Welcome to E-XFL.COM

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 ~ 105°C (TA)
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/mcimx6x3cvn08ab

i.MX

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

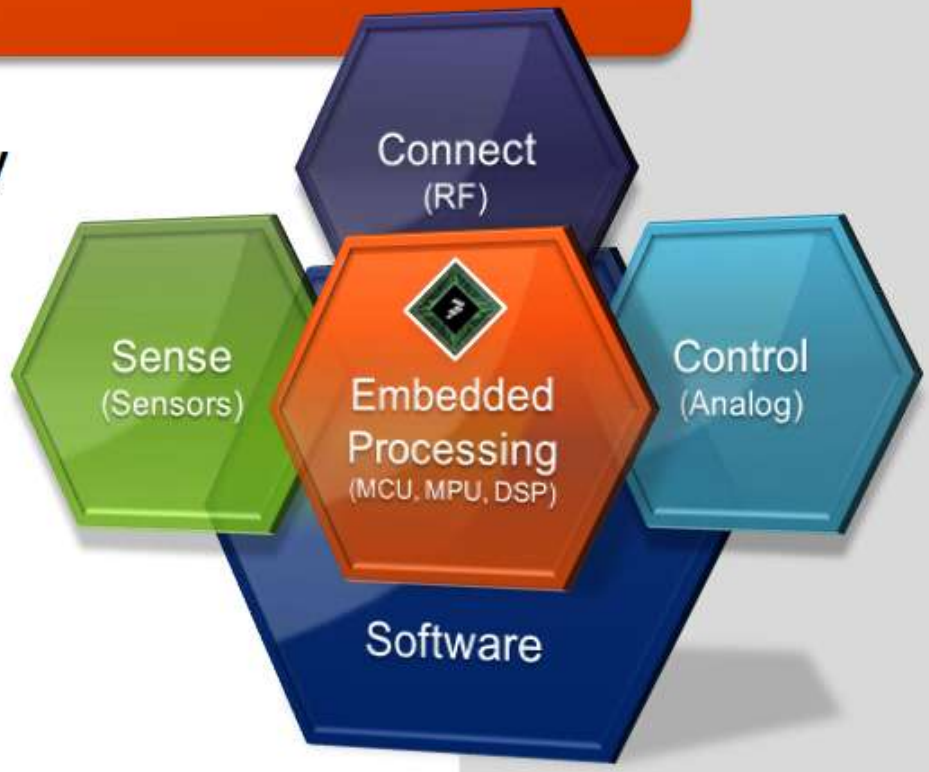
A Global Leader of
Embedded Processing Solutions

Two Core Product Groups

- Automotive, Industrial & Multi-Market Solutions
  - Microcontrollers
  - Sensors
  - Analog
- Networking and Multimedia Solutions
  - Communications Processors
  - Applications Processors
  - RF Power

Four Primary Markets

- Automotive
- Industrial
- Networking
- Consumer



Platform-Level Solutions

>50 Year Legacy

>5,500 Engineers

>6,000 Patent Families

>18,000 Customers

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Freescale i.MX Applications Processors

i.MX 6Quad

High Performance Tablet

Media Box

Luxury Infotainment

Advanced HMI

i.MX 6Dual
i.MX 6DualLite

i.MX53

Color eReader

Business Tablet

Mainstream Infotainment

Medical

i.MX 6Solo
i.MX 6SoloLite

i.MX28, i.MX233, i.MX25, i.MX35, i.MX50

Monochrome eReader

Single Function Tablet

Connected Radio

Smart Energy Meter

Performance/ Multimedia Capability

Content Creation, Technology Driver

Good, Better, Best Differentiation

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i.MX 6 Series At a Glance

Red indicates change from column to the left

i.MX 6SoloLite

- Single ARM® Cortex™-A9 at 1.0GHz
- 256KB L2 cache, Neon, VFPvd16, Trustzone
- 2D graphics
- 32-bit DDR3 and LPDDR2 at 400MHz
- Integrated EPD controller

i.MX 6Solo

- Single ARM Cortex-A9 at 1.0GHz
- **512KB** L2 cache, Neon, VFPvd16, Trustzone
- **3D graphics** with 1 shader
- 2D graphics
- 32-bit DDR3 and LPDDR2 at 400MHz
- Integrated EPD controller

i.MX 6DualLite

- **Dual** ARM Cortex-A9 at 1.0GHz
- 512KB L2 cache, Neon, VFPvd16, Trustzone
- 3D graphics with 1 shader
- 2D graphics
- **64-bit** DDR3 and 2-channel 32-bit LPDDR2 at 400MHz
- Integrated EPD controller

i.MX 6Dual

- **Dual** ARM Cortex-A9 at 1/**1.2GHz**
- **1 MB** L2 cache, Neon, VFPvd16, Trustzone
- 3D graphics with **4 shaders**
- **Two** 2D graphics engines
- 64-bit DDR3 and 2-channel 32-bit LPDDR2 at **533MHz**
- Integrated **SATA-II**

i.MX 6Quad

- **Quad** ARM Cortex-A9 at 1.2GHz
- 1 MB L2 cache, Neon, VFPvd16, Trustzone
- 3D graphics with 4 shaders
- Two 2D graphics engines
- 64-bit DDR3 and 2-channel 32-bit LPDDR2 at 533MHz
- Integrated SATA-II

i.MX 6 Series Highlights

- ARM Cortex-A9 based solutions ranging up to 1.2GHz
- HD 1080p encode and decode (except 6SL)
- 3D video playback in High definition (except 6SL)
- Low power 1080p playback at 350mW Integrated IO's that include HDMI v1.4, MIPI and LVDS display ports, MIPI camera, Gigabit Ethernet, multiple USB 2.0 and PCI-Express
- SW support: Google Android™, Windows® Embedded CE, Ubuntu, Linux®, Skype™

Features vary by product family

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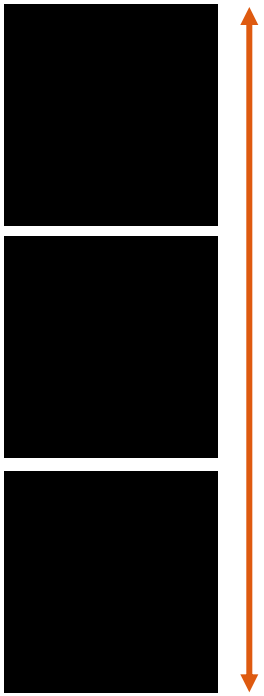
Freescale i.MX 6: unmatched pin-compatibility

Competitors



Pin-compatibility
inside a family
(typically frequency scaling)

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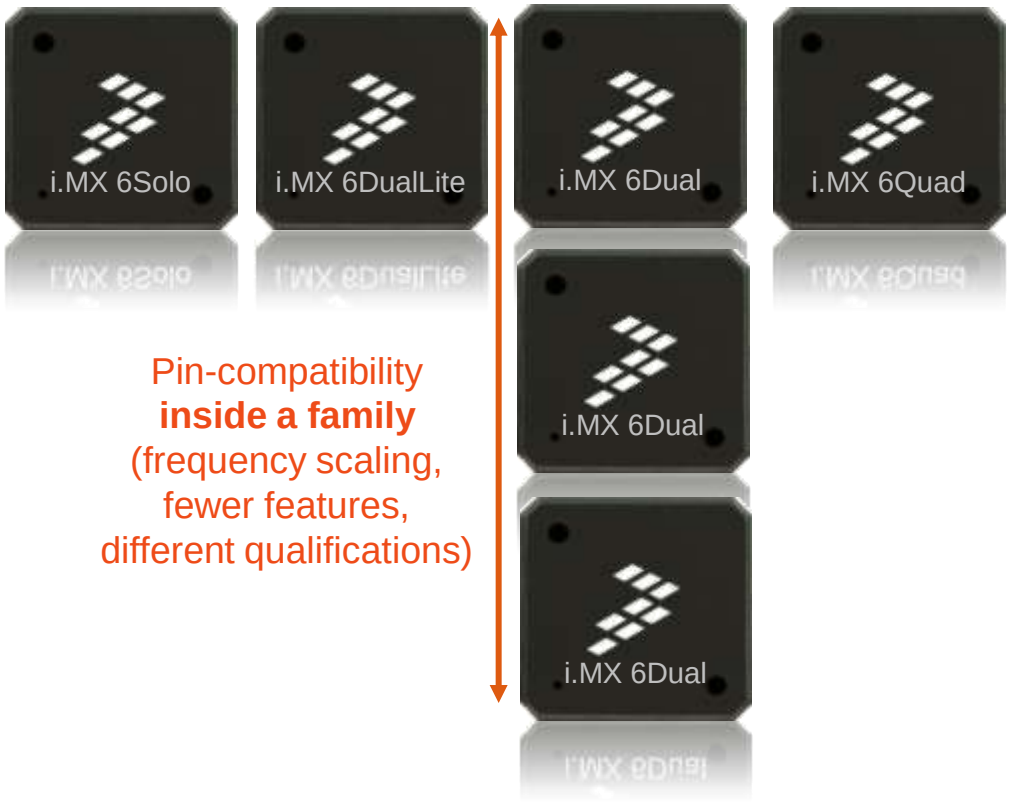
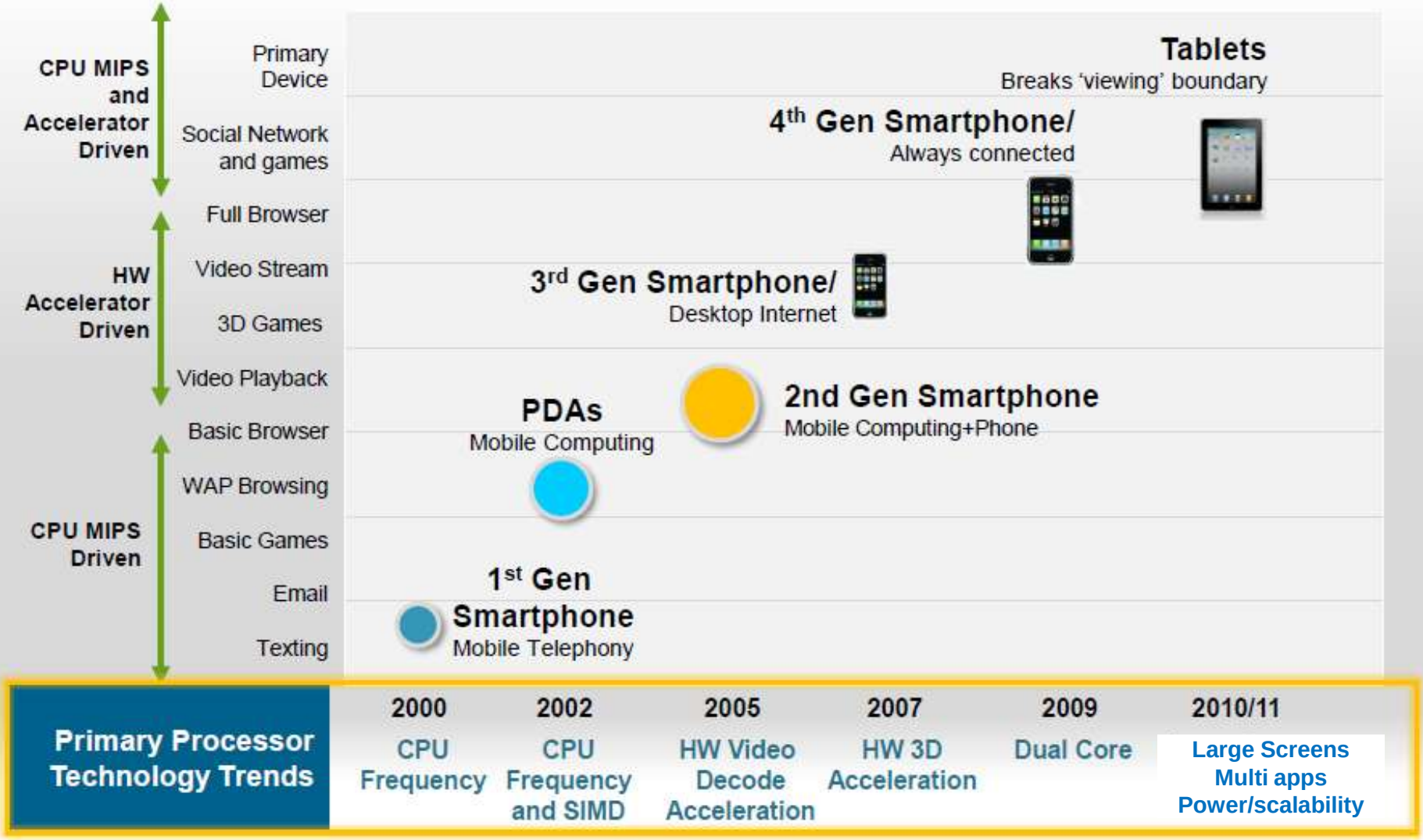
Pin-compatibility
between families



Pin-compatibility
inside a family
(frequency scaling,
fewer features,
different qualifications)

Optimizing the Processor Platform



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=JYFmBIk3itI#t=2m49s

User Interfaces – Characteristics and Implications

- **UI content is inherently dynamic**
  - Unlike Games (which use pre-cached images/textures)
  - User content can/will change at any time
  - Therefore UI must refresh continuously in case new content emerges
  - Requires high speed (533Mhz) and wide (64-bit) memory bus to ensure high frame rates

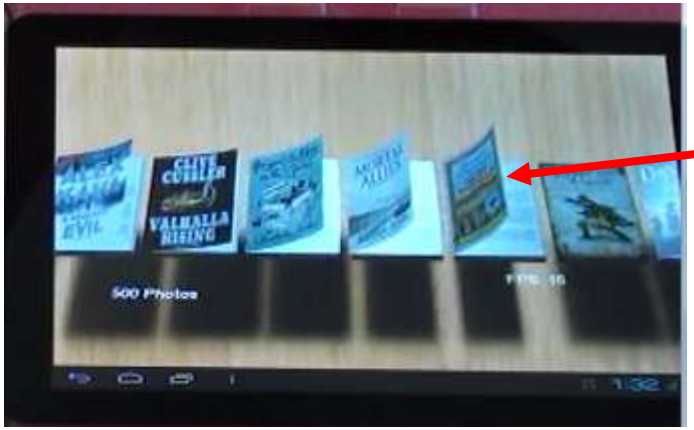
Recommend Dual Core + 64-bit Memory Bus

User Content is dynamic and (potentially) always changing. Especially true of streaming movies, YouTube, pictures, home moviews

User expects their 'latest' content to be instantly visible when scrolling (either touch or via remote with TV)
Thumbnails must be visible and smooth as they scroll left to right.

User Interfaces – Characteristics and Implications

- **UI requires high resolution support → 1080p TV or LCD is now the norm**
  - 1080p30 fps content is becoming a standard offering from websites and streaming
  - 1080p60 is around the corner
  - Must be able to decode h.264 High Profile 1080p at high bitrates (for user content decode as well as for video streaming over the net)
  - Must be able to support newer 1080p TVs. Consumer devices starting to hit >1080p LCDs (iPAD HD) Requires large memory space, fast display capabilities, in hardware rotation/scaling
  - Advantage Freescale i.MX 6: up to 4XGA, dual display engines, 64bit memory space @ 533Mhz
- **Access to fast CPU MIPS → used for complicated transforms to augment visual experience**
  - CPU cores useful to add in additional transforms that don't map well to 3D unit
  - Morphing effects and some fluid dynamics for innovative UI effects
  - CPU cores can also be used to augment 3D unit and act as a 'secondary' 3D unit
  - Advantage Freescale i.MX 6: up to Quad core Cortex A9 at 1.2Ghz → nearly 5Ghz of CPU horsepower



Book cover icon "blowing in the wind" when scrolling fast to visually indicate speed. Can use CPU power to calculate

Gaming Performance

- **Benchmarking 3D game performance is tricky**
  - Dependent upon the 3D HW, the CPU speed and memory BW
  - Must balance all three to get best performance
- **Review websites use generally available benchmarks to rate tablets**
  - Example: Basemark, NenaMark, Antutu, Quadrant

Taiji Girl (Basemark ES2)

NenaMark2 3D Benchmark

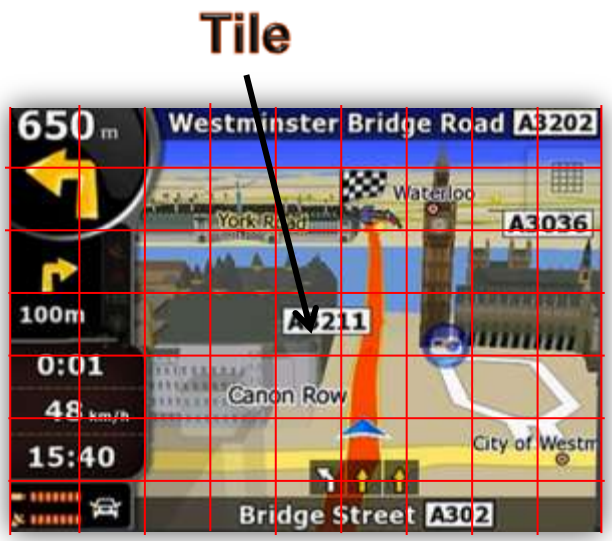
AnTuTu Benchmark

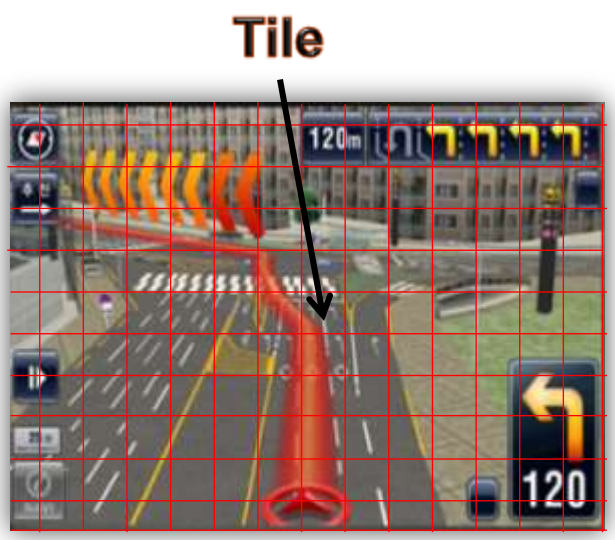
Quadrant Benchmark

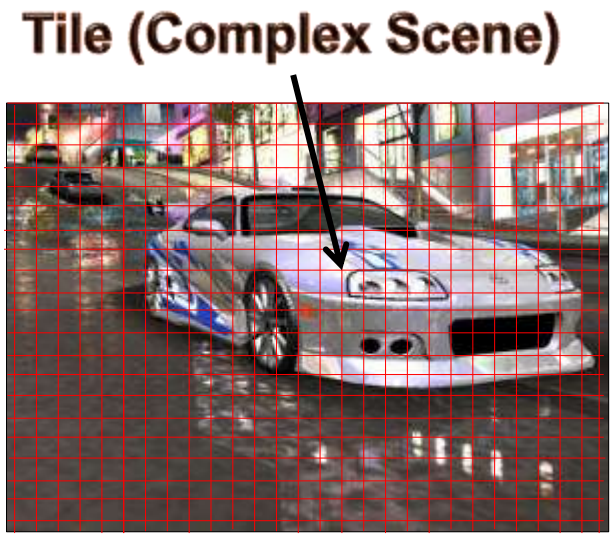
	6Quad	6DualLite	6Solo	Tegra2
Taiji Girl	25.65 fps	9.2 fps	7.67 fps	6 fps
NenaMark	49.2	30.5	27.2	21
AnTuTu	9605	5583	4531	4904
Quadrant	4011	3005	2414	2559

Tile Based Rendering (Chunkers)

- Size of scene buffer unknown before rendering
  - Possible overflow if scene requires more data than expected
- Good rendering method for baseline GUI/3D Apps with smaller object count (less details)
  - More bandwidth efficient than FMR in simple (yesterday) use cases
- For next generation dynamic scenes in new and future applications with lots of objects, details and post-processing effects, tile based Chunkers require multi-pass memory access to constantly process changing 3D/scene data
  - PC Level Applications (Performance, Quality, Effects) → Tablets → Smartphones → Infotainment







i.MX 6Series – Power Consumption Summary

Sleep	**3.8mW**	**Sleep**	**3.8mW**	**Sleep**	**3.9mW**	**Sleep**	**3.1mW**	**Sleep**	**2.6mW**
IDLE	**227mW**	**IDLE**	**220mW***	**IDLE**	**151mW**	**IDLE**	**143mW**	**IDLE**	**14.5mW**
Video	**867mW**	**Video**	**867mW**	**Video**	**772mW**	**Video**	**695mW**	**Video**	**n/a**
3D	**1.6W**	**3D**	**1.6W**	**3D**	**1.1W**	**3D**	**1.1W**	**3D**	**n/a**
TypMax	**3.8W**	**TypMax**	**n/a**	**TypMax**	**2.4W**	**TypMax**	**1.7W**	**TypMax**	**n/a**

n/a = results pending release june 30th

*** 6Dual cores are estimated on 6Quad by clock gating two cores**

- All results include power at the chip (cores, accelerators, peripherals, DDR I/O) as well as the power consumption of the external DDR3 ICs.
- Power application notes listed in the presentation contain the full breakouts for the chip and DDR3. Note that use of LPDDR2 memory will substantially reduce memory IC power consumption

Scalable Performance and Power Consumption
'One Series fits all'

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i.MX 6 Series feature list (1/4)

Red indicates change from column to the left

	i.MX 6SoloLite	i.MX 6Solo	i.MX 6DualLite	i.MX 6Dual	i.MX 6Quad
Cortex-A9	1x 1GHz Cortex-A9 2400 DMIPS	1x 800MHz-1GHz Cortex-A9 2400 DMIPS	**2x** 800MHz-1GHz Cortex-A9 **4800 DMIPS**	2x 800MHz-1.2GHz Cortex-A9 **5700 DMIPS**	**4x** 800MHz-1.2GHz Cortex-A9 **11500 DMIPS**
Cortex-M4	-	-	-	-	-
On-Chip Memory	256KB L2 + 32K+32K I/D L1 + 256KB SRAM	**512KB L2** + 32K+32K I/D L1 + 128KB SRAM	512KB L2 & 32K+32K I/D L1 + 128KB SRAM	**1MB L2** + 32K+32K I/D L1 + **256KB** SRAM	1MB L2 + 32K+32K I/D L1 + 256KB SRAM
Process Tech	40nm, LP	40nm, LP	40nm, LP	40nm, LP	40nm, LP
DRAM Interface	Up to 2GB 1x32 LP-DDR2, 1chx32 DDR3 or DDR3L	Up to **4GB** 1x32 LP-DDR2, 1chx32 DDR3 or DDR3L	Up to 4GB **2x32** LP-DDR2, **1chx64** DDR3 or DDR3L	Up to 4GB 2x32 LP-DDR2, 1chx64 DDR3 or DDR3L	Up to 4GB 2x32 LP-DDR2, 1chx64 DDR3 or DDR3L
Max DDR Speed	400MHz (800MT/s)	400MHz (800MT/s)	400MHz (800MT/s)	**533MHz (1066MT/s)**	533MHz (1066MT/s)
External Flash Support	-	**8-bit SLC/MLC NAND, 40-bit ECC, ONFI2.2**	8-bit SLC/MLC NAND, 40-bit ECC, ONFI2.2	8-bit SLC/MLC NAND, 40-bit ECC, ONFI2.2	8-bit SLC/MLC NAND, 40-bit ECC, ONFI2.2
	16/32-bit NOR	16/32-bit NOR	16/32-bit NOR	16/32-bit NOR	16/32-bit NOR
	eMMC 4.4	eMMC 4.4	eMMC 4.4	eMMC 4.4	eMMC 4.4
	-	-	-	-	-
	4x SPI	4x SPI	4x SPI	**5x** SPI	5x SPI

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 i.MX 6 series Development Systems

SABRE Board for Smart Devices

P/N: MCIMX6Q-SDB

- **Cost-effective ($399)**, open source development platform
- Designed to **simplify product evaluation**

SABRE Platform for Smart Devices

P/N: MCIMX6Q-SDP
MCIMX6DL-SDP

- Smart Device Market-focused
- Form-factor ready to accelerate design & time to market ($999)

SABRE Platform for Automotive Infotainment

P/N: MCIMXABASEV1
MCIMX6SAICPU1
MCIMX6QAICPU1

- Automotive Market-focused
- Standard base board ($699) and adaptable CPU card ($799) system

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...MX 6 Quad SABRE Lite Board (TO1.0 Silicon)

http://boundarydevices.com/products/sabre-lite-imx6-sbc/

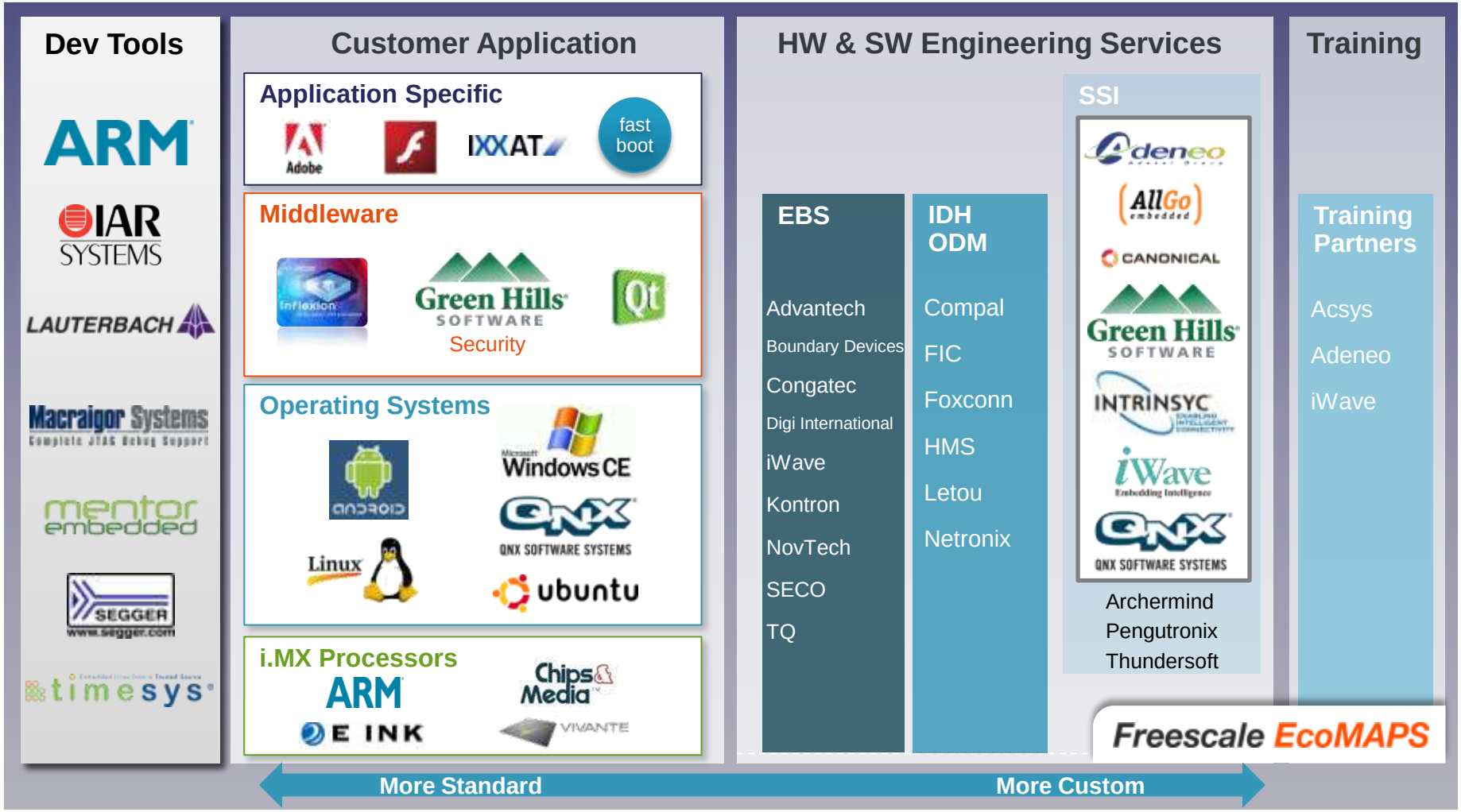
Low Cost Community Board

- 1GByte of 64-bit wide DDR3 @ 532MHz
- Three display ports (24-bit RGB, LVDS, HDMI)
- Two camera ports (1xParallel, 1xMIPI)
- Serial ATA (SATA)
- Dual SDHC card slots (1 std, 1 micro)
- PCI express port
- Analog (headphone/mic) and Digital (HDMI) audio
- Compact size (3¼"x3¼")
- 10/100/1G Ethernet
- 10-pin JTAG interface
- 3 High speed USB ports (2xHost, 1xOTG)
- CAN port
- UART debug port
- I2C

- Purchase directly from Boundary Devices
  - PO, Credit Card or PayPal placed directly with Boundary Devices
  - Schematics and user manual available on Boundary website
- Additional supply partners available in Q3

SABRE-Lite will not be stocked, sold, or supported by Freescale
All support from Boundary Devices, partners or IMXCommunity.org

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

Freescale Product Longevity Program

- The embedded market needs **long-term product support**
- Freescale has a longstanding track record of **providing long-term production support** for our products
- Freescale is pleased to introduce a **formal product longevity program** for the market segments we serve
  - For the automotive and medical segments, Freescale will make a broad range of program devices available for a minimum of **15 years**
  - For all other market segments in which Freescale participates, Freescale will make a broad range of devices available for a minimum of **10 years**
  - **Life cycles** begin at the time of launch
- A list of participating **Freescale products** is available at: www.freescale.com/productlongevity

SABRE Platform for Smart Devices (SDP)

i.MX 6Quad 1GHz Cortex-A9 Processor
i.MX 6DualLite 1GHz Cortex-A9 Processor
- Freescale MMPF0100 PMIC
- 1 GB DDR3 memory (non terminated)
- 3” x 7” 8-layer PCB

Part Numbers: MCIMX6Q-SDP ($999)
MCIMX6DL-SDP ($999)

Display (4.3”): MCIMX28LCD ($199)
WiFi: Silex WiFi module

Display connectors
- Native 1024x768 LVDS display (comes with kit)
- 2nd LVDS connector
- Connector for 24 bit 4.3” 800x480 WVGA with 4-wire touch screen
- HDMI Connector
- MIPI DSI connector

Audio
- Wolfson Audio Codec
- Microphone and headphone jacks
- Dual 1W Speakers

Expansion Connector
- Enables parallel LCD or HDMI output
- Camera CSI port signals
- I2C, SSI, SPI signals

Tools Support
- Lauterbach, ARM (DS-5), Macraigor debug/IDE tool chain

Connectivity
- 2x Full-size SD/MMC card slot
- 22-pin SATA connector
- 10/100/1000 Ethernet port
- 1x high-speed USB OTG port
- mPCI-e connector

Debug
- JTAG connector
- Serial to USB connector

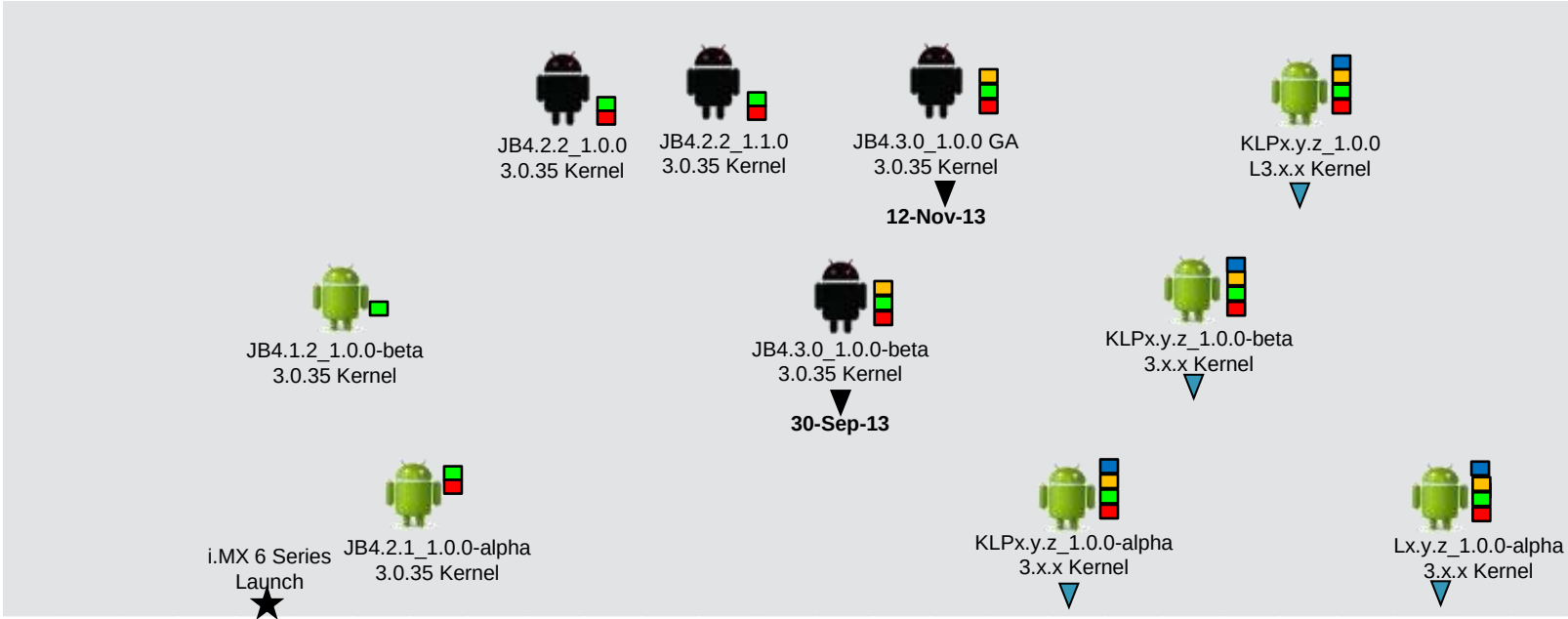
Additional Features
- 3-axis Freescale accel
- GPS receiver
- Ambient Light Sensor
- eCompass
- Dual 5MP Cameras
- Power supply
- Battery Charger
- Battery connectors

OS Support
- Linux and Android IceCream Sandwich from Freescale;
- Others: support by 3rd parties

Android Roadmap

Google Android Releases

Releases



Extended Android Release
Core Android Release
Execution
Planning
Proposed

- i.MX6Q/i.MX6D SabreSDB/SDP, SabreAI
- i.MX6DL/i.MX6S SabreSDP, SabreAI
- i.MX6SL EVK
- i.MX6SoloX SabreSDB

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

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