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Android Quick Start Guide

Rev. automotive-12.0.0_2.1.0 —
1 September 2022

User guide

Document information

Information	Content
Keywords	Android, i.MX, automotive-12.0.0_2.1.0
Abstract	This document guides you through the processes of downloading and running this release package. It only explains how to download and run the default release image with default configuration.

1 Overview

This document guides you through the processes of downloading and running this release package. It only explains how to download and run the default release image with default configuration. For details on using the release package, see the *Android User's Guide* (AUG) included in this release package.

1.1 Acronyms

Table 1. Acronyms

Acronym	Description
U-Boot	Universal Boot Loader
SPL	U-Boot Secondary Program Loader
OS	Operating system
EVS	Android Exterior View System - https://source.android.com/devices/automotive/camera-hal
i.MX 8	i.MX 8 Series Applications Processors
PC	Personal (host) computer
AOSP	Android Open Source Project - https://source.android.com/
GCC	GNU Compiler collection - https://gcc.gnu.org/
MEK	Multisensory Enablement Kit - https://www.nxp.com/design/development-boards/i-mx-evaluation-and-development-boards:SABRE_HOME
SoC	System on Chip - https://en.wikipedia.org/wiki/System_on_a_chip
GAS	Google Automotive Services - https://developers.google.com/cars
CST	(NXP) Code Signing Tool
GPT	GUID partition table - https://en.wikipedia.org/wiki/GUID_Partition_Table
OTA	Over-The-Air programming
BT	Bluetooth
HVAC	Heating, ventilation, and air conditioning
eMMC	Embedded Multi-Media Card
SOF	Sound Open Firmware

2 Hardware Requirements

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

Supported system-on-chips (SoCs):

- i.MX 8QuadMax (Silicon Revision B0)
- i.MX 8QuadXPlus (Silicon Revision B0 and Silicon Revision C0)

Supported boards:

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

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3 Working with the i.MX 8QuadXPlus/8QuadMax MEK Board

3.1 Board hardware

The figures below show the different components of the i.MX 8QuadXPlus/8QuadMax MEK boards.
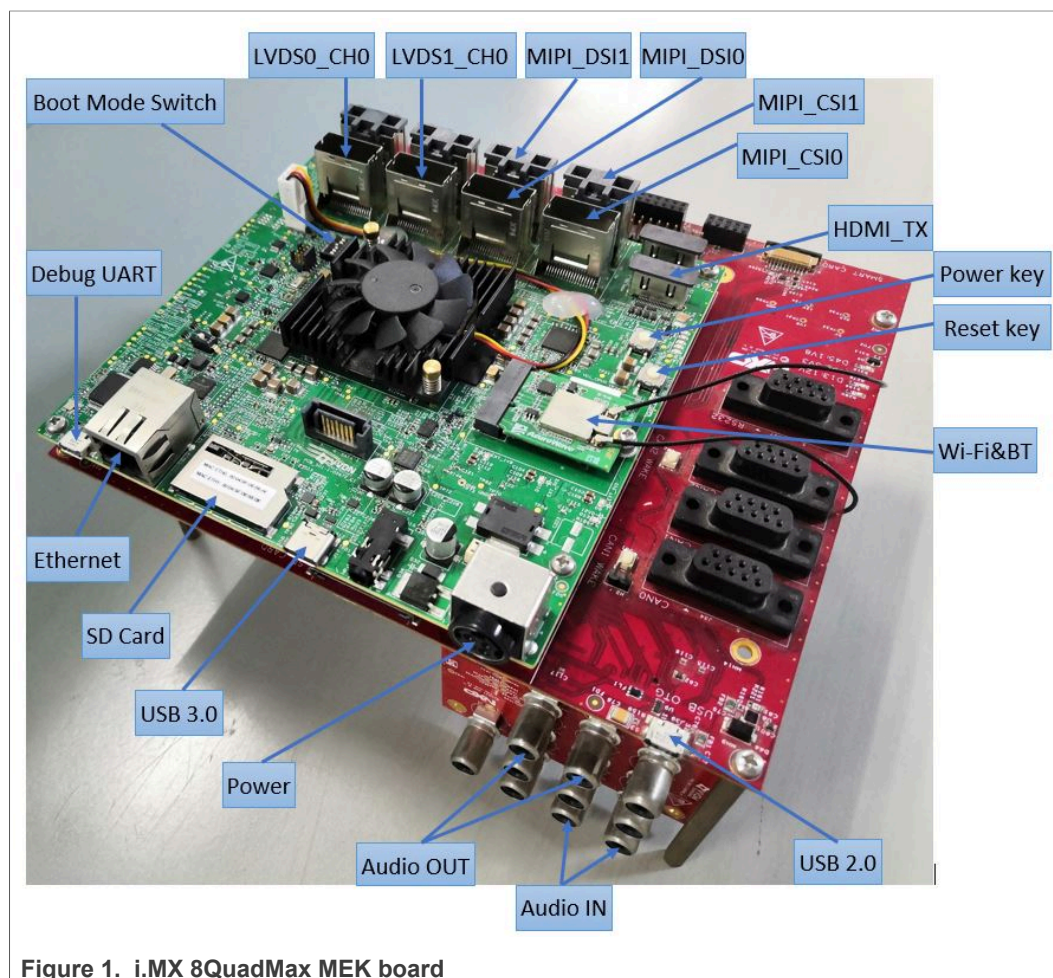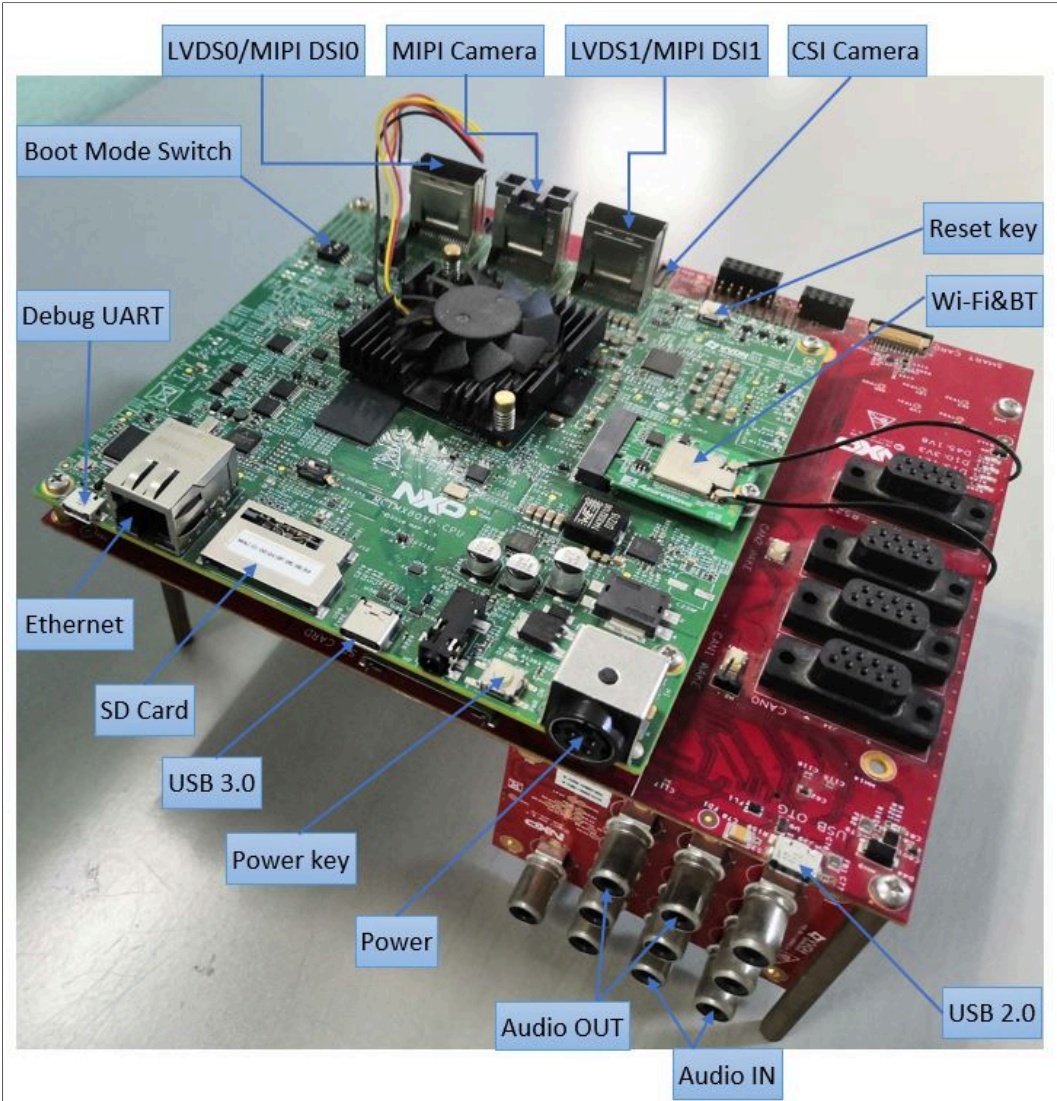

Figure 1. i.MX 8QuadMax MEK board

Figure 2. i.MX 8QuadXPlus MEK board

Figure 3. i.MX mini SAS cable with LVDS-to-HDMI adapter

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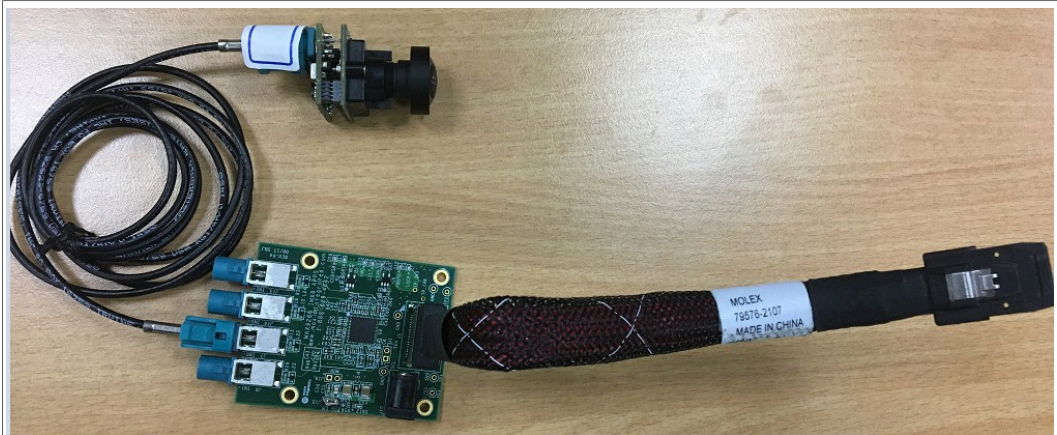**Rev. automotive-12.0.0_2.1.0 — 1 September 2022**

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Figure 4. i.MX rearview camera (MAX9286)

Note:

- *To use i.MX rearview camera (MAX9286), ensure that the jumper J15 on the camera converter board is installed.*
- *i.MX 8QuadMax MEK*
  - *To test the display, connect the "LVDS1_CH0" port to the LVDS-to-HDMI adapter with the i.MX mini SAS cable.*
  - *To test the rearview camera, connect the "MIPI_CSI0" port with the i.MX MAX9286 MIPI camera.*
- *i.MX 8QuadXPlus MEK*
  - *To test the display, connect the "LVDS0" port to the LVDS-to-HDMI adapter with the i.MX mini SAS cable.*
  - *To test the rearview camera, connect the "MIPI Camera" port with the i.MX MAX9286 MIPI camera.*
- *"MCIMX8-8X-BB" is required for:*
  - *"car" image for the UART interface to control the EVS function.*
  - *Audio media input/output.*

3.2 Board images

There are two sets of images of `automotive-12.0.0_2.1.0_image_8qmek_car.tar.gz` and `automotive-12.0.0_2.1.0_image_8qmek_car2.tar.gz`. The following table lists their differences with `8qmek_car` and `8qmek_car2` representing these two packages.

Table 2. Image differences

	8qmek_car	8qmek_car2
Exterior View System (EVS) function enabled in Cortex-M core	Y	N
EVS function enabled in Cortex-A core	Y	Y
Supports dynamic partition	N	Y
Supports updatable apex	N	Y

The table below describes the location in the board partitions of the software images in `automotive-12.0.0_2.1.0_image_8qmek_car.tar.gz`.

Table 3. Board images

Image name	Download target
`spl-imx8qm.bin`	0 KB offset of eMMC boot0 partition for i.MX 8QuadMax MEK.
`spl-imx8qm-secure-unlock.bin`	0 KB offset of eMMC boot0 partition for i.MX 8QuadMax MEK.
`spl-imx8qxp.bin`	32 KB offset of eMMC boot0 partition for i.MX 8QuadXPlus MEK with silicon revision B0 chip.
`spl-imx8qxp-secure-unlock.bin`	32 KB offset of eMMC boot0 partition for i.MX 8QuadXPlus MEK with silicon revision B0 chip.
`spl-imx8qxp-c0.bin`	32 KB offset of eMMC boot0 partition for i.MX 8QuadXPlus MEK with silicon revision C0 chip.
`spl-imx8qm-xen.bin`	SPL with XEN support.
`bootloader-imx8qm.img`	`bootloader_a` and `bootloader_b` partitions for i.MX 8Quad Max.
`bootloader-imx8qm-secure-unlock.img`	`bootloader_a` and `bootloader_b` partitions for i.MX 8Quad Max.
`bootloader-imx8qxp.img`	`bootloader_a` and `bootloader_b` partitions for i.MX 8Quad XPlus MEK with silicon revision B0 chip.
`bootloader-imx8qxp-secure-unlock.img`	`bootloader_a` and `bootloader_b` partitions for i.MX 8Quad XPlus MEK with silicon revision B0 chip.
`bootloader-imx8qxp-c0.img`	`bootloader_a` and `bootloader_b` partitions for i.MX 8Quad XPlus MEK with silicon revision C0 chip.
`bootloader-imx8qm-xen.img`	Bootloader with XEN support.
`u-boot-imx8qm-mek-uuu.imx`	Bootloader used by UUU for i.MX 8QuadMax MEK board. It is not flashed to MMC.
`u-boot-imx8qxp-mek-uuu.imx`	Bootloader used by UUU for i.MX 8QuadXPlus MEK board with silicon revision B0 chip. It is not flashed to MMC.
`u-boot-imx8qxp-mek-c0-uuu.imx`	Bootloader used by UUU for i.MX 8QuadXPlus MEK board with silicon revision C0 chip. It is not flashed to MMC.
`boot.img`	`boot_a` and `boot_b` partitions to support LVDS-to-HDMI display.
`partition-table.img`	Program to first 17 KB, and then back up to last 17 KB of the boot storage. GPT table image for 16 GB boot storage.
`partition-table-28GB.img`	Program to first 17 KB, and then back up to last 17 KB of the boot storage. GPT table image for 32 GB boot storage.
`vbmeta-imx8qm-md.img`	`vbmeta_a` and `vbmeta_b` partitions for i.MX 8QuadMax to support multiple displays.
`vbmeta-imx8qm.img`	`vbmeta_a` and `vbmeta_b` partitions for i.MX 8QuadMax MEK to support LVDS-to-HDMI display.
`vbmeta-imx8qxp.img`	`vbmeta_a` and `vbmeta_b` partitions for i.MX 8QuadXPlus to support LVDS-to-HDMI display.

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Table 3. Board images...*continued*

Image name	Download target
`vbmeta-imx8qm-xen.img`	`vbmeta_a` and `vbmeta_b` partitions for i.MX 8QuadMax MEK to support XEN.
`system.img`	`system_a` and `system_b` partitions.
`system_ext.img`	`system_ext_a` and `system_ext_b` partitions.
`vendor.img`	`vendor_a` and `vendor_b` partitions.
`product.img`	`product_a` and `product_b` partitions.
`dtbo-imx8qm.img`	`dtbo_a` and `dtbo_b` partitions for i.MX 8QuadMax.
`dtbo-imx8qm-md.img`	`dtbo_a` and `dtbo_b` partitions for i.MX 8QuadMax to support multiple displays.
`dtbo-imx8qm-sof.img`	`dtbo_a` and `dtbo_b` partitions for i.MX 8QuadMax to support SOF on DSP.
`dtbo-imx8qxp.img`	`dtbo_a` and `dtbo_b` partitions for i.MX 8QuadXPlus.
`dtbo-imx8qxp-sof.img`	`dtbo_a` and `dtbo_b` partitions for i.MX 8QuadXPlus to support SOF on DSP.
`rpmb_key_test.bin`	Prebuilt test RPMB key, which can be used to set the RPMB key as fixed 32 bytes 0x00.
`testkey_public_rsa4096.bin`	Prebuilt AVB public key. It is extracted from the default AVB private key.

3.3 Flashing board images

The board image files can be flashed into the target board using Universal Update Utility (UUU).

UUU source code and binary file are released on GitHub: <u>UUU release page on GitHub</u>.

To achieve more flexibility, two script files are provided to invoke UUU to automatically flash all Android images.

- `uuu_imx_android_flash.sh` for Linux OS
- `uuu_imx_android_flash.bat` for Windows OS

For this release, these two scripts are validated on UUU 1.4.182 version. Download corresponding version from GitHub:

- For Linux OS, download the file named `uuu`.
- For Windows OS, download the file named `uuu.exe`.

Because the two script files will directly invoke UUU, make sure that UUU is in a path contained by the system environment variable of "PATH".

Perform the following steps to download the board images:

1. Download the UUU binary file from GitHub as described before. Install UUU into a directory contained by the system environment variable of "PATH".
2. Make the board enter serial download mode.
   - Change the board's SW2 (boot mode) to 001000 (1-6 bit) to enter serial download mode for i.MX 8QuadMax.

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   - Change the board's SW2 (boot mode) to 1000 (1-4 bit) to enter serial download mode for i.MX 8QuadXPlus.
3. Power on the board. Use the USB cable on the board USB 3.0 Type-C port to connect your PC with the board.
   Note:
   - *There are three USB ports on the i.MX 8QuadMax/8QuadXPlus MEK board: USB-to-UART, USB 2.0, and USB 3.0.*
   - *The USB-to-UART is known as debug UART, which can be used to watch the log of hardware boot processing.*
   - *USB 2.0 is USB Host and USB 3.0 is USB OTG.*
4. Decompress `release_package/automotive-12.0.0_2.1.0_image_8qmek_car.tar.gz` or `release_package/automotive-12.0.0_2.1.0_image_8qmek_car2.tar.gz`, which contains the image files and UUU scripts.
5. Execute the `uuu_imx_android_flash` tool to flash images.
   The `uuu_imx_android_flash` tool can be executed with options to get help information and specify the images to be flashed. For Android Auto images on i.MX 8QuadMax/8QuadXPlus MEK board, related options are described as follows.

Table 4. Options for uuu_imx_android_flash tool

Option	Description
`-h`	Displays the help information of this tool.
`-f soc_name`	Specifies the SoC information. For i.MX 8QuadMax, it should be `imx8qm`. For i.MX 8QuadXPlus, it should be `imx8qxp`. This option is mandatory.
`-a`	Only flashes slot a. If this option and `-b` option are not used, slots a and b are both flashed.
`-b`	Only flashes slot b. If this option and `-a` option are not used, slots a and b are both flashed.
`-c card_size`	Optional setting: 14 / 28. • If it is not set, use `partition-table.img` or `partition-table-dual.img` (default). • If it is set to **14**, use `partition-table-14GB.img` for 16GB SD card. • If it is set to **28**, use `partition-table-28GB.img` or `partition-table-28GB-dual.img` for 32GB SD card. Make sure the corresponding file exists for your platform.
`-m`	Flashes the MCU image.
`-u uboot_feature`	Flashes U-Boot or SPL&bootloader image with `uboot_feature` in their names. For i.MX 8QuadMax MEK, it can be `secure-unlock`. For i.MX 8QuadXPlus MEK, it can be `c0` or `secure-unlock`. If this option is not used, the default `spl-imx8qm.bin` and `bootloader-imx8qm.img` are flashed for i.MX 8QuadMax MEK, and the default `spl-imx8qxp.bin` and `bootloader-imx8qxp.img` are flashed for i.MX 8Quad XPlus MEK.

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Table 4. Options for uuu_imx_android_flash tool*...continued*

Option	Description
-d dtb_feature	Flashes dtbo and vbmeta images with `dtb_feature` in their names. For i.MX 8QuadMax MEK, it can be `md`. For i.MX 8QuadXPlus MEK, do not use this option. If this option is not used, default `dtbo-imx8qm.img` and `vbmeta-imx8qm.img` are flashed for i.MX 8QuadMax MEK.
-e	Erases user data after images are flashed.
-D directory	Specifies the directory in which there are the images to be flashed. For `uuu_imx_android_flash`, it must be followed with an absolute path. If this option is not used, images in the current working directory are flashed.
-daemon	Run UUU in Daemon mode. This option is used to flash multiple boards of the same type.
-i	If the script is executed with this option, no images will be flashed. The script loads U-Boot to RAM and executes to fastboot mode. this option is used for development.
-dryrun	Only generates a UUU script but not executes UUU with this script.

- On Linux system, open the shell terminal. For example, you can execute a command as follows:
  - For i.MX 8QuadMax:

    ```
    > sudo ./uuu_imx_android_flash.sh -f imx8qm -e
    ```

  - For i.MX 8QuadXPlus (Silicon Revision C0):

    ```
    > sudo ./uuu_imx_android_flash.sh -f imx8qxp -e -u c0
    ```

- On Windows system, open the command line interface in administrator mode. The corresponding command is as follows:
  - For i.MX 8QuadMax:

    ```
    > .\uuu_imx_android_flash.bat -f imx8qm -e
    ```

  - For i.MX 8QuadXPlus (Silicon Revision C0):

    ```
    > .\uuu_imx_android_flash.bat -f imx8qxp -e -u c0
    ```

When the command above is executed, the default images will be flashed into eMMC both slot a and slot b for i.MX 8QuadMax and all user data will be erased.

Note:

- *If `uuu_imx_android_flash.bat` is used to flash images on a remote server through samba, you need to map the remote resource to the local environment first. Take the following command as an example:*

  ```
  > net use z: \\192.168.1.1\daily_images
  ```

  "z" in the command represents an available drive letter. It can be other available drive letter.

- *To test the demonstration implementation of secure unlock, execute the tool with `-u secure-unlock`. For secure unlock details, see the i.MX Android Security User's Guide (ASUG).*

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- *To test multiple displays on i.MX 8QuadMax MEK with images in* `automotive-12.0.0_2.1.0_image_8qmek_car.tar.gz,` *execute the tool with* `-d md.`
- *To test multiple displays on i.MX 8QuadMax MEK with images in* `automotive-12.0.0_2.1.0_image_8qmek_car2.tar.gz,` *execute the tool with* `-u md -d md.`

6. Wait for the `uuu_imx_android_flash` execution to complete. If there is not any error, you will get information on the command window indicating that images are already flashed.
7. Power off the board.
8. Change boot device as eMMC.
   - Change SW2 to switch the board back to 000100 (1-6 bit) to enter eMMC boot mode for i.MX 8QuadMax.
   - Change SW2 to switch the board back to 0100 (1-4 bit) to enter eMMC boot mode for i.MX 8QuadXPlus.

4   Revision History

Table 5. Revision history

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

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