恩智浦I.MX 8M系列處理器架構與功能介紹

PUBLIC

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SECURE CONNECTIONS
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AGENDA

- ◆ NXP's Win10 IoT BSP page

- ◆ i.MX Win10 BSP Docs: Release Note and User's Guide

- ◆ i.MX8M Family Highlights

NXP's Win10 IoT BSP page

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NXP'S WIN10 IOT BSP PAGE

https://www.nxp.com/design/software/embedded-software/i-mx-software/windows-10-iot-enterprise-for-i-mx-applications-processors:IMXWIN10IOT

NXP PRODUCTS APPLICATIONS DESIGN SUPPORT COMPANY

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Windows 10 IoT Enterprise for i.MX Applications Processors

IMXWIN10IOT   Receive alerts ⓘ

Overview   Software Details   Support   DOWNLOADS

NXP supports the Windows 10 IoT through board support packages (BSPs) on i.MX Applications Processors and featured development boards.

The highly optimized Windows 10 IoT BSPs on i.MX Applications platforms make it easier to build secure, scalable solutions from device-to-cloud, ranging from provisioning to managing and securing devices at scale.

Designers can easily run cloud services and gain insights from IoT devices. Windows 10 IoT on i.MX Applications Processors provides faster time-to-market with many included user interfaces and device stacks that works out of the box.

Software Details

NXP'S WIN10 IOT PAGE(CONT.)

https://www.nxp.com/design/software/embedded-software/i-mx-software/windows-10-iot-enterprise-for-i-mx-applications-processors:IMXWIN10IOT

NXP Windows 10 IoT Enterprise for i.MX Applications Processors

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Overview   Software Details   Support

DOWNLOADS

Releases

Windows Current Release

Release and Documentation	Build Sources / Binaries	Supported Platforms
W21H2-1-1-0	BSP Source Files BSP Prebuild Binaries	i.MX 8M Quad EVK i.MX 8M Mini EVK i.MX 8M Nano EVK i.MX 8M Plus EVK
Documentation i.MX Windows 10 IoT Enterprise Release notes i.MX Windows 10 IoT Enterprise User Guide		

Windows Past Release

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Release and Documentation	Build Sources / Binaries and Documentation	Supported Platforms
W21H2-1-0-0	Documentation • BSP Source Files • BSP Prebuild Binaries	• i.MX 8M Quad EVK • i.MX 8M Mini EVK
W21H2-0-9-1	Documentation BSP Source Files	i.MX 8M Quad EVK

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I.MX WIN10 BSP DOCS: RELEASE NOTE AND USER'S GUIDE

Release Note

I.MX WIN10 BSP DOCS: RELEASE NOTE

Content:

Contents

I.MX WIN10 BSP DOCS: RELEASE NOTE

BSP Change History:

1. Supported boards
2. New features
3. Fixes

2.4 6/2022 : W1.1.0

Public release for i.MX8M Nano and i.MX8M Plus platforms.

- **Supported boards:** MCIMX8M-EVK evaluation kit
    8MMINILPD4-EVK evaluation kit
    8MNANOD4-EVK evaluation kit
    8MPLUSLPD4-EVK evaluation kit

- New features:

    - **Camera driver:** OV5640 camera in J1502 connector has been supported on i.MX8M EVK board.

    - **FlexCAN driver:** FlexCAN device has been supported on i.MX8M Plus EVK by the imxcan.sys driver.

    - **I2C driver:** I2C expander (PCA6416) has been supported in iMX8BoardInit module and options "SelectCAN1InsteadOfI2C5" and "SelectCAN2InsteadOfPDMStream3" allows to configure corresponding selectors on the Base Board.

    - **GPU driver:** GPU driver has been updated to v1.1.

    - **Debug drivers:** WinDbg over Ethernet has been supported. WinDbg over ethernet requires the kd_8003_1fc9.dll library which is not distributed as a part of the BSP. Please contact Microsoft to get this library.

    - **ENET driver:** HW checksum offload has been supported in the NDIS miniport driver.

- Fixes:

    - **Audio driver:** A failure during uninstallation in the Device manager has been fixed.

    - **Display driver:** IMX-LVDS-HDMI and IMX-MIPI-HDMI converters: If a native HDMI display resolution exceeds the upper limit, the fixed maximum available resolution is set

BSP Supported Features – 1

List of supported boards, including board revision, schematics revision.

3 BSP Supported Features

The following table displays the features supported in this BSP release. If no board is explicitly mentioned, the feature is shared across All boards listed in Supported Hardware in the Release contents section; otherwise, the feature is only supported on the boards listed.

Table 3.1: Supported boards

Board name	Board revision	Schema revision	BSP name
MCIMX8M-EVK	700-29615 REV A3	SCH-29615 REV B4	NXPEVK_iMX8M_4GB
8MMINILPD4-EVK	700-31407 REV X5	SCH-3140 REV C	NXPEVK_iMX8M_Mini_2GB
8MNANOD4-EVK	700-31407 REV A3 (base board)	SCH 31407 REV C3 (base board)	EVK_iMX8MN_2GB
	700-45699 REV X3 (cpu board)	SCH-45699 REV A1 (cpu board)	
8MPLUSLPD4-EVK	700-46370 REV X1 (base board)	SCH-46370 REV A1 (base board)	EVK_iMX8MP_6GB
	700-46368 REV X2 (cpu board)	SCH-46368 REV A (cpu board)	

I.MX WIN10 BSP DOCS: RELEASE NOTE

BSP Supported Features – 2

List of supported features and which boards the feature is enabled on.

Table 3.2: Supported features

Feature	Supported board	Comment
Networking drivers		
ENET	All i.MX	• i.MX8 supports Atheros AR8031 PHY with 10/100/1000 bps mode
PCIe	All i.MX	• i.MX8 supports M.2 interface.
Sound drivers		
WM8524 codec	i.MX8M/Mini/Nano	• Supports playback
WM8960 codec	i.MX8M Plus	• Supports playback.
USB drivers		
USB Host	All i.MX	• Supports USB-A and USB-C connectors.

I.MX WIN10 BSP DOCS: RELEASE NOTE AND USER'S GUIDE

User's Guide

I.MX WIN10 BSP DOCS: USER'S GUIDE

Contents:

- Deploy image to target boards
- Build image from source
- Signing Firmware/Secure-boot

Contents

Components of Win IoT BSP:

1. NXP i.MX boot firmware and Windows driver.
2. Win IoT OS from Microsoft.
3. Firmware tools/binaries.
4. Signing tools for secure-boot.

3.1.2 The NXP i.MX Windows IoT BSP source package

The Windows IoT BSP for NXP i.MX Processors consists of multiple parts, namely:

1) The NXP i.MX BSP sources package which is available at www.NXP.com. Package contains sources for both the boot firmware and Windows drivers.
2) The iMX firmware and NXP Code Signing Tool (CST) available at www.NXP.com.
3) Open-source parts of boot firmware and tools that are not distributed as part NXP BSP package.
4) The Windows IOT Enterprise operating system provided by Microsoft.

To prepare sources for building BSP follow these steps:

Note Only steps 1-3 are required for building Windows drivers from source. All steps are required for building firmware from source.

Acquire Win IoT OS from Microsoft(with links and contact information)
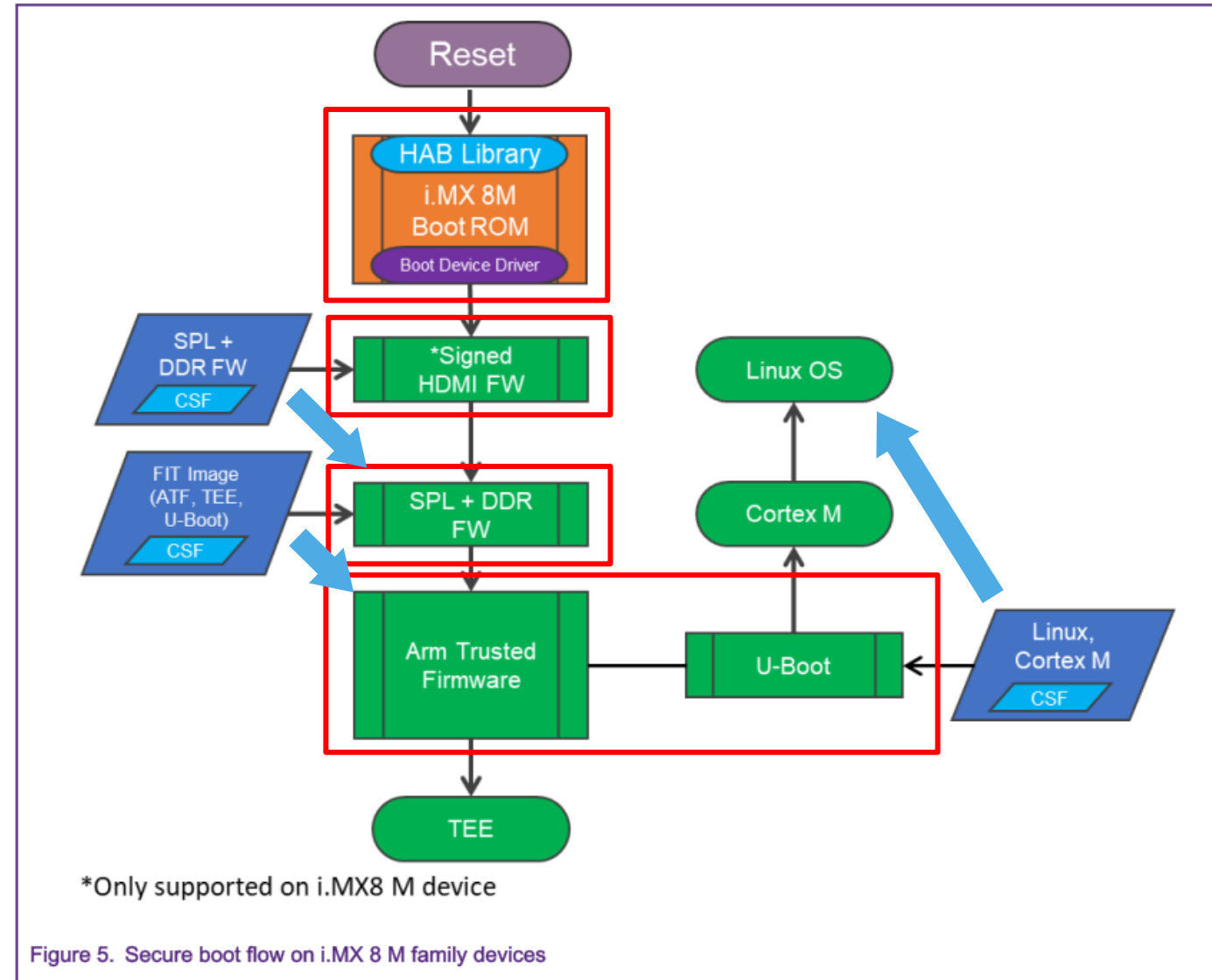
2.2 Software prerequisites

- Binary drivers and firmware (either downloaded from NXP.com or built locally)
- Windows IoT operating system. There are two options:

  - **Recommended**: Windows 10 IoT Enterprise LTSC 2021 for Arm64
    * *Preview available on Microsoft Collaborate https://partner.microsoft.com/en-us/dashboard/collaborate/packages/12392. Please contact Microsoft at WinIoT-on-NXP@microsoft.com for access*
  - Windows 10 IoT Enterprise 21H2 GAC for Arm64
    * *Please contact a Windows IoT distributor for access*

- Windows ADK 1809 https://docs.microsoft.com/en-us/windows-hardware/get-started/adk-install

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I.MX WIN10 BSP DOCS: USER'S GUIDE

Signing firmware/Secure boot: i.MX HAB(High Assurance Boot)

AN4581 -- i.MX Secure Boot on HABv4 Supported Devices

https://www.nxp.com/products/processors-and-microcontrollers/arm-processors/i-mx-applications-processors/i-mx-8-processors/i-mx-8m-family-armcortex-a53-cortex-m4-audio-voice-video:i.MX8M

Figure 5. Secure boot flow on i.MX 8 M family devices

Signing firmware – Secure boot

- eFuse inside i.MX8M Family for Key Hash, One-time program.
- eFuse inside i.MX8M Family for secure-boot enablement(default: Open/non-secure).

4 Signing Firmware

This document offers a high level overview of the various signing keys to construct the High Assurance Boot chain from Boot ROM all the way to Windows IoT Core.

4.1 High Assurance Boot

High Assurance Boot is an NXP security feature to ensure that the Boot ROM will only load code that has been signed with the correct private key. This is accomplished by creating a public/private key-pair with NXP's Code Signing Tool (CST), burning the Super Root Key Hash of the public key into SoC fuses, then signing the SPL binary with the manufacturer's private key. The private keys used for HAB **MUST BE** kept secure and secret because they are the root of trust for your device and any firmware signed with these private keys will be allowed to run.

Testing keys for development have already been generated and are available in the test_keys_no_security folder (../build/firmware/test_keys_no_security). By default all SPLs built in imx-windows-iot are signed with these keys.

- These keys are for development only and **MUST NOT** be used for production!
- To enable High Assurance Boot the Super Root Key Hash of these public keys must be burned into the SoC. This is **permanent** and no other first stage firmware except those signed with this key will be allowed to run.

The test keys folder is selected using the KEY_ROOT define in imx8.mk (../build/firmware/imx8.mk) and the specific keys in the folder are chosen in u-boot_sign.csf-template. The makefile copies u-boot_sign.csf-template into u-boot_sign.csf then fills out some build specific information. Then u-boot_sign.csf is used with CST to sign the SPL binary for High Assurance Boot.

Documentation on generating new keys can be found inside the download for the NXP Code Signing Tool: https://www.nxp.com/webapp/sps/download/license.jsp?colCode=IMX_CST_TOOL

i.MX8M Family Highlights

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I.MX8M FAMILY HIGHLIGHTS

i.MX8 Family Product Page:

https://www.nxp.com/products/processors-and-microcontrollers/arm-processors/i-mx-applications-processors/i-mx-8-processors:IMX8-SERIES?tid=vanIMX8

MX8M function matrix – Core power

Could be pin-to-pin compatible,

Details in **AN12667**

A53 multi-core

Product	i.MX 8M Quad / QuadLite	i.MX 8M Mini / Mini Lite	i.MX 8M Nano	i.MX 8M Plus
Sample / Production	Production Website – www.nxp.com/imx8m	Production Website – www.nxp.com/imx8mmini	Production Website – www.nxp.com/imx8mnano	Production Website – www.nxp.com/imx8mplus
Main CPU	2x or 4x A53 1.5GHz, **1MB L2**	1x, 2x or 4x A53 **1.8GHz**, 512KB L2	1x, 2x or 4x A53 1.5GHz, 512KB L2	2x or 4x A53 1.8-2GHz, 512KB L2
MCU/DSP	M4 266MHz	M4 400MHz	**M7 up to 750MHz**	**M7 800MHz, HiFi4 800 MHz**
DDR	x16 or x32 LPDDR4/DDR4/DDR3L	x16 or x32 LPDDR4/DDR4/DDR3L	x16 LPDDR4/DDR4/DDR3L	x16 or x32 LPDDR4/DDR4/DDR3L **Inline ECC**
GPU	3D – GC7000Lite (4 shaders) (OpenGL® ES 2.1/3.0/3.1, OpenCL™ 1.2, Vulkan)	2D – GC320 3D – GC NanoULTRA (OpenGL® ES 2.1)	GC7000UL (OpenGL® ES 2.1/3.0/3.1, OpenCL™ 1.2, Vulkan)	2D - GC520L 3D – GC7000UltraLite (OpenGL® ES 2.1/3.0/3.1, OpenCL™ 1.2, Vulkan)
AI/ML	A53, GPU (OpenCL)	A53	A53, GPU (OpenCL)	**ML Accel 2+ TOPS**
Process	28nm	14nm FinFET	14nm FinFET	14nm FinFET
Package	17x17mm, 0.65p (no microvias)	14x14mm, 0.5p (no microvias)	14x14mm, 0.5p (no microvias)	15x15mm, 0.5p (no microvias)

I.MX WIN10 BSP DOCS: RELEASE NOTE AND USER'S GUIDE

MX8M function matrix – Multi-Media

Product	i.MX 8M Quad / QuadLite	i.MX 8M Mini / Mini Lite	i.MX 8M Nano	i.MX 8M Plus
GPU	3D – GC7000Lite (4 shaders) (OpenGL® ES 2.1/3.0/3.1, OpenCL™ 1.2, Vulkan)	2D – GC320 3D – GC NanoULTRA (OpenGL® ES 2.1)	GC7000UL (OpenGL® ES 2.1/3.0/3.1, OpenCL™ 1.2, Vulkan)	2D - GC520L 3D – GC7000UltraLite (OpenGL® ES 2.1/3.0/3.1, OpenCL™ 1.2, Vulkan)
Camera	2x MIPI CSI (4-lane)	1x MIPI CSI (4-lane)	1x MIPI CSI (4-lane)	2x MIPI CSI (4-lane), **ISP 2 camera**
Display	HDMI 2.0a Tx/eDP, MIPI DSI (4-lane)	1x MIPI DSI (4-lane)	1x MIPI DSI (4-lane)	HDMI 2.0a Tx (**eARC**), MIPI DSI (4-lane), **1x LVDS (8-lane)**
Display Resolution	1x 4Kp30 or 2x1080p60 or 1x1080p60 + 2x 720p60	1 x 1080p60	1 x 1080p60	1 x 4Kp30 or 2 x 1080p60 or 1 x 1080p60 + 2 x720p60
HDR	**HDR10, HLG, Dolby Vision**	None	None	None
Video Decode	**4Kp60 HEVC**, VP9, 4Kp30 H.264, **legacy codecs**	1080p60 HEVC, H.264, VP9, VP8	None	1080p60 H.265, H.264, VP9, VP8
Video Encode	No HW acceleration	1080p60 H.264, VP8	No HW acceleration	1080p60 **H.265**, H.264

I.MX WIN10 BSP DOCS: RELEASE NOTE AND USER'S GUIDE

MX8M function matrix – Connectivity

Product	i.MX 8M Quad / QuadLite	i.MX 8M Mini / Mini Lite	i.MX 8M Nano	i.MX 8M Plus
Audio	20x I2S TDM (32b @384KHz), S/PDIF Tx+Rx	20x I2S TDM (32b @384KHz), 8ch PDM DMIC input), S/PDIF Tx+Rx	12x I2S TDM (32b @384KHz), ASRC, 8ch PDM DMIC input), S/PDIF Tx+Rx	18x I2S TDM (32b @384KHz), ASRC, 8ch PDM DMIC input), S/PDIF Tx+Rx
Expansion I/O	2x USB3.0, 2x PCIe Gen 2	2x USB2.0, 1x PCIe Gen 2	1x USB2.0	2x USB 3.0 Type C, 1x PCIe Gen 3
Network	1x Enet	1x Enet	1x Enet	1x Enet, 1x TSN Enet, 2x CAN-FD
Storage	2x SD/eMMC, MLC/SLC NAND	3x SD/eMMC, MLC/SLC NAND	3x SD/eMMC, MLC/SLC NAND	3x SD/eMMC, MLC/SLC NAND
UART	4 x UART (5Mbps)	4 x UART (5Mbps)	4 x UART (5Mbps)	4 x UART (5Mbps)
SPI, I2C	3 x SPI/4 x I2C	3 x SPI/4 x I2C	3 x SPI/4 x I2C	3 x SPI/6 x I2C
PWM	4 x PWM	4 x PWM	4 x PWM	4 x PWM

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