

RN00210

i.MX Linux Release Notes

Rev. LF6.18.2_1.0.0 — 26 March 2026

Release notes

Document information

Information	Content
Keywords	i.MX, Linux, RN00210, LF6.18.2_1.0.0, Yocto Project 5.3.1
Abstract	This document contains important information about the package contents, supported features, known issues and limitations in this release.



1 Overview

This document contains important information about the package contents, supported features, known issues and limitations in this release.

This is a consolidated release for v6.18.2 kernel upgrade. It supports SoCs from the i.MX 6, i.MX 7, i.MX 8, and i.MX 9 series that were previously released and have been fully tested. Automated testing was performed to validate patches added since the last GA release.

This document contains information for all previously released active i.MX SoCs. The content is intended solely to provide contextual background for this release.. A future consolidated GA release will test and support all previously released GA i.MX SoCs listed below.

For information on changes in this release, see the manifest Readme at <index: imx-manifest.git> and the Change Logs at <index: imx-manifest-ChangeLog.git>.

i.MX reference boards

- i.MX 9 Series
 - i.MX 91 9x9 QSB Board (9x9 A1 silicon)
 - i.MX 91 EVK board (11x11 A1 silicon)
 - FRDM-IMX91 board (11x11 A1 silicon)
 - FRDM-IMX91S board (11x11 A1 silicon)
 - i.MX 93 EVK board (11x11 A2 silicon)
 - i.MX 93 PF09 EVK board (11x11 A2 silicon)
 - i.MX 93 9x9 QSB Board (9x9 A2 silicon)
 - i.MX 93 14x14 EVK Board (14x14 A2 silicon)
 - FRDM-IMX93 Board (11x11 A2 silicon)
 - i.MX 95 19x19 EVK Board (B0 silicon revision)
 - i.MX 95 15x15 EVK Board (B0 silicon revision)
 - i.MX 95 19x19 Verdin Board (B0 silicon revision)
 - FRDM-IMX95 board (15x15 B0 silicon revision)
 - i.MX 943 19x19 EVK Board
 - i.MX 943 15x15 EVK Board
 - i.MX 943 OrangeBox
- i.MX 8 Series
 - i.MX 8ULP EVK Board (15x15 A2 CES and 9x9 A2 CES)
 - i.MX 8M Plus EVK Board
 - FRDM-IMX8MPLUS Board
 - i.MX 8DualX MEK Board
 - i.MX 8DXL EVK Board (B0 silicon tested on LPDDR4 WEVK and DDR3L EVK)
 - i.MX 8QuadXPlus MEK Board (C0 silicon revision)
 - i.MX 8QuadMax MEK Board
 - i.MX 8M Quad EVK Board
 - i.MX 8M Quad WEVK Board
 - i.MX 8M Mini EVK Board
 - i.MX 8M Nano EVK Board
- i.MX 7 Series
 - i.MX 7Dual SABRE-SD Board

- i.MX 7ULP EVKB Board
- i.MX 6 Series
 - i.MX 6QuadPlus SABRE-SD Boards
 - i.MX 6Quad SABRE-SD Boards
 - i.MX 6DualLite SDP SABRE-SD Boards
 - i.MX 6SoloX SABRE-SD Boards
 - i.MX 6UltraLite EVK Board
 - i.MX 6ULL EVK Board
 - i.MX 6ULZ EVK Board
 - i.MX 6SLL EVK Board

Note:

In this document, the following notation is used:

- 6SABRE-SD stands for the i.MX 6Quad, i.MX 6QuadPlus, i.MX 6DualLite, and i.MX 6DualPlus SABRE-SD Platforms.
- 6SoloLite stands for the i.MX 6SoloLite EVK
- 6SoloX-SD stands for the i.MX 6SoloX SABRE-SD Platform.
- 7D-SABRE-SD stands for the i.MX 7Dual SABRE-SD Platform.
- 6UltraLite stands for the i.MX 6UltraLite EVK Platform.
- 6ULL stands for the i.MX 6ULL EVK Platform.
- 6ULZ stands for the i.MX 6ULZ EVK Platform.
- 7ULP stands for the i.MX 7 Ultra Low Power Platform.
- 8QuadMax stands for the i.MX 8QuadMax MEK Platform.
- 8QuadXPlus stands for the i.MX 8QuadXPlus MEK Platform.
- 8M Quad stands for the i.MX 8M Quad EVK and WEVK Platforms.
- 8M Mini stands for the i.MX 8M Mini EVK Platform.
- 8M Nano stands for the i.MX 8M Nano EVK Platform.
- 8MP stands for the i.MX 8M Plus EVK Platform.
- 8DXL stands for the i.MX 8DualXLite EVK Platform.
- 8ULP stands for the i.MX 8ULP EVK Platform.
- i.MX 91 stands for the i.MX 91 11x11 EVK and i.MX 91 9x9 QSB Platforms.
- i.MX 93 stands for the i.MX 93 11x11 EVK, i.MX 93 11x11 PF09 EVK, i.MX 93 9x9 QSB, and i.MX 93 14x14 EVK Platforms.
- i.MX 95 stands for the i.MX 95 19x19 EVK, i.MX 95 15x15 EVK, and i.MX 95 19x19 Verdin Platforms.
- i.MX 943 stands for the i.MX 943 EVK and OrangeBox platforms.
- FRDM-IMX8MPLUS stands for the i.MX 8M Plus FRDM platform.
- FRDM-IMX91 stands for the i.MX 91 FRDM platform.
- FRDM-IMX91S stands for the i.MX 91 FRDM platform.
- FRDM-IMX93 stands for the i.MX 93 FRDM platform.
- FRDM-IMX95 stands for the i.MX 95 FRDM platform.

The following table lists the testing that was done for each SoC.

Table 1. Board validation and support scope

SoC	Test validation and support scope
i.MX 943 15x15 EVK	Beta quality.
i.MX 943 19x19 EVK	Beta quality.
i.MX 943 OrangeBox	Boot test.

Table 1. Board validation and support scope...continued

SoC	Test validation and support scope
i.MX 95 15x15 EVK	GA quality.
i.MX 95 19x19 Verdin	GA quality.
i.MX 95 19x19 EVK	GA quality.
i.MX 93 11x11 PF09 EVK	GA quality.
i.MX 93 9x9, 11x11, 14x14 EVK	GA quality.
i.MX 91 9x9	GA quality.
i.MX 91 11x11	GA quality.
FRDM-IMX8MPLUS	Automation tested.
FRDM-IMX91	Automation tested.
FRDM-IMX91S	Automation tested.
FRDM-IMX93	Automation tested.
FRDM-IMX95	Automation tested.
8ULP	GA quality.
8M Plus	GA quality.
8DualX MEK	GA quality.
8DXL EVK	GA quality.
8M Quad	GA quality.
8M Nano	GA quality.
8M Mini	GA quality.
8QuadMax MEK	GA quality.
8QuadXPlus (C0 silicon) MEK	GA quality.
7Dual/Solo	GA quality.
7ULP	GA quality.
6QuadPlus	GA quality.
6Quad	GA quality.
6DualLite	GA quality.
6SoloX	GA quality.
6UltraLite	GA quality.
6ULL	GA quality.
6SLL	GA quality.
6ULZ	GA quality.

1.1 References

i.MX has multiple families supported in software. The following lists the available families and their respective System-on-Chips (SoCs). Details on which SoCs are supported in the current release can be found in the *i.MX Linux Release Notes* (RN00210). Some SoCs from previous releases may still be buildable in the current release but not validated if they are at the previous validated level.

- i.MX 6 Family: 6QuadPlus, 6Quad, 6DualLite, 6SoloX, 6SLL, 6UltraLite, 6ULL, 6ULZ
- i.MX 7 Family: 7Dual, 7ULP
- i.MX 8 Family: 8QuadMax, 8QuadPlus, 8ULP
- i.MX 8M Family: 8M Plus, 8M Quad, 8M Mini, 8M Nano
- i.MX 8X Family: 8QuadXPlus, 8DXL, 8DualX
- i.MX 9 Family: i.MX 91, i.MX 93, i.MX 95, i.MX 943

This release includes the following references and additional information.

- *i.MX Linux Release Notes* (RN00210): Provides the release information.
- *i.MX Linux User's Guide* (UG10163): Provides the information on installing U-Boot and Linux OS and using i.MX-specific features.
- *i.MX Yocto Project User's Guide* (UG10164): Describes the board support package for NXP development systems using Yocto Project to set up host, install tool chain, and build source code to create images.
- *i.MX Porting Guide* (UG10165): Provides the instructions on porting the BSP to a new board.
- *i.MX Machine Learning User's Guide* (UG10166): Provides the machine learning information.
- *i.MX DSP User's Guide* (UG10167): Provides the information on the DSP for i.MX 8.
- *i.MX 8M Plus Camera and Display Guide* (UG10168): Provides the information on the ISP Independent Sensor Interface API for the i.MX 8M Plus.
- *i.MX Digital Cockpit Hardware Partitioning Enablement for i.MX 8QuadMax* (UG10169): Provides the i.MX Digital Cockpit hardware solution for i.MX 8QuadMax.
- *i.MX Graphics User's Guide* (UG10159): Describes the graphics features.
- *i.MX Linux Reference Manual* (RM00293): Provides the information on Linux drivers for i.MX.
- *i.MX VPU Application Programming Interface Linux Reference Manual* (RM00294): Provides the reference information on the VPU API on i.MX 6 VPU.
- *EdgeLock Enclave Hardware Security Module API* (RM00284): This document is a software reference description of the API provided by the i.MX 8ULP, i.MX 93, and i.MX 95 Hardware Security Module (HSM) solutions for the EdgeLock Enclave (ELE) Platform.
- *i.MX 95 Camera Porting Guide* (UG10215): This document describes the steps to enable a RAW Bayer camera sensor into the i.MX 95 applications processor internal image signal processing on top of Linux camera software stack.

The quick start guides provide basic information about the board and instructions for setting it up. They are available on the NXP website:

- [SABRE Platform Quick Start Guide \(IMX6QSDPQSG\)](#)
- [i.MX 6UltraLite EVK Quick Start Guide \(IMX6ULTRALITEQSG\)](#)
- [i.MX 6ULL EVK Quick Start Guide \(IMX6ULLQSG\)](#)
- [i.MX 7Dual SABRE-SD Quick Start Guide \(SABRESDBIMX7DUALQSG\)](#)
- [i.MX 8M Quad Evaluation Kit Quick Start Guide \(IMX8MQUADEVKQSG\)](#)
- [i.MX 8M Mini Evaluation Kit Quick Start Guide \(8MMINIEVKQSG\)](#)
- [i.MX 8M Nano Evaluation Kit Quick Start Guide \(8MNANOEVKQSG\)](#)
- [i.MX 8QuadXPlus Multisensory Enablement Kit Quick Start Guide \(IMX8QUADXPLUSQSG\)](#)
- [i.MX 8QuadMax Multisensory Enablement Kit Quick Start Guide \(IMX8QUADMAXQSG\)](#)
- [i.MX 8M Plus Evaluation Kit Quick Start Guide \(IMX8MPLUSQSG\)](#)
- [i.MX 8ULP EVK Quick Start Guide \(IMX8ULPQSG\)](#)
- [i.MX 8ULP EVK9 Quick Start Guide \(IMX8ULPEVK9QSG\)](#)
- [i.MX 93 EVK Quick Start Guide \(IMX93EVKQSG\)](#)
- [i.MX 93 9x9 QSB Quick Start Guide \(93QSBQSG\)](#)
- [FRDM i.MX 8M PLUS Development Board Quick Start Guide \(FRDM-IMX8MPLUS\)](#)
- [FRDM i.MX 91 Development Board Quick Start Guide \(FRDM-IMX91\)](#)

- [FRDM i.MX 91S Development Board Quick Start Guide \(FRDM-IMX91S\)](#)
- [FRDM i.MX 93 Development Board Quick Start Guide \(FRDM-IMX93\)](#)

Documentation is available at nxp.com.

- i.MX 6 information is at nxp.com/iMX6series.
- i.MX SABRE information is at nxp.com/imxSABRE.
- i.MX 6UltraLite information is at nxp.com/iMX6UL.
- i.MX 6ULL information is at nxp.com/iMX6ULL.
- i.MX 6ULZ information is at nxp.com/imx6ulz.
- i.MX 7Dual information is at nxp.com/iMX7D.
- i.MX 7ULP information is at nxp.com/imx7ulp.
- i.MX 8 information is at nxp.com/imx8.
- i.MX 91 information is at nxp.com/imx91.
- i.MX 93 information is at nxp.com/imx93.
- i.MX 95 information is at nxp.com/imx95.
- i.MX 943 information is at nxp.com/imx94.

1.2 Release contents

This release consists of the following:

- Pre-built images
- Manufacturing tools (UUU)
- Documentation
- Git repo open source distributions on the GitHub
- Proprietary distributions on Yocto Project i.MX external mirror
- Limited access third-party distributions

The GA releases are named L<Kernel_version>_<x.y.z>.

<Kernel_version>: BSP Kernel version (For example, L6.18.2 indicates that this BSP release is based on the kernel version 6.18.2).

<x.y.z>: Semantic versioning specification, where X is the major version, Y is the minor version, and Z is the patch version.

The following tables list the contents included in each package.

Table 2. Release contents

Component	Description
Linux OS Kernel and Device Trees	6.18.2
U-Boot	v2025.04
SD Card images	Prebuilt images used for testing to use on target i.MX reference boards
Manufacturing Tools (UUU)	Version: 1.5.243, used to burn a production image into the board
i.MX Open Source repos	i.MX open source modifications or NXP original open source
NXP Component downloads	System Controller Porting kit and AACPlus Decoder downloadable on nxp.com
i.MX Proprietary on Yocto Project mirror	i.MX proprietary components for download Yocto Project mirror on nxp.com
i.MX Limited Access	i.MX 3rd-party packages requiring NXP marketing assistance

The release packages contain the following:

- Documentation.
- Prebuilt binaries:
 - SD Card prebuilt image for the release target SoC
 - Kernel and Device trees
 - Boot Images
 - Applicable Arm Cortex-M4 and M7 Demos if applicable to the target SoC
- UUU default scripts that burn into eMMC. UUU example scripts are used as reference.

See the *i.MX Linux User's Guide* (UG10163) for the information on how to use these release contents.

The following packages are available on the NXP Yocto Project mirror. Each package is pulled into builds directly when doing a Yocto Project build but can also be retrieved using the following command on the Linux OS:

```
wget https://www.nxp.com/lgfiles/NMG/MAD/YOCTO/<package file name>
```

Table 3. BSP and multimedia standard packages

File name	Description
imx-codec-4.10.0-464e9d8.bin	i.MX optimized Audio and Video core codec libraries
imx-parser-4.10.3-65603f3.bin	i.MX optimized core parser
imx-vpu-5.4.39.3.bin	i.MX VPU library for i.MX 6 with VPU
imx-vpu-hantro-1.40.0-52c7e45.bin	i.MX VPU Hantro libraries for i.MX 8M Quad, 8M Mini, and 8M Plus
imx-vpu-hantro-daemon-1.9.0-a4cefcc.tar.gz	i.MX VPU Hantro daemon binary for i.MX 8M Quad, 8M Mini, and 8M Plus
imx-vpu-hantro-vc-1.11.0-5e18a84.bin	i.MX VPU Hantro VC8000E Encoder libraries for i.MX 8M plus
firmware-imx-8.31-4fa5b46.bin	i.MX Firmware including firmwares for VPU, DDR, EPDC, HDMI, DP (Display Port), and SDMA
imx-seco-5.9.4.1-0333596.bin	i.MX SECO firmware for i.MX 8QuadMax, 8QuadXPlus, and 8DXL reference boards
imx-gpu-viv-6.4.11.p4.4-aarch32-8626797.bin	i.MX Graphics libraries for i.MX 6 and 7 SoCs with Vivante GPU
imx-gpu-viv-6.4.11.p4.4-aarch64-8626797.bin	i.MX Graphics libraries for i.MX 8 SoC with Vivante GPU
imx-gpu-viv-6.4.11.p4.4-aarch32-8626797.bin	i.MX Graphics G2D libraries for i.MX 6 and 7 with Vivante GPU
imx-gpu-g2d-6.4.11.p4.4-aarch64-8626797.bin	i.MX Graphics G2D libraries for i.MX 8
imx-dpu-g2d-v1-2.5.0.2-f126d54.bin	i.MX G2D library for i.MX 8 Auto SoC with DPU blitter engine
mali-imx-r54p1.4-89d0444.bin	i.MX Graphics libraries for i.MX 9 SoC with Mali GPU
imx-dpu-g2d-v2-2.5.0.2-f126d54.bin	i.MX G2D library for i.MX 9 SoC with DPU blitter engine
imx-sc-firmware-1.18.0-654907b.bin	i.MX System Controller Firmware for i.MX 8QuadMax, 8QuadXPlus, and 8DXL reference boards
isp-imx-4.2.2.26.1-3cbd4a2.bin	i.MX 8M Plus ISP SDK
imx7d-sabresd-m4-freertos-1.0.bin	i.MX 7D Cortex-M4 Demo
imx7ulp-m4-demo-2.16.000.bin	i.MX 7ULP Cortex-M4 Demo

Table 3. BSP and multimedia standard packages...continued

File name	Description
imx8qm-m4-demo-2.9.0.bin	i.MX 8QuadMax Cortex-M4 Demo
imx8qx-m4-demo-2.9.0.bin	i.MX 8QuadXPlus Cortex-M4 Demo
imx8mq-m4-demo-26.03.00.bin	i.MX 8M Quad Cortex-M4 Demo
imx8mm-m4-demo-26.03.00.bin	i.MX 8M Mini Cortex-M4 Demo
imx8mn-m7-demo-26.03.00.bin	i.MX 8M Nano Cortex-M7 Demo
imx8dxl-m4-demo-2.9.0.bin	i.MX 8DXL Cortex-M4 Demo
imx8mp-m7-demo-26.03.00.bin	i.MX 8M Plus Cortex-M7 Demo
imx8ulp-m33-demo-26.03.00.bin	i.MX 8ULP Cortex-M33 Demo
imx93-m33-demo-26.03.00.bin	i.MX 93 Cortex-M33 Demo
imx943-mcore-demo-26.03.00.bin	i.MX 943 Cortex-M33 and Cortex-M7 Demo
imx95-m7-demo-26.03.00.bin	i.MX 95 Cortex-M7 Demo
firmware-ele-imx-2.0.5-29313e0.bin	i.MX 91, i.MX 93, i.MX 95, and i.MX 8ULP ELE Firmware
firmware-upower-1.3.1.bin	i.MX 8ULP uPower firmware

Note:

The Cortex-M MCUXpresso SDK is distributed by the MCUXpresso Web Builder tool. To obtain the MCUXpresso SDK for the Cortex-M core of your i.MX SoC, visit <http://mcuxpresso.nxp.com>.

The following packages are available for download on nxp.com.

Table 4. NXP.com packages

File name	Description
imx-aacpcodec-4.10.0-464e9d8.bin	Coding Technologies AACplus decoder
imx-scfw-porting-kit-1.18.0.tar.gz	System Controller Firmware porting kit
imx-upower-porting-kit-1.3.1.tar.gz	uPower firmware porting kit

i.MX BSP also releases open source through repos on [i.MX GitHub](https://github.com). The following table lists all the repos on GitHub.

Table 5. i.MX GitHub Distributions Repos

Repo	Description
imx-manifest	i.MX Yocto Project Linux BSP Manifest
linux-imx	i.MX Linux Kernel
uboot-imx	i.MX U-Boot
imx-atf	i.MX Arm Trusted Firmware for i.MX 8
imx-oei	DDR OEI
imx-sm	System Manager
imx-mkimage	i.MX Mkimage boot image tool
imx-lib	i.MX Libraries
imx-test	i.MX Driver unit test applications

Table 5. i.MX GitHub Distributions Repos...continued

Repo	Description
imx-optee-os	i.MX OP-TEE OS
imx-optee-test	i.MX OP-TEE Test
imx-optee-client	i.MX OP-TEE Client
imx-gst1.0-plugin	i.MX Multimedia GStreamer Plugins
gst-plugins-base	i.MX Multimedia GStreamer Base
gst-plugins-bad	i.MX Multimedia GStreamer Bad
gst-plugins-good	i.MX Multimedia GStreamer Good
gstreamer	i.MX Multimedia GStreamer Core
imx-alsa-plugins	i.MX ALSA Plugins
libdrm-imx	i.MX Graphics DRM
opencv-imx	i.MX Graphics OpenCV
weston-imx	i.MX Graphics Weston
wayland-protocols-imx	i.MX Graphics Wayland Protocols
xf86-video-imx-vivante	i.MX Graphics X.org Vivante Driver
meta-imx	i.MX Yocto Project Release Layer
armnn-imx	i.MX ArmNN Fork
onnxruntime-imx	i.MX Onnxruntime Fork
nn-imx	i.MX NN Fork
mwifiex	NXP Wi-Fi kernel driver
gtec-demo-framework	i.MX Graphics Demo Framework
imx-firmware	i.MX Firmware for Cypress and NXP Wi-Fi and Bluetooth
imx-seco-libs	i.MX SECO libraries
imx-vpuwrap	i.MX VPU Wrapper
arm-computelibrary-imx	Arm compute library
pyarmnn-release	PyArmNN
tensorflow-imx	TensorFlow
v2xseshm	V2XSE SHM library
vtest	V2X test application
sof	Sound Open Firmware
imx-xen	Xen Hypervisor for i.MX platforms
imx-qemu	Xen hypervisor virtio backend support
libcamera	Linux camera management framework
meta-nxp-connectivity	i.MX Matter components

An additional part of the release are Yocto Project demos that show additional use cases on different i.MX hardware. These demos are layers that work on top of a public BSP release. These are listed below and are updated within a month of each consolidated GA release. These demos are not fully tested but show how to integrate different stacks of software to use with i.MX reference boards and our BSP release.

- `meta-imx-orangebox`: Orangebox demos for i.MX Orangebox with i.MX 943.
- `OTA`: Note no extra layer. Third parties support over the air solutions, such as Mender or Foundries.io. Contact one of these third parties to integrate an OTA solution.

1.3 License

The Board Support Package (BSP) is composed of a set of packages and metadata (for Yocto Project Recipes) and each one has its own licensing. Verify the license of the target package before developing. The license can be found at the top of a recipe or a source file (such as `*.c` or `*.h`). For details, contact your NXP representative.

During the Yocto Project setup, to set up an i.MX build, accept the NXP license. This acceptance is recorded in the build configuration files so that the following proprietary binaries can be extracted during the build process. The NXP proprietary packages contain a Software Content Register (SCR) file that lists information about the package: `imx-gpu-viv`, `imx-codec`, and `imx-parser`.

1.4 Limited access proprietary packages

Limited access packages listed in the following table are provided on nxp.com with controlled access because they require additional licensing by a 3rd party. Contact your sales representative for access. Each package has its own Readme file with instructions on how to build, install, and run.

For the i.MX 95 platform, NXP can also provide Functional Safety deliverables (Beta quality), but these are not available on nxp.com, as additional licensing terms are required. Please contact your sales representative for access.

Table 6. Limited access packages for Yocto project releases

Package	Description
<code>imx-mscodec-4.10.0-464e9d8.bin</code>	i.MX optimized Microsoft codec
<code>imx-msparser-4.10.3-65603f3.bin</code>	i.MX optimized Microsoft ASF parser
<code>imx-real-4.10.3-1647c85.bin</code>	i.MX Real Networks RMVB Decoders and Parsers
<code>imx-dsp-2.1.10-ea4fe3f.bin</code>	DSP firmware
<code>imx-dsp-codec-2.1.8.bin</code>	DSP decoders (MP2, MP3, BSAC, DRM, DABPlus, SBC, AAC)
<code>imx-dsp-codec-ext-2.1.8.bin</code>	DSP extra codecs
<code>imx-dsp-codec-aacp-2.1.8.bin</code>	DSP AACPlus decoder
<code>imx-ap1302-1.0.0.tar.gz</code>	Firmware Yocto recipe for Camera AP1302+AR0144.

1.5 Instructions to get the AP1302 firmware

Perform the following steps to get the AP1302 firmware from OnSemi GitHub:

1. Download [ap1302_60fps_ar0144_27M_2Lane_awb_tuning.bin](#) from OnSemi GitHub [NXP_i.MX93_ap1302_firmware](#) by following [README.md](#).
2. Rename it to `ap1302_ar0144_single_fw.bin`.
3. Copy it to the target board under the `/lib/firmware/` folder.

2 What's New?

This section describes the changes in this release, including new features and defect fixes.

2.1 New features

A summary of the main new features is as follows.

New features added for all supported boards:

- Upgraded the kernel to 6.18.2 with consolidated Linux Factory Kernel.
- Updated EULA to v63 May 2025.
- Supports the GCC 14.3 toolchain.
- Supports Glitch Detection (GDET) on i.MX 93.
- Cortex-M33 update for 8ULP, i.MX 93, and i.MX 943; Cortex-M7 updates for i.MX 8M Nano, i.MX 8M Plus, i.MX 95, and i.MX 943; Cortex-M4 update for i.MX 7ULP, i.MX 8M Mini, and i.MX 8M Quad.
- Security
 - OP-TEE upgraded to 4.8.0.
Note: *With this upgrade since 6.12.49, due to security improvements in upstream OP-TEE, xtest takes more time to complete.*
- Multimedia updates:
 - Supports ROI encoding for i.MX 95.
 - Supports PipeWire screen recording. For details, see Section "Screen recording" in the *i.MX Linux User's Guide* (UG10163).
- Graphics updates:
 - i.MX 9 GPU driver upgraded to r54p1, which starts to support Vulkan1.4.
 - i.MX 6/7/8 GPU driver upgraded to 6.4.11.p4.4 with Vulkan enablement, bug fixes, performance optimizations, NPU mmuSwSwitch feature (optional) and mitigations added to address the CVE-2025-66425 issue.
 - GPU SDK upgraded to 6.5.0.
 - Chromium upgraded to 138.0.7204.157.
Note: *Chromium is not supported on i.MX 6 and i.MX 7 any longer due to the DRM/KMS display driver limitation, but is still supported on i.MX 8 and i.MX 9.*
 - Added Chromium support for i.MX 93 and i.MX 943.
Note: *Software only. No GPU hardware acceleration and WebGL support.*
 - Added Flutter support for i.MX 93 with Mesa RVGPU accelerator.
Note: *The RVGPU accelerator is a GPU emulator running on the i.MX platform.*
- Machine Learning updates:
 - OpenCV upgraded to 4.11.0.
 - TensorFlow Lite upgraded to 2.19 with GPU acceleration.
 - i.MX 93 Vela upgraded to 4.4.1.
- Yocto updates:
 - Toaster is supported. For details, see the *i.MX Yocto Project User's Guide* (UG10164).
- i.MX 8M Plus
 - Updates for ISP 4.2.2.26.1.
- i.MX 943
 - Supports i.MX 943 19x19 LPDDR5 EVK, i.MX 943 19x19 LPDDR4 EVK, and i.MX 943 15x15 LPDDR4 EVK.
- Arm SystemReady-IR (SR-IR) certification
 - i.MX 8M Mini EVK board has passed the Arm SR-IR certification.
 - i.MX 8M Plus EVK board has passed the Arm SR-IR certification.
 - i.MX 8M Quad EVK board has passed the Arm SR-IR certification.
 - i.MX 8M Nano EVK board has passed the Arm SR-IR certification.

- Supports the Cyber Resilient Recovery Module (CRRM).
- KernelSpace XDP based `xdp_fp` application
 - Supports CMM with `xdp_fp` on i.MX 95 and i.MX 943.
- The following boards are not supported in this release:
 - i.MX 8QuadXPlus B0 MEK
 - i.MX 8DXL A1 LPDDR4 EVK, A1 DDR3L EVK
 - i.MX 6QuadPlus SABRE-AI
 - i.MX 6Quad/Dual SABRE-AI
 - i.MX 6DualLite SABRE-AI

3 SoC Feature Summary

The following table describes the SoC features summarized into groups.

Table 7. SoC hardware acceleration features

Feature	SoC
2D Graphics with GPU	i.MX 6 Family: 6Quad, 6DualLite, 6Solo, 6SoloX i.MX 7 Family: 7ULP i.MX 8 Family: 8ULP i.MX 8M Family: 8M Mini, 8M Plus
3D GPU	i.MX 6 Family: 6Quad, 6DualLite, 6Solo, 6SoloX i.MX 7 Family: 7ULP i.MX 8 Family: 8QuadMax, 8ULP i.MX 8X Family: 8QuadXPlus i.MX 8M Family: 8M Quad, 8M Mini, 8M Nano, 8M Plus i.MX 9 Family: i.MX 95
2D Graphics with DPU	i.MX 8 Family: 8QuadMax i.MX 8X Family: 8QuadXPlus i.MX 9 Family: i.MX 95
Vulkan GPU	i.MX 8 Family: 8QuadMax, 8ULP i.MX 8X Family: 8QuadXPlus i.MX 8M Family: 8M Plus, 8M Quad, 8M Nano i.MX 9 Family: i.MX 95
OpenVX	i.MX 8 Family: 8QuadMax, 8M Plus
VPU	i.MX 6 Family: 6Quad, 6DualLite, 6QuadPlus i.MX 8 Family: 8QuadMax i.MX 8X Family: 8QuadXPlus, 8DualX i.MX 8M Family: 8M Quad, 8M Mini, 8M Plus i.MX 9 Family: i.MX 95
EPDC	i.MX 6 Family: 6DualLite, 6SLL, 6ULL i.MX 7 Family: 7Dual i.MX 8 Family: 8ULP
PXP	i.MX 6 Family: 6DualLite, 6SLL, 6UL, 6ULL, 6ULZ i.MX 7 Family: 7Dual i.MX 8 Family: 8ULP i.MX 9 Family: i.MX 93, i.MX 943
Frame Buffer Display	i.MX 6 Family: 6Quad, 6DualLite, 6Solo, 6SoloX, 6SLL, 6UL, 6ULL, 6ULZ

Table 7. SoC hardware acceleration features...continued

Feature	SoC
	i.MX 7 Family: 7Dual, 7ULP
DRM Display	i.MX 8 Family: 8QuadMax, 8ULP i.MX 8X Family: 8QuadXPlus, 8DualX i.MX 8M Family: 8M Quad, 8M Mini, 8M Nano, 8M Plus i.MX 9 Family: i.MX 93, i.MX 95
Cortex-M Core	i.MX 6 Family: 6SoloX i.MX 7 Family: 7Dual, 7ULP i.MX 8 Family: 8QuadMax, 8ULP i.MX 8X Family: 8QuadXPlus, 8DX, 8DXL i.MX 8M Family: 8M Quad, 8M Mini, 8M Nano, 8M Plus i.MX 9 Family: i.MX 93, i.MX 95, i.MX 943
HiFi4 DSP	i.MX 8 Family: 8QuadMax, 8ULP i.MX 8X Family: 8QuadXPlus, 8DualX i.MX 8M Family: 8M Plus
NXP eIQ Machine Learning	i.MX 8 Family: 8QuadMax, 8ULP i.MX 8X Family: 8QuadXPlus, 8DualX i.MX 8M Family: 8M Quad, 8M Mini, 8M Nano, 8M Plus i.MX 9 Family: i.MX 93, i.MX 95, i.MX 943
V2X	i.MX 8DXL i.MX 9 Family: i.MX 95, i.MX 943
NPU	i.MX 8 Family: 8M Plus i.MX 9 Family: i.MX 93, i.MX 95, i.MX 943

4 BSP Supported Features

The following table describes the features that are supported in this BSP release. In this table, if no board is explicitly stated, the feature is shared across all boards listed in [Section 1](#). Otherwise, the feature is only supported on the boards listed.

Table 8. Supported features

Feature	Supported board	Comment
Kernel		
Kernel	All i.MX	Kernel version: 6.18.2
File System	All i.MX	EXT2/EXT3/EXT4 are used as the file system in MMC/eMMC/SD card. <ul style="list-style-type: none"> • UBIFS is used for NAND on 8DXL DDR3L. • JFFS2/UBIFS is used for Parallel NOR, QSPI NOR on 7D-SABRE-SD.
Boot image		
U-Boot	All i.MX	U-Boot delivery is based on U-Boot version v2025.04, compiled at local, and needs to install <code>efitools</code> <code>sudo apt install efitools</code> . Clock, Anapop regulator, ENET, UART, MMC/SD, eMMC4.3/4.4/4.5/5.1. High-Assurance Boot, ROM Plug-in Mode. SPI-NOR, Parallel NOR, SATA, NAND, FlexSPI-NOR, USB Mass Storage.

Table 8. Supported features...continued

Feature	Supported board	Comment
		<p>See Table 9 "U-Boot configurations" for the U-Boot configurations supported on each board for SPI_NOR, NAND, Parallel NOR, FlexSPI-NOR. These are not supported on all boards.</p> <p>i.MX 6QuadPlus/Quad/DualLite SABRE-SD support DDR3 528 MHz @ 64 bit.</p> <p>i.MX 6 SoloX SABRE-SD support LDDR3 400 MHz @ 32 bit.</p> <p>i.MX 7Dual SABRE-SD supports DDR3 533 MHz @ 32 bit and boot using L2Cache as OCRAM.</p> <p>i.MX 6UltraLite EVK supports DDR3 400 MHz @ 16 bit.</p> <p>i.MX 6ULL supports DDR3 400 MHz @ 16 bit.</p> <p>i.MX 6ULZ supports DDR3 400 MHz @ 16 bit.</p> <p>i.MX 6SLL supports LPDDR3 400 MHz @ 32 bit.</p> <p>i.MX 7ULP supports Clock, UART, MMC/SD, eMMC4.3/4.4/4.5, High-Assurance Boot, ROM Plug-in Mode QuadSPI-NOR, USB Mass Storage I2C, and SPI.</p> <p>i.MX 8 and i.MX 9 use <code>imx-mkimage</code> to produce the <code>flash.bin</code> file that contains the i.MX 8 or i.MX 9 system controller firmware and U-Boot. The <code>flash.bin</code> file that can be flashed to the SD cards with the command: <code>dd if=<flash.bin> of=/dev/sd<x> seek=<x> bs=1k</code>.</p> <p>For 8M Mini, <code>seek=33</code>.</p> <p>For i.MX 8M Quad/Mini/Nano/Plus, U-Boot supports distro boot. For 8M mini EVK, U-Boot also supports EFI and is able to boot openSUSE and Fedora.</p> <p>For 8M Quad, 8QuadMax A0, and 8QuadXPlus A0, <code>seek=33</code>.</p> <p>For 8QuadMax B0, 8QuadXPlus C0, 8M Nano, 8M Plus, 8DXL, i.MX 93, i.MX 95, and i.MX 943, <code>seek=32</code>.</p>
Boot Firmware	All i.MX 8 i.MX 91 i.MX 93 i.MX 95 i.MX 943	<p>All i.MX 8 and i.MX 91 boards require Arm Trusted Firmware.</p> <p>i.MX 8QuadMax 8DXL and 8QuadXPlus require System Controller Firmware.</p> <p>i.MX 8QuadMax, 8DXL and 8QuadXPlus require SECO Firmware.</p> <p>i.MX 8QuadMax requires signed HDMI Firmware.</p> <p>i.MX 8ULP requires Secure Enclave and uPower Firmware.</p> <p>i.MX 91, i.MX 93, i.MX 95, and i.MX 943 require Secure Enclave Firmware.</p> <p>i.MX 95 and i.MX 943 require System Manager and OEI Firmware.</p>
OP-TEE	All i.MX	OP-TEE OS is required on the boot partition with the TEE file for OP-TEE enablement.
Jailhouse Hypervisor	All i.MX 8M 8ULP i.MX 93 i.MX 95 i.MX 943	Jailhouse is a Type 1 hypervisor for i.MX 8 and i.MX 9. Look for related device trees for inmate and root device trees.
Machine-specific layer		
Arm Core	All i.MX	<p>i.MX 6 SABRE-SD, 6SLL, and 6 SoloX-SD support the Arm Cortex-A9 processor.</p> <p>i.MX 7Dual SABRE-SD and 7ULP EVK support the Arm Cortex-A7 and Cortex-M processor.</p> <p>i.MX 6UltraLite EVK, 6ULL EVK, and 6ULZ EVK support the Arm Cortex-A7 processor.</p> <p>i.MX 8QuadXPlus processor consists of five cores:</p> <ul style="list-style-type: none"> • Four Arm Cortex-A35 • One Arm Cortex-M4F <p>i.MX 8QuadMax processor consists of eight cores:</p> <ul style="list-style-type: none"> • Four Arm Cortex-A53 cores

Table 8. Supported features...continued

Feature	Supported board	Comment
		<ul style="list-style-type: none"> • Two Arm Cortex-A72 cores • Two Arm Cortex-M4F cores <p>i.MX 8M Quad and i.MX 8M Mini support four Arm Cortex-A53 cores and one Arm Cortex-M4 core.</p> <p>i.MX 8M Nano supports four Arm Cortex-A53 cores and one Arm Cortex-M7F core.</p> <p>i.MX 8M Plus supports four Arm Cortex-A53 cores and one Arm Cortex-M7F core.</p> <p>i.MX 8ULP supports two Arm Cortex-A35 cores and one Arm Cortex-M33F core.</p> <p>i.MX 8DXL supports two Arm Cortex-A35 cores and one Arm Cortex-M4F core.</p> <p>i.MX 91 supports one Arm Cortex-A55 core.</p> <p>i.MX 93 supports two Arm Cortex-A55 cores and one Arm Cortex-M33 core.</p> <p>i.MX 95 supports six Arm Cortex-A55 cores, one Arm Cortex-M7 core, and one Arm Cortex-M33 core.</p> <p>i.MX 943 supports four Arm Cortex-A55 cores, two Arm Cortex-M7 cores, and two Arm Cortex-M33 cores.</p>
Memory	All i.MX	<p>On i.MX 6 and i.MX 7 SoC, the user/kernel space is split 2G/2G.</p> <p>On i.MX 8 with 64-bit configuration, the memory is not split.</p> <p>i.MX 8QuadMax supports two 32-bit LPDDR4 channels @1600 MHz.</p> <p>i.MX 8QuadXPlus supports one 32-bit LPDDR4 channel @1200 MHz.</p> <p>i.MX 8DXL supports one 16-bit LPDDR4 channel @ 1200 MHz.</p> <p>i.MX 8M Quad supports one 32-bit LPDDR4 channel @ 1600 MHz and 50 MHz.</p> <p>i.MX 8M Mini supports one 32-bit LPDDR4 channel @ 1500 MHz and 50 MHz.</p> <p>i.MX 8M Nano supports one 16-bit LPDDR4 channel @ 750 MHz and 25 MHz.</p> <p>i.MX 8M Plus supports one 32-bit LPDDR4 channel @ 2000 MHz and 50 MHz.</p> <p>i.MX 8ULP supports Multi-port 32-bit LPDDR4, LPDDR4x, up-to 533 MHz clock.</p> <p>i.MX 91 supports Multi-port 16-bit LPDDR4, up to 2.4 gigabyte transfers per second.</p> <p>i.MX 93 11x11 EVK supports Multi-port 16-bit DDR LPDDR4, LPDDR4x, up to 3.733 gigabyte transfers per second.</p> <p>i.MX 93 14x14 EVK supports Multi-port 16-bit DDR LPDDR4, LPDDR4x, up to 3.733 gigabyte transfer per second.</p> <p>i.MX 93 9x9 QSB supports Multi-port 16-bit DDR LPDDR4, LPDDR4x, up to 3.2 gigabyte transfers per second.</p> <p>i.MX 95 19x19 EVK supports Multi-port 32-bit LPDDR5 up to 25.6 gigabyte transfers per second.</p> <p>i.MX 95 15x15 EVK supports Multi-port 32-bit LPDDR4x up to 16 gigabyte transfers per second.</p> <p>i.MX 943 EVK supports Multi-port 32-bit LPDDR5 or LPDDR4 up to 17.064 gigabyte transfers per second.</p>
Interrupt	All i.MX	GIC
Clock	All i.MX	Controls the system frequency and clock tree distribution.
Timer	All i.MX	<p>System timer tick and broadcast timer support.</p> <p>GPT Timer used for i.MX 6 and i.MX 7.</p> <p>On i.MX 8M SoC and 8QuadXPlus, system counter timer instead of GPT.</p> <p>On i.MX 8 and i.MX 9, Arm Arch timer used instead of GPT.</p> <p>On i.MX 6 and i.MX 7 Enhanced Periodic Interrupt Timer (EPIT) available.</p>
GPIO/EDIO	All i.MX	GPIO is initialized in earlier phase according to hardware design.

Table 8. Supported features...continued

Feature	Supported board	Comment
IOMUX	All i.MX	Provides the interfaces for I/O configuration. IOMUX-V3 version is used on i.MX 6, i.MX 7, and i.MX 8M boards. For i.MX 8QuadMax, i.MX 8DXL and 8QuadXPlus the system controller manages access to the IOMUX.
System Controller	8QuadMax 8QuadXPlus 8DXL	Provides abstraction to the hardware features and runs on Arm Cortex-M4 executing firmware.
System Manager	i.MX 95 i.MX 943	Provides abstraction to the hardware features and runs on Arm Cortex-M33 executing firmware.
DMA engine		
SDMA	All i.MX 6 All i.MX 7 All i.MX 8M	Conforms to the DMA engine framework.
eDMA	7ULP 8ULP 8QuadMax 8QuadXPlus 8DXL All i.MX 9	Conforms to the DMA engine framework. i.MX 95 and i.MX 943 ACP eDMA only supports memory to memory.
Character device drivers		
UART	All i.MX	<p>i.MX 6 SABRE-SD supports console through internal Debug UART1.</p> <p>i.MX 6 SoloX SABRE-SD supports Cortex-A9 processor through UART1 and Cortex-M4 processor through UART2.</p> <p>i.MX 7Dual SABRE-SD supports Cortex-A7 processor through UART1 and Cortex-M4 processor through UART2.</p> <p>i.MX 6UltraLite, 6ULL, and 6ULZ EVK boards support Cortex-A7 processor through UART1.</p> <p>i.MX 7ULP EVK supports through LPUART. There are two LPUARTs on the i.MX 7ULP EVK board. LPUART0 is connected to Arm Cortex-M4 domain and LPUART4 to Arm Cortex-A7 domain.</p> <p>i.MX 8M Mini EVK supports CA53 through UART2 and Cortex-M4 through UART4.</p> <p>i.MX 8M Quad supports Cortex-A53 processor through UART1 and Cortex-M4 processor through UART2.</p> <p>i.MX 8QuadMax, 8QuadXPlus, and 8DualX use LPUART.</p> <p>i.MX 8QuadMax and 8QuadXPlus support Cortex-A53 processor through UART0 and Cortex-M4 processor through UART2.</p> <p>i.MX 8M Nano supports Cortex-A53 through UART2 and Cortex-M7 through UART4.</p> <p>i.MX 8M Plus supports Cortex-A53 through UART2 and Cortex-M7 through UART4.</p> <p>i.MX 8DXL supports Cortex-A35 through UART0 and Cortex-M4 through M40_UART0.</p> <p>i.MX 8ULP supports Cortex-A35 through LPUART5.</p> <p>i.MX 91, i.MX 93, i.MX 95, and i.MX 943 support Cortex-A55 through LPUART1.</p>
Power Management drivers		
Anatop Regulator	All i.MX 6 All i.MX 7	Supports Anatop regulator management.

Table 8. Supported features...continued

Feature	Supported board	Comment
Lower Power mode	All i.MX 6 All i.MX 7 All i.MX 8 All i.MX 9	Supports standby mode and dormant (mem) mode on i.MX 6, i.MX 7, i.MX 8, i.MX 91, i.MX 93, and i.MX 95 boards.
Low Drive mode	i.MX 93	The system runs at low drive mode frequency and voltage.
CPUIdle	All i.MX 6 All i.MX 7 All i.MX 8 All i.MX 9	2-level CPUIdle supported: purely WFI and WFI with wait mode enabled.
CPUFreq	All i.MX except for 8ULP, i.MX 91, i.MX 93, i.MX 95, and i.MX 943	CPUFreq can be used for CPU frequency adjustment. The Interactive governor is added and enabled by default.
BusFreq	All i.MX 6 7D-SABRE-SD All i.MX 8M	Supports the system bus clock frequency scaling.
Battery charging	All i.MX 6 All i.MX 7 All i.MX 8M i.MX 8ULP	Supports battery charge type detection.
Networking drivers		
ENET	All i.MX 6 7D-SABRE-SD All i.MX 8 All i.MX 9	i.MX 6Quad/SoloX board supports AR8031 PHY, i.MX 6UltraLite EVK board supports KSZ8081 PHY, and i.MX 7Dual SABRE-SD board supports BCM54220 PHY. i.MX 6 SoloX SABRE-SD and i.MX 7Dual SABRE-SD support AVB features. i.MX 8 supports Atheros AR8031 PHY with 10/100/1000 bps mode, NXP automotive PHY TJA1100 PHY, and AVB features. For i.MX 8DXL, it has pin conflict with SD card. i.MX 93 supports TJA1103 SDBR RMII and SJA1105Q-EVB RGMII.
ENETC	i.MX 95 i.MX 943	i.MX 95 supports RTL8211 PHY RGMII, AQR113C PHY 10GBASE-R, and TJA1104 RGMII and RMII. It also supports TSN features like 802.1 Qav, 802.1 Qbv, 802.1 Qci, and 802.1 Qbu.
NETC Switch	i.MX 943	i.MX 943 supports RTL8211 PHY RGMII, GPY215C PHY (SGMII), and DP83849I PHY (MII). It also supports TSN features like IEEE 802.1 Qav, 802.1Qbv, 802.1 Qci, and 802.1 Qbu.
EQOS_TSN	i.MX 8M Plus i.MX 8DXL All i.MX 9	i.MX 8DXL supports AR8031 PHY, i.MX 8M Plus supports RTL8211FDI. Supports Ethernet TSN features. For i.MX 8DXL, it has pin conflict with SD card.
IEEE 1588	All i.MX 6 All i.MX 7 All i.MX 8 All i.MX 9	Supports Linux PTP stack. Supports IPv4, IPv6, and IEEE 802.3 transport. Supports E2E, and P2P transparent clock. Supports IEEE802.1AS-2011 in the role of end station.
PCIe	All i.MX except for 6SLL, 6UL,	With the platform that supports PCIe module.

Table 8. Supported features...continued

Feature	Supported board	Comment
	6ULL, 6ULZ, 8M Nano	For i.MX 6 and 7, the default kernel configuration does not enable PCIe. The i.MX 8 defconfig does enable PCIe. For EP/RC validation on i.MX 8, use a converter cable that converts from standard PCIe interface to M.2. <ul style="list-style-type: none"> • EP can be initialized/enumerated by RC. • EP can access the memory of RC. • RC can access the memory of EP. • EP can trigger MSI, and the triggered MSI can be captured by RC.
FlexCAN	All i.MX 6 7D-SABRE-SD 8QuadMax 8QuadXPlus 8M Plus All i.MX 9	Supports both CANs using the FlexCAN device tree but has a pin conflict with FEC. Supports with the default device tree on i.MX 6 SoloX-SD, 7Dual SABRE-SD, 6Ultr Lite EVK, and 6ULL EVK. With the platform that supports the FlexCAN module, FlexCAN supports CANFD mode.
Wi-Fi/Bluetooth wireless technology	All i.MX	Supports the NXP SDIO IW612 (tested with Murata LBES5PL2EL) on i.MX 8MPlus, i.MX 93, i.MX 95 15x15 EVK, i.MX 943 LP4CPU 15x15 EVK, and i.MX 943 LP4CPU 19x19 EVK. Supports the NXP SDIO IW610 (tested with Murata LBES5PL2LL) on i.MX 91. Supports the NXP SDIO IW416 (tested with Murata LBEE5CJ1XK on i.MX 8ULP). Supports the NXP PCIe 88W9098 (tested with Murata LBEE5ZZ1XL) on i.MX 8M Quad WEVK, i.MX 8QuadMax, i.MX 8QuadXPlus, and i.MX 8DXL. Supports the NXP SDIO 88W9098 (tested with Murata LBEE5ZZ1XL) on i.MX 8M Plus. Supports the NXP SDIO 88W8987 Wi-Fi/Bluetooth SoC (tested with Murata LBEE5 QD1ZM) on i.MX 6, i.MX 7Dual, i.MX 7ULP, and (tested with Azurewave AW-CM358) on i.MX 8M Mini LPDDR4 EVK and i.MX 8M Nano LPDDR4 EVK. Supports the NXP PCIe AW693 (tested with U-Blox JODY-W6) on i.MX 95 19x19 EVK and i.MX 943 LP5CPU 19x19 EVK. All the i.MX 6 boards require board modifications to support Bluetooth and to boot with the Wi-Fi/Bluetooth device tree.
DPDK	8M Mini 8M Plus 8DXL i.MX 91 i.MX 93 i.MX 95 i.MX 943	Userspace Ethernet FEC, QOS, and ENETC drivers <ul style="list-style-type: none"> • DPDK version 22.11 • i.MX 8M Mini supports ENETFEC Ethernet interface. • i.MX 8DXL supports ENETQOS Ethernet interface. • i.MX 8M Plus, i.MX 93, and i.MX 91 support ENETFEC and ENETQOS Ethernet interfaces. • i.MX 95 supports ENETC ethernet interface. • 12fwd, 13fwd, and testpmd applications supported. • i.MX 93 and i.MX 95 support the DPDK-FPR application. • i.MX 943 supports ENETC Ethernet interface. • i.MX 95 supports the MTCP stack. • i.MX 95 supports TSN-QBV. • i.MX 95 supports OpenSSL-based applications. For details on executing 12fwd, 13fwd, and testpmd applications, see the dpdk/nxp/README file. For more details, see Section "Data Plane Development Kit (DPDK)" in the <i>i.MX Linux Reference Manual (RM00293)</i> .
XDP_FP	i.MX 95 i.MX 943	<ul style="list-style-type: none"> • i.MX 95 supports XDP. • i.MX 95 and i.MX 943 support CMM.
Security drivers		

Table 8. Supported features...continued

Feature	Supported board	Comment
CAAM	All i.MX except for i.MX 6 ULL/6ULZ/6 SLL/91/93/95	Cryptographic Acceleration and Assurance Module.
SNVS	All i.MX 6 except for 6 ULL/6ULZ/6 SLL All i.MX 7 All i.MX 8M	Secure Non-Volatile Storage.
BBSM and BBNSM	All i.MX 9	Battery Backed Security Module for secure and non-secure storage.
SIMv2	6UltraLite 7D-SABRE-SD	Smart Card Interface.
EMVSIM	8QuadMax	Smart Card Interface.
Sound drivers and DSP		
DSP	8QuadXPlus 8QuadMax 8M Plus 8ULP	One HiFi 4 DSP
AK5558 AK4497 AK4458 AK5552	All i.MX 8M	Supported on Audio board but AK4497 and AK4458 on current audio board cannot work for i.MX 8M Nano and 8M Plus. AK5552 is only supported on 8M Plus.
WM8524 WM8960 SAI WM8962 SAI	All i.MX 8M	Supports playback.
WM8962/SSI WM8960/SSI	6 SABRE-SD 6 SoloX-SD 7D-SABRE-SD 6UltraLite 6ULL 6ULZ 6SLL 7ULP 8ULP	Supports playback.
SAI/MQS	8QuadMax i.MX 93	Supports playback.
S/PDIF	6 SABRE-SD 8QuadMax 8QuadXPlus 8ULP All i.MX 8M i.MX 91 i.MX 93	Supports 16 bit and 24 bit stereo playback from 32 kHz to 48 kHz sample rate. Supports 24 bit stereo record from 16 kHz to 96 kHz.

Table 8. Supported features...continued

Feature	Supported board	Comment
ASRC	6 SoloX-SD 6UltraLite 6ULL 6ULZ 8QuadMax 8QuadXPlus 8M Nano 8M Plus	Supports sample rates conversion from 5 kHz to 192 kHz and output sample rates from 32 kHz to 192 kHz. Supports ALSA plug-in library playback.
ESAI/CS42888/ CS42448	8QuadMax 8QuadXPlus i.MX 91 i.MX 93 i.MX 95	Supports 16 bit, 24 bit PCM format, channel from 2 to 6, and sample rate from 8 kHz to 192 kHz for playback with ASRC P2P. Supports sample rate from 8 kHz to 96 kHz for record and playback without ASRC. Supports 4 channels input and 8 channels output. Supports full duplex operations. Supports amixer alsamixer control from user space. i.MX 91 and i.MX 93 support CS42448. i.MX 95 19x19 EVK and i.MX95 15x15 FRDM support CS42888.
SAI/MQS/WM8962	6 SoloX-SD 7D-SABRE-SD 6UltraLite 6ULL 6ULZ 7ULP All i.MX 8M 8QuadMax 8QuadXPlus i.MX 91 i.MX 93	Supports 16 bit, 24 bit, and 32 bit PCM format. Supports sample rate from 8 kHz to 96 kHz for record and playback. Supports full duplex operations. Supports amixer alsamixer control from user space. Supports clock control. Supports MQS only on i.MX 6 and i.MX 7. Supports WM8962 on i.MX 8QuadMax and i.MX 8M Plus.
AMIX	8QuadMax 8QuadXPlus	Supports 16 bit, 18 bit, 20 bit, 24 bit, and 32 bit PCM format. Supports sample rate from 8 kHz to 96 kHz for record and playback. Supports amixer alsamixer control from user space.
HDMI Audio	6 SABRE-SD 7ULP 8QuadMax 8M Quad 8M Plus	For i.MX 8QuadMax, it is not supported on the reference board but is able to add to the custom board. i.MX 8M Quad supports audio playback through HDMI.
eARC	8M Plus	i.MX 8M Plus supports audio receive from eARC.
Audio HAT	i.MX 91 i.MX 93 i.MX 95 15x15 FRDM	Supports CS42448, SPDIF, PDM MIC.
8MIC-REVE	8M Nano 8M Mini 8M Plus i.MX 93	Supports PDM MIC recording.
Input device drivers		

Table 8. Supported features...continued

Feature	Supported board	Comment
USB devices	All i.MX	Supports USB mouse and USB keypad through USB ports.
Touch panel	All i.MX	6 SABRE-SD supports the EGalaxy capacitive touch screen. 7Dual SABRE-SD supports E Ink touch screen with a separate package download. 6 SoloX SABRE-SD supports LVDS panel. 7ULP EVK supports touch through DSI panel. All MIPI panels on i.MX 8M support Touch. i.MX 93 11x11 EVK supports MIPI Panel TS and LVDS panel TS. i.MX 93 14x14 EVK supports MIPI Panel TS. i.MX 95 19x19 EVK supports MIPI Panel TS. i.MX 95 15x15 EVK supports MIPI Panel TS. i.MX 95 19x19 Verdin supports MIPI Panel TS.
Keypad	6UltraLite 7D-SABRE-SD 7ULP	Supports the resistive touch panel.
Storage drivers		
FlexSPI-NOR	6 SoloX-SD 6UltraLite 6ULL 6ULZ 7D-SABRE-SD All i.MX 8 i.MX 93 i.MX 95	i.MX 6 SoloX SABRE-SD supports QSPI2. i.MX 6UltraLite EVK supports QSPI1. i.MX 7Dual SABRE-SD supports QSPI1. i.MX 8QuadXPlus, 8M Quad, 8M Mini, and 8M Plus support FlexSPI1. i.MX 8M Mini supports NOR Flash Boot. i.MX 93 11x11 EVK, 14x14 EVK, and 9x9 QSB support M.2 FlexSPI-NOR (MT25 QU512A) card. i.MX 95 19x19 EVK and 15x15 EVK support FlexSPI NOR.
NAND	7D-SABRE-SD 8QuadXPlus 8M Quad 8M Mini 8DXL DDR3L	Normal NAND and ONFI NAND asynchronous mode with BCH40/BCH62.
Parallel NOR	8QuadMax	Supports Parallel NOR by using the EIM interface.
SATA	6 SABRE-SD 8QuadMax	i.MX 6DualQuad SABRE-SD and i.MX 6 QuadPlus SABRE-SD support Serial ATA 2.0. i.MX 8QuadMax supports SATA III (6.0 GB/s).
USB drivers		
USB Host	All i.MX	Supports USB HOST1 and USB OTG host.
USB Device	All i.MX	Supports USB OTG device mode.
USB	All i.MX	Supports USB OTG 2.0, USB Host 2.0 for all i.MX except 8M Plus. All i.MX 8 and i.MX 7ULP EVK boards support Type-C ports. The boards that support USB 3.0 are i.MX 8QuadMax and 8QuadXPlus MEK boards, 8M Quad and 8M Plus EVK boards, i.MX 95 and i.MX 943 EVK boards. USB Host mode: MSC, HID, UVC, and USB audio. USB device mode: MSC, Ethernet, and Serial. USB OTG pin detect support for Dual-role switch at USB2.
Graphics and Video drivers		
GPU	6 SABRE-SD 7ULP	Graphics Chips Details: See the <i>i.MX Graphics User's Guide</i> (UG10159) for more details.

Table 8. Supported features...continued

Feature	Supported board	Comment
	All i.MX 8M 8QuadXPlus 8QuadMax 8ULP i.MX 95	<p>Mali G310 and DPU blitter on i.MX 95. PXP blitter on i.MX 93 and i.MX 943. One GC7000-Lite on 8M Quad. One GC7000-Ultra-Lite on 8M Nano. One GC7000-NanoUltra and GC320 on 8M Mini. One GC7000-Ultra-Lite and GC520I on 8M Plus. Two GC7000XSVX on 8QuadMax. One GC7000-Lite on 8QuadXPlus. One GC7000-NanoUltra and GC328 on 7ULP. GC2000, GC355, and GC320 on 6Dual/6Quad. GC2000+, GC355, and GC320 on 6QuadPlus. GC880 and GC320 on 6Solo/DualLite. GC400T on 6 SoloX.</p> <p>The GPU on the chips listed above supports these features that include 2D and 3D hardware acceleration:</p> <ul style="list-style-type: none"> • Supports EGL 1.5 for fbdev and XWayland. • Supports OpenGL ES1.1. • Supports OpenGL ES2.0 (WebGL 1.0.3 compatible). • Supports OpenGL ES3.0 on all except i.MX 6 SoloX, 7ULP, and 8M Mini, which support 2.0 only. • Supports OpenGL ES3.1 i.MX 8QuadMax, 8QuadXPlus, 8DualX, 8M Plus, and 8M Quad. • Supports OpenGL ES3.2 on i.MX 8QuadMax and i.MX 95. • Supports Vulkan 1.3 on i.MX 8QuadMax, 8QuadXPlus, 8DualX, 8M Plus and 8M Quad. • Supports OpenVX on i.MX 8QuadMax and 8M Plus. • Supports OpenVG1.1 on i.MX 6, i.MX 7, and i.MX 8. • Supports OpenCL1.1 on GC2000 on i.MX 6Quad. • Supports OpenCL1.2 on GC2000+ on i.MX 6Quad Plus. • Supports OpenCL on GC7000XSVX and GC7000L on i.MX 95, 8QuadMax, 8QuadXPlus, 8DualX, and 8M Quad. • Supports G2D on all except for i.MX 8M Quad and i.MX 8M Nano. <p>Note: For i.MX 8, <code>wl_shell</code> has been removed by the community since Weston 11. The Wayland application needs to covert it to XDG-Shell.</p>
Frame Buffer Display	All i.MX 6 and 7	<p>MXC Frame buffer driver for IPU V3 on i.MX 6 SABRE-SD. MXC Frame buffer driver for PXP on i.MX 6 SoloX SABRE-SD, i.MX 6UltraLite EVK, i.MX 6ULZ EVK i.MX 6ULL EVK, and i.MX 7Dual SABRE-SD.</p>
Direct Rendering Manager (DRM) Display	All i.MX 8 i.MX 93 i.MX 95	<p>DCSS is used for i.MX 8M Quad. DCNANO is used for i.MX 8ULP. LCDIF is used for all i.MX 8M and i.MX 93. DCIF is used for i.MX 943. i.MX DPU DRM is used for i.MX 8QuadMax, 8QuadXPlus, and i.MX 95.</p>
Framebuffer compression	8M Quad	Supports graphic framebuffer compression with DEC400.
VDOA	6 SABRE-SD	Supports Video Data Order Adapter for tiling.
LVDS	6 SABRE-SD 6 SoloX-SD	Supports HannStar LVDS panel on i.MX 6. It is the default display if no other video option is set up. Uses the LDB controller. i.MX 8 supports the Mixel controller.

Table 8. Supported features...continued

Feature	Supported board	Comment
	8QuadMax 8QuadXPlus 8M Plus i.MX 93 i.MX 95 i.MX 943	i.MX 93 supports LVDS PHY designed by NXP. i.MX 95 Verdin supports the LVDS panel 10 inch. i.MX 95 15x15 EVK supports the BOE-WXGA LVDS panel. i.MX 95 19x19 EVK supports the WUXGA LVDS panel.
HDMI Display	6 SABRE-SD 6 SoloX-SD 7D-SABRE-SD 7ULP i.MX 943	i.MX 6 SABRE-SD and 7Dual support on-chip HDMI hardware. i.MX 6 SoloX SABRE-SD supports external HDMI hardware. i.MX 7ULP EVK supports HDMI through the MIPI pins with external HDMI hardware.
HDMI/Display Port	8M Quad 8QuadMax 8M Plus	i.MX 8QuadMax supports HDMI/Display audio and on-chip HDMI hardware. i.MX 8M Quad supports HDMI/Display through DCSS. i.MX 8M Plus only supports HDMI.
LVDS to HDMI	8QuadMax 8M Plus 8QuadXPlus i.MX 93 i.MX 95 i.MX 943	Uses ITE Driver IT6263. Note: For i.MX 95, the Verdin board does not support LVDS-HDMI.
MIPI to HDMI	All i.MX 8 7ULP i.MX 93 i.MX 95	Uses ADI ADV7535. Supports 4K converter with Lontium LT9611UXC on i.MX 95.
HDCP	6 SABRE-SD i.MX 8M 8QuadMax	Supports HDCP v1.2 specifications on specific HDCP parts. i.MX 8QuadMax can support HDCP v1.4 (for TX) and HDCP v2.2 (for RX and TX).
MIPI-DSI Display	6 SABRE-SD All i.MX 7 i.MX 8 i.MX 93 i.MX 95	Supports 2 lanes through MIPI daughter card on i.MX 6 and i.MX 7-SABRE-SD. Supports 2 lanes MIPI DSI with direct connection on i.MX 7ULP. The default display for i.MX 7ULP EVK board is HDMI. MIPI DSI supports with hardware rework. Supports 4 lanes driven by DPU with up to 1080p60 on i.MX 8QuadMax and 8QuadXPlus. Supports 4 lanes driven by LCDIF with up to 720p60 on i.MX 8M Quad. Supports 4 lanes driven by LCDIF up to 1920x1200p60 on i.MX 8M Mini, 8M Nano, and 8M Plus. Supports 4 lanes driven by DCSS with up to 1080p60 on i.MX 8M Quad. Supports RM67191 OLED display panel through the MIPI DSI on i.MX 8. Supports RM67199 OLED display panel through the MIPI DSI on i.MX 8M Mini, 8M Nano, 8M Plus, 8M Quad, 8QuadMax, 8QuadXPlus, and i.MX 93. Supports RM68200 OLED display panel through the MIPI DSI on i.MX 8ULP. Supports RM692C9 OLED display panel through the MIPI DSI on i.MX 95. Supports MIPI Panel DSI 10 inch on the i.MX 95 Verdin board.
Parallel-LCD Display	All i.MX 6 All i.MX 7 i.MX 93	Supports SEIKO WVGA panel. For i.MX 6UltraLite, i.MX 6ULZ, i.MX 6ULL, and i.MX 7Dual SABRE-SD, it supports Embest LCD8000-43T LCD panel.

Table 8. Supported features...continued

Feature	Supported board	Comment
PxP	6DualLite-SD 6SLL 6 SoloX-SD 7D-SABRE-SD 6UltraLite 6ULL 6ULZ i.MX 93 i.MX 943	Enables PxP Driver for EPDC. Enables PxP Driver for G2D on i.MX 93 and i.MX 943. Conforms to DMA engine framework.
EPDC	6DualLite-SD 6SLL 6ULL 6ULZ 7D-SABRE-SD	Supports RGB565 frame buffer format. Supports Y8 frame buffer format. Supports full and partial EPD screen updates. Supports up to 256 panel-specific waveform modes. Supports automatic optimal waveform selection for a given update. Supports synchronization by waiting for a specific update request to complete. Supports screen updates from an alternate (overlay) buffer. Supports automated collision handling. Supports 64 simultaneous update regions. Supports pixel inversion in a Y8 frame buffer format. Supports posterization of the update contents (driving all pixels to either solid black or white). Supports use of a color map to remap Y8 frame buffer contents. Supports 90, 180, and 270 degree HW-accelerated frame buffer rotation. Supports panning (y-direction only). Supports three EPDC driver display update schemes: Snapshot, Queue, and Queue and Merge. Supports user control of the delay between completing all updates and powering down the EPDC. Supports dithering. i.MX 7Dual supports E Ink but requires a separate download. Contact Marketing representative.
VPU	6 SABRE-SD All i.MX 8 listed i.MX 9	i.MX 6 Encoder: MPEG-4, H.263, H.264 (AVC/MVC), MJPEG i.MX 8QuadMax and 8QuadXPlus Encoder: H.264 i.MX 6 Decoder: MPEG-4, H.263, H.264 (AVC/MVC), VC-1, MPEG-2, MJPEG, AVS, VP8 i.MX 8QuadMax and 8QuadXPlus Decoder: HEVC, H.264, MPEG4, MPEG2 i.MX 8M Quad Decoder: HEVC, VP9, H.264, VP8, RV9, AVS, MJPEG, H.263 i.MX 8M Mini Decoder: HEVC, VP9, H.264, VP8 i.MX 8M Mini Encoder: H.264, VP8 i.MX 8M Plus Encoder: 1080p60 HEVC, H.264 i.MX 8M Plus Decoder: 1080p60 HEVC, H.264, VP9, VP8 i.MX 95 Decoder: 4Kp60 HEVC/H264, MJPEG i.MX 95 Encoder: 4Kp60 HEVC/H264, MJPEG
LCDIFv3	8M Plus i.MX 93	Supports through DRM display framework.
DPU	8QuadMax 8QuadXPlus	Supports through DRM display framework and provides 2D Graphics processing. Supports DPR tiling.

Table 8. Supported features...continued

Feature	Supported board	Comment
	i.MX 95	
DCSS	8M Quad	Supports display frame buffers in memory out to Ultra HD or HDTVs.
DCNANO	8ULP	Supports through DRM display framework.
DCIF	i.MX 943	Supports through DRM display framework.
IPU	6 SABRE-SD	On i.MX 6 SABRE-SD, the IPU driver provides interfaces to access IPU V3 modules.
PRE/PRG driver	6QuadPlus SABRE-SD	On i.MX 6QuadPlus provides interfaces to support prefetch linear frames or resolve tiled frames for display.
V4L2 Output	All i.MX 6 All i.MX 7	i.MX 6 SABRE-SD uses the IPU post-processing functions for video output. i.MX i.MX 6 SoloX SABRE-SD, 6UltraLite, 6ULL, 6ULZ EVKs and i.MX 7D SABRE-SD use the PXP post-processing functions for video output. i.MX 7ULP EVK uses MIPI connection for V4L2 output.
Video Capture drivers		
V4L2 Capture	All i.MX	Supports 2 cameras on i.MX 6 SABRE-SD. Supports 1 camera on i.MX 6 SoloX SABRE-SD, 6UltraLite EVK, 6ULL EVK, 6ULZ EVK and 7D-SABRE-SD, and i.MX 8M Mini. Supports 2 cameras on i.MX 8M Quad and i.MX 8M Plus and 1 camera on i.MX 8M Mini, and 8M Nano. Supports 4 cameras on i.MX 8QuadXPlus and i.MX 95. Supports 8 cameras on i.MX 8QuadMax. Supports 1 parallel camera on i.MX 91. Supports 1 MIPI camera or 1 parallel camera on i.MX 93.
MIPI Camera CSI	6 SABRE-SD 7D-SABRE-SD 7ULP All i.MX 8M 8QuadMax 8QuadXPlus i.MX 93 i.MX 95	Supports 2-lane CSI MIPI camera OV5640 with 720p30, 640x480@30, 320x240@30, 720x480@30, 1080p@30, 2592x1944@15, 176x144@30. Supports CSI MIPI camera OV10635 with 1280x800@30, ov10635 max supports 1280x800@30, and ISI does not support upscale, so 1080p, 2592x1944 cannot be supported on i.MX 8QuadMax and 8QuadXPlus. Supports 4-lane Basler CSI MIPI cameras AR0821 with 4K@30 with ISP on i.MX 8M Plus. Supports 4-lane CSI MIPI camera OS08A20 with 4K with ISP on i.MX 8M Plus and i.MX 95. Supports 2-lane CSI MIPI camera AP1302+AR0144 with 1080p@45, 1280x800@60, 720P@60 and 640x480@60 on i.MX 93. Supports 4-lane CSI MIPI camera AP1302+AR0144 with 1080p@60, 1280x800@60 on i.MX 95. Supports 4-lane CSI MIPI camera OX03C10 + MAX96717/MAX96724 GMSL2 SerDes (4 cameras) with ISP on i.MX 95.
Parallel CSI	6 SABRE-SD 6 SoloX-SD 6UltraLite 6ULL 6ULZ 6SLL 8QuadXPlus i.MX 91 i.MX 93	Supports OV5640 camera sensor. i.MX 93 and i.MX 91 do not support OV5640 camera sensor. They support MT9M114 with 320x240@25, 640x480@25, 800x480@25, 1280x720@25.

Table 8. Supported features...continued

Feature	Supported board	Comment
ISI	8QuadMax 8QuadXPlus 8M Nano 8M Plus i.MX 91 i.MX 93 i.MX 95	Supports capture through ISI controller. ISI Mem2Mem function is supported on i.MX 8M Plus and i.MX 95.
ISP	8M Plus i.MX 95	Supports capture through ISP controller on i.MX 8M Plus and i.MX 95. Supports stream configuration using Libcamera on i.MX 95. Supports image enhancing algorithms: <ul style="list-style-type: none"> • i.MX 8M Plus: AE/AF/AWB/DEWARP/LSC/CPROC, etc. • i.MX 95: AWB/AGC/AEC
IPU-CSI	6 SABRE-SD	Supports capture through IPU CSI controller.
TV-IN	8QuadMax	Supports TV-IN through ADV7180 on the 8QuadMax with NTSC, and PAL.
General drivers		
uSDHC	All i.MX	Supports SD2.0 and SDXC. Supports SD3.0 on all i.MX except 6 SABRE-SD. Supports eMMC 1bit/4bit/8bit SDR/DDR mode. i.MX 6 SABRE-SD is soldered and i.MX 6 SoloX-SD is not soldered. Supports eMMC4.5 on i.MX 6 SoloX-SD. Supports eMMC5.0 on i.MX 7Dual SABRE-SD. Supports eMMC5.1 on i.MX 8, i.MX 8M, and i.MX 9.
Watchdog	All i.MX	Supports Watchdog reset.
I2C	All i.MX	Supports I2C master. Supports PCA9646 I2C switch on i.MX 8QuadXPlus.
SPI	All i.MX	Supports SPI master mode and slave mode.
I3C	8ULP i.MX 91 i.MX 93 i.MX 95 i.MX 943	Supports I3C master with SDR speed.
Pulse Width Modulator	All i.MX	Supports the backlight driver through PWM.
ADC	6 SoloX-SD 7D-SABRE-SD 6UltraLite 6ULL 6ULZ 7ULP 8QuadMax 8QuadXPlus i.MX 95 i.MX 943	Supports the ADC driver.

Table 8. Supported features...continued

Feature	Supported board	Comment
Temperature monitor	All i.MX	Pre-calibrated. See the "Thermal Driver" chapter in <i>i.MX Linux Reference Manual</i> (RM00293) for more information.
Accelerometer	6 SABRE-SD 6 SoloX-SD 6UltraLite 6ULL 6ULZ 7D-SABRE-SD 7ULP 8QuadXPlus 8QuadMax	Supports the MMA8451 sensor on i.MX 6SABRE and i.MX 6 SoloX. Supports the FXLS8471Q sensor on 6UltraLite EVK, 6ULZ and 6ULL EVK. Supports the FXOS8700 sensor on the i.MX 7. Supports the FXOS8700 sensor on the i.MX 8.
GPIO Expander	6 SABRE-SD 7D-SABRE-SD 8QuadMax 8QuadXPlus i.MX 93 i.MX 95	Supports the MAX7310 GPIO expander on i.MX 6 SABRE-SD. Supports the 74LV595 GPIO expander on i.MX 7Dual SABRE-SD. Supports PCA9557 and PCA6416 on i.MX 8. Supports ADP5585 and PCAL6524 on i.MX 93. Supports ADP5585/PCAL6408/PCAL6416/PCAL6524 on i.MX 95.
SNVS RTC	All i.MX 6 All i.MX 7 All i.MX 8	SNVS is a block that interfaces with CAAM and SRTC.
BBNSM RTC	All i.MX 9	-
Ambient Light Sensor	6 SABRE-SD 6 SoloX-SD 8QuadMax 8QuadXPlus	Supports the ISL29023 sensor on i.MX 6 SABRE-SD and 6 SoloX boards. Supports the ISL29023 sensor on i.MX 8QuadMax and i.MX 8QuadXPlus boards
Gyroscope Sensor	All i.MX 7 8ULP i.MX 93	Supports FXA2100 Gyroscope sensor. Supports LSM6DSO_GYRO Gyroscope sensor on i.MX 8ULP and i.MX 93.
Pressure Sensor	7D-SABRE-SD 8QuadMax 8QuadXPlus	Supports MPL3115 pressure sensor.
Magnetometer Sensor	i.MX 6	Supports MAG3110 magnetometer sensor on all i.MX 6 except 6SLL.

5 U-Boot and Device Trees

This section describes the different U-Boots and device trees, as well as different kernel and boot parameters.

5.1 U-Boot configurations

In the following table, the U-Boot configurations are listed for each machine configuration. The machine configurations are provided through the Yocto Project layers in the `meta-freescale` and `meta-imx` layers in the `conf/machine` subdirectory.

Table 9. U-Boot configurations

U-Boot configuration for Boot device	Description	Supported machine configuration
sd	<p>sd supports boot from an SD card. This is the default U-Boot configuration.</p> <p>For boards supporting eMMC, such as i.MX 6QuadPlus/Quad/DualLite, i.MX 8/9, SD boot can be flashed in eMMC for boot from eMMC instead of an SD card.</p>	<p>imx6qsabresd, imx6qpsabresd, imx6dlsabresd imx6s11evk imx6sxsabresd imx7dsabresd imx6ulevk imx6ull114x14evk, imx6ullz4x14evk imx7ulpevk imx8qmmek imx8qxpmev, imx8qxp0mek imx8mqevk, imx8mqwevk imx8mmevk imx8mnevk imx8mpevk, imx8mp-lpddr4-frdm imx8dxlevk, imx8dx1b0-ddr31-evk, imx8dx1b0-lpddr4-evk imx8dxmek imx91-11x11-lpddr4-evk, imx91-9x9-lpddr4-qsb, imx91-11x11-lpddr4-frdm, imx91-11x11-lpddr4-frdm-imx91s imx93-11x11-lpddr4x-evk, imx93-14x14-lpddr4x-evk, imx93-9x9-lpddr4-qsb, imx93-11x11-lpddr4x-frdm imx95-19x19-lpddr5-evk, imx95-15x15-lpddr4-evk, imx95-19x19-verdin-evk, imx95-15x15-lpddr4x-frdm imx943-evk, imx943-orangebox</p>
nand	Supports booting from NAND.	<p>imx7dsabresd imx6ull114x14evk imx8dx1b0-ddr31-evk imx91-11x11-lpddr4-frdm-imx91s</p>
sata	Supports booting from SATA.	imx6qsabresd, imx6qpsabresd
qspi	<p>Supports booting from QSPI. Booting from the Arm Cortex-M4 processor is supported through QSPI2 and QSPI1. Use U-Boot command <code>bootaux</code> to boot the Arm Cortex-M4 processor. The booting address for QSPI2 is 0x78000000. The booting address for QPIS1 is 0x68000000.</p>	<p>imx6sxsabresd with QSPI2 imx7dsabresd with QSPI1 imx6ulevk with QSPI1 imx6ulz14x14evk with QSPI1</p>
emmc	<p>Supports the board boot from eMMC, which has the eMMC populated. Users need to populate it if needed. For other boards supporting eMMC such as i.MX 6QuadPlus/Quad/DualLite, SD boot is used.</p>	<p>imx6sxsabresd imx7dsabresd imx6ull114x14evk imx6ulz14x14evk imx7ulpevk imx8qmmek imx8qxp0mek imx8dxlevk</p>

Table 9. U-Boot configurations...continued

U-Boot configuration for Boot device	Description	Supported machine configuration
		imx8mpevk imx8mmevk imx8ulpevk imx8dx1b0-lpddr4-evk imx91-11x11-evk, imx91-11x11-lpddr4-frdm imx93-9x9-qsb, imx93-11x11-lpddr4x-evk, imx93-14x14-lpddr4x-evk, imx93-9x9-lpddr4-qsb, imx93-11x11-lpddr4x-pf0900-evk, imx93-11x11-lpddr4x-frdm imx95-19x19-evk, imx95-15x15-lpddr4-evk, imx95-19x19-verdin-evk, imx95-15x15-lpddr4x-frdm imx943-evk, imx943-orangebox
m4fastup	Supports booting from Arm Cortex-M4 processor by disabling QSPI2 from using Arm Cortex-M4 processor.	imx6xsabresd
epdc	Supports EPDC splash screen in U-Boot.	imx7dsabresd
flexspi (fsp_i)	Supports FlexSPI boot.	imx8qmmek imx8qxpmev imx8qxp0mek imx8dx1b0-lpddr4-evk, imx8dx1a1-lpddr4-evk imx8mmevk imx8mnevk imx8mpevk imx8ulpevk imx93-14x14-lpddr4x-evk imx95-19x19-evk
ecc	Supports DDR ECC.	imx91-11x11-lpddr4-evk, imx91-11x11-lpddr4-frdm, imx91-11x11-lpddr4-frdm-imx91s imx93-11x11-lpddr4x-evk, imx93-9x9-lpddr4-qsb, imx93-11x11-lpddr4x-pf0900-evk, imx93-11x11-lpddr4x-frdm imx95-19x19-lpddr5-evk
XSPI	Supports XSPI NOR.	imx943-evk
CRRM	Supports XSPI boot with CRRM enabled.	imx943-evk

5.2 Kernel device trees

The following table describes the kernel and device trees included in this release. A list of several device tree files is provided for each board to offer examples on how to handle different pin conflicts due to pin muxing.

Table 10. Kernel and device tree configurations

Kernel and device tree configuration	Description
Kernel Binary Image	i.MX 6 and i.MX 7 zImage kernel is built with the <code>imx_v7_defconfig</code> in <code>arch/arm/configs</code> . i.MX 8 and i.MX 9 Image kernel is built with <code>imx_v8_defconfig</code> in <code>arch/arm64/configs</code> .
DTB Descriptions	Each reference board has a standard device tree as follows: <ul style="list-style-type: none"> • <code>imx6q-sabresd.dtb</code>, <code>imx6qp-sabresd.dtb</code> • <code>imx6dl-sabresd.dtb</code> • <code>imx6sx-sdb.dtb</code>: Supports the i.MX 6SoloX SABRE-SDB Rev. B board, and <code>imx6sx-sdb-reva.dtb</code> supports the SABRE-SDB Rev. A board. • <code>imx7d-sdb.dtb</code>: Supports the i.MX 7Dual SABRE-SDB Rev. C and Rev. D boards, and <code>imx7d-sdb-reva.dtb</code> supports the Rev. A board. • <code>imx6ul-14x14-evk.dtb</code>, <code>imx6ul-9x9-evk.dtb</code> • <code>imx6ulz-14x14-evk.dtb</code> • <code>imx6ull-14x14-evk.dtb</code> • <code>imx7ulp-evk.dtb</code> • <code>imx8mq-evk.dtb</code>: Supports both i.MX 8M Quad EVK board and i.MX 8M Quad WEVK board. • <code>imx8mm-evk.dtb</code>, <code>imx8mm-ddr4-evk</code> • <code>imx8mn-evk.dtb</code>, <code>imx8mn-ddr4-evk.dtb</code>, <code>imx8mn-ddr3l-evk.dtb</code> (for i.MX 8M NanoUltraLite) • <code>imx8mp-evk.dtb</code>: Supports single or multiple displays with HDMI, MIPI-DSI-HDMI, and LVDS-HDMI. • <code>imx8mp-evk-revb4.dtb</code>, <code>imx8mp-frdm.dtb</code>: Supports i.MX 8M Plus Rev. B4 board. • <code>imx8dxl-evk.dtb</code> • <code>imx8qm-mek.dtb</code>: Supports the LVDS-HDMI or MIPI-DSI-HDMI display with the LVDS-HDMI or MIPI-DSI-HDMI converts. The detection is on-the-fly by using the device-tree overlay technology. It is for non-partition boot that <code>flash.bin</code> does not include the Cortex-M4 image. • <code>imx8qm-mek-rpmsg.dtb</code>: Supports partition reset, and supports the LVDS-HDMI or MIPI-DSI-HDMI display with the LVDS-HDMI or MIPI-DSI-HDMI converts. This requires <code>flash.bin</code> to include the Cortex-M4 image. • <code>imx8qm-mek-revd-rpmsg.dtb</code> • <code>imx8qm-mek-revd.dtb</code> • <code>imx8qxp-mek.dtb</code>: Supports one LVDS-HDMI through the LVDS0-CH0 on the LVDS-HDMI daughter card. It is for non-partition boot that <code>flash.bin</code> does not include the Cortex-M4 image. • <code>imx8qxp-mek-rpmsg.dtb</code> • <code>imx8ulpevk.dtb</code> • <code>imx8ulp-9x9-evk.dtb</code> • <code>imx943-orangebox-mic.dtb</code> • <code>imx943-orangebox-netc-m33.dtb</code> • <code>imx943-orangebox.dtb</code> • <code>imx91-11x11-evk.dtb</code> • <code>imx91-11x11-frdm.dtb</code> • <code>imx91-11x11-frdm-imx91s.dtb</code> • <code>imx91-9x9-qsb.dtb</code> • <code>imx93-11x11-evk.dtb</code> • <code>imx93-11x11-evk-pmic-pf0900.dtb</code> • <code>imx93-11x11-frdm.dtb</code> • <code>imx93-9x9-qsb.dtb</code> • <code>imx93-14x14-evk.dtb</code>

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
	<ul style="list-style-type: none"> • imx95-15x15-evk.dtb • imx95-15x15-frdm.dtb • imx95-19x19-verdin.dtb • imx95-19x19-evk.dtb: Not the default dtb; supports Bluetooth/Wi-Fi card; does not support any display/camera. • imx943-evk.dtb
Audio	<p>Enables various audio device trees.</p> <ul style="list-style-type: none"> • imx8ulp-evk-sof-btsco.dtb: Sound open firmware • imx8mp-ab2.dtb: audio board • imx8mp-evk-sof-wm8960.dtb: Sound open firmware for WM8960 audio • imx8mp-evk-rpmsg.dtb: Supports low-power audio playback. • imx8mp-evk-rpmsg-lpv.dtb Supports low-power voice. • imx8mp-evk-revb4.dtb: Supports WM8962 codec. • imx8mq-evk-ak4497.dtb: Audio board ak4497 codec • imx8mq-evk-pdm.dtb: PDM microphone • imx8mq-evk-audio-tdm.dtb: Audio board TDM • imx8mm-evk-ak4497.dtb: Audio board ak4497 codec • imx8mm-evk-ak5558.dtb: Audio board ak5558 codec • imx8mm-evk-audio-tdm.dtb: Audio board TDM • imx8mn-dd4-evk-ak5558.dtb: Audio board TDM • imx7ulp-evk-wm8960.dtb: Enables WM8960 audio as the default one and disables HDMI audio • imx7d-sdb-reva-hdmi-audio.dtb: Enables HDMI audio as the default one and disables WM8960 audio • imx8mp-evk-revA3-8mic-revE.dtb, imx8mp-frdm-8mic-revE.dtb: For 8MIC audio used on the SCH-46370 REV A3/B new reversion • imx93-14x14-evk-aud-hat.dtb • imx93-11x11-evk-aud-hat.dtb • imx93-11x11-evk-mqs.dtb • imx93-11x11-evk-rpmsg.dtb • imx93-11x11-evk-rpmsg-lpv.dtb • imx93-11x11-evk-pmic-pf0900-aud-hat.dtb • imx93-11x11-evk-pmic-pf0900--mqs.dtb • imx93-11x11-evk-pmic-pf0900--rpmsg.dtb • imx93-11x11-evk-pmic-pf0900--rpmsg-lpv.dtb • imx93-11x11-frdm-8mic-reve.dtb • imx93-11x11-frdm-aud-hat.dtb • imx93-9x9-qsb-aud-hat.dtb • imx93-9x9-qsb-rpmsg-lpv.dtb • imx93-9x9-qsb-rpmsg.dtb • imx93-9x9-qsb-aud-hat.dtb • imx95-19x19-evk-cs42888.dtb • imx95-19x19-evk-rpmsg.dts: Low Power Audio • imx95-19x19-evk-rpmsg-lpv.dts: Low Power Voice • imx95-19x19-evk-sof-wm8962.dts: Sound Open Firmware on the Cortex-M core • imx95-15x15-evk-aud-hat.dts: Audio Hat board. • imx95-15x15-ab2.dts: Audio Board 2 • imx95-15x15-evk-mqs.dts: MQS output • imx95-15x15-evk-rpmsg.dts: Low Power Audio

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
	<ul style="list-style-type: none"> • imx95-15x15-evk-rpmsg-lpv.dts: Low Power Voice • imx95-15x15-frdm-aud-hat.dtb • imx95-15x15-frdm-8mic.dtb • imx91-11x11-evk-aud-hat.dts: Audio Hat Board • imx91-11x11-evk-mqs.dts: MQS output • imx91-11x11-frdm-8mic-reve.dtb • imx91-11x11-frdm-aud-hat.dtb • imx91-11x11-frdm-imx91s-8mic-revE.dtb • imx91-11x11-frdm-imx91s-aud-hat.dtb • imx91-9x9-qsb-aud-hat.dts: Audio Hat board
<p>Bluetooth wireless technology Wi-Fi</p>	<p>Enables the Bluetooth wireless technology and Wi-Fi hardware.</p> <p>The followings support NXP SDIO 88W8987 chip inside:</p> <ul style="list-style-type: none"> • imx6q-sabresd-btwifi.dtb • imx6qp-sabresd-btwifi.dtb • imx6dl-sabresd-btwifi.dtb • imx6s11-evk-btwifi.dtb • imx6sx-sabresd-btwifi.dtb • imx6ul-14x14-evk-btwifi.dtb • imx6ull-14x14-evk-btwifi.dtb • imx6ulz-14x14-evk-btwifi.dtb • imx7ulp-evkb.dtb • imx7d-sdb-usd-wifi.dtb • imx8mm-evk.dtb • imx8mn-evk.dtb <p>The followings support NXP PCIe 88w9098 chip inside:</p> <ul style="list-style-type: none"> • imx8mq-evk.dtb (for i.MX 8M Quad WEVK board) • imx8qm-mek-rpmsg.dtb • imx8qxp-mek-rpmsg.dtb • imx8dxl-evk-rpmsg.dtb <p>The following supports NXP SDIO 88w9098 chip inside:</p> <ul style="list-style-type: none"> • imx8mp-evk.dtb <p>The following supports NXP SDIO IW416 chip inside:</p> <ul style="list-style-type: none"> • imx8ulp-evk.dtb <p>The followings support NXP SDIO IW612 chip inside:</p> <ul style="list-style-type: none"> • imx8mp-evk.dtb • imx93-11x11-evk.dtb • imx93-11x11-evk-pmic-pf0900.dtb • imx93-11x11-frdm.dtb • imx93-9x9-qsb.dtb • imx95-15x15-evk.dtb • imx95-19x19-verdin.dtb • imx943-evk-sdwifi.dtb <p>The following supports NXP SDIO AW611 chip inside:</p> <ul style="list-style-type: none"> • imx93-14x14-evk.dtb <p>The followings support NXP SDIO IW610 chip inside:</p> <ul style="list-style-type: none"> • imx91-11x11-evk.dtb • imx91-11x11-frdm.dtb • imx91-9x9-qsb.dtb

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
	<p>The followings support NXP PCIe AW693 chip inside:</p> <ul style="list-style-type: none"> • imx95-19x19-evk.dtb • imx943-evk.dtb <p>The followings support MAYA-W276 with NXP IW612:</p> <ul style="list-style-type: none"> • imx8mp-frdm.dtb • imx93-11x11-frdm.dtb • imx95-15x15-frdm.dtb <p>The followings support MAYA-W476 with NXP IW610:</p> <ul style="list-style-type: none"> • imx91-11x11-frdm.dtb • imx91-11x11-frdm-imx91s.dtb
Video Capture	<ul style="list-style-type: none"> • imx8qxp-mek-ov5640.dtb: Supports one MIPI OV5640 and one parallel OV5640, which indicates to support two cameras. Tested with non-M4 flash.bin. • imx8qxp-mek-ov5640-csi.dtb: Supports one MIPI OV5640 camera. • imx8qxp-mek-ov5640-parallel.dtb: Supports one Parallel OV5640 camera. • imx8qxp-mek-ov5640-dual.dtb: Supports one MIPI and one Parallel OV5640 cameras, which indicates to support two cameras. • imx8qxp-mek-max9286.dtb: Supports one setup of 4 OV10635 cameras with the MAX9286 de-serializer on the CSI0 port. • imx8qm-mek-ov5640.dtb: Supports one or two OV5640 sensors at the same time. • imx8qm-mek-ov5640-csi0.dtb: Supports one MIPI OV5640 camera on the CSI0 port • imx8qm-mek-ov5640-csi1.dtb: Supports one MIPI OV5640 camera on the CSI1 port. • imx8qm-mek-ov5640-dual.dtb: Supports two MIPI OV5640 cameras on both the CSI0 and CSI1 ports. • imx8qm-mek-max9286-csi0.dtb: Supports one setup of 4 OV10635 cameras with the MAX9286 de-serializer on the CSI0 port. • imx8qm-mek-max9286-csi1.dtb: Supports one setup of 4 OV10635 cameras with the MAX9286 de-serializer on the CSI1 port. • imx8qm-mek-max9286-dual.dtb: Supports two setups of 4 OV10635 cameras with the MAX9286 de-serializer on both the CSI0 and CSI1 ports. • imx8qm-mek-hdmi-rx.dtb: Supports capture from HDMI RX port. hdprx_enable must be set to "yes" in U-Boot environment to enable the HDMIRX firmware load. • imx8mq-evk: Supports up to two OV5640 cameras. • imx8mp-evk-basler.dtb: One Basler ISP camera (AR0821), reaches up to 4K30. • imx8mp-evk-dual-basler.dtb: Dual Basler ISP cameras (AR0821), reaches up to 1080 P60. • imx8mp-evk-basler-ov5640.dtb: Dual-camera Basler ISP + OV5640. • imx8mp-evk-os08a20.dtb, imx8mp-frdm-os08a20.dtb: Support one ISP camera - OS08A20. • imx8mp-evk-dual-os08a20.dtb, imx8mp-frdm-os08a20-dual.dtb: Support dual ISP cameras - OS08A20. • imx8mp-evk-os08a20-ov5640.dtb: Supports dual cameras OS08A20 + OV5640. • imx8mp-frdm-ap1302-dual.dtb: Supports two AP1302. • imx6ul-14x14-evk-csi.dtb: Avoids the pin conflict between SIM and CSI and enables CSI support for V4L2. • imx6ul-9x9-evk-csi.dtb: Avoids the pin conflict between SIM and CSI and enables CSI support for V4L2. • imx93-11x11-evk.dtb, imx93-11x11-evk-pmic-pf0900.dtb: Support AP1302. • imx93-11x11-frdm-ov5640.dtb: Supports MIPI OV5640 camera on the CSI port. • imx91-11x11-evk-mt9m114.dtb, imx91-9x9-qsb-mt9m114.dtb, imx91-11x11-frdm-mt9m114.dtb, imx91-11x11-frdm-imx91s-mt9m114.dtb, imx93-11x11-

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
	<p>evk-mt9m114.dtb, imx93-9x9-qsb-mt9m114.dtb, imx93-11x11-frdm-mt9m114.dtb: Support parallel MT9M114 camera.</p> <ul style="list-style-type: none"> • imx95-19x19-evk-ap1302.dtb, imx95-15x15-evk-ap1302.dtb, imx95-15x15-frdm-ap1302.dtb: Support AP1302 with miniSAS interface. • imx95-15x15-evk-ap1302_rpi.dtb: Supports AP1302 with RPI interface. • imx95-15x15-evk-ox03c10-isp-adv7535.dtb, imx95-19x19-evk-ox03c10-isp-it6263-lvds0.dtb, imx95-19x19-verdin-ox03c10-isp-lt8912.dtb: Support OX03C10 with ISP. • imx95-15x15-evk-os08a20-isp-adv7535.dtb, imx95-19x19-evk-os08a20-isp-it6263-lvds0.dtb, imx95-19x19-verdin-os08a20-isp-lt8912.dtb, imx95-15x15-frdm-os08a20-isp.dtb, imx95-15x15-frdm-os08a20-combo-isp.dtb, imx95-15x15-frdm-dual-os08a20-isp.dtb: Support camera OS08A20 with ISP and the default display. • imx95-15x15-evk-ox03c10-isp-adv7535.dtb, imx95-19x19-evk-ox03c10-isp-it6263-lvds0.dtb, imx95-19x19-verdin-ox03c10-isp-lt8912.dtb: Support camera OX03C10 + MAX96717/MAX96724 GMSL2 SerDes (4 cameras) with ISP and the default display. • imx95-15x15-evk-ox05b1s-isp-adv7535.dtb, imx95-19x19-evk-ox05b1s-isp-it6263-lvds0.dtb, imx95-19x19-verdin-ox05b1s-isp-lt8912.dtb: Support 5MP RGBIR camera OX05B1S with ISP and the default display.
Video Display	<ul style="list-style-type: none"> • imx7d-sdb-epdc.dtb: Pin conflict between HDMI and EPDC. Disables HDMI for EPDC. • imx7d-sdb-reva-epdc.dtb: Pin conflict between HDMI and EPDC. Disables HDMI for EPDC. • imx7d-sdb-mipi-dsi.dtb: Enables MIPI-DSI. • imx7ulp-evk-mipi.dtb: Enables MIPI-DSI. • imx8ulp-evk-epdc.dtb: Parallel EPDC panel. • imx8ulp-evk-rk055hdmipi4m.dtb: MIPI DSI panel. • imx8mp-evk-it6263-lvds-dual-channel.dtb: Dual-channel LVDS to HDMI converter. • imx8mp-evk-rm67191.dtb: MIPI MX8-DSI-OLED1 panel. • imx8mp-evk-rm67199.dtb: MIPI MX8-DSI-OLED1A panel. • imx8mp-evk-jdi-wuxga-lvds-panel.dtb: LVDS panel. • imx8mp-frdm-boe-wuxga-lvds0-panel.dtb, imx8mp-frdm-boe-wuxga-lvds1-panel.dtb: LVDS panel. • imx8mp-frdm-waveshare-7inch-c-panel.dtb: Waveshare MIPI 7-inch panel. • imx8qxp-mek-dsi-rm67191.dtb: Supports RM67191 MIPI MX8-DSI-OLED1 display panel. Tested with non-M4 flash.bin. • imx8qxp-mek-dsi-rm67191-rpmsg.dtb: Supports RM67191 MIPI MX8-DSI-OLED1 display panel. Tested with M4 flash.bin. • imx8qxp-mek-dsi-rm67199.dtb: Supports RM67199 MIPI MX8-DSI-OLED1 display panel. Tested with non-M4 flash.bin. • imx8qxp-mek-dsi-rm67199-rpmsg.dtb: Supports RM67199 MIPI MX8-DSI-OLED1 display panel. Tested with M4 flash.bin. • imx8qxp-mek-it6263-lvds0-dual-channel.dtb: Supports the LVDS-HDMI display with LVDS0 dual-channel feature. Tested with non-M4 flash.bin. • imx8qxp-mek-it6263-lvds1-dual-channel: Supports the LVDS-HDMI display with LVDS1 dual-channel feature. Tested with non-M4 flash.bin. • imx8qxp-mek-jdi-wuxga-lvds1-panel.dtb: Supports the dual-channel LVDS panel, connecting the two mini-SAS ports with the LVDS1 CH0 and LVDS1 CH1. Tested with non-M4 flash.bin.

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
	<ul style="list-style-type: none"> • <code>imx8qxp-mek-jdi-wuxga-lvds0-panel.dtb</code>: Supports the dual-channel LVDS panel, connecting the two mini-SAS ports with the LVDS0 CH0 and LVDS0 CH1. Tested with non-M4 flash.bin. • <code>imx8qm-mek.dtb</code>: Supports the LVDS-HDMI or MIPI-DSI-HDMI display with the LVDS-HDMI or MIPI-DSI-HDMI converts. The detection is on-the-fly by using the device-tree overlay technology. • <code>imx8qm-mek-hdmi.dtb</code>: Supports native HDMI TX interface on the CPU board. • <code>imx8qm-mek-jdi-wuxga-lvds1-panel.dtb</code>: Supports the dual-channel LVDS panel, connecting the two mini-SAS ports with the LVDS1 CH0 and LVDS1 CH1. • <code>imx8qm-mek-dsi-rm67191.dtb</code>: Supports RM67191 MIPI MX8-DSI-OLED1 display panel. • <code>imx8qm-mek-dsi-rm67199.dtb</code>: Supports RM67199 MIPI MX8-DSI-OLED1 display panel. • <code>imx8mq-evk-lcdif-adv7535.dts</code>: LCDIF + MIPI-DSI + HDMI adapter. • <code>imx8mq-evk-dcss-adv7535.dtb</code>: DCSS + MIPI-DSI + HDMI adapter. • <code>imx8mq-evk-dcss-rm67191.dtb</code>: DCSS + MIPI-DSI + RM67191 MX8-DSI-OLED1 panel. • <code>imx8mq-evk-dcss-rm67199.dtb</code>: DCSS+MIPI-DSI+ RM67199 MX8-DSI-OLED1A panel. • <code>imx8mq-evk-lcdif-rm67191.dtb</code>: LCDIF+MIPI-DSI+ RM67191 MX8-DSI-OLED1 panel. • <code>imx8mq-evk-lcdif-rm67199.dtb</code>: LCDIF+MIPI-DSI+ RM67199 MX8-DSI-OLED1A panel. • <code>imx8mq-evk-dual-display.dtb</code>: Dual-display-to-HDMI and MIPI-to-HDMI adapter. • <code>imx8mq-evk-dp.dtb</code>: Display Port support (Set <code>video_off=y</code> in U-Boot with onboard DP connector). • <code>imx8mq-evk-epd.dtb</code>: Embedded Display Port support. • <code>imx8dx1-evk-lcdif.dtb</code>: Supports the LCDIF panel. • <code>imx8dx-mek-dsi-rm67191.dtb</code>: Supports RM67191 MIPI MX8-DSI-OLED1 display panel. Tested with non-M4 flash.bin. • <code>imx8dx-mek-dsi-rm67191-rpmsg.dtb</code>: Supports RM67191 MIPI MX8-DSI-OLED1 display panel. Tested with M4 flash.bin. • <code>imx8dx-mek-jdi-wuxga-lvds0-panel.dtb</code>: Supports the dual-channel LVDS panel, connecting the two mini-SAS ports with the LVDS0 CH0 and LVDS0 CH1. Tested with non-M4 flash.bin. • <code>imx8dx-mek-jdi-wuxga-lvds0-panel-rpmsg.dtb</code>: Supports the dual-channel LVDS panel, connecting the two mini-SAS ports with the LVDS0 CH0 and LVDS0 CH1. Tested with M4 flash.bin. • <code>imx8dx-mek-jdi-wuxga-lvds1-panel.dtb</code>: Supports the dual-channel LVDS panel, connecting the two mini-SAS ports with the LVDS1 CH0 and LVDS1 CH1. Tested with non-M4 flash.bin. • <code>imx8dx-mek-jdi-wuxga-lvds1-panel-rpmsg.dtb</code>: Supports the dual-channel LVDS panel, connecting the two mini-SAS ports with the LVDS1 CH0 and LVDS1 CH1. Tested with M4 flash.bin.
Video Display	<ul style="list-style-type: none"> • <code>imx8mm-evk-rm67191.dtb</code>: RM67191 MX8-DSI-OLED1 panel. • <code>imx8mm-evk-rm67199.dtb</code>: RM67199 MX8-DSI-OLED1A panel. • <code>imx8mm-ddr4-evk-rm67191.dtb</code>: DDR4 EVK with RM67191 MX8-DSI-OLED1 panel. • <code>imx8mn-ddr4-evk-rm67191.dtb</code>: DDR4 EVK with RM67191 MX8-DSI-OLED1 panel. • <code>imx8mm-ddr4-evk-rm67199.dtb</code>: DDR4 EVK with RM67199 MX8-DSI-OLED1A panel. • <code>imx8mn-evk-rm67191.dtb</code>: LPDDR4 EVK with RM67191 MX8-DSI-OLED1 panel. • <code>imx8mn-ddr4-evk-rm67199.dtb</code>: DDR4 EVK with RM67199 MX8-DSI-OLED1A panel. • <code>imx8mn-evk-rm67199.dtb</code>: LPDDR4 EVK with RM67199 MX8-DSI-OLED1A panel.

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
	<ul style="list-style-type: none"> • imx91-11x11-evk-tianma-wvga-panel.dtb, imx91-9x9-qsb-tianma-wvga-panel.dtb, imx91-11x11-frdm-tianma-wvga-panel.dtb, imx91-11x11-frdm-imx91s-tianma-wvga-panel.dtb: Supports Tianma TM050RDH03 5.0" WVGA TFT LCD panel. • imx93-14x14-evk-lvds-it6263.dtb: Single-channel LVDS-to-HDMI converter. • imx93-14x14-evk-rm67199.dtb: MIPI MX8-DSI-OLED1A panel. • imx93-11x11-evk-rm67199.dtb, imx93-11x11-evk-pmic-pf0900-rm67199.dtb: Supports RM67199 MIPI MX8-DSI-OLED1 display panel. • imx93-11x11-evk-boe-wxga-lvds-panel.dtb, imx93-11x11-evk-pmic-pf0900-boe-wxga-lvds-panel.dtb: Supports BOE EV121WXM-N10-1850 LVDS Panel. • imx93-11x11-frdm-tianma-wvga-panel.dtb: Supports Tianma TM050RDH03 5.0" WVGA TFT LCD panel. • imx93-11x11-frdm-waveshare-7inch-c-panel.dtb: Supports Waveshare MIPI 7-inch panel. • imx93-9x9-qsb-ontat-wvga-panel.dtb: Supports On Tat Industrial Company 5" WVGA DPI TFT LCD panel. • imx95-19x19-evk-rm692c9.dtb, imx95-15x15-evk-rm692c9.dtb, imx95-19x19-verdin-rm692c9.dtb: Raydium RM692C9 1080x1920 DSI panel. • imx95-19x19-evk-jdi-wuxga-lvds-panel.dtb: Dual-channel JDI WUXGA LVDS panel. • imx95-19x19-evk-it6263-lvds1.dtb: Single-channel LVDS-to-HDMI converter. • imx95-19x19-evk-it6263-lvds0.dtb: Single-channel LVDS-to-HDMI converter. • imx95-19x19-evk-it6263-lvds-two-disp.dtb: Two single-channel LVDS-to-HDMI converter. • imx95-19x19-evk-adv7535.dtb: DSI-to-HDMI converter. • imx95-15x15-evk-adv7535.dtb: Supports DSI to HDMI adapter. • imx95-15x15-evk-boe-wxga-lvds0-panel.dtb: Supports BOE WXGA LVDS panel. • imx95-15x15-evk-boe-wxga-lvds1-panel.dtb: Supports BOE WXGA LVDS panel. • imx95-15x15-evk-boe-wxga-lvds-two-panels.dtb: Supports two BOE WXGA LVDS panel. • imx95-15x15-evk-lt9611uxc.dtb: Supports 4K DSI to HDMI adapter. • imx95-15x15-evk-rm692c9.dtb: Supports RM692C9 1080x1920 DSI panel • imx95-19x19-verdin-adv7535.dtb: Supports DSI-to-HDMI adapter. • imx95-19x19-verdin-lt8912.dtb: Supports DSI to HDMI adapter. • imx95-19x19-verdin-lt9611uxc.dtb: Supports 4K DSI to HDMI adapter. • imx95-19x19-verdin-panel-cap-touch-10inch-dsi.dtb: Supports Toradex 10" capacitive touch DSI panel. • imx95-19x19-verdin-panel-cap-touch-10inch-lvds.dtb: Supports Toradex 10" LVDS panel. • imx95-19x19-verdin-rm692c9.dtb: Supports RM692C9 1080x1920 DSI panel. • imx95-15x15-frdm-boe-wxga-lvds-panel.dtb: Supports BOE WXGA LVDS panel. • imx95-15x15-frdm-waveshare-7inch-c-panel.dtb: Supports Waveshare MIPI 7-inch panel.
LPSP1	<p>Enables LPSP1 or LPSP1 slave mode, which is disabled in the default DTB.</p> <ul style="list-style-type: none"> • imx7ulp-evkb-spi-slave.dtb • imx8dx1-evk-lpspi-slave.dtb • imx8ulp-evk-lpspi-slave.dtb • imx91-11x11-evk-i2c-spi-slave.dtb • imx91-9x9-qsb-i2c-spi-slave.dtb • imx93-11x11-evk-i2c-spi-slave.dtb

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
	<ul style="list-style-type: none"> • imx93-9x9-qsb-lpspi-slave.dtb • imx93-9x9-qsb-lpspi.dtb • imx93-11x11-evk-pmic-pf0900-lpspi.dtb • imx93-11x11-evk-pmic-pf0900-lpspi-slave.dtb • imx95-19x19-evk-lpspi-slave.dtb • imx95-15x15-evk-i2c-spi-slave.dtb
eMMC	<p>The eMMC chip is DNP by default. This requires hardware modifications to burn the eMMC4.5 chip on the eMMC socket on uSDHC0 and connect eMMC signals as well as disconnect BOOT SD CARD slot signals.</p> <ul style="list-style-type: none"> • imx6sx-sdb-emmc.dtb • imx7ulp-evk-emmc.dtb • imx6ulz-14x14-evk-emmc.dtb
ENET2	<p>A second ENET port is supported with these device trees. Also the TJA1100 daughter cord enabled a 2nd Ethernet port enabled with TJA device trees listed below:</p> <ul style="list-style-type: none"> • imx8qxp-mek-enet2.dtb: Supports ENET port on base boards. • imx8qxp-mek-enet2-tja1100.dtb: ENET2 uses TJA1100 Ethernet PHY. • imx8qm-mek-enet2-tja1100.dtb: ENET2 uses TJA1100 Ethernet PHY. • imx8dx1-evk-enet0.dtb: Used for Atheros 8031 PHY by connecting IMXAI2ETH-ATH on the ENET0 port. Pin conflict with the SD card. • imx93-14x14-evk-tja1103.dtb • imx93-14x14-evk-sja1105.dtb
ENETC	<ul style="list-style-type: none"> • imx95-19x19-evk-tja1104-rgmii.dtb, imx95-19x19-evk-tja1104-rmii.dtb: Supports i.MX 95 19x19 EVK ENETC 1 port connecting to the TJA1104-SDBR daughter card. The first DTB is for RGMII mode, and the second DTB is for RMII mode. • imx95-19x19-evk-netc-rpmsg.dtb: Supports i.MX 95 19x19 EVK ENETC 2 port shared with Cortex-A and Cortex-M cores. The ENETC 2 PF is owned by Cortex-M, and the two VFs of ENETC 2 is owned by Cortex-A. Must use the custom flash.bin file: imx-boot-variant-netc-imx95-19x19-lpddr5-evk-sd.bin-flash_netc. • imx943-evk-netc-rpmsg.dtb: Supports i.MX 943 EVK board ENETC 3 port shared with Cortex-A and Cortex-M cores. The PF is owned by the Cortex-M33 core, and the 3 VFs of ENETC 3 are owned by the Cortex-A cores. Must use the custom flash.bin files: <ul style="list-style-type: none"> - imx-boot-variant-netc-imx943-19x19-lpddr4-evk-sd.bin-flash_all: For the i.MX 943 LPDDR4 19x19 EVK board. - imx-boot-variant-netc-imx943-19x19-lpddr5-evk-sd.bin-flash_all: For the i.MX 943 LPDDR5 19x19 EVK board. - imx-boot-variant-netc-imx943-15x15-lpddr4-evk-sd.bin-flash_all: For the i.MX 943 15x15 EVK board.
NETC Switch	<ul style="list-style-type: none"> • imx943-evk.dtb: The swp0 and swp1 ports of the NETC switch of the i.MX 943 EVK board use the MII interfaces. • imx943-evk-sgmii.dtb: The swp0 and swp1 ports of the NETC switch of i.MX 943 EVK board use the SGMII (1 G and 2.5 G) interfaces.
Enetirq	<p>An example to demonstrate GPIO6 workaround for the bug where only the ENET wake-up interrupt request can wake the system from Wait mode. Since the pad GPIO6 is used by I2C3 on the board, these device trees have I2C3 disabled to enable this workaround.</p> <ul style="list-style-type: none"> • imx6q-sabresd-enetirq.dtb • imx6dl-sabresd-enetirq.dtb
Flexcan1	<p>Enables FlexCAN1, which is disabled by default in standard DTB file due to pin conflicts with FEC.</p> <ul style="list-style-type: none"> • imx93-9x9-qsb-can1.dtb

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
Flexcan2	Enables flexcan2, which is disabled by default in standard DTB. <ul style="list-style-type: none"> imx8mp-evk-flexcan2.dtb
GPMI and EIM_NOR	Enables the GPMI and EIM-NOR. Due to pin conflicts, the GPMI and EIM-NOR are disabled by default. See the device tree file for more details: <ul style="list-style-type: none"> imx7d-sdb-gpmi-weim.dtb, imx7d-sdb-reva-gpmi-weim.dtb imx6ulz-14x14-evk-gpmi-weim.dtb
HDCP	Enables the HDMI-HDCP feature. This avoids the pin conflict between the I2C2 and HDCP-DDC pins. <ul style="list-style-type: none"> imx6q-sabresd-hdcp.dtb imx6dl-sabresd-hdcp.dtb imx6qp-sabresd-hdcp.dtb
Hypervisor Jailhouse	Enables the Jailhouse Hypervisor device trees. <ul style="list-style-type: none"> imx8mq-evk-root.dtb: DTB for root-cell imx8mq-evk-inmate.dtb: DTB for the inmate cell imx8mm-evk-root.dtb: DTB for root-cell imx8mm-evk-inmate.dtb: DTB for the inmate cell imx8mq-evk-root.dtb: Supports Jailhouse hypervisor imx8mm-evk-root.dtb: Supports Jailhouse hypervisor imx8mn-evk-root.dtb: Supports Jailhouse hypervisor imx8mn-evk-inmate.dtb: DTB for the inmate cell imx8mp-evk-inmate.dtb: DTB for the inmate cell imx8mp-evk-root.dtb: DTB for root-cell imx93-11x11-evk-root.dtb, imx93-11x11-evk-pmic-pf0900-root.dtb: DTB for root-cell imx93-11x11-evk-inmate.dtb, imx93-11x11-evk-pmic-pf0900-inmate.dtb: DTB for inmate-cell imx95-19x19-evk-inmate.dtb imx95-19x19-evk-root.dtb imx943-evk-root.dtb imx943-evk-inmate.dtb
LDO	In standard DTB file, the LDO bypass is enabled. Therefore, to use LDO device trees on configurations with CPU@1.2GHz, which does not support LDO bypass mode, it is important to enable LDO. The LDO is enabled in the following DTB files: <ul style="list-style-type: none"> imx6q-sabresd-ldo.dtb imx6qp-sabresd-ldo.dtb imx6ul-9x9-evk-ldo.dtb imx6dl-sabresd-ldo.dtb imx6sx-sdb-ldo.dtb imx6sx-sdb-reva-ldo.dtb
LP UART	Enables LPUART. <ul style="list-style-type: none"> imx7ulp-evk-lpuart.dtb imx91-11x11-evk-lpuart.dts imx93-11x11-evk-lpuart.dtb imx93-11x11-evk-pmic-pf0900-lpuart.dtb imx93-11x11-frdm-lpuart.dtb
Multi-Core, M-Core, and RPMSG	Enables the M-Core and RPMSG <ul style="list-style-type: none"> imx8mp-evk-rpmsg.dtb, imx8mp-frdm-rpmsg.dtb: RPMSG.

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
	<ul style="list-style-type: none"> • imx8dxl-evk-rpmsg: RPMSG. • imx8dx-mek-rpmsg.dtb, imx8dx-mek-it6263-lvds1-dual-channel-rpmsg.dtb, imx8dx-mek-it6263-lvds0-dual-channel-rpmsg.dtb, imx8dx-mek-jdi-wuxga-lvds0-panel-rpmsg.dtb, imx8dx-mek-jdi-wuxga-lvds1-panel-rpmsg.dtb, imx8dx-mek-ov5640-rpmsg.dtb: RPMSG. • imx8qxp0-mek-rpmsg and imx8qxp-mek-rpmsg with RPMSG. • imx8qxp-mek-rpmsg.dtb: Supports partition reset, RPMSG audio codec on Cortex-M4, and supports the LVDS-HDMI or MIPI-DSI-HDMI display with the LVDS-HDMI or MIPI-DSI-HDMI converts. This requires the flash.bin to include the Cortex-M4 image. • imx8qm-mek-rpmsg.dtb: Supports partition reset, and supports the LVDS-HDMI or MIPI-DSI-HDMI display with the LVDS-HDMI or MIPI-DSI-HDMI converts. This requires flash.bin to include the Cortex-M4 image. • imx8qm-mek_ca53.dtb: Supports four CortexA53 cores only. • imx8qm-mek_ca72.dtb: Supports two Cortex-A72 cores only. You need to build the special boot image through the imx-mkimage tools, and select the flash_ca72 build target. • imx8qm-mek-enet2-tja1100.dtb: Supports the tja1100 ENET daughter card. • imx8mq-evk-rpmsg.dtb: RPMSG. • imx8mm-evk-rpmsg.dtb: RPMSG. • imx8mn-evk-rpmsg.dtb and imx8mn-ddr4-evk-rpmsg.dtb: RPMSG. • imx8dx-mek-rpmsg.dtb • imx6sx-sdb-m4.dtb: Disables the access of ADC 1 and 2, FlexCAN 1 and 2, I2C3, UART 2 and QSPI 2 from Cortex-A processor when Arm Cortex-M4 processor is running. • imx7d-sdb-m4.dtb: Disables the access of ADC 1 and 2, FlexCAN 1 and 2, I2C3, UART 2, and QSPI 2 from Cortex-A processor when Arm Cortex-M4 processor is running. • imx8qxp-mek-sof-wm8960.dtb, imx8qm-mek-sof-wm8960.dtb: Enables playback/record using Sound Open Firmware for HiFi4 DSP with WM8960 codec. • imx8qm-mek-sof-cs42888.dtb, imx8qm-mek-sof-cs42888.dtb: Enables playback/record using Sound Open Firmware for HiFi4 DSP with CS42888 codec. <p>Note: On i.MX 8QuadMax and 8QuadXPlus, multiple partitions are supported. Due to the board design, flash.bin and the DTB need to be matched. If flash.bin includes the Cortex-M4 partition, use x-rpmsg.dtb.</p> <ul style="list-style-type: none"> • imx93-11x11-evk-rpmsg.dtb, imx93-9x9-qsb-rpmsg.dtb, imx93-11x11-evk-pmic-pf0900-rpmsg-lpv.dtb, imx93-11x11-evk-pmic-pf0900-rpmsg.dtb: RPMSG. • imx95-15x15-evk-rpmsg.dtb, imx95-19x19-evk-rpmsg.dtb: For low power audio. • imx95-15x15-evk-rpmsg-lpv.dtb, imx95-19x19-evk-rpmsg-lpv.dtb: For low power voice. • imx943-evk-rpmsg.dtb: For low power audio.
QSPI	<p>Enables DDR Quad mode for Macronix QSPI chip mx25I51245g by setting Quad bit in status register.</p> <ul style="list-style-type: none"> • imx7-sdb-qspi.dtb, imx7-sdb-reva-qspi.dtb • imx7ulp-evk-qspi.dtb
SD1	<p>Enables sd1 on uSDHC1 on the base board.</p> <ul style="list-style-type: none"> • imx7ulp-sd1.dtb
Touch	<p>Adds tsc2046 touch screen controller support. Because the pin PENIRQ of tsc2046 conflicts with the interrupt pin of HDMI, this disables the HDMI.</p> <ul style="list-style-type: none"> • imx7-sdb-reva-touch.dtb
USB	<p>Enables USB certification for i.MX 6UltraLite.</p> <ul style="list-style-type: none"> • imx6ul-14x14-evk-usb-certi.dtb

Table 10. Kernel and device tree configurations...continued

Kernel and device tree configuration	Description
DPDK	<ul style="list-style-type: none"> • imx8mm-evk-dpdk.dtb, imx8mp-evk-dpdk.dtb: DTB file to export the FEC and QOS Ethernet ports to the Userspace DPDK enetfec driver and enetqos driver. • i.MX 8M Mini supports only the FEC interface. • i.MX 8M Plus supports both FEC and QOS interfaces.
I3C	<p>Enables I3C, which is not used in the default DTB.</p> <ul style="list-style-type: none"> • imx8ulp-evk-i3c.dtb • imx8ulp-9x9-evk-i3c.dtb • imx91-11x11-evk-i3c.dtb • imx91-9x9-qsb-i3c.dtb • imx93-11x11-evk-i3c.dtb • imx93-9x9-qsb-i3c.dtb • imx93-11x11-evk-pmic-pf0900-i3c.dtb
FlexIO	<p>Enables FlexIO I2C master, which is not used in the default DTB.</p> <ul style="list-style-type: none"> • imx8ulp-evk-flexio-i2c.dtb • imx93-11x11-evk-flexio-i2c.dtb • imx93-11x11-evk-pmic-pf0900-flexio-i2c.dtb <p>Note: FlexIO has exact timing requirement. Using FlexIO on non real-time ROS might cause timing issues. It is not recommended to use it on non real-time ROS.</p>
FlexSPI NOR	<p>Supports FlexSPI NOR through the M.2 interface.</p> <ul style="list-style-type: none"> • imx91-11x11-evk-flexspi-m2.dtb • imx91-9x9-qsb-flexspi-m2.dtb • imx93-11x11-evk-flexspi-m2.dtb • imx93-11x11-evk-pmic-pf0900-flexspi-m2.dtb • imx93-9x9-qsb-flexspi-m2.dtb • imx93-14x14-evk-flexspi-m2.dtb
FlexSPI NAND	<p>Supports FlexSPI NAND through the M.2 interface on 11x11 EVK, while no M.2 interface on 9x9 QSB (soldered).</p> <ul style="list-style-type: none"> • imx91-11x11-evk-flexspi-nand-m2.dtb • imx91-9x9-qsb-flexspi-nand.dtb
LD	<p>Supports the system to be switched to Low Drive (LD) mode.</p> <ul style="list-style-type: none"> • imx91-11x11-frdm-imx91s-ld.dtb • imx93-11x11-evk-ld.dtb • imx93-11x11-evk-pmic-pf0900-ld.dtb • imx93-11x11-frdm-ld.dtb • imx93-9x9-qsb-ld.dtb

5.3 Kernel boot parameters

Depending on the booting or usage scenario, you may need different kernel boot parameters.

The following table describes different boot parameters.

To force the i.MX 6SABRE-AI board to disable SMP to remove overhead, add the boot parameter nosmp. Disabling CONFIG_SMP configuration can remove further overhead for a single core.

Table 11. Common kernel boot parameters

Kernel parameter	Description	Typical value	Used when
console	Where to output the kernel logging by printk.	For i.MX 6 SABRE-SD, console=ttyMxc0, 115200 For i.MX 7ULP, console=ttyLP0, 115200 For i.MX 8QuadMax and i.MX 93 EVK, console=ttyLP0, 115200 earlycon	All use cases
nosmp	A command-line option of nosmp disables SMP activation entirely.	nosmp	CONFIG_SMP is defined. Use this to disable SMP activation. SMP is activated by default through the CONFIG_SMP configuration.
ip	Tells the kernel how or whether to get an IP address.	ip=none ip=dhcp ip=static_ip_address	ip=dhcp or ip=static_ip_address is mandatory in boot from TFTP/NFS.
nfsroot	Location of the NFS server/directory.	nfsroot=<ip_address>:<rootfs path>	Used in "boot from tftp/NFS" together with root=/dev/nfs.
root	Location of the root file system.	root=/dev/nfs or root=/dev/mmcblk0p2	Used in "boot from tftp/NFS" (that is, root=/dev/nfs); Used in "boot from SD" (that is, root=/dev/mmcblk0p2). root is set by default by U-Boot to the SD/MMC slot that U-Boot is booting from.
rootfstype	Indicates the file system type of the root file system.	rootfstype=ext4	Used in "boot from SD" together with "root=/dev/mmcblkXpY" (X is the MMC device number while Y is the rootfs partition number.)
rootwait	Waits (indefinitely) for the root device to show up.	rootwait	Used when mounting SD root file system.
mem	Tells the kernel how much memory can be used.	None or mem=864M	Note: MemTotal-<mem> - <gpu_memory> is reserved.
max17135	Configures the maximum of 17135 EPD PMIC pass number and VCOM voltage.	max17135:pass=[pass_num], vcom=[vcom_uV] For 7D-SABRE-SD (EPDC panel upgrade to DC4): max17135:pass=2, vcom=-2370000	Used when enabling EPDC. pass_num should be 2 for all the IMXEBOOKDC2 cards. vcom_uV, in microvolts, should be equal to the value printed on the cable connector that is attached to the E Ink panel being used.
fec.macaddr	Tells the Ethernet MAC address.	fec.macaddr=0x00, 0x04, 0x9f, 0x01, 0x30, 0x05	Changes the FEC MAC address.
maxcpus	[SMP] Maximum number of processors that	maxcpus=1	maxcpus=n : n >= 0 limits the kernel to using 'n' processors. n=0 is a special

Table 11. Common kernel boot parameters...continued

Kernel parameter	Description	Typical value	Used when
	SMP kernel should use.		situation. It is equivalent to nosmp.
epdc	Enables EPDC.	video=mxcepdcfb:E060SCM, bpp=16 For 7D-SABRE-SD (EPDC panel upgrade to DC4): video=mxcepdcfb:ED060XC8	Adds to kernel options only if E Ink is the primary display panel. If other display panel is primary, this option may result in a pixel clock conflict and improper display function.
Video on 6SABRE-SD	Tells the kernel/driver which resolution/depth and refresh rate should be used for display port 0 or 1. See the parameter information under Documentation/fb/modedb.txt. Tells the kernel/driver which IPU display interface format should be used.	<ol style="list-style-type: none"> video=mxcfb0:dev=hdmi, 1920x1080M@60, if=RGB24 video=mxcfb1:dev=ldb, if=RGB666 video=mxcfb0:dev=ldb, if=RGB666 video=mxcfb1:dev=hdmi, 1920x1080M@60, if=RGB24 video=mxcfb0:dev=hdmi, 1920x1080M@60, if=RGB24 video=mxcfb0:dev=ldb, if=RGB666 video=mxcfb0:dev=lcd, CLAA-WVGA, if=RGB656 video=mxcfb0:dev=mipi_dsi, TRULY-WVGA, if=RGB24 	<ol style="list-style-type: none"> Used when primarily displaying on HDMI with 1080P60 mode. Secondly displaying on LVDS with XGA mode. Used when primarily displaying on LVDS with XGA mode. Secondly displaying on HDMI with 1080P60 mode. Used when primary displaying on HDMI with 1080P60 mode. Used when primary displaying on the HannStar LVDS1. Used when primary displaying on the CLAA-WVGA dumb parallel LCD panel. Used when primary displaying on the TRULY-WVGA MIPI DSI LCD panel. <p>GBR24/RGB565/YUV444 represents the display HW interface format. Typical values for certain different display devices are as follows:</p> <ul style="list-style-type: none"> TVOUT: YUV444 VGA: GBR24 HDMI&DVI: RGB24 CLAA WVGA LCD: RGB565 <p>Typical values for dev= are shown as follows:</p> <ul style="list-style-type: none"> lcd: LCD interface ldb: LVDS hdmi: HDMI on-chip or sii902x dvi: DVI port vga: VGA through TVE tve: TVOUT

Table 11. Common kernel boot parameters...continued

Kernel parameter	Description	Typical value	Used when
Video on 7D SABRE-SD	Tells the ELCDIF FB driver which LCD panel is in use and which bpp should be used for the Frame Buffer.	<code>video=mxcfb0:dev=mipi_dsi,TRULY-WVGA,if=RGB24</code>	Used when primary displaying on the TRULY-WVGA MIPI DSI LCD panel.
<code>dmfc</code>	Tells the kernel/driver how to set the IPU DMFC segment size.	None Or <code>dmfc=3</code>	<code>dmfc=1</code> means <code>DMFC_HIGH_RESOLUTION_DC</code> . <code>dmfc=2</code> means <code>DMFC_HIGH_RESOLUTION_DP</code> . <code>dmfc=3</code> means <code>DMFC_HIGH_RESOLUTION_ONLY_DP</code> . <code>DMFC_HIGH_RESOLUTION_ONLY_DP</code> can only be set by the command line. It is recommended to set this when no IPU connects the two panels. When it is set, each IPU can only connect one panel.
UART clock from OSC for 6SoloX low power idle and scenario of Linux OS and FreeRTOS running together	Chooses the UART's clock parent.	<code>uart_from_osc</code>	This is necessary for low power idle and all use cases with the FreeRTOS running on Arm Cortex-M4 processor. When setting this parameter, UART sources clock from OSC instead of <code>PLL3_80M</code> , and then all PLLs can be off in low power idle.
<code>transparent_hugepage</code>	Controls the default behavior of the system with respect to transparent hugepages. See Documentation/admin-guide/kernel-parameters.txt for details.	<code>always, madvise, never</code>	THP has big impact for the CMA allocation that cannot be isolated from the CMA region, which leads to CMA allocation failure under some conditions. Users can disable the THP by this kernel command line by setting it to <code>never</code> or <code>madvise</code> according to system requirement.
<code>clk-imxXX.mcore_booted snd_pcm.max_alloc_per_card</code>	Enables clock for Cortex-M core and enlarges the audio buffer for low power audio case.	For i.MX 8ULP: <code>snd_pcm.max_alloc_per_card=134217728</code> For i.MX 8M Mini: <code>clk-imx8mm.mcore_booted snd_pcm.max_alloc_per_card=134217728</code> For i.MX 8M Nano: <code>clk-imx8mn.mcore_booted snd_pcm.max_alloc_per_card=134217728</code> For i.MX 8M Plus: <code>clk-imx8mp.mcore_booted snd_pcm.max_alloc_per_card=134217728</code> For i.MX 93:	Low Power Audio (LPA) and Low Power Voice (LPV).

Table 11. Common kernel boot parameters...continued

Kernel parameter	Description	Typical value	Used when
		clk-imx93.mcore_booted_snd_pcm. max_alloc_per_card=134217728	

Note: For full command line list, see the kernel source tree *Documentation/admin-guide/kernel-parameters.txt*.

6 Known Issues/Limitations

Read through all hardware-related reference material and ensure that the necessary hardware modifications are made before using the software.

The following tables list some key known issues.

Table 12. Known issues and workarounds for i.MX 6 Family SoC

SoC	Module	Source	Description	Workaround
All	Kernel/BSP	Software	After getting the IP address for WLAN 0, the Ethernet is down and loses IP address with the SD card image.	Use connmanctl to set up WLAN 0 instead of directly calling UDHCPD. See https://wiki.archlinux.org/index.php/ConnMan#Wi-Fi .
All	Bluetooth	Software	Bluetooth cannot work anymore if unloading the Bluetooth NXP UART driver when the HCI0 interface is down.	Run <code>hciconfig hci0 up</code> , <code>hciconfig hci0 reset</code> , or <code>bluetoothctl power on</code> before unloading the Bluetooth NXP UART driver.
All	Bluetooth	Hardware	If only the Bluetooth driver is loaded without the Wi-Fi driver, Bluetooth cannot work anymore after resuming, because the whole Wi-Fi/Bluetooth module is powered down by the SDIO bus.	For the SDIO Wi-Fi/Bluetooth module, load the Wi-Fi driver first, and then load the Bluetooth driver.

Table 13. Known issues and workarounds for i.MX 7 Family SoC

SoC	Module	Source	Description	Workaround
i.MX 7 family and i.MX 8 family	Kernel/BSP	Software	After getting IP address for WLAN 0, the Ethernet is down and loses IP address with the SD card image.	Use connmanctl to set up WLAN 0 instead of directly calling UDHCPD. See https://wiki.archlinux.org/index.php/ConnMan#Wi-Fi .

Table 14. Known issues and workarounds for i.MX 8 Family SoC

SoC	Module	Source	Description	Workaround
i.MX 8QuadMax	Kernel/BSP	Software	RTC Kernel hangs during the suspend resume stress test.	Use a longer wake-up time.
i.MX 8Quad Max/8Quad XPlus	Camera	Software	Some old OV10635 sensors cannot be probed after soft reboot.	No workaround.

Table 14. Known issues and workarounds for i.MX 8 Family SoC...continued

SoC	Module	Source	Description	Workaround
i.MX 8M Plus	PCIe	Software	When PCIe is supported, there is no EP (end point) device connected on the PCIe port.	Add <code>pcie_cz_enabled=yes</code> to the kernel command line. The PCIe clocks and power supplies should be kept on. Refer to the workaround of one erratum (Erratum ERR051128).
i.MX 8ULP	SOF	Software	SOF only supports an 8K Sample rate.	It is a limitation.
i.MX 8ULP	Kernel/BSP	Software	In Linux OS, data cannot be transmitted by FlexIO 100% correctly.	It is a limitation.
i.MX 8ULP	Kernel/BSP	Software	In linux OS, sometimes Ethernet fails to probe when booting up using DTB of FlexIO I2C.	It is a limitation.
i.MX 8DXL DL3	SEC	V2X FW	ECB cipher test fails on V2X_SHE.	No workaround.
i.MX 8M Mini, 8M Nano, 8M Plus	Low-power audio playback with Cortex-M core	Software	As the LPA needs a large buffer size, which exceeds the default size in ALSA, the LPA sound card probe fails with the default boot command.	Add the parameter <code>snd_pcm.max_alloc_per_card=134217728</code> in boot command when booting with <code>*-rpmmsg.dtb</code> on these platforms.
i.MX 8M Plus	8MIC-REVE board	Software	8MIC-REVE board pin conflicts with UART3 for REVA3, REVB, and higher revision EVK board.	Disable UART3 node in DTS when the 8MIC-REVE board is used with REVA3/REVB or higher.
i.MX 8M, i.MX 8ULP, i.MX 93	ATF	Software	bl31 version uses the Android tag.	Ignore the Android tag, using the Git hash ID in the version strings.
i.MX 8M Quad EVK	Yocto	Software	There is no prebuild <code>.wic</code> image for i.MX 8M Quad EVK board.	Burn the <code>.wic</code> image for i.MX 8M Quad EVK board, and then update the boot image with <code>imx-boot-imx8mq-evk-sd.bin-flash_evk</code> .
i.MX 8Quad XPlus C0 MEK	ROM	Software	When the UUU tool runs on the Linux Host PC, it fails with higher rate on the i.MX 8QuadXPlus C0 MEK board with the Type-C port (USB_OTG2).	Run the following command on the Linux Host PC to force the USB driver to perform similar to the Windows OS before connecting the USB wire: <code>echo Y > /sys/module/usbcore/parameters/old_scheme_first</code> .

Table 15. Known issues and workarounds for i.MX 9 Family SoC

SoC	Module	Source	Description	Workaround
i.MX 93	Headphone detection	Hardware	Headphone detection does not work on the first batch of the REV. B board.	Do hardware rework: Remove R1203, R1204. Jump wire between R1203.2 and R1204.2. Jump wire between R1204.1 and R132.1.
i.MX 93	Audio Hat CS42448	Hardware	CS42448: The playback has an issue with channel swap.	For old SCH-50567, REV A reversion: add an audio cable and swap the L/R channel from the cable. For a new board, reversion already has this rework by default.
i.MX 93	LVDS Touchscreen	Hardware	On SCH-51961 B1 and earlier versions, LVDS touchscreen cannot report events after touching for several times.	Do hardware rework: remove R131, and install R181 with 0Ω/0402.

Table 15. Known issues and workarounds for i.MX 9 Family SoC...continued

SoC	Module	Source	Description	Workaround
i.MX 93	TypeC PTN5110 and GPIO expander PCAL65240	Hardware	Keep PTN5110 connected to the PC, and power off and on the board. In some low rate, PTN5110 causes the I2C bus stuck and Linux dump (IRQ storm).	Use the i.MX GPIO for PTN5110 alert# and do not share the GPIO with other modules.
i.MX 93	QT/Yocto	Software	Qt applications are showing graphics issues like flickering and dragging images on i.MX 93 after Qt is upgraded to 6.5.0.	Revert these three commits of the PR (https://github.com/nxp-imx/meta-imx/pull/4/commits).
i.MX 93	Parallel Display	Hardware	Parallel panel: The display is abnormal after it is resumed from suspending and has an obvious flicker after several times of suspending resuming.	This issue is fixed in the i.MX 93 9X9 QSB Rev. A2 board.
i.MX 93	Audio	Hardware	ALSA DAC: The right channel (2nd channel) has voice while playing 1 channel audio file.	This issue is fixed in the EVK V2 board.
i.MX 93 9x9 QSB	Audio	Hardware	CS42448: 192k playback no voice.	Exists on SCH-54852 Rev. A1. Do hardware rework: change R745 from 1 Kohm to 33 ohm.
i.MX 93 9X9 QSB	USB	Hardware	USB DC wake-up test resulted in a board damage.	Exists on SCH-54852 Rev. A1. Do hardware rework: change R314 and C308 to 0 ohm 1206 or short directly.
i.MX 93/ i.MX 91	I2C	Hardware	The VBUS of PTN5110 for USB1 and USB2 is kept when powering off the board and connecting the type C cable to the PC, which makes the I2C bus stuck by the PTN5110 in low rate. In such case, devices like audio, camera on I2C, cannot work.	This is a board design issue, and there is no workaround currently. To avoid the impact, when powering off the board, disconnect the USB cable from the USB ports.
i.MX 93	Low Power Management	Software	The strict requirement for executing the ELE voltage-change sequence, using two back-to-back API exchanges (ELE_VOLT_CHANGE_START_REQ 0x12 followed by ELE_VOLT_CHANGE_FINISH_REQ 0x13), is currently failing.	Disable HRNG offload to the ELE before issuing any voltage-change requests. To disable HRNG offload to ELE, set CONFIG_IMX_ELE_TRNG=n in the kernel kconfig.

7 Multimedia

This chapter provides the information on the 4.10.3 multimedia component of the BSP.

The GStreamer version in this release is 1.26.6.

7.1 i.MX GStreamer plugins

Table 16. i.MX GStreamer 1.0 plugins

Plugin	Features
Demux	aiurdemux: AIUR universal demuxer plugin support Supports AVI, MKV, MP4, MPEG2, ASF, OGG, FLV, WebM, RMVB

Table 16. i.MX GStreamer 1.0 plugins...continued

Plugin	Features
	spdifdemux: Parses IEC937 data into compress audio. Parses IEC958 data into PCM audio or compress audio.
Audio decoder	beepdec: unified audio decoder plugin Supports MP3, AAC, AAC+, WMA, AC3, Vorbis, DD+, AMR, RA
Audio encoder	lamemp3enc: MP3 encoder plugin
Video decoder	<p>i.MX 6 family:</p> <ul style="list-style-type: none"> vpudec: VPU-based video decoder plugin <p>i.MX 8QuadXPlus or 8QuadMax:</p> <ul style="list-style-type: none"> v4l2h263dec: V4L2 H.263 Decoder v4l2h265dec: V4L2 H.265 Decoder v4l2h264dec: V4L2 H.264 Decoder v4l2mpeg4dec: V4L2 MPEG4 Decoder v4l2xviddec: V4L2 XVID Decoder v4l2mpeg2dec: V4L2 MPEG2 Decoder v4l2vc1dec: V4L2 VC1 Decoder v4l2vp8dec: V4L2 VP8 Decoder v4l2jpegdec: V4L2 JPEG Decode v4l2rvdec: V4L2 RealVideo Decoder v4l2spkdec: V4L2 SPK Decoder <p>i.MX 8M Mini and i.MX 8M Plus:</p> <ul style="list-style-type: none"> v4l2h265dec: V4L2 H.265 Decoder v4l2h264dec: V4L2 H.264 Decoder v4l2vp8dec: V4L2 VP8 Decoder v4l2vp9dec: V4L2 VP9 Decoder <p>i.MX 8M Quad:</p> <ul style="list-style-type: none"> v4l2h263dec: V4L2 H.263 Decoder v4l2h264dec: V4L2 H.264 Decoder v4l2h265dec: V4L2 H.265 Decoder v4l2mpeg4dec: V4L2 MPEG4 Decoder v4l2mpeg2dec: V4L2 MPEG2 Decoder v4l2jpegdec: V4L2 JPEG Decode v4l2avsdec: V4L2 AVS Decode v4l2vp8dec: V4L2 VP8 Decoder v4l2vp9dec: V4L2 VP9 Decoder v4l2rvdec: V4L2 RMVB Decoder v4l2vc1dec: V4L2 VC1 Decoder v4l2xviddec: V4L2 XVID Decoder <p>i.MX 95:</p> <ul style="list-style-type: none"> v4l2h264dec: V4L2 H.264 Decoder v4l2h265dec: V4L2 H.265 Decoder v4l2jpegdec: V4L2 JPEG Decode <p>i.MX all:</p> <ul style="list-style-type: none"> Software video decoder plugins: uses <code>gst-libav</code> plugins
Video encoder	<p>i.MX 6 family:</p> <ul style="list-style-type: none"> vpuenc_h264: VPU-based AVC/H.264 video encoder vpuenc_h263: VPU-based H.263 video encoder vpuenc_mpeg4: VPU-based MPEG4 video encoder vpuenc_jpeg: VPU-based JPEG video encoder

Table 16. i.MX GStreamer 1.0 plugins...continued

Plugin	Features
	<p>i.MX 8QuadXPlus or 8QuadMax:</p> <ul style="list-style-type: none"> v4l2h264enc: V4L2 H.264 encoder v4l2jpegenc: V4L2 JPEG Encoder <p>i.MX 8M Mini:</p> <ul style="list-style-type: none"> v4l2h264enc: VPU-based AVC/H.264 video encoder v4l2vp8enc: VPU-based VP8 video encoder <p>i.MX 8M Plus:</p> <ul style="list-style-type: none"> v4l2h264enc: VPU-based AVC/H264 video encoder v4l2h265enc: VPU-based HEVC video encoder <p>i.MX 95:</p> <ul style="list-style-type: none"> v4l2h264enc: VPU-based AVC/H.264 video encoder v4l2h265enc: VPU-based HEVC video encoder v4l2jpegenc: V4L2 JPEG encoder <p>Note: i.MX 8M Mini, i.MX 8M Plus, and i.MX 95 support Region of Interest (ROI) encoding.</p>
Audio source	<p>pulsesrc: PulseAudio Audio Source</p> <p>Note: <i>The PulseAudio server has been replaced by the PipeWire since the L6.6.3_1.0.0 release. Users need to start the PipeWire by running <code>systemctl --user --now enable pipewire wireplumber pipewire-pulse</code> for the first time after the bootup.</i> <i>The default audio source may not be the expected one. You can set the desired default one:</i></p> <pre>wpctl status wpctl set-default {ID}</pre>
Audio resampler	<p>i.MX 8QuadXPlus, 8QuadMax, and i.MX 8M Plus:</p> <ul style="list-style-type: none"> imxasrc_hw: Audio resampler with hardware ASRC peripheral imxasrc_ssrc: Audio resampler with SSRC software method imxasrc_dsps: Audio resampler with DSPC software method
Audio render	<p>pulsesink: PulseAudio Audio Sink</p> <p>Note: <i>The PulseAudio server has been replaced by the PipeWire since the L6.6.3_1.0.0 release. Users need to start the PipeWire by running <code>systemctl --user --now enable pipewire wireplumber pipewire-pulse</code> for the first time after the bootup.</i> <i>The default audio sink may not be the expected one. You can set the desired default one:</i></p> <pre>wpctl status wpctl set-default {ID}</pre>
Video render	<p>i.MX 8 family, i.MX 93, and i.MX 95:</p> <ul style="list-style-type: none"> waylandsink: video sink based on Wayland interfaces <p>i.MX 8M:</p> <ul style="list-style-type: none"> kmssink: video sink based on the DCSS KMS driver, only for the second display in dual-display case <p>i.MX 6 family:</p> <ul style="list-style-type: none"> overlaysink: G2D-based video sink plugin imxv4l2sink: V4L2-based video sink plugin

Table 16. i.MX GStreamer 1.0 plugins...continued

Plugin	Features
	i.MX with GPU3D: <ul style="list-style-type: none"> • <code>glimagesink</code>: video sink based on EGL
Video source	i.MX 8M Mini, i.MX 8M Quad, i.MX 8ULP, and i.MX 95: <ul style="list-style-type: none"> • <code>libcamerasrc</code>: libcamera-based video capture source plugin i.MX 8 family and i.MX 9 family: <ul style="list-style-type: none"> • <code>v4l2src</code>: V4L2-based camera source plugin i.MX 6 family: <ul style="list-style-type: none"> • <code>imxv4l2src</code>: V4L2-based camera source plugin
Video convert	i.MX hardware based video convert plugins to perform video color space conversion, resize, rotate, keep aspect ratio, and so on. <ul style="list-style-type: none"> • <code>imxvideoconvert_g2d</code>: GPU2D-based video convert plugin. • <code>imxvideoconvert_ipu</code>: IPU-based video convert plugin. • <code>imxvideoconvert_pxp</code>: PXP-based video convert plugin. • <code>imxvideoconvert_ocl</code>: OpenCL-based video convert plugin. • <code>autovideoconvert</code>: select the i.MX hardware based video convert plugins or other video convert plugins according to the input and output format. • <code>v4l2convert</code>: V4L2 memory-to-memory based convert plugin. <p>Note:</p> <ul style="list-style-type: none"> • For <code>imxvideoconvert_ocl</code>, rotation is not supported currently. CSC, deinterlace, downscale, dewarp, video crop, and color range conversion are supported. • For <code>v4l2convert</code>, it is automatically registered on the platforms with ISI memory-to-memory supported.
Video compositor	i.MX 2D hardware based video compositor plugins can compose multiple videos into one, support color space conversion, resize, rotate, alpha, z-order, and keep aspect ratio feature at the same time while composition. <ul style="list-style-type: none"> • <code>imxcompositor_g2d</code>: GPU2D-based video compositor plugin • <code>imxcompositor_ipu</code>: IPU-based video compositor plugin • <code>imxcompositor_pxp</code>: PXP-based video compositor plugin
OpenGL (ES) Plugins	<ul style="list-style-type: none"> • <code>gleffects</code>: GL Shading Language effects plugin • <code>gldeinterlace</code>: video deinterlacing based on shaders • <code>glvideomixer</code>: compositing multiple videos together • <code>glcolorconvert</code>: video color space convert based on shaders • <code>glcolorbalance</code>: adjusting brightness, contrast, hue, and saturation on a video stream

Note:

- To support WMA, AAC+, and RA decoding, install separate packages.
- On i.MX 8M Quad, enable video framebuffer compression (DTRC) by using: `kmssink force-hantrotile=true` or `waylandsink enable-tile=true`.

7.2 i.MX playback example

i.MX provides an example `gplay-1.0` application based on GStreamer's high-level API `GstPlayer`. The example provides the following functions.

Table 17. i.MX playback engine example

Function	Feature
Playback	<ul style="list-style-type: none"> • Play, Stop

Table 17. i.MX playback engine example...continued

Function	Feature
	<ul style="list-style-type: none"> • Pause, Resume • Fast seek, Accurate seek • Playback rate control (fast forward, fast rewind, slow forward)
Media Info	<ul style="list-style-type: none"> • Media metadata (artist, year, etc.) • Video Thumbnail • Audio Album Art
Subtitle	<ul style="list-style-type: none"> • Supports internal and external subtitle
Track Selection	<ul style="list-style-type: none"> • Audio Track Selection • Video Track Selection • Subtitle Selection
Display Control	<ul style="list-style-type: none"> • Resize • Rotate [0, 90, 180, 270] (flipping is not supported.)

7.3 i.MX recording engine API

i.MX provides a high-level API set for camera-related applications based on the GStreamer framework. This API set is based on the camerabin, which is from the `gst-plugins-bad` package.

This API can be found at `gst1.0-fsl-plugin/tools/grecorder/recorder_engine.h`.

This API is supported on the i.MX 6, i.MX 8, and i.MX 9 platforms, which have a VPU hardware encoder.

This API set can provide the following functions.

Table 18. Recording engine functions

Function	Feature
Image capture	Captures images from the camera with different resolutions and saves them to JPEG files.
Video recording	Records audio and video into various file formats, supporting (MP3) x (H.264, MPEG4, H.263, MJPEG, HEVC, VP8) x (MP4, MKV, AVI, FLV, TS, fMP4).
Meta data	Adds the time and date information to the captured image or recorded video.
Endless recording	Records to multiple file segments and specifies the total file segment count and each file's maximum size. It can record a file endlessly, saving to file segments in a loop. This function can only work with the TS file format.
Web camera	Records audio and video, and sends them out through RTP. This function can only work with the TS file format.
Graphic effect	Supports adding the graphic effect in the video and record into the file.
Device selection	Supports selecting different camera and audio sources.
Fragment recording	Supports recording into fragment container format by passing fragment duration through the option <code>fragment_duration</code> . Only supported when the container format is fMP4 or MKV.

Note:

This recording engine is only available in platforms with VPU.

7.4 Multimedia feature matrix

This section provides feature matrix details of various codecs used for playback.

7.4.1 Parser/Demuxer specifications

The demuxer support of a particular audio or video type requires the availability of the codec.

Table 19. Parser/Demuxer supported audio/video

	Demuxer feature	ASF	AVI	MP4	OGG	FLV	MPG2	MKV	RMVB
Video	H264	-	Y	Y	-	Y	Y	Y	-
	MPEG2	-	Y	-	-	-	Y	Y	-
	MPEG4	Y	Y	Y	-	-	-	Y	-
	H263	-	Y	Y	-	Y	-	Y	-
	MJPEG	-	Y	Y	-	-	-	Y	-
	VC1	Y	Y	-	-	-	-	Y	-
	DivX	Y	Y	Y	-	-	-	Y	-
	Xvid	-	Y	-	-	-	-	Y	-
	VP8	-	-	-	-	-	-	Y	-
	VP6	-	-	-	-	Y	-	Y	-
	Theora	-	-	-	Y	-	-	-	-
	RV	-	-	-	-	-	-	Y	Y
Audio	AAC	-	Y	Y	-	Y	Y	Y	Y
	MP3	Y	Y	Y	-	Y	Y	Y	-
	WMA	Y	Y	-	-	-	-	Y	-
	AC3	-	Y	Y	-	-	Y	Y	-
	PCM/ADPCM	Y	Y	Y	-	Y	Y	Y	-
	AMR	-	-	Y	-	-	-	Y	-
	Vorbis	-	Y	Y	Y	-	-	Y	-
	SPEEX	-	-	-	Y	Y	-	Y	-
	DTS	-	-	-	-	-	Y	Y	-
	FLAC	-	-	-	Y	-	-	Y	-
	DD+	Y	-	Y	-	-	Y	Y	-
	RA	-	-	-	-	-	-	-	Y

7.4.2 Video codec specifications

The tables in this section show the video codec specifications with and without VPU acceleration. Check [Section 4](#) to determine if your board supports VPU.

Table 20. Video codec specification for hardware with VPU acceleration

	Format	Platform	Profile	Max. Bit Rate	Min. Resolution	Max. Resolution	Frame Rate	Portrait Mode	Comment
Video Decoder	HEVC	i.MX 8M Quad	main/main 10	160 Mbps	144 x 144	4096 x 2304	60 fps (3840 x 2160)	Y	-

Table 20. Video codec specification for hardware with VPU acceleration...continued

	Format	Platform	Profile	Max. Bit Rate	Min. Resolution	Max. Resolution	Frame Rate	Portrait Mode	Comment
		i.MX 8M Plus i.MX 8M Mini	main/main 10	100 Mbps	144 x 144	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8 QuadXPlus	main	100 Mbps	144 x 144	4096 x 2160	30 fps (3840 x 2160)	Y	-
		i.MX 8 QuadMax	main	100 Mbps	144 x 144	4096 x 2160	60 fps (3840 x 2160)	Y	-
		i.MX 95	main	100 Mbps	64 x 64	4096 x 2304	60 fps (3840 x 2160)	Y	-
	H264	i.MX 8M Quad	HP/MP/BP	60 Mbps	48 x 48	4096 x 2304	30 fps (3840 x 2160)	Y	-
		i.MX 8M Plus i.MX 8M Mini	HP/MP/BP	60 Mbps	48 x 48	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8 QuadXPlus i.MX 8 QuadMax	HP/MP/BP	50 Mbps	64 x 64	4096 x 2160	30 fps (3840 x 2160)	Y	-
		i.MX 6	HP/MP/BP	50 Mbps	64 x 64	1920 x 1080	60 fps (1920 x 1080)	N	-
		i.MX 95	HP/MP/BP	50 Mbps	64 x 64	4096 x 2304	60 fps (3840 x 2160)	Y	-
	VP9	i.MX 8M Quad	profile 0, 2	100 Mbps	144 x 144	4096 x 2304	60 fps (3840 x 2160)	N	-
		i.MX 8M Plus i.MX 8M Mini	profile 0, 2	100 Mbps	144 x 144	1920 x 1080	60 fps (1920 x 1080)	Y	-
	VP8	i.MX 8M Quad	-	60 Mbps	48 x 48	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8M Plus i.MX 8M Mini	-	60 Mbps	48 x 48	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8 QuadXPlus i.MX 8 QuadMax	-	60 Mbps	64 x 64	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 6Quad	-	20 Mbps	64 x 64	1920 x 1080	30 fps (1920 x 1080)	N	-
		i.MX 6Dual Lite	-	20 Mbps	64 x 64	1280 x 720	30 fps (1280 x 720)	N	-

Table 20. Video codec specification for hardware with VPU acceleration...continued

	Format	Platform	Profile	Max. Bit Rate	Min. Resolution	Max. Resolution	Frame Rate	Portrait Mode	Comment
	MPEG4/XVID	i.MX 8M Quad	SP/ASP	-	48 x 48	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8 QuadXPlus i.MX 8 QuadMax	SP/ASP	-	64 x 64	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 6	SP/ASP	40 Mbps	64 x 64	1920 x 1080	30 fps (1920 x 1080)	N	-
	MPEG2	i.MX 8M Quad	MP	-	48 x 48	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8 QuadXPlus i.MX 8 QuadMax	MP	-	64 x 64	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 6	MP	50 Mbps	64 x 64	1920 x 1080	30 fps (1920 x 1080)	N	-
	H263	i.MX 8M Quad	P0/P3	-	48 x 48	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8 QuadXPlus i.MX 8 QuadMax	P0/P3	-	64 x 64	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 6	P0/P3	20 Mbps	64 x 64	1920 x 1080	30 fps (1920 x 1080)	N	-
	WMV9/VC1	i.MX 8M Quad	AP/MP/SP	-	48 x 48	1920 x 1080	60 fps (1920 x 1080)	N	-
		i.MX 8 QuadXPlus i.MX 8 QuadMax	AP/MP/SP	-	64 x 64	1920 x 1080	60 fps (1920 x 1080)	N	-
		i.MX 6	AP/MP/SP	45 Mbps	64 x 64	1920 x 1080	30 fps (1920 x 1080)	N	-
	MJPEG	i.MX 8M Quad	-	180 Mpixl	48 x 48	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8 QuadXPlus i.MX 8 QuadMax	-	-	64 x 64	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 6	-	120 Mpixl	64 x 64	1920 x 1080	30 fps (1920 x 1080)	N	-
		i.MX 95	-	-	64 x 64	4096 x 2160	30 fps (3840 x 2160)	Y	400 MSample/s The maximum resolution for a JPEG

Table 20. Video codec specification for hardware with VPU acceleration...continued

	Format	Platform	Profile	Max. Bit Rate	Min. Resolution	Max. Resolution	Frame Rate	Portrait Mode	Comment
									image is 8192 x 8192.
	RV	i.MX 8M Quad	8/9/10	-	48 x 48	1920 x 1080	60 fps (1920 x 1080)	N	-
		i.MX 8 QuadXPlus i.MX 8 QuadMax	8/9/10	-	64 x 64	1920 x 1080	60 fps (1920 x 1080)	N	-
		i.MX 6	8/9/10	40 Mbps	64 x 64	1920 x 1080	30 fps (1920 x 1080)	N	-
	Sorenson Spark	i.MX 8 QuadXPlus i.MX 8 QuadMax	-	-	64 x 64	1920 x 1080	60 fps (1920 x 1080)	Y	-
Video Encoder	H264	i.MX 8M Plus	HP/MP/BP	240 Mbps	144 x 144	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8M Mini	HP/MP/BP	60 Mbps	144 x 96	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 8 QuadXPlus i.MX 8 QuadMax	HP/MP/BP	-	64 x 64	1920 x 1080	30fps (1920 x 1080)	Y	-
		i.MX 6	BP	20 Mbps	64 x 64	1920 x 1080	30 fps (1920 x 1080)	N	-
		i.MX 95	HP/MP/BP	20 Mbps	256 x 128	4096 x 2304	60 fps (3840 x 2160)	N	-
	H265	i.MX 8M Plus	main/main 10	40 Mbps	136 x 136	1920 x 1080	60 fps (1920 x 1080)	Y	-
		i.MX 95	main	-	256 x 128	4096 x 2304	60 fps (3840 x 2160)	N	-
	MJPEG	i.MX 95	-	-	64 x 64	4096 x 2160	15fps (3840 x 2160)	Y	The maximum resolution for a JPEG image is 8192 x 8192.
VP8	i.MX 8M Mini	-	60 Mbps	144 x 96	1920 x 1080	30 fps (1920 x 1080)	Y	-	
Software Video Decoder	-	i.MX All	-	According to system performance	-	According to system performance	According to system performance	-	Supported with FFmpeg

Note: When portrait mode is supported, the VPU can swap the maximum width/height when decoding. For example, the VPU can decode up to 1920 x 1080 in normal mode. If portrait mode is supported, it can also decode 1080 x 1920 stream.

7.4.3 Audio codec specification

Table 21. Audio codec specification

	Platform	Feature/ Profile	Feature/ Profile	Channel	Sample rate (kHz)	Bit rate (kbps)	Comment
DSP Audio Decoder	i.MX 8M Plus i.MX Quad XPlus i.MX 8Quad Max i.MX 8ULP	MP3	MPEG-1 (Layer-1/ Layer-2/ Layer-3)	stereo/mono	<= 48	32-448	-
			MPEG-2 (Layer-1/ Layer-2/ Layer-3)		<= 24	8-256	-
			MPEG-2.5 (Layer-3)		<= 12	8-160	-
	i.MX 8M Plus i.MX Quad XPlus i.MX 8Quad Max i.MX 8ULP	AACL	MPEG-2 AACLC MPEG-4 AACLC	i.MX 8ULP: stereo/mono others: <=5.1	8-96	-	Bit rate depends on both the sample rate and the number of channels
	i.MX 8M Plus i.MX Quad XPlus i.MX 8Quad Max	Ogg Vorbis	q1 - q10	Stereo	8-192	<= 500	-
	i.MX 8M Plus i.MX Quad XPlus i.MX 8Quad Max	WMA STD	L1 @ QL1	stereo/mono	44.1	64-161	-
			L2 @ QL1		<= 48	<= 161	-
			L3 @ QL1		<= 48	<= 385	-
	i.MX 8M Plus i.MX Quad XPlus i.MX 8Quad Max	WMA Pro	M0a @ QL2	stereo/mono	<= 48	48-192	-
			M0b @ QL2	stereo/mono	<= 48	<= 192	-
			M1 @ QL2	<= 5.1	<= 48	<= 384	-
			M2 @ QL2	<= 5.1	<= 96	<= 768	-
M3 @ QL2			<= 7.1	<= 96	<= 1500	-	
i.MX 8M Plus i.MX Quad XPlus i.MX 8Quad Max	WMA Lossless	N1	stereo/mono	<= 48	<= 3000	-	
		N2	<=5.1	<= 96	<= 3000	-	
		N3	<= 7.1	<= 96	<= 3000	-	
i.MX 8M Plus i.MX Quad XPlus i.MX 8Quad Max	AMR_NB	-	-	8	12.2, 10.2, 7.9, 7.4, 6.7, 5.9, 5.15, 4.75	-	
	AMR_WB	-	-	16	23.85, 23.05, 19.85, 18.25, 15.85, 14.25, 12.65, 8.85, 6.6	-	

Table 21. Audio codec specification...continued

	Platform	Feature/ Profile	Feature/ Profile	Channel	Sample rate (kHz)	Bit rate (kbps)	Comment			
Software Audio Decoder	i.MX All	MP3	MPEG-1 (Layer-1/ Layer-2/ Layer-3)	stereo/mono	<=48	8-448	-			
			MPEG-2 (Layer-1/ Layer-2/ Layer-3)							
			MPEG-2.5 (Layer-3)							
		AACLC	MPEG-2 AACLC MPEG-4 AACLC	<=5.1	8-96	8-368	-			
		HE-AAC	HE-AAC V1 HE-AAC V2	stereo/mono	8-96	Mono: 8-384 stereo: 16- 768	-			
		Ogg Vorbis	q1-q10	stereo	8-192	<= 500	-			
		WMA STD	L1 @ QL1	stereo/mono	44.1	64-161	-			
			L2 @ QL1					<= 48	<= 161	-
			L3 @ QL1					<= 48	<= 385	-
		WMA Pro	M0a @ QL2	stereo/mono	<= 48	48-192	-			
			M0b @ QL2	stereo/mono	<= 48	<= 192	-			
			M1 @ QL2	<= 5.1	<= 48	<= 384	-			
			M2 @ QL2	<= 5.1	<= 96	<= 768	-			
			WMA Pro	<= 7.1	<= 96	<= 1500	-			
		WMA Lossless	N1	stereo/mono	<= 48	<= 3000	-			
N2	<=5.1		<= 96	<= 3000	-					
N3	<=7.1		<= 96	<= 3000	-					
RA	cook	stereo/mono	8, 11.025, 22. 05, 44.1	-	-					
AMR_NB	-	-	8	12.2, 10.2, 7. 9, 7.4, 6.7, 5. 9, 5.15, 4.75	-					
AMR_WB	-	-	16	23.85, 23.05, 19.85, 18.25, 15.85, 14.25, 12.65, 8.85, 6.6	-					
BSAC	-	<=5.1	<=48	64 per channel	Core codec only					

7.4.4 Speech codec specification

Table 22. Speech codec specification

	Feature	Sample rate	Bit rate (kbps)	H/W or S/W
Speech codec	G.711	8 kHz	64	S/W
	G.723.1	8 kHz	5.3, 6.3	S/W
	G.726	8 kHz	16, 24, 32, 40	S/W
	G.729ab	8 kHz	8	S/W
	AMR_NB	8 kHz	12.2, 10.2, 7.9, 7.4, 6.7, 5.9, 5.15, 4.75	S/W
	AMR_WB	16 kHz	23.85, 23.05, 19.85, 18.25, 15.85, 14.25, 12.65, 8.85, 6.6	S/W

7.4.5 Streaming protocol specification

Table 23. Streaming protocol specification

Protocol	Feature
HTTP/HTTPS	HTTP/HTTPS progressive streaming
RTSP	RTP, SDP
RTP/UDP	RTP/UDP MPEGTS streaming
HLS	HTTP live streaming
MPEG-DASH	MPEG Dynamic Adaptive Streaming over HTTP

7.4.6 RTSP streaming server specification

To support the RTSP server, the `gst-rtsp-server` open source package needs to be installed. See Section “RTSP Streaming Server” in the *i.MX Linux User’s Guide* (UG10163) for information on how to build and install it.

Table 24. RTSP streaming server specification

Demux feature		AVI	MP4	FLV	MKV	MP3	AAC
Video	H264	Y	Y	Y	Y	-	-
	MPEG4	Y	Y	-	Y	-	-
Audio	MP3	Y	Y	Y	Y	Y	-
	AAC	Y	Y	Y	Y	-	Y

7.4.7 Subtitle specification

Table 25. Subtitle specification

Internal/External	Subtitle format
Internal	SRT, SSA, ASS
External	SRT

7.4.8 Sound Open Firmware

Sound Open Firmware was updated to v2.8.0 and contains the following new features:

- Support for i.MX 8ULP platform
- Equalizer support based on IIR and FIR filters
- Dynamic Range Compress support

7.4.9 Chromium

Chromium is updated to 138.0.7204.157 and VPU is integrated with V4L2VD to accelerate Chromium video decoding on the i.MX 8 series platforms and the i.MX 95 platform with VPU hardware.

Table 26. Chromium supported hardware video codec

Chromium video codec	MP4		WEBM	
	HEVC	H.264	VP8	VP9
i.MX 8M Mini	Y	Y	Y	Y
i.MX 8M Plus	Y	Y	Y	Y
i.MX 8M Quad	Y	Y	Y	Y
i.MX 8QuadXPlus	Y	Y	Y	-
i.MX 8Quad Max	Y	Y	Y	-
i.MX 95	Y	Y	-	-

7.5 Known issues and limitations for multimedia

Issues seen on GStreamer 1.x:

- As the maximum buffer size of the playbin multiqueue is 10 MB, problems may be seen with some long audio or video interleaved streams. You can enlarge this buffer size to support these special use cases.
- AAC decoder: The ADIF format does not support seek mode nor FF/FB.
- Playing recorded AVI file on i.MX with VPU (MPEG4 (vpu) + AVI (avimux)) fails because the AVIMUX mark MPEG4 video to DIVX is not supported.
- Rotation on i.MX 6 with VPU is not supported for interlaced streams whose width or height is larger than 968 x 968 when enabled deinterlacing due to a driver limitation.
- Rewind may report an EOS when using libav for video decoding.
- Accurate seek mode may take a longer time delay.
- For clips with no index table in containers (or video with only very few key frames), seeking is not supported.
- Audio-only clips do not support FB.
- Playback may fail to start for some fuzz stream when using playbin3 as the playback backend. playbin3 has different error bitstream handling compared with playbin2. It reports error rather than continue to play.

Issues seen on Chromium:

- As Chromium disables auto spawning of the PulseAudio, users need to manually start PulseAudio with `systemctl --user --now enable pipewire wireplumber pipewire-pulse` before running Chromium command if needed.
- Since the L6.1.55_2.2.0 release, PipeWire has been supported. Users can also start pulse on PipeWire as audio backend of Chromium.
- Streams with out-of-order frames like H.264 with b-frames have video flicker.

- Switching between streams multiple times without exiting the process may cause CMA allocation failure and related kernel dump. This is limited by community design and the issue is recorded in <https://issuetracker.google.com/issues/41496457>.

8 Note About the Source Code in the Document

Example code shown in this document has the following copyright and BSD-3-Clause license:

Copyright 2026 NXP Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of the copyright holder nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

9 Revision History

This table provides the revision history.

Revision history

Document ID	Release date	Description
RN00210 v.LF6.18.2_1.0.0	26 March 2026	Upgraded to the 6.18.2 kernel, removed i.MX 8DXL Orange Box support, and added i.MX 943 OrangeBox support.
RN00210 v.LF6.12.49_2.2.0	12 December 2025	Upgraded to the 6.12.49 kernel, and added the i.MX 95 FRDM board support.
RN00210 v.LF6.12.34_2.1.0	20 October 2025	Updated the ELE Firmware version number in Section 1.2 .
RN00210 v.LF6.12.34_2.1.0	25 September 2025	Upgraded to the 6.12.34 kernel, i.MX 943 A0 and i.MX 95 B0 support with Beta quality, and added the i.MX 8MP/91/93 FRDM boards support.
RN00210 v.LF6.12.20_2.0.0	7 August 2025	Modified "Advantec ADV7535" to "ADI ADV7535" in Section 4 .
RN00210 v.LF6.12.20_2.0.0	26 June 2025	Upgraded to the 6.12.20 kernel, U-Boot v2025.04, TF-A 2.11, OP-TEE 4.6.0, Yocto 5.2 Walnascar, and added the i.MX 943 as Alpha quality.
RN00210 v.LF6.12.3_1.0.0	3 April 2025	Added the i.MX 8ULP uPower firmware to Table 3 .
RN00210 v.LF6.12.3_1.0.0	31 March 2025	Upgraded to the 6.12.3 kernel.

Revision history...continued

Document ID	Release date	Description
RN00210 v.LF6.6.52_2.2.0	16 December 2024	Upgraded to the 6.6.52 kernel.
RN00210 v.LF6.6.36_2.1.0	30 September 2024	Upgraded to the 6.6.36 kernel.
IMXLXRN_6.6.23_2.0.0	28 June 2024	Upgraded to the 6.6.23 kernel, U-Boot v2024.04, TF-A v2.10, OP-TEE 4.2.0, Yocto 5.0 Scarthgap, and added the i.MX 91 as Alpha quality, i.MX 95 as Beta quality.
IMXLXRN v.LF6.6.3_1.0.0	29 March 2024	Upgraded to the 6.6.3 kernel, removed the i.MX 91P, and added the i.MX 95 as Alpha Quality.
IMXLXRN v.LF6.1.55_2.2.0	30 January 2024	Updated the i.MX 91P validation quality to 11x11 EVK as Alpha quality and 9x9 QSB as GA quality.
IMXLXRN v.LF6.1.55_2.2.0	12/2023	Updated Table 3 "BSP and multimedia standard packages".
IMXLXRN v.LF6.1.55_2.2.0	12/2023	Upgraded to the 6.1.55 kernel.
IMXLXRN v.LF6.1.36_2.1.0	10/2023	Updated the Security features in Section 2.1 .
IMXLXRN v.LF6.1.36_2.1.0	09/2023	Upgraded to the 6.1.36 kernel and added the i.MX 91P.
IMXLXRN v.LF6.1.22_2.0.0	08/2023	Updated Table 3 "BSP and multimedia standard packages".
IMXLXRN v.LF6.1.22_2.0.0	06/2023	Upgraded to the 6.1.22 kernel.
IMXLXRN v.LF6.1.1_1.0.1	05/2023	Patch release for LF6.1.1_1.0.1.
IMXLXRN v.LF6.1.1_1.0.0	04/2023	Updated the Known issues for the i.MX 93.
IMXLXRN v.LF6.1.1_1.0.00	03/2023	Upgraded to the 6.1.1 kernel.
IMXLXRN v.LF5.15.71_2.2.0	12/2022	Upgraded to the 5.15.71 kernel.
IMXLXRN v.LF5.15.52_2.1.0	09/2022	Upgraded to the 5.15.52 kernel, and added the i.MX 93.
IMXLXRN v.LF5.15.32_2.0.0	06/2022	Upgraded to the 5.15.32 kernel, U-Boot 2022.04, and Kirkstone Yocto.
IMXLXRN v.LF5.15.5_1.0.0	03/2022	Upgraded to the 5.15.5 kernel, Honister Yocto, and Qt6.
IMXLXRN v.LF5.10.72_2.2.0	12/2021	Upgraded the kernel to 5.10.72 and updated the BSP.
IMXLXRN v.LF5.10.52_2.1.0	11/2021	Updated Table 3 "BSP and multimedia standard packages".
IMXLXRN v.LF5.10.52_2.1.0	09/2021	Updated for i.MX 8ULP Alpha and the kernel upgraded to 5.10.52.
IMXLXRN v.LF5.10.35_2.0.0	06/2021	Upgraded Yocto Project to Hardknot and the kernel upgraded to 5.10.35.
IMXLXRN v.LF5.10.9_1.0.0	03/2021	Upgraded Yocto Project to Gatesgarth and the kernel upgraded to 5.10.9.
IMXLXRN v.L5.4.70_2.3.0	01/2021	Updated the command lines in Section "Running the Arm Cortex-M4 image".
IMXLXRN v.L5.4.70_2.3.0	12/2020	i.MX 5.4 consolidated GA for release i.MX boards including i.MX 8M Plus and i.MX 8DXL.
IMXLXRN v.L5.4.47_2.2.0	09/2020	i.MX 5.4 Beta2 release for i.MX 8M Plus, Beta for 8DXL, and consolidated GA for released i.MX boards.
IMXLXRN v.L5.4.24_2.1.0	06/2020	i.MX 5.4 Beta release for i.MX 8M Plus, Alpha2 for 8DXL, and consolidated GA for released i.MX boards.

Revision history...continued

Document ID	Release date	Description
IMXLXRN v.L5.4.3_2.0.0	04/2020	i.MX 5.4 Alpha release for i.MX 8M Plus and 8DXL EVK boards.
IMXLXRN v.LF5.4.3_1.0.0	03/2020	i.MX 5.4 Kernel and Yocto Project Upgrades.
IMXLXRN v.L4.19.35_1.1.0	10/2019	i.MX 4.19 Kernel and Yocto Project Upgrades.
IMXLXRN v.L4.19.35_1.0.0	07/2019	i.MX 4.19 Beta Kernel and Yocto Project Upgrades.
IMXLXRN v.L4.14.98_2.0.0_ga	04/2019	i.MX 4.14 Kernel upgrade and board updates.
IMXLXRN v.L4.14.78_1.0.0_ga	01/2019	i.MX 6, i.MX 7, i.MX 8 family GA release.
IMXLXRN v.L4.14.62_1.0.0_beta	11/2018	i.MX 4.14 Kernel Upgrade, Yocto Project Sumo upgrade.
IMXLXRN v.L4.9.123_2.3.0_8mm	09/2018	i.MX 8M Mini GA release.
IMXLXRN v.L4.9.88_2.2.0_8qxp-beta2	07/2018	i.MX 8QuadXPlus Beta2 release.
IMXLXRN v.L4.9.88_2.1.0_8mm-alpha	06/2018	i.MX 8M Mini Alpha release.
IMXLXRN v.L4.9.88_2.0.0-ga	05/2018	i.MX 7ULP and i.MX 8M Quad GA release.
IMXLXRN v.L4.9.51_imx8mq-ga	03/2018	Added i.MX 8M Quad GA.
IMXLXRN v.L4.9.51_8qm-beta2/8qxp-beta	02/2018	Added i.MX 8QuadMax Beta2 and i.MX 8QuadXPlus Beta.
IMXLXRN v.L4.9.51_imx8mq-beta	12/2017	Added i.MX 8M Quad.
IMXLXRN v.L4.9.51_imx8qm-beta1	12/2017	Added i.MX 8QuadMax.
IMXLXRN v.L4.9.51_imx8qxp-alpha	11/2017	Initial release.

Legal information

Definitions

Draft — A draft status on a document indicates that the content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included in a draft version of a document and shall have no liability for the consequences of use of such information.

Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <https://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Suitability for use in non-automotive qualified products — Unless this document expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

HTML publications — An HTML version, if available, of this document is provided as a courtesy. Definitive information is contained in the applicable document in PDF format. If there is a discrepancy between the HTML document and the PDF document, the PDF document has priority.

Translations — A non-English (translated) version of a document, including the legal information in that document, is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Security — Customer understands that all NXP products may be subject to unidentified vulnerabilities or may support established security standards or specifications with known limitations. Customer is responsible for the design and operation of its applications and products throughout their lifecycles to reduce the effect of these vulnerabilities on customer's applications and products. Customer's responsibility also extends to other open and/or proprietary technologies supported by NXP products for use in customer's applications. NXP accepts no liability for any vulnerability. Customer should regularly check security updates from NXP and follow up appropriately. Customer shall select products with security features that best meet rules, regulations, and standards of the intended application and make the ultimate design decisions regarding its products and is solely responsible for compliance with all legal, regulatory, and security related requirements concerning its products, regardless of any information or support that may be provided by NXP.

NXP has a Product Security Incident Response Team (PSIRT) (reachable at PSIRT@nxp.com) that manages the investigation, reporting, and solution release to security vulnerabilities of NXP products.

NXP B.V. — NXP B.V. is not an operating company and it does not distribute or sell products.

Trademarks

Notice: All referenced brands, product names, service names, and trademarks are the property of their respective owners.

NXP — wordmark and logo are trademarks of NXP B.V.

Amazon Web Services, AWS, the Powered by AWS logo, and FreeRTOS — are trademarks of Amazon.com, Inc. or its affiliates.

AMBA, Arm, Arm7, Arm7TDMI, Arm9, Arm11, Artisan, big.LITTLE, Cordio, CoreLink, CoreSight, Cortex, DesignStart, DynamIQ, Jazelle, Keil, Mali, Mbed, Mbed Enabled, NEON, POP, RealView, SecurCore, Socrates, Thumb, TrustZone, ULINK, ULINK2, ULINK-ME, ULINK-PLUS, ULINKpro, μ Vision, Versatile — are trademarks and/or registered trademarks of Arm Limited (or its subsidiaries or affiliates) in the US and/or elsewhere. The related technology may be protected by any or all of patents, copyrights, designs and trade secrets. All rights reserved.

Bluetooth — the Bluetooth wordmark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by NXP Semiconductors is under license.

EdgeLock — is a trademark of NXP B.V.

eIQ — is a trademark of NXP B.V.

I2C-bus — logo is a trademark of NXP B.V.

Microsoft, Azure, and ThreadX — are trademarks of the Microsoft group of companies.

Contents

1	Overview	2
1.1	References	4
1.2	Release contents	6
1.3	License	10
1.4	Limited access proprietary packages	10
1.5	Instructions to get the AP1302 firmware	10
2	What's New?	10
2.1	New features	11
3	SoC Feature Summary	12
4	BSP Supported Features	13
5	U-Boot and Device Trees	27
5.1	U-Boot configurations	27
5.2	Kernel device trees	29
5.3	Kernel boot parameters	40
6	Known Issues/Limitations	44
7	Multimedia	46
7.1	i.MX GStreamer plugins	46
7.2	i.MX playback example	49
7.3	i.MX recording engine API	50
7.4	Multimedia feature matrix	50
7.4.1	Parser/Demuxer specifications	51
7.4.2	Video codec specifications	51
7.4.3	Audio codec specification	55
7.4.4	Speech codec specification	57
7.4.5	Streaming protocol specification	57
7.4.6	RTSP streaming server specification	57
7.4.7	Subtitle specification	57
7.4.8	Sound Open Firmware	58
7.4.9	Chromium	58
7.5	Known issues and limitations for multimedia ...	58
8	Note About the Source Code in the Document	59
9	Revision History	59
	Legal information	62

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.