

i.MX Linux® Release Notes

Contents

1 Release Contents

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

Additionally, the following sections contain release contents and license information.

Supported hardware SoC/board

- i.MX 6Quad SABRE-SD Board and Platform
- i.MX 6DualLite SABRE-SD Board
- i.MX 6Quad SABRE-AI Board
- i.MX 6DualLite SABRE-AI Board
- i.MX 6SoloLite EVK Board
- i.MX 6SoloX SABRE-SD Board
- i.MX 6SoloX SABRE-AI Board

NOTE

In this document, the following notation is used:

- 6SABRE-SD means the i.MX 6Quad and i.MX 6DualLite SABRE-SD Platforms.

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Release Contents

- 6SABRE-AI means the i.MX 6Quad and i.MX 6DualLite SABRE-AI Platforms.
- 6SoloLite means the i.MX 6SoloLite EVK
- 6SoloX-SD means the i.MX 6SoloX SABRE-SD Platform.
- 6SoloX-AI means the i.MX 6SoloX SABRE-AI Platform.

1.1 Contents

This release consists of the following package files:

- L3.14.28_1.0.0_IMX6SL_BUNDLE.tar.gz
- L3.14.28_1.0.0_IMX6QDLS_BUNDLE.tar.gz
- L3.14.28_1.0.0_IMX6SX_BUNDLE.tar.gz
- L3.14.28_1.0.0_AACP_CODECS.tar.gz
- fsl-yocto-L3.14.28_1.0.0.tar.gz

The release version is named "L<Kernel_version>_<x.y.z>."

"<Kernel_version>": BSP Kernel version. (For example, "L3.14.28" indicates that this BSP release is based on the kernel version 3.14.28.)

"<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 1. Release contents

Component	Description
Linux™ Kernel and Device Trees	3.14.28
U-Boot Configurations	v2014.04
SD Card images	Images
Manufacturing Tools	Manufacturing tools support

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-fsl-arm and meta-fsl-bsp-release layers in the `conf/machine` sub-directory.

Table 2. U-Boot configurations

U-Boot configuration for Boot device	Description	Supported machine configuration
sd	This supports booting from the SD card. This is the default U-Boot configuration.	imx6qsabresd, imx6dlsabresd imx6qsabreauto, imx6dlsabreauto imx6slevk imx6xsabresd imx6xsabreauto
spi-nor	This supports booting from SPI-NOR	imx6qsabreauto, imx6dlsabreauto imx6slevk
eim-nor	This supports booting from Parallel NOR.	imx6qsabreauto, imx6dlsabreauto, imx6solosabreauto

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Table 2. U-Boot configurations (continued)

U-Boot configuration for Boot device	Description	Supported machine configuration
nand	This supports booting from NAND.	imx6qsabreauto, imx6dlsabreauto, imx6solosabreauto imx6sxsabreauto
sata	This supports booting from SATA.	imx6qsabresd imx6qsabreauto
qspi2	This supports booting from QSPI2.	imx6sxsabresd
qspi1	This supports booting from QSPI1. Booting from the ARM [®] Cortex [®] -M4 processor is supported through QSPI1. Use U-Boot command "bootaux" to boot ARM Cortex-M4. The booting address is changed to 0x68000000.	imx6sxsabreauto
emmc	This supports booting from EMMC.	imx6sxsabresd
m4fastup	This supports booting from M4 by disabling QSPI2 from using M4.	imx6sxsabresd

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

Table 3. Kernel and device tree configurations

Kernel and device tree configuration	Description
zImage	Binary kernel image for the 3.14.28 kernel. This kernel is built with the imx_v7_defconfig.
Standard	Each reference board has a standard device tree as follows: <ul style="list-style-type: none"> zImage-imx6q-sabresd.dtb zImage-imx6dl-sabresd.dtb zImage-imx6q-sabreauto.dtb zImage-imx6dl-sabreauto.dtb zImage-imx6sl-evk.dtb zImage-imx6sx-sdb.dtb zImage-imx6sx-sdb-reva.dtb zImage-imx6sx-sabreauto.dtb <p>Note: zImage-imx6sx-sdb.dtb is used for supporting the i.MX 6SoloX SABRE-SDB Rev. B board, and imx6sx-sdb-reva.dtb is used for supporting the legacy SABRE-SDB Rev. A board.</p>
GPMI and EIM_NOR	Enables the GPMI and EIM-NOR. Due to pin conflict, the GPMI and EIM-NOR are disabled by default. See the device tree file for more details: <ul style="list-style-type: none"> zImage-imx6dl-sabreauto-gpmi-weim.dtb zImage-imx6q-sabreauto-gpmi-weim.dtb
ldo	Enables the LDO feature. By default, the LDO bypass is enabled. Use LDO device trees on configurations with CPU@1.2GHZ, which does not support LDO bypass mode. <ul style="list-style-type: none"> zImage-imx6q-sabresd-ldo.dtb, zImage-imx6dl-sabresd-ldo.dtb zImage-imx6sl-evk-ldo.dtb zImage-imx6sx-sdb-ldo.dtb, zImage-imx6sx-sdb-reva-ldo.dtb

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Table 3. Kernel and device tree configurations (continued)

Kernel and device tree configuration	Description
hdcp	Enables the HDMI-HDCP feature. This avoids the pin conflict between the I2C2 and HDCP-DDC pins. <ul style="list-style-type: none"> zImage-imx6q-sabresd-hdcp.dtb zImage-imx6dl-sabresd-hdcp.dtb
ecspi	Enables eCSPI, which is disabled by default. <ul style="list-style-type: none"> zImage-imx6dl-sabreauto-ecspi.dtb zImage-imx6q-sabreauto-ecspi.dtb
flexcan1	Enables flexcan1, which is disabled by default due to pin conflicts with fec. <ul style="list-style-type: none"> zImage-imx6q-sabreauto-flexcan1.dtb zImage-imx6dl-sabreauto-flexcan1.dtb
csi	Enables CSI support for V4L2. <ul style="list-style-type: none"> zImage-imx6sl-evk-csi.dtb
pf200	Enables PMIC pf200 support. <ul style="list-style-type: none"> zImage-imx6sl-evk-pf200.dtb zImage-imx6dl-sabresd-pf200.dtb
enetirq	An example to demonstrate GPIO6 workaround for 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. <ul style="list-style-type: none"> zImage-imx6q-sabresd-enetirq.dtb zImage-imx6dl-sabresd-enetirq.dtb
uart	Enables UART support on SABRE-SD boards to support bluetooth UART devices. <ul style="list-style-type: none"> zImage-imx6q-sabresd-uart.dtb zImage-imx6sl-evk-uart.dtb
emmc	The eMMC chip is DNP by default. This requires hardware modifications to burn the eMMC4.5 chip on the eMMC socket on uSDHC4 and connect eMMC signals as well as disconnect BOOT SD CARD slot signals. <ul style="list-style-type: none"> zImage-imx6sx-sdb-emmc.dtb
M4	Disables ADC 1 & 2, flexcan 1 & 2, I2C3, UART 2 and QSPI 2 when M4 is running. <ul style="list-style-type: none"> zImage-imx6sx-sdb-m4.dtb zImage-imx6sx-sabreauto-m4.dtb

The release package contains the following pre-built images.

Table 4. Pre-built images

Package	Description
X11 SDCard	This release provides the following SD card images. These images are Qt5 with X11 backend. The imx6qdlSolo image works on all i.MX 6SABRE-SD and i.MX 6Sabre-AI boards with U-Boot and device tree changes. To change U-Boot and the device tree, see the <i>i.MX Linux® User's Guide</i> . <ul style="list-style-type: none"> fsl-image-qt5-x11-imx6qdlSolo.sdcard

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Table 4. Pre-built images (continued)

Package	Description
	<ul style="list-style-type: none"> fsl-image-qt5-x11-imx6sxsabresd.sdcard, fsl-image-gui-x11-imx6sxsabresd.sdcard fsl-image-qt5-imx6slevk.sdcard
DirectFB SDCard	<p>This release provides the following SD card images for the DirectFB backend.</p> <ul style="list-style-type: none"> fsl-image-gui-dfb-imx6qdlsolext3 fsl-image-gui-dfb-imx6slevk.ext3 fsl-image-gui-dfb-imx6sxsabresd.ext3
Frame Buffer SDCard	<p>This release provides the following SD card images for the Frame Buffer backend.</p> <ul style="list-style-type: none"> fsl-image-qt5-fb-imx6qdlsolext3 fsl-image-gui-fb-imx6qdlsolext3 fsl-image-qt5-fb-imx6sxsabresd.ext3 fsl-image-gui-fb-imx6sxsabresd.ext3 fsl-image-gui-fb-imx6slevk.ext3
Wayland SDCard	<p>This release provides the following SD card images for the Wayland backend with the Weston compositor.</p> <ul style="list-style-type: none"> fsl-image-qt5-wayland-imx6qdlsolext3 fsl-image-gui-wayland-imx6qdlsolext3 fsl-image-gui-wayland-imx6sxsabresd.ext3 fsl-image-qt5-wayland-imx6sxsabresd.ext3 fsl-image-gui-wayland-imx6slevk.ext3
Kernel	Kernel and device trees as specified in Table 3.
U-Boot	U-Boot files as specified in Table 2.
mfgtools_with_rootfs.tar.gz	Manufacturing tools are supported with the manufacturing tools kernel.

Table 5. L3.14.28_1.0.0_IMX6QDLS_BUNDLE.tar.gz content

File name	Description
EULA	Freescall End User License Agreement
Freescall_Yocto_Project_Users_Guide.pdf	Freescall Yocto Project User's Guide
Freescall README	Freescall README for L3.14.28_1.0.0-GA
doc/i.MX	i.MX Linux® BSP Release Notes, User's Guide, and Reference Manual

Table 6. Multimedia standard packages

File name	Description	Comment
gst1.0-fsl-plugins-4.0.2.tar.gz	GStreamer plugins	Freescall GStreamer plugins
gst-fsl-plugins-4.0.2.tar.gz		
libfslcodec-4.0.2.bin	Freescall codecs	Freescall optimized A/V core codec
libfslparser-4.0.2.bin	Freescall parser	Freescall optimized core parser
libfslvpwrap-1.0.57.bin	Freescall VPU wrapper	Freescall VPU wrapper for VPU library

Table 7. Multimedia controlled access packages

File name	Description	Comment
libfslaaccodec-4.0.2.bin	AACplus decoder	Freescale optimized AACplus decoder
libfslmscodec-4.0.2.bin	Microsoft codecs	Freescale optimized Microsoft codecs
libfslmspartner-4.0.2.bin	Microsoft parser	Freescale optimized Microsoft ASF parser
libfslac3codec-4.0.2.bin	AC3 decoder	Freescale optimized Dolby audio AC3 decoder
libfslddpcodec-4.0.2.bin	DDplus decoder	Freescale optimized Dolby audio DDplus decoder
libfslreal-4.0.2.bin	Real Networks codecs and parser	Freescale optimized Real Networks real audio decoder, real media parser, and real video firmware

1.2 License

All source code files of the Board Support Package (BSP) are either GNU General Public License (GPL), GNU Lesser General Public License (LGPL), or another open source license.

The following components are released as binary files on the Yocto Project Mirror and have Freescale Proprietary Licenses. During the Yocto Project setup, the Freescale license must be accepted to set up an i.MX build. This acceptance is recorded in the build configuration files so that the following proprietary binaries can be extracted during the build process. The Freescale proprietary packages contain a Software Content Register (SCR) file that lists information about the package

- imx-gpu-viv
- fsl-gpu-sdk
- imx-vpu
- fslqtapplications
- firmware-imx
- libfslcodec
- libfslparser
- libfslvpuwrap

1.3 Multimedia licensing

Freescale multimedia packages can be found in two locations:

- Standard packages are provided on the Freescale mirror. They are accessed automatically by the Yocto Project scripts as needed.
- Limited Access packages are provided on freescale.com with controlled access. Contact your marketing representative for access. They are listed in the following table. These include codecs to support WMA, WMV, RMVB, AAC+, AC3, DD+ decoding, and WMA encoding. Each package has its own README file with instructions on how to build, install, and run.

Table 8. Limited access packages for Yocto project releases

Name	Package	Comment
AACPlus Decoder	libfslaaccodec-[version].bin	Freescale AACplus core decoder

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Table 8. Limited access packages for Yocto project releases (continued)

Name	Package	Comment
Microsoft Codec	libfslmscodec-[version].bin	Freescale optimized MS codec
Microsoft Parser	libfslmspartner-[version].bin	Freescale optimized ASF parser
AC3 Decoder	libfslac3codec-[version].bin	Freescale AC3 core decoder
DDplus Decoder	libfslddpcodec-[version].bin	Freescale DD-plus decoder
RMVB Decoders and Parser	libfslreal-[version].bin	Freescale Real Networks

1.4 References

This release includes the following references and additional information.

- *i.MX Linux[®] Release Notes (IMX6LXRN)* - Provides the release information.
- *i.MX Linux[®] User's Guide (IMXLUG)* - Contains the information on installing U-Boot and Linux OS and using i.MX specific features.
- *Freescale Yocto Project User's Guide (IMXLXYOCTOUG)* - Contains the instructions for setting up and building Linux in the Yocto Project.
- *i.MX 6 Linux[®] Reference Manual (IMX6LXRM)* - Contains the information on Linux drivers for i.MX.
- *i.MX 6 Graphics User's Guide* - Describes the graphics used.
- *i.MX 6 Linux[®] High Assurance Boot (HAB) User's Guide (IMX6HABUG)* - Contains the information on using High Assurance Boot.
- *i.MX 6 BSP Porting Guide (IMX6XBSPPG)* - Contains the instructions on porting the BSP to a new board.
- *i.MX 6 VPU Application Programming Interface Linux[®] Reference Manual (IMX6VPUAPI)* - Provides the reference information on the VPU API.

The quick start guides contain basic information on the board and setting it up. They are on the Freescale website.

- [SABRE Platform Quick Start Guide \(IMX6QSDPQSG\)](#)
- [SABRE Board Quick Start Guide \(IMX6QSDBQSG\)](#)
- [SABRE Automotive Infotainment Quick Start Guide \(IMX6SABREINFOQSG\)](#)
- [i.MX 6SoloLite Evaluation Kit Quick Start Guide \(IMX6SLEVKQSG\)](#)

Documentation is available online at freescale.com.

- i.MX 6 information is at freescale.com/iMX6series
- i.MX 6 SABRE information is at freescale.com/imxSABRE
- i.MX 6SoloLite EVK information is at freescale.com/6SLEVK

2 What's New?

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

2.1 New features

See the git log for the complete list of new features and enhancements since the last release.

A summary of the main new features is as follows.

What's New?

New features added for all supported boards:

- Yocto Project upgraded to version 1.7 Dizzy.
- Supports the GCC 4.9.1 toolchain with the hardware floating point build.
- The Linux kernel upgraded to v3.14.28.
- New graphics features:
 - GPU driver upgraded to Vivante v5.0.11p4.4.
 - Apitrace tools added to trace OpenGL, OpenGL ES, Direct3D, and DirectDrawAPIs for all backends.
- New multimedia features:
 - GStreamer 1.4 supported.

2.2 Power management supported features

The following common power management features are supported:

- CPU/GPU frequency throttle
- GPU dynamic power management
- CPU idle framework support with two working levels: pure WFI and WFI with wait mode enabled
- Low power mode support: standby and dormant (mem) mode
- Thermal temperature support

Power management features on 6SoloLite are supported:

- LDO bypass

Power management features on 6SABRE-SD and 6SABRE-AI are supported:

- CPUFreq driver support: CPU frequency adjusted based on the CPU loading and Interactive governor
- VPU/GPU dynamic power management
- LDO bypass
- Bus requery support
- SD3.0 dynamic clock management
- USB remote wake-up and USB charger

2.3 Graphics

This section describes new features and bug fixes for the graphics provided in this release.

Table 9. New features

Feature	Description
Khronos OpenGL ES 3.0 API	<p>The 5.x driver fully supports the latest Khronos OpenGL ES 3.0 API (current 3.0.2 spec dated 8 April 2013) and compliant to Khronos OpenGL ES 3.0 conformance test. From the Khronos announcement, new functionality in the OpenGL ES 3.0 API includes:</p> <ul style="list-style-type: none">• Rendering pipeline enhancements to enable acceleration of advanced visual effects, including occlusion queries, transform feedback, instanced rendering, and support for four or more rendering targets.• High quality ETC2/EAC texture compression, which eliminates the need for a different set of textures for each platform.• Shading language enhancements, which include full support for integer and 32-bit floating point operations.

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Table 9. New features (continued)

Feature	Description
	<ul style="list-style-type: none"> • Enhanced texturing functionality, including guaranteed support for floating point, 3D, depth, vertex, NPOT, R/RG, immutable, and 2D array textures, as well as for swizzles, LOD and mip level clamps, seamless cube maps, and sampler objects. • Extensive set of required, explicitly sized texture and render-buffer formats, which reduces implementation variability and makes it much easier to write portable applications.
Compatible with 4.x Driver for OpenGL ES 2.0 API	<ul style="list-style-type: none"> • The 5.x driver is compatible with the the 4.x driver. Applications developed using 4.x drivers can run on the 5.x driver without any changes. • Application performance on the 5.x driver is better than or equal to that with the 4.x driver.
Bug Fixes	<ul style="list-style-type: none"> • QT 3D app cannot run in i.MX 6SoloX board • Fixed es30 conformance fails related with glReadPixels • Fix libCLC failure • Disable apitrace for static build • UI reboot when do Projection Tests in CTS-Verifier. • Chrome crash when run webgl case "multisample-corruption" on sabreauto_6q. • Change driver build script to enable or disable OpenCL build for Yocto • Fix screen garbage when play some video with rotation • Correct framebuffer bufferSize calculation • OCL queue worker thread polling • Add cl buffer dependency • Disable RTZ when propagate constants • Do not leave garbage in outside pointer • ES3 "empty" vertex doesn't work • Remove dependency of XServer in libGL2 • Enable test build to support parallel threaded building • Make sure pixmap rendering is complete before CPU operation • Do not dereference a NULL display • Correct EGL error handling • Disable frame skipping in wayland backend • Power mutex track is buggy in gckKERNEL_Dispatch • Missing GL_RGB support from glReadPixels • GPU driver cannot pass build on Android 5.0 (Lollipop) • Fix libGAL crash without valid command queue • Support N VSYNC feature in Weston client. • Correct two libg2d APIs name. • Add two new APIs in libg2d to wrap two EGL APIs • NOSApp regression crash • vCompiler: crashed on 64-bit Windows® OS • Creating context on 5.x is slower than 4.x due to process name read • Remove cyclic dependency between gl_wayland_protocol and libGAL libraries • Wayland EGL is not throttling to VSYNC by default • glmark2 met Segmentation fault • Dump GPU AQAXISStatus register for AXI BUS ERROR • Detect VG state in power management • Android 5.0 popup window display is garbled • Set NUM_FRAMEBUFFER_SURFACE_BUFFERS to 3 by default • Refine g2d separated 2D code for Vivante build • eglWaitSyncKHR is used in the Android platform native fence but not implemented

2.4 Defect Fixes

See the log of each git repo by using the command git log, for the list of the defects fixed in this release.

3 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 Supported Hardware in the Release contents section, otherwise only the boards listed.

Table 10. Supported features

Feature	Supported board	Comment
Kernel		
Kernel	All i.MX	Kernel version: 3.14.28
File System	All i.MX	EXT2/EXT3/EXT4 are used as the file system in MMC/SD Hard Disk. On i.MX 6SABRE-AI, <ul style="list-style-type: none"> • UBIFS is used for NAND. • JFFS2/UBIFS is used for Parallel NOR.
Bootloader		
U-Boot	All i.MX	U-Boot delivery is based on U-Boot version v2014.04. Clock, Anapop regulator, ENET, UART, MMC/SD, eMMC4.3/4.4. High Assurance Boot, ROM Plug-in Mode. SPI-NOR, Parallel NOR, SATA, NAND, QuadSPI-NOR, USB Mass Storage. Review Table 2 in Section 1.1 for U-Boot configurations supported on each board for SPI_NOR, NAND, Parallel NOR, QuadSPI-NOR, and SATA. These are not supported on all boards. i.MX 6Quad/Dual Lite SABRE-SD and SABRE-AI support DDR3 528 MHz @ 64 bit. i.MX 6Dual Lite/Solo SABRE-SD and SABRE-AI support DDR3 400 MHz @ 64 bit. i.MX 6SoloX SABRE-SD and SABRE-AI support LDDR3 400 MHz @ 32 bit i.MX 6SoloLite EVK supports LPDDR2 400 MHz @ 32 bit and boot using L2Cache as OCRAM
Machine specific layer		
ARM® Core	All i.MX	Supports Cortex-A9®. Supports reboot and power-off.
Memory	All i.MX	The user/kernel space is split 2G/2G.
Interrupt	All i.MX	GIC.
Clock	All i.MX	Controls the system frequency and clock tree distribution.
Timer (GPT)	All i.MX	System timer tick support.
GPIO/EDIO	All i.MX	GPIO is initialized in earlier phase according to hardware design.
IOMUX	All i.MX	Provides the interfaces for I/O configuration. IOMUX-V3 version is used.
DMA engine		
SDMA	All i.MX	Conforms to the DMA engine framework.

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Table 10. Supported features (continued)

Feature	Supported board	Comment
APBH-Bridge-DMA	6SABRE-AI	Conforms to the DMA engine framework. This feature requires a NAND U-Boot.
Character device drivers		
MXC UART	All i.MX	i.MX 6 SABRE-SD, and SoloLite EVK support console through internal Debug UART1. i.MX 6SoloX SABRE-SD and SABRE-AI support A9 Debug through UART1 and M4 Debug through UART2. i.MX 6 SABRE-AI supports console through internal Debug UART 4.
Power Management Drivers		
Anatop Regulator	All i.MX	Supports Anatop regulator management.
Lower Power mode	All i.MX	Supports standby mode and dormant (mem) mode.
CPUIidle	All i.MX	2 levels CPUIidle supported: purely WFI and WFI with wait mode enabled.
CPUFreq	All i.MX	CPUFreq can be used for CPU frequency adjustment. The Interactive governor is added and enabled by default.
BusFreq	All i.MX	Supports the system bus clock frequency scaling.
Battery charging	All i.MX	-
Networking drivers		
ENET	All i.MX	Supports AR8031 PHY. i.MX 6SoloX SABRE-SD and SABRE-AI support AVB Features.
IEEE 1588	All i.MX	Supports Linuxptp stack. Features: <ul style="list-style-type: none"> • Supports IPv4, IPv6, IEEE 802.3 transport. • Supports E2E, P2P transparent clock. • Supports IEEE802.1AS-2011 in the role of end station. Note: Linuxptp stack is open source. Command instance: <pre>ptp4l -A -4 -H -m -i eth0</pre>
PCIe	All i.MX except 6SoloLite	-
PCIe EP/RC validation system	i.MX 6Quad SD and i.MX 6SoloX SDB	Two same i.MX 6Quad SD boards or i.MX 6SoloX SDB boards, one is used as RC, and the other is used as EP. <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.
MediaLB	6SABRE-AI 6SoloX-AI	On i.MX 6SABRE-AI, CPU1 supports MLB 150 and MLB 25/50. On i.MX 6SABRE-AI, CPU2 supports MLB 25/50 only. On i.MX 6SoloX-AI, it supports MLB 25/50.
FlexCAN	6SABRE-AI 6SoloX-SD 6SoloX-AI	Supported one CAN with default the device tree on i.MX 6SABRE-AI. Supported both CAN using the flexcan device tree but has pin conflict with FEC. Supported with default device tree on i.MX 6SoloX-SD but has pin conflict with QSPI1.

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Table 10. Supported features (continued)

Feature	Supported board	Comment
Security drivers		
CAAM	All i.MX except 6SoloLite	Security drivers
SNVS	All i.MX	-
Sound drivers		
WM8962/SSI	6SABRE-SD 6SoloLite 6SoloX-SD	Supports playback.
S/PDIF	6SABRE-SD 6SABRE-AI 6SoloX-AI	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.
ASRC	6SABRE-AI 6SoloX-SD	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	6SABRE-AI 6SoloX-AI	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.
SAI	6SoloX-SD	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.
HDMI Audio	6SABRE-SD 6SABRE-AI	Supported on i.MX 6Dual/Quad and i.MX 6DualLite for SABRE-SD and SABRE-AI
Input device drivers		
USB devices	All i.MX	Supports USB mouse and USB keypad via USB ports.
Touch panel	All i.MX	6SABRE-SD and 6SABRE-AI supports EGalaxy capacitive touch screen. 6SoloLite supports E Ink touch screen on DC2/DC3 add-on card. i.MX 6SoloX SABRE-SD and SABRE-AI support WVGA panel.
Keypad	6SoloLite	6SoloLite supports 4x4 keypads on DC2/DC3 add-on card.
MTD driver		
QuadSPI-NOR	6SoloX-SD 6SoloX-AI	i.MX 6SoloX SABRE-AI supports QSPI1. i.MX 6SoloX SABRE-SD supports QSPI2.
SPI-NOR	6SABRE-AI 6SoloLite	Supports M25P32 On i.MX 6SABRE-SD DualQuad/DualLite there is a pin conflict for supporting SPI-NOR

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Table 10. Supported features (continued)

Feature	Supported board	Comment
NAND	6SABRE-AI 6SoloX-AI	Normal NAND and ONFI NAND asynchronous mode with BCH40.
Parallel NOR	6SABRE-AI	Supports Parallel NOR by using the EIM interface.
SATA	6SABRE-SD 6SABRE-AI	Serial ATA 2.0 supports only i.MX 6 DualQuad SABRE-SD and SABRE-AI.
USB drivers		
USB Host	6SABRE-AI 6SoloLite 6SoloX-SD 6SoloX-AI	Supports USB HOST1 and USB OTG host.
USB Device	All i.MX	Supports USBOTG device mode.
USB	All i.MX	Supports USB OTG2.0 and USB Host2.0 ports. USB Host mode: MSC, HID, UVC, USB audio. USB device mode: MSC, Ethernet, Serial. USB OTG pin detect support for HNP and SRP on OTG.
Graphics drivers		
GPU	All i.MX 6	Graphics Chips Details GC2000, GC355 and GC320 on 6Dual/6Quad GC880, GC355 and GC320 on 6Solo/DualLite GC400T on 6SoloX The GPU on the chips listed above supports these features which include 2D and 3D hardware acceleration: <ul style="list-style-type: none"> • Supports EGL 1.4 for fbdev, X11, directFB, Wayland • Supports OpenGL ES1.1 • Supports OpenGL ES2.0 (WebGL 1.0.1 compatible on X11) • Supports OpenGL ES3.0 • Supports OpenVG1.1 • Supports OpenCL1.1 • Supports OpenGL2.1 GC355 and GC320 on 6SoloLite which include only 2D hardware acceleration <ul style="list-style-type: none"> • Supports EGL 1.4 for fbdev, X, directFB, Wayland • Supports OpenVG1.1
Frame Buffer Driver	All i.MX	MXC Frame buffer driver for IPU V3 on i.MX 6SABRE-SD and i.MX 6SABRE-AI. MXC Frame buffer driver for PXP on i.MX 6SoloLite and i.MX 6SoloX SABRE-SD and SABRE-AI.
VDOA	6SABRE-SD 6SABRE-AI	Supports Video Data Order Adapter.
LVDS	6SABRE-SD 6SABRE-AI 6SoloX-SD	Supports HannStar LVDS panel. It's the default display if no other video option is setup. On the SABRE-AI there are 2 ports. Port 0 is the default.

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Table 10. Supported features (continued)

Feature	Supported board	Comment
	6SoloX-AI	
HDMI	6SABRE-SD 6SABRE-AI 6SoloLite 6SoloX-AI	i.MX 6SABRE-SD and SABRE-AI support on-chip DesignWare HDMI hardware module. i.MX 6SoloLite and i.MX 6SoloX SABRE-AI support external HDMI.
HDCP	6SABRESA	Supports HDCP v1.2 specifications.
WVGA panel	All i.MX	Supports SEIKO WVGA panel.
PxP	6SABRE-SD 6SoloLite 6SoloX-SD 6SoloX-AI	On i.MX 6SABRE-SD, PXP is only supported on i.MX 6DualLite SABRE SD. Enables PXP Driver for EPDC on i.MX 6SoloLite and i.MX 6DualLite SABRE-SD. Conforms to DMA engine framework.
MIPI Display	6SABRE-SD	Supports MIPI DSI driver through MIPI daughter card.
EPDC	6SABRE-SD 6SoloLite	Enable EPDC on i.MX 6DualLite SABRE-SD and i.MX 6SoloLite EVK: 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.
Multimedia Drivers		
IPU V3 driver	6SABRE-SD 6SABRE-AI	On i.MX 6SABRE-SD and i.MX 6SABRE-AI provides interfaces to access IPU V3 modules.
V4L2 Output	All i.MX	On i.MX 6SABRE-SD and i.MX 6SABRE-AI uses the IPU post-processing functions for video output.

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Table 10. Supported features (continued)

Feature	Supported board	Comment
		On i.MX 6SoloLite and i.MX 6SoloX SABRE-SD and SABRE-AI, they use the PXP post-processing functions for video output.
V4L2 Capture	All i.MX	Supports dual camera on i.MX 6SABRE-SD and SABRE-AI. Supports single camera on i.MX 6SoloLite and i.MX 6SoloX SABRE-SD and SABRE-AI.
VPU	6SABRE-SD 6SABRE-AI	Encoder: MPEG-4, H.263, H.264(AVC/MVC), MJPEG Decoder: MPEG-4, H.263, H.264(AVC/MVC), VC-1, MPEG-2, MJPEG, AVS, VP8.
MIPI	6SABRE-SD	Supports 2 lanes CSI and DSI. Supports OV5640 camera sensor
Parallel CSI	6SoloLite 6SoloX-SD 6SABRE-SD	Supports OV5640 camera sensor.
TV-IN	6SABRE-AI	Supports TV-IN via ADV7180 on the 6SABRE-AI. Supports bt656, NTSC, and PAL.
General drivers		
uSDHC	All i.MX	Supports SD2.0, SD3.0 and SDXC. Supports eMMC 1bit/4bit/8bit SDR/DDR mode. i.MX 6SABRE-SD is soldered, i.MX 6SABRE-AI uses the daughter card, i.MX 6SoloX-SD is not soldered. Supports eMMC4.5 on i.MX 6SoloLite and i.MX 6SoloX-SD.
Watchdog	All i.MX	Supports Watchdog reset.
I2C	All i.MX	Supports I2C master.
SPI	All i.MX	Supports SPI master mode.
PWM	All i.MX	Supports the backlight driver via PWM.
ADC	6SoloX-SD 6SoloX-AI	Supports ADC driver.
Temperature monitor	All i.MX	Pre-calibrated. See the "Thermal Driver" chapter in <i>i.MX 6 Linux Reference Manual</i> for more information.
Accelerometer	6SABRE-SD 6SoloLite 6SoloX-SD 6SoloX-AI	Supports MMA8451 sensor on i.MX 6SABRE-SD and i.MX 6SoloX-SABRE-SD and SABRE-AI. Supports MMA8450 sensor on i.MX 6SoloLite.
Wi-Fi	All i.MX	Supports AR6003 Wi-Fi.
Bluetooth	6SABRE-SD 6SoloLite 6SoloX-SD 6SoloX-AI	Bluetooth supported with Atheros Drivers on i.MX 6 boards
GPIO Expander	6SABRE-SD 6SABRE-AI	Supports MAX7310 GPIO expander on i.MX 6 SABRE-SD and SABRE-AI.
SNVS RTC	All i.MX	Low power section only.
Ambient Light Sensor	6SABRE-SD 6SABRE-AI	Supports ISL29023 sensor on i.MX 6 boards.

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Table 10. Supported features (continued)

Feature	Supported board	Comment
	6SoloX-SD 6SoloX-AI	
Magnetometer Sensor	6SABRE-SD 6SABRE-AI 6SoloX-SD 6SoloX-AI	Supports MAG3110 sensor. on i.MX 6 boards.
AM/FM module	6SABRE-AI	Supports SI4763 AM/FM module. Supports FM by using the SSI interface.

4 Kernel Boot Parameters

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

The following table describes different boot parameters.

In order to force the i.MX 6SABRE-AI board to disable SMP to remove overhead, add boot parameters "nosmp" by default. Disabling CONFIG_SMP configuration can remove further overhead for single core.

Table 11. Common kernel boot parameters

Kernel parameter	Description	Typical value	Used when
console	Where to output the kernel logging by printk.	console=ttyMXC0,115200 For 6SABRE-AI, console=ttyMXC3,115200 For 6SoloX-AI, console=ttyMXC0,115200	All cases
ip	Tell 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/mmcblk1p2."
rootwait	Waits (indefinitely) for the root device to show up.	rootwait	Used when mounting SD root file system.

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Table 11. Common kernel boot parameters (continued)

Kernel parameter	Description	Typical value	Used when
mem	Tell the kernel how much memory can be used.	None or mem=864M	Note: MemTotal-<mem> - <gpu_memory> is reserved.
max17135	Configure the maximum of 17135 EPD PMIC pass number and VCOM voltage.	max17135:pass=[pass_num],vcom=[vcom_uV]	Used when enabling EPDC. pass_num should equal 2 for all IMXEBOOKDC2 cards. vcom_uV, in microvolts, should be equal to the value printed on the cable connector that is attached 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 SMP kernel should use.	maxcpus=1	maxcpus=n : n >= 0 limits the kernel to using 'n' processors. n=0 is a special case. It is equivalent to "nosmp".
epdc	Enables EPDC	epdc video=mxcepcfb:E060SCM,bpp=16	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"> 1. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24 2. video=mxcfb1:dev=ldb,if=RGB666 3. video=mxcfb0:dev=ldb,if=RGB666 4. video=mxcfb1:dev=hdmi, 1920x1080M@60,if=RGB24 5. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24 6. video=mxcfb0:dev=ldb,if=RGB666 7. video=mxcfb0:dev=lcd,CLAA-WVGA,if=RGB656 8. video=mxcfb0:dev=mipi_dsi,TRULY-WVGA,if=RGB24 	<ul 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>NOTE: GBR24/RGB565/YUV444 etc represents the display HW interface format. Typical values for certain different display devices are as follows:</p> <p>TVOUT: YUV444</p> <p>VGA: GBR24</p> <p>HDMI&DVI: RGB24</p> <p>CLAA WVGA LCD: RGB565</p> <p>Typical values for dev= are shown as follows:</p>

Table continues on the next page...

Table 11. Common kernel boot parameters (continued)

Kernel parameter	Description	Typical value	Used when
			lcd: LCD interface ldb: LVDS hdmi: HDMI on chip or sii902x dvi: DVI port vga: VGA through TVE tve: TVOUT
video on 6SABRE-AI	<p>Tells the kernel/driver which resolution/depth and refresh rate should be used for display port 0 or 1.</p> <p>See the parameter information under Documentation/fb/modedb.txt</p> <p>Tells the kernel/driver which IPU display interface format should be used.</p>	<ol style="list-style-type: none"> 1. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24video=mxcfb1:dev=ldb,if=RGB666 2. video=mxcfb0:dev=ldb,if=RGB666video=mxcfb1:dev=hdmi, 1920x1080M@60,if=RGB24 3. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24 4. video=mxcfb0:dev=ldb,if=RGB666 5. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24 	<ul 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 LVDS0. • Used when enabling HDMI 1080P60 mode and LVDS0. To enable second display, run "echo 0 > /sys/class/graphics/fb2/blank" <p>NOTE: GBR24/RGB565/YUV444 etc represents the display HW interface format. Typical values for certain different display devices are shown as follows:</p> <p>TVOUT: YUV444 VGA: GBR24 HDMI&DVI: RGB24 CLAA WVGA LCD: RGB565</p> <p>Typical values for dev= are shown below:</p> <p>lcd: LCD interface ldb: LVDS hdmi: HDMI on chip or sii902x dvi: DVI port vga: VGA through TVE tve: TVOUT</p>
video on 6SoloLite	Tells the EPDC FB driver which E Ink panel is in use and what bpp should be used for the Frame Buffer.	video=mxcepdcfb:E060SCM,bpp=16	<p>Used when enabling EPDC to select the correct E Ink panel parameters to use.</p> <p>bpp=16 selects RGB565 FB pix format bpp=8 selects Y8 FB pixel format</p>

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Table 11. Common kernel boot parameters (continued)

Kernel parameter	Description	Typical value	Used when
video on 6SoloLite	Tells the ELCDIF FB driver which LCD panel is in use and which bpp should be used for the Frame Buffer.	video=mxm_elcdif_fb:SEIKO-WVGA,bpp=16	Used when enabling LCDIF to select the correct panel parameters to use. bpp=16 selects RGB565 FB pix format Note: if only use EPDC FB, then turn off ELCDIF FB by "video=mxm_elcdif_fb:off"
dmfc	Tells the kernel/driver how to set the IPU DMFC segment size.	None Or dmfc=3	"dmfc=1" means DMFC_HIGH_RESOLUTION_DC. "dmfc=2" means DMFC_HIGH_RESOLUTION_DP. "dmfc=3" means DMFC_HIGH_RESOLUTION_ONLY_DP. DMFC_HIGH_RESOLUTION_ONLY_DP 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.
mtddparts on 6SABRE-AI	Tells the kernel mtd partition information.	mtddparts=gpmi-nand:16m(boot), 16m(kernel),1024m(rootfs),-(user)	When to enable NAND. The partition: 16m(boot),16m(kernel),1024m(rootfs) is an example, you can change it according to your needs.
csi	Enables the CSI driver.	csi	Used when enabling CSI driver(needed by ov5640) Note: CSI and EPDC have pin conflicts. When CSI is enabled, EPDC cannot be used.
bluetooth	Chooses which bluetooth module is on the board.	bluetooth=ar3001 or, bluetooth=sxsdman	Choose AR3001 on UART2, or choose SXSDMAN on UART4.
uart clock from osc for 6SoloX low power idle and scenario of Linux/MQX™ operating system running together.	Chooses the UART's clock parent.	uart_from_osc	This is necessary for low power idle and all use cases with the MQX RTOS running on ARM Cortex-M4. When setting this parameter, UART sources clock from OSC instead of PLL3_80M, and then all PLLs can be off in low power idle.

5 Known Issues/Limitations

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

Known Issues/Limitations

The following tables list some key known issues.

Table 12. Common known issues and workarounds

Module	Source	Description	Workaround
Thermal	Hardware	The Temperature Monitor should only be enabled for chips that have undergone proper thermal sensor calibration. MC marked devices have undergone temperature calibration.	Ensure proper temperature calibration before using the temperature monitor. See the "Thermal Driver" Chapter in the <i>i.MX Linux® Reference Manual</i> .
GPU	Software	The driver recovery mechanism may not work properly sometimes.	None.
GPU	Software	The 2D blt performance may decrease by 10-30% in some cases.	None.
GPU	Software	The pixelmap performance for Frame Buffer backend drops.	None.
GPU	Software	The OpenVG library for GC355 core is not available in X11 backend.	None.
GPU	Software	The ES11 conformance test fails.	None.
GPU	Software	Xorg 1.15.0 GLX Pixmap causes Xorg server to enter an invalid state.	Uses Xorg 1.14.4.
GPU	Software	Run more than one DFB application may cause "segmentation fault".	None.
GPU	Software	glcontexts may cause segmentation fault.	None.
GPU	Software	glmark2 may cause segmentation fault .	None.
GPU	Software	glx pixmap fails to be executed.	None

Table 13. Known issues and workarounds for i.MX 6 SABRE-SD and i.MX 6 SABRE-AI

Module	Source	Description	Workaround
ARM	Software	smp_wmb performance is very low.	This is the common side-effect of SMP. No fix plan.
IPU	Software	The framebuffer driver and v4l2 output driver share the same fb device. For example, /dev/video16 also uses the /dev/fb0 to do video playback.	Frame Buffer operations should be banned during video playback on the same fb device.
IPU	Hardware	Currently, only supports 4-stripe and 2-stripe split mode. When doing large ratio up-scaling from low resolution frames to high resolution frames, for example, 64x64 to 1920x1080, the requirement cannot be covered by the current split mode solution, that is, each stripe would exceed 1024 pixels for width. Therefore, the video cannot display a full screen.	No.
PCIe	Hardware/ Software	PCIe does not support Hot Plug and Power Management.	No.

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Table 13. Known issues and workarounds for i.MX 6 SABRE-SD and i.MX 6 SABRE-AI (continued)

Module	Source	Description	Workaround
Memory Management	Software	The system reports page allocation failure: order:9, mode:0xd0 when the system does not have sufficient physical continuous memory to allocate.	This may be caused by the 3.5.7 kernel page reclaiming issue. One workaround for this: <code>echo 1 > /proc/sys/vm/drop_caches</code> before you run the application.
HDMI	Software	ENGR00290866 HDMI cannot be set to 1080p@60hz with kernel configuration settings.	Use the <code>xrandr</code> application to configure the HDMI resolution from user-space.
MMC	Software	Hynix eMMC: times out when the rootfs automatically mounts the RPMB partition on i.MX 6SABRE-SD.	Rootfs should not automatically mount the RPMB partition, since it is a secure partition.
GPU	Software	OpenCL output accuracy may be insufficient.	None.
GPU	Software	WEBGL 1.0.1 conformance test fails.	None.
ASRC	Hardware	Two ASRC M2M instances and one P2P instance conversion simultaneously meet serious noise on 176 K and 192 K sampling rates.	When there are three instances, the total MIPS consumption should not exceed the ASRC master clock (132 M). In this case, the total MIPS consumption is more than 120 M, and it is close to the threshold (132 M) in theory. Therefore, this is a capability issue of ASRC, and the noise is expected.

Table 14. Known issues and workarounds for i.MX 6 SABRE-SD

Module	Source	Description	Workaround
SPI NOR boot	Hardware	SPI NOR boot is not supported by the SABRE-SD board.	Current SD board uses KEY relative PINs as SPI interface. However, this set of PINs are not supported by ROM. Therefore, SPI NOR boot is not supported by the SABRE-SD board.
CPU hotplug	Software	System hangs after conducting CPU hot plug many times during heavy interrupt.	Known ARM Linux limitation. No workaround as of yet.
VPU	Software	Cannot support the "-x 1" option for unit test program <code>mxc_vpu_test.out</code> , because the IPU library is removed.	To avoid this issue, do not use "-x 1", since "-x 1" means enable for IPU library.
IPU	Hardware	Currently, only supports 4-stripe and 2-stripe split mode. When doing large ratio up-scaling from low resolution frames to high resolution frames, for example, 64x64 to 1920x1080, the requirement cannot be covered by the current split mode solution, that is, each stripe would exceed 1024 pixels for width. Therefore, the video cannot display a full screen.	No.

Table 15. Known issues and workarounds specifically for i.MX 6Dual/6Quad SABRE-SD

Module	Source	Description	Workaround
SATA Boot	Hardware	The system cannot boot from SATA on the Rev.B board.	Remove R7.
Boot	Hardware	The system cannot boot sometimes when it ist powered on the Rev. B board for the first time.	Add 2.2M ohm resistor to 24M OSC.
Suspend/Resume	Hardware/ Software	Suspend/Resume failure if board rework "Add 2.2M ohm resistor to 24M OSC".	Remove rework.

Table 16. Known issues and workarounds specifically for i.MX 6Solo/ 6DualLite SABRE-SD

Module	Source	Description	Workaround
PMIC	Hardware	The i.MX 6DualLite SD board depopulates the resistor R30 and takes away the ability of the processor to turn off the PMIC in hardware.	i.MX 6DualLite uses dumb mode by default.
EPDC	Hardware	The PINs of EPDC are in conflict with other modules.	To enable EPDC, add the "epdc" command option into the boot command line.
EPDC	Software	Enabling E Ink Auto-update mode (Device Drivers > Graphics Support > E Ink Auto-update Mode Support) causes E Ink panel updates to be distorted and flaky.	Disable the E Ink Auto-update Mode feature in the menuconfig.
EPDC	Hardware	The three boards cannot boot with EPDC DC2 attached while they boot normally without DC2 daughter cards.	This occurs when the SW3 (KEYPAD_LOCK) switch on the EBOOK DC2 board is switched "ON", which affects the boot bin "EIM_DA7" (BT_CFG1_7). You need to set the SW3 in DC2 board to "OFF."
uSDHC	Hardware	SD3.0: U-Boot cannot boot with SDR50 and SDR104. This is not an issue with i.MX 6Dual/6Quad.	Fixed in TO1.1.

Table 17. Known issues and workarounds for i.MX 6Dual/6Quad SABRE-AI

Module	Source	Description	Workaround
ARM	Software	CONFIG_SMP should be disabled for the i.MX 6Solo chip.	To remove overhead caused by SMP for better performance, CONFIG_SMP is expected to be disabled for single core. Complete support with SMP disabled will be provided with future Linux BSP release.
IPU	Hardware	Default 24bpp on the second display used by HDMI. IPU keeps printing error for hardware bandwidth limitation as described in CR ENGR00293432.	No.

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Table 17. Known issues and workarounds for i.MX 6Dual/6Quad SABRE-AI (continued)

Module	Source	Description	Workaround
eCompass	Hardware	eCompass cannot work after EIM-NOR or SPI-NOR are enabled on the kernel.	No.
USB	Software	USB OTG and USB host cannot work after EIM-NOR or SPI-NOR are enabled on kernel.	No.
TV-IN	Software	Error messages may be expected along with bad quality at first frames on the TV-IN interface. This may occur on a hot plug connection.	No.
U-Boot	Hardware	ENGR00236878: eMMC 4.4 fails to boot on SABRE-AI boards.	No.
MLB	Software	The SYNC mode cannot work stably in the test.	No
SDIO3.0	Software	No available device to do the SDIO 3.0 test.	-

Table 18. Known issues and workarounds specifically for i.MX 6Solo/6DualLite SABRE-AI

Module	Source	Description	Workaround
Hardware manufacture	Hardware	HDMI, SD3 card detection, and eGalax touch screens are found to fail on some boards.	This is because some PINs are not soldered well. If any basic feature, which is announced to be supported, does not work on your board, please check the board.
CPU hotplug	Software	System hangs after conducting CPU hot plug many times during heavy interrupt.	Known ARM Linux limitation. No workaround as of yet.
VPU	Software	Cannot support "-x 1" option for unit test program mxc_vpu_test.out, because IPU library is removed.	To avoid this issue, do not use "-x 1", because "-x 1" means enabled for IPU library.
uSDHC	Hardware	SD3.0: U-Boot can't boot with SDR50 and SDR104.	Fixed in TO1.1.

Table 19. Known issues and workarounds for i.MX 6SoloLite

Module	Source	Description	Workaround
EPDC	Software	Enabling E Ink Auto-update mode (Device Drivers > Graphics Support > E Ink Auto-update Mode Support) causes E Ink panel updates to be distorted and flaky.	Disable the E Ink Auto-update Mode feature in the menuconfig.
GPU	Software	The driver recovery mechanism may not work properly sometimes.	No.

Table continues on the next page...

Table 19. Known issues and workarounds for i.MX 6SoloLite (continued)

Module	Source	Description	Workaround
System	Hardware	Reboot may not work on the EVK board.	Reboot function should be always okay if the hardware can trigger PMIC reset, which ensures RESET key and watchdog reset can control PMIC_ON_REQ pin.
CSI/EPDC	Hardware	Cannot be used simultaneously, because these two modules share the same pins on the EVK board.	The board file in BSP configures these pins for proper function through DTS. Use imx6sl-evk.dts for EPDC, and imx6sl-evk-csi.dts for CSI.
X-Acceleration	Hardware/Software	Out of memory error during the x11perf test.	It is a system limitation since the x11perf needs a lot of memory. No work-around on the EVK board (only with LPDDR2 memory of 512 MB). Users may use a larger memory to work around this issue.
Mfgtool2	Software	Mfgtool2 may fail to execute the <code>frf</code> command if there is no <code>send</code> or <code>pipe</code> command executed prior to it.	Remove the <code>frf</code> command from ucl2.xml to fix this issue.
FUSE for RTC	Hardware	SEC_CONFIG[0] fuse bit is not burned, which leads the RTC not to be functional.	In U-Boot prompt, run the command "imxotp blow --force 4 0x2".
SDIO3.0	Software	No available device to do the SDIO 3.0 test.	
HDMI	Software	ENGR00298771, i.MX 6SoloLite EVK: on some special resolutions, such as 1400x1050, the Yocto Project GUI display on HDMI is distorted. This is caused by <code>xrandr</code> and tries to expand the frame buffer size to 1408x1050 to align with 16 bytes. However, i.MX 6SoloLite ELCDIF does not support stride buffer and cannot crop 1400x1050 from the buffer 1408x1050, which then causes distortion.	No. Only found on 1400x1050 mode until now.

Table 20. Known issues and workarounds for i.MX 6SoloX

Module	Source	Description	Workaround
Video	Software	The video display has a green line at bottom during <code>gplay</code> .	No workaround.
CAAM	Software	The system reboots after the CAAM RNG test is suspended and resumed.	There is hardware function conflict between the Mega/Fast mix off feature and CAAM. To use CAAM after kernel bootup, the user should enable the CAAM wakeup function to avoid Mega mix off in DSM. Workaround: <code>echo enabled > /sys/bus/platform/devices/2100000.aips-bus/2100000.caam/2101000.jr0/power/wakeup</code>
VADC	Software	Sometimes VADC cannot correctly detect the video standard. CSI works	The VADC auto standard detect function is not required. VADC input device does not change in

Table continues on the next page...

Table 20. Known issues and workarounds for i.MX 6SoloX (continued)

Module	Source	Description	Workaround
		in NTSC mode but the VADC input is PAL.	product. Hard code VADC input standard in the VADC driver.
MLB	Software	SYNC mode is not stable.	No workaround.
QSPI-NOR	Hardware	PMIC needs to be reset to reset the QSPI-NOR flash on the board to the default 3 bytes mode.	The hardware workaround is required.
PCIe	Hardware/ Software	When the extremely power save mode is enabled on i.MX 6SoloX PCIe, the i.MX 6 SoloX PCIe phy/controller would be powered off completely, all the TLPs on the PCIe link would be discarded, and link would be down in suspend. The i.MX 6 SoloX PCIe and the PCIe link would be re-initialized completely during resume operations. There is one known issue when the pcie2usb device is used during suspend/resume. The development node of the pcie2usb device maybe changed, since the pcie2usb device is reset when the i.MX 6SoloX PCIe is re-initialized during resume.	No.
MMC	Software	Hynix eMMC times out when the rootfs automatically mounts the RPMB partition on i.MX 6SoloX SD.	Rootfs should not automatically mount the RPMB partition, because it is a secure partition.
CSI/LCD	Hardware	CSI and LCD cannot be used simultaneously since the two modules share the same pins on the i.MX 6SoloX SABRE-SD board.	No.
UART	Hardware	UART cannot wake up with the RTS pin programmed with hard flow control enabled. And there is limitation of the framesize to about 16.	No.

6 Multimedia

This chapter contains the information on the multimedia component of the BSP.

The versions of the Gstreamer releases are listed below:

6.1 Freescale GStreamer plugins

NOTE

- To support WMA, WMV, AAC+, AC3, DD+, rmvb decoding, and WMA encoding, you need to install special and excluded packages.
- vpudec plugins are only for SoCs with the VPU hardware.
- imxvideoconvert_g2d can only perform color space converting to RGB space.

6.2 Multimedia feature matrix

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

6.2.1 Parser/Demuxer specifications

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

Table 21. 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

6.2.2 Video codec specifications

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

Table 22. Video codec specification for hardware with VPU acceleration

-	Feature	Profile	Max. resolution	Min. resolution	Max. framerate	H/W or S/W	Bitrate	Comment
Video decoder	MPEG2	MP	1920 * 1080	64 * 64	30 fps	H/W	50 Mbps	-
	MPEG4	SP	1920 * 1080	64 * 64	30 fps	H/W	40 Mbps	-
	MPEG4	ASP	1920 * 1080	64 * 64	30 fps	H/W	40 Mbps	-
	H.263	P3	1920 * 1080	64 * 64	30 fps	H/W	20 Mbps	-
	H.264	BP	1920 * 1080	64 * 64	30 fps	H/W	50 Mbps	-
	H.264	MP	1920 * 1080	64 * 64	30 fps	H/W	50 Mbps	-
	H.264	HP	1920 * 1080	64 * 64	30 fps	H/W	50 Mbps	-
	VC-1	SP	1920 * 1080	64 * 64	30 fps	H/W	45 Mbps	-
	VC-1	MP	1920 * 1080	64 * 64	30 fps	H/W	45 Mbps	-
	VC-1	AP	1920 * 1080	64 * 64	30 fps	H/W	45 Mbps	-
	VP8	-	1280 * 720	64 * 64	30 fps	H/W	20 Mbps	i.MX 6DualLite
	VP8	-	1920 * 1080	64 * 64	30 fps	H/W	20 Mbps	i.MX 6Quad
	MJPEG	-	1920 * 1080	64 * 64	30 fps	H/W	120 Mpixl	-
	RV	8/9/10	1920 * 1080	64 * 64	30 fps	H/W	40 Mbps	-

Table 23. Video codec specification for hardware without VPU acceleration

	Feature	Profile	Max. resolution	Min. resolution	Max. framerate	H/W or S/W	Comment
Video decoder	MPEG4	SP/ASP	D1	64 * 64	30 fps	S/W	Gstreamer 0.10 only
	H.264	BP/MP/HP	CIF	64 * 64	30 fps	S/W	-
	WMV9	SP/MP	D1	64 * 64	30 fps	S/W	Gstreamer 0.10 only

Gstreamer 1.x uses the gst-libav plugin which is available separately.

Gstreamer 0.10 uses the gst-ffmpeg plugin which is available separately.

6.2.3 Audio codec specification

Table 24. Audio codec specification

Decoder	Feature/Profile	Channel	Sample rate (KHz)	Bit rate (kbps)	H/W or S/W	Comment
MP3	MPEG-1 (Layer-1/ Layer-2/Layer-3) MPEG-2 (Layer-1/ Layer-2/Layer-3) MPEG-2.5 (Layer-3)	stereo/mono	<= 48	8 - 448	S/W	-

Table continues on the next page...

Table 24. Audio codec specification (continued)

Decoder	Feature/Profile	Channel	Sample rate (KHz)	Bit rate (kbps)	H/W or S/W	Comment
AACLC	MPEG-2 AACLC MPEG-4 AACLC	<= 5.1	8 - 96	8 - 256	S/W	-
HE-AAC	HE-AAC V1 HE-AAC V2	stereo/mono	8 - 96	Mono: 8 - 384 stereo: 16 - 768	S/W	-
WMA10 Std	L1 @ QL1	stereo/mono	44.1	64 - 161	S/W	-
	L2 @ QL1	stereo/mono	<= 48	<= 161	S/W	-
	L3 @ QL1	stereo/mono	<= 48	<= 385	S/W	-
WMA10 Pro	M0a @ QL2	stereo/mono	<= 48	48 - 192	S/W	-
	M0b @ QL2	stereo/mono	<= 48	<= 192	S/W	-
	M1 @ QL2	<= 5.1	<= 48	<= 384	S/W	-
	M2 @ QL2	<= 5.1	<= 96	<= 768	S/W	-
	M3 @ QL2	<= 7.1	<= 96	<= 1500	S/W	-
WMA 9 Lossless	N1	stereo/mono	<= 48	<= 3000	S/W	-
	N2	<=5.1	<= 96	<= 3000	S/W	-
	N3	<=7.1	<= 96	<= 3000	S/W	-
AC-3	-	<=5.1	<= 48	32 - 640	S/W	-
FLAC	-	<=7.1	8 - 192	-	N/A	-
BSAC	-	<=5.1	<= 48	64 per channel	N/A	Core codec only
Ogg Vorbis	q1 - q10	Stereo	8 - 192	<= 500	S/W	-
DD-plus	-	<=7.1	32, 44.1, 48 64, 88.2, 96	<= 6.144 Mbps	S/W	-
RA	cook	stereo/mono	8k, 11.025k, 22.05k, 44.1k	-	S/W	-

NOTE

- The bitrate (bps) supported for MP3 encoder: 32k, 48k, 56k, 64k, 80k, 96k, 112k, 128k, 160k, 192k, 224k, 256k, 320k
- The sample and supported bitrate (bps) combinations for WMA8 encoder:
 - For mono output:
 - 22050 Hz: 20k, 16k, 22k, 17.6k
 - 32000 Hz: 20k, 22k
 - 44100 Hz: 32k, 35.2k, 48k, 52.8k
 - For Stereo output:
 - 22050 Hz: 35.2k, 32k, 22k, 20k
 - 32000 Hz: 52.8k, 48k, 44k, 40k, 35.2k, 32k
 - 44100 Hz: 211.2k, 192k, 176k, 160k, 140.8k, 128k, 105.6k, 96k, 88k, 80k, 70.4k, 64k
 - 48000 Hz: 211.2k, 192k, 176k, 160k, 140.8k, 128k

6.2.4 Image codec specification

Table 25. Image codec specification

	Feature	Profile	Max. resolution	H/W or S/W
Image decoder	JPEG	Baseline	Memory related	S/W
	PNG	N/A	Memory related	S/W
	GIF	N/A	Memory related	S/W
	BMP	N/A	Memory related	S/W
Image encoder	JPEG	Baseline	Memory related	S/W

6.2.5 Speech codec specification

Table 26. 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

6.2.6 Streaming protocol specification

Table 27. Streaming protocol specification

Protocol	Feature
HTTP	HTTP progressive streaming
RTSP	RTP, SDP
RTP/UDP	RTP/UDP MPEGTS streaming

6.2.7 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* for information on how to build and install it.

Table 28. 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

6.3 Known issues and limitations for multimedia

- As the maximum buffer size of the \$PLAYBIN multi-queue is 2 MB, problems may be seen with some long audio or video interleaved streams. You can enlarge this buffer size to support these special cases.
- AAC decoder: The ADIF format does not support seek mode nor FF/FB.
- Playing recorded AVI file (MPEG4(vpu) + AVI(avimux)) fails, because the AVIMUX mark MPEG4 video to DIVX is not supported.
- The accurate seek mode may have a longer time delay.
- Because the stream container does not have an index table, seek is not supported.
- Fast rewind of audio does not support audio-only streams.
- Pulseaudio is only available for the X11 backend.
- Rotation is not supported for interlaced streams whose width or height is larger than 968 x 968 when enabled deinterlacing due to a driver limitation.
- For long time video playback, the system memory may be occupied by file cache as Linux kernel policy. This may cause some driver allocate page failure, and then cause playback failure. To avoid this issue, include the following command line in your /etc/rc.local:

```
echo 30000 > /proc/sys/vm/min_free_kbytes
```

Issues only seen on Gstreamer 1.x:

- Rewind may report an EOS when using libav for video decoding.

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