

Microcontrollers



ARM

Kinetis and LPC Microcontrollers

- #1 MCU Supplier, offering ARM Cortex-M0+, M3, M4 and M7 MCUs
- **Kinetis & LPC** for consumer and industrial markets

Application Processors



ARM

i.MX Applications Processors

- HMI, Display, Multimedia, Image Processing Leader
- **i.MT RT Crossover Processors:** highest performance embedded processor based on Cortex-M7
- Power efficiency, battery operation



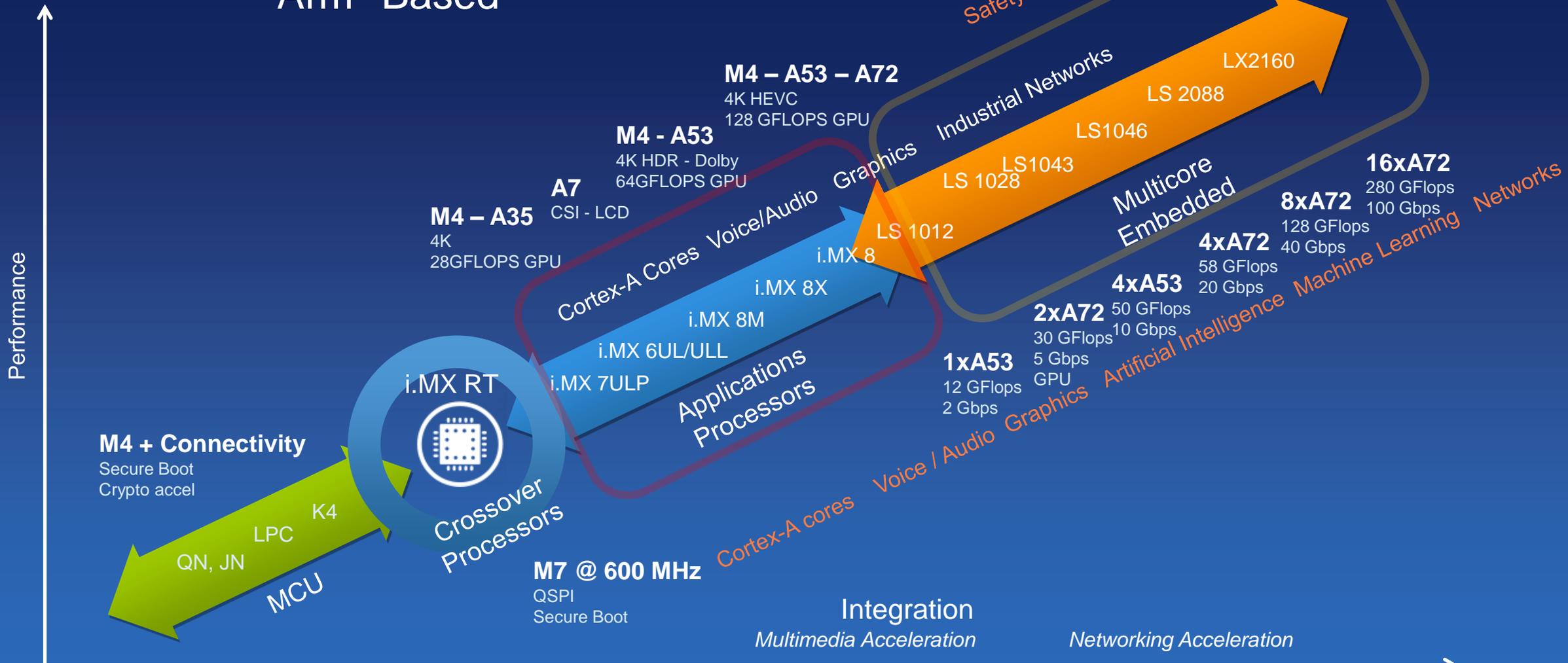
ARM

QorIQ Layerscape Multicore Processors

- 1 to 24 cores, 1-10 GB Ethernet
- Highest performance fanless operation
- Industry leading security and integration

NXP Scalable Industrial & IoT Processing Continuum

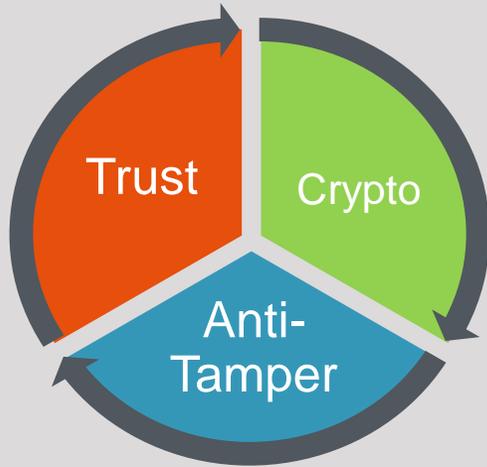
Software compatibility & ease-of-use
 Arm® Based



NXP'S ARM® CORTEX®-M PORTFOLIO

 <p>Performance & Integration</p>	<p>i.MX RT Crossover Processor for Ultimate Performance & Extensibility</p> <ul style="list-style-type: none"> • 600 MHz with advanced HMI and real-time control • Highest performance (3020 CoreMark/ 1284 DMIPs); Arm® Cortex®-M7 M33 • From 128KB to 5MB SRAM with unlimited extensibility (Quad/Octal SPI flash) 	<p>Available Q2 '19</p> <ul style="list-style-type: none"> • i.MXRT1060 1st AVS certified MCU 	<p>Coming next</p> <p>From \$1 to 1GHz</p> <ul style="list-style-type: none"> • i.MX RT1010 <\$1 • i.MX RT1170 1GHz
 <p>Mainstream Efficiency</p>	<p>LPC5500 MCU Series for Unrivalled Compute Efficiency</p> <ul style="list-style-type: none"> • ≥ 100 MHz, Cortex-M33, Arm TrustZone® technology and DSP acceleration • Enhanced security & accelerators • Balance power and performance (150-500 DMIPs) Cortex-M33 	<p>Available Q2 '19</p> <ul style="list-style-type: none"> • LPC55S6x, first Cortex-M33 to market, based on cost & performance efficient 40nm technology 	<p>Coming next</p> <ul style="list-style-type: none"> • Path to lower cost • Increased MIPS • More integration (Memory, analog, graphic eng., CAN)
 <p>Ultra-low Power</p>	<p>K32 L MCU Series for Extended Battery Life</p> <ul style="list-style-type: none"> • < 100 MHz, fast wake-up, security, & high-precision analog • Target low leakage across operating range (40-120 DMIPs); Cortex-M4 & M0+ • From 32KB to 1MB internal flash and 4-8:1 Flash to SRAM ratio 	<p>Available Q3 '19</p> <ul style="list-style-type: none"> • Introduced first L3 power optimized, dual-core superset 	<p>Coming next</p> <ul style="list-style-type: none"> • Path to lower cost with scalable L2 family based on Cortex-M0+
 <p>Value</p>	<p>LPC800 MCU Series for Entry-Level 8-bit Alternative</p> <ul style="list-style-type: none"> • ≤ 30 MHz with range of features & package options • High power efficiency (10-50 DMIPs) Cortex-M0+ • From 8KB to 64KB internal flash and 4-8:1 Flash to SRAM ratio 	<p>Available Q2 '19</p> <ul style="list-style-type: none"> • LPC84x, LPC82x, LPC81x, LPC80x all MP • Added WLCS (LPC802 and LPC804) 	<p>Coming next</p> <ul style="list-style-type: none"> • Looking at expansion options for memory, security and analog
 <p>Vertical Focus</p>	<p>KE/KV/KM & S32K for their Target markets</p> <ul style="list-style-type: none"> • KE: 5V/Robust/Touch/CAN • KV: High Performance Control • KM: Metering and Metrology 	<p>Available Q2 '19</p> <ul style="list-style-type: none"> • Introduced 32 – 64KB KE version with CAN & Touch • KE, KV, KM in many different variants 	<p>Coming next</p> <ul style="list-style-type: none"> • Increasing memory on KM

Product Longevity



I.MX APPLICATIONS PROCESSOR VALUES

- **Trusted Supply**
 - Product longevity: Minimum 10 to 15 years
 - Security and safety: Hardware acceleration, software
 - Reliability: Zero-defect methodology, ULA, low SER FIT
 - Quality: Automotive AEC-Q100, Industrial/Consumer JEDEC
- **Scalability for Maximum Platform Reuse**
 - Pin compatibility and software portability
 - Integration: CPU (single/dual/quad, asymmetric), GPU, IO
 - Manufacturability: 0.65 to 0.8mm pitch, fewer PCB layers
- **Support and Enablement**
 - Software: Linux, Android, Windows-embedded, RTOS
 - Industry-leading partners and support community
 - System solutions: Voice, Video, Vision, Machine Learning, Sensors, Power Management, Connectivity



i.MX

APPLICATIONS PROCESSORS

- Arm Cortex-A class and Cortex-M cores
- 600 MHz to 2 GHz performance
- Thousands of applications
- Full open-source OS platforms



The Best of Both Worlds

- Arm Cortex-M cores
- Performance up to 300 MHz
- Embedded memory
- Easy to use tools
- RTOS support



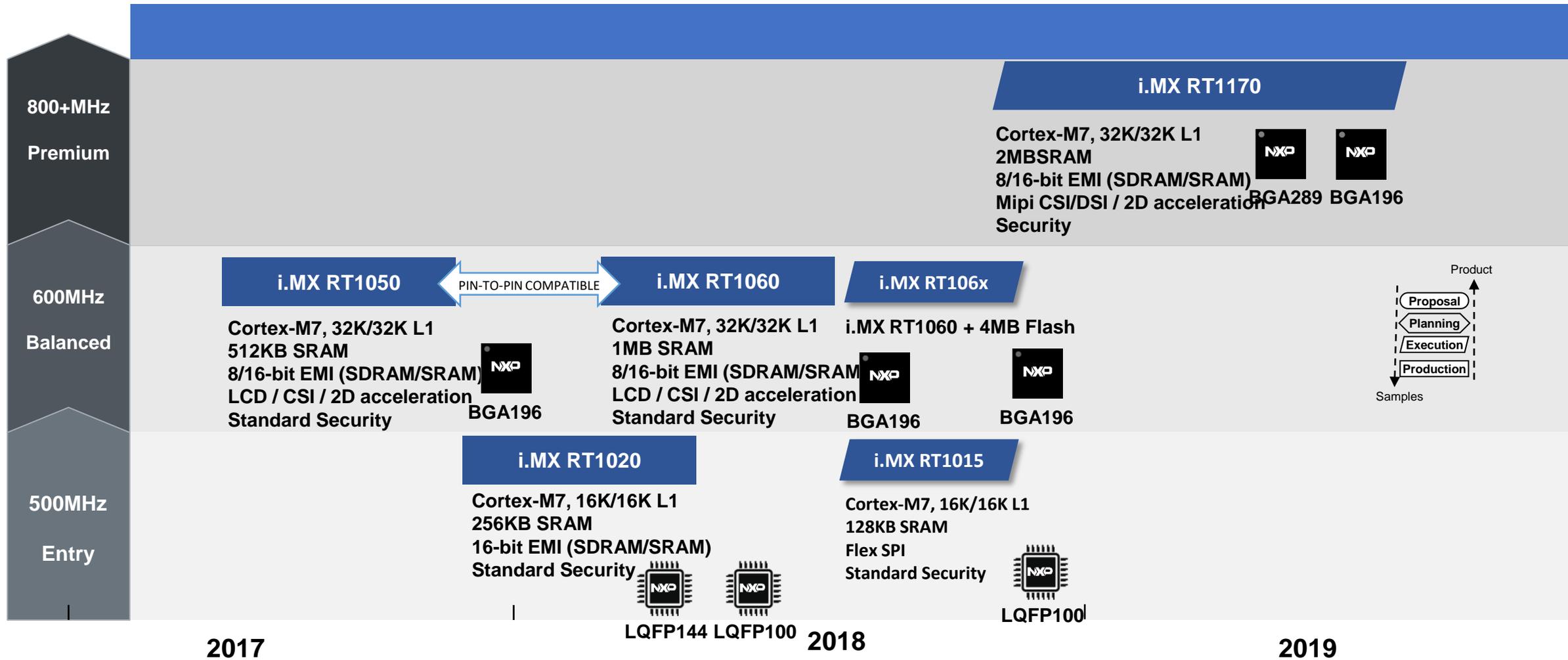
MCUXpresso

RTOS

KINETIS & LPC
MCUs



CROSSOVER MPU (I.MX RT) ROADMAP



i.MX RT SERIES KEY HIGHLIGHTS



High Performance Real-time Processing

- Cortex-M7 up to 600MHz (50% faster than current existing M7 products)
- 20ns interrupt latency
- Up to 1MB On Chip SRAM
- Up to 512KB Tightly Couple Memory



High Level of Integration

- High Security enabled by AES-128, HAB and On-the-fly QSPI Flash Decryption
- 2D graphics acceleration engine with Parallel CSI
- LCD display controller up to WXGA (1366x768)
- Audio interface with three I2S for multichannel high performance audio
- Up to 2x Ethernet and 1x CANFD



Low BOM Cost

- Competitive Pricing – starting @ 1.48k RSL
- Fully integrated PMIC with DC-DC
- Low cost packages enabling 4 layer (BGA) & 2 layer (LQFP) PCB design
- SDRAM interface



Easy to Use

- MCU customers can leveraging their current toolchain (MCUXpresso, IAR, Keil)
- Rapid and easy prototyping and development with NXP FreeRTOS, SDK, ARM mbed and the global ARM ecosystem
- Single voltage input simplifies power circuit design
- Scalability to Kinetis & i.MX products

i.MX RT1010 Family



Consumer

- Smart connected appliances
- Guitar pedals
- Professional microphone
- Camera



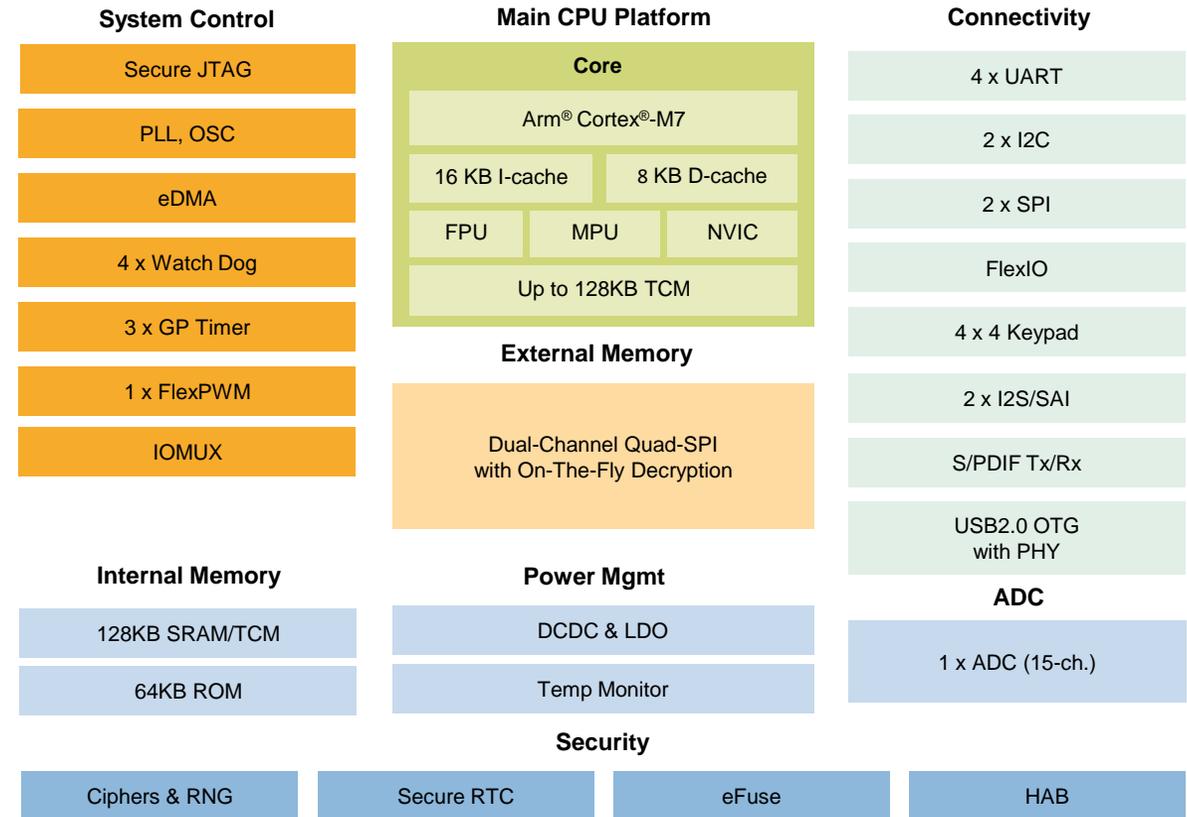
Smart Home

- Door locks
- Smart thermostats
- Lighting control
- Security systems

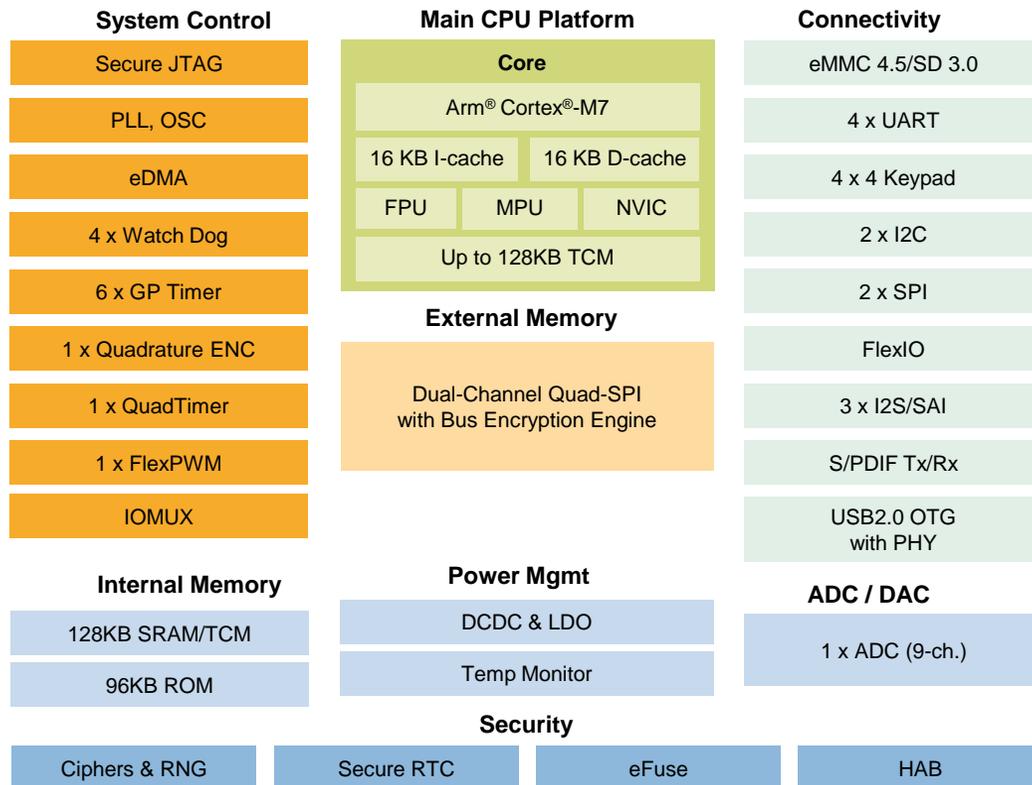


Industrial

- Factory automation
- Robotics
- Programmable Logic controller
- Unmanned vehicles (ground, air, water)



I.MX RT1015 BLOCK DIAGRAM



High Performance and Integration

- Cortex-M7 up to 500MHz with 16KB/16KB I/D cache
- High Speed USB with PHY
- Security (On-The-Fly FlexSPI decryption)
- Rich Audio features

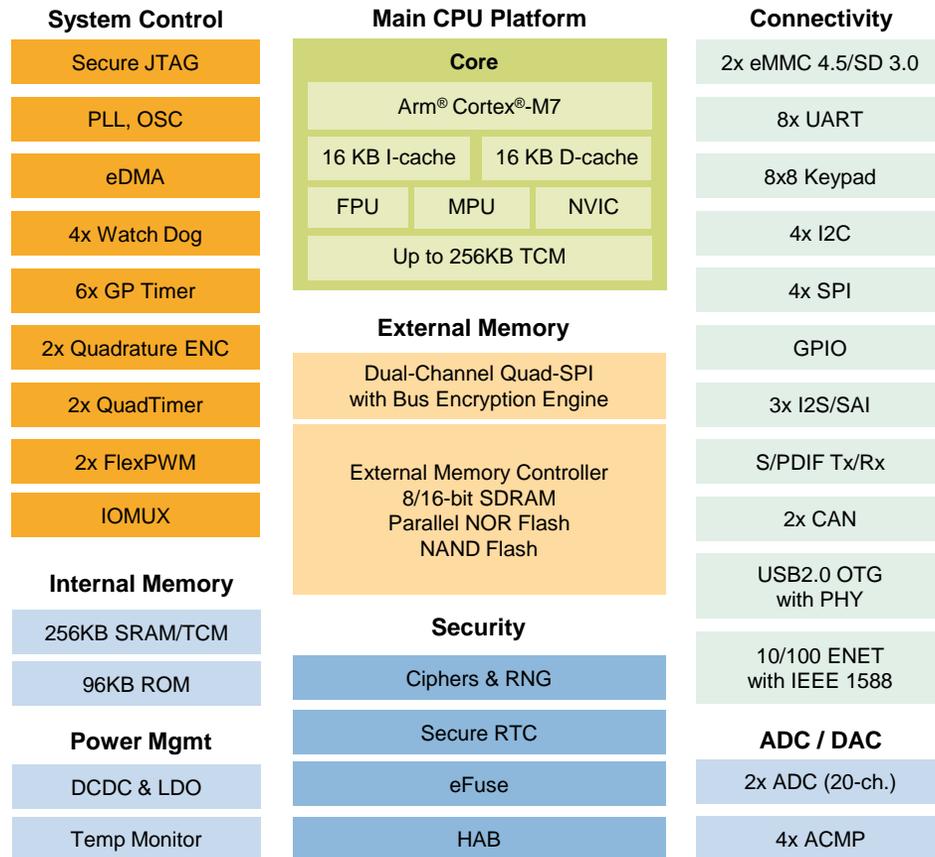
Low cost and easy to develop

- Starting from \$1.49 @ 10Ku
- LQFP Packages enable low cost 2-layer PCB design
- Integrated power management module reduces complexity of external power supply
- FreeRTOS with SDK
- MCUXpresso / Keil / IAR

Specifications

- Package: 100LQFP, 14x14, 0.5p
- Temp / Qual: -40 to 105°C (Tj) Industrial
0 to 95°C (Tj) Consumer

I.MX RT1020 BLOCK DIAGRAM



High Performance and Integration

- Cortex-M7 up to 500MHz with 16KB/16KB I/D cache
- High Speed USB with PHY
- Multi PWM for dual motor control
- Security (On-The-Fly FlexSPI decryption)
- Rich Audio features

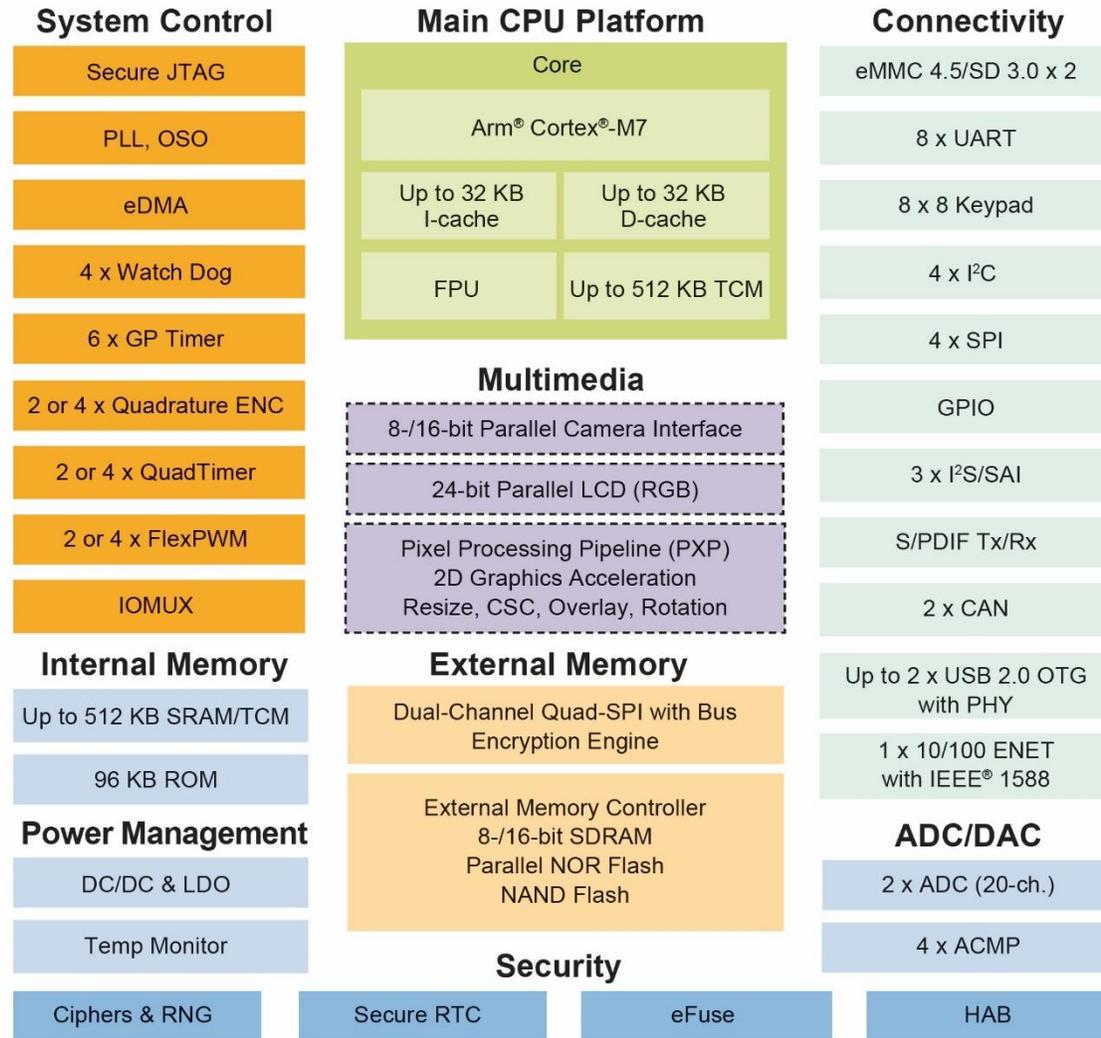
Low cost and easy to develop

- Starting from \$2.18 @ 10Ku
- LQFP Packages enable low cost 2-layer PCB design
- Integrated power management module reduces complexity of external power supply
- FreeRTOS with SDK
- MCUXpresso / Keil / IAR

Specifications

- Package: 144LQFP, 10x10, 0.5p
100LQFP, 14x14, 0.5p
- Temp / Qual: -40 to 105°C (Tj) Industrial
0 to 95°C (Tj) Consumer

I.MX RT1050 BLOCK DIAGRAM



Key Features and Benefits

Specifications

- Package: MAPBGA196 | 10x10mm², 0.65mm pitch (130 GPIOs)
- Temp / Qual: -40 to 105°C (Tj) Industrial / 0 to 95°C (Tj) Consumer

High Performance Real Time system

- Cortex-M7 up to 600MHz , 50% faster than any other existing M7 products
- 20ns interrupt latency, a TRUE Real time processor
- 512KB SRAM, configurable to 512KB TCM

Rich Peripheral

- Motor Control: Flex PWM X 4, Quad Timer X 4, ENC X 4
- 2x USB, 2x SDIO, 2x CAN, 1x ENET with 1588, 8xUART, 4x SPI, 4x I²C
- 8/16-bit CSI interface and 8/16/24-bit LCD interface
- Quad-SPI interface, with Bus Encryption Engine
- Audio interface: 3x SAI/ SPDIF RX & TX/ 1x ESAI

Security

- TRNG&PRNG(NIST SP 800-90 Certified)
- 128-AES cryptography
- Bus Encryption Engine: Protect QSPI Flash Content

Ease of Use

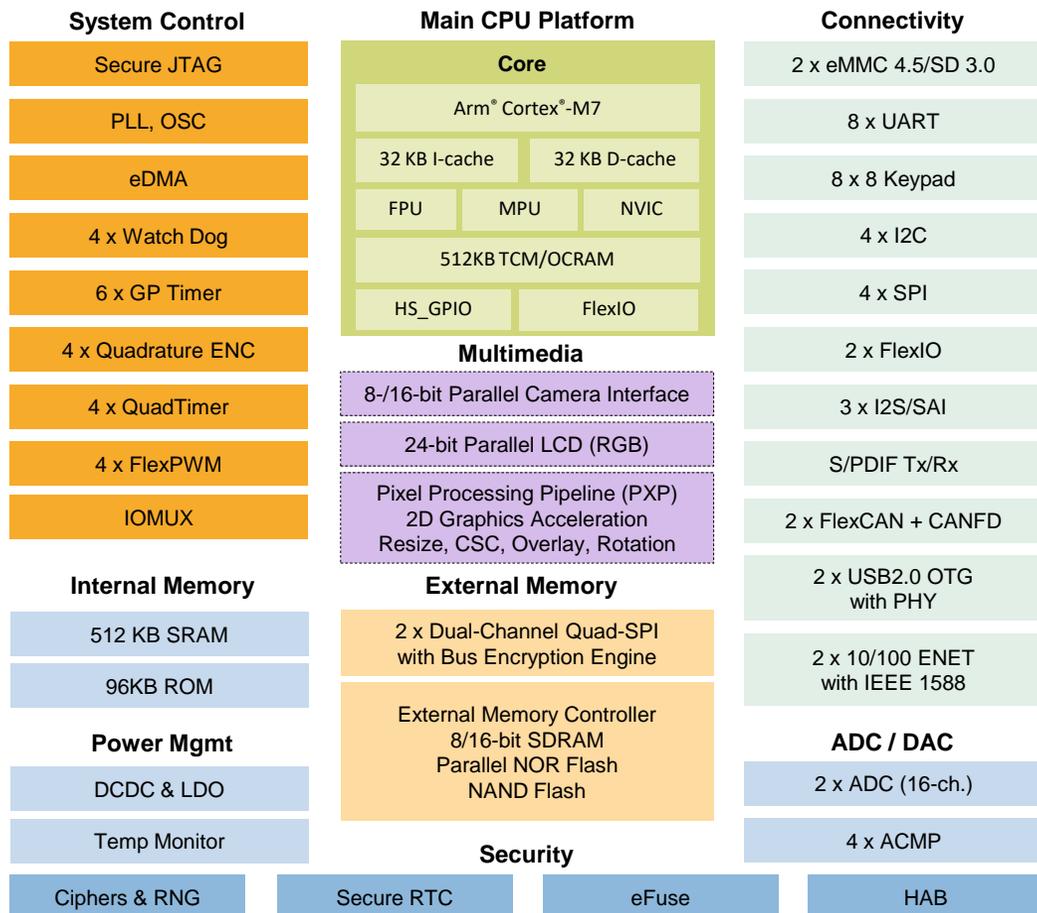
- FreeRTOS with SDK
- MCUXpresso
- Comprehensive ecosystem

Low BOM Cost

- Competitive Price
- Fully integrated PMIC with DC-DC
- Low cost package, 10x10 BGA with 0.65mm Pitch
- SDRAM interface

Available on certain product families

I.MX RT1060 BLOCK DIAGRAM



 Available on certain product families

Key Features and Benefits

Specifications

- Package: MAPBGA196 | 10x10mm², 0.65mm pitch (130 GPIOs)
- Temp / Qual: -40 to 105°C (Tj) Industrial / 0 to 95°C (Tj) Consumer

High Performance Real Time system

- Cortex-M7 up to 600MHz , 50% faster than any other existing M7 products
- 20ns interrupt latency, a TRUE Real time processor
- 512KB SRAM + 512KB TCM/OCRAM

Rich Peripheral

- Motor Control: Flex PWM X 4, Quad Timer X 4, ENC X 4
- 2x USB, 2x SDIO, 2x CAN + 1x CANFD, 2x ENET with 1588, 8xUART, 4x SPI, 4X I2C
- 8/16-bit CSI interface and 8/16/24-bit LCD interface
- 2x Qual-SPI interface, with Bus Encryption Engine
- Audio interface: 3x SAI/ SPDIF RX & TX/ 1x ESAI

Security

- TRNG&PRNG(NIST SP 800-90 Certified)
- 128-AES cryptography
- Bus Encryption Engine: Protect QSPI Flash Content

Ease of Use

- MCUXpresso with SDK
- FreeRTOS
- Comprehensive ecosystem

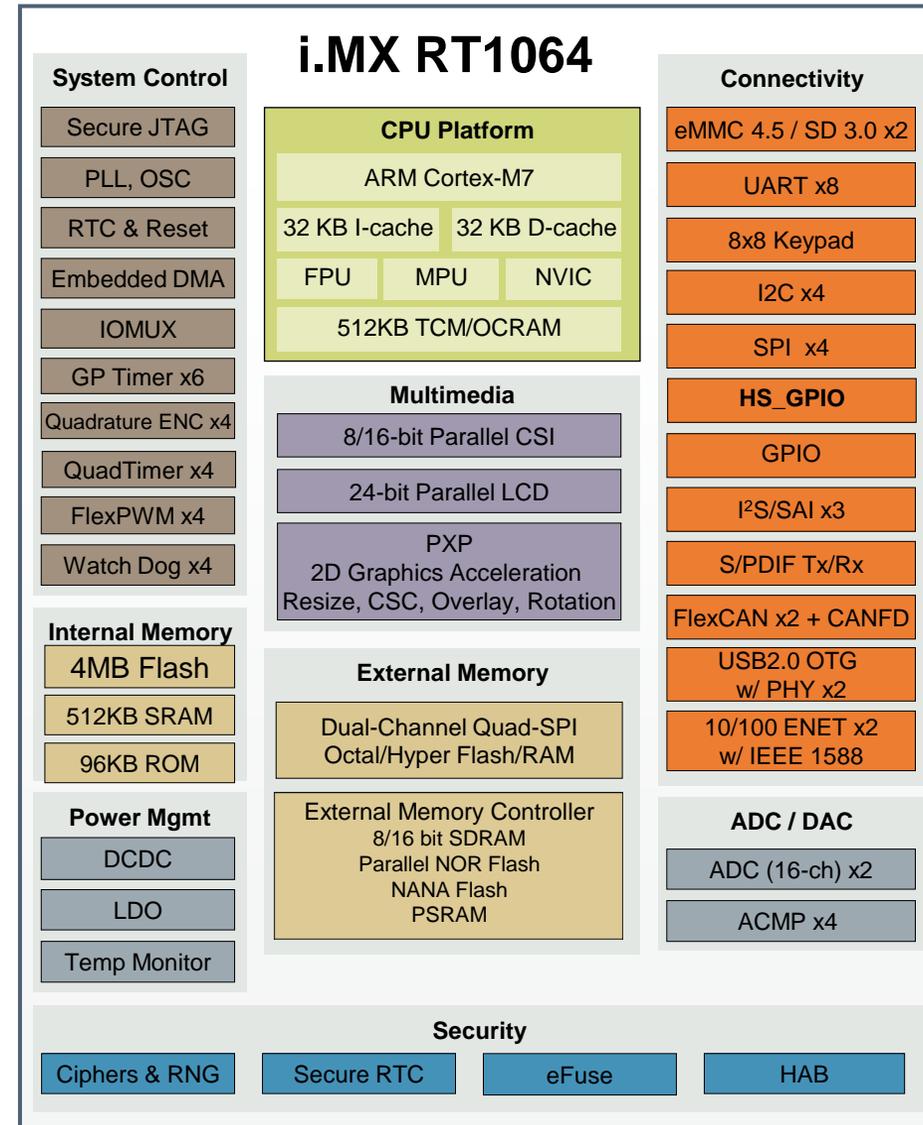
Low BOM Cost

- Competitive Price
- Fully integrated PMIC with DC-DC
- Low cost package, 10x10 BGA with 0.65mm Pitch
- SDRAM interface

I.MX RT1064 BLOCK DIAGRAM

► Key Features and Advantages

- ARM Cortex-M7 processor, 600MHz, 32KB I-Cache, 32KB D-Cache, 512KB TCM/OCRAM
 - 512KB on-chip SRAM
 - 4MB Flash
 - High Speed GPIO
 - 8/16-bit SDRAM controller
 - Parallel LCD Display up to WXGA (1366x768)
 - 8/16-bit Parallel Camera Sensor Interface
 - 8/16-bit Parallel NOR FLASH / PSRAM
 - Dual-channel Quad-SPI NOR FLASH
 - 2x MMC 4.5/SD 3.0/SDIO Port
 - 2x USB 2.0 OTG, HS/FS, Device or Host with PHY
 - 2x FlexCAN + 1x CANFD
 - Audio: 3x I2S/SAI, 1x S/PDIF Tx/Rx
 - 2x 10/100 Ethernet with IEEE 1588
 - 2x 12-bit ADC, up to 20 input channels
 - Full PMU Integration, DCDC+LDOs
 - Security Block: TRNG, Crypto, Secure Boot
- Package: 196 MAPBGA, 10x10mm, 0.65mm pitch (**Pin to Pin compatible with RT1060, RT1050**)
 - Temperature: -40C to 105C (Tj)



Sample in Q3, Launch in Q4.

Public



► Specifications

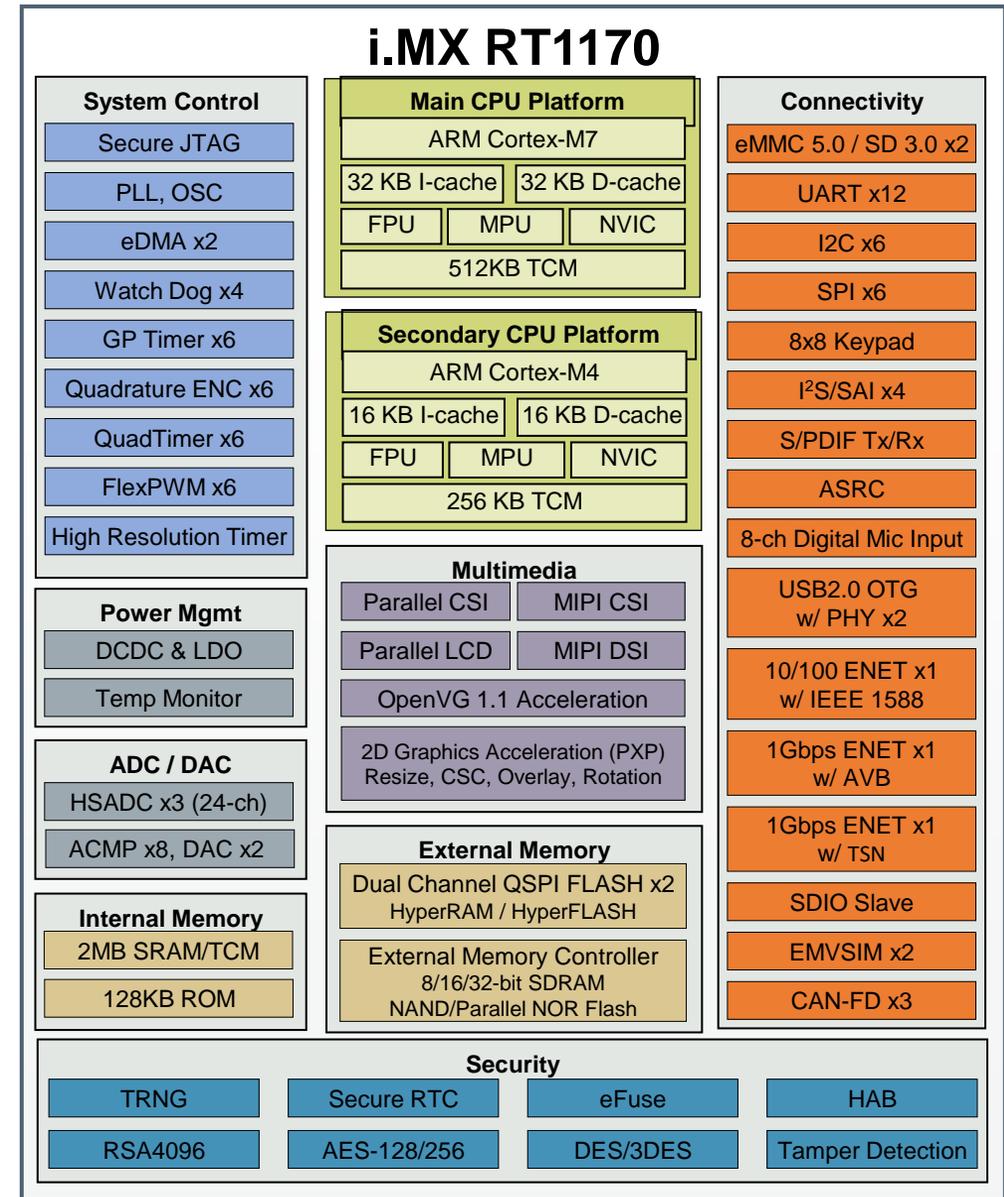
- **Process:** SEC 28FD-SOI
- **Core Voltage:** 1.0V
- **Package:** MAPBGA289, 14x14mm, 0.8mm pitch
MAPBGA196, 10x10mm, 0.65mm pitch
- **Temperature:** -40C to 125C (Tj)

► Key Features and Advantages

- ARM [Cortex-M7](#) processor, 1 GHz, 32KB/32KB L1 Cache, 512KB TCM
- ARM Cortex-M4 processor, 400MHz, 16KB/16KB L1 Cache, 256KB TCM
- [2MB on-chip SRAM](#) (including TCM for CPU core)
- Parallel LCD Display up to [WXGA \(1280x800\)](#)
- 8/16-bit Parallel Camera Sensor Interface
- 2-lane [MIPI CSI](#) and 2-lane [MIPI DSI](#)
- 2D Graphics Acceleration & OpenVG Acceleration
- 8/16/32-bit [SDRAM](#) controller up to 200MHz
- 8/16-bit Parallel NOR FLASH / NAND FLASH / PSRAM
- 2x QSPI NOR FLASH / HyperRAM / HyperFLASH Interface
- 2x eMMC 5.0/SD 3.0/SDIO Port
- 2x USB 2.0 OTG, HS/FS, Device or Host with PHY
- Audio: 4x I2S/SAI, 1x S/PDIF Tx/Rx, [ASRC](#), [digital microphone input](#)
- 3x ENET: [1Gbps ENET w/ AVB](#) + 10/100 ENET w/ IEEE 1588 + [1Gbps ENET w/ TSN](#)
- 3x 12-bit ADC, [2Msamples/s](#), up to 24 input channels total
- 8x Analog comparator, 2x DAC
- [Full PMU Integration](#), DCDC+LDOs
- Secure Boot, TRNG, RSA4096, Tamper Detection, Secure Key Storage

► Enablement

- [MCUXpresso](#), [FreeRTOS with SDK](#)
- [Autosar](#)



I.MX RT FEATURE SUMMARY

Red indicates change from column to the left

Feature	RT1015	RT1020	RT1050	RT1060	RT1170
Core	ARM Cortex-M7				
Speed	500MHz	500MHz	600MHz	600MHz	1GHz
Cache	16 KB-I, 16KB-D	16 KB-I, 16KB-D	32 KB-I, 32KB-D	32 KB-I, 32KB-D	32 KB-I, 32KB-D
OCRAM/TCM	128KB	256KB	512KB	1MB	2MB
External Memory	-	8/16-bit Interface for SDRAM, SRAM, NOR, NAND	8/16-bit Interface for SDRAM, SRAM, NOR, NAND	8/16-bit Interface for SDRAM, SRAM, NOR, NAND	8/16/32-bit Interface for SDRAM, SRAM, NOR, NAND
SDIO	SD3.0/eMMC4.5 x1	SD3.0/eMMC4.5 x2	SD3.0/eMMC4.5 x2	SD3.0/eMMC4.5 x2	SD3.0/eMMC5.0 x2
QSPI / Octal / HyperBus	Dual Channel / 8-bit	Dual Channel / 8-bit	Dual Channel / 8-bit	2x Dual Channel / 8-bit	2x Dual Channel / 16-bit
Ethernet	-	10/100Mbps x1	10/100Mbps x1	10/100Mbps x2	10/100Mbps x1 + 1Gbps ENET AVB x1
USB with PHY	OTG, HS/FS x 1	OTG, HS/FS x 1	OTG, HS/FS x 2	OTG, HS/FS x 2	OTG, HS/FS x 2
CAN	-	FlexCAN x2	FlexCAN x2	FlexCAN x2 + CANFD x1	CAN-FD x3
Graphics	-	-	PxP for 2D acceleration	PxP for 2D acceleration	2D Graphics Acceleration & OpenVG Acceleration
CSI	-	-	8/10/16-bit Parallel	8/10/16-bit Parallel	8/10/16-bit Parallel + MIPI-CSI
LCD	-	-	8/16/18/24-bit Parallel	8/16/18/24-bit Parallel	8/16/18/24-bit Parallel + MIPI DSI
Security	TRNG, AES-128, SHA Secure Boot	TRNG, AES-256, SHA, DES, 3DES, RSA2048, Secure Boot, Tamper Monitor			
UART / SPI / I2C / FlexIO	4/2/2/2	8/4/4/2	8/4/4/2	8/4/4/3	12/6/6/3
I2S / SPDIF / ASRC	3/1/0	3/1/0	3/1/0	3/1/0	4/1/1
ADC	1M sample/s x1	1M sample/s x2	1M sample/s x2	1M sample/s x2	2M sample/s x3
ACMP / DAC	0/0	4/0	4/0	4/0	8/2
Quad ENC/Quad Timer/FlexPWM	1/1/1	2/2/2	4/4/4	4/4/4	6/6/6
GP Timer / WDOG	6/4	6/4	6/4	6/4	6/4
High Resolution Timer	0	0	0	0	1
High Speed GPIO	-	-	-	HSGPIO	HSGPIO
Package	LQFP-100	LQFP-100, LQFP-144	BGA-196	BGA-196	BGA-196, BGA-289
Temperature	Consumer: 0C to 95C (Tj) Industrial: -40C to 105C (Tj)	Consumer: 0C to 95C (Tj) Industrial: -40C to 105C (Tj)	Consumer: 0C to 95C (Tj) Industrial: -40C to 105C (Tj)	Consumer: 0C to 95C (Tj) Industrial: -40C to 105C (Tj)	Consumer: 0C to 95C (Tj) Industrial: -40C to 105C (Tj) Automotive: -40C to 125C(Tj)

Enablement Overview, including ecosystem partners

Runtime Software

NXP Solutions:



MCUXpresso Software and Tools

- IDE
- SDK
- Config Tools

For NXP Cortex-M controllers

- Kinetis MCUs
- LPC Microcontrollers
- i.MX Application Processors

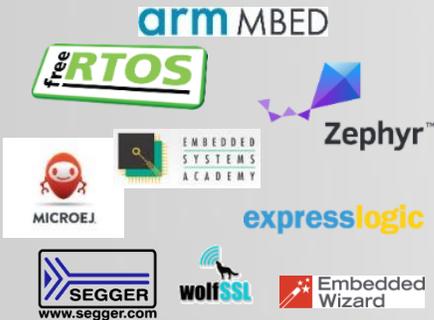




Software Development Tools

IDE / Toolchains:

RTOS, Middleware Partners:




Comprehensive frameworks and solutions for low-power, connected, and secure embedded systems

Industry leading IDE support and intuitive software configuration tools to accelerate application development

Hardware Development Tools

Evaluation Kits:



Partner Solutions



Low cost hardware platforms for evaluation and application development. Partner solutions for hardware debugging solutions

Application Specific



- IoT Sensing SDK
- Graphics
- Cloud Connectivity
- Voice activation
- USB Audio
- Touch HMI
- Camera interface



Connectivity Solutions



802.15.4



Software frameworks and development tools for targeted applications and certified connectivity solutions

Support

Broad Market:



- Out-Of-Box Walkthroughs
- NXP Community
- Reference Designs
- Solution Designs
- Application Notes
- Schematics



All:



- Professional Support
- Professional Services

Get started quickly and get the support you need, when you need it



MCUXpresso Software and Tools

COMMON TOOLKIT
FOR THOUSANDS
OF KINETIS® & LPC
MICROCONTROLLERS



www.nxp.com/mcuxpresso



MCUXpresso Software and Tools

for LPC & Kinetis MCUs and i.MX RT crossover processors



MCUXpresso IDE

Edit, compile, debug and optimize in an intuitive and powerful IDE



MCUXpresso SDK

Runtime software including peripheral drivers, middleware, RTOS, demos and more



MCUXpresso Config Tools

Online and desktop tool suite for system configuration and optimization



MCUXpresso IDE

Eclipse Framework for C/C++, extendible with many plug-ins

Integrated MCUXpresso Config Tools – Pins, Clocks, Peripherals

Quickstart Panel

Support for SDK and LPCOpen for ARM® Cortex®-M Cores

Combined Development Perspective

Peripheral View

Power Measurement

Advanced Build Steps

Instruction Trace

SWO Trace / Profiling

New Project Wizard

Linker and Memory Configuration

Data Watching

FreeRTOS Kernel Awareness

ARM GCC

ARM GDB

newlib

newlib-nano

RedLib

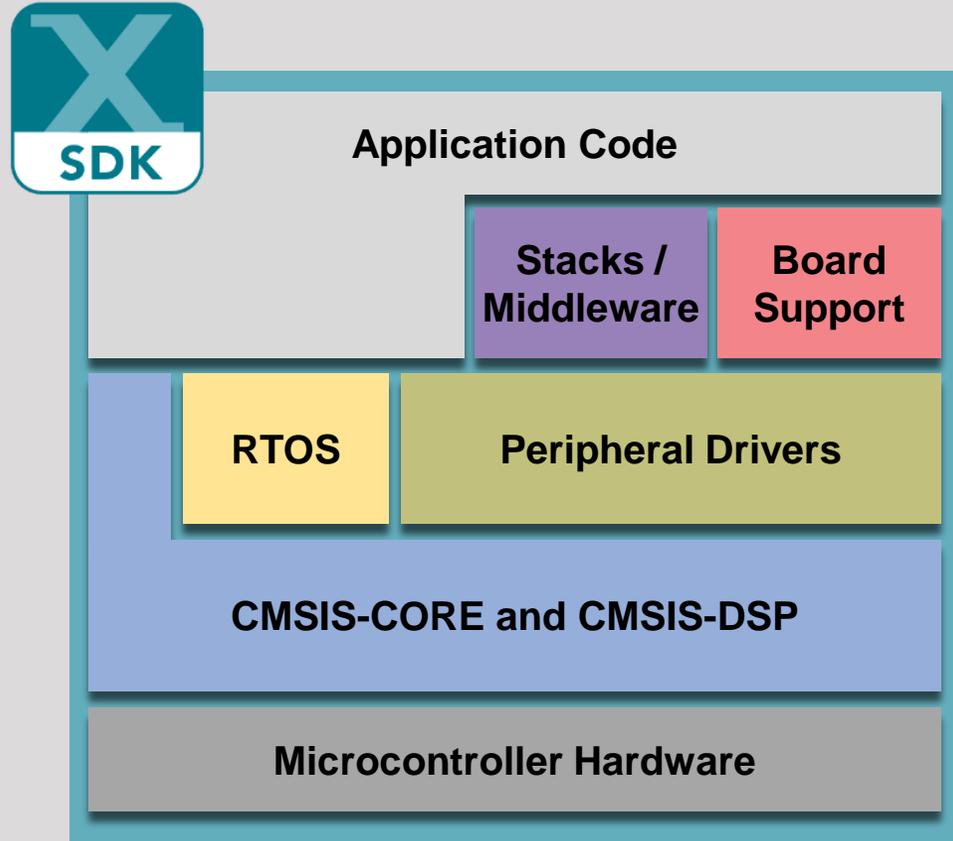
CMSIS-DAP

P&E

SEGGER

MCUXPRESSO IDE FREE ECLIPSE / GCC-BASED DEVELOPMENT

- **Feature-rich, unlimited code size**, optimized for ease-of-use, based on industry standard Eclipse framework for NXP's **Kinetis** and **LPC** MCUs and **i.MX RT** crossover processors
- Application development with Eclipse and GCC-based IDE for advanced editing, compiling and debugging
- Supports custom development boards, Freedom, Tower and LPCXpresso boards with debug probes from NXP, P&E and Segger
- **Free:** Full Featured, unlimited Code Size, no special activation needed, community based support, advanced trace capabilities, MTB and ETB instruction trace
- Works in conjunction with **MCUXpresso Config Tools** and **MCUXpresso SDK** to provide complete development environment



MCUXPRESSO SDK SOFTWARE FRAMEWORK AND DRIVERS

Architecture:

- CMSIS-CORE compatible
- Single driver for each peripheral
- Transactional APIs w/ optional DMA support for communication peripherals

Integrated RTOS:

- Amazon FreeRTOS
- RTOS-native driver wrappers

Integrated Stacks and Middleware:

- USB Host, Device and OTG
- lwIP, FatFS, LittleFS
- Crypto acceleration plus wolfSSL & mbedTLS
- SD and eMMC card support

Reference Software:

- Peripheral driver usage examples
- Application demos
- FreeRTOS usage demos
- AWS WiFi and lwIP examples

License:

- Clear BSD 3-clause for startup, drivers, USB stack

Toolchains:

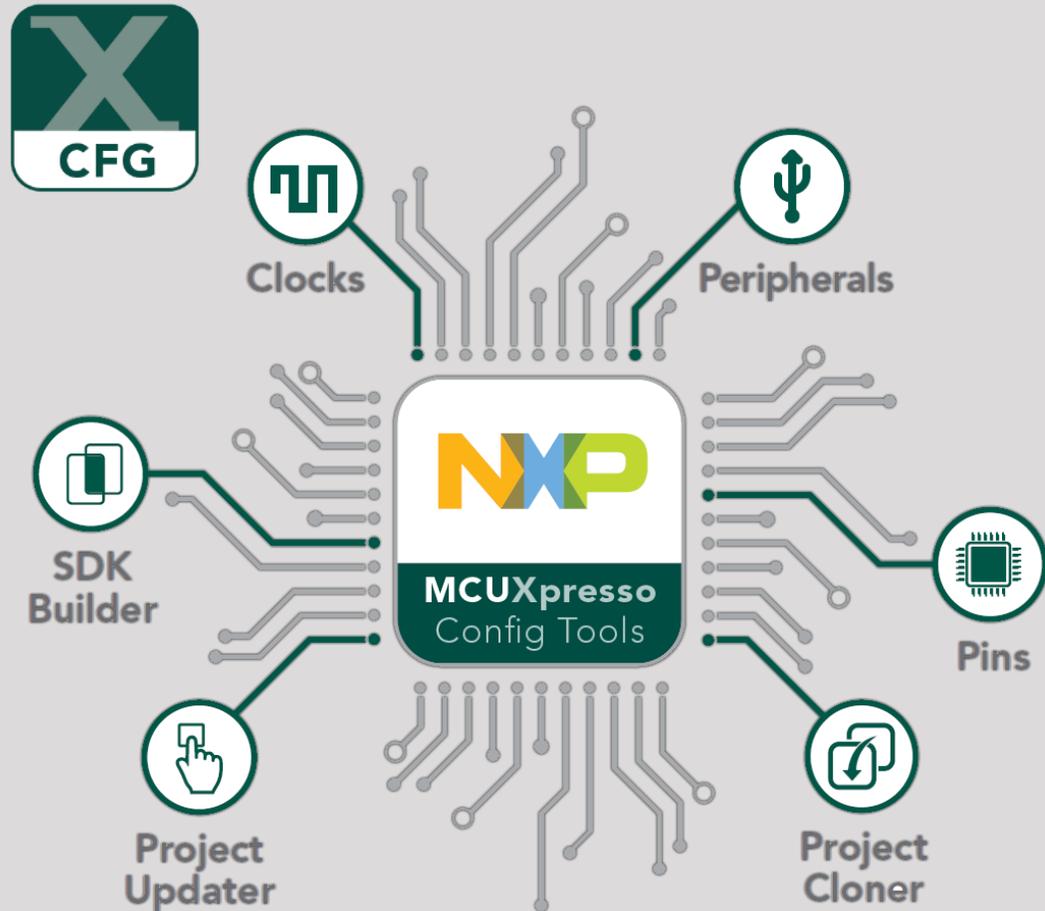
- MCUXpresso IDE
- IAR®, ARM® Keil®, GCC w/ Cmake

Quality:

- Production-grade software
- MISRA 2004 compliance
- Checked with Coverity® static analysis tools



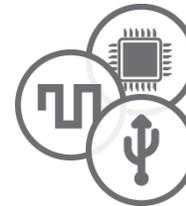
Open Source Initiative



MCUXPRESSO CONFIG TOOLS CONFIGURATION AND CODE GENERATION



SDK Builder packages custom SDKs based on user selections of MCU, evaluation board, and optional software components.



Pins, Clocks, and Peripheral tools generate initialization C code for custom board support. Features validation of inputs and cross-tool conflict resolution.

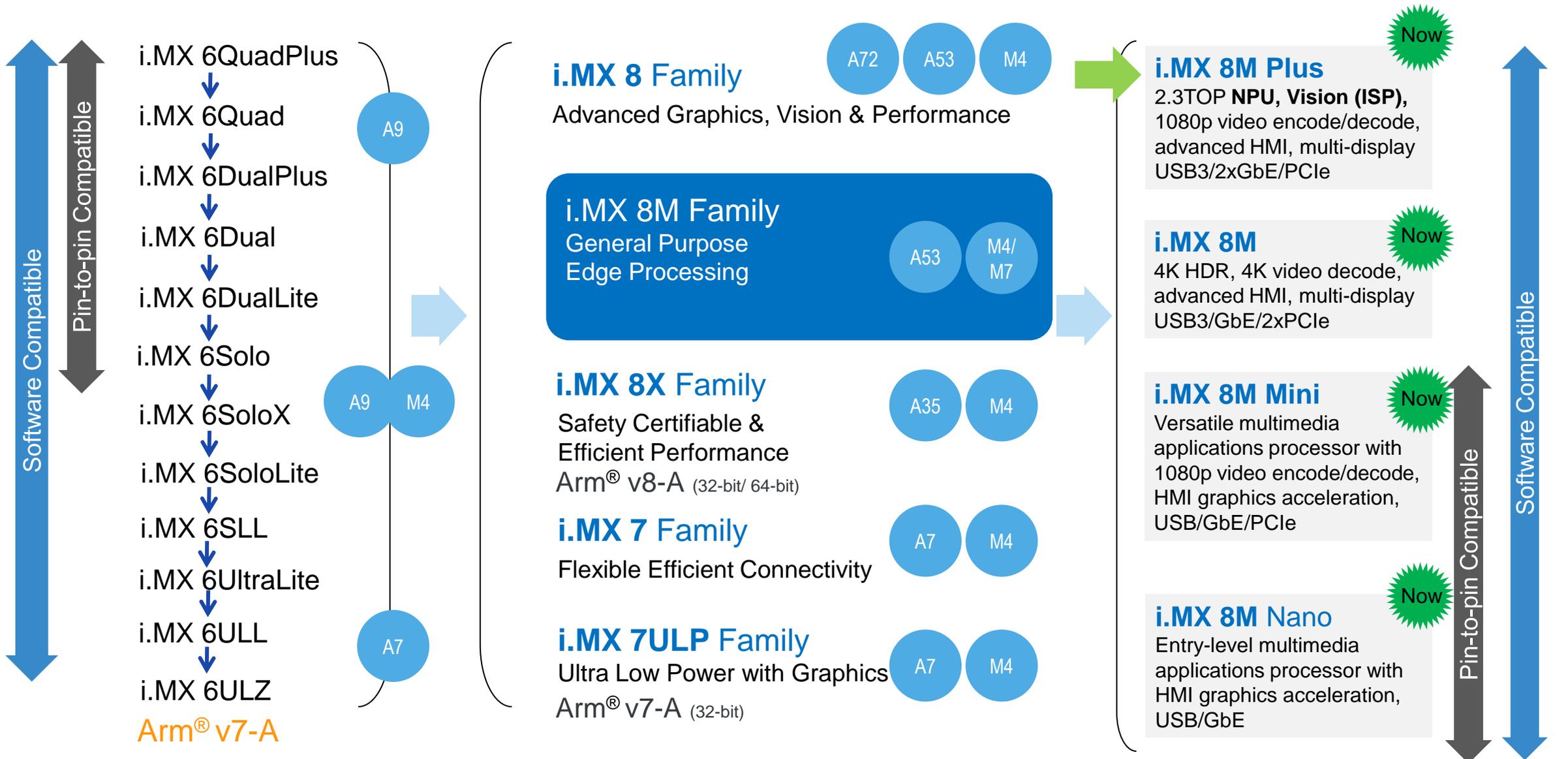


Project Update works directly with existing SDK-based IDE projects with generated Pins, Clocks, and Peripheral source files.



Project Cloning creates a standalone SDK project based on an example application available within SDK release.

i.MX 8M FAMILY OF APPLICATIONS PROCESSORS

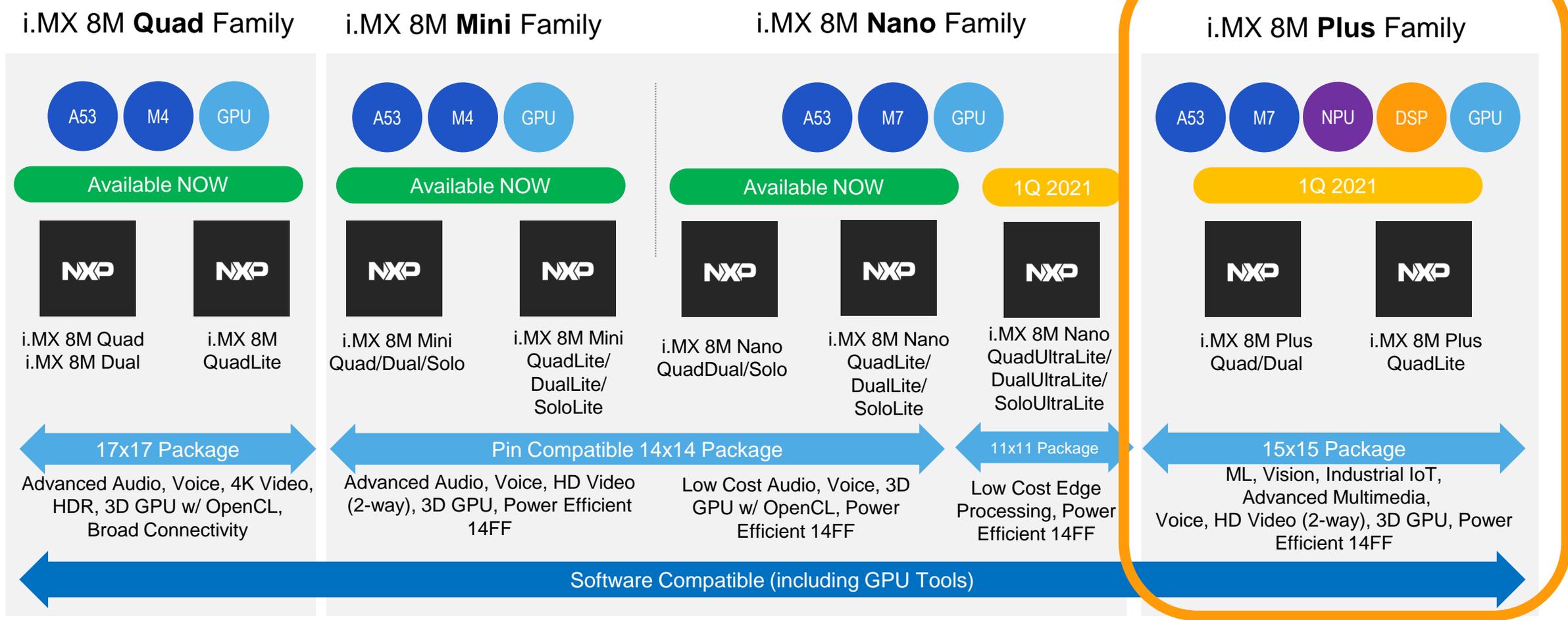


Public



i.MX 8M: SCALABLE BROAD MARKET SOLUTIONS

March 2021:
Full Market Launch



Scalable series of **FOUR** Arm V8 64-bit (/32-bit) based SoC Families

I.MX 8M MINI TARGET APPLICATIONS

Consumer & Pro Audio Systems

- Portable audio devices
- Wireless or networked speakers
- Surround sound and sound bars
- Audio/video receiver
- Public address systems



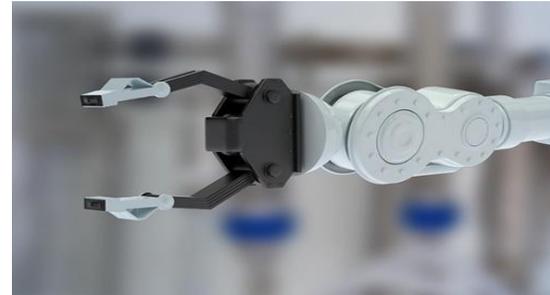
Home & Building Automation

- Video doorbell
- Digital signage
- Two-way video conferencing
- HVAC climate control
- Security and surveillance systems
- IoT gateways



Voice Assistance & Machine Vision

- Voice-assisted products
- Factory automation
- Test and measurement
- HMI control assembly line robotics
- Robotic vacuum cleaners
- 3D printers
- Image analytics
- Machine visual inspection



Consumer & Healthcare

- Smart appliances
- Cameras & LCDs
- Mobile patient care, e.g. infusion pump or respirator
- Blood pressure monitor
- Activity and wellness monitor
- Exercise equipment with display



i.MX 8M MINI KEY FEATURES



• Scalable Performance at Low Power

- Advanced process technology node delivers much lower leakage than standard technology
- Single-, dual- or quad-core Cortex-A53 cores up to 2.0 GHz; scalable performance in a pin-compatible package
- Heterogeneous multi-core processing with Cortex-M4 running at 400+ MHz; offload tasks, optimize power
- Power efficient 3D GPU and VPU enables 1080p video transcode and display
- DDR3L, DDR4, and LPDDR4 Support



• Triple-Play Audio/Voice/Video

- Up to 1080p60 video decoding (H.265, H.264, VP8/9)
- Up to 1080p60 video encoding (H.264, VP8) using parallel VPU engine enables video transcode applications (video calling)
- 2D and 3D GPU to enable 1080p media UI
- Advanced audio capabilities including 8ch DMIC support, 32-bit @ 384kHz audio interfaces, multiple audio channels

• System Design Optimization

- 14x14 0.5mm package designed for maximum feature enablement with 6-8 layer board design and no microvias
- Pin-compatible with the i.MX 8M Nano provides drop-in scalable product performance
- 17x17 0.75mm package for the broad market (*TBD)
- 8ch DMIC support for direct connection of PDM microphones (no CODEC) enables low system-cost
- Enabling software such as Linux/Android BSP and solutions software (e.g. Voice, Machine Learning, Audio Framework)

• Broad System Connectivity

- MIPI-DSI (4-lanes) for display
- MIPI-CSI (4-lanes) for camera input
- Multiple SDIO interfaces to enable flexibility in supporting boot, expansion and connectivity (Wi-Fi)
- PCIe with L1 low power substates enables a range of high-performing Wi-Fi/BT solutions and other connectivity
- Gigabit Ethernet and USB 2.0

i.MX 8M MINI

Quad/Dual/Solo ARM Cortex-A53 @ 1.6-2.0 GHz (up to 18,400 DMIPS)

- ARM v8 Fully 64-bit capable

ARM Cortex-M4 @ 400+ MHz for Low Power, Security

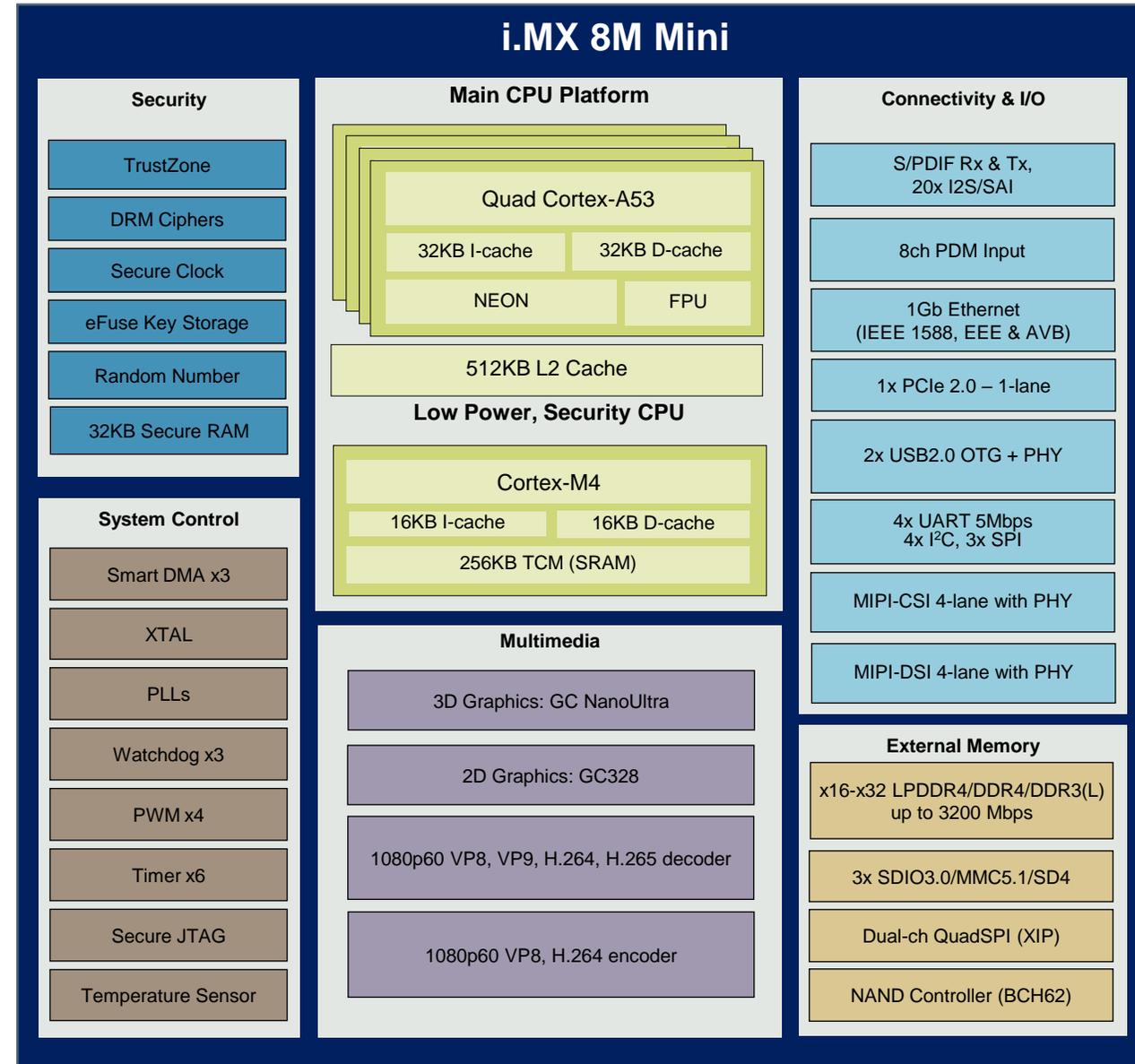
Package: FCBGA 14x14mm, 0.5mm pitch de-pop array
 FCBGA 17x17mm, 0.75mm pitch (*TBD)

Operating System targets: Linux OS, Android OS, FreeRTOS

Qualification for Consumer and Industrial applications

Feature Highlights:

- Security: DRM support for RSA, AES, 3DES, DES
- GC NanoUltra 3D Graphics GPU, 1 shader core, OpenGL ES 2.0, 6.4 GFLOPS, 400M Pix/s, 40M Tri/s
- GC328 2D Graphics GPU
- 1080p60 H.265/HEVC, VP9, H.264, VP8 decoder
- 1080p60 H.264, VP8 encoder
- x16, x32 LPDDR4/DDR4/DDR3(L) (up to 3200 Mtps) LPDDR4: 1600bps @ 800MHz
- High quality image resizing and graphics overlay
- Audio: S/PDIF Rx & Tx, 20x I2S (up to 20ch 32bit @ 384Khz support)
- Display Interfaces: 1x MIPI DSI (4-lane) with PHY
- Camera Interfaces: 1x MIPI CSI2 input (4-lane each) with PHY
- 2x USB 2.0 OTG with PHY
- 1x Gb Ethernet (MAC): AVB & IEEE 1588 for sync, and EEE for low power
- 1x PCIe 2.0 (1-lane) with L1 substates (low power, fast wakeup)
- 4x UART, 4x I2C, 3x SPI
- 3x SDIO3.0 / eMMC5.0 / SD4
- Raw NAND controller (BCH62)
- Quad-SPI for fast boot from SPI NOR; with Execute in Place (XIP); single-bit, dual-bit, quad-bits and octal-bits access are supported.



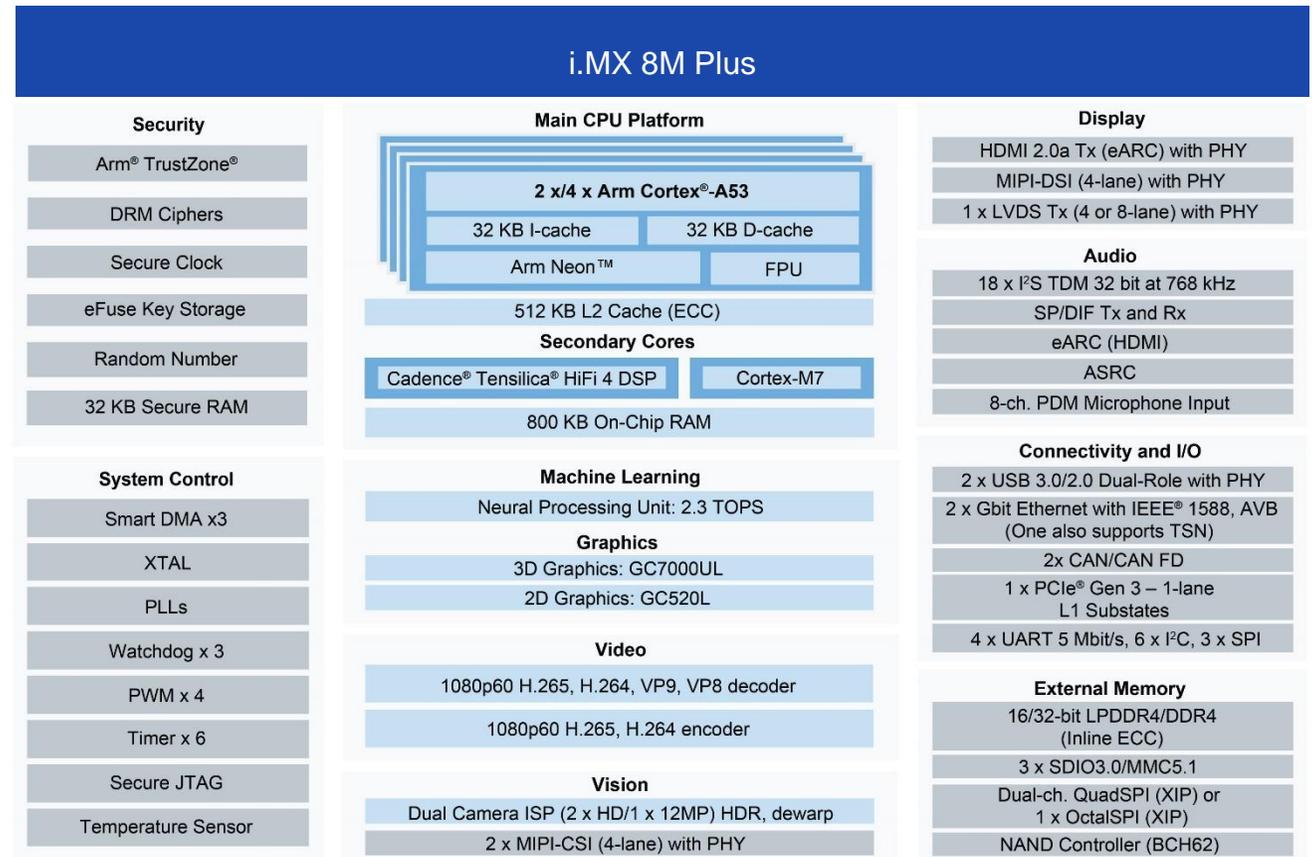
Target Timeline

- Alpha Samples Jul'18, Beta Samples Oct'18
- Production Target 1Q'19

i.MX 8M PLUS APPLICATIONS PROCESSOR

Feature Highlights:

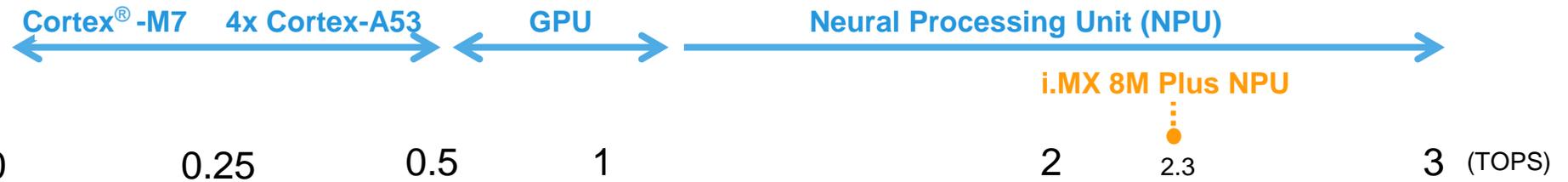
- **Quad Arm® Cortex® -A53** up to **1.8 GHz** (up to 20,988 DMIPS)
- ARMv8 fully 64-bit capable, 512KB L2 cache (ECC)
- **Arm Cortex-M7** up to **800MHz** with 512KB RAM (ECC)
- **Voice Acceleration co-processor:** HiFi4 DSP up to 800MHz with 256KB RAM (ECC)
- **Machine Learning accelerator:** Neural Processing Unit (NPU) 2.3 TOPS performance
- **Package:** FCBGA 15x15mm, 0.5mm pitch, depop (consumer and industrial)
- **Operating System targets:** Linux OS, Android OS, HiFi4 SDK, FreeRTOS
- **Qualification:** Consumer (0C to +95C); Industrial (-40C to +105C)
- **External memory:**
 - x32/x16 LPDDR4/DDR4 (Inline ECC)
 - 3x SDIO3.0/eMMC5.1
 - Dual-channel QuadSPI (XIP) or 1x OctalSPI
 - NAND Controller (BCH62)
 - SPI NAND
- **Graphics processors:**
 - GC7000UL (3D GPU, 2-shaders, OpenGL® ES 3.1, Vulkan®, Open CL™ 1.2 FP)
 - GC520L (2D GPU, OpenVG™ 1.1)
- **Video processors:**
 - Decode: 1080p60 H.265, H.264, VP9, VP8
 - Encode: 1080p60 H.265, H.264
- **Display controllers** (up to 3 simultaneous displays):
 - 1x HDMI 2.0a Tx (eARC) with PHY
 - 1x LVDS Tx (4 or 8-lane) with PHY
 - 1x MIPI-DSI (4-lane) with PHY
- **Vision:**
 - Camera (up to 2 cameras): 2x MIPI-CSI (4-lane) with PHY
 - Image Signal Processor (ISP): 12MP resolution, 2x187MP or 1x375MP input rate, HDR, Dewarp
- **Audio:**
 - 18x I²S TDM (32-bit @ 768KHz), DSD512, SP/DIF Tx + Rx
 - 8 channel PDM microphone input
 - eARC, ASRC
- **Connectivity and I/O:**
 - 2x USB 3.0/2.0 Type C with PHY
 - 1x PCIe Gen 3.0 (1 lane) with L1 Substates for fast wake from low power mode
 - 2x Gigabit Ethernet with IEEE 1588, EEE and AVB (one with TSN, but no EEE)
 - 2x CAN-FD



i.MX 8M PLUS - FEATURE / BENEFIT

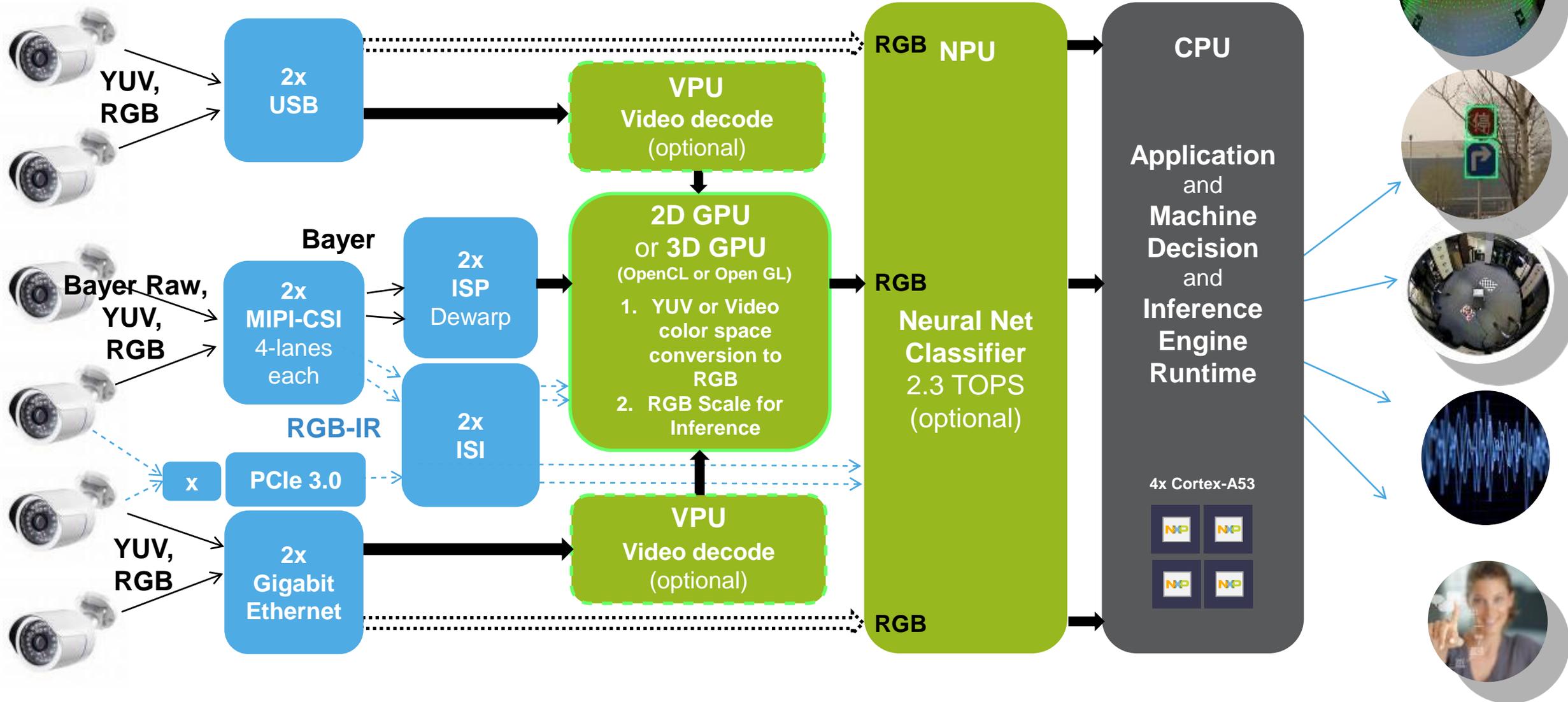
	Capability	Benefits	Features
Machine Learning Vision & Voice	Machine Learning	<ul style="list-style-type: none"> Edge Smartness with Machine Learning Inference. No cloud dependency, privacy, better user experience ~80x faster than 4xCA53 up to 1.8GHz 	Neural Processing Unit (NPU) up to 2.3 TOPS NXP eIQ Library and Tools
	Vision System	<ul style="list-style-type: none"> UHD Vision / HD Stereo Vision Image Signal Processor (ISP) 	2x ISP + MIPI-CSI up to 350MPixel/s, ISP de-warp engine
	Voice	<ul style="list-style-type: none"> Voice systems with processing at the edge. Privacy and less cloud bandwidth required. 	8ch-PDM, Low Power Voice processor
Advanced Multimedia	HD Video	<ul style="list-style-type: none"> High resolution video compression for cloud upload or local storage 	1080p60 encode/decode H.264, H.265/HEVC
	3D/2D Graphics	<ul style="list-style-type: none"> Advanced 3D and 2D graphics for rich HMI and user experience 	3D/2D GPU, 1GPix/s, OVG1.1, OGLES3.1, Vulkan,OCL1.2FP
	Advanced Audio	<ul style="list-style-type: none"> Enables the latest and greatest audio standards for soundbars and AV Receivers. Dolby Atmos. High performance HDMI audio path with eARC 	Audio Interfaces, eARC, ASRC
Industrial Network & Reliability	Industrial Network	<ul style="list-style-type: none"> Support low latency network with GbE/TSN network. Widely adopted CAN control Interface. Gateway support with dual Ethernet. 	2x Ethernet (1w/ TSN), 2x CAN-FD
	Memory Reliability	<ul style="list-style-type: none"> High Industrial system reliability for Safety Industrial Level SIL3. 	DDR Inline ECC ECC on internal memories, low SER rates
	Real time Processing	<ul style="list-style-type: none"> 12x times the performance than a typical MCU. Reduce system BOM 	Cortex-M7 @ 800MHz
Performance & Connectivity	High Performance Low power	<ul style="list-style-type: none"> Up to 21,600 DMIPS. Applications running <2.0W. Deep Sleep Mode < 20mW 	4xCortexA53 @1.8GHz, 14FinFet, Low Power Modes
	Display Interfaces	<ul style="list-style-type: none"> Multiple interface options capable to be used simultaneously. Up to 1080p60 	MIPI-DSI, HDMI 2.0b, LVDS 4/8-lane
	High-Speed Interfaces	<ul style="list-style-type: none"> Fast connections to Wi-Fi®, FPGAs, co-processors. Seconds to move media files or large data set 	2xUSB 3.0 (500MByte/s each) PCIe 3.0, 2x SDIO 3.0 100MB/s

MACHINE LEARNING USE CASES AND ACCELERATORS



	0	0.25	0.5	1	2	2.3	3 (TOPS)
 Computer Vision	Face and still image recognition, person detection (images)		Multi-face recognition, object detection (video)		Live video face and object recognition		Multi-object surveillance (people, cars, animals)
 Speech Analysis	Wake word, 10 Word speech, speaker recognition		Automatic speech recognition (basic command phrases)		40,000 words vocabulary, multiple speaker recognition		Speech accents interpretation
 Video Processing	Super resolution upscaling, denoising		Live video upscaling, denoising			Scene segmentation	
 Sequence Analysis	Anomaly detection (environmental sensors)		Pose estimation		Gesture recognition		Complex real-time motion analysis

i.MX 8M PLUS APPLICATIONS PROCESSOR – MACHINE VISION AND INFERENCE



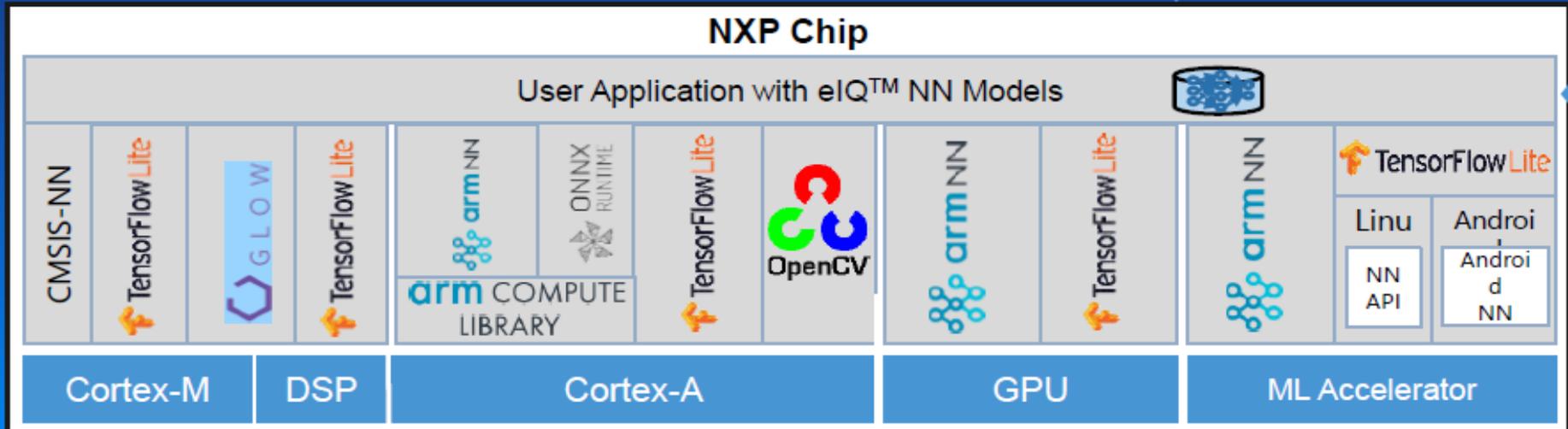
I.MX 8M PLUS ISP KEY FEATURES

- Bayer de-mosaicing and filtering (including denoising, sharpening and blurring)
- Defect pixel cluster correction (DPCC)
- Color processor (CPROC)
- Chromatic aberration correction (CAC)
- Denoise
- Histogram
- Lens shading correction (LSC)
- Wide Dynamic Range (local tone mapping)
- Color noise removal (CNR)
- Automatic white balance measurements (AWB)
- Exposure measurement for AE (AEC/AGC) Auto focus measurement (AF)
- 2-exposure and 3-exposure DoL/Staggered HDR

NXP ISP SUPPORT LEVELS

Support Type	Description
 Default Enablement	<ul style="list-style-type: none">➤ The default ISP enablement for our customers is through the NXP Linux BSP and the i.MX 8M Plus Reference Camera Module by Basler. The following ISP features are integrated within the NXP Linux BSP.➤ The i.MX 8M Plus Reference Camera Module by Basler is already tuned and calibrated for the integrated ISP within the i.MX 8M Plus.➤ Included in the default enablement is the customer's access to the Camera Porting Guide document. This document helps customers port their camera sensor module to our ISP.➤ For BSP/Driver as well as reference camera module support, open a community question: https://community.nxp.com/
Basler pylon Camera Software Suite	<ul style="list-style-type: none">➤ When using the i.MX 8M Plus Reference Camera Module by Basler, customers can access additional advanced ISP features using the Basler pylon Camera Software.➤ Pylon is an extension to the camera driver embedded in the NXP Linux BSP and provides a development environment with a selection of C and C++ pylon code examples.➤ Access the camera enablement package based on the i.MX 8M Plus GA release
 Tuning and Calibration Services	<ul style="list-style-type: none">➤ If customers would like to select a camera/lens or module other than the Basler camera module, or need assistance with tuning, calibration and integration assistance with new sensors and alternative camera modules, customers can directly engage with:<ul style="list-style-type: none">➤ Basler➤ Innowave➤ Lantronix➤ NXP Pro-support

NXP eIQ™ Machine Learning Development Environment



i.MX RT1050
i.MX RT1060

i.MX 8M Plus
i.MX 8QM, i.MX 8QXP
i.MX 8M Quad, i.MX 8M Nano, i.MX 8M Mini

i.MX 8QM, i.MX 8QXP
i.MX 8M Quad, i.MX 8M Nano

i.MX 8M Plus

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I.MX 8M FAMILY COMPARISON CHART

Product	i.MX 8M Quad / Quad Lite	i.MX 8M Mini / Mini Lite	i.MX 8M Nano / Nano Lite	i.MX 8M Nano UltraLite	i.MX 8M Plus
Production Status	Mass Production	Mass Production	Mass Production	1Q2021	1Q2021
Main CPU	2-4xA53 1.5GHz, 1MB L2	1-4xA53 1.8GHz, 512KB L2	1-4xA53 1.5GHz, 512KB L2	1-4xA53 1.4GHz, 512KB L2	2-4xA53 1.8GHz, 512KB L2
MCU/DSP	M4 266MHz	M4 400MHz	M7 up to 750MHz	M7 up to 750MHz	M7 800MHz, HiF i4 800 MHz
DDR	x16 or x32 LPDDR4/DDR4/DDR3L	x16 or x32 LPDDR4/DDR4/DDR3L	x16 LPDDR4/DDR4/DDR3L	x16 LPDDR4/DDR4/DDR3L	x32 LPDDR4/DDR4 Inline ECC
GPU	3D – GC7000L (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 – GC7000UL (OpenGL ES 2.1/3.0/3.1, OpenCL 1.2, Vulkan)
Security	CAAM, RDC, Arm® TrustZone®	CAAM, RDC, Arm TrustZone	CAAM, RDC, Arm TrustZone	CAAM, RDC, Arm TrustZone	CAAM, RDC, Arm TrustZone
AI/ML	OpenCL CPU: 32 GOPS	A53	OpenCL CPU, GPU: 32 GOPS	A53	ML Accel 2+ TOPS
SRAM	128KiB + 32KiB	256KiB + 32KiB	512KiB + 32KiB	512KiB + 32KiB	768KiB + 32KiB
Camera	2x MIPI CSI (4-lane)	1x MIPI CSI (4-lane)	1x MIPI CSI (4-lane)	1x MIPI CSI (4-lane)	2x MIPI CSI (4-lane), 2 ISPs (3-exposure HDR)
Display	HDMI 2.0a Tx, MIPI DSI (4-lane), eDP; HDR10, HLG, Dolby Vision	1x MIPI DSI (4-lane)	1x MIPI DSI (4-lane)	-	HDMI 2.0a Tx (eARC), MIPI DSI (4-lane), 1x LVDS (8-lane)
OSD Overlay	4Kp60	1080p60	1080p60	-	4Kp30
Video Decode	4Kp60 HEVC, VP9, 4Kp30 H.264, legacy codecs	1080p60 HEVC, H.264, VP9, VP8	None	None	1080p60 H.265, H.264, VP9, VP8
Video Encode	None	1080p60 H.264, VP8	None	None	1080p60 H.265, H.264
Connectivity	PCIe, SDIO, USB	PCIe, SDIO, USB	SDIO, USB	SDIO, USB	PCIe, SDIO, USB
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	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, 1xPCIe Gen 2	1x USB2.0	1x USB2.0	2x USB 3.0, 1x PCIe Gen 3
Network, Storage	1x GbE, 2x SD/eMMC, MLC/SLC NAND	1x GbE, 3xSD/eMMC, MLC/SLC NAND	1x GbE, 3xSD/eMMC, MLC/SLC NAND	1x GbE, 3x SD/eMMC, MLC/SLC NAND	2x GbE (1x TSN), 2x CAN-FD, 3x SD/eMMC, MLC/SLC NAND
Process	28nm	14nm FinFET	14nm FinFET	14nm FinFET	14nm FinFET
Package	17x17mm, 0.65mm	14x14mm, 0.5mm de-pop	14x14mm, 0.5mm de-pop	11x11mm, 0.5mm de-pop	15x15mm, 0.5mm de-pop

← Pin Compatible →

Highlighted Feature

Public



ENABLEMENT EXAMPLE | ISP AND THE BASLER CAMERA MODULE

Production ready 8MP camera module by **BASLER**

Camera Drivers:

- Basic feature set
- 4VL support
- Integrated on NXP BSP



V4L2

Camera Module Performance Package:

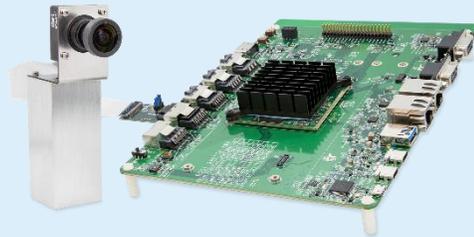
Powered by Basler

Camera Driver Performance

- Full Feature Set
- Important Machine Vision Features
 - Triggering
 - Individual image capture
 - Highly differentiated camera configuration options
- Easy access to custom features
- Integrated into **GEN<i>i</i>CAM** standard

Pylon Software Suite

- Unified SDK for all interfaces & platforms
- Camera access from
 - Source code
 - GUI
 - 3rd party software
- Full feature support incl. guidance, tooltips, error handling,...



Mass Production Design

- Longevity
- Scalability
 - Other sensors and lenses available in portfolio
- Easy design in and optimized time to market

MIPI CSI-2

- For stable image transmission
- Standardized Basler dart BCON for MIPI interface

ISP Calibration & Tuning

- Bridging between ISP and Basler Pylon SDK to realize machine vision control and parameter sequencing

Industrial Proven

- Exchange lens
- Industrial standards and feature set
- Industrial OnSemi 8MP sensor

Kit Contents

Ready for production
camera module



OnSemi AR0821
4K sensor



M12 lens
easy to exchange



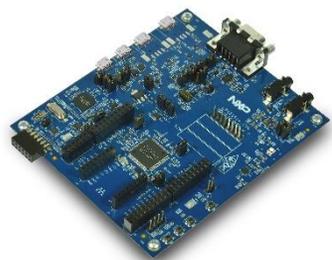
Mini-SAS to Basler
dart BCON MIPI connector
& flat flex cable



Part Number:
108225



NXP's Scalable Edge Processing Product Spotlights Addressing Breadth of Industrial Applications



LPC55S16

150MHz Cortex® -M33
CAN-FD,
High precision ADC,
Enhanced Safety
and Security

Example Applications:

- Remote IO and Sensor Nodes
- Elevators and Lifts
- Smart Lighting and Utilities



i.MX RT1170

800MHz Cortex-M7
GbE, TSN, CAN-FD,
Rich Integration,
Advanced Security

Example Applications:

- Industrial Control
- Security Access Panel
- Fleet Management
- Diagnostic Equipment



i.MX 8M Plus

Quad/Dual Cortex-A53 with
2.3 TOPS NPU & ISP
Real-time Cortex-M7 with
CAN-FD, GbE, TSN

Example Applications:

- Machine Vision
- Industrial Computer
- Safety, security and surveillance



LS1028A

Dual Cortex-A72
Dual TSN Ethernet
Controllers with Port
Switch, CAN-FD

Example Applications:

- Industrial Networking
- PLCs
- Robotics & Motion Control



LX2160

16 high-performance
Cortex-A72 cores
40G + Dual 25G
Ethernet, PCIe

Example Applications:

- Optical transport & backhaul
- Test & measurement
- Aerospace & Defense

Industrial Processors for Reliable, Scalable & Secure Solutions



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