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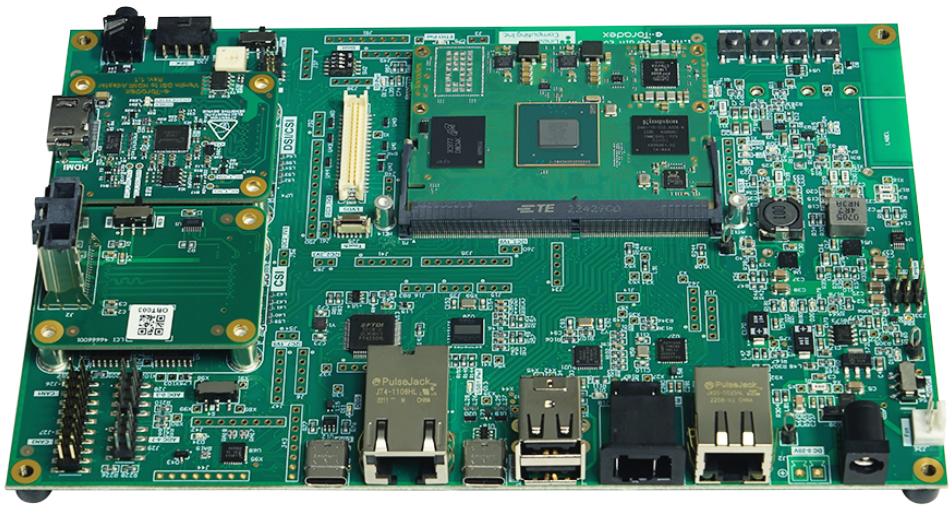
i.MX 95 Verdin EVK Getting Started



Revision History

Document Revisions

Date	Doc. Revision	Product Version	Changes
02-Apr-2024	Rev. 0.1	V1.0	Initial documentation
14-Jun-2024	Rev. 0.2	V1.0	Correction on Section 4.2.
27-Jun-2024	Rev. 0.3	V1.0	Section 4.2: Add warning box.
15-Jul-2024	Rev. 0.4	V1.2	Section 4.2: Clarify that push button B5 is not assembled.
19-Jul-2024	Rev. 0.5	V1.2	Section 4: Move content into Section 4.1. Section 4.2: Minor changes and improvements on instructions and admonitions.
30-Jul-2024	Rev. 0.6	V1.2	Section 6.2: Add section about 10Gigabit Ethernet.
01-Nov-2024	Rev. 0.7	V1.3A	Section 4.1: update warning box. Section 4.2: update command for compatibility with the latest version of the reference image.
08-Apr-2025	Rev. 0.8	V1.3A	Section 2 on page 4: Minor changes to instruction involving DIP Switch.

Contents

1 Introduction

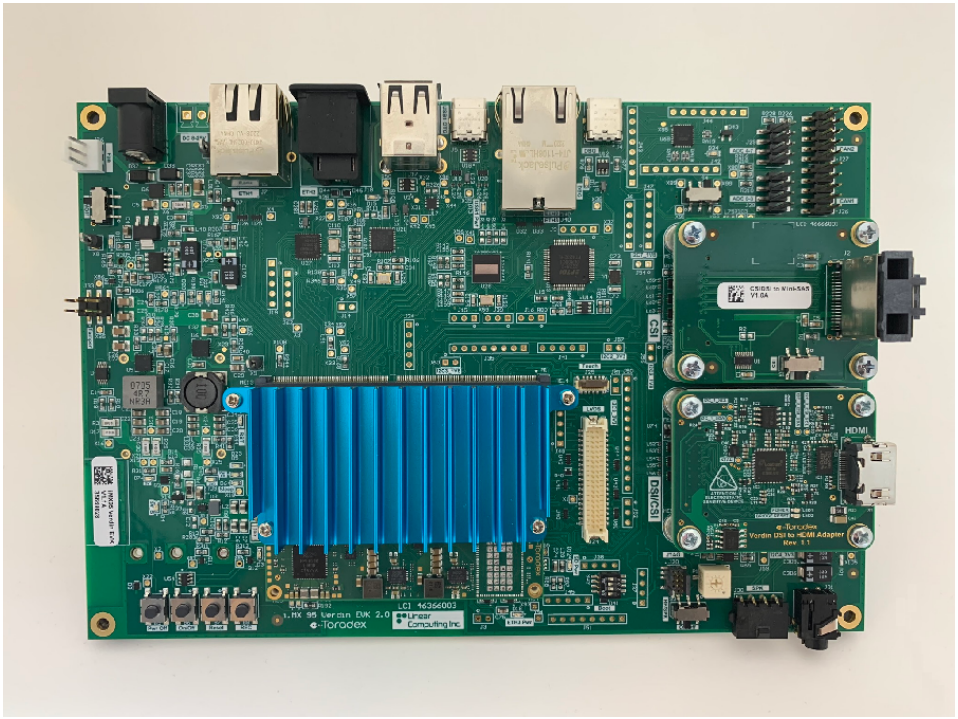
i.MX 95 Verdin Evaluation Kit comes with the best accessory ecosystem compatibility to ensure an easy out-of-the-box experience. The kit includes:

- 12V/30W AC/DC Power Adapter with barrel plug 2.1mm I.D. x 5.5mm O.D;
- Verdin Industrial Heatsink;
- Verdin DSI to HDMI Adapter providing out-of-the-box support for external HDMI displays;
- Verdin DSI/CSI to mini SAS Adapter allowing accessories from the NXP eco-system to be easily connected and used;
- u-blox Maya-W2 WiFi 6 module attached on M.2 Key E slot, and additionally 2 antennas.

2 Unboxing and Setup Cables

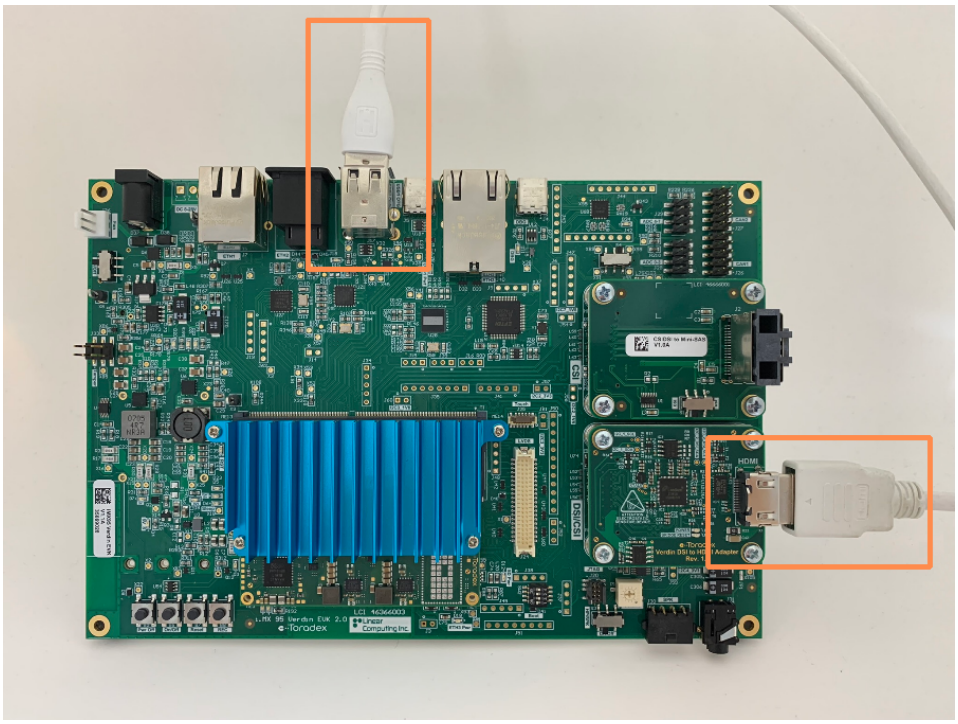
Remove the i.MX 95 Evaluation Kit from the blisters:

Figure 1: i.MX 95 Verdin EVK



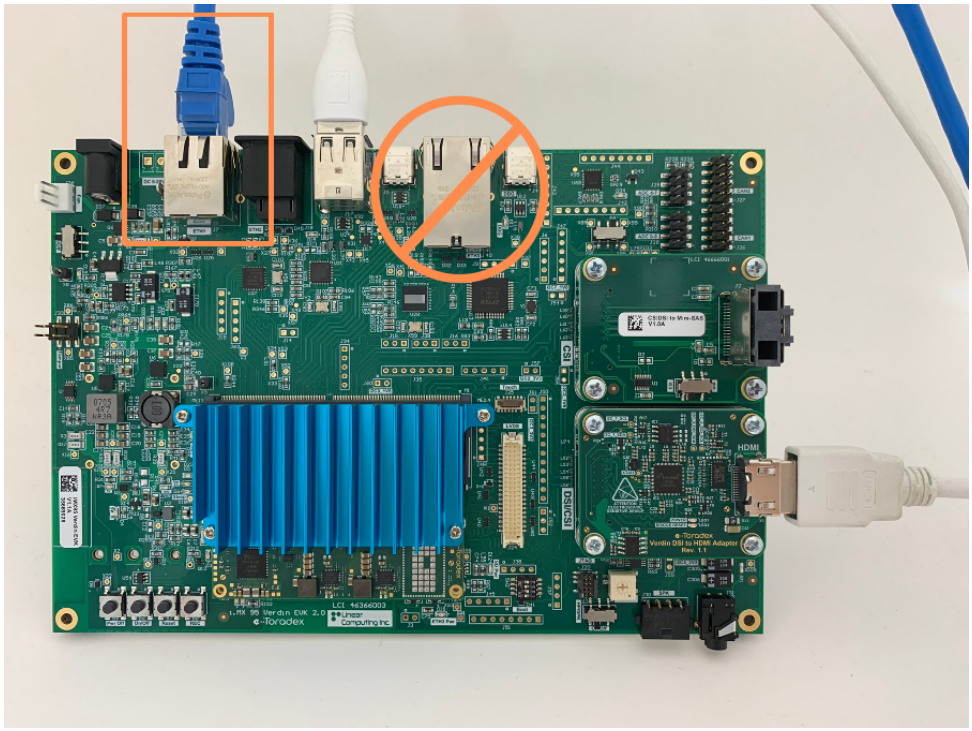
Plug an HDMI display into the Verdin DSI to HDMI Adapter. If your display uses USB as a power supply or has touch, please connect on this step.

Figure 2: HDMI and Display power/touch USB Connection



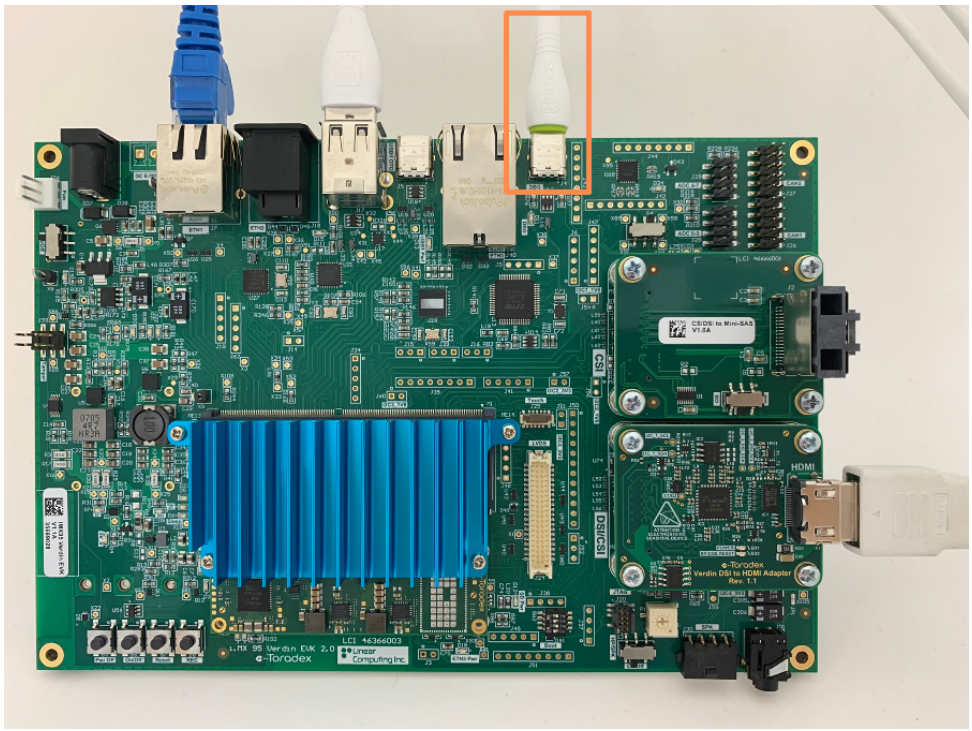
Plug the Ethernet cable into the J7 connector:

Figure 3: Ethernet Connection



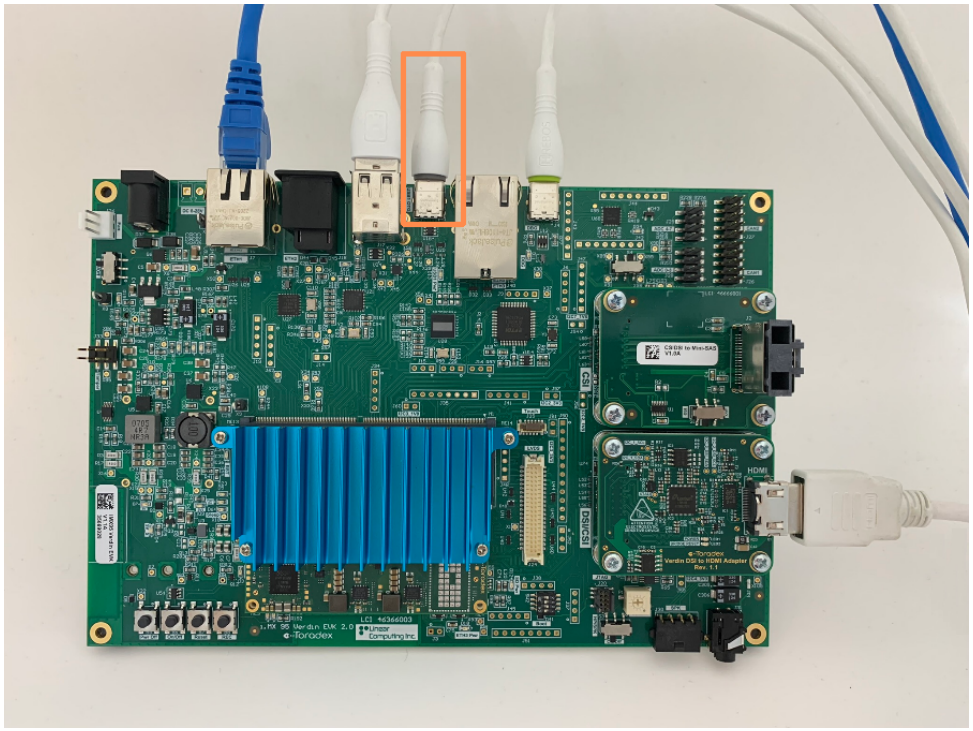
Plug an USB Type-C cable into J4 connector for serial communication:

Figure 4: USB Debug Connection



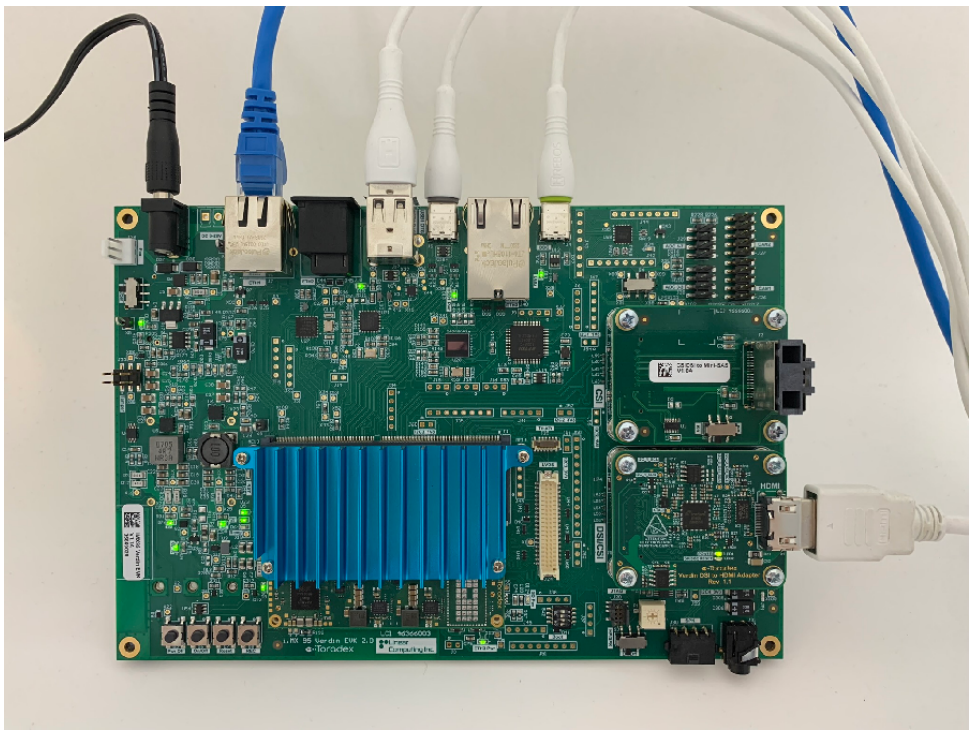
Plug an USB Type-C cable into J5 connector for OTG access:

Figure 5: USB OTG Connection



Plug the power supply into barrel jack J1:

Figure 6: Power Supply connection



Make sure the DIP Switch SW2 is setup as 1010, as that is the proper configuration to boot from the eMMC:

Figure 7: Dip Switch SW2 configuration

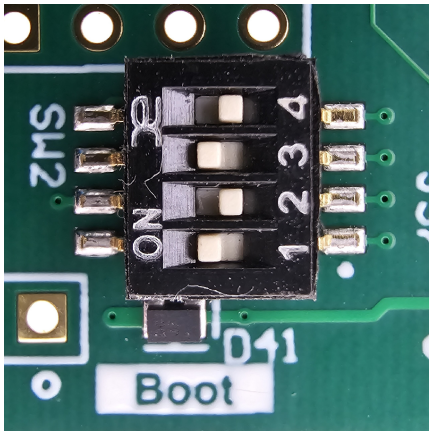
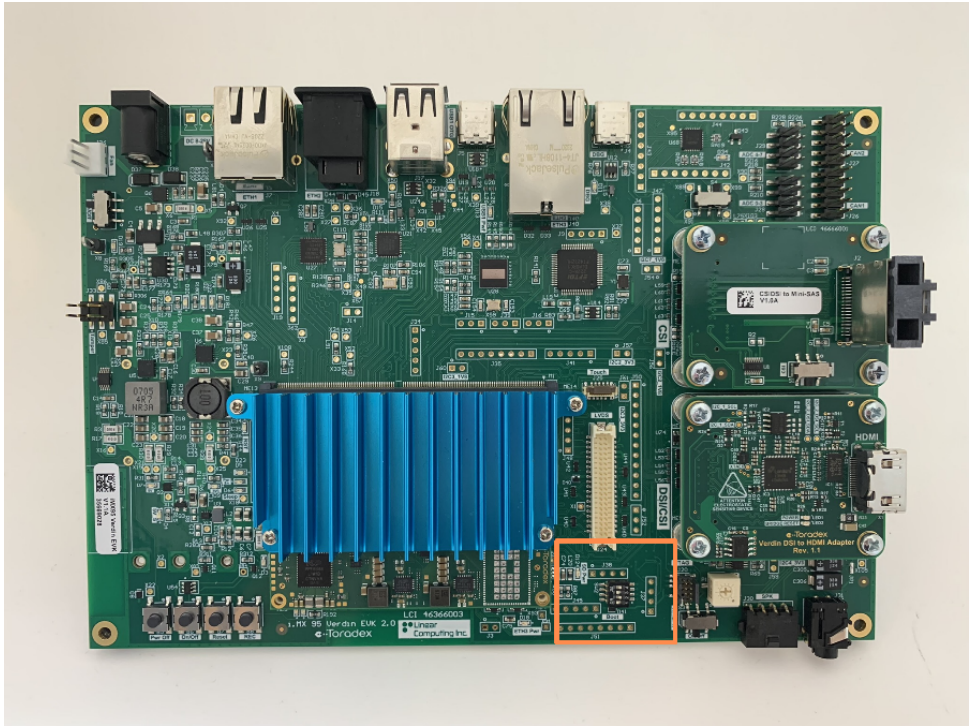


Figure 8: Location of Dip Switch SW2



3 Communication via Serial Port

Linux host machine required.
Some steps on this guide require software that can only run in Linux, and the instructions are also meant for Linux host machines.

The serial console used on i.MX 95 Verdin EVK is `ttyUSB2`. There are different command-line applications to communicate with the serial port, in this document picocom will be used. On your host machine, open a terminal and initiate a new serial connection:

```
$ picocom -b 115200 /dev/ttyUSB2
```

4 Choosing and Flashing the OS

4.1 Available OSs

With the i.MX95 Verdin EVK you have different ready-to-boot Linux image options:

- Torizon Linux OS
- NXP's Full Reference Image
- NXP's Multimedia Reference Image *(flashed by default)*

All of them are built on top of the same NXP BSP, and can be customized with the Yocto Project. Torizon OS and NXP's Full Reference Image also offer out-of-the-box demos, where you can evaluate the performance of the i.MX95 for yourself. The recommended approach is with the Torizon OS image, which additionally provides:

- More ready-to-deploy demos (like Qt, Crank, Codesys and more);
- Built-in remote access for shared remote development;
- Simple and reliable updates to keep your board up-to-date with the latest BSP;
- Built-in automotive-grade security with the Uptane Framework;
- Visual Studio Code integration for Qt, Rust, C, C++, .NET and more;
- Fast, low-risk way to scale to production;
- No extensive Yocto knowledge required.

You can read more about Torizon and how it helps you on torizon.io.

Torizon OS on the i.MX95 Verdin EVK.
Due to regulation constraints, Torizon OS is not yet available for iMX95 users. Until then, we recommend you evaluate the EVK initially using NXP's Reference Images and come back later to try out Torizon, still is the best option for easily and securely scaling to production with the iMX95 SoC. If you'd like faster access to Torizon on the iMX95, contact Toradex.

The board comes flashed with NXP's Multimedia Reference Image. While it provides a weston environment, it doesn't provide any demos, so we still recommend you reflash the board to NXP's Full Reference Image. Keep reading this guide to learn how to do it.

If instead you choose to go forward with NXP's Multimedia Reference Image, just turn on the board and you'll see the Linux login prompt on the serial connection. The user is root, with no password. For HDMI output, you might need to change the device tree file (see Section 6.1 on page 15 to learn how). From here on, you should follow your typical Yocto procedure, and the rest of this manual doesn't apply.

4.2 Installing NXP's Full Reference Image

1. Download the uuu utility from NXP github[1] (minimum version 1.5.163).
2. Move the uuu file to the working directory.
3. Grant the ability to execute the file uuu:

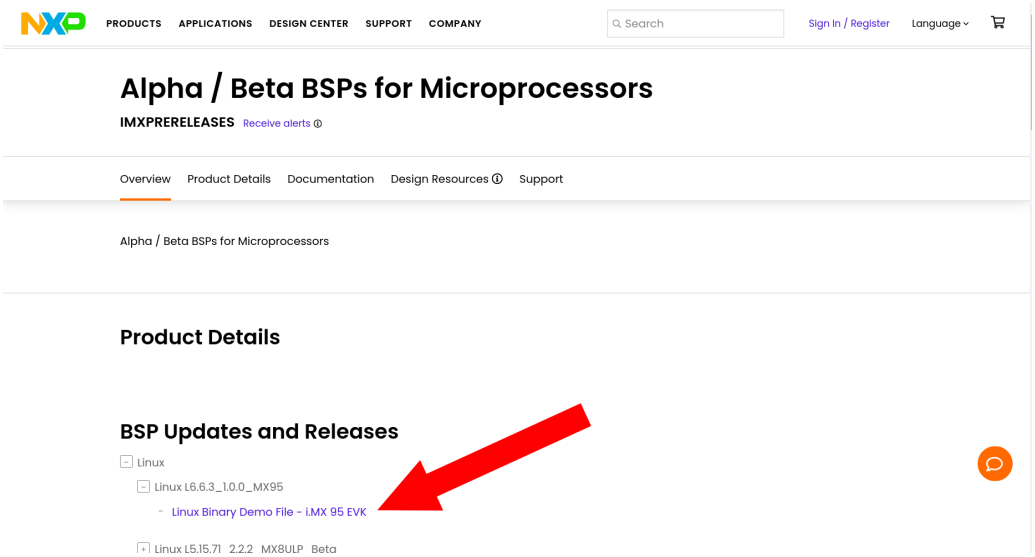
```
chmod +x uuu
```

4. The DIP Switch SW2 should be already correctly configured to boot from the eMMC. Please make sure it's setup as 1010 (see Section 2 on page 4 to learn how).

[1] https://github.com/nxp-imx/mfgtools/releases

5. Download the image from NXP's website[2]. You should have an account with enough permissions to download the file, if you don't, please contact NXP.

Figure 9: Link to download NXP's Reference Images for the i.MX95 Verdin EVK



6. Make sure the USB1 OTG (J5) is connected to the host machine.

7. Keep pressing the Recovery Button (B8), change the power on/off switch S6 to the "ON" position.

There are other ways to power the board on and off.
The board's power can be controlled through switches other than S6, please refer to the datasheet for more details. Note that push button B5 (labeled PWR OFF) is not assembled by default.

Figure 10: Recovery Button B8

Figure 11: Power On/Off Switch S6

[2] https://www.nxp.com/pages/alpha-beta-bsps-for-microprocessors:IMXPRERELEASES

Figure 12: Recovery Button B8 location

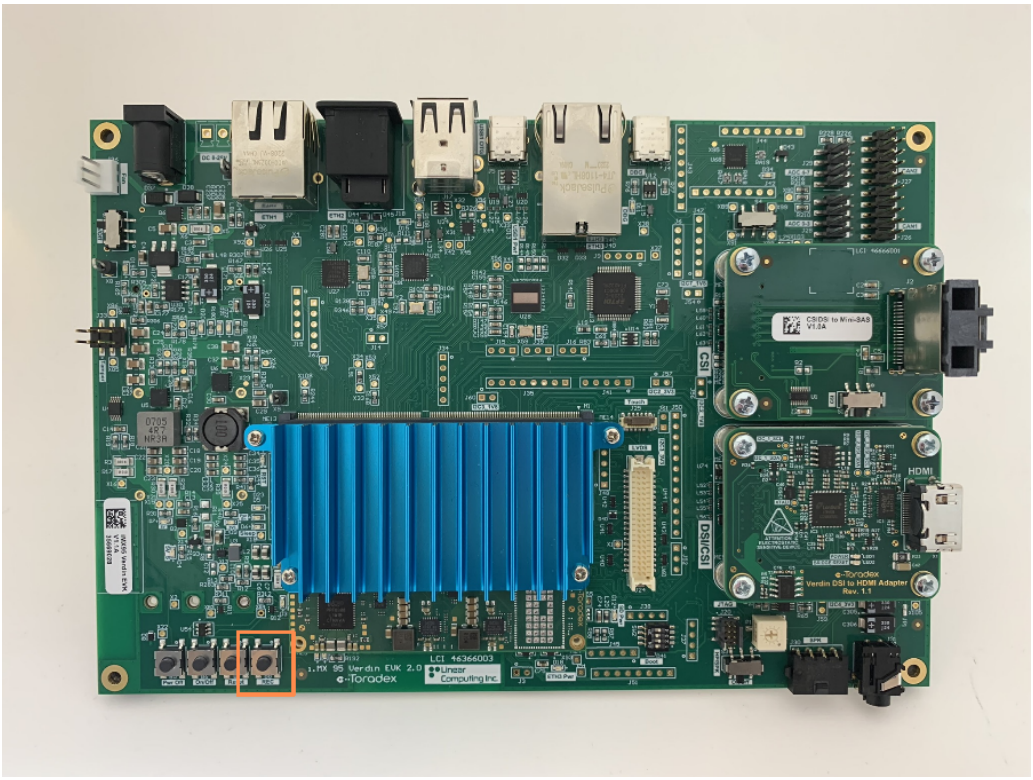
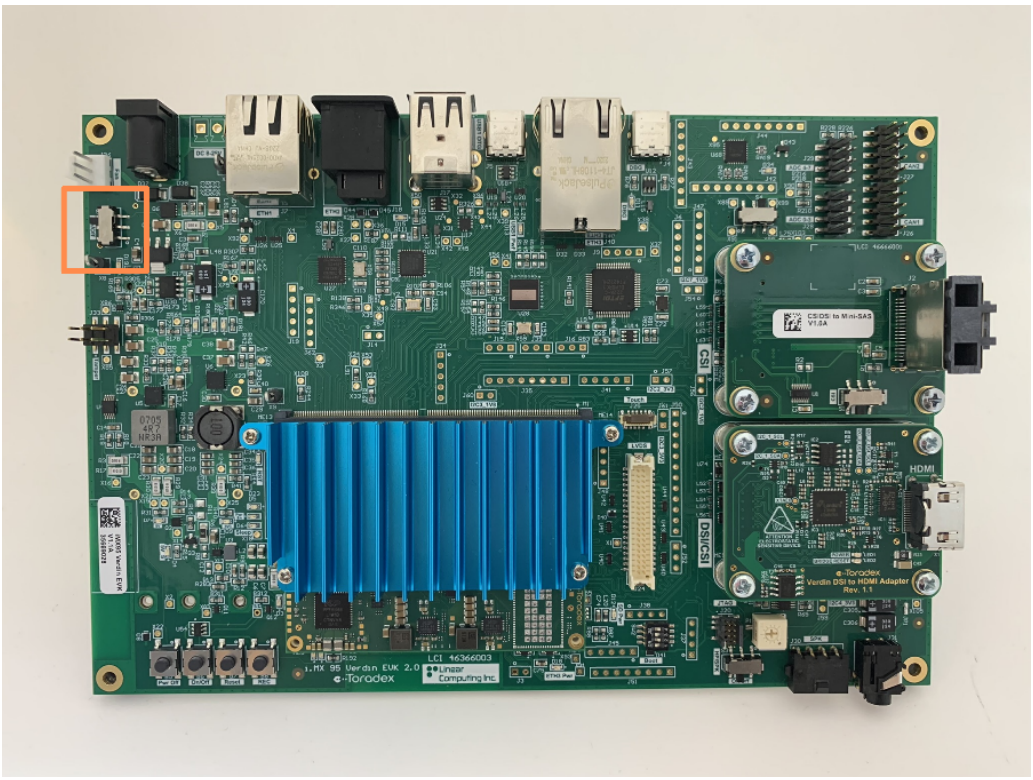


Figure 13: Location of Power On/Off Switch S6



8. Flash the image using UUU, if you are using the L6.6.36-2.1.0_MX95:

```
sudo ./uuu -v -b emmc_all ./imx-boot-imx95-19x19-verdin-sd.bin-flash_all \
           ./imx-image-full-imx95-19x19-verdin.wic
```

If you are using the LF_v6.6.23-2.0.0_images_IMX95, use the following command:

sudo ./uuu -v -b emmc_all ./imx-boot-imx95-19×19-verdin-sd.bin-flash_all ./imx-image-full-imx95evk.wic

If you are using the LF_v6.6.3-1.0.0_images_IMX95, use the following command:

sudo ./uuu -v -b emmc_all ./imx-boot-imx95-19×19-titan-sd.bin-flash_all ./imx-image-full-imx95-19×19-lpddr5-evk.wic

9. After the end of the process, turn off the board.

10. Turn on the board and check with the serial communication to confirm a successful installation. On the login prompt, the user is `root` with no password.

Some display aspect ratios may not work properly.
The Linux BSP is in early access and has been validated only in some monitors with 16:9 aspect ratio.

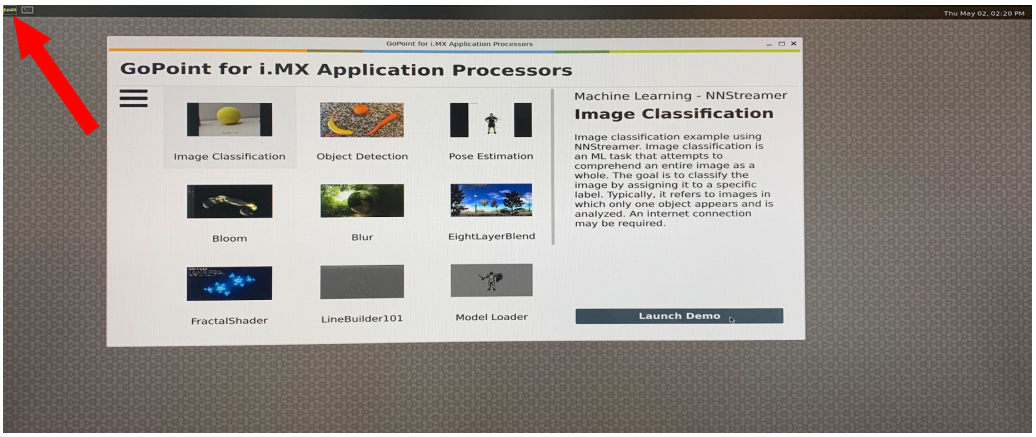
5 Running an Application

5.1 NXP GPU-Accelerated Demos

Before following this step, please check the Device Tree section to make sure the correct device tree is loaded for the HDMI display output. Otherwise, you won't see any output on the HDMI display.

Upon booting the board with the correct device tree loaded, you'll see a small NXP icon in the top left portion of the display. Click this icon to view all deployable demos. You will need to connect a mouse on the USB port.

Figure 14: Weston and GPU demos on NXP's Full Image



6 Additional Resources

6.1 Device Tree

It is necessary to check if the right device tree file is loaded on the u-boot to ensure that the software has all hardware described correctly.

1. Connect to the module via serial communication.
2. Press reset button B7.
3. Press backspace before the autoboot sequence starts to enter u-boot console.
4. Configure Linux to boot using the EVK device tree:

The EVK device tree ensures that our software recognize all hardware, such as Ethernet0 and HDMI.

For LF_v6.6.23-2.0.0 and newer images:

```
setenv fdtfile imx95-19x19-verdin-lt8912.dtb
saveenv
```

If you are using the LF_v6.6.3-1.0.0_images_IMX95 image:

```
setenv fdtfile imx95-19x19-titan-lt8912.dtb
saveenv
```

5. Continue the boot sequence:

```
bootd
```

6.2 Procedure to use the 10Gigabit Ethernet

Latest release image required.
It is required to use the latest release image available. LF_v6.6.23-2.0.0 image version.

1. Download the `aquantia-firmware-utility` zip from NXP github[3], and unzip it to a USB drive.
2. Download the `AQR-G4_v5.6.D-AQR_Marvell_NoSwap_XFI_ID44834_VER2068.cld` file from the Marvell website[4], and copy it to the USB drive. You should have an account and request access to download the file.
3. Boot the i.MX 95 Verdin EVK and log into the SoM using the user root.
4. Plug the USB drive and enter:

```
cd /run/media/sda/aquantia-firmware-utility-master
```

5. Run the `make` command:

```
make
```

[3] https://github.com/nxp-qoriq/aquantia-firmware-utility/tree/master
[4] https://www.marvell.com/portal/my-collaterals.html?rootPath=/content/dam/marvell/en/my-products&folderPath=/transceivers/aqr/gen4/general&assetPath=/content/dam/marvell/en/my-products/Transceivers/AQR/AQR-Gen4-PHY/Firmware/AQR-G4_v5.6.D-AQR_Marvell_NoSwap_XFI.zip

6. Copy the `aq-firmware-tool` to the home directory:

```
cp aq-firmware-tool ~/
```

7. Copy the `AQR-G4_v5.6.D-AQR_Marvell_NoSwap_XFI_ID44834_VER2068.cld` to the home directory:

```
cd ..
cp AQR-G4_v5.6.D-AQR_Marvell_NoSwap_XFI_ID44834_VER2068.cld ~/
```

8. Go to the home directory and run the following command:

```
cd ~/
./aq-firmware-tool AQR-G4_v5.6.D-AQR_Marvell_NoSwap_XFI_ID44834_VER2068.cld \
-i eth2 8
```

9. Wait until the flash is complete. A “Device burned and verified” message will appear”.

10. Reboot the SoM.

DISCLAIMER