

# AARN

## Android Automotive Release Notes

Rev. automotive-13.0.0\_2.3.0 —

4 January 2024

Release notes

### Document information

Information	Content
Keywords	Android, i.MX, Automotive, automotive-13.0.0_2.3.0
Abstract	The i.MX Android automotive-13.0.0_2.3.0 release is an Android Automotive GA (RFP) release on NXP's i.MX 8QuadXPlus/8QuadMax MEK board and platform, which is based on Android 13.



## 1 Release Description

The i.MX Android automotive-13.0.0\_2.3.0 release is an Android Automotive GA (RFP) release on NXP's i.MX 8QuadXPlus/8QuadMax MEK board and platform, which is based on Android 13. It supports the device type In-vehicle infotainment defined in <https://source.android.com/devices/automotive/>.

i.MX Android automotive-13.0.0\_2.3.0 release includes all necessary code, documents, and tools to assist users in building and running Android Automotive on the i.MX 8QuadXPlus/8QuadMax MEK board from scratch. Pre-built images are also included for a quick trial on the following platforms:

- i.MX 8QuadXPlus/8QuadMax MEK Board and Platform

This release includes all porting and enhancements based on the Android open source code.

Most of the deliveries in this release are provided in source code with the exception of some proprietary modules/libraries from third parties.

## 2 Supported Hardware SoC/Boards

The supported hardware system-on-chip (SoCs)/boards are listed as follows:

- i.MX 8QuadMax (Silicon Revision B0) MEK Board and Platform
- i.MX 8QuadXPlus (Silicon Revision B0, C0) MEK Board and Platform

## 3 Release Package Contents

The automotive-13.0.0\_2.3.0 release package includes the following software and documents.

**Table 1. Release package contents**

i.MX Android proprietary source code package	<ul style="list-style-type: none"> <li>• <code>imx-automotive-13.0.0_2.3.0.tar.gz</code>: i.MX Android Automotive proprietary source code package to enable Android Automotive on i.MX boards. For example, Hardware Abstraction Layer implementation, and hardware codec acceleration.</li> </ul>
Documents	<p>The following documents are included in <code>android_automotive-13.0.0_2.3.0_docs.zip</code>:</p> <ul style="list-style-type: none"> <li>• <i>Android Quick Start Guide (AQSUG)</i>: A document that explains how to run Android Automotive on an i.MX board using prebuilt images.</li> <li>• <i>Android User's Guide (AUG)</i>: A document describing procedures for configuring and building this release package.</li> <li>• <i>Android Release Notes (ARN)</i>: A document that introduces key updates and known issues in this release.</li> <li>• <i>i.MX Android Extended Codec Release Notes (IMXACRN)</i>: A document that provides the extended codec information.</li> <li>• <i>i.MX Android Security User's Guide (ASUG)</i>: A document that describes how to do customization work on security features supported by i.MX Android software.</li> <li>• <i>i.MX TensorFlow Lite on Android User's Guide (IMXTFLUG)</i>: A document that describes the TensorFlow Lite on Android platform.</li> <li>• <i>i.MX Graphics User's Guide (IMXGRAPHICUG)</i>: A document that describes graphics APIs, Tools, Memory, and Application programming guidelines.</li> </ul>
Prebuilt images	<p>You can test Android Automotive with a prebuilt image on i.MX reference board before building any code:</p> <ul style="list-style-type: none"> <li>• <code>automotive-13.0.0_2.3.0_image_8qmek_car.tar.gz</code>: Prebuilt-image for i.MX 8QuadXPlus/8QuadMax MEK board with Exterior View System (EVS) function enabled in the ARM Cortex-M4 CPU core during Android OS</li> </ul>

Table 1. Release package contents...continued

	<p>boot process when EVS function is switched to Cortex-A CPU core, which includes NXP extended features.</p> <ul style="list-style-type: none"> <li>automotive-13.0.0_2.3.0_image_8qmek_car2.tar.gz: Prebuilt-image for i.MX 8QuadMax/8QuadXPlus MEK board with EVS function enabled in the Arm Cortex-A CPU core only (EVS function is available after start Android OS from Cortex-A core), which includes NXP extended features.</li> </ul> <p>All prebuilt images are in a separate package. See the <i>Android Quick Start Guide</i> (AQSUG) and <i>Android User's Guide</i> (AUG) to choose the appropriate image.</p>
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## 4 Features

This section describes features in this package.

Table 2. Features

Feature	i.MX 8QuadXPlus/ 8QuadMax MEK	Remarks
Google Android 13 release	Y	Based on android-13.0.0_r69 release.
Linux 6.1.25 kernel (merged with the AOSP kernel)	Y	Based on Linux OS BSP LF6.1.36_2.1.0 release.
U-Boot	Y	v2023.04
Trusty OS	Y	-
Graphics-HW	Y	VeriSilicon GC7000L GPU for i.MX 8QuadXPlus, GC7000 XSVX GPU for i.MX 8QuadMax with 6.4.11.p1.658245 driver
Graphics-HW 3D acceleration	Y	OpenGL ES 1.1/2.0/3.1 through GC7000L for i.MX 8Quad XPlus, OpenGL ES 1.1/2.0/3.1/3.2 through GC7000XSVX for i.MX 8QuadMax.
Graphics-HW accelerated UI surface composition	Y	OpenGL ES 3.1 through GC7000L for i.MX 8QuadXPlus, OpenGL ES 3.2 through GC7000XSVX for i.MX 8QuadMax.
SCFW	Y	Version 1.15.0
SECO firmware	Y	Version 3.8.5 for i.MX 8QuadMax B0, i.MX 8QuadXPlus B0, and i.MX 8QuadXPlus C0.
Boot source	eMMC	-
Splash Screen	Y	Supports USB mouse.
UI (input)	Y	-
UI (display)	HDMI display	Supports LVDS-to-HDMI display.
UI (brightness control)	N	-
Storage - External Media	Y	-
Connectivity - Ethernet	Y	Atheros AR8031
Connectivity - Bluetooth wireless technology	Y	PCIE9098 (Murata LBEE5ZZ1XL). Profiles: A2DP Sink, AVRCP, BLE Host, HFP, PBAPClient, MAPMCE, PAN, MAPMCE, PAN, HID Device.
Connectivity - Wi-Fi	Y	PCIE9098 (Murata LBEE5ZZ1XL). Features: STA mode, AP mode, AP/STA Concurrency.
Connectivity - USB Tethering	Y	Supports Wi-Fi as upstream.

Table 2. Features...continued

Feature	i.MX 8QuadXPlus/ 8QuadMax MEK	Remarks
Power - CPU Freq	Y	-
Power - Bus Freq	Y	-
Media - Music Play	Y	SAI+WM8960 ESAI+CS42888 (no support for multichannel). SOF+ESAI+CS42888 (with special DTBO image)
Media - HDMI audio output	N	-
Misc - ADB over USB	Y	-
Misc - Fastboot utility	Y	-
Misc - SW update and factory reset	Y	-
File-based Encryption	Y	-
webGL	Y	-
Vulkan	Y	-
USB TYPEC PD	Y	-
OTA for A/B	Y	-
TEE backed Keymaster HAL	Y	This is based on i.MX Trusty OS TEE firmware.
TEE backed AVB	Y	This is based on i.MX Trusty OS TEE firmware and secure storage of eMMC chip. In this release, the RPMB part needs to be initialized manually.
Media rearview camera	Y	MAX9286 camera.
Car Audio Policy	Y	Alarm, notification, and system sounds are played from the audio jack on the CPU board. Other sounds such as music are played from the extended audio board.

## 5 Multimedia Codecs

For multimedia codecs and features, see the *i.MX Android Extended Codec Release Notes (IMXACRN)*.

## 6 Change Log

Compared to the automotive-13.0.0\_2.1.0 release, automotive-13.0.0\_2.3.0 has the following major changes:

- Upgraded the Android code base from android-13.0.0\_r43 to android-13.0.0\_r69.
- Upgraded the VeriSilicon GPU driver from 6.4.11.p1 to 6.4.11.p2.
- Supports new Wi-Fi features:
  - Multichip Wi-Fi HAL: Two WiFi modules can be used simultaneously (PCIe enabled on i.MX 8QuadMax only).
  - AP+AP concurrency feature.
  - AP+STA concurrency feature + bridging of those interfaces.

## 7 Known Issues and Limitations

The known issues about the hardware and hardware rework instructions are not included in this document. Read all hardware-related reference materials and ensure the necessary hardware modifications have been made before using the software.

**Table 3. Known issues and limitations**

Issue description	Remarks
For i.MX 8QuadXPlus silicon revision B0 chip, it fails to boot from some types of eMMC.	In the default settings, the UUU script burns the boot image into eMMC Boot Partition with 32KB offset. Although it works properly on the MEK board, it fails to read the boot image on some types of eMMC. There are two possible solutions: <ul style="list-style-type: none"> <li>• Download <code>flash.bin</code> in the eMMC Boot Partition + 0KB offset + eMMC fastboot enabled in fuse.</li> <li>• Download <code>flash.bin</code> in the eMMC User Partition + 32KB offset (eMMC fastboot can be either enabled or disabled in fuse).</li> </ul> For more information, see <a href="https://community.nxp.com/docs/DOC-342877">https://community.nxp.com/docs/DOC-342877</a> .
The board stays offline (no ADB or fastboot connection) during reboot stress test. The issue is reproducible after 1028 iteration (around 18 hours).	This issue will be fixed in future release.
The board stays offline (no ADB connection) after switching to the PTP USB configuration. This issue usually gets reproduced during automated tests.	This issue will be fixed in future release.
The camera might freeze if only one camera is connected to the MAX9286 board.	This issue will be fixed in future release.
Sound Open Firmware (SOF) is not working with i.MX8QuadXPlus.	This issue is related to the image flashed using the <code>-d sof</code> option ( <code>dtbo-imx8qxp-sof.img</code> ). When the SOF dtbo image is used, media audio is routed to i.MX 8QuadXPlus DSP (running SOF) but the SOF is crashing during boot (DSP crash observed in kernel log). This affects media audio, in which case CS42888 codec audio is not working.
Kernel panic or Application crash during CTS Verifier Wi-Fi tests.	CTS Verifier test "Network suggestion modification in place" may fail when executed in multiple retries. The failure causes crash of the CTS Verifier application. Sometimes kernel panic may also occur. This issue is related to NXP Wi-Fi kernel module and will be fixed in future release.
Kernel panic when copying file through MTP (file transfer mode) with disabled ADB.	The file is not copied to the target. The copy operation freezes. The issue is caused by "ERR050149: USB3: TRB OUT endpoints transfer blockage and performance delays".
Dual Hotspots cannot be used simultaneously with Wi-Fi station.	Simultaneous usage of dual hotspots (AP+AP concurrency) with Wi-Fi station (board connected to the external network) is not supported (= STA+AP+AP concurrency is not supported).
Weather/Radio/Map icons are sometimes not visible after reboot.	Press the phone and Home to make them visible. The issue is available on the i.MX 8QuadXPlus chip and Car image type only.
When starting <code>trusty-core.ko</code> , the Linux kernel module can cause system failure.	Issue with the fix has been created to the Google issue tracker: <a href="https://issuetracker.google.com/318049117">https://issuetracker.google.com/318049117</a> . This issue will be fixed in future release.
Boot animation is not available when starting the Car image type.	Boot animation is terminated earlier during starting the <code>init</code> process. This issue will be fixed in future release.

## 8 Revision History

This table provides the revision history.

**Table 4. Revision history**

Revision number	Release date	Description
automotive-13.0.0_2.3.0	4 January 2024	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-13.0.0_2.1.0	10/2023	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-13.0.0_1.3.0	07/2023	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-13.0.0_1.1.0	05/2023	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-12.1.0_1.1.0	12/2022	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-12.0.0_2.1.0	09/2022	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-12.0.0_1.1.0	06/2022	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-11.0.0_2.5.0	03/2022	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-11.0.0_2.3.0	12/2021	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-11.0.0_2.1.0	11/2021	Added the examples for i.MX 8QuadXPlus and upgraded the tool version
android-11.0.0_1.1.0-AUTO	01/2021	i.MX 8QuadXPlus/8QuadMax MEK GA release
android-10.0.0_2.4.0	07/2020	i.MX 8QuadMax MEK GA release
android-10.0.0_2.2.0-AUTO	06/2020	i.MX 8QuadXPlus/8QuadMax MEK GA release
automotive-10.0.0_1.1.0	03/2020	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0) GA release
P9.0.0_2.1.0-AUTO-ga	08/2019	Updated the location of the SCFW porting kit
P9.0.0_2.1.0-AUTO-ga	04/2019	i.MX 8QuadXPlus/8QuadMax Automotive GA release
P9.0.0_1.0.2-AUTO-beta	01/2019	i.MX 8QuadXPlus/8QuadMax Automotive Beta release
P9.0.0_1.0.2-AUTO-alpha	11/2018	i.MX 8QuadXPlus/8QuadMax Automotive Alpha release
O8.1.0_1.1.0_AUTO-beta	05/2018	i.MX 8QuadXPlus/8QuadMax Beta release
O8.1.0_1.1.0_AUTO-EAR	02/2018	Initial release

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## Contents

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1	Release Description .....	2
2	Supported Hardware SoC/Boards .....	2
3	Release Package Contents .....	2
4	Features .....	3
5	Multimedia Codecs .....	4
6	Change Log .....	4
7	Known Issues and Limitations .....	5
8	Revision History .....	6
	Legal information .....	7

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