

Introducing NXP's i.MX 8M Nano Applications Processor

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Consumer and Industrial i.MX Applications Processors

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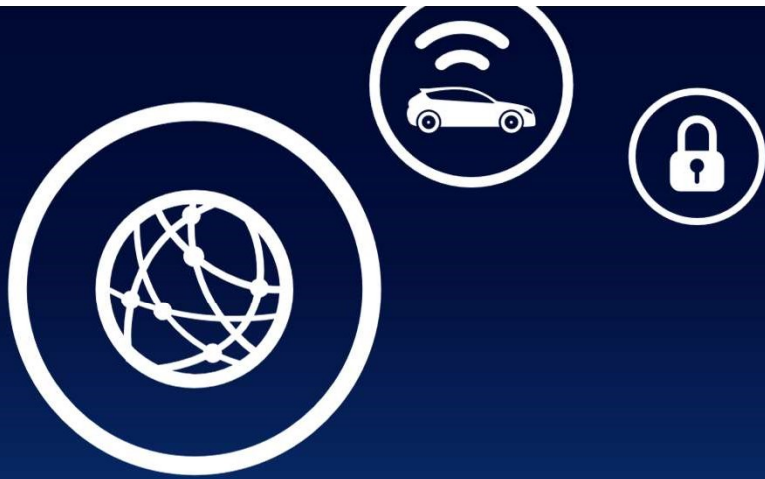


SECURE CONNECTIONS
FOR A SMARTER WORLD

PUBLIC

Agenda

- Extending decades of success in i.MX
- Meet the i.MX 8M Nano; NXP's newest applications processor for edge computing
- Addressing your design challenges; i.MX 8M Nano best practices for system design
- Real world application examples of how you can use i.MX 8M Nano in your product
- NXP and its partner ecosystem gets your i.MX 8M Nano development on the fast-track



Extending Decades of Success in i.MX Applications Processing



Why i.MX?

Trust. Scalability. Support

SECURE CONNECTIONS FOR THE SMARTER WORLD

Everything
Smart



40B+ devices with
intelligence shipped in 2020

Processing

Automotive

Everything
Connected



1B+ additional consumers online,
30B+ connected devices

Connectivity

Industrial

Connected Devices

Everything
Secure



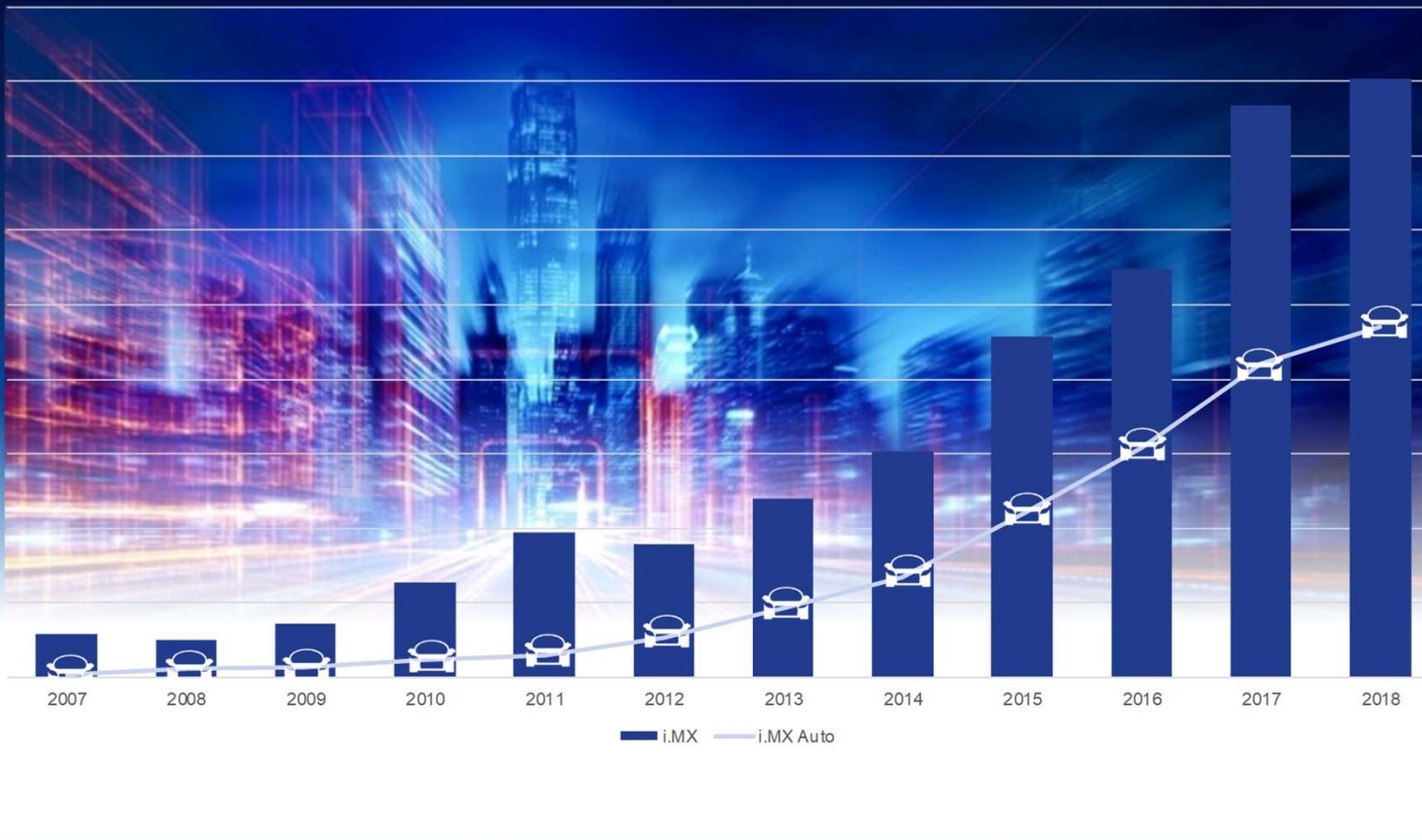
Potential economy savings
up to half trillion dollars

Security

IoT

i.MX – Trust. Scalability. Support. Longevity.

Industry-leading Portfolio of Arm® Cortex-A General Purpose MPUs



- i.MX21
- i.MX23
- i.MX25
- i.MX27
- i.MX28
- i.MX31
- i.MX35
- i.MX50
- i.MX51
- i.MX53
- i.MX 6Q
- i.MX 6D
- i.MX 6QP
- i.MX 6DP
- i.MX 6DL
- i.MX 6S
- i.MX 6SX
- i.MX 6SL
- i.MX 6SLL
- i.MX 6UL
- i.MX 6ULL
- i.MX 6ULZ
- i.MX 7S/D
- i.MX 8M

New in 2019!

- i.MX 8M Mini
- i.MX 8M Nano
- i.MX 8QM
- i.MX 8QP
- i.MX 8X
- i.MX 7ULP

i.MX – Trusted Long-term Supplier

Product Longevity



The Product Longevity program ensures a stable supply of products for your embedded designs.

Participating products are available for a minimum of 10 years from product launch (15 years from product launch for many products developed for the automotive, telecom and medical segments), and are supported by standard end-of-life notification policies.

- NXP understands that your applications require product longevity
 - Design cycles can be extensive due to required end-product certifications
 - Many industrial devices are required to ship for many years post-certification
- NXP has committed to 10- and 15-year supply longevity options
 - Formal program with products listed at www.nxp.com/productlongevity

i.MX – For Extreme Operating Conditions

- Minimum 10-year product operating life with continuous operation
 - Product operating life application notes available on www.nxp.com
- Extreme temperature conditions for industrial
 - As low as -40°C junction temperature for cold start
 - Up to 105°C junction temperature for hot operation
- Low power consumption for **fanless designs** achieved through process technology selection, design innovation, dedicated hardware accelerators, and software optimizations
- Small footprint for **space-constrained designs**
- Automotive options **on some devices** (AEC-Q100) as well as extended temperature operating conditions (up to 125°C junction temperature)



NXP and i.MX – Trusted Security Partner

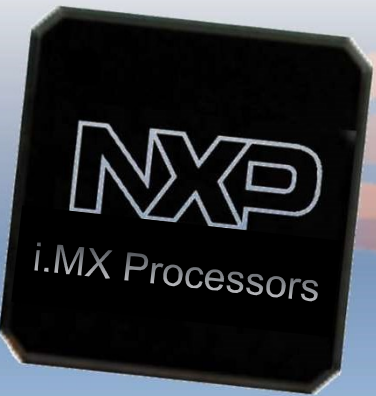


i.MX Market Leading Ecosystem and Support

Professional
Engineering Services



Commercial
Software Products



NXP
i.MX Enablement

i.MX Factory Support

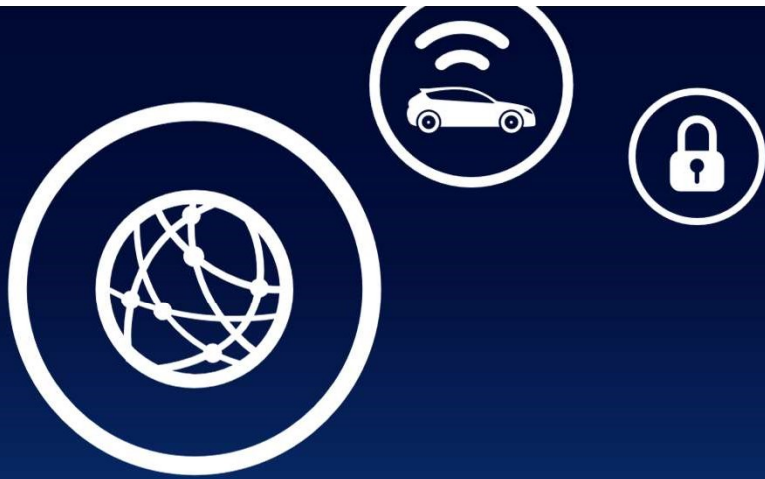
i.MX Field Support

1000's of Customers

100's of Partners

NXP Greater than 4,000 members
3500 new pieces of content added every year
Forums – Discussions – Groups – Blogs Posts – News – Multimedia Gallery – Training

Built to support **thousands of customers** with **world-class** enablement, ecosystem, community, services and field resources



Meet the i.MX 8M Nano

NXP's Newest Quad-core Applications Processor for Secure, Intelligent and Cost-Effective Edge Computing

i.MX 8M Family: Extends Across Multiple Applications

i.MX 8M family

A53

M4/M7

Advanced Computing, Audio/Video & Voice

- High Performance Computing
- Video Encode/Decode
- 3D GPU
- Display/Camera
- High Speed Interfaces
- High-end Audio Support
- Hardware Scalability
- Software Scalability
- Industrial and Consumer

Similar 'look and feel' to the popular i.MX 6 series, but with upgraded performance and features

i.MX 8M

- 8M Quad
- 8M QuadLite
- 8M Dual

NOW

i.MX 8M Mini

- 8M Mini Quad
- 8M Mini QuadLite
- 8M Mini Dual
- 8M Mini DualLite
- 8M Mini Solo
- 8M Mini SoloLite

NOW

i.MX 8M Nano

- 8M Nano Quad
- 8M Nano QuadLite
- 8M Nano Dual
- 8M Nano DualLite
- 8M Nano Solo
- 8M Nano SoloLite

NOW

Pin-to-pin Compatible

Software Compatible



i.MX 8M Nano Key Features

Secure, Connected, Cost-Effective Edge Processing



Power Efficient and Scalable Performance

- Built in 14LPC FinFET
- 1x-4x Cortex-A53 up to 1.5GHz per core
- Cortex-M7 up to 750MHz for task offload, power optimizations, security
- Pin-compatible with i.MX 8M Mini applications processor



Media-rich: Graphics, Audio, User Interface

- 3D GPU supports OpenGL® ES2.0/3.0/3.1, Vulkan®, OpenCL™ 1.2
- 1080p display (MIPI-DSI)
- Camera input (MIPI-CSI)
- USB 2.0, 10/100/100 Ethernet with IEEE1588 and AVB timestamping
- Advanced audio support includes hardware ASRC



Size- and Cost-optimized System Design

- Cost optimized package delivers 6-layer board design with no microvias
- Support for LPDDR4, DDR4, DDR3L memory
- Direct connection of PDM microphones
- NXP supported Android and Linux BSPs, and other enabling software



Industrial and Commercial, Longevity of Supply

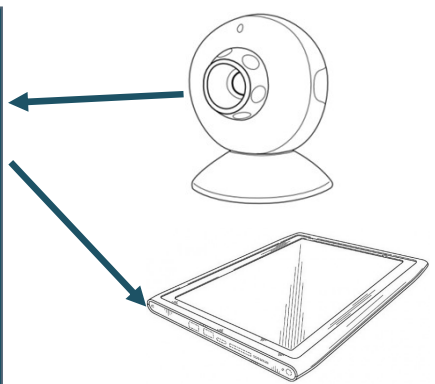
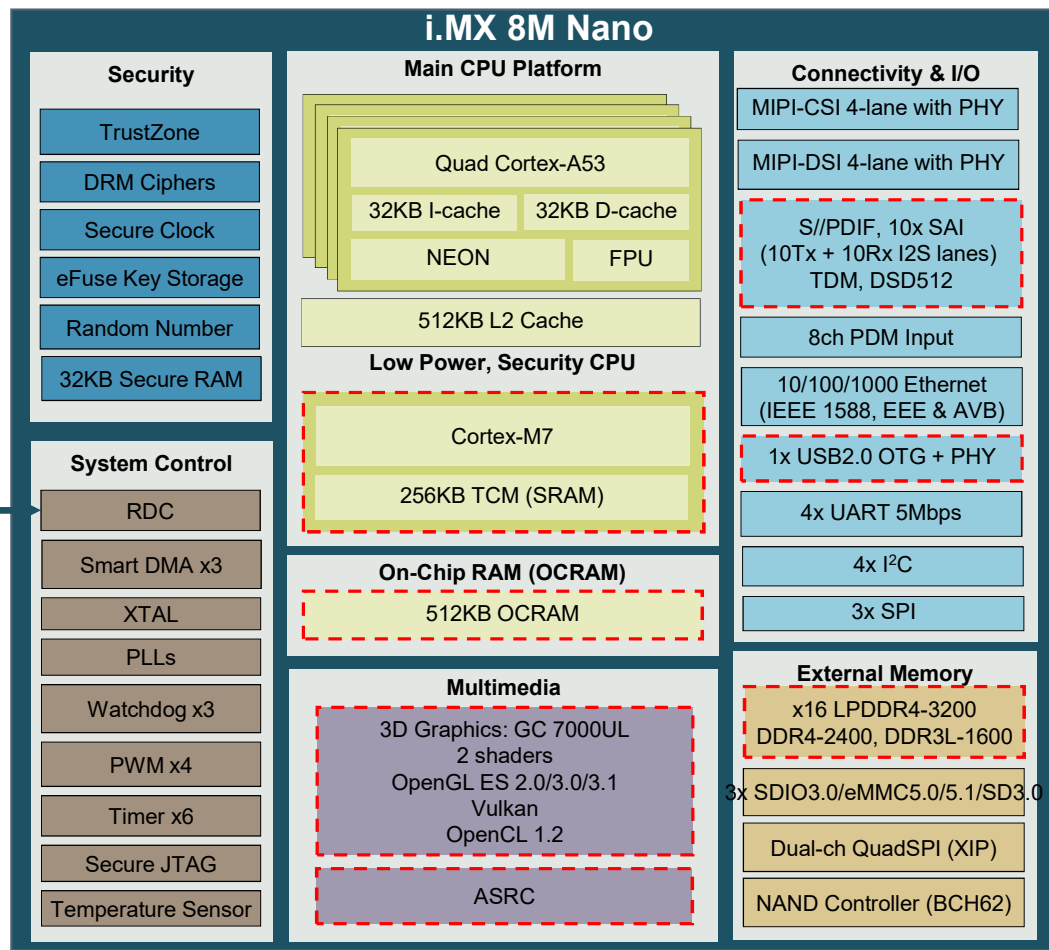
- Up to -40C to 105C junction temperature and qualification for industrial
- Up to 10 year continuous operation for industrial
- Minimum 10 year supply longevity on commercial and industrial devices

Looking Inside the i.MX 8M Nano



i.MX 8M Nano Provides Connectivity and Performance

RDC (resource domain controller) enables flexible, secure mapping of peripheral to Cortex-A or Cortex-M core



Package

- FCBGA 14x14mm, 0.5mm pitch de-pop array

Qualification

- Consumer (0 to +95C)
- Industrial (-40C to +105C, 10yr 24/7) applications

Longevity

- 10yr longevity program (minimum)

Differences to i.MX 8M Mini

i.MX 8M Nano Target Applications

Smart Building Control and Automation, HMI, Appliances, Healthcare, Audio, Intelligent Edge Processing



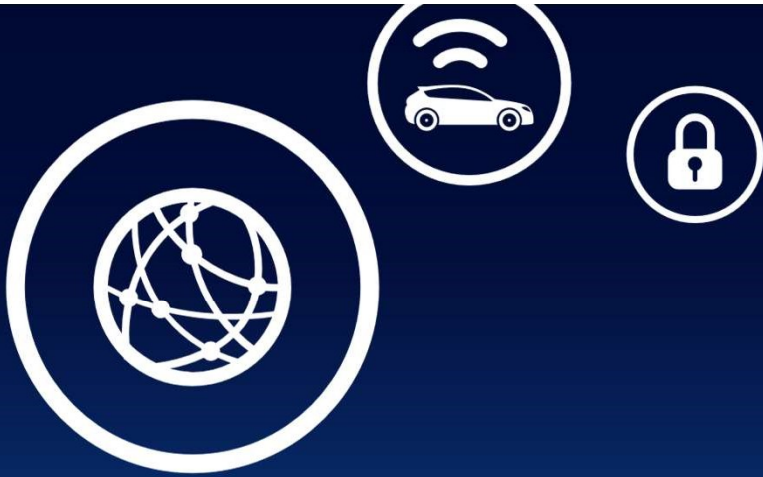
- Portable audio devices
- Networked speakers
- Wireless speakers
- Voice assistance
- Soundbars
- Audio/video receiver
- Public address systems

- Smart appliances
- Video doorbell
- Smart lighting control
- HVAC climate control
- IoT gateway
- Service robot, e.g. vacuum, mower, cleaner
- Elevator control panel

- Barcode or image scanner
- Industrial printer
- Ruggedized HMI
- Machine visual inspection
- Factory automation
- Test and measurement
- Mobility and logistics

- Mobile patient care, e.g. infusion pump, respirator
- Blood pressure monitor
- Activity/wellness monitor
- Exercise equipment





Addressing your design challenges

i.MX 8M Nano best practices for system design

Design Challenge #1: Memory Selection



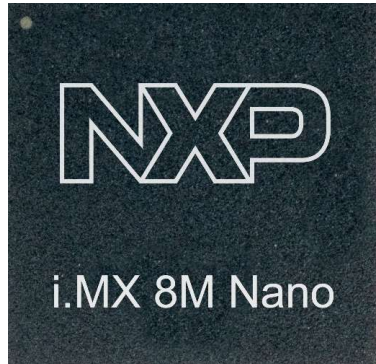
Feature	DDR3L	DDR4	LPDDR4
Advantages	<ul style="list-style-type: none"> Lowest density offering (today) 	<ul style="list-style-type: none"> More performance than DDR3L Lower power than DDR3L 	<ul style="list-style-type: none"> Highest performance Lowest run and idle mode power suits power-constrained applications
Bus Width	x8, x16	x4, x8, x16	x16
Voltage	1.35V	1.2V	1.1V
Maximum Speed	2133MT/s <small>*i.MX 8M Nano supports 1600MT/s</small>	3200MT/s <small>*i.MX 8M Nano supports 2400MT/s</small>	4267MT/s <small>*i.MX8M Nano supports 3200MT/s</small>

Considerations when selecting your memory may include:

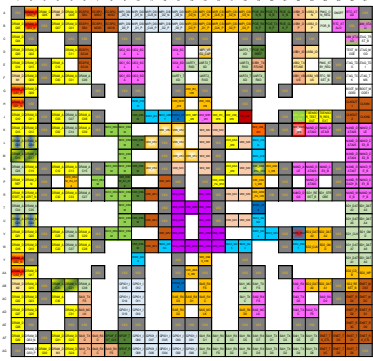
- Available density (low, high)
- Memory cost
- Performance
- Lowest power
- Longevity

NXP enables all three memory types on the i.MX 8M Nano, with software enablement and proven reference designs

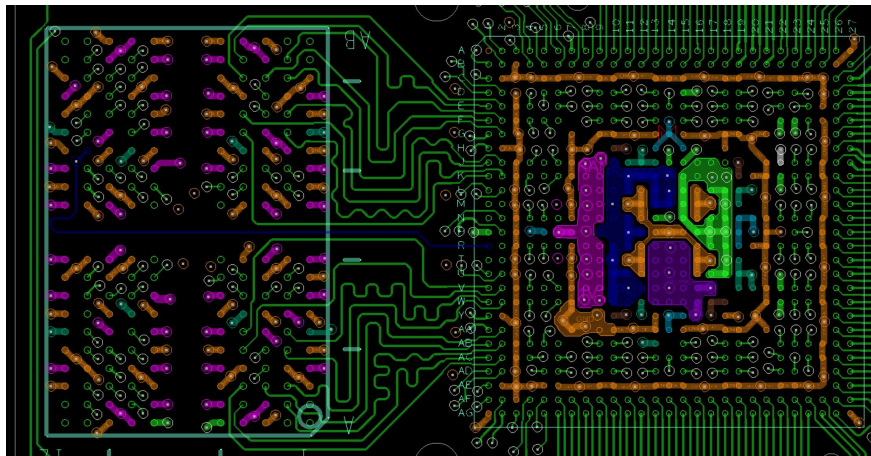
Design Challenge #2: PCB Design and Layout



Top View



Bottom View



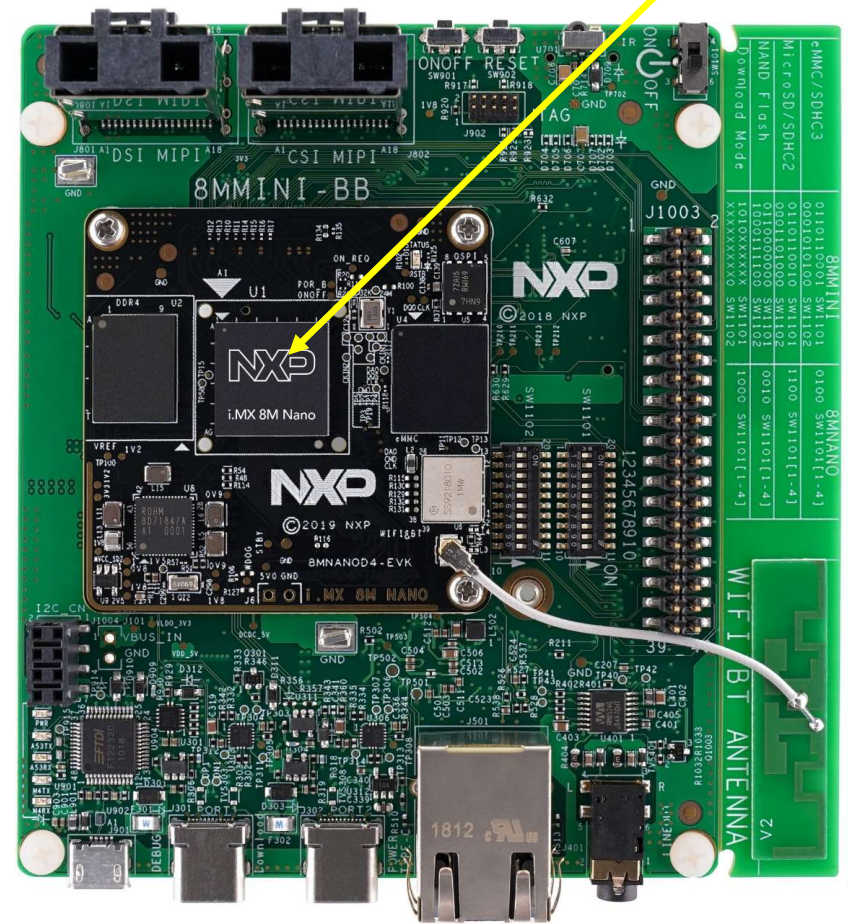
Example Layout

- The i.MX 8M Nano package has been designed to address both size and manufacturability
- Delivered in a 14x14mm BGA package, 0.5mm pin pitch, 486 pins, with de-populated array:
 - Enables 6-layer board design with high-speed DDR (saves \$)
 - Can use low cost drilled vias; no high-cost laser microvias are required (saves \$)
 - 3.2 mil trace and space escape (manufacturability)
 - Optimized power placement accommodates decoupling capacitors under the BGA (efficiency)
- NXP provides reference schematics and layouts on NXP.com to help you implement our design know-how and best practices

Design Challenge #3: Designing for Scalability

i.MX 8M Nano

- Design your hardware once, scale your product performance and features
- Same base board (8MMINI-BB) used in both EVKs
- Same compute module design, different memory chip, different SoC (i.MX 8M Nano or i.MX 8M Mini)
- Further scalability through part number selection (i.MX 8M Nano – number of Cortex-A53 cores, GPU) (i.MX 8M Mini – number of Cortex-A53 cores, VPU)
- Design compatibility guide and NXP proven reference design available to you at www.nxp.com/8mnanoevk



i.MX 8M Nano Applications Processors

Cost-optimized, high-performing applications processor for consumer and industrial applications

Voice Assistants

AI, Machine Vision

Industrial IoT

Edge Compute



i.MX 8M Nano Quad
i.MX 8M Nano Dual
i.MX 8M Nano Solo



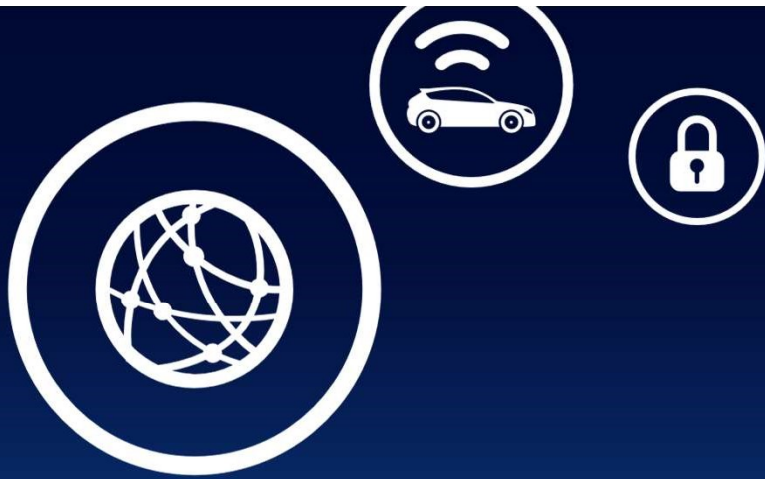
i.MX 8M Nano QuadLite
i.MX 8M Nano DualLite
i.MX 8M Nano SoloLite

Up to 15,000 DMIPS

Up to 15,000 DMIPS

	ARM CPU Cortex-A53 Cortex-M7	Video	3D GPU	Display / Camera	Audio I/O	Connectivity I/O
<ul style="list-style-type: none"> A53 up to 1.5GHz Quad – 4x A53 Dual – 2x A53 Solo – 1x A53 M7 up to 750MHz 	<ul style="list-style-type: none"> No hardware video acceleration – can implement in SW 	<ul style="list-style-type: none"> 2 Vec4 Shader OpenGL® ES 2.0/3.0/3.1 Vulkan OpenVG 1.1 OpenCL™ 1.2 	<ul style="list-style-type: none"> Single display MIPI-DSI 4-lane MIPI-CSI 4-lane 	<ul style="list-style-type: none"> >20-channels 32-bits @ 768kHz DSD512, TDM SPDIF Tx & Rx 8-ch PDM MIC ASRC 	<ul style="list-style-type: none"> 1x USB 2.0 3x SDIO 1x GbE x16 LPDDR4, DDR4, DDR3L 	
<ul style="list-style-type: none"> A53 up to 1.5GHz Quad – 4x A53 Dual – 2x A53 Solo – 1x A53 M7 up to 750MHz 	<ul style="list-style-type: none"> No hardware video acceleration – can implement in SW 	<div style="background-color: #003366; color: white; padding: 2px; text-align: center;">No HW graphics acceleration</div>	<ul style="list-style-type: none"> Single display MIPI-DSI 4-lane MIPI-CSI 4-lane 	<ul style="list-style-type: none"> >20-channels 32-bits @ 768kHz DSD512, TDM SPDIF Tx & Rx 8-ch PDM MIC ASRC 	<ul style="list-style-type: none"> 1x USB 2.0 3x SDIO 1x GbE x16 LPDDR4, DDR4, DDR3L 	

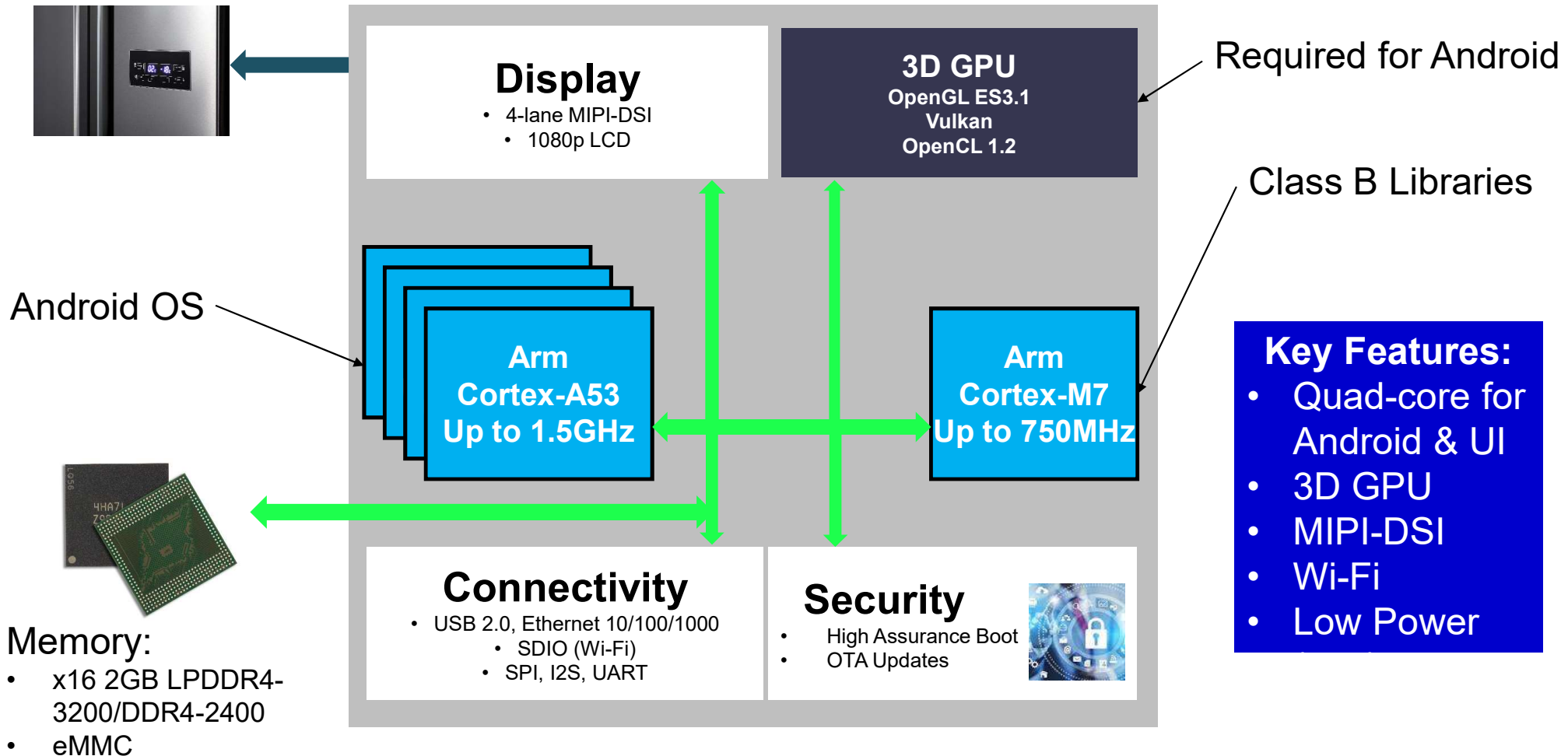




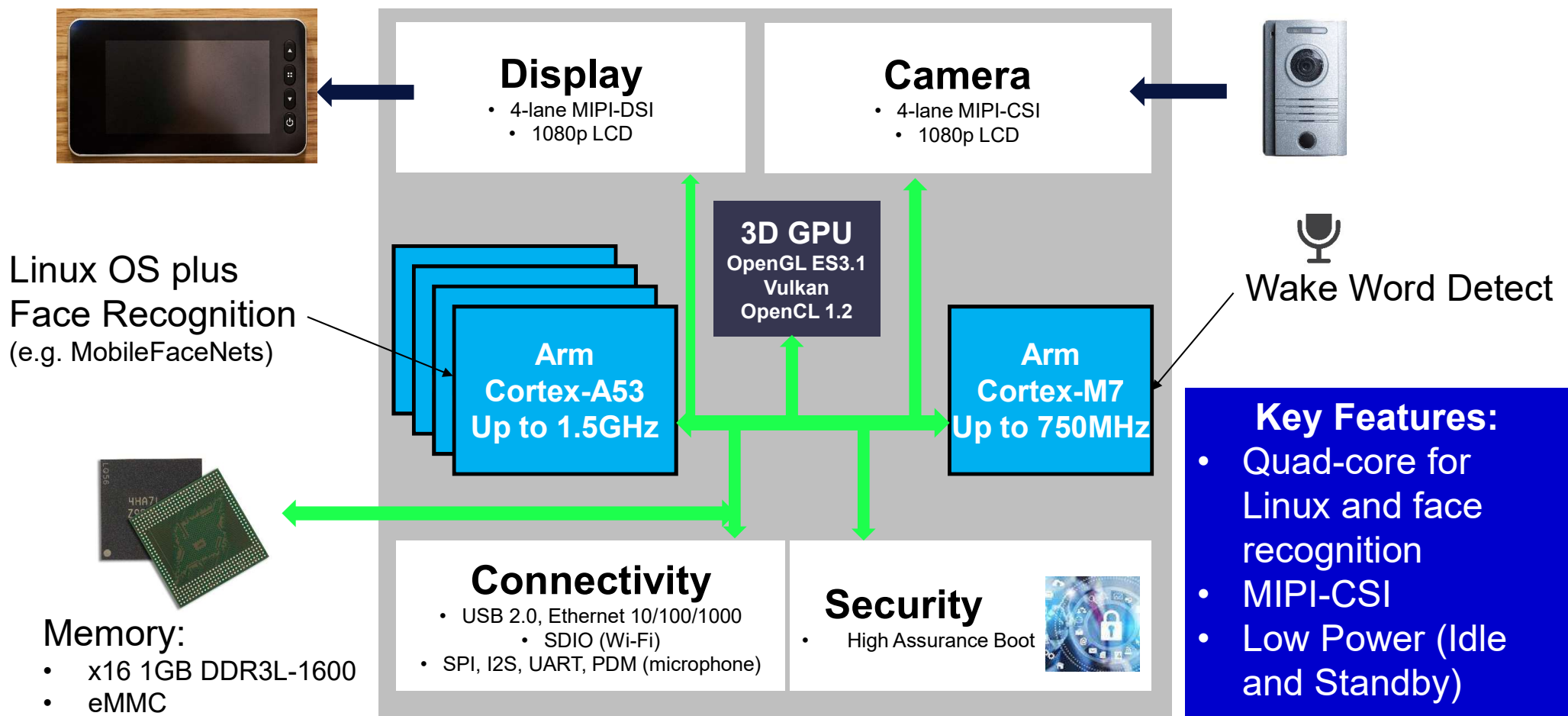
Real world application examples

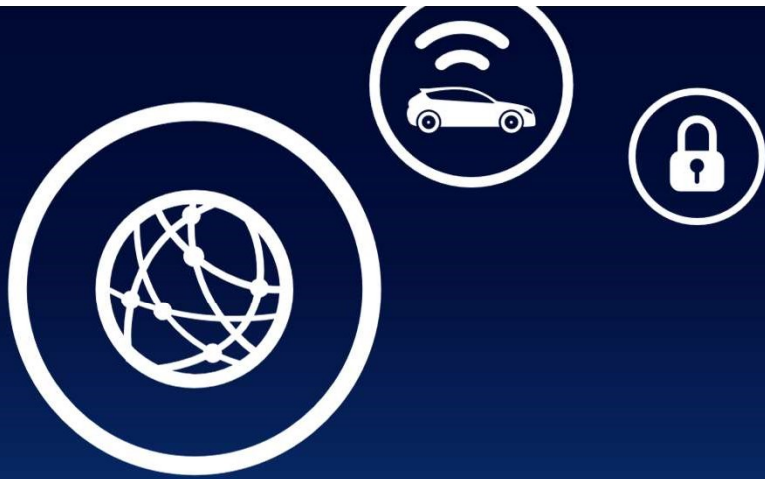
Ideas for how you can use i.MX 8M Nano in your product

i.MX 8M Nano for Smart Connected Appliances



i.MX 8M Nano for Smart Access Control





Fast-track your i.MX 8M Nano design

NXP and its partner ecosystem gets your i.MX 8M Nano development on the fast-track with boards, software and design collateral

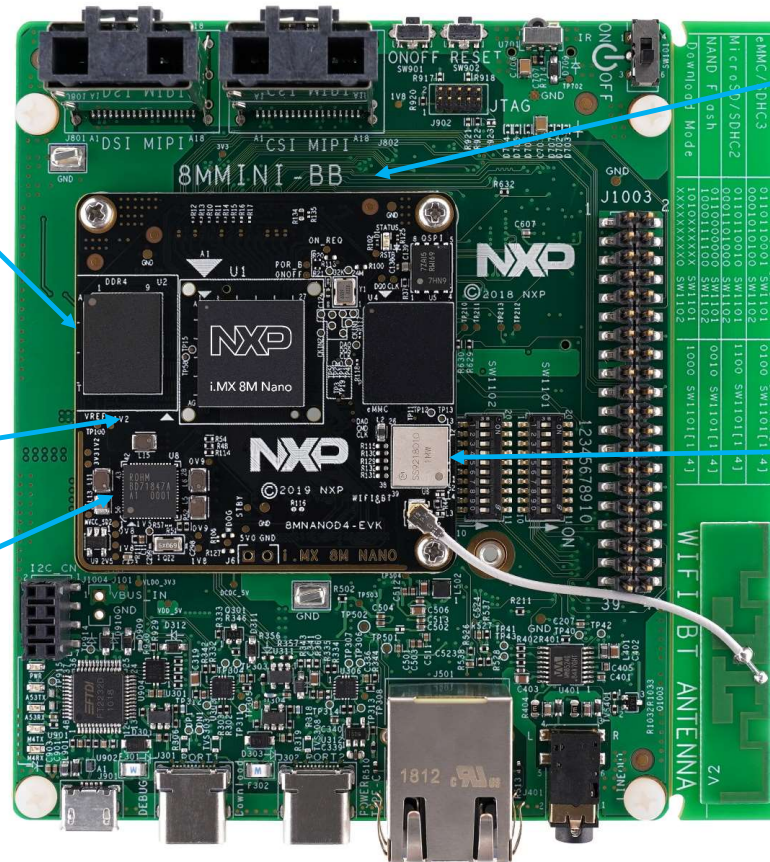
How NXP Gets You Up and Running Fast with i.MX 8M Nano

High-speed DDR4-2400 design is implemented and proven

- LPDDR4 reference design also available on NXP.com

6-layer board design with i.MX 8M Nano, no microvias needed

BOM optimized PMIC with proven software enablement



Pin-compatibility with i.MX 8M Mini lets you re-use your same base design

Wi-Fi/BT module soldered down on compute module, enabled out-of-the-box

- Multiple Wi-Fi/BT module vendors can be enabled



i.MX 8M Nano Evaluation Kit

Available NOW

Part Number:

1. 8MNANOD4-EVK i.MX 8M Nano / DDR4 / eMMC / Type1MW (CYW43455)



The EVK Un-boxed



Kit Contents

- i.MX 8M Nano board.
- MIPI-DSI to HDMI adapter board with 8" mini-SAS cable.
- USB Micro-B cable.
- USB Type-C cable.
- USB Type-C to A adapter.
- USB Type C power supply.
- Android BSP image pre-programmed.

EVK: Compute Module

- NXP i.MX 8M Nano Quad
- Wi-Fi/BT module:
 - Murata Type 1MW (CYW43455)
 - Dual band 2.4G/5G
 - 802.11a/b/g/n/ac (1x1)
 - BT/BLE 5.0
 - NXP Wi-Fi in 1Q20
- PMIC
 - LPDDR4 reference schematics available
 - DDR3L reference schematics in 2Q20
- 16GB eMMC 5.1
- 64MB QSPI Flash
- 6-layer PCB, No HDI
- Size 2"x2"
- Not sold separately.

EVK: Base Board

- Same base board for i.MX 8M Mini and i.MX 8M Nano
- Display Connector: 1x mini-SAS MIPI-DSI
- Camera connector: 1x mini-SAS MIPI-CSI
- Audio DAC (WM8524)
- Microphone/headphone jacks
- 1x full-size SD/MMC card slot
- 10/100/1000 Ethernet port (AR8031 Gigabit PHY)
- 1x USB 3.0 Type C
- Connectivity expansion connector:
 - M.2 connector
- Audio expansion connector:
 - FPC 0.5mm pitch 60pin ZIF
 - UART, I2S
- General purpose expansion connector (RPI-like):
 - UART, I2S
 - NXP PN7150RPI board supported via this interface
- Size 4.2"x4.2"

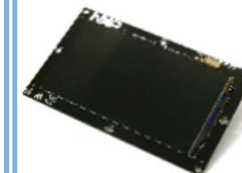
OS Support

- Linux 4.14 (5.4 in 2020)
- Android 9 (Android 10 in 2020)
- FreeRTOS (Cortex-M)
- Others: 3rd parties

Optional Add-ons



OV5640 5Mpix
MIPI CSI camera
miniSAS based
MINISASTOCSI



OLED
MIPI DSI panel
miniSAS based
5.5", 1920 x 1080
MX8-DSI-OLED1



i.MX 8M Nano Embedded Board Solutions Available Today!

Board Partner	Website
Boundary Devices	https://www.boundarydevices.com/
Variscite	https://www.variscite.com/
Digi	https://www.digi.com
Ka-Ro	https://www.karo-electronics.com
Toradex	https://www.toradex.com
Congatec	https://www.congatec.com/
BCM	https://www.bcmcom.com/

i.MX 8M Nano – Get Started Today!



- www.nxp.com/imx8mnano
 - Product documentation
 - Ordering information

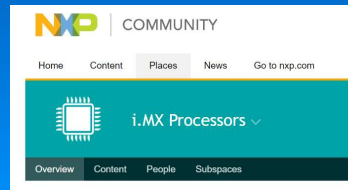


- www.nxp.com/imx8mnanoevk
 - Design files (DDR4, LPDDR4)
 - Hardware design guides
 - Ordering information



ANDROID

- www.nxp.com/imxsw
 - Linux and Android BSPs
 - Programming tools, pinmux tools, code-signing tools



- www.nxp.com/imxcommunity
 - Engineering technical support



A World of Smart Possibilities

i.MX 8M Nano Applications Processors for Smart Homes, Buildings and Industries

NXP

SECURE CONNECTIONS
FOR A SMARTER WORLD

