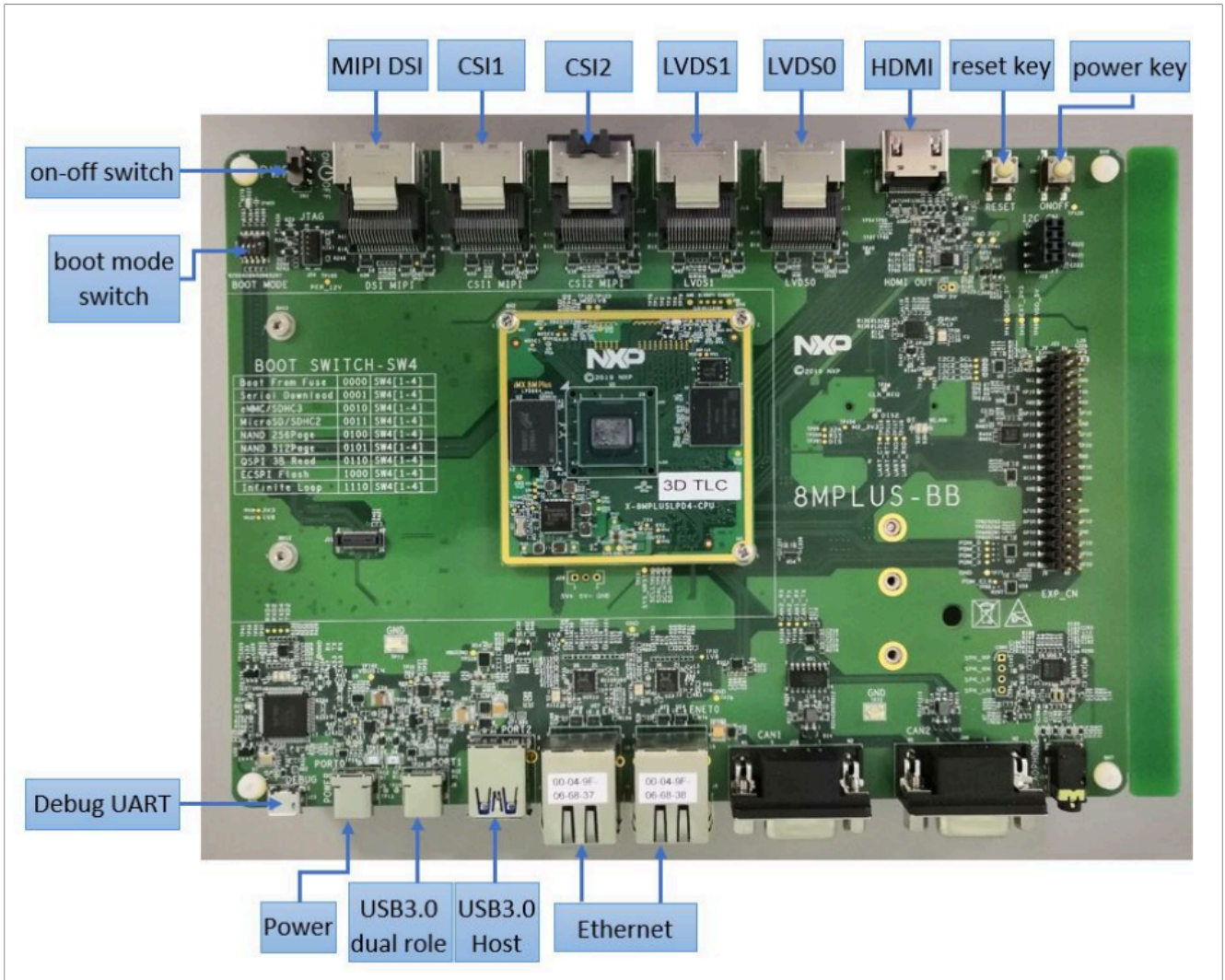


Figure 9. i.MX 8M Plus EVK board



Figure 10. i.MX mini SAS cable with LVDS-to-HDMI adapter



Figure 11. OV5640 CSI MIPI camera

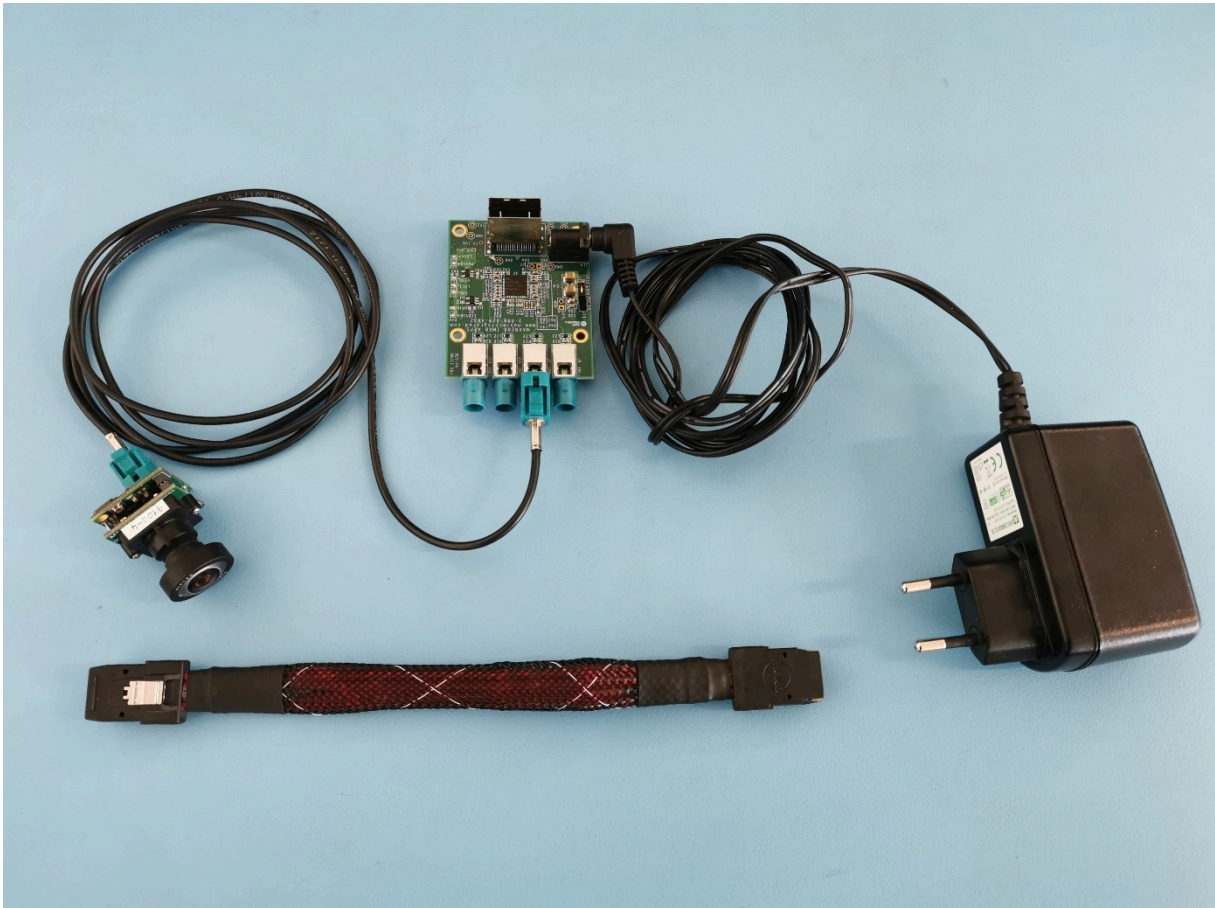


Figure 12. OV10635 Camera set

6.2 Display interface support

- An HDMI compatible display is supported and can be connected using a standard HDMI cable to the HDMI display interface on the EVK board (see [Figure 9](#)). This display interface is selected as the default one.
- The LVDS to HDMI converter IMX-LVDS-HDMI is supported. The converter is connected to the LVDS0 display interface on the EVK board (see [Figure 9](#)) with a mini-SAS cable (see [Figure 10](#)). Use a standard HDMI cable to connect an HDMI compatible display. It is necessary to update the Display0Interface parameter in the registry or `galcore.inf` to 0x4 and reboot/re-install the GPU driver (for more information, see i.MX Windows 10 IoT User's Guide, IMXWGU).
- Optionally, a single LVDS display (connected to LVDS0) and a dual LVDS display (connected to both LVDS0 and LVDS1) can be used. It is necessary to update the Display0Interface parameter in the registry or `galcore.inf` to 0x4 (single LVDS) or 0x6 (dual LVDS) for the windows GPU driver and reboot/re-install the GPU driver (for more information, see i.MX Windows 10 IoT User's Guide, IMXWGU).

- MIPI-DSI to HDMI converter IMX-MIPI-HDMI is supported. The converter is connected to the MIPI-DSI display interface on the EVK board (see [Figure 9](#)) with a mini-SAS cable (see [Figure 2](#)). Use a standard HDMI cable to connect an HDMI compatible display. It is necessary to update the Display2Interface parameter in the registry or `galcore.inf` to 0x2 and reboot/re-install the GPU driver (for more information, see i.MX Windows 10 IoT User's Guide, IMXWGU).
- Optionally, a MIPI-DSI display (connected to MIPI-DSI) can be used. It is necessary to update the Display2Interface parameter in the registry or `galcore.inf` to 0x2 and reboot/re-install the GPU driver (for more information, see i.MX Windows 10 IoT User's Guide, IMXWGU).

7 Working with the i.MX 8M Quad EVK Board

7.1 Board hardware

The figures below show different components of the i.MX 8M Quad EVK board.

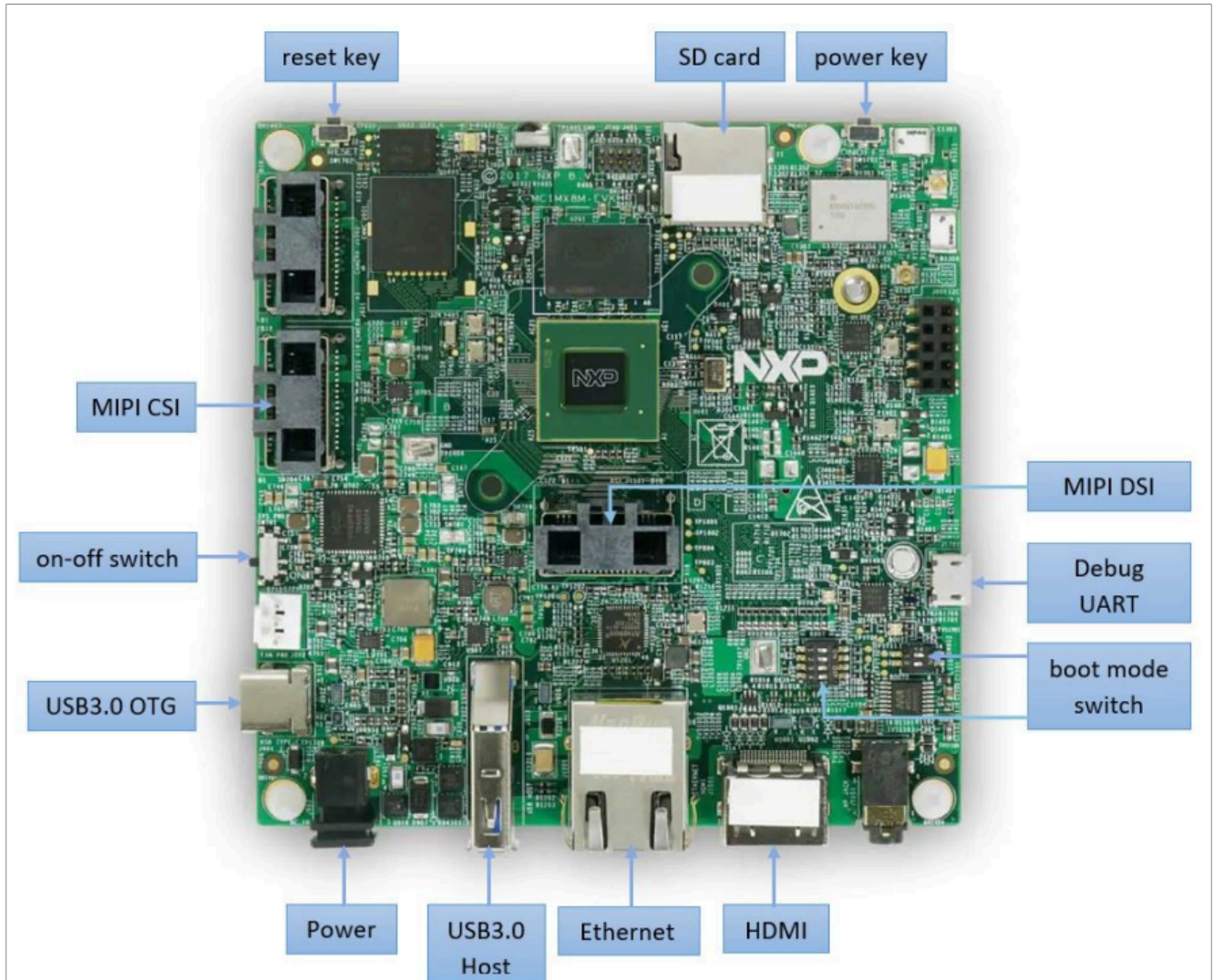


Figure 13. i.MX 8M Quad EVK board



Figure 14. OV5640 CSI MIPI camera

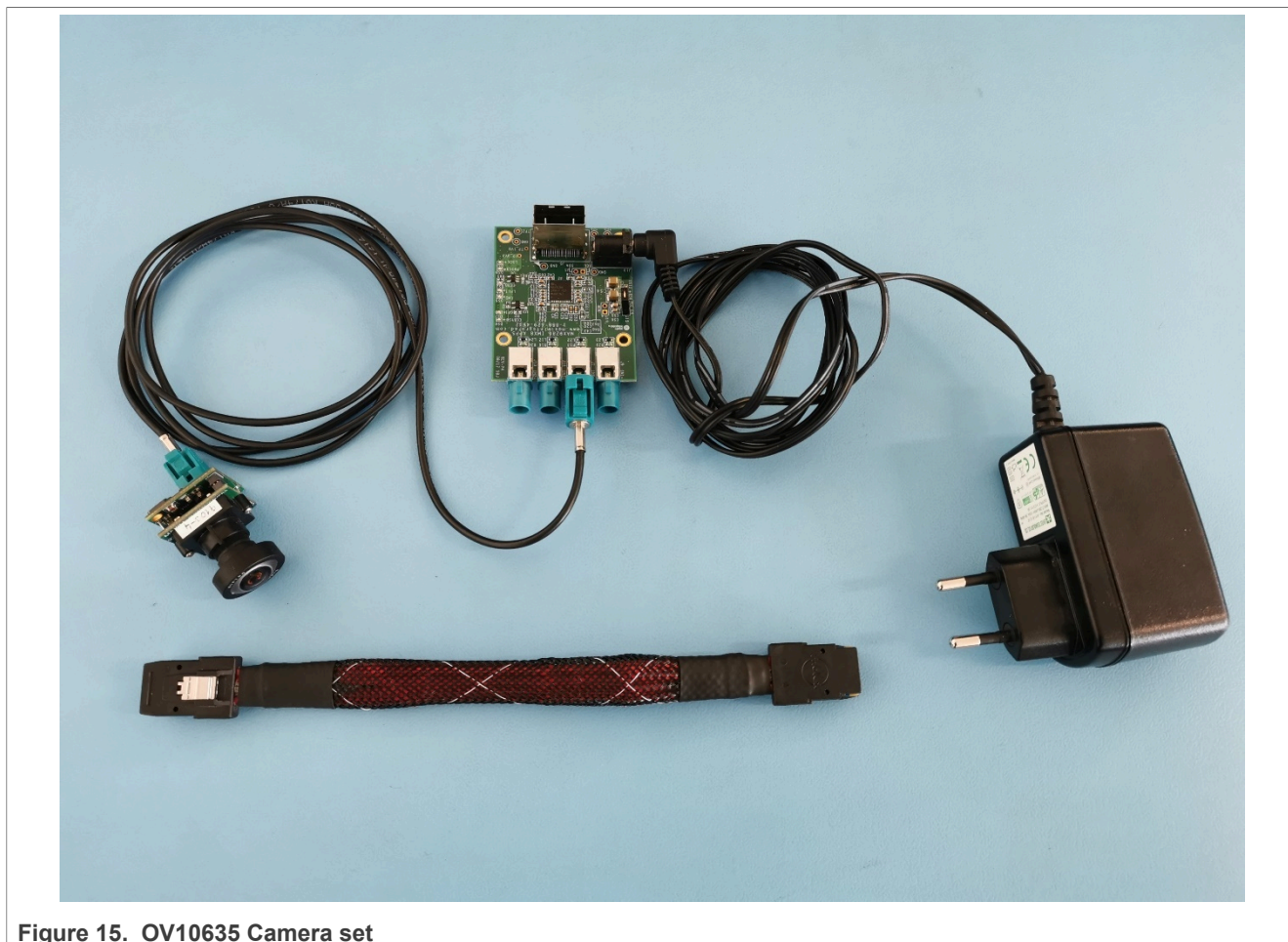


Figure 15. OV10635 Camera set

7.2 Display interface support

The HDMI interface is supported on the EVK board (see [Figure 13](#)). Use a standard HDMI cable to connect an HDMI compatible display.

8 Working with the i.MX 8QuadXPlus MEK Board

8.1 Board hardware

The figures below show different components of the i.MX 8QuadXPlus MEK board.

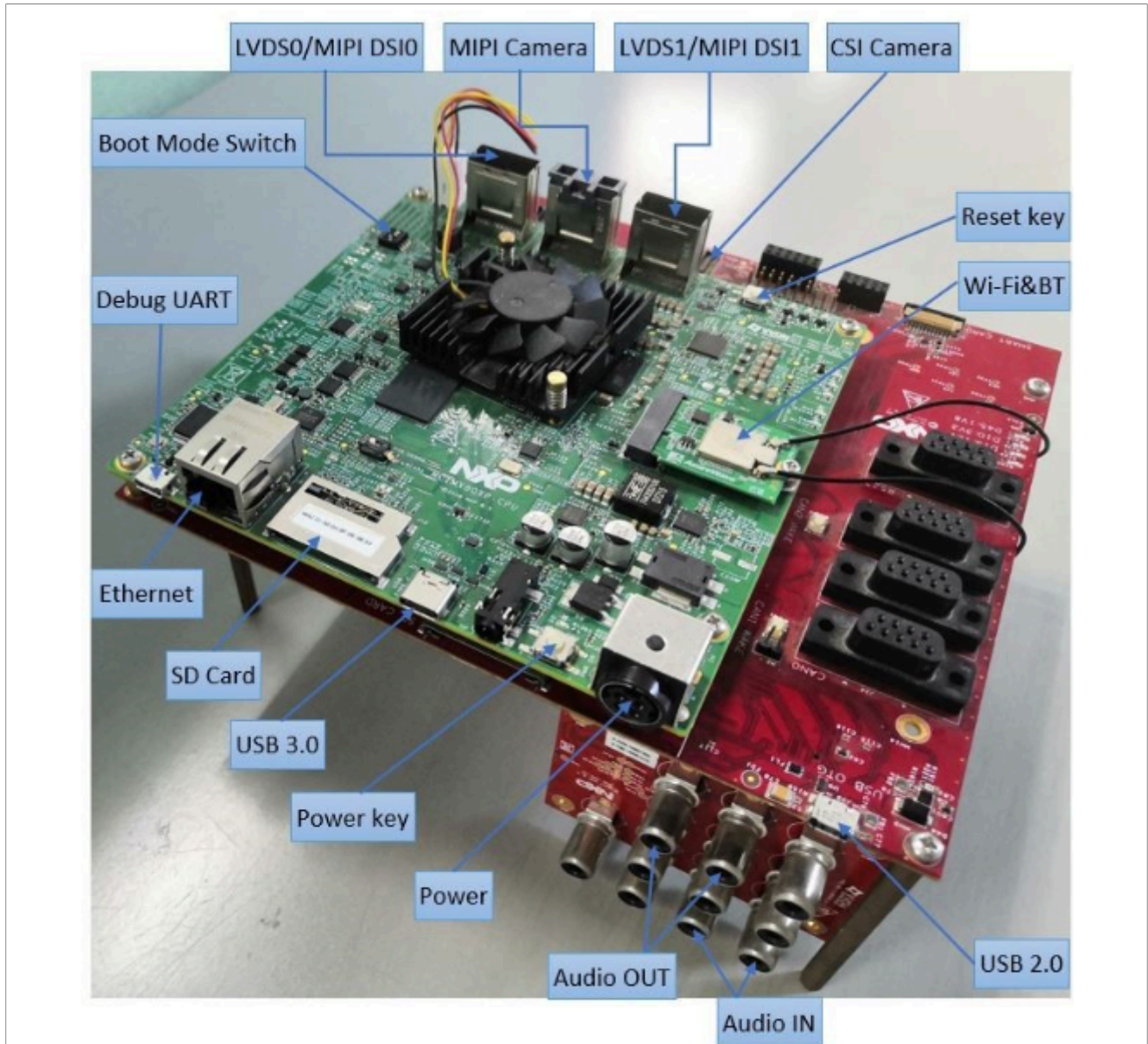


Figure 16. i.MX 8QuadXPlus MEK board



Figure 17. OV5640 CSI MIPI camera

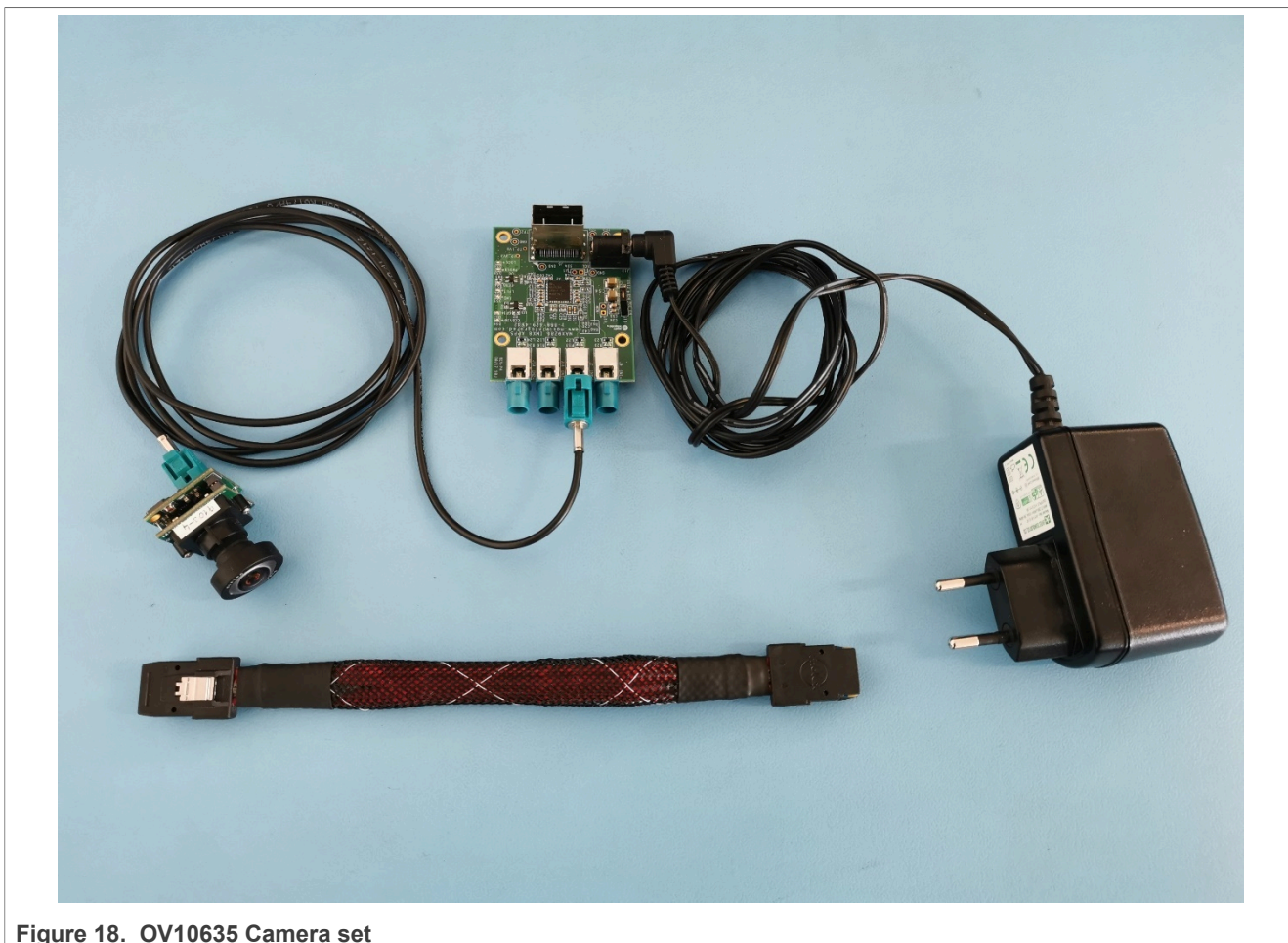


Figure 18. OV10635 Camera set

Note:

- Do not connect the 12 V external adapter to the camera plugged into the i.MX 8QuadXPlus MEK board. The 12 V power source is embedded on the development board.

8.2 Display interface support

- The LVDS to HDMI converter IMX-LVDS-HDMI is supported. The converter is connected to the LVDS0 display interface on the MEK board (see [Figure 16](#)) with a mini-SAS cable (see [Figure 10](#)). Use a standard HDMI cable to connect an HDMI compatible display.
- Optionally, an additional LVDS1 display interface can be used (LVDS to HDMI converter or LVDS display). It is necessary to update the Display1Interface parameter in the registry or `galcore.inf` to 0x5 and reboot/re-install the GPU driver (for more information, see i.MX Windows 10 IoT User's Guide, IMXWGU).

9 Working with the i.MX 93 EVK Board

9.1 Board hardware

The figures below show different components of the i.MX 93 EVK board.

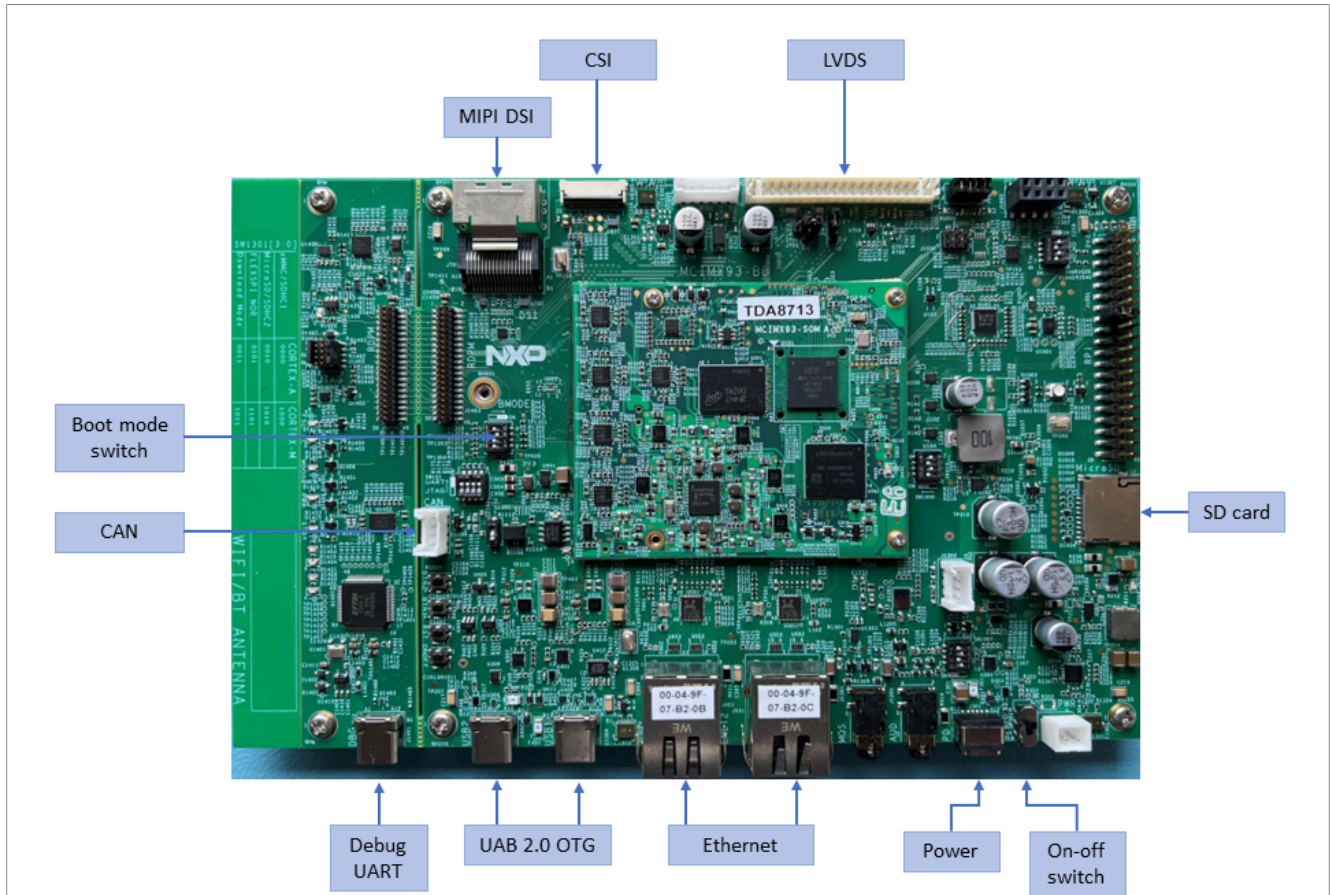


Figure 19. i.MX 93 EVK board



Figure 20. i.MX Mini SAS cable with the DSI-to-HDMI adapter IMX-MIPI-HDMI

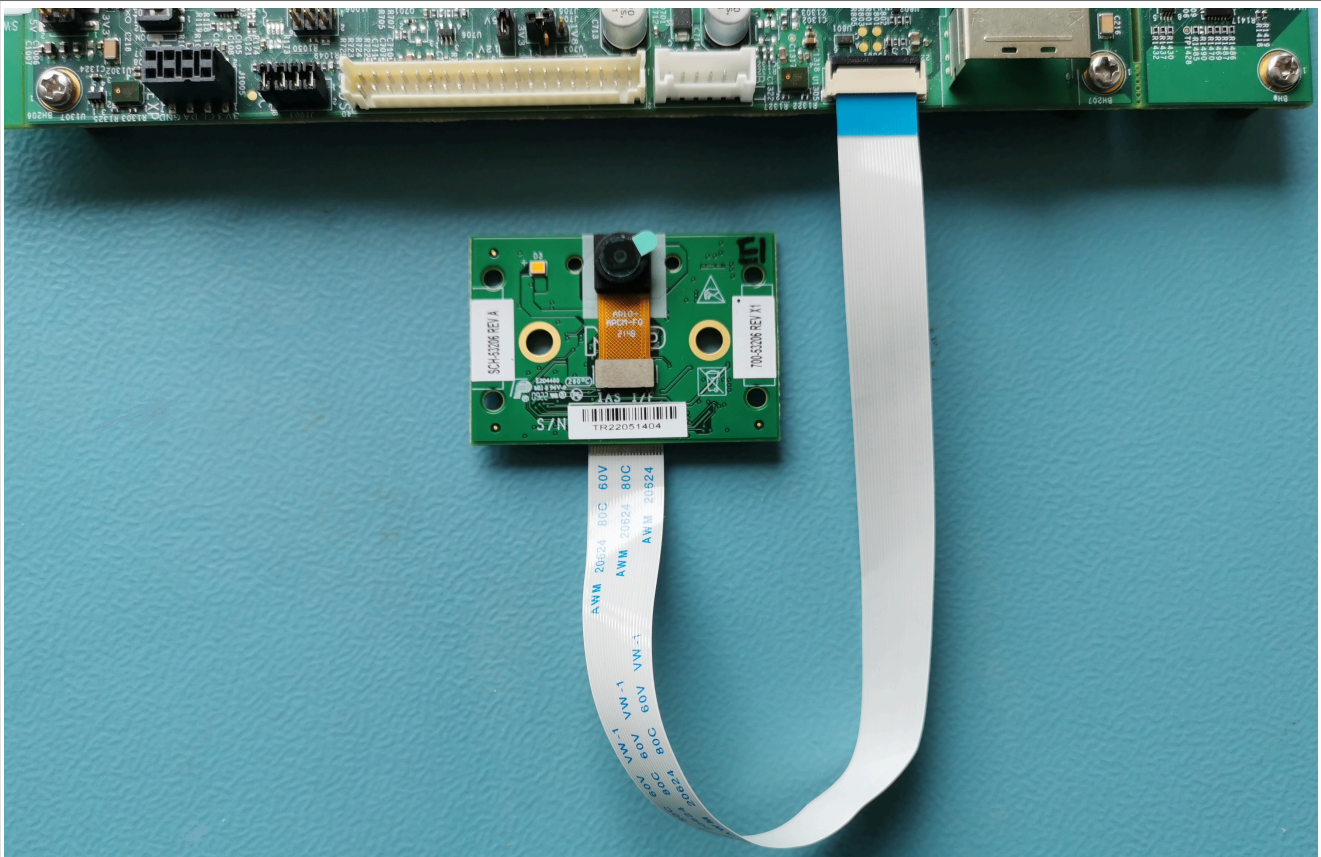


Figure 21. X-RPI-CAM-MIPI camera board

9.2 Display interface support

The MIPI-DSI to HDMI converter IMX-MIPI-HDMI is supported as the default display interface. The converter is connected to the MIPI-DSI display interface on the EVK board (see [Figure 19](#)) with a mini-SAS cable (see [Figure 20](#)). Use a standard HDMI cable to connect an HDMI compatible display. Alternatively, an LVDS panel EV121WXM-N12 with resolution 1280x800 can be connected to the LVDS display interface on the EVK board (see [Figure 22](#)). To switch to the LVDS display interface, set `PcdDisplayInterface` to 2 in the `/mu_platform_nxp/NXP/MX93_11X11_EVK/MX93_11X11_EVK.dsc` file. The firmware must then be recompiled.



10 Flashing Windows IoT image

Windows 10 IoT must be installed on the eMMC from the SD card. Preparing the bootable SD card consists of two steps: flashing the Windows 10 IoT installer and flashing the firmware to an SD card.

10.1 Flashing Windows 10 IoT Installer to the SD card

Currently, the only way to deploy a Windows IoT Enterprise on the onboard eMMC is to use WinPE.

OS (Windows Preinstallation Environment) to write the Windows IoT image to eMMC.

Windows manufacturing OS (WinPE) that can be fully loaded and run from memory without using persistent storage. The following steps create an SD card with WinPE and a Windows IoT image that contains the BSP drivers. The boot firmware checks the SD card and boots WinPE, which then installs the Windows IoT image to the eMMC.

1. Decompress the W21H2-1-x-x-imx-windows-bsp-binaries.zip file. The package contains release-signed prebuilt binaries and image files.
2. Open the elevated command prompt and navigate to the *IoTEntOnNXP* directory.
3. Mount the previously downloaded Windows IoT Enterprise ISO image file (see chapter [Software requirements](#)) and copy the *install.wim* file from the `<DVD mount drive:>\sources\install.wim` to the *IoTEntOnNXP* directory.
Note: This step can be skipped - instead of mounting the ISO image file, copy it into the *install.wim* directory and add parameter `/iso` into the command line in the next step.
4. Execute the command:

```
.\make-winpe-enterprise.cmd /disable_updates /test_signing
```

This command creates a copy of the selected *install.wim* image with injected i.MX drivers and applied updates from the *kbpatch/* directory. These patches are for Windows 21H2, build 19044.1288 and update the image to build 19044.2566.
Note: Be sure to copy the whole command line.
5. Execute the command:

```
.\make-winpe-enterprise.cmd /apply <disk_number>
```

where `<disk_number>` is the physical number of the SD card disk on your PC. It can be obtained using the Disk Management tool (right-click the start menu icon and select Disk Management). This command deploys the WinPE image to the SD card.
CAUTION:
Make sure to select the correct disk number, as this step formats the selected disk! The WinPE-based Windows installer is now deployed on the SD card.
6. Continue with the firmware installation to the SD card.

10.2 Flashing firmware to the SD card

During active development of the boot firmware, it can be time-consuming and error-prone to repeatedly change the dip switches between UUU download mode and eMMC boot mode. To simplify this process, i.MX EVK boards support SD card boot mode that allows you to keep the boot firmware on an SD card.

To deploy boot firmware to an SD card from Windows, use the [Cfimgager tool](#).

Perform the following steps to flash the firmware to the SD card:

1. Download the NXP cfimgager tool and copy it into the *firmware* directory or a directory listed in the system environment variable `%PATH%`.
2. Navigate to the *firmware* directory.
3. Plug the SD card into the host PC and execute the following board-specific command:
For the i.MX 8M Mini EVK board:

```
.\flash_bootloader.cmd /device MX8M_MINI_EVK /target_drive <SD card driver letter, for example, f:>
```

For the i.MX 8M Quad EVK board:

```
.\flash_bootloader.cmd /device MX8M_EVK /target_drive <SD card driver letter, for example, f:>
```

For the i.MX 8M Nano EVK board:

```
.\flash_bootloader.cmd /device MX8M_NANO_EVK /target_drive <SD card driver letter, for example, f:>
```

For the i.MX 8M Plus EVK board:

```
.\flash_bootloader.cmd /device MX8M_PLUS_EVK /target_drive <SD card driver letter, for example, f:>
```

For the i.MX 8QuadXPlus MEK board:


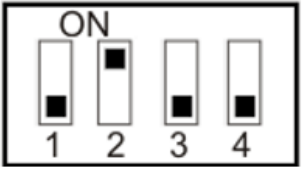
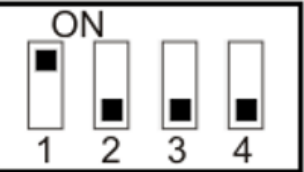

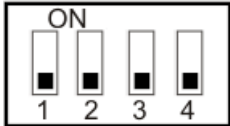

```
.\flash_bootloader.cmd /device MX8QXP_MEK /target_drive <SD card driver letter, for example, f:>
```

For the i.MX 93 EVK board:

```
.\flash_bootloader.cmd /device MX93_11X11_EVK /target_drive <SD card driver letter, for example, f:>
```

4. Power off the board.
5. Insert the SD card to the board.
6. Change the boot device to the SD card.
7. Power on the board.

Board	SD card boot	eMMC boot	USB download mode
MX8M_MINI_EVK			
MX8M_EVK			
MX8M_NANO_EVK			
MX8M_PLUS_EVK			

Board	SD card boot	eMMC boot	USB download mode
MX8QXP_CPU			
MX93_EVK			

10.3 Flashing Firmware to eMMC

The second option is to load the firmware to the eMMC memory. To flash the bootable firmware to eMMC, we recommend downloading the UUU (Universal Update Utility) 1.5.21 tool used for BSP testing from https://github.com/nxp-imx/mfgtools/releases/tag/uuu_1.5.21.

Note: The UUU tool requires U-Boot with UUU boot support enabled. For security reasons, it is recommended to disable UUU download support in the U-Boot in final designs.

To deploy boot firmware to eMMC via USB download mode, follow the steps below:

1. Navigate to the firmware directory. In the source package, it is in `imx-windows-iot/BSP/firmware`.
2. Download the UUU tool and copy it into the `firmware\tools\uuu\` directory (Create the `tools\` and `uuu\` directories, as they are not present in the source package).
3. Start preparing the board by turning it off.
4. Switch the target board to USB download mode using DIP switches. See the table in section [Flashing firmware to the SD card](#).
5. Connect a USB-C cable to the desktop and the board's USB-C port. Then turn on the board.
6. Run `flash_bootloader.cmd` as: `.\flash_bootloader.cmd /device <device_name> /secure <insecure=0, secure=1>` where `tag /secure` specifies temporary firmware with the UUU tool support (by default `firmware_uuu.bin` is used for nonsecure selection, `signed_firmware_uuu.bin` is used for secure build selection). This firmware is used to program the user's firmware on eMMC. Ensure that the corresponding firmware is built. If the corresponding firmware is not found, the user is prompted to select a custom firmware or exit the program.
7. When the process is complete, power off the board. Disconnect the USB-C cable and connect the board to the PC. Failure to disconnect from the PC may cause errors in subsequent steps.
8. Switch the board to eMMC boot mode. See the table in section [Flashing firmware to the SD card](#). Basic Board Setup UUU documentation is available at <https://github.com/NXPmicro/mfgtools>.

10.4 Installing Windows 10 IoT on eMMC and Booting Windows 10 IoT

1. Power on the board and let the Windows installer install Windows IoT Enterprise to the eMMC, then reboot into installed Windows. Installing Windows IoT Enterprise from the SD card can take around 30 minutes.

Note: The WinPE installer renames the EFI folder at the root of the SD card to `_efi`, which causes UEFI to skip the SD card at boot time. This allows you to keep the SD card inserted across reboots without having Windows IoT reinstalled on each reboot. If you wish to boot into the WinPE installer again, you can rename `_efi` back to `EFI`.
2. Make sure to disable sleep in “Power and sleep” settings after Windows OS boots up to avoid unexpected system hangs.

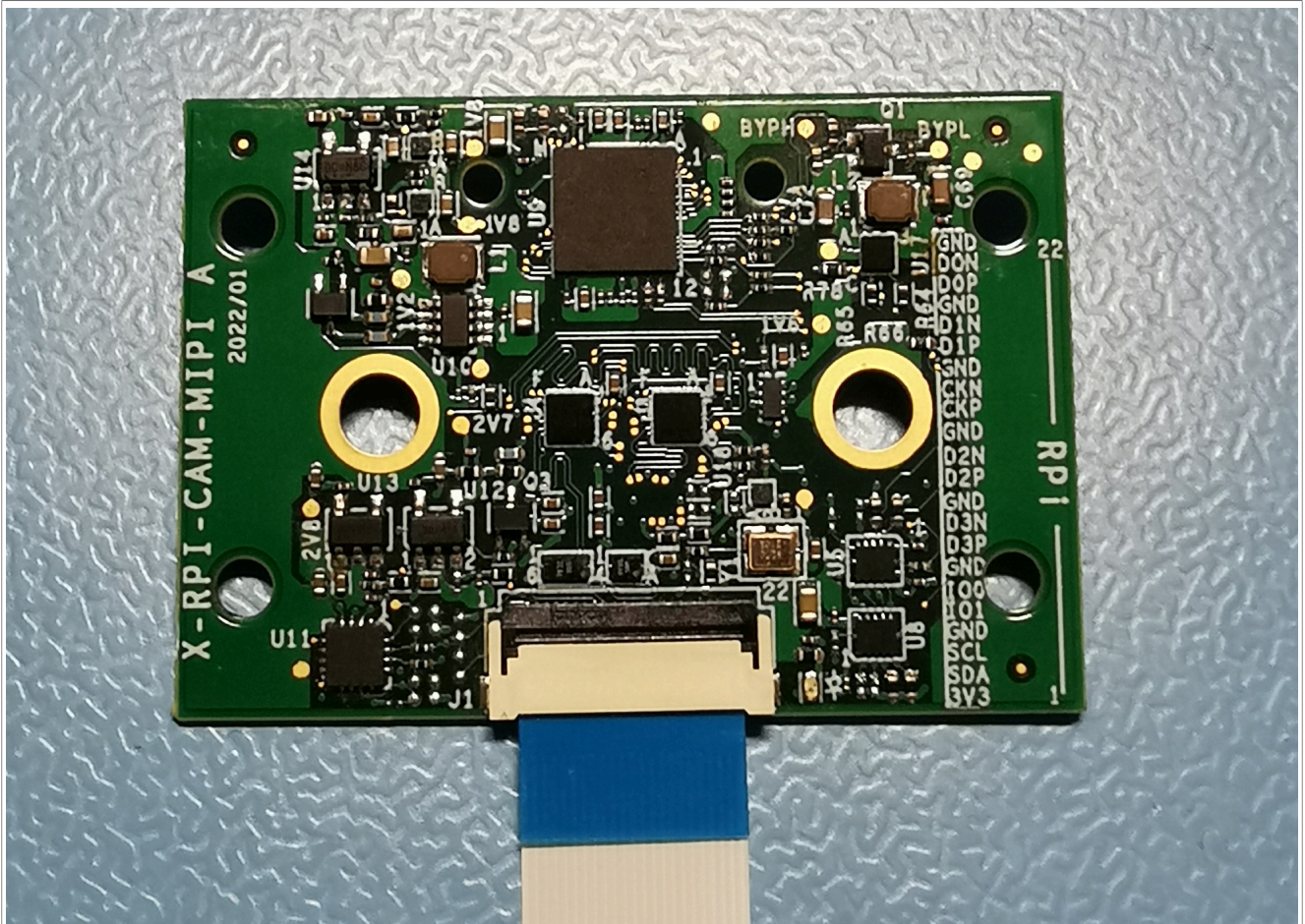


Figure 24. Connection of the ribbon cable on X-RPI-CAM-MIPI camera board side

12 Camera Connection and UEFI Parameters

MX8M_EVK Board:

Camera	Connector	UEFI PCD symbol/macro
OV5640	J1502 (CAMERA)	PcdCsi1CameraOv5640
OV5640	J1503 (CAMERA)	PcdCsi2CameraOv5640
OV10635	J1502 (CAMERA)	PcdCsi1CameraOv10635
OV10635	J1505 (CAMERA)	PcdCsi2CameraOv10635

MX8M_PLUS_EVK Board:

Camera	Connector	UEFI PCD symbol/macro
OV5640	J12 (CSI 1 MIPI)	PcdCsi1CameraOv5640
OV5640	J13 (CSI 2 MIPI)	PcdCsi2CameraOv5640
OV10635	J12 (CSI 1 MIPI)	PcdCsi1CameraOv10635
OV10635	J13 (CSI 2 MIPI)	PcdCsi2CameraOv10635

MX8M_NANO_EVK Board:

Camera	Connector	UEFI PCD symbol/macro
OV5640	J802 (CSI MIPI)	PcdCsi1CameraOv5640
OV10635	J802 (CSI MIPI)	PcdCsi1CameraOv10635

MX8M_MINI_EVK Board:

Camera	Connector	UEFI PCD symbol/macro
OV5640	J802 (CSI MIPI)	PcdCsi1CameraOv5640
OV10635	J802 (CSI MIPI)	PcdCsi1CameraOv10635

MX8QXP_CPU Board:

Camera	Connector	UEFI PCD symbol/macro
OV5640	J2 (CSI)	PcdCsi1CameraOv5640
OV10635	J2 (CSI)	PcdCsi1CameraOv10635

MX93_11x11_EVK Board:

Camera	Connector	UEFI PCD symbol/macro
X-RPI-CAM-MIPI (AP1302 ISP + AR0144)	J801 (CSI)	PcdCsi1CameraRpiCamMipi

13 Revision history

Revision number	Date	Substantive changes
W1.2.0	9/2022	Initial version of the Quick Start Guide.
W1.2.1	10/2022	Section 3 is updated.
W1.3.0	12/2022	i.MX 8QuadXPlus MEK board support is added.
W1.4.0	3/2023	i.MX 93 EVK board support is added.
W1.4.1	7/2023	Minor technical changes.

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