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Understanding [Embedded - Microprocessors](#)



Embedded microprocessors are specialized computing chips designed to perform specific tasks within an embedded system. Unlike general-purpose microprocessors found in personal computers, embedded microprocessors are tailored for dedicated functions within larger systems, offering optimized performance, efficiency, and reliability. These microprocessors are integral to the operation of countless electronic devices, providing the computational power necessary for controlling processes, handling data, and managing communications.

Applications of [Embedded - Microprocessors](#)

Embedded microprocessors are utilized across a broad spectrum of applications, making them indispensable in

Details

Product Status	Active
Core Processor	ARM® Cortex®-A9, ARM® Cortex®-M4
Number of Cores/Bus Width	2 Core, 32-Bit
Speed	200MHz, 800MHz
Co-Processors/DSP	Multimedia; NEON™ MPE
RAM Controllers	LPDDR2, LVDDR3, DDR3
Graphics Acceleration	Yes
Display & Interface Controllers	Keypad, LCD
Ethernet	10/100/1000Mbps (2)
SATA	-
USB	USB 2.0 + PHY (1), USB 2.0 OTG + PHY (2)
Voltage - I/O	1.8V, 2.5V, 2.8V, 3.15V
Operating Temperature	-40°C ~ 125°C (TJ)
Security Features	A-HAB, ARM TZ, CAAM, CSU, SNVS, System JTAG, TVDECODE
Package / Case	400-LFBGA
Supplier Device Package	400-MAPBGA (17x17)
Purchase URL	https://www.e-xfl.com/product-detail/nxp-semiconductors/mcimx6x2avn08ab

Your Interface to the World

i.MX families offer some of the most versatile platforms for multimedia and display applications, bringing personality and interactivity to a whole new world of products

i.MX Smart Devices



Giant Waterproof Tablet – i.MX53



Honeywell Lynx Touch security panel with the i.MX25



Icephone, Medical Phone with i.MX31



**Navico
Marine Navigation
i.MX51**



Maxtrack tablet for Brazilian Police with i.MX51



Avaak Vue Personal Video Network With the i.MX25



Invoxia
IP Phone - i.MX503



Gigaset DECT phone with i.MX233



Sophia systems' non-contact card Reader/Writer for DoCoMo with i.MX51



AMX 20.3" Modero X Series Panoramic Table Top Touch Panel with i.MX53



Televisie in België trams using MX51



**Line6
“Stagescape”
audio mixing
system with
i.MX51**



Self service touch screen terminal



i.MX233 based i'mWatch



Sharp e-Dictionary with i.MX28



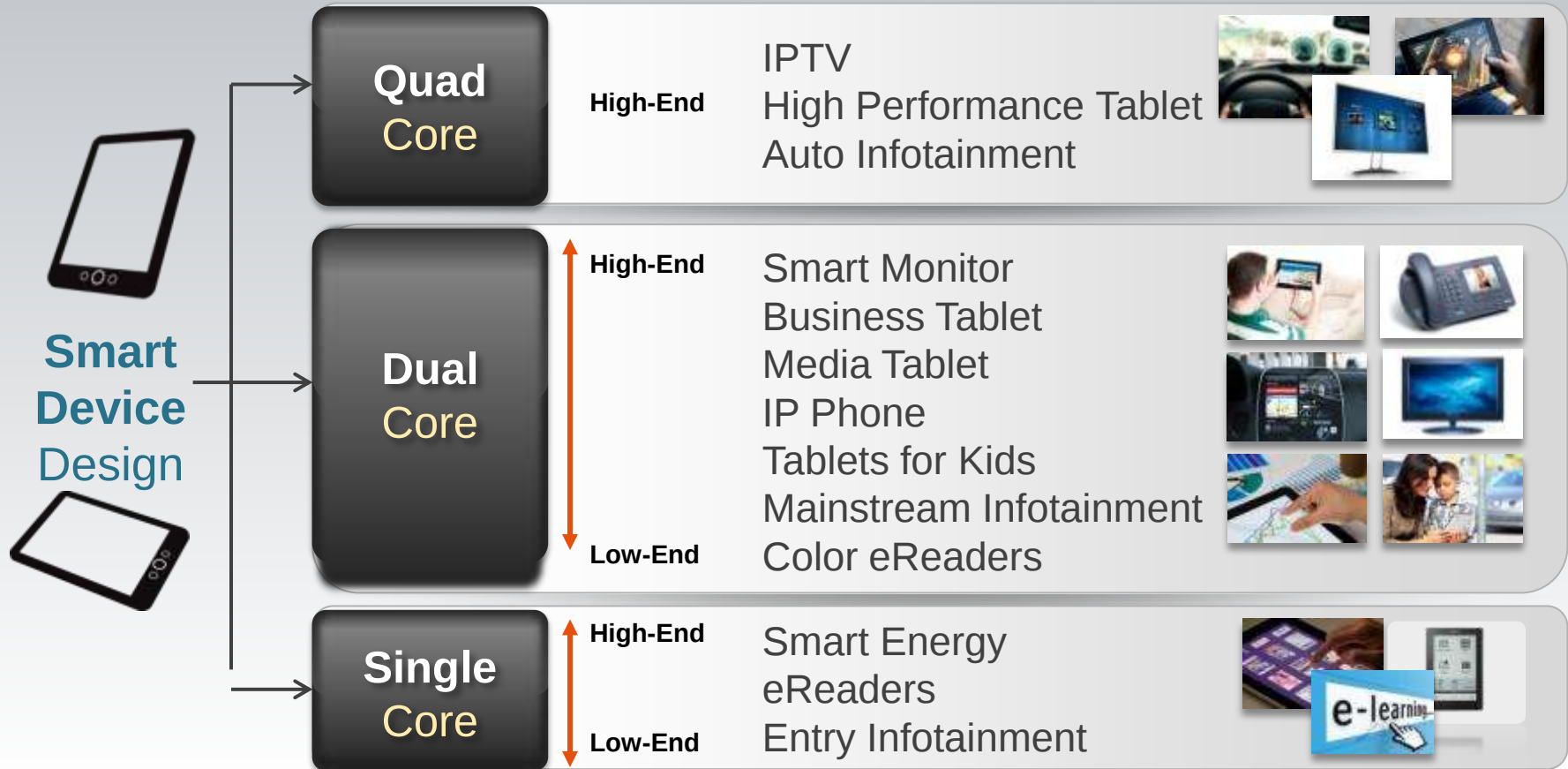
Harris military communication equipment with i.MX27



Japanese Boarding Gate Pass Reader with i.MX27

i.MX 6: One Platform, Differentiated Products

Saves development costs and improves time to market.
Scalability with multiple cores is key to implement this strategy.





Why Dual or Quad Core?

Webkit Browser page rendering and scrolling

2D 'Fish Tank' (HTML5)

JPEG decode + encode
1024x768

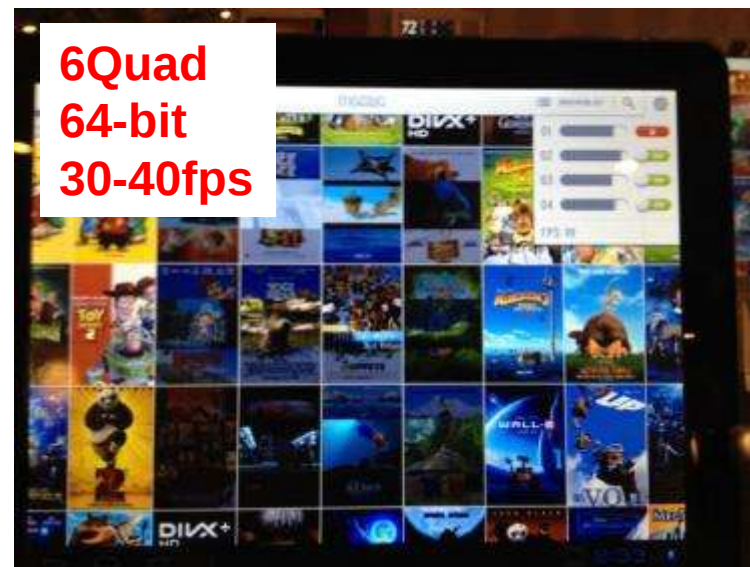
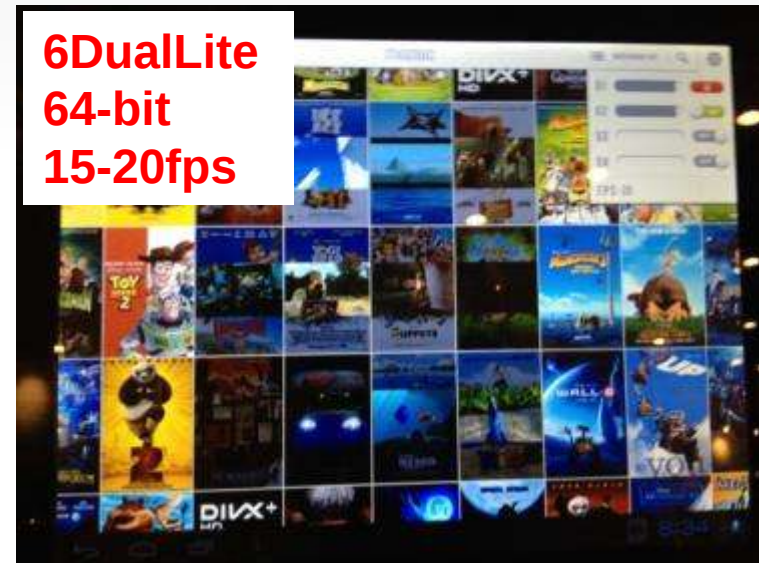
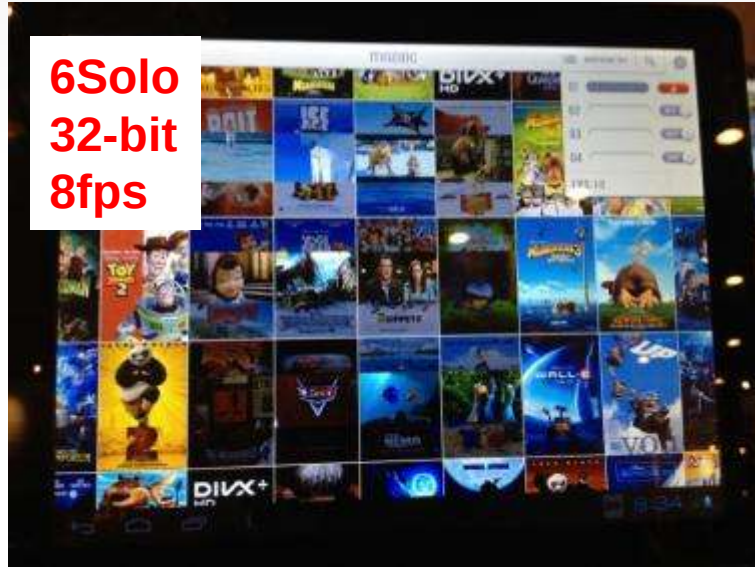
- All workloads implemented on CPU
- Does not use HW accelerators at all
- Done in order to test CPU capabilities

CPU Utilization
(1, 2 and 4 cores)

Android Honeycomb Application	1 Core	2 Core	4 Core	Quad speedup vs Dual Core
JPEG	.2 fps	~1fps	~4.5 fps	4x faster
Browser Scroll Time	289	36.25	15	>50% faster
Browser FPS	3.45	27.58	64.4	>2x higher
Fish Tank FPS	~14-20fps	~18-25fps	~22-30fps	~25% higher

Watch it live! <http://www.youtube.com/watch?v=JYFmBlk3itI#t=2m49s>

User Interfaces in Action – Dual Core + 64-bit matters



Browsing and Image Viewing

Webkit Browser page rendering and scrolling

JPEG decode +
encode
1024x768



- All workloads implemented on CPU
- Does not use HW accelerators at all
- Done in order to test CPU capabilities

App	1 Core	2 Core	Dual Core vs Single Core	4 Core	Quad Core vs Dual Core
JPEG	.2 fps	~1fps	5x faster	~4.5 fps	4x faster
Browser Scroll Time	289	36.25	>87% faster	15	>50% faster
Browser FPS	3.45	27.58	8x higher	64.4	>2x higher

Watch it live!

[http://www.youtube.com/watch?v=JYFmBlk3itI#t=2m49s ...](http://www.youtube.com/watch?v=JYFmBlk3itI#t=2m49s)

User Interfaces – Characteristics and Implications

- Screenshots of Unreal Citadel Running on i.MX 6Quad



i.MX 6 Series VPU: *Transcoding & Full-duplex* *On-fly-transcoding*

Source Resolution (decoded stream)	Max # Streams @ 30fps Target Resolution (encoded stream)		
	SD (720x480)	HD720p (1280x720)	HD1080p (1920x1080)
SD	4	--	--
HD720p	2	2 (24fps, TBD))	--
HD1080p	1	1	1 (24fps) 1 (TBD for 30fps)

Full-duplex

	Standard	Profile	Performance	
Full-duplex HW Codec	H.264	BP	720p@30fps, 1080p@24fps	20Mbps
			1080p@30fps (TBD) Dual 720p@30fps (TBD) <i>(TBD, current VPU standalone testing shows 29fps for bitrate less than 5Mbps, but see room for encoder optimization)</i>	5Mbps
	MPEG4	Simple	720p@30fps	15Mbps
	H.263	P0/P3	720p@30fps	15Mbps



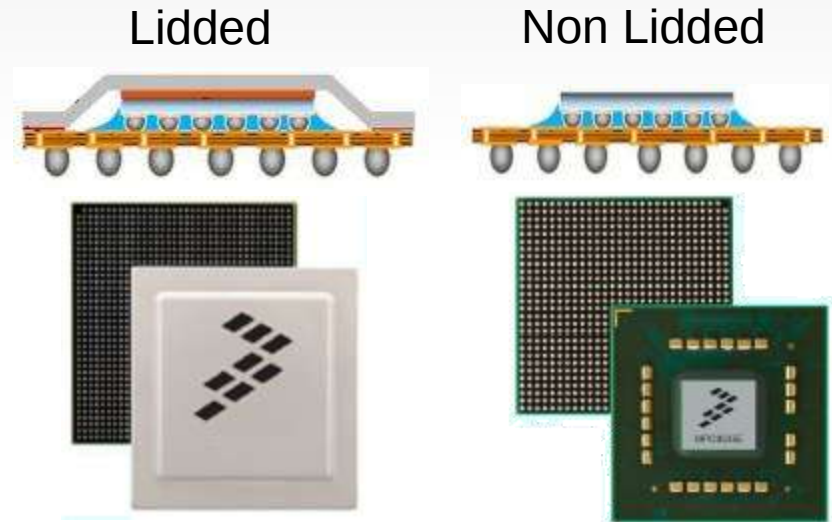
i.MX 6 Series Software – Current BSP Releases

- All public software releases are available at www.freescale.com/imx6tools
- Future releases will support Linux 3.10 kernel and Android JB 4.3

BSP	Distribution	Kernel	SoC Supported	Release Date
L3.0.35_4.0.0	LTIB	3.0.35	i.MX 6Quad i.MX 6Dual i.MX 6DualLite i.MX 6Solo	5/13/2013
L3.0.35_2.1.0	LTIB	3.0.35	i.MX 6SoloLite	6/4/2013
JB4.2.2_1.1.0	Android JB 4.2.2	3.0.35	i.MX 6Quad i.MX 6Dual i.MX 6DualLite i.MX 6Solo	7/11/2013
R13.4.1	Android ICS 4.0.4	3.0.35	i.MX 6Quad i.MX 6Dual i.MX 6DualLite i.MX 6Solo	12/12/12
R13.5.0	Android ICS 4.0.4	3.0.35	i.MX 6SoloLite	11/16/12

Package and Qual levels – 21x21 FCBGA Package

- **Lidded – Auto and Industrial**
 - Contains a metal lid covering the processor
 - More robust for industrial or automotive environments
 - **Non-Lidded – Consumer**
 - Exposes the back side of the die (flipchip)
 - Lower Z-height for space constrained devices
 - Easier to attach custom heat spreaders
 - **Three types of Qual for i.MX 6Series**
 - Consumer→ Highest Frequency
 - Automotive→ Maximum environmental support
 - Industrial→ Longest duration (“always on”)
 - **Only Non-Lidded packaging will be available in Consumer Temp**
- 
- 



Type	Characteristics
Consumer	• -20 to 105Deg Tj • 5 year life cycle @ 50% duty cycle • Max of 1.2Ghz CPU speed
Automotive	• -40 to 125Deg Tj • 10 year life cycle @ 10% duty cycle • Max of 1Ghz CPU speed
Industrial	• -40 to 105Deg Tj • 10 year life cycle @ 100% duty cycle • Max of 800Mhz CPU speed



FC-BGA Manufacturing
App note (Lid and non-Lid)
Available on freescale.com

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PIX 6 Series feature list (2/4)

Red indicates change from column to the left

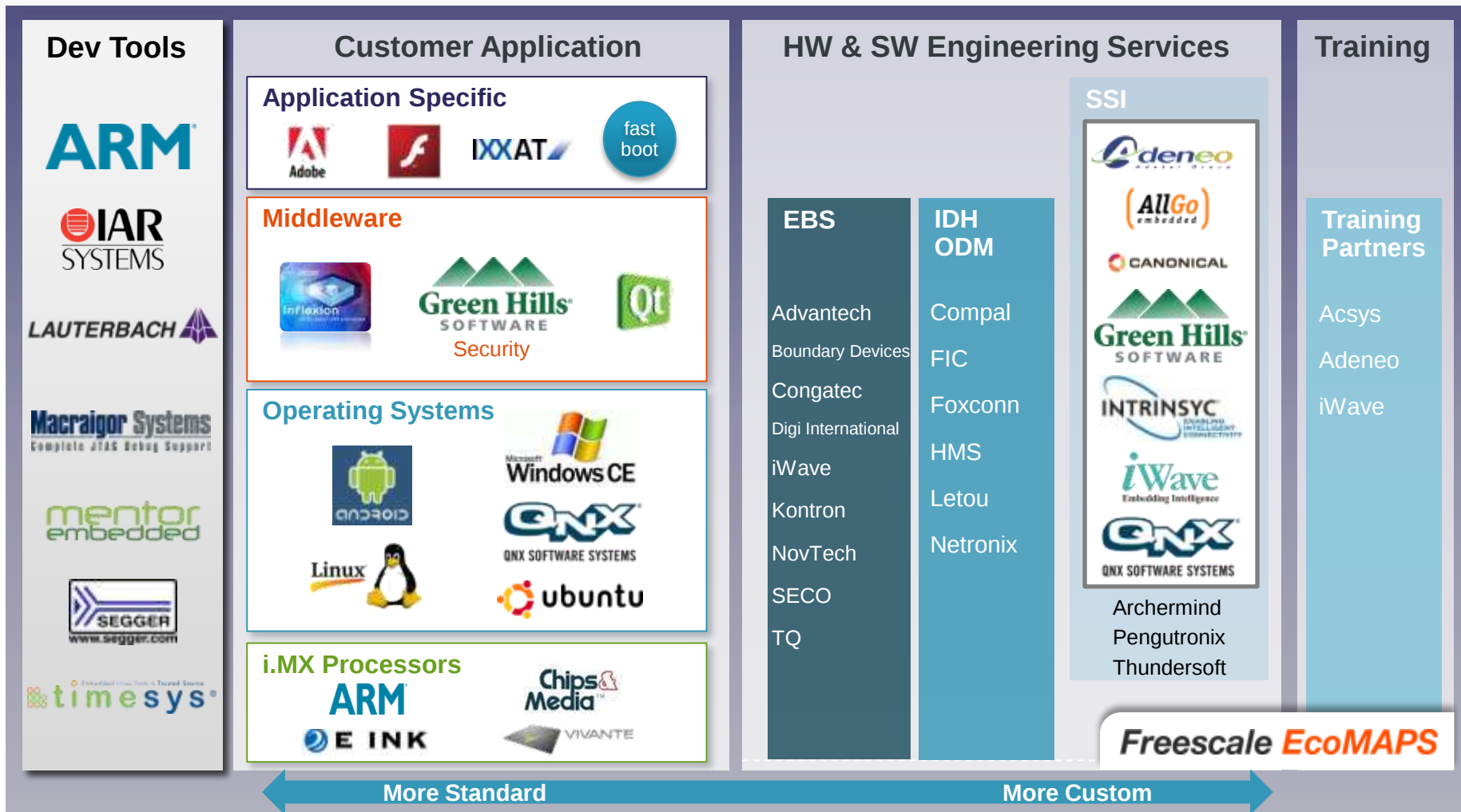
	i.MX 6SoloLite	i.MX 6Solo	i.MX 6DualLite	i.MX 6Dual	i.MX 6Quad
Ethernet	1x 10/100	1x GbE* + IEEE1588 * performance limited to 480Mbps	1x GbE* + IEEE1588 * performance limited to 480Mbps	1x GbE*+ IEEE1588 * performance limited to 480Mbps	1x GbE*+ I EEE1588 * performance limited to 480Mbps
USB	3x USB2.0 HS • 1x OTG + PHY • 1x Host + PHY • 1x Host HSIC	4x USB2.0 HS • 1x OTG + PHY • 1x Host + PHY • 2x Host HSIC	4x USB2.0 HS • 1x OTG + PHY • 1x Host + PHY • 2x Host HSIC	4x USB2.0 HS • 1x OTG + PHY • 1x Host + PHY • 2x Host HSIC	4x USB2.0 HS • 1x OTG + PHY • 1x Host + PHY • 2x Host HSIC
CAN	-	2x FlexCAN	2x FlexCAN	2x FlexCAN	2x FlexCAN
MLB	-	MLB 25/50/150	MLB 25/50/150	MLB 25/50/150	MLB 25/50/150
PCIe	-	1x PCIe 2.0 (x1 lane)	1x PCIe 2.0 (x1 lane)	1x PCIe 2.0 (x1 lane)	1x PCIe 2.0 (x1 lane)
SD/MMC	3x SD/MMC 4.4 1x SDXC	3x SD/MMC 4.4 1x SDXC	3x SD/MMC 4.4 1x SDXC	3x SD/MMC 4.4 1x SDXC	3x SD/MMC 4.4 1x SDXC
MIPI	-	MIPI-CSI2 MIPI-DSI	MIPI-CSI2 MIPI-DSI	MIPI-CSI2 MIPI-DSI MIPI-HSI	MIPI-CSI2 MIPI-DSI MIPI-HSI
Camera Interface	1x Input • 1x 16-bit Parallel	2x Inputs • 2x 20-bit Parallel • 2x lane MIPI-CSI2	2x Inputs • 2x 20-bit Parallel • 2x lane MIPI-CSI2	3x Inputs • 2x 20-bit Parallel • 4x lane MIPI-CSI2	3x Inputs • 2x 20-bit Parallel • 4x lane MIPI-CSI2
HDD I/F	-	-	-	S-ATA II 3Gbps	S-ATA II 3Gbps
Audio Acc.	-	ASRC	ASRC	ASRC	ASRC
Audio	3x I2S SPDIF Tx/Rx	3x I2S SPDIF Tx/Rx ESAI	3x I2S SPDIF Tx/Rx ESAI	3x I2S SPDIF Tx/Rx ESAI	3x I2S SPDIF Tx/Rx ESAI

i.MX 6 Series feature list (3/4)

Red indicates change from column to the left

	i.MX 6SoloLite	i.MX 6Solo	i.MX 6DualLite	i.MX 6Dual	i.MX 6Quad
Display Resolution (@60Hz)	WXGA (WXGA=1366x768)	2x WXGA	2x WXGA	2x 4XGA or 2x [1080p + WXGA] (4XGA=2048x1536)	2x 4XGA or 2x [1080p + WXGA]
Display Interfaces	2x Outputs • 1x Parallel • EPDC	2x Outputs • 2x Parallel • 2x LVDS • HDMI • MIPI-DSI • EPDC	2x Outputs • 2x Parallel • 2x LVDS • HDMI • MIPI-DSI • EPDC	4x Outputs • 2x Parallel • 2x LVDS • HDMI • MIPI-DSI	4x Outputs • 2x Parallel • 2x LVDS • HDMI • MIPI-DSI
GPU 3D	-	Vivante GC880 • 53Mtri/s • 266Mpxl/s • OpenGL ES 1.1/2.0/3.0	Vivante GC880 • 53Mtri/s • 266Mpxl/s • OpenGL ES 1.1/2.0/3.0	Vivante GC2000 • 176Mtri/s • 1000Mpxl/s • OpenGL ES 1.1/2.0/3.0 • OpenCL 1.1 EP	Vivante GC2000 • 176Mtri/s • 1000Mpxl/s • OpenGL ES 1.1/2.0/3.0 • OpenCL 1.1 EP
GPU 2D (Vector Graphics)	Vivante GC355 • 300Mpxl/s • OpenVG 1.1	via GPU 3D • OpenVG 1.1	via GPU 3D • OpenVG 1.1	Vivante GC355 • 300Mpxl/s • OpenVG 1.1	Vivante GC355 • 300Mpxl/s • OpenVG 1.1
GPU 2D (BLIT)	Vivante GC320 • 600Mpxl/s	Vivante GC320 • 600Mpxl/s	Vivante GC320 • 600Mpxl/s	Vivante GC320 • 600Mpxl/s	Vivante GC320 • 600Mpxl/s
Video Dec	SW Only	1080p30 + D1 MPEG-2, H.264 MVC, VC1, MPEG-4/Xvid, DivX 6, H.263, MJPEG, VP6 / WebM VP8	1080p30 + D1 MPEG-2, H.264 MVC, VC1, MPEG-4/Xvid, DivX 6, H.263, MJPEG, VP6 / WebM VP8	1080p60 + D1 2x 1080p30 MPEG-2, H.264 MVC, VC1, MPEG-4/Xvid, DivX 6, H.263, MJPEG, VP6 / WebM VP8	1080p60 + D1 2x 1080p30 MPEG-2, H.264 MVC, VC1, MPEG-4/Xvid, DivX 6, H.263, MJPEG, VP6 / WebM VP8
Video Enc	-	1080p30 2x 720p H.264, H.263, MPEG-4, MPEG-2, MJPEG	1080p30 2x 720p H.264, H.263, MPEG-4, MPEG-2, MJPEG	1080p30 2x 720p H.264, H.263, MPEG-4, MPEG-2, MJPEG	1080p30 2x 720p H.264, H.263, MPEG-4, MPEG-2, MJPEG

FreescalE EcoMAPS for i.MX Architectures



IDE: Integrated Development Environment
BDM: Background Debug Module

EBS: Embedded Board Solutions

IDH: Independent Design House
ODM Original Design Manufacturer

SSI: Software & Solution Integrators

- **Power and Memory**
- Freescale MMPF0100 PMIC
- 2 GB DDR3 memory (i.MX 6Dual/Quad)
- 1GB DDR3 memory (i.MX 6Solo)
- 32GB Parallel NOR Flash
- NAND Socket

- LVDS connector
 - compatible with MCIMX-LVDS1
- Parallel RGB display interface
- HDMI output connector

- JTAG connector
- Debug UART connector

- SD Card Slot
- High Speed USB OTG
- Ethernet
- SATA
- MIPI CSI
- PCIe
- MLB150 INIC connector
- 281-pin MXM card edge connector for main board expansion

SABRE AI boards will only be supported at automotive customers

Base Board: MCIMXABASEV1 (\$699)
CPU Cards: MCIMX6SAICPU1 (\$799)
 MCIMX6QAICPU1 (\$799)
Display: MCIMX-LVDS1 (\$499)



- SD card slot (WiFi module or SD)
- Bluetooth or Bluetooth+WiFi header
- AM/FM tuner header
- Sirius XM Module header (de-pop'd)
- GPS (UART) module connector
- 2x CAN
- Dual High Speed USB Host connectors
- MLB 25/50 INIC connector
- SPI NOR flash

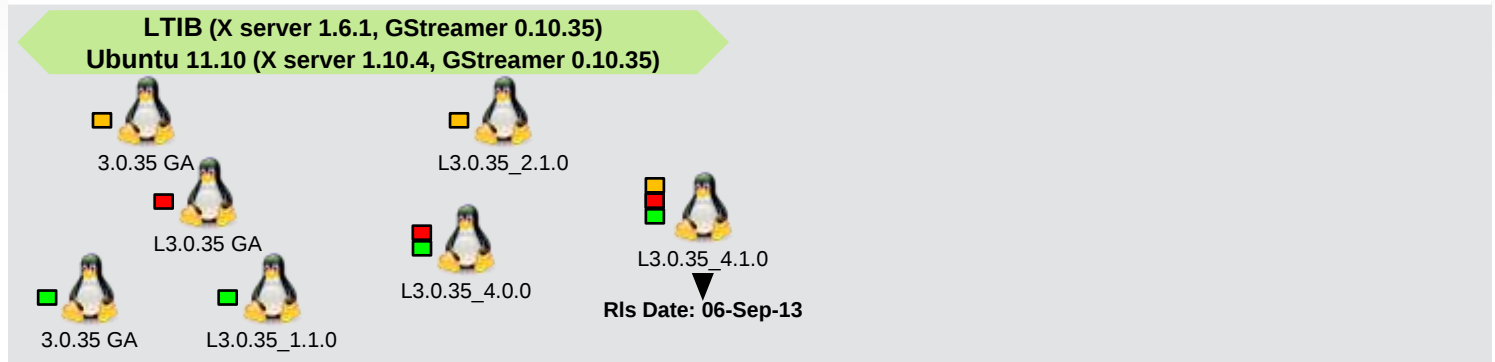
- LVDS connector
 - compatible with MCIMX-LVDS1
- Analog Video Input
- LVDS Input

- Cirrus multichannel audio codec
 - Up to 8 outputs
 - Dual microphone inputs
 - Stereo Line Level Input
- SPDIF receiver

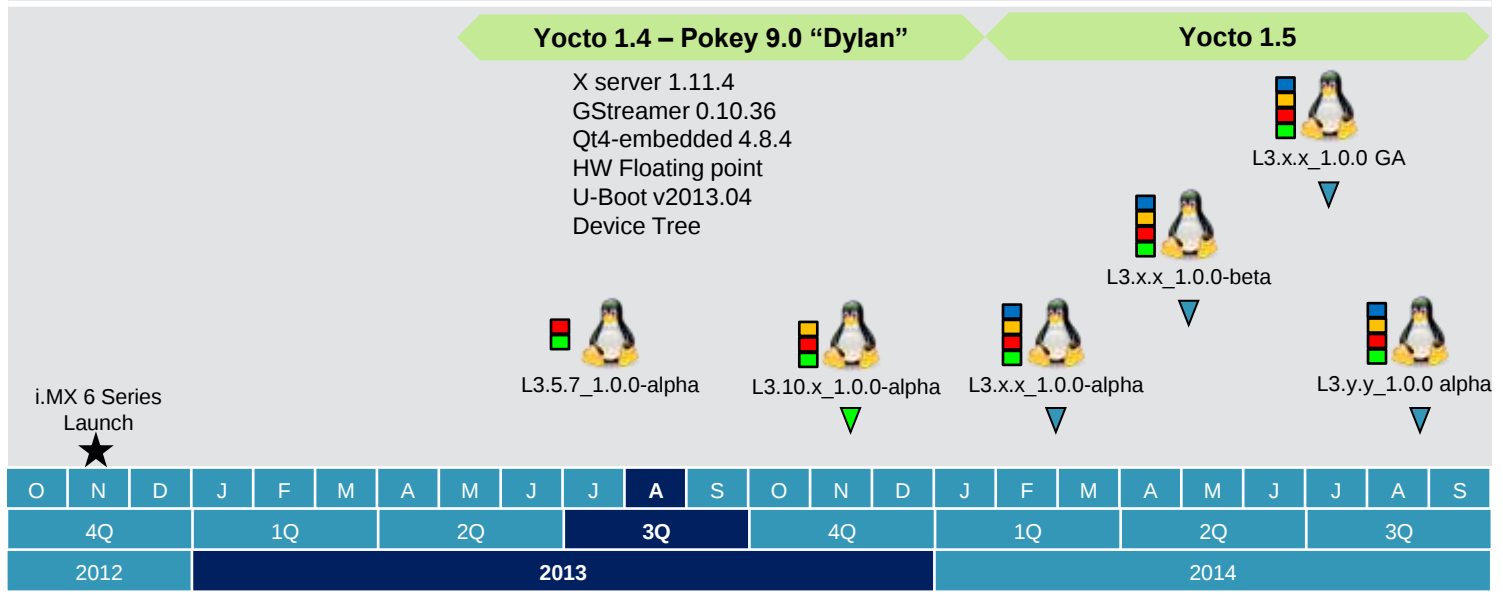
- Linux
- Others: future support by 3rd parties

Linux Roadmap

Legacy Distribution



Yocto



- | | |
|-------------|---------------------------------------|
| ▼ Execution | ■ i.MX6Q/i.MX6D SabreSDB/SDP, SabreAI |
| ▼ Planning | ■ i.MX6DL/i.MX6S SabreSDP, SabreAI |
| ▼ Proposed | ■ i.MX6SL EVK |
| | ■ i.MX6SoloX SabreSDP |

GA – Support for 1 year
Alpha & Beta – Support until next release

The diagram illustrates the development timeline of Android versions from Jellybean 4.1 to "L" Android (Est.). The timeline is divided into quarters (3Q, 4Q, 1Q, 2Q, 3Q, 4Q, 1Q, 2Q, 3Q) and years (2012, 2013, 2014). Key milestones include the launch of i.MX 6 Series in 4Q 2012, and the release of JB4.2.2_1.0.0 GA, JB4.3.0_1.0.0 GA, and KLPx.y.z_1.0.0 GA in 3Q 2013. The timeline ends with "L" Android (Est.) in 3Q 2014.

Version	Kernel	Release Date	Quarter	Year
Jellybean 4.1			3Q	2012
Jellybean 4.2			4Q	2012
Jellybean 4.3			1Q	2013
JB4.2.2_1.0.0	3.0.35		2Q	2013
JB4.2.2_1.0.0 GA	3.0.35	12-Nov-13	3Q	2013
JB4.3.0_1.0.0 GA	3.0.35		4Q	2013
KLPx.y.z_1.0.0	L3.x.x		1Q	2014
JB4.1.2_1.0.0-beta	3.0.35		2Q	2013
JB4.3.0_1.0.0-beta	3.0.35	30-Sep-13	3Q	2013
KLPx.y.z_1.0.0-beta	3.x.x		4Q	2013
KLPx.y.z_1.0.0-alpha	3.x.x		1Q	2014
Lx.y.z_1.0.0-alpha	3.x.x		2Q	2014
"L" Android (Est.)			3Q	2014

Extended Android Release	Core Android Release
Execution	i.MX6Q/i.MX6D SabreSDB/SDP, SabreAI
Planning	i.MX6DL/i.MX6S SabreSDP, SabreAI
Proposed	i.MX6SL EVK
	i.MX6SoloX SabreSDB

GA – Support for 1 year
Alpha & Beta – Support until next release



History of Android Development

Android	Google Release	First Freescale Release
Cupcake	Android 1.0 (September 2008) Android 1.1 (February 9, 2009) Android 1.5 (April 2009)	R3 (June 2009)
Donut	Android 1.6 (September 2009)	R5 (September 2009)
Eclair	Android 2.0 (October 2009) Android 2.0.1 (December 2009) Android 2.1 (January 2010)	R7 (January 2010)
Froyo	Android 2.2 (May 2010) Android 2.2.1 (January 2011) Android 2.2.2 (January 2011) Android 2.2.3 (November 2011)	R9 (August 2010)
Gingerbread	Android 2.3 (December 2010) Android 2.3.3 (February 2011) Android 2.3.4 (April 2011) Android 2.3.5 (July 2011) Android 2.3.6 (September 2011) Android 2.3.7 (September 2011)	R10 (January 2011)
Honeycomb	Android 3.2 (July 2011) Android 3.2.1 (September 2011) Android 3.2.2 (August 2011) Android 3.2.4 (December 2011) Android 3.2.6 (February 2012)	R11 (September 2011 – i.MX53) R12 (September 2011 – i.MX 6D/Q)
Ice Cream Sandwich	Android 4.0.1 (October 2011) Android 4.0.2 (November 2011) Android 4.0.3 (December 2011) Android 4.0.4 (March 2012)	R13 (December 2011) R13.1 (January 2012) R13.3 (June 2012) R13.4 GA (September 2012) *to align to 6Series launch
JellyBean	Android 4.1 (September 2012) Android 4.2 (December 2012)	JB 4.1 GA candidate – Dec 2012 JB 4.2 Beta Feb 2013 JB 4.2 GA – April 2013