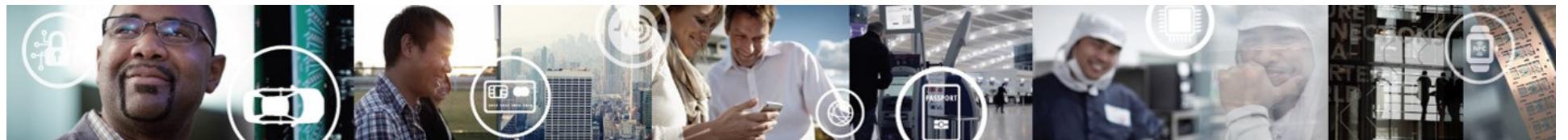


# INTRODUCTION TO I.MX SOLUTIONS

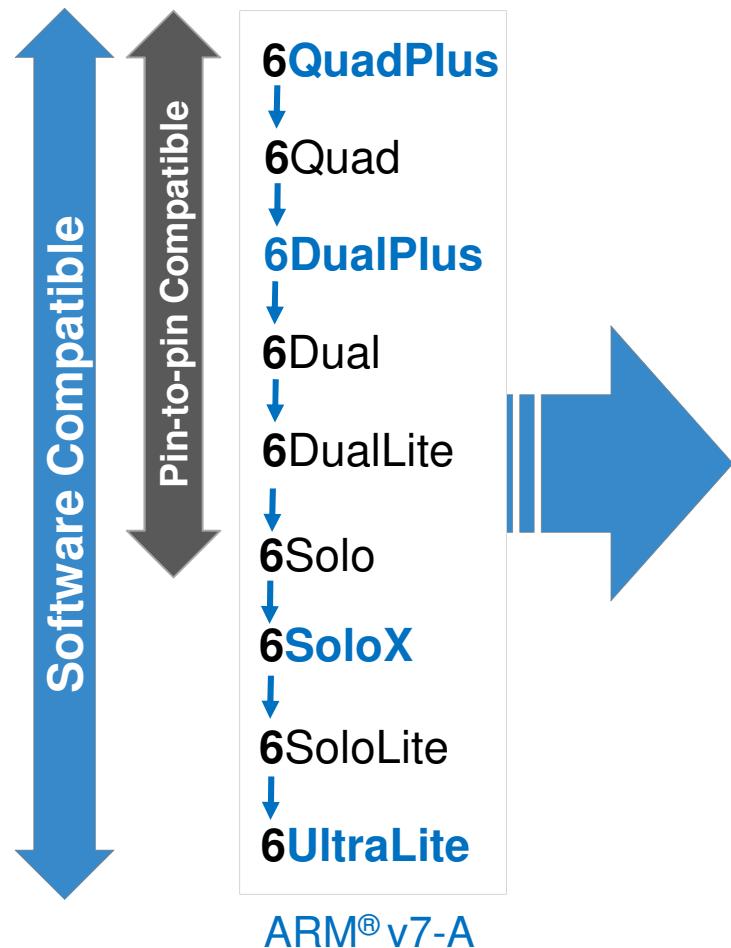
PHILIPPE MANGAUD  
FIELD APPLICATION ENGINEER  
MAY.2016



SECURE CONNECTIONS  
FOR A SMARTER WORLD

# i.MX Processor Roadmap

Two New i.MX Platforms based on 28nm FDSOI\*



## i.MX 8 series

Advanced Graphics & Performance  
ARM® v8-A  
(64-bit)

## i.MX 7 & 8X series

Power Efficiency & BOM cost Optimizations

ARM® v7-A & v8-A\*  
(32-bit / 64Bbit)

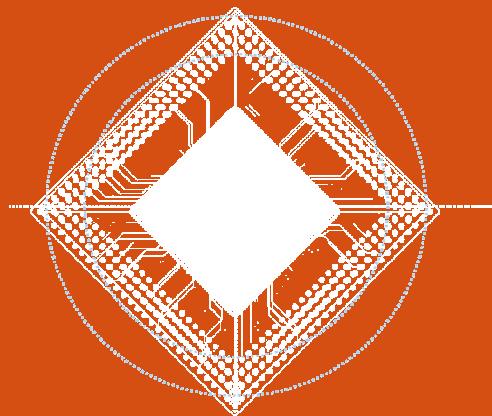


\* On i.MX8X series



# i.MX Core Values & Differentiators

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# i.MX Application Processors - Core Values

## • Scalability

- ARM Based MPU ( Cortex A 32/64 bits single/dual/quad, asymmetric), GPU, Peripherals
- Software: Linux, Android, FreeRTOS, QNX\*, GHS\*, Windows\*
- Industry Leading Ecosystem and Partnerships



## • Integration

- GPU , key Peripherals (PCIE – LVDS – Ethernet – HW Security.)
- Automotive/Industrial/Consumer peripheral sets
- Packaging ( 0.8 mm pitch – standard BGA – secure packaging)
- Qualifications: AEC-Q100, JEDEC Industrial and Consumer



## • Trust

- Longevity: Minimum of 10-15 years in all markets
- Consistency of Supply, Accessibility
- Quality, Robustness, Zero-defect methodology
- Security and Safety



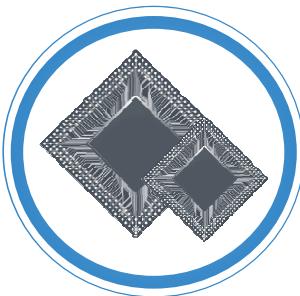
## • Ease of Adoption

- Communities, Innovation, Support
- Design Collateral, Distribution
- System Solutions: EVK including SoC, Sensors, PMIC, IoT Comms, SBC



\*via Partners and third parties

# i.MX Key technological differentiators



**Heterogeneous  
Multi-Processing (HMP)**  
Cortex® A + Cortex ® M



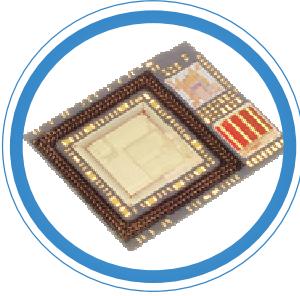
**Product Longevity  
& Reliability**



**Security**



**28nm FD-SOI  
Technology**



**RCP Technology**



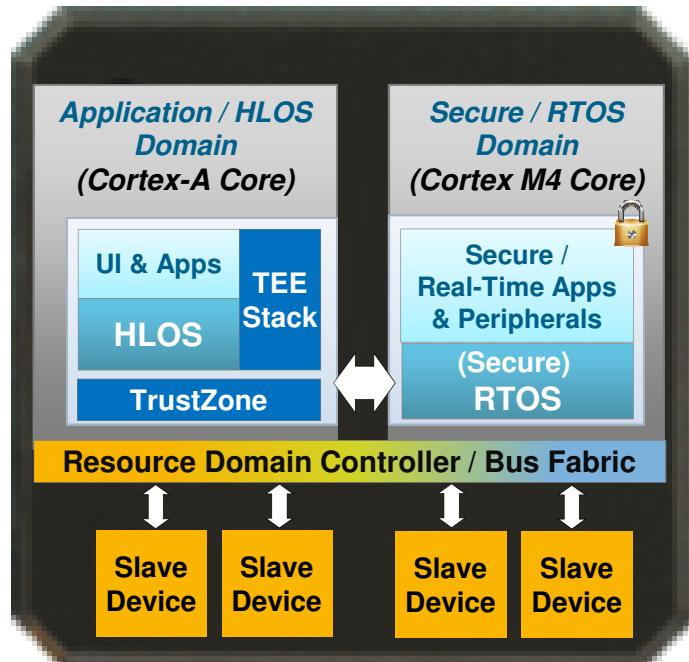
**NXP Partners &  
Ecosystem**

**Enabling  
Real-time capable,  
Power Efficient,  
Scalable & Reliable  
Secure  
Solutions**



# Heterogeneous multi-processing (HMP)

## Overview



HMP technical overview [Here](#)

### Heterogeneous architecture with smart system power

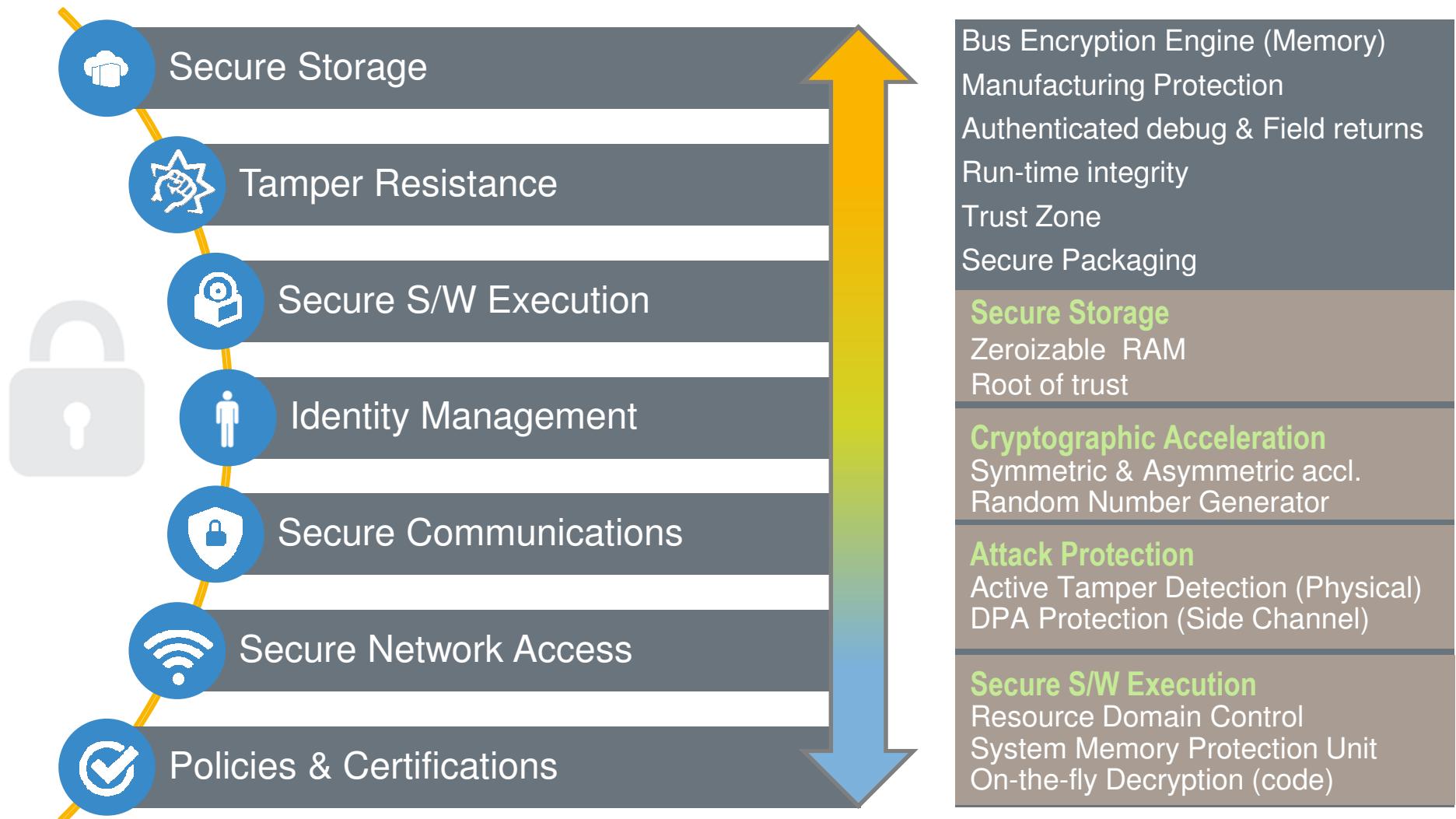
- **Multiple software execution environments enabling:**
  - Real-time performance
  - System integrity and security
  - Power consumption
  - Fast boot
- **Run UI-rich OS on Cortex-A7 core while still benefitting from deterministic and fast **real-time** responsiveness from a real-time / Secure OS running on the Cortex-M4 core.**
- System aware and **power efficient state** with complete shut down of the Cortex-A7 domain at significantly **low power** consumption.



Enabling New Low Power Modes and **Security Features** bringing together **MPU performance** and **MCU Low Power**



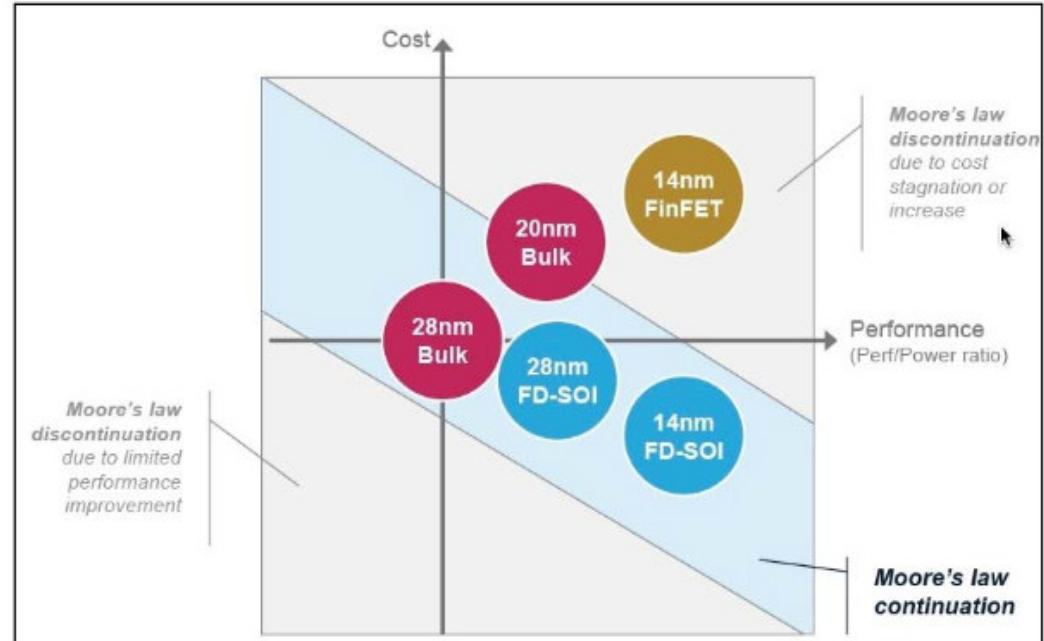
# i.MX Security Enablement Overview



# 28 nm FD-SOI - Cost Effective Low Power Solution

## Power Efficiency & Performances

- High computing power per watt lower thermal dissipation, and extended battery life for portable devices.
- Effective control of the transistor channel through biasing, allowing the optimization of static and dynamic power consumption. Translating to significantly lower leakage.
- 10x ~ 100x better Soft Error Rate (SER) reliability for critical safety functions as compared to Bulk Technologies.
- Better analog and RF characteristics over Bulk.



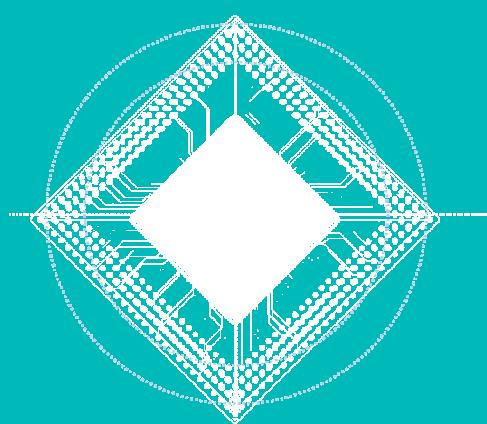
Source: FD=SOI Keeps Moor's Law on Track, Advanced Substrates, Feb 2014

**28 FD-SOI** is a key technological and most optimal choice for the **Next Generation of i.MX7 & 8 platforms**

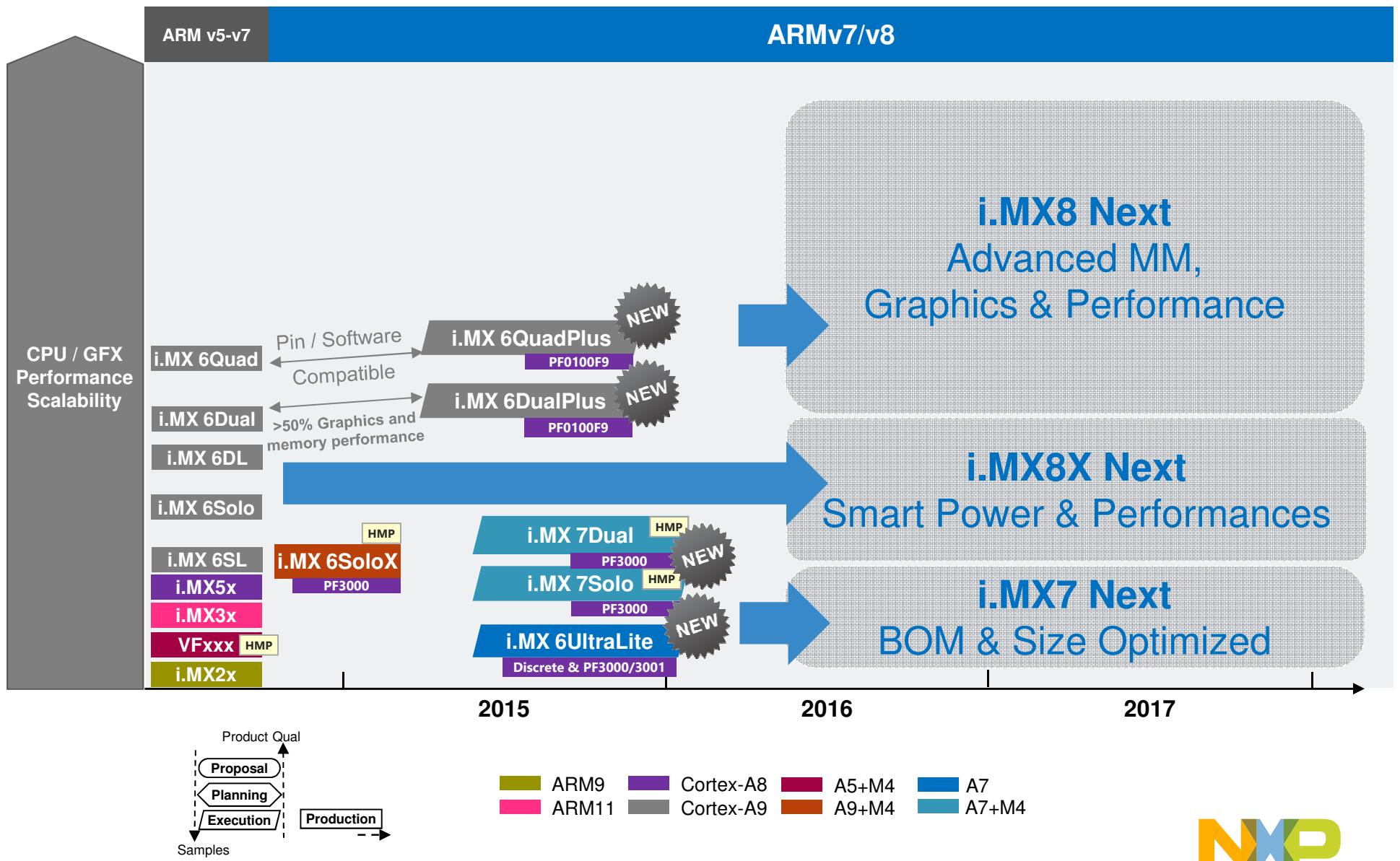


# i.MX Roadmap

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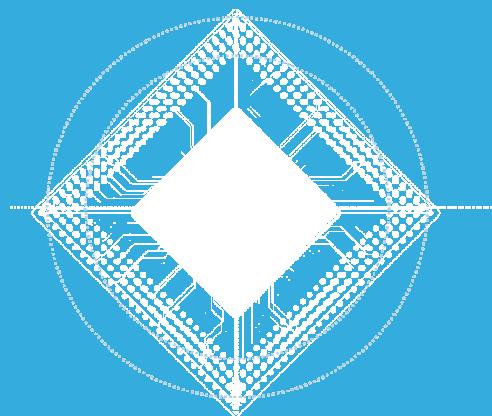


# i.MX Apps Processor Roadmap



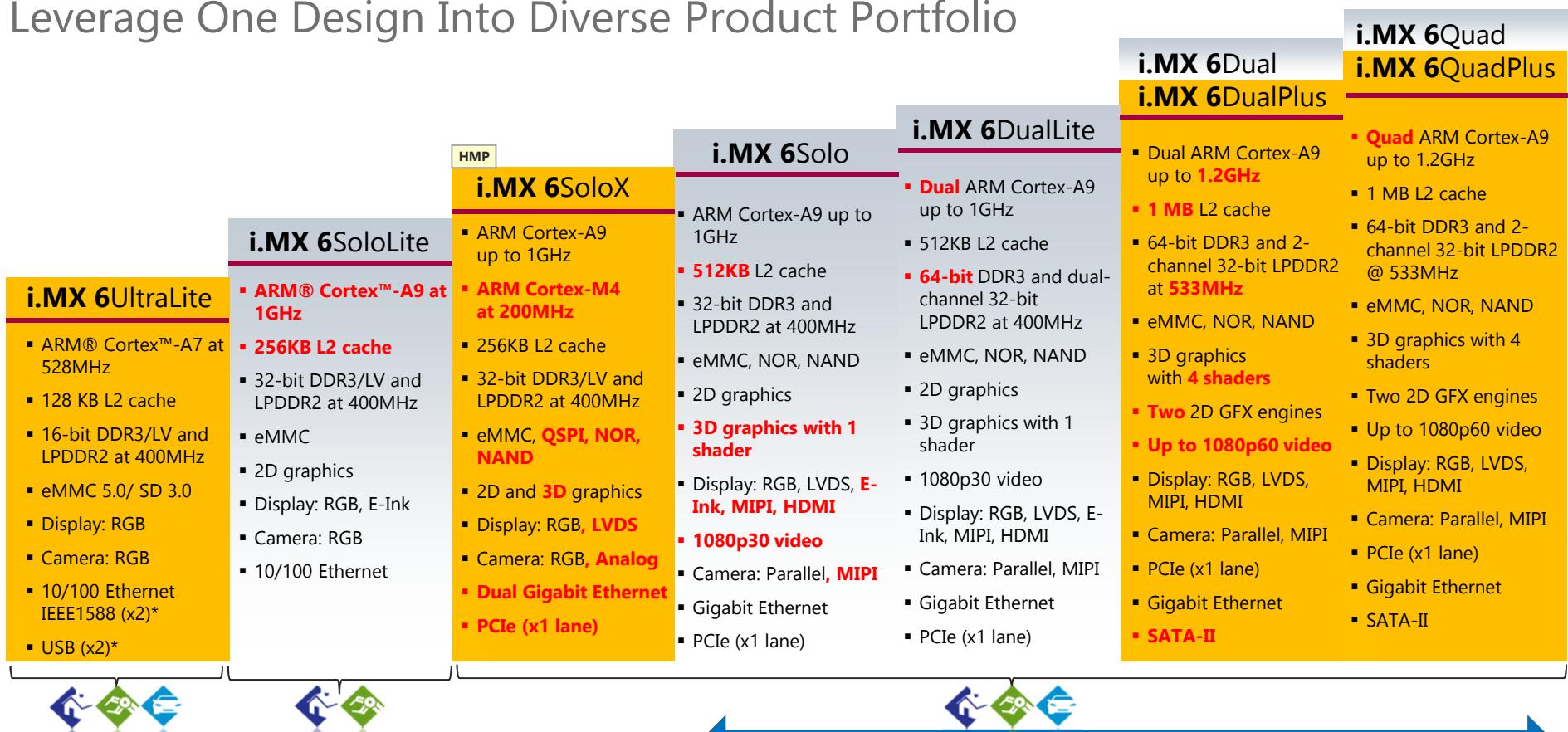
# Introduction to i.MX6 Series

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# i.MX6 Supreme Scalable & Flexible Family

Leverage One Design Into Diverse Product Portfolio



Pin-to-pin and Power Compatible (\*except PoP)

Software Compatible

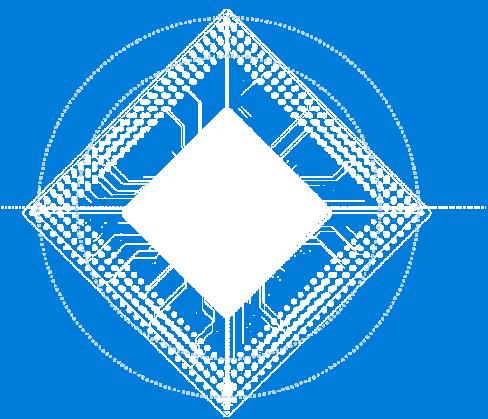
- ARM Cortex-A9 based solutions ranging up to 1.2GHz
- HD 1080p encode and decode (except 6SoloLite/6SoloX), 3D video playback in high definition (except 6SoloLite/6SoloX)
- Integrated IO's may include HDMI v1.4, MIPI and LVDS, display ports, MIPI camera, Gigabit Ethernet, multiple USB 2.0, SATA and PCI-Express
- SW support: Google Android™, Linux®, QNX (3rd party), Windows® Embedded CE (3rd party)11



\* Depending the part number

# Introduction to i.MX6 UltraLite

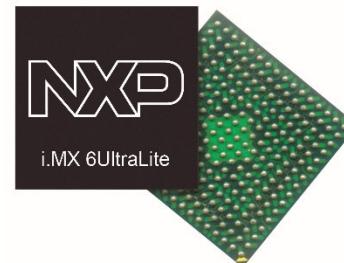
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# i.MX 6UltraLite Applications Processor Wins 2015 EEPW Editor's Choice Award



**Best Applications Processor**  
December 2015



i.MX 6UltraLite is the **smallest, most secure, most energy-efficient** ARM® Cortex®-A7-based applications processor

[eepw.com.cn/event/action/award2015/about.html](http://eepw.com.cn/event/action/award2015/about.html)



# i.MX 6 UltraLite Advantages



- **Lowest cost and smallest i.MX 6 member**

ARM Cortex- A7 @ 528 MHz/ Up to 700Mhz\*

- The **14x14** 289 MAPBGA with 0.8mm pitch for simple and low cost PCB design.
- The **9x9** 289 MAPBGA with 0.5mm pitch for space constrained applications.

\*On selected Qualifications Only

- **Most Power efficient Applications Processor from i.MX6 Family**

- Integrated power management module that reduces the complexity of external power supply and simplifies power sequencing.

*"It provides up to 20% more single thread performance than the Cortex-A5 and provides similar performance to mainstream Cortex-A9 based smartphones in 2012 while consuming less power."*

[www.arm.com/products/processors/cortex-a/cortex-a7.php](http://www.arm.com/products/processors/cortex-a/cortex-a7.php)

- **Connectivity optimized for Industrial and IoT applications**

- 2x high-speed USB on-the-go with PHY
- Multiple Serial Communication ports: (4x I2C, 4SPI, 8 UART, 2 Smartcard interface)
- 2x 12-bit ADC modules (up to 10 input channels) with on Touch Control
- Dual speed 10/100 Mbit/s Ethernet MAC compliant with the IEEE802.3-2002 standard
- 2x CAN ports

- **Advanced Security**

- Hardware-enabled security features that enable secure e-commerce, digital rights management (DRM), information encryption, On-The-Fly DRAM encryption, secure boot and secure software downloads



# i.MX 6UltraLite - Device Options

Feature	G0	G1 (Headless)	G2	G3 (full Security)
<b>Sub Family</b>	6UL Base	6UL General Purpose 1	6UL General Purpose 2	6UL Security
<b>Core</b>	ARM Cortex-A7	ARM Cortex-A7	ARM Cortex-A7	ARM Cortex-A7
<b>Speed</b>	528 MHz	528 MHz	528 MHz	528 MHz
<b>Cache</b>	32 KB-I, 32KB-D	32 KB-I, 32KB-D <b>128 KB L2</b>	32 KB-I, 32KB-D 128 KB L2	32 KB-I, 32KB-D 128 KB L2
<b>OCRAM</b>	128 KB	128 KB	128 KB	128 KB
<b>DRAM</b>	16-bit LP-DDR2, DDR3/DDR3L	16-bit LP-DDR2, DDR3/DDR3L	16-bit LP-DDR2, DDR3/DDR3L	16-bit LP-DDR2, DDR3/DDR3L
<b>Efuse for Customer</b>	512-bit	<b>1024-bit</b>	<b>1536-bit</b>	<b>2048-bit</b>
<b>NAND (BCH40)</b>	Yes	Yes	Yes	Yes
<b>Parallel Nor/EBI</b>	Yes	Yes	Yes	Yes
<b>Ethernet</b>	10/100 MB x 1	10/100 MB x 1	10/100 MB <b>x 2</b>	10/100 MB x 2
<b>USB with PHY</b>	OTG, HS/FS x 1	OTG, HS/FS <b>x 2</b>	OTG, HS/FS x 2	OTG, HS/FS x 2
<b>CAN</b>	0	<b>1</b>	<b>2</b>	2
<b>Security</b>	None	<b>TRNG, Crypto Engine (AES/TDES/SHA), Secure Boot</b>	TRNG, Crypto Engine (AES/TDES/SHA), Secure Boot	TRNG, Crypto Engine (AES/TDES/SHA/RSA with DPA), Secure Boot, <b>Tamper Monitor, PCI4.0 pre-certification, OTF DRAM Encryption</b>
<b>Graphic</b>	None	None	<b>PxP</b>	PxP
<b>CSI</b>	None	None	<b>16-bit Parallel CSI</b>	16-bit Parallel CSI
<b>LCD</b>	None	None	<b>24-bit Parallel LCD</b>	24-bit Parallel LCD
<b>QSPI</b>	1	1	1	1
<b>SDIO</b>	2	2	2	2
<b>UART</b>	4	<b>8</b>	8	8
<b>ISO7816-3</b>	0	<b>2</b>	2	2
<b>IIC</b>	2	<b>4</b>	4	4
<b>SPI</b>	2	<b>4</b>	4	4
<b>I<sup>2</sup>S/SAI</b>	1	<b>3</b>	3	3
<b>S/PDIF</b>	1	1	1	1
<b>Timer/PWM</b>	Timer x2, PWM x4	Timer <b>x4</b> , PWM <b>x8</b>	Timer x4, PWM x8	Timer x4, PWM x8
<b>12-bit ADC</b>	1x8ch	1x8ch	<b>2x8ch</b>	2x8ch
<b>Keyboard (8x8)</b>	Yes	Yes	Yes	Yes
<b>Temperature</b>	0C to 95°C (T <sub>j</sub> )	-40°C to 105°C (T <sub>j</sub> )	-40°C to 105°C (T <sub>j</sub> )	-40°C to 105°C (T <sub>j</sub> )
<b>Package</b>	289 MAPBGA (14x14,0.8mmp)	289 MAPBGA (14x14,0.8mmp) & (9x9, 0.5mmp)	289 MAPBGA (14x14,0.8mmp) & (9x9, 0.5mmp)	289 MAPBGA (14x14,0.8mmp)

Blue indicates change from column to the left



# i.MX 6UL-3 High Security Processor

## ▪ Specifications

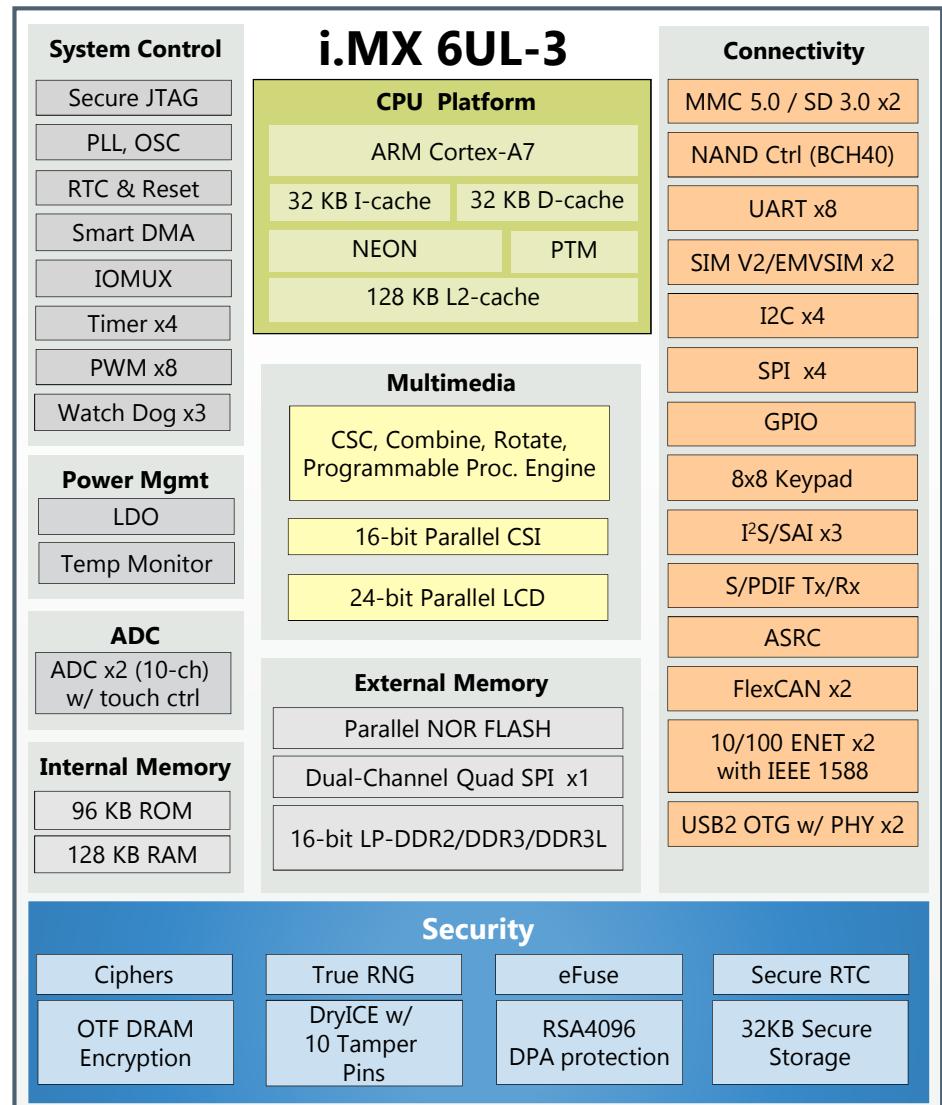
- Process: TSMC 40LP | Core Voltage: 1.1V
- Package:
  - 289 MAPBGA (14x14, 0.8 mm pitch)
  - 289 MAPBGA (9x9, 0.5mm pitch)
- Qualifications:
  - Commercial | 0° C to 95° C (T<sub>j</sub>)
  - Industrial | -40° C to +105° C (T<sub>j</sub>)
  - Automotive | -40° C to +125° C (T<sub>j</sub>)

## ▪ Key Features and Advantages

- ARM Cortex-A7 up to 700MHz, 128 KB L2 cache
- LCD Display up to WXGA (1366x768)
- 8-bit/10-bit/16-bit Parallel Camera Sensor Interface
- 16-bit LP-DDR2, DDR3/LV-DDR3
- 16-bit Parallel NOR FLASH / PSRAM
- Dual-channel QuadSPI NOR FLASH
- 8-bit Raw NAND FLASH with 40-bit ECC
- 2x MMC 5.0/SD 3.0/SDIO Port
- 2x USB 2.0 OTG, HS/FS, Device or Host with PHY
- Audio Interfaces include I2S/SSI, S/PDIF Tx/Rx
- 10/100 Ethernet with IEEE 1588 x 2
- **2 x EMV compatible ISO7816-3 interfaces**
- **Security Block:** TRNG, Crypto Engine (AES/TDES/SHA/RSA with DPA), Tamper Monitor, Secure Boot, SIMV2/EVMSIM X 2, OTF DRAM Encryption, PCI4.0 pre-certification

## ▪ Enablement

- Linux BSP from Freescale
- Brillo ([Under development](#))



# Detailed i.MX6UL Specifications

CPU Processing	<ul style="list-style-type: none"> <li>ARM Cortex-A7 with NEON co-processing, 32KB/32KB I/D-cache, 528MHz</li> <li>1003DMIPS</li> <li>128KB L2 Cache</li> </ul>	<b>Security</b>          	<ul style="list-style-type: none"> <li>TRNG&amp;PRNG(NIST SP 800-90 Certified)</li> <li>Cryptographic Engine           <ul style="list-style-type: none"> <li>AES(128/256)/DES/3DES with DPA protection</li> <li>SHA: up to SHA512</li> <li>Public key crypto: RSA-4096, Elliptic curve cryptography</li> </ul> </li> <li>32KB secure RAM</li> <li>Tamper detection, up to 10+ tamper inputs</li> <li>Voltage/temperature/clock frequency monitor</li> <li>HABv4.2 Based Secure Boot</li> <li>OTF DRAM encryption/decryption</li> <li>2xSIMV2/EMVSIM I/F</li> <li>PCI4.0 pre-certification</li> <li>Secure JTAG</li> <li>ARM TrustZone</li> </ul>
On-Chip Memory	<ul style="list-style-type: none"> <li>128KB RAM</li> <li>96KB ROM</li> </ul>		<ul style="list-style-type: none"> <li>2xUSB 2.0 OTG w/ PHY</li> <li>4xSPI, 8xUART, 4xI2C, 2xSD3.0/SDIO/MMC4.5</li> <li>2xFlexCAN</li> </ul>
External Memory Support	<ul style="list-style-type: none"> <li>16-bit LPDDR2/DDR3/LVDDR3</li> <li>2GB address space</li> <li>Max frequency: 400MHz</li> </ul> <p><i>*Note: DDR3 has better performance, availability and pricing compared to DDR2. Longevity of product with only DDR2 support is limited to boutique memory vendors at higher price.</i></p>		<ul style="list-style-type: none"> <li>2x ADC w/ TSC up to 5-wire</li> <li>1xLDO</li> </ul>
Display Support	<ul style="list-style-type: none"> <li>24-bit LCD w/ PXP for imaging resize, rotation, overlay &amp; CSC</li> <li>w/ touch sensing</li> <li>Resolutions up to WXGA@60Hz (1366x768)</li> </ul>		<ul style="list-style-type: none"> <li>8xPWM</li> <li>3xTimer</li> <li>8x8 Keypad</li> </ul>
Camera Processing	<ul style="list-style-type: none"> <li>24-bit CSI (also support 8/10/16-bit)</li> <li>Support ITU-R BT.656 interface</li> </ul>		<ul style="list-style-type: none"> <li>NOR/NAND flash</li> <li>SD/MMC</li> <li>SPI NOR flash/EEPROM</li> <li>QSPI flash</li> </ul>
Packaging	<ul style="list-style-type: none"> <li>289-ball MAPBGA 14x14mm, 0.8mm pitch</li> <li>289-ball MAPBGA 9x9mm, 0.5mm pitch</li> </ul>		<ul style="list-style-type: none"> <li>ARM core power 112mW@528MHz</li> <li>0.5mW@suspend mode</li> <li>0.045mW@RTC-only mode</li> </ul>
GPIO	<ul style="list-style-type: none"> <li>129 GPIOs</li> </ul>		<ul style="list-style-type: none"> <li>-40C to 105C</li> </ul>
Ethernet	<ul style="list-style-type: none"> <li>2x 10/100 Mbps Ethernet w/ IEEE 1588 compliant</li> <li>Ethernet PLL integrated</li> </ul>		<ul style="list-style-type: none"> <li>Free Linux BSP support by FSL</li> <li>Low cost EVK</li> <li>Software compatible with i.MX6 series</li> </ul>
Wifi/BT Interface Options	<ul style="list-style-type: none"> <li>SD3.0/SDIO/MMC4.5, USB 2.0, UART</li> </ul>		<ul style="list-style-type: none"> <li>Consumer, Industrial &amp; Automotive</li> </ul>
External Storage	<ul style="list-style-type: none"> <li>8-bit raw SLC/MLC NAND flash w/ up to 40bit ECC, up to 100MHz DDR</li> <li>8/16-bit NOR flash, up to 133MHz</li> <li>2xHS SD3.0/SDIO/MMC4.5, up to 200MHz</li> <li>2-ch DDR QSPI for serial flash</li> </ul>		<ul style="list-style-type: none"> <li>Consumer/Industrial: min 10yrs</li> <li>Automotive: min 15yrs</li> </ul>
Audio	<ul style="list-style-type: none"> <li>3xSAI w/ support to I2S/AC97/TDM/CODEC</li> <li>1xSPDIF</li> <li>Hardware sample rate conversion (ASRC)</li> <li>Audio PLL integrated</li> </ul>		

# i.MX 6UL-3 - Security Features

<b>Hardware Cryptographic Accelerators (CAAM)</b>	<p>Symmetric key authentication:</p> <ul style="list-style-type: none"> <li>- AES-128/256, with DPA protection</li> <li>- DES, 3DES</li> <li>- ARC4</li> </ul> <p>Asymmetric Authentication (public key)</p> <ul style="list-style-type: none"> <li>- RSA (up to 4096)</li> <li>- Elliptic curve "ECDSA" (up to P-521).</li> </ul>
<b>Cryptographic hash function</b>	MD5, SHA-1, SHA-224, SHA-256
<b>Tamper detection &amp; Protection</b>	<ul style="list-style-type: none"> <li>- DryICE (On-Chip Voltage, Temp, Freq Monitoring)</li> <li>- Dedicated tamper pins, 10 pins total (Can be configured to be 10 passive or up to 5 active pairs</li> <li>- Tamper Logging</li> </ul>
<b>DRAM Encryption</b>	On-the-fly DRAM data encryption/decryption with AES-128
<b>Hardened readback disable</b>	Yes, lock bit can disable the access of the key
<b>DPA resistant</b>	DPA Protection for AES
<b>Obfuscated key Storage protection</b>	On-chip zeroizable 8x4kB Secure RAM
	Off-chip key/data blobs AES-256 master key (CAAM/SNVS)
<b>Permanent JTAG disable</b>	Yes - Secure JTAG Controller (with electrical fuses)
<b>Internal key clearance</b>	On-chip zeroizable 8x4kB Secure RAM (32KB)
<b>Unique ID (Device DNA)</b>	Yes, as the OTPMK secret, which is unique per part. The OTPMK cannot be directly read but can be used to encrypt a constant to create a unique number, for use as a unique ID. Each chip has a 64-bit unique ID in OTP fuse.
<b>Unique ID (User eFuse)</b>	Yes - General purpose OTP fuse for customer use
<b>Secure storage</b>	<ul style="list-style-type: none"> <li>- Zero-able master key (256-bit)</li> <li>- General purpose 32-bit register</li> <li>- Secure High Assurance Boot</li> <li>- Up to 2K-bit E-Fuse</li> </ul>
<b>Permanent decryptor disable</b>	Yes (export disable fuse – disable all crypto except hash engine and RNG)
<b>Secure RAM w/ battery backup</b>	Yes - 256-bit master key storage with Secure RTC (real-time clock) power (SNVS)
<b>Additional Security Features</b>	<ul style="list-style-type: none"> <li>- Run-time Integrity Checker and Security Controller</li> <li>- Random Number Generator (NIST SP 800-90)</li> <li>- ARM TrustZone</li> <li>- 2x EMV compatible SIM V2 &amp; EMVSIM module</li> </ul>



# i.MX 6UltraLite Development Platform Key Features

## Processor

- Freescale i.MX 6UltraLite 528MHz\* ARM® Cortex™-A7 CPU (\*696MHz version coming)

## Memory

- 4Gb DDR3L DRAM memory
- 256Mb QSPI Flash
- Footprint for NAND
- Footprint for eMMC
- TF socket for boot

## Display

- Parallel WVGA LCD add-on card via expansion connector
- HDMI connector and Footprint for HDMI transmitter
- Camera Connector

## Audio

- Audio Codec
- 4-pole Audio Headphone Jack
- External speaker connection
- Microphone

## Connectivity

- USB Host connector
- Micro USB OTG connector
- Two Ethernet (10/100T) connector
- SD/SDIO Connector
- Two CAN Transceivers
- EMV Smart Card connector
- Arduino compatibility

## Debug

- JTAG connector
- Serial to USB connector

## Sensors

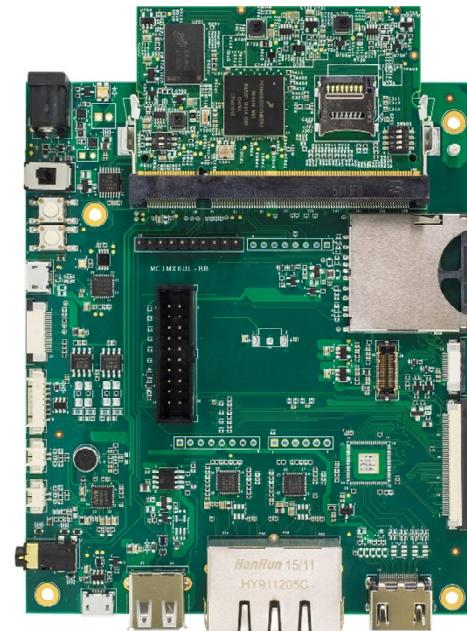
- Footprint for FXAS21000CQR1 Gyro
- FXLS8471Q three-axis digital accelerometer
- MAG3110 Digital eCompass

## Tools & OS Support

- Linux® BSPs from Freescale

## Others

- CPU Module: 1.67x2.66 inch
- Base Board: 4.25x5.12 inch
- 4 layer through hole PCB



**Part Numbers:** MCIMX6UL-EVK (\$149)  
**Display (4.3"):** LCD8000-43T (\$100)



# i.MX 6UltraLite - Orderable Part Numbers



Product Longevity

## i.MX6UltraLite Series Parts List

Part Number	Freq Cortex-A7	Qual	Temp (Tj)	Package (MAPBGA)
MCIMX6G3DVM05AA	A7 528MHz	Consumer	0 - 95 °C	14x14, 0.8 pitch
MCIMX6G3DVK05AA	A7 528MHz	Consumer	0 - 95 °C	9x9, 0.5 pitch
MCIMX6G2DVK05AA	A7 528MHz	Consumer	0 - 95 °C	9x9, 0.5 pitch
MCIMX6G2DVM05AA	A7 528MHz	Consumer	0 - 95 °C	14x14, 0.8 pitch
MCIMX6G0DVM05AA	A7 528MHz	Consumer	0 - 95 °C	14x14, 0.8 pitch
MCIMX6G3CVM05AA	A7 528MHz	Industrial	-40 - 105 °C	14x14, 0.8 pitch
MCIMX6G3CVK05AA	A7 528MHz	Industrial	-40 - 105 °C	9x9, 0.5 pitch
MCIMX6G2CVM05AA	A7 528MHz	Industrial	-40 - 105 °C	14x14, 0.8 pitch
MCIMX6G2CVK05AA	A7 528MHz	Industrial	-40 - 105 °C	9x9, 0.5 pitch
MCIMX6G1CVM05AA	A7 528MHz	Industrial	-40 - 105 °C	14x14, 0.8 pitch
MCIMX6G1AVM05AA	A7 528MHz	Automotive	-40 - 125 °C	14x14, 0.8 pitch
MCIMX6G2AVM05AA	A7 528MHz	Automotive	-40 - 125 °C	14x14, 0.8 pitch

 **Automotive Qualification:** 10% duty cycle (max speed), 15 years, -40 °C to 125 °C Tj

 **Industrial Qualification:** 100% duty cycle (max speed) , 10 years, -40 °C to 105 °C Tj

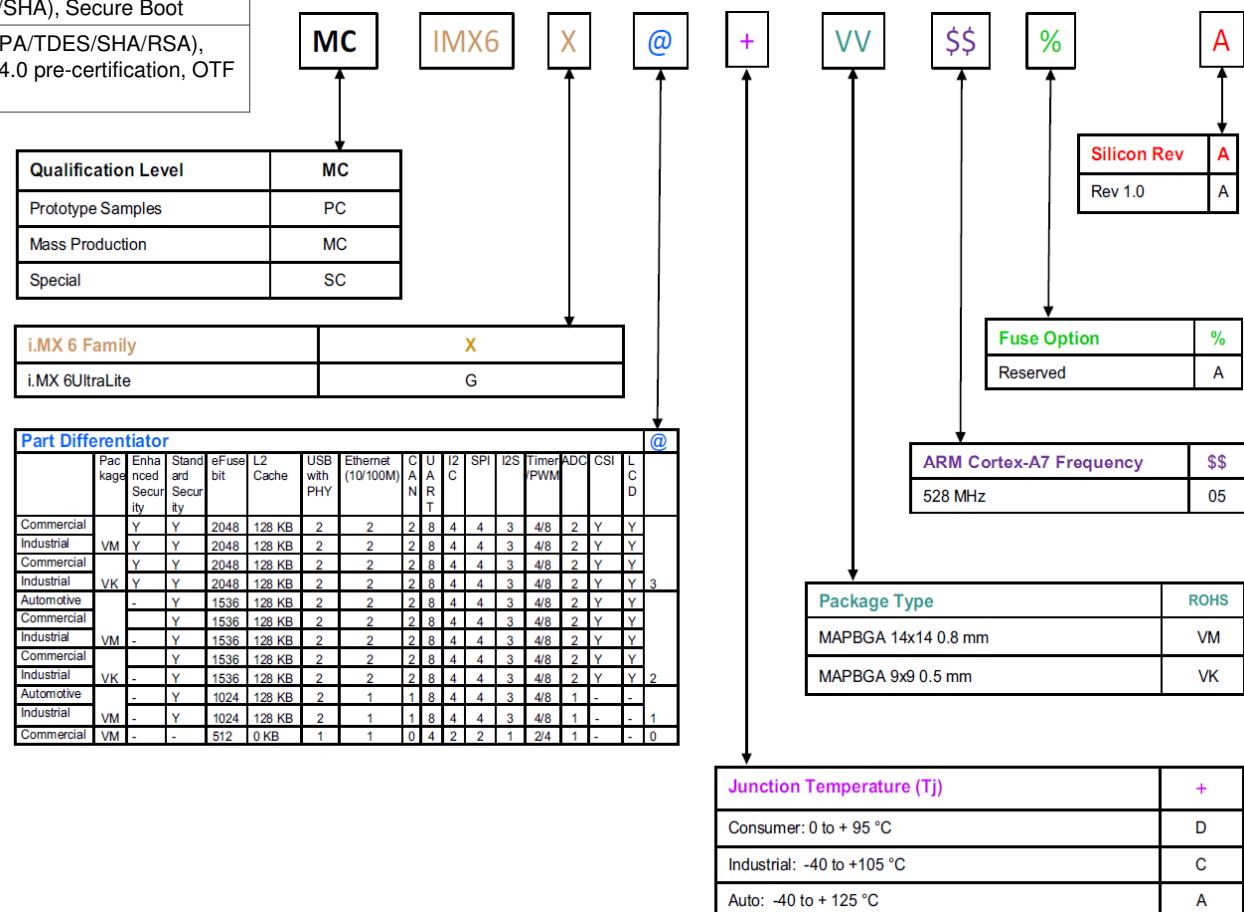
 **Consumer Qualification:** 50% duty cycle (max speed), 5 years, 0 °C to 95 °C Tj



# i.MX 6UltraLite - Part Decoder & features

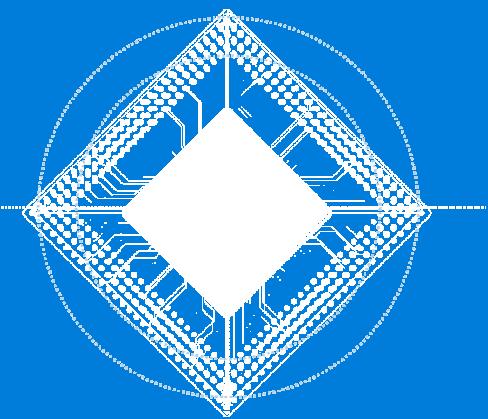
Part Number	Std Security	Adv Security	LCD	Camera	CAN	L2 Cache	ISO7816-3
MCIMX6G0DVM05AA	-	-	-	-	-	-	-
MCIMX6G2DVK05AA	X	-	X	X	2	X	X
MCIMX6G2DVM05AA	X	-	X	X	2	X	X
MCIMX6G3DVK05AA	X	X	X	X	2	X	X
MCIMX6G3DVM05AA	X	X	X	X	2	X	X

<b>Standard Security</b>	TRNG, Crypto Engine (AES/TDES/SHA), Secure Boot
<b>Adv Security</b>	TRNG, Crypto Engine (AES with DPA/TDES/SHA/RSA), Secure Boot, Tamper Monitor, PCI4.0 pre-certification, OTF DRAM Encryption

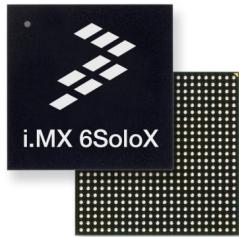


# Introduction to i.MX6 SoloX

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# i.MX 6 SoloX



Highly integrated multi-market applications processor enabling connected homes

## Heterogeneous architecture with smart system power

- Run UI-rich OS on Cortex-A9 core while still benefitting from deterministic and fast real-time responsiveness from the Cortex-M4 core.
- Maintain a system aware and power efficient state with complete shut down of the Cortex-A9 core, with the Cortex-M4 still active and performing low-level system monitoring tasks.
- Cortex-M4 core can be used as an additional processing source to run low-bandwidth tasks to improve performance to provide BOM-level component and code consolidation for cost reduction.

## Secure solutions for optimized performance efficiency

- Four independently controlled resource domains provide customer flexibility when partitioning system resources like memory and peripherals.
- Integral hardware semaphore unit enables cooperative multicore software to safely access shared peripherals.
- Peripheral and memory access requests are hardware-verified to provide secure isolation and prevent tainting of system resources.
- Advanced security supporting high assurance (secure) boot, cryptographic cipher engines and random number generator.

## Optimized integration for design flexibility

- Dual-port gigabit Ethernet audio video bridging (AVB) for quality of service in automotive and other applications with enhanced traffic shaping and packet prioritization.
- Cost-effective 3D graphics processing unit (GPU) for enhanced HMI development.
- Flexible boot options, with interfaces for DDR3, low power DDR2, quad SPI for flash capabilities, and raw NAND.
- Smart integration with additional UARTs and timers to maximize functionality of the dual cores.



# i.MX 6 SoloX Advantages



- **Heterogeneous architecture with smart system power**

- Single Cortex-A9 paired with a Cortex-M4
- Enables concurrent execution of multiple software environments to provide high performance with real time responsiveness, allowing for smart system power

- **Optimized integration for design flexibility**

- Dual Gb Ethernet with hardware AVB support
- PCIe for high-speed connectivity
- 2D/3D hardware graphics acceleration for advanced UI's
- LPDDR2 and cost-effective DDR3/DDR3L Memory controller

- **Optimized Power**

- Maintain a system aware and power efficient state with complete shut down of the Cortex-A9 core, with the Cortex-M4 still active and performing low-level system monitoring tasks.

- **Secure solutions for optimized performance efficiency**

- On-chip resource domain controller providing a centralized programming model to configure isolation and sharing of system resources.
- Advanced security supporting high assurance (secure) boot, cryptographic cipher engines and random number generator.



# i.MX 6 SoloX Device Options

Feature	6SX-1	6SX-2	6SX-3	6SX-4
Primary Core			1x ARM® Cortex™ A9	
Speed			up to 1GHz	
Cache L1/L2			32 KB-I, 32KB-D L1 ; 256 KB L2	
Secondary Core			ARM® Cortex™ M4	
Speed			up to 227MHz	
Cache L1			16 KB-I, 16KB-D L1	
TCM			64 KB TCM	
OCRAM			128KB General Purpose / 96KB HAB / 32K SRAM	
DRAM			16/32-bit LP-DDR2 (400MHz) ; 16/32-bit DDR3/DDR3L (400MHz)	
NAND / NOR Flash			8-bit raw SLC/MLC NAND flash w/ up to 60bit ECC (BCH60) 16/32-bit NOR flash	
QSPI			2x Dual-channel DDR QuadSPI	
Parallel Nor/EBI			Yes	
Ethernet			2x 10/100/1000 MB (IEEE1588 & AVB compatible)	
USB 2.0			2x USB OTG HS w/PHY 1x HSIC	
CAN			2x FlexCan	
UART			6	
IIC			4	
eCSPI			5	
I2S/SAI/SPDIF		x3 SSIs ; 2x SAIs (Configurable up to 5x I2S/AC97 ports); 1x SPDIF		
Timer/PWM			Timer x4, PWM x8	
Security			Secure Boot/HAB, PRNG, AES/3DES/Elliptical Curve/RSA, DPA protection, Up to 10 Tamper Pins	
PCIe	N/A	1x PCIe 2.0 (1 lane)	1x PCIe 2.0* (1 lane)	1x PCIe 2.0 (1 lane)
2D & 3D GFX	N/A	3D GPU - GC400T 27M Tri/s, 166Pxl/s	N/A	3D GPU - GC400T 27M Tri/s, 166Pxl/s
Camera I/F			8-bit via RGMII2	2x 24-bit CSI Video ADC (PAL/NTSC)
LCD			24-bit // LCD up to WVGA -	24-bit // LCD up to WVGA 1x LVDS (up to 85MP/sec)
SDIO			3	4
12-bit SAR ADC	2x 8ch	N/A	2x 8ch*	2x 8ch

\*Not on all packages



# i.MX 6SoloX

## ▪ Specifications:

- CPU1: ARM Cortex-A9 @ 800MHz/1GHz
- CPU2: ARM Cortex-M4 @166MHz-227MHz
- Process: 40nm
- Package:
  - 14x14, 0.65mm pitch MAPBGA
  - 17x17, 0.8mm pitch MAPBGA
  - 19x19, 0.8mm pitch MAPBGA
- Qual Tiers:
  - Commercial | -20 °C to +105 °C
  - Industrial | -40 °C to +105 °C
  - Automotive | -40 °C to +105 °C

## ▪ Key Features and Advantages:

### Memory Support

- 16/32bit LP-DDR2, DDR3/DDR3L @ 400MHz
- 2x SDIO3.0/eMMC4.5
- 8-bit NAND Flash with ECC(BCH62)

**Multiple boot sources include managed NAND, raw NAND, parallel NOR and dual DDR Quad SPI**

### Display / Camera

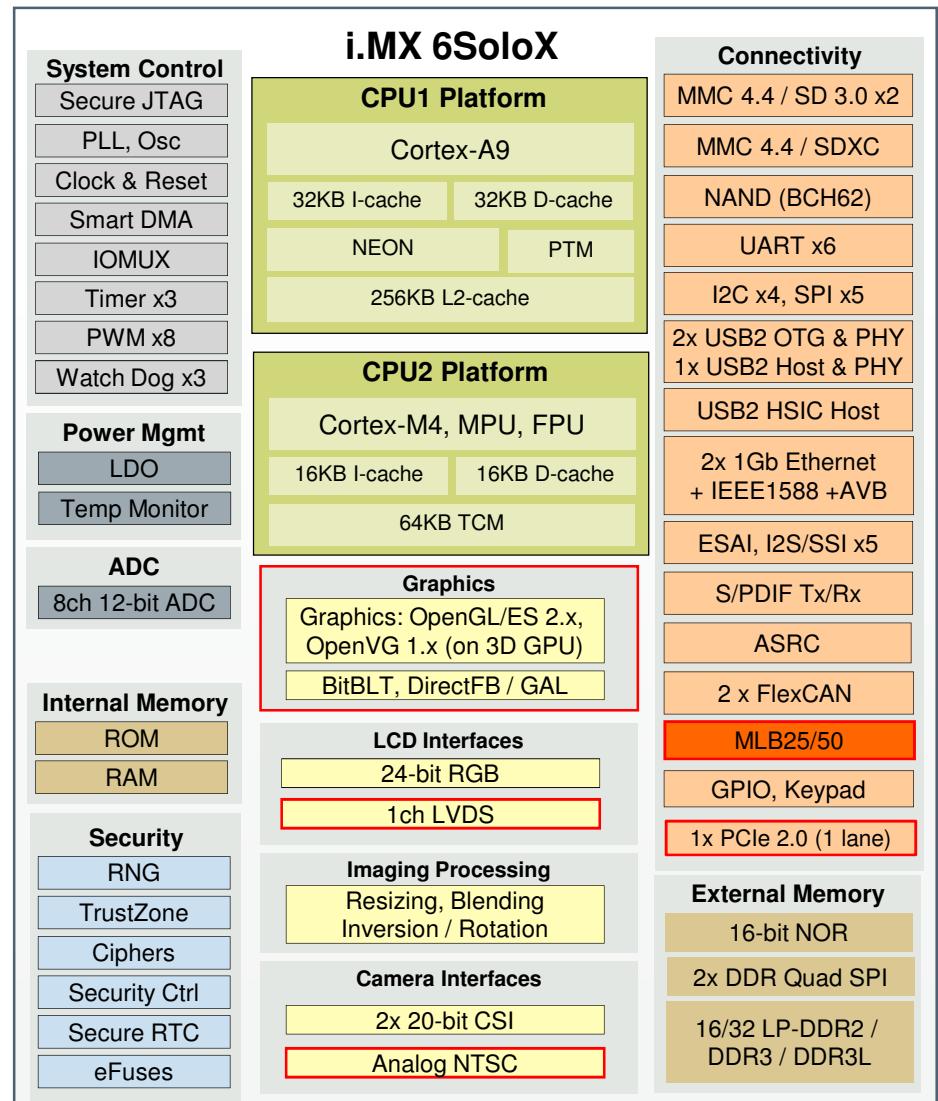
- 24-bit Parallel LCD + LVDS\*
- 24-bit parallel CSI + Video ADC (NTSC/PAL)\*

### Multimedia:

- Vivante GC400T GPU supporting 27M Tri/s, 166M Pxl/s OpenGL ES 2.x / OpenVG 1.x

### I/O

- 2x USB 2.0 OTG w/ PHY + 1xUSB 2.0 HOST/HSIC
- 2x Gigabit Ethernet Ports-AVB
- 1x PCIe 2.0 (x1 lane)\*
- 2x FlexCAN, 1x MLB25/50\* (automotive only)
- 2x 8-ch 12-bit SAR ADC
- 4x SPI; 4x I2C; 6x UARTs
- 8x PWMs; 3x 32-bit Timer (GPT)



Red box: \*not available on all packages      Red border: Auto only



# i.MX 6SoloX – Development Platform Key Features

## Processor

- Freescale i.MX 6SoloX 19x19 package
  - Cortex™-A9 CPU @1GHz
  - Cortex-M4 CPU @227MHz
- Freescale PF0200 Power Management IC

## Memory

- 1 GB DDR3
- Footprint for Managed NAND (eMMC/eSD)
- 32MB x2 QuadSPI Flash
- SD/MMC socket

## Display/Camera

- LVDS display connector
- Parallel LCD expansion connector
- Parallel camera connector

## Wireless

- Via external module

## Audio

- 3.5 mm audio stereo HP jack
- Board mounted microphone

## Connectivity

- USB host connector
- Micro USB OTG connector
- 2x Ethernet (1Gbit) connector
- mPCIe connector
- 2x CAN (DB-9) using Freescale MC34901 CAN transceiver
- 12-bit ADC connector
- GPIO

## Debug

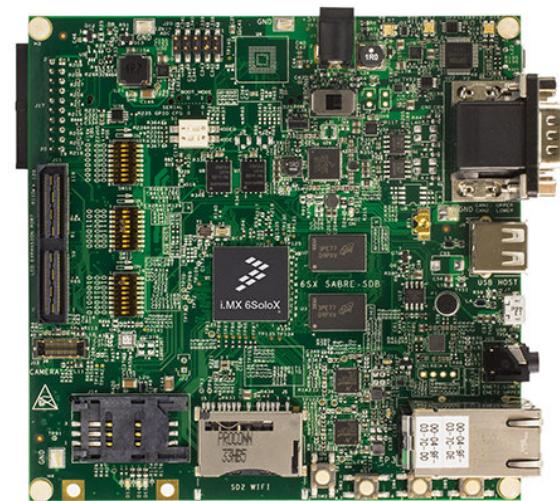
- JTAG connector
- UART via USB

## Sensors

- Freescale MMA8451 three-axis digital accelerometer
- Freescale MAG3110 three-axis digital magnetometer
- Ambient light sensor

## Tools & OS Support

- Cortex-A9
  - Linux®
  - Android™
- Cortex-M4
  - MQX/ FreeRtos



Part Numbers: MCIMX6SX-SDB (\$399)

Display (10.1"): [MCIMX-LVDS1](#) (\$499)



# i.MX 6SoloX

## Orderable Part Numbers



Product Longevity

### i.MX6SoloX Series Parts List

Part Number	Freq A9	SPDIF	ADC	MLB	PCIe	GPU	LVDS	Qual	Temp (Tj)	Package
MCIMX6X1EVK10AB	A9 1GHz	x	x					Ext. Cons.	-20 - 105 °C	14x14, 0.65 pitch
MCIMX6X1EVO10AB	A9 1GHz	x	x					Ext. Cons.	-20 - 105 °C	17x17, 0.8 pitch
MCIMX6X1CVK08AB	A9 800MHz	x	x					Industrial	-40 - 105 °C	14x14, 0.65 pitch
MCIMX6X1CVO08AB	A9 800MHz	x	x					Industrial	-40 - 105 °C	17x17, 0.8 pitch
MCIMX6X1AVK08AB	A9 800MHz		x	x				Automotive	-40 - 125 °C	14x14, 0.65 pitch
MCIMX6X1AVO08AB	A9 800MHz		x	x				Automotive	-40 - 125 °C	17x17, 0.8 pitch
MCIMX6X2EVN10AB	A9 1GHz	x			x			Ext. Cons.	-20 - 105 °C	17x17, 0.8 pitch
MCIMX6X2CVN08AB	A9 800MHz	x			x			Industrial	-40 - 105 °C	17x17, 0.8 pitch
MCIMX6X2AVN08AB	A9 800MHz			x	x			Automotive	-40 - 125 °C	17x17, 0.8 pitch
MCIMX6X3EVK10AB	A9 1GHz	x	x			x		Ext. Cons.	-20 - 105 °C	14x14, 0.65 pitch
MCIMX6X3EVO10AB	A9 1GHz	x	x			x		Ext. Cons.	-20 - 105 °C	17x17, 0.8 pitch
MCIMX6X3EVN10AB	A9 1GHz	x			x	x		Ext. Cons.	-20 - 105 °C	17x17, 0.8 pitch
MCIMX6X3CVO08AB	A9 800MHz	x	x			x		Industrial	-40 - 105 °C	17x17, 0.8 pitch
MCIMX6X3CVN08AB	A9 800MHz	x			x	x		Industrial	-40 - 105 °C	17x17, 0.8 pitch
MCIMX6X4EVM10AB	A9 1GHz	x	x	x	x	x	x	Ext. Cons.	-20 - 105 °C	19x19, 0.8 pitch
MCIMX6X4CVM08AB	A9 800MHz	x	x	x	x	x	x	Industrial	-40 - 105 °C	19x19, 0.8 pitch
MCIMX6X4AVM08AB	A9 800MHz		x	x		x	x	Automotive	-40 - 125 °C	19x19, 0.8 pitch

**Automotive Qualification:** 10% duty cycle (max speed), 15 years, -40°C to 125°C Tj

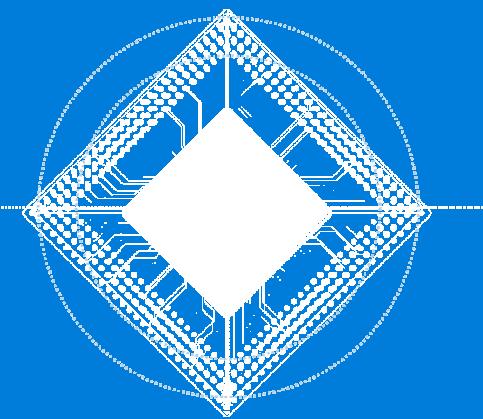
**Industrial Qualification:** 100% duty cycle (max speed), 10 years, -40°C to 105°C Tj

**Extended Consumer Qualification:** 100% duty cycle (max speed), 10 years, -20°C to 105°C Tj



# Introduction to i.MX6 DQPlus

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# i.MX 6 QuadPlus | i.MX 6DualPlus Advantages

- **Extreme Graphics Performance**

- Quad/Dual Core Cortex-A9 Cores



- Graphics performance increase to 720Mhz
    - Pin to Pin Compatibility
    - Leading edge 3D and 2D graphics, as well as high-definition video

- **Display Improvements**

- Addition of new pre-fetch and resolve (PRE) modules to the existing IPU block on the all Plus processors
  - Addition of two new 128 Kbyte OCRAM blocks and for performance increase to add to the existing 256kb for a total of 512kb OCRAM

- **DDR Performance Increase**

- Redefined AXI Bus Switch Structure
  - DRAM Improvement performance of systems by dramatically increasing the memory bandwidth utilization of over 50%
  - Optimized data flow to reduce memory access
    - Driver compatibility with all i.MX 6 Series

- **i.MX 6DQPlus Secure Solutions**

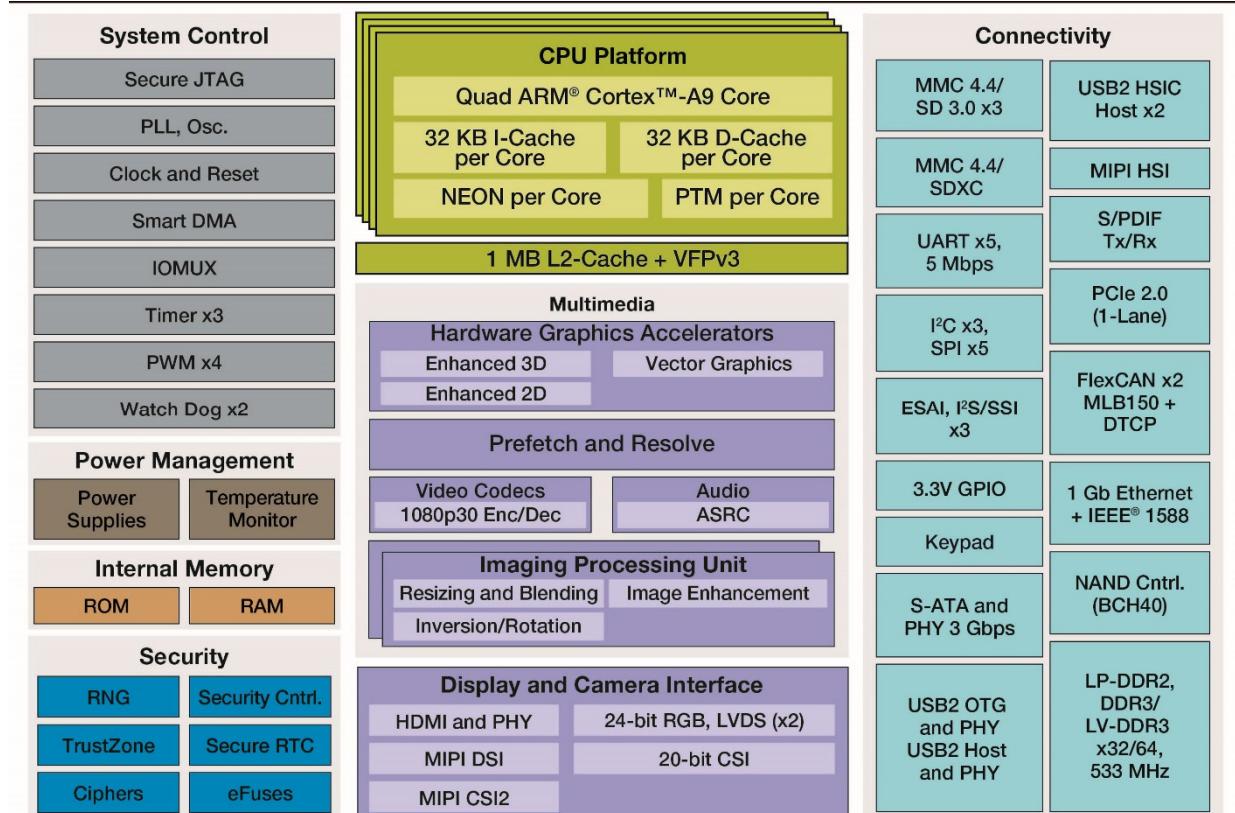
- TrustZone architecture and High Assurance Boot (HAB) enablement
  - e-commerce, digital rights management
  - Information encryption, secure boot and secure software downloads.



# i.MX 6 QuadPlus | i.MX 6DualPlus Block Diagram

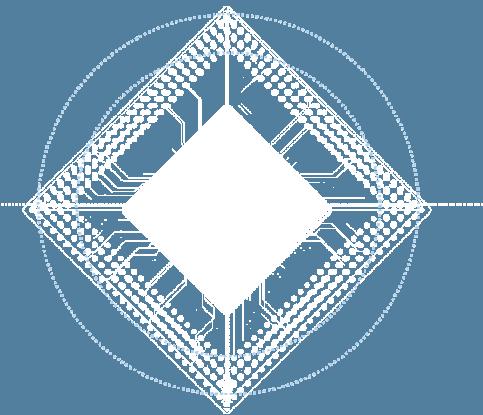
## Specifications:

- **CPU:**
  - i.MX 6QuadPlus: 4x Cortex-A9 @ 800MHz/852MHz/1GHz
  - i.MX 6DualPlus: 2x Cortex-A9 @ 800MHz/852MHz/1GHz
- **Process:** TSMC 40nm LP
- **Package:** 21x21 0.8mm Flip-chip BGA
- **Qual Tiers:**
  - Ext. Commercial | -20 °C to +105 °C (T<sub>j</sub>)
  - Industrial | -40 °C to +105 °C (T<sub>j</sub>)
  - Automotive | -40 °C to +125 °C (T<sub>j</sub>)
- **Pin compatible with i.MX 6Quad and i.MX 6Dual**
- **Up to 10,000 DMIPS**



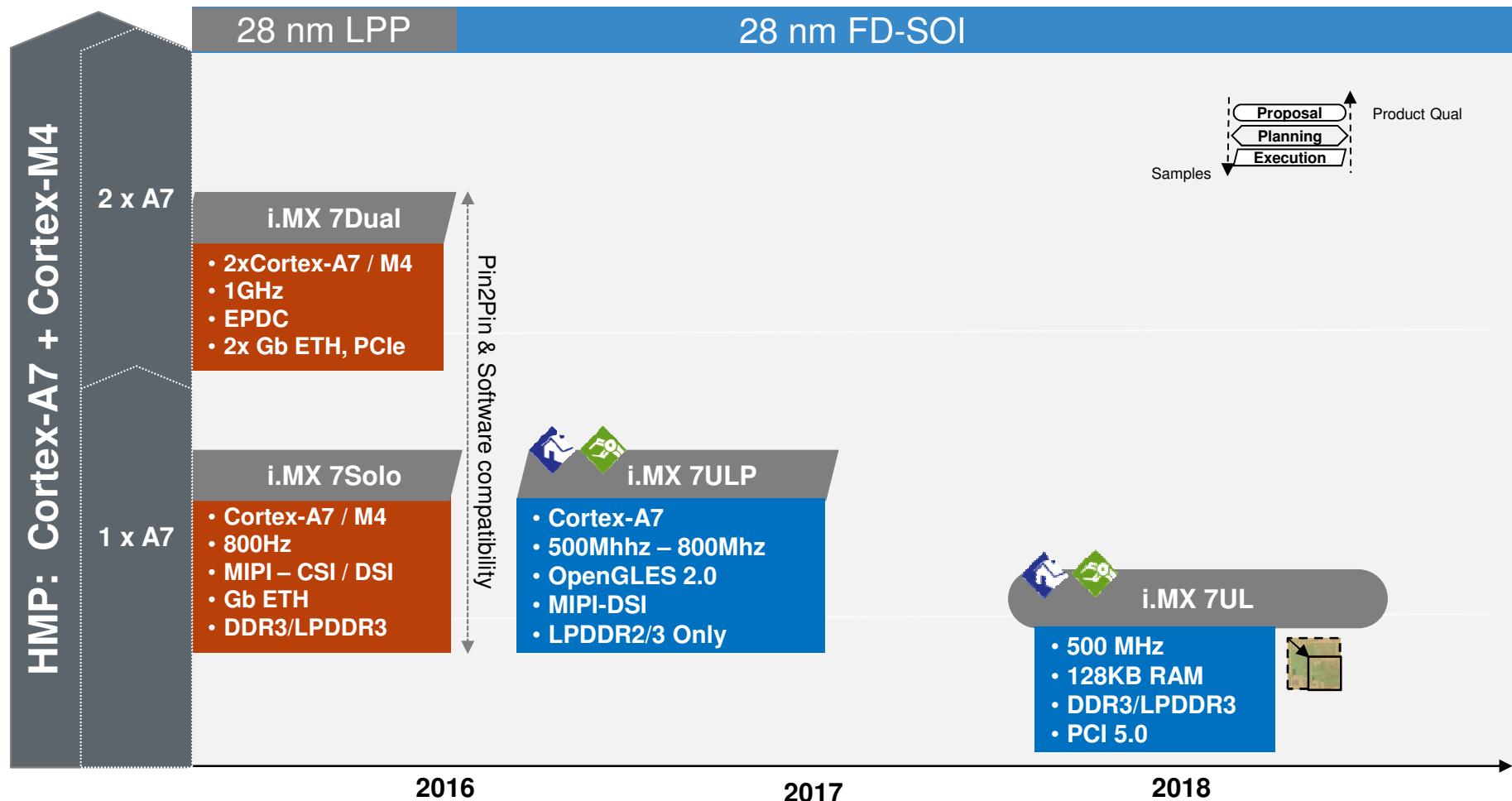
# Introduction to i.MX7 Series

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# i.MX 7Series - Roadmap Embedded / Industrial

Preliminary, subject to change



# Introduction to i.MX7 Dual i.Solo

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# i.MX7 Dual | Solo Target Applications

## MOBILE DEVICES

LPDDR2/3  
Small Package



- Healthcare / Patient Monitoring
- HMI Control / Security
- Point of Sale
- Printing
- Home Control
- Wearables
- eReaders
- General Embedded Control
- Embedded Board Solutions
- IoT

## CONNECTED DEVICES

Low Cost DDR3  
Larger Pitch Package



# i.MX7 Dual | Solo High Level Comparison



## i.MX 7Solo

- Single ARM® Cortex®-A7 up to 800 MHz
- Cortex-M4 up to 200 MHz
- 512KB L2 cache
- 16/32-bit DDR3/DDR3L and LPDDR2/3 at 533 MHz
- Single Gigabit Ethernet (AVB)
- **Full security with tamper resist**



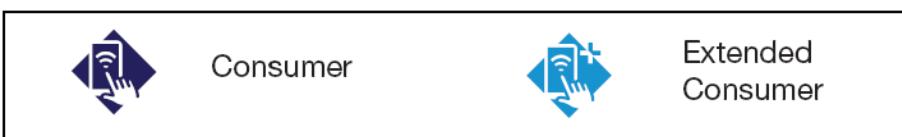
## i.MX 7Dual

- **Dual** ARM® Cortex®-A7 up to **1.0 GHz**
- Cortex-M4 up to 200 MHz
- 512 KB L2 cache
- 16/32-bit DDR3/DDR3L and LPDDR2/3 at 533 MHz
- **Dual** Gigabit Ethernet (AVB)
- **Full security with tamper resist**
- **EPD controller**
- **PCIe (x1 lane)**

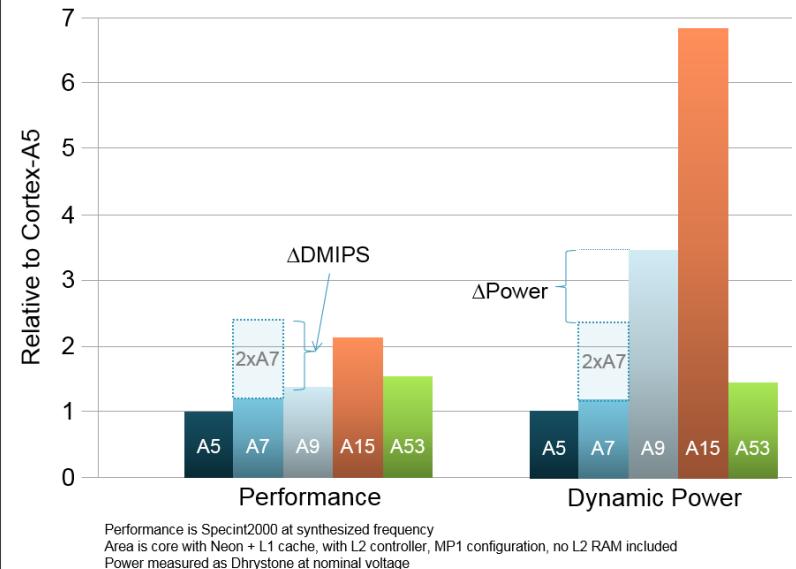
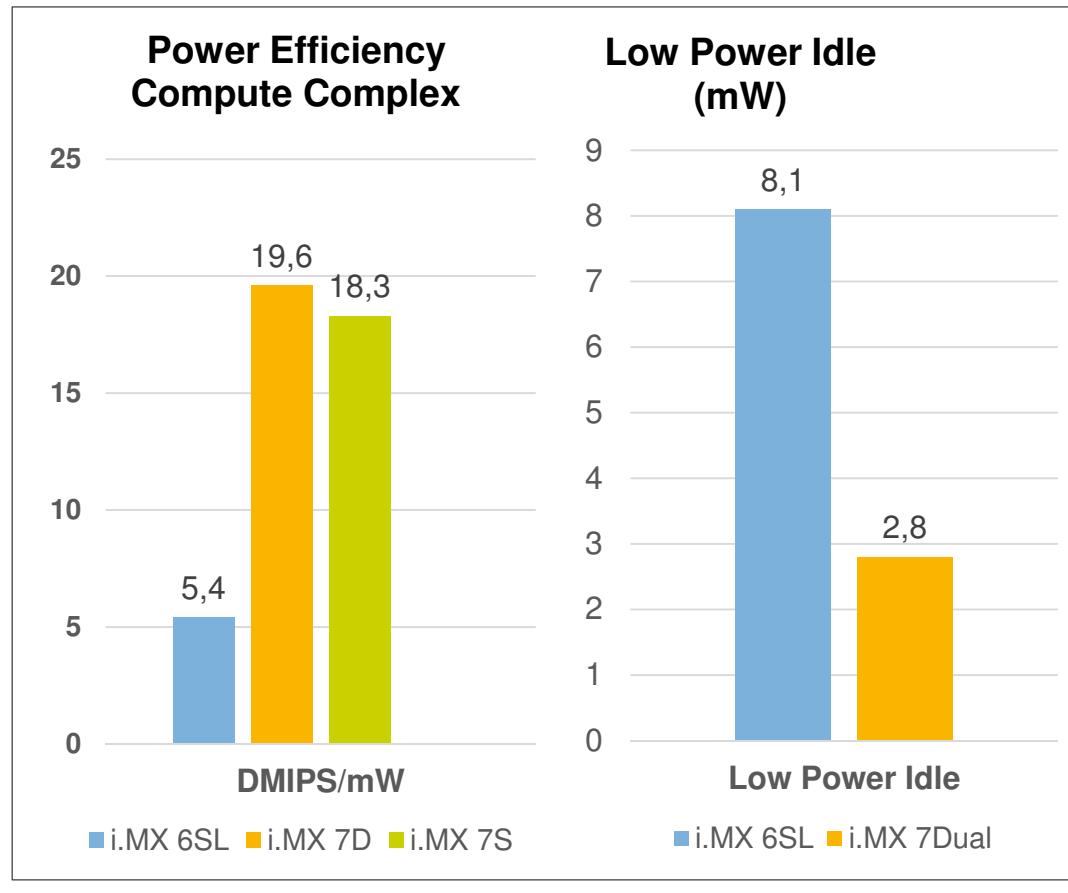
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Pin-to-pin and power compatible

Software compatible

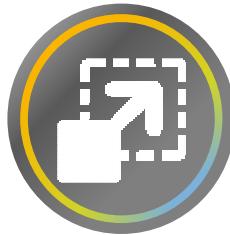


# i.MX7Dual - Cortex-A7 Efficiency vs. Cortex-A9



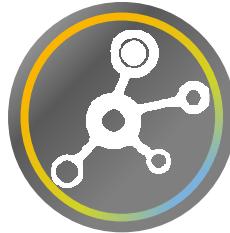
# i.MX 7 Dual | Solo Advantages

- **Scalable Heterogeneous Architecture**
  - Single and Dual Cortex-A7 Core up to 1GHz
  - Cortex-M4 up to 200MHz
    - Offload Tasks
    - Optimize Power
    - Increase Security



- **Unmatched Power Efficiency**
  - **3x** improvement in Power Efficiency vs. i.MX 6
    - 100 uW/MHz for Cortex-A7
    - 70 uW/MHz for Cortex-M4
  - One third the power consumed in the Low Power suspend mode (250 uW) vs. i.MX 6.

- **Flexible High Speed connectivity**
  - PCI-e v2.1
  - 2x high-speed USB on-the-go with PHY
  - Dual Gbit Ethernet with AVB
  - DDR QuadSPI support
  - eMMC 5.0



- **Complete Security Infrastructure**
  - Secure Boot
  - Crypto H/W Acceleration
  - Internal and External Tamper Detection
  - Secure RAM
  - DPA attack Resistance
  - Secure JTAG



**NXP**

\*Under Investigation

# i.MX 7 Dual | Solo - Device Options

Feature	Solo	Dual	Additional comments
<b>Primary Core</b>	1x ARM® Cortex™ A7	<b>2x</b> ARM® Cortex™ A7	
Speed	up to 800MHz	up to <b>1GHz</b>	<ul style="list-style-type: none"> <li>▪ 1520 DMIPS @ 800MHz</li> <li>▪ 1900 DMIPS @ 1GHz</li> <li>▪ 3800 DMIPS @ 2x 1GHz</li> </ul>
<b>Cache L1</b>	32 KB-I, 32KB-D	32 KB-I, 32KB-D	
<b>Cache L2</b>	512 KB	512 KB	
<b>Secondary Core</b>	ARM® Cortex™ M4	ARM® Cortex™ M4	Including MPU & FPU extensions
Speed	up to 200MHz	up to 200MHz	<ul style="list-style-type: none"> <li>▪ 250 DMIPS @ 200MHz</li> </ul>
<b>Cache L1</b>	16 KB-I, 16KB-D	16 KB-I, 16KB-D	
<b>TCM</b>	64 KB TCM	64 KB TCM	
<b>OCRAM</b>	256KB	256KB*	<ul style="list-style-type: none"> <li>▪ For non EPDC devices</li> </ul>
<b>DRAM</b>	16/32-bit LP-DDR2, LPDDR3 (533MHz) 16/32-bit DDR3/DDR3L (533MHz)	16/32-bit LP-DDR2, LPDDR3 (533MHz) 16/32-bit DDR3/DDR3L (533MHz)	
<b>NAND / NOR Flash</b>	Yes	Yes	<ul style="list-style-type: none"> <li>▪ 8-bit NAND, 62-bit ECC, 16-bit NOR</li> </ul>
<b>Parallel Nor/EBI</b>	Yes	Yes	
<b>Ethernet</b>	10/100/1000 MB x 1 (AVB)	10/100/1000 MB <b>x2</b> (AVB)	
<b>USB 2.0</b>	1x USB OTG HS w/PHY 1x HSIC	<b>2x</b> USB OTG HS w/PHY 1x HSIC	<ul style="list-style-type: none"> <li>▪ HSIC is Chip to Chip interconnect via USB</li> </ul>
<b>CAN</b>	2x FlexCan	2x FlexCan	
<b>Security</b>	Secure Boot/HAB, PRNG, AES/3DES/Elliptical Curve/RSA, DPA protection, Up to 10 Tamper Pins	Secure Boot/HAB, PRNG, AES/3DES/Elliptical* on 19x19 package only Curve/RSA, DPA protection, Up to 10* Tamper Pins	
<b>PCIe</b>	-	<b>1x PCIe 2.1 (x1 lane)</b>	
<b>Camera I/F</b>	Parallel (up to 24-bit) , MIPI-CSI (2 Lane)	Parallel (up to 24-bit) , MIPI-CSI (2 Lane)	
<b>LCD</b>	24-bit // LCD + 1x MIPI-DSI 2-lane	24-bit // LCD + 1x MIPI-DSI 2-lane <b>1x EPD Display</b>	
<b>QSPI</b>	1x Dual-channel DDR QuadSPI	1x Dual-channel DDR QuadSPI	
<b>SDIO</b>	2	<b>3</b>	HS 400 DDR mode supported
<b>UART</b>	7	7	
<b>ISO7816-3</b>	2	2	
<b>IIC</b>	4	4	
<b>eCSPI</b>	4x (up to 66MHz) x3	4x (up to 66MHz) x3	
<b>I2S/SAI</b>			
<b>Timer/PWM</b>	Timer x4, PWM x8	Timer x4, PWM x8	
<b>12-bit ADC</b>	2x8ch	2x8ch	
<b>Keyboard (8x8)</b>	Yes	Yes	



# i.MX 7Dual - Detailed Specifications

Main CPU	<ul style="list-style-type: none"> <li>Dual ARM <b>Cortex-A7</b> with NEON up to 1GHz</li> <li>32KB/32KB I/D L1 cache</li> <li><b>512KB unified L2 Cache</b></li> </ul>	<p><b>Security</b></p> <ul style="list-style-type: none"> <li>TRNG&amp;PRNG(NIST SP 800-90 Certified)</li> <li>Cryptographic Engine           <ul style="list-style-type: none"> <li><b>AES (128/256)</b> with DPA protection</li> <li>DES/3DES</li> <li>SHA: up to SHA256</li> <li>Public key crypto: RSA-4096, Elliptic curve cryptography</li> </ul> </li> <li><b>32KB secure RAM</b></li> <li><b>Tamper detection, up to 10+ tamper inputs</b></li> <li><b>Voltage/temperature/clock frequency monitor</b></li> <li>HABv4.2 Based Secure Boot</li> <li><b>2xSIMV2/EMVSIM I/F</b></li> <li>Secure JTAG</li> <li><b>ARM TrustZone</b></li> </ul>
Secondary CPU	<ul style="list-style-type: none"> <li>Single ARM <b>Cortex-M4F</b> up to 200MHz</li> <li>16KB/16KB I/D L1 cache</li> <li><b>64KB Tightly Coupled Memory (TCM)</b></li> </ul>	
On-Chip Memory	<ul style="list-style-type: none"> <li>256KB General Purpose RAM (OCRAM)</li> <li>96KB ROM</li> </ul>	
External Memory Support	<ul style="list-style-type: none"> <li><b>16/32-bit LPDDR2/LPDDR3/DDR3/LVDDR3</b></li> <li><b>Max frequency: 533MHz (1066)</b></li> </ul> <p>*Note: DDR3 has better performance, availability and pricing compared to DDR2</p>	
Display Support	<ul style="list-style-type: none"> <li><b>24-bit Parallel RGB (up to 1920x1080)</b></li> <li>1x Mipi DSI (2 lane up to 1.5Gbps)</li> <li><b>PXP v3.0</b> (resize, Combine, rotate, HW dithering, Basic 2D Blit &amp; CSC)</li> </ul>	
Camera Processing	<ul style="list-style-type: none"> <li><b>24-bit CSI (also support 8/10/16-bit)</b></li> <li>Support ITU-R BT.656 interface</li> </ul>	
Packaging	<ul style="list-style-type: none"> <li>541-ball MAPBGA 19x19mm, 0.8mm pitch</li> <li>488-ball MAPBGA 12x12mm, 0.5mm pitch</li> </ul>	
GPIO	<ul style="list-style-type: none"> <li><b>168 GPIOs</b></li> </ul>	
Ethernet	<ul style="list-style-type: none"> <li>2x Gig Ethernet MAC w/ AVB support (IEEE 1588 compliant)</li> <li><b>Ethernet PLL integrated</b></li> </ul>	
Wi-Fi/BT I/F Options	<ul style="list-style-type: none"> <li>SD3.0/SDIO/MMC5, USB 2.0, UART</li> </ul>	
External Storage	<ul style="list-style-type: none"> <li><b>8-bit raw SLC/MLC NAND flash w/ up to 62bit ECC</b>, up to 100MHz DDR</li> <li>8/16-bit NOR flash, up to 133MHz</li> <li>2xHS <b>SD3.0/SDIO/MMC5.0 (HS400)</b></li> <li>2-ch DDR QSPI for serial flash</li> </ul>	<p><b>Connectivity Support</b></p> <ul style="list-style-type: none"> <li>2x High Speed (HS) USB 2.0 OTG (Up to 480 Mbps) with HS PHY</li> <li>1x High Speed (HS) USB 2.0 Host with HSIC</li> <li><b>4x eCSPi, support, up to 66MHz</b></li> <li><b>1x PCIe v2.1 One lane</b></li> <li><b>7xUART</b> High speed (up to 4Mbps)           <ul style="list-style-type: none"> <li>Providing RS232 I/F</li> <li>9 bit RS-485 multidrop mode</li> </ul> </li> <li><b>4x I2C</b> (Compatible w/ v2.1 specs - all up to 320Kb/s)</li> <li>3xSD3.0/SDIO/MMC5.0</li> <li><b>2xFlexCAN</b></li> </ul>
Audio	<ul style="list-style-type: none"> <li>3xSAI w/ support to I2S/AC97/TDM/CODEC</li> </ul>	<p><b>Analog Integration</b></p> <ul style="list-style-type: none"> <li><b>2x 2-Channel 12 bit ADC</b></li> <li><b>7xLDO's</b></li> </ul> <p><b>Other Peripherals</b></p> <ul style="list-style-type: none"> <li><b>8xPWM (16-bit resolution with a 4x16 data FIFO)</b></li> <li>4xTimers</li> <li><b>8x8 Keypad</b></li> </ul> <p><b>Boot Devices</b></p> <ul style="list-style-type: none"> <li>NOR/NAND flash ; SD/MMC ; SPI NOR flash/EEPROM; QSPI flash</li> </ul> <p><b>Power</b></p> <ul style="list-style-type: none"> <li>Arm Core <b>160 mW</b>@ 2x 800MHz   <b>262 mW</b> @ 2x 1GHz</li> <li><b>28 mW</b>@system idle ; <b>2.8 mW</b>@Low Power Idle</li> <li><b>1.16 mW</b>@Suspend mode ; <b>0.27 mW</b>@ LPSR mode</li> <li><b>0.015 mW</b>@RTC-only mode (SNVS)</li> </ul>
Temperature Range		<ul style="list-style-type: none"> <li>-20C to 105C (Ext. Consumer) ; 0-95°C (Consumer)</li> </ul>
BSP Support		<ul style="list-style-type: none"> <li>Free Linux, Android BSP &amp; FreeRtos support on SABRE EVK</li> </ul>
Qualification		<ul style="list-style-type: none"> <li>Consumer, <b>Extended Consumer</b></li> </ul>
Longevity Program		<ul style="list-style-type: none"> <li>Yes - min 10yrs</li> </ul>



# i.MX 7Solo

## Specifications:

### CPU:

- Single Core Cortex-A7 up to 800MHz
- Cortex-M4 up to 200Mhz

**Process:** 28nm LPP

**Package:**

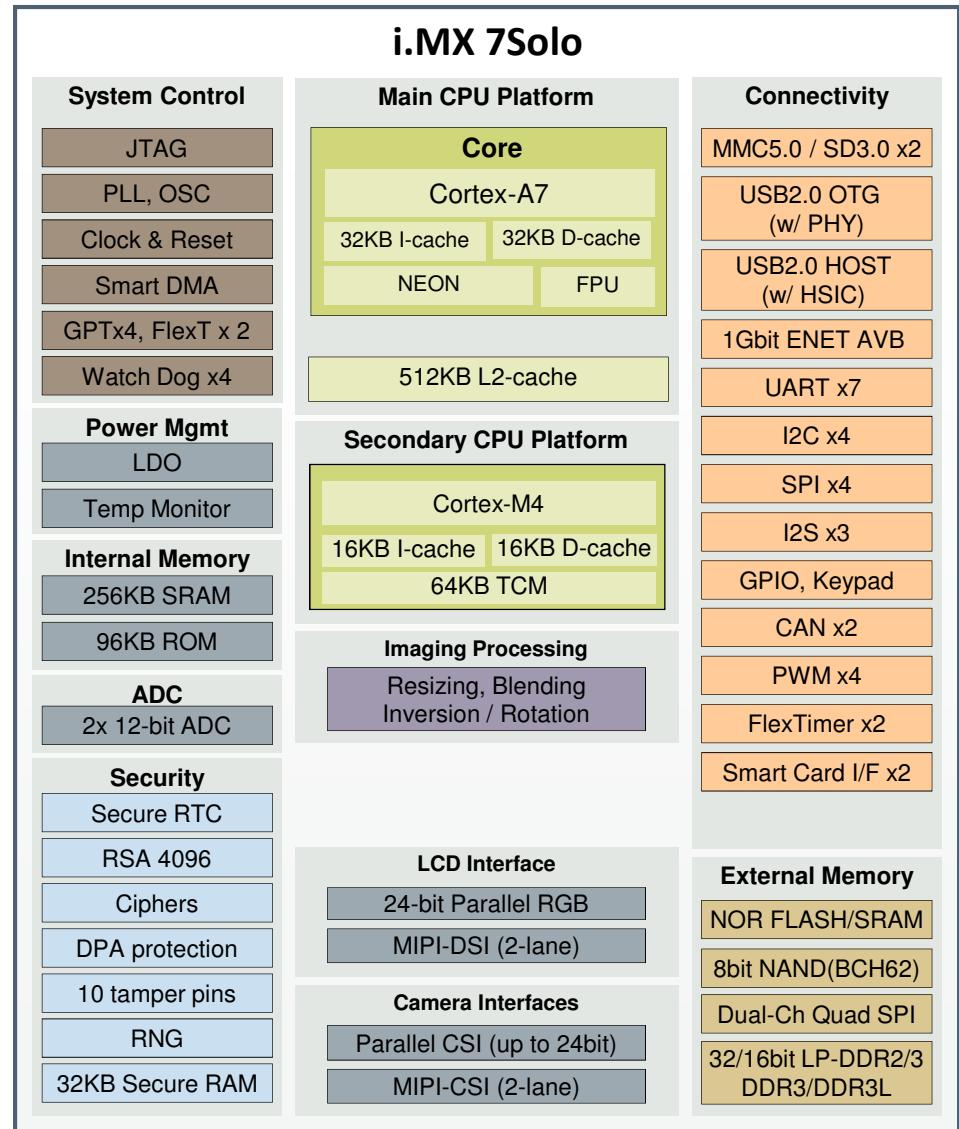
- 19x19, 0.75mm pitch BGA
- 12X12, 0.4 mm pitch BGA\*

**Qual Tiers:**

- Commercial | 0°C to +95°C
- Extended Commercial | -20°C to +105°C
  - 10yrs lifetime @ 100% duty cycle

## Key Features and Advantages

- 800MHz, Cortex-A7, 32KB I/D, 512KB L2 Cache
- 200MHz Cortex M4, 16KB I/D, 64KB TCM
- **Memory Support**
  - 16/32bit LP-DDR2/3, DDR3/L @ 533MHz;
  - Total of 256KB OCRAM
  - 2x SDIO3.0/eMMC5.0, 8-bit NAND Flash with ECC(BCH62)
- **Display / Camera**
  - 24-bit Parallel LCD and MIPI DSI (2-lane)
  - Parallel (up to 24-bit) and MIPI CSI (2-lane)
- **I/O**
  - 1x USB 2.0 OTG w/ PHY + 1xUSB 2.0 HOST/HSIC
  - 1x Gigabit Ethernet Ports-AVB;
  - 4x SPI (1x is 60MHz and 3x at least 10MHz);
  - 4x 32-bit Timer (GPT), 2x FlexTimer
  - 4x PWMs; 4x I2C,
  - 7x UARTs
  - SIMv2/EMVSIM (ISO7816/EMV2000L1 support)
- **Security module**
  - High Assurance Boot
  - Crypto Acceleration: AES-128/256, SHA-1 SHA-224, SHA-256
  - RNG and Tamper Detection



\* Feature limited (1 ADC, 4 tamper pins)



# i.MX 7Dual

## Specifications:

### CPU:

- Dual Core Cortex-A7 up to 1GHz
- Cortex-M4 up to 200MHz

**Process:** 28nm LPP

### Package:

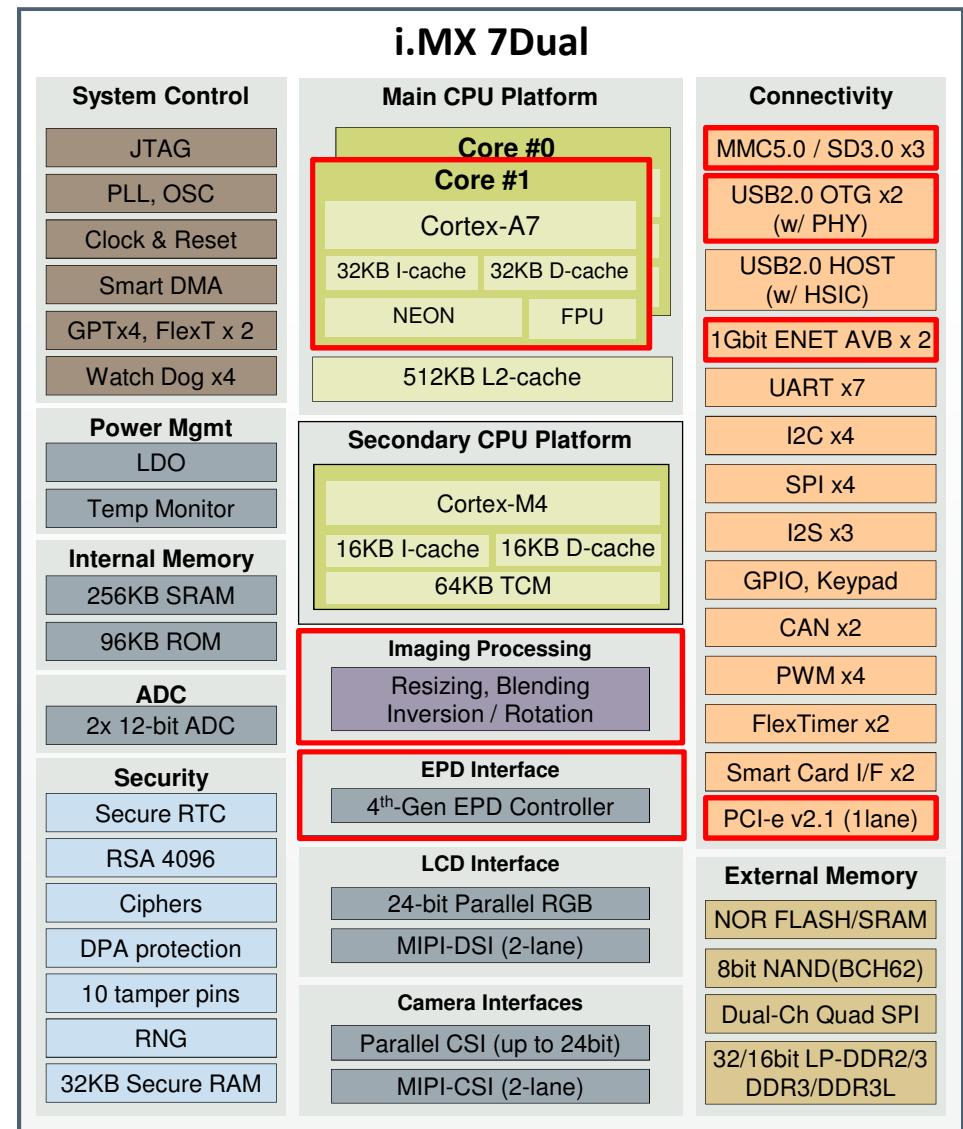
- 19x19, 0.75mm pitch BGA
- 12X12 @ 0.4 mm pitch BGA\*

### Qual Tiers:

- Commercial | 0 °C to +95 °C
- Extended Commercial | -20 °C to +105 °C
  - 10yrs lifetime @ 100% duty cycle

## Key Features and Advantages

- **1GHz**, Cortex-A7, 32KB I/D, 512KB L2 Cache
- 200MHz Cortex M4, 16KB I/D, 64KB TCM
- **Memory Support**
  - 16/32bit LP-DDR2/3, DDR3/L @ 533MHz;
  - Total of 256KB OCRAM (128KB dedicated to EPDC)
  - **3x** SDIO3.0/eMMC5.0, 8-bit NAND Flash with ECC
- **Display / Camera**
  - **4th generation EPD Controller (2332x1650@106Hz)**
  - LCD: 24-bit Parallel LCD and MIPI DSI (2-lane)
  - Parallel (up to 24-bit) and MIPI CSI (2-lane)
- **I/O**
  - 1x PCI-e (1-lane)
  - 2x USB 2.0 OTG w/ PHY + 1xUSB 2.0 HOST/HSIC
  - 2x GigE Ethernet Ports-AVB;
  - 4x SPI (1x is 60MHz and 3x at least 10MHz);
  - 4x 32-bit Timer (GPT), 2x FlexTimer
  - 4x PWMs; 4x I2C,
  - 7x UARTs
  - SIMv2/EMVSIM (ISO7816/EMV2000L1 support)
- **Security module**
  - High Assurance Boot
  - Crypto Acceleration: AES-128/256, SHA-1 SHA-224, SHA-256
  - RNG and Tamper Detection



\* Feature limited (1 ADC, 4 tamper pins)

Updated from i.MX 7Solo



# i.MX 7Dual | Solo – Key Security Features

Feature	i.MX 7
Trusted Execution	TrustZone, (ARM Cortex-A7) Peripheral access control (CSU, RDC) Memory access control (ARM TZASC, RDC) Interrupt separation (ARM GIC) Secure storage separation (CAAM/SNVS) Cryptographic separation (CAAM)
High Assurance Boot	HABv4.2 Secure boot with 256-bit security
External Tamper Detection	Dedicated Tamper Inputs both passive and active for wire mesh (10 pins / 5 active cuircits).
Internal Tamper Sensing	Voltage, Temp, Freq Monitoring Customer programmable trim settings
Encrypted boot	Authenticated + Encrypted Boot
Secure Storage	On-chip zeroizable 8x4kB Secure RAM Off-chip key/data blobs AES-256 master key (CAAM/SNVS)
True Random Number Gen	Yes. Designed to be compliant with NIST SP800-90A and includes a hardware entropy source. NISTI/BSI >2015 to comply with PCI
Cryptographic Accelerators	Asymmetric: RSA (up to 4096) ECDSA Symmetric: AES-128/256, DES, 3DES, ARC4 Hash & HMAC: MD5, SHA-1, SHA-224/256 256-bit security (CAAM)
Secure Clock	SNVS
DPA Protection	AES, 3DES
Secure Debug	Full or Controlled Disable (3 modes)
SJTAG Configuration	Open, Closed, Field Return



# i.MX7 Dual | Solo - SABRE Platform Key Features

## Processor

- Freescale i.MX 7Dual
  - Dual Cortex™-A7 @1GHz
  - 512KB L2\$
- Freescale PF3000 PMIC

## Memory

- 1 GB DDR3
- eMMC5.0 footprint
- QuadSPI Flash
- SD/MMC socket
- NAND footprint

## Display/Camera Connectors

- HDMI
- Parallel LCD
- MIPI-DSI
- Electronic Paper Display
- MIPI-CSI (camera)

## Wireless

- Wifi (802.11ac) onboard
- BT4.0 / BLE onboard

## Audio

- Audio HP Jack
- External speaker connection

## Connectivity

- USB Host connectors
- microUSB OTG connector
- ETH (1Gbit) Receptacle
- ETH (10/100) Receptacle
- Full Mini PCIe socket
- SIM Card slot
- CAN (DB-9)
- GPIO
- MFi Module support
- MikroBus expander

## Debug

- JTAG connector
- UART via USB

## Sensors

- FXOS8700 three-axis digital accelerometer/Magnetometer
- MPL3115A2R Altimeter/Pressure sensor
- FXAS21000 three-axis digital Gyroscope

## Tools & OS Support

- Linux®
- Android™
- FreeRTOS



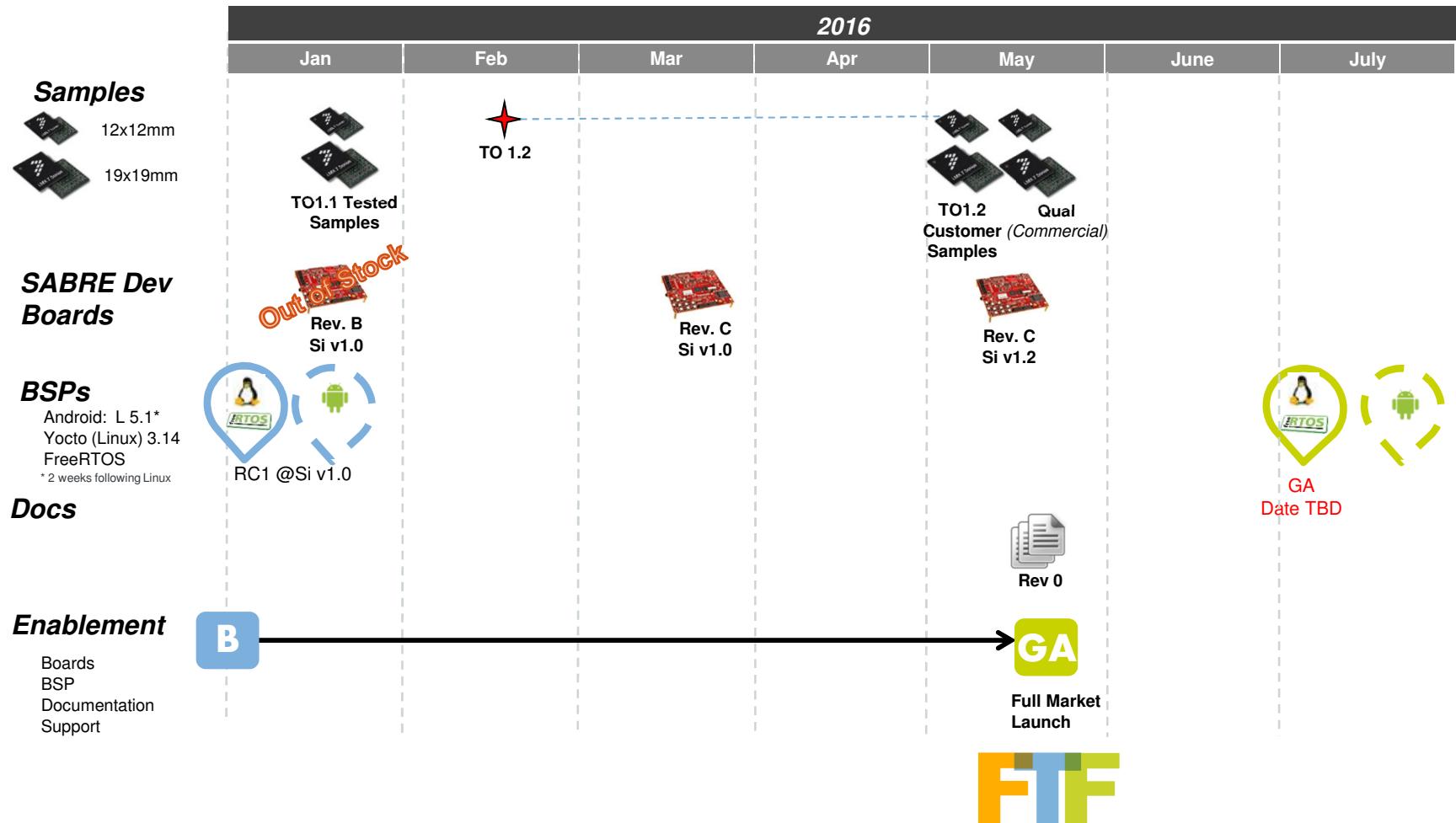
General availability  
expected in 2Q2016



# i.MX7 Dual | Solo - Program Schedule

All dates are estimates and may change

## i.MX 7Dual/7Solo Program Schedule Update



# i.MX7 Dual | Solo



## Orderable Part Numbers

Product **Longevity**

Part Number	Package	Qual	A7 Cores	MHz	EPDC	ETH	CAN	USB	PCIe	SD/MMC
MCIMX7D7DVK10SB	12x12 0.4mm	Consumer	2	1 GHz	Y	2	Y	2xOTG 1xHSIC	Y	3
MCIMX7D7DVM10SB	19x19 .75mm	Consumer	2	1 GHz	Y	2	Y	2xOTG 1xHSIC	Y	3
MCIMX7D5EVM10SB	19x19 .75mm	Extended	2	1 GHz	N	2	Y	2xOTG 1xHSIC	Y	3
MCIMX7D3DVK10SB	12x12 0.4mm	Consumer	2	1 GHz	N	2	N	2xOTG 1xHSIC	Y	3
MCIMX7D3EVK10SB	12x12 0.4mm	Extended	2	1 GHz	N	2	N	2xOTG 1xHSIC	Y	3

Part Number	Package	Qual	A7 Cores	MHz	EPDC	ETH	CAN	USB	PCIe	SD/MMC
MCIMX7S5EVM08SB	19x19 .75mm	Extended	1	800 MHz	N	1	Y	1xOTG 1xHSIC	N	2
MCIMX7S5EVK08SB	12x12 0.4mm	Extended	1	800 MHz	N	1	Y	1xOTG 1xHSIC	N	2
MCIMX7S3DVK08SB	12x12 0.4mm	Consumer	1	800 MHz	N	1	N	1xOTG 1xHSIC	N	2
MCIMX7S3EVK08SB	12x12 0.4mm	Extended	1	800 MHz	N	1	N	1xOTG 1xHSIC	N	2



**Extended Consumer Qualification:** 100% duty cycle (max speed), 10 years, -20°C to 105°C Tj



**Consumer Qualification:** 50% duty cycle (max speed), 5 years, 0°C to 95°C Tj

**Note:** Silicon 1.2 may introduce a Rev. C part number – TBD at a later stage





SECURE CONNECTIONS  
FOR A SMARTER WORLD