**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/pro/item?MUrl=&PartUrl=mcimx6x3cvo08ab |

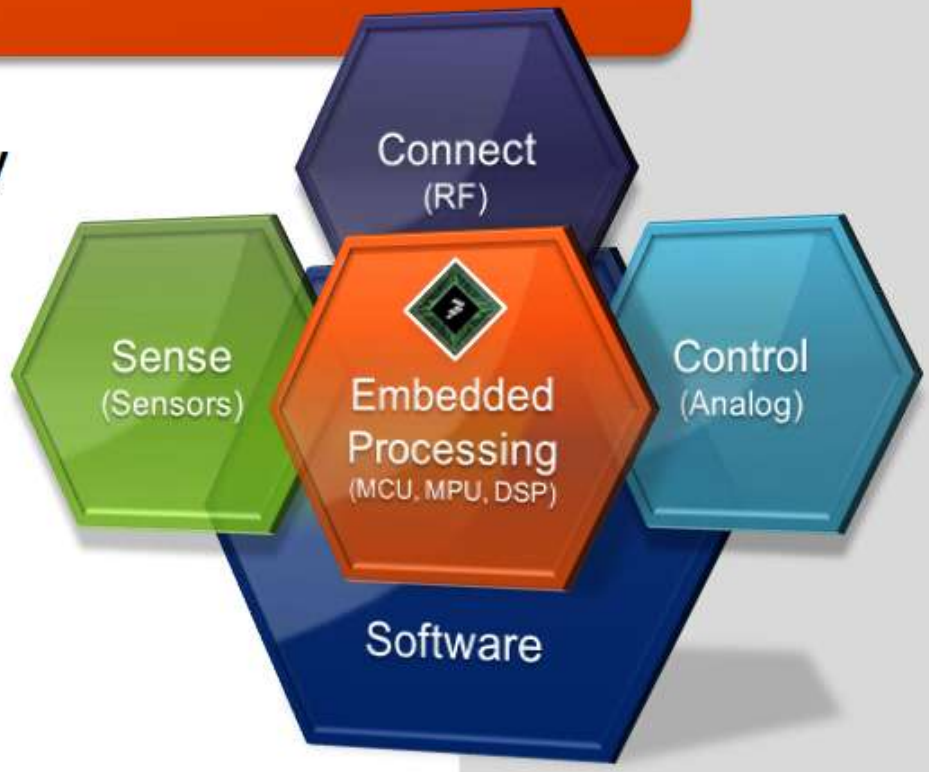
# A Global Leader of
# Embedded Processing Solutions

## 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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# 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

Televic in Belgium trams using MX51


Line6 "Stagescape" audio mixing system with i.MX51


i.MX233 based i'mWatch

Japanese Boarding Gate Pass Reader with i.MX27

Self service touch screen terminal

Sharp e-Dictionary with i.MX28

Harris military communication equipment with i.MX27

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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 Overview

## Scalable series of five ARM Cortex A9-based SoC families


### i.MX 6SoloLite

- 1x 1GHz
- x32 400MHz DDR3
- No HW video accel.
- 2D graphics (2 GPUs)
- LCD, EPD


### i.MX 6Solo

- 1x 1GHz
- x32 400MHz DDR3
- **HD1080p video**
- 2D+**3D** (2 GPUs), 53Mtri/s
- LCD, EPD


### i.MX 6DualLite

- **2x** 1GHz
- **x64** 400MHz DDR3
- HD1080p video
- 2D+3D (2 GPUs), 53Mtri/s
- LCD, EPD


### i.MX 6Dual

- 2x 1/**1.2GHz**
- x64 **533MHz** DDR3
- **Dual** HD1080p video
- 2D+3D (3 GPUs), **176 Mtri/s**
- LCD

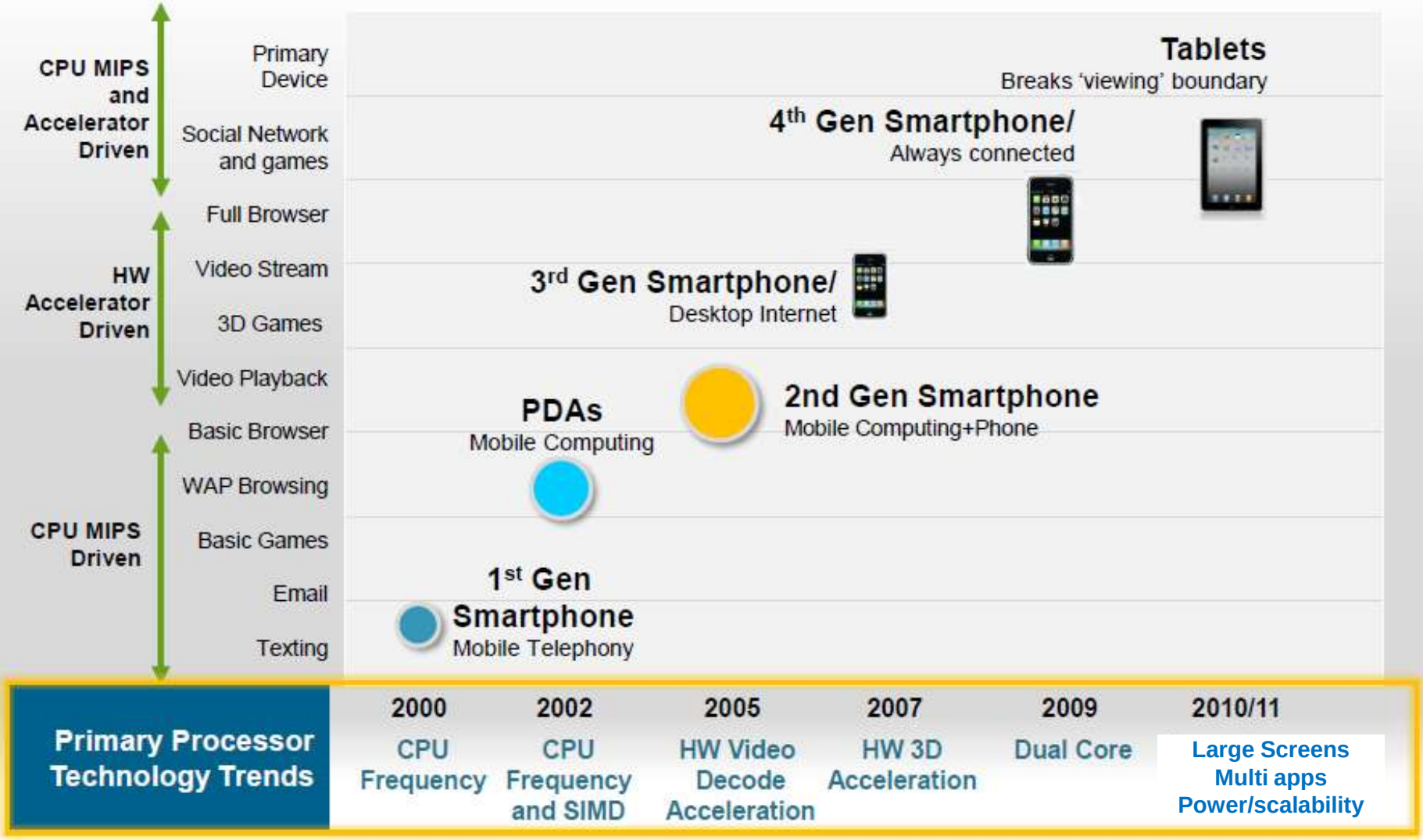

### i.MX 6Quad

- **4x** 1/1.2GHz
- x64 533MHz DDR3
- Dual HD1080p video
- 2D+3D (3 GPUs), 176 Mtri/s
- LCD

Pin-to-pin Compatible

Software Compatible

# Optimizing the Processor Platform



# i.MX 6 Series Triple-Play Graphics support

| i.MX 6Solo / i.MX 6DualLite | i.MX 6Dual | i.MX 6Quad |
|---|---|---|
|  |  |  |
| Composition (2D BLIT) | Composition (2D BLIT) | Composition (2D BLIT) |
| |  |  |
| | Vector Graphics | Vector Graphics |
|  |  |  |
| 3D + GP GPU 1 shader core | 3D + GP GPU 4 shader cores | 3D + GP GPU 4 shader cores |

***Same GPU drivers for all i.MX 6 Processors***

# User Interfaces – Characteristics and Implications

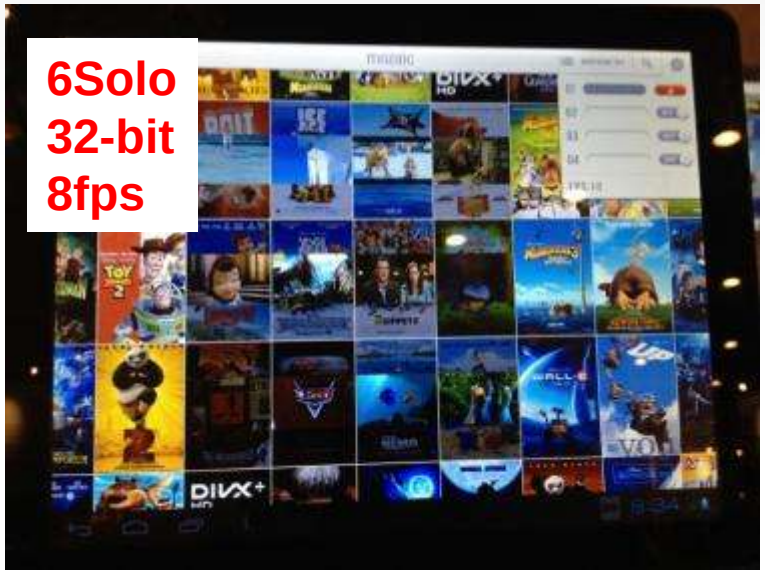
- **UI content is inherently dynamic**
  - Unlike Games (which use pre-cached images/textures)
  - User content can/will change at any time
  - Therefore UI must  refresh continuously in case new content emerges
  - Requires high speed (533Mhz) and wide (64-bit) memory bus to ensure high frame rates

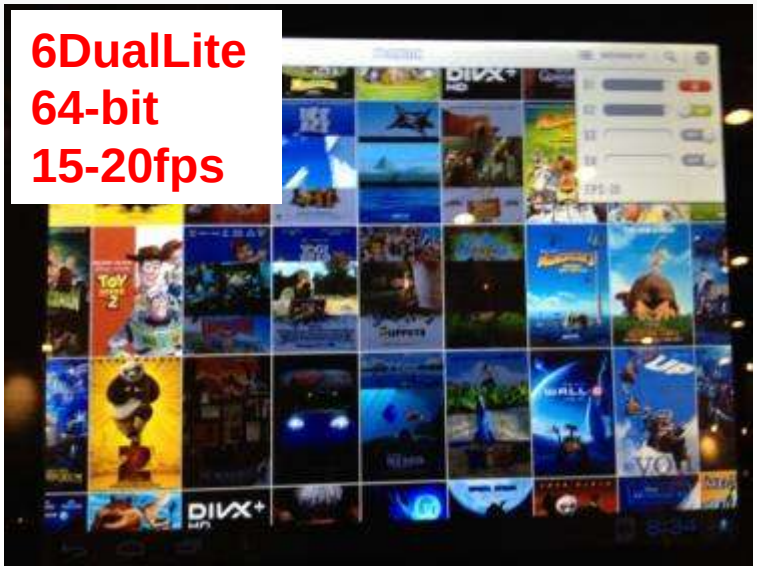
Recommend Dual Core + 64-bit Memory Bus

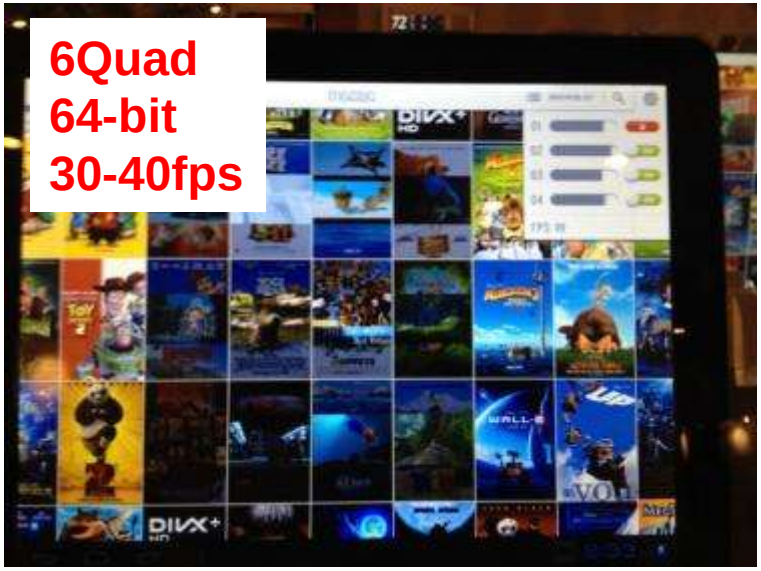

**User Content is dynamic and (potentially) always changing. Especially true of streaming movies, YouTube, pictures, home moviews**

**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 in Action – Dual Core + 64-bit matters



# 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**

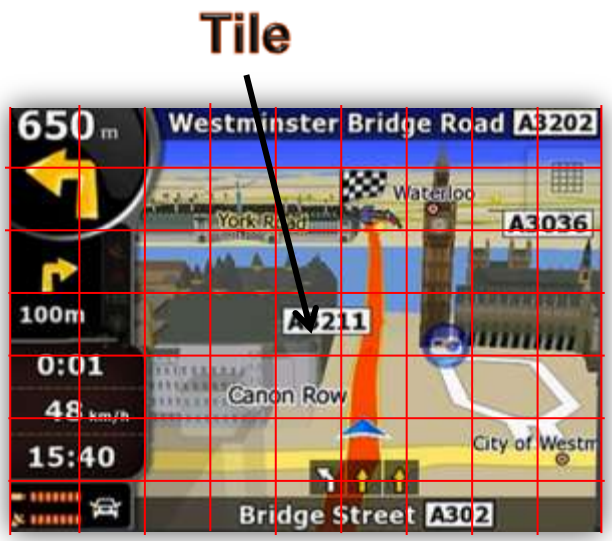
**AnTuTu Benchmark**

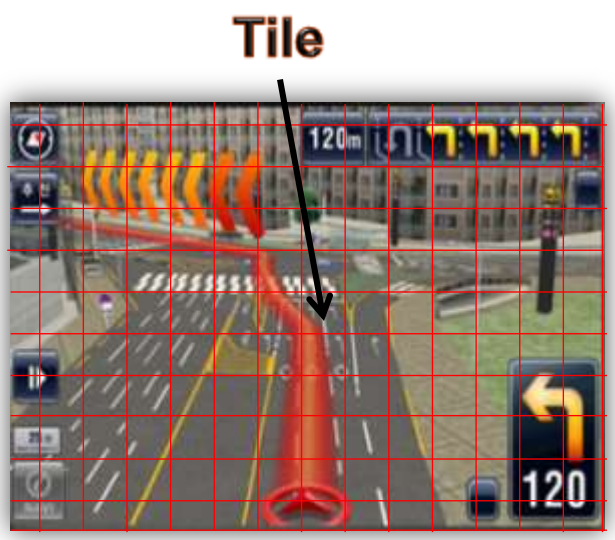

**Quadrant Benchmark**

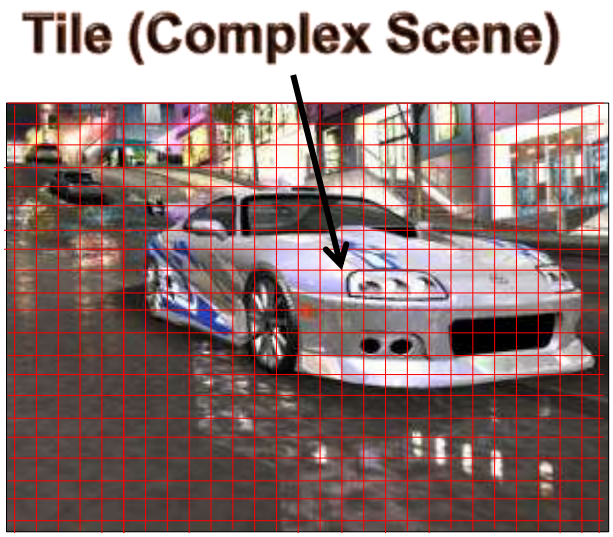
| | 6Quad | 6DualLite | 6Solo | Tegra2 |
|---|---|---|---|---|
| **Taiji Girl** | 25.65 fps | 9.2 fps | 7.67 fps | 6 fps |
| **NenaMark** | 49.2 | 30.5 | 27.2 | 21 |
| **AnTuTu** | 9605 | 5583 | 4531 | 4904 |
| **Quadrant** | 4011 | 3005 | 2414 | 2559 |

# 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 6 Series VPU: *Multi-streams*

| | Standard | Profile | Max # Streams | | | |
|---|---|---|---|---|---|---|
| | | | D1@ 30fps | 720p@ 30fps | 1080p@ 24fps | 1080p@ 30fps |
| HW Decoder | H.264 | BP/MP/HP | 8 | 3 | 2 | 1 |
| | On2 VP8 | -- | 4 | 2 | 1 | 1 (iMX6Q/D, **TBD**)<br>1 (iMX6D/S) |
| | VC1 | SP/MP/AP | 8 | 3 | 2 | 1 |
| | MPEG4 | SP/ASP | 8 | 3 | 2 | 1 |
| | H.263 | P0/P3 | 8 | 3 | 2 | 1 |
| HW Encoder | H.264 | BP | 6 | 2 | 2 (**TBD**) | 1 |
| | MPEG4-SP/H.263 | MPEG4-SP<br>H.263-P0/P3 | 6 | 2 | -- | -- |

# 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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# SABRE Platforms: Enabling Faster Time to Market

**i.MX 6 series** development tools are **Freescale designed** and **Freescale supported**

## SABRE Platform for Smart Devices

- i.MX 6Quad/6DualLite 1 GHz ARM Cortex-A9
- Multiple connectivity options: Wi-Fi®, Bluetooth®, GPS, Ethernet, SD, parallel/serial interfaces, SATA (i.MX 6Quad only), PCIe and MIPI CSI
- SABRE Board plus:
  - 10.1" capacitive multi-touch display
  - Battery charging ICs
  - The SPI NOR Flash
  - MIPI display and MIPI camera connectors
  - 2x MIPI camera sensors
  - Digital microphones
  - Ambient light sensor, GPS
  - EPDC connector (i.MX 6DualLite only)

## SABRE for Auto Infotainment

- Available to Tier 1 automotive OEMs
- i.MX 6Quad or i.MX6DualLite CPU card and i.MX 6 series base board
- Support for terrestrial and satellite radio tuners, Wi-Fi, Bluetooth, GPS, cellular modem, iAP authentication modules, MOST vehicle networking, cameras and displays
- Processor capability ranges from single ARM Cortex-A9 core at 800 MHz up to a quad core at up to 1 GHz

## SABRE Board for Smart Devices

- i.MX 6Quad 1 GHz ARM Cortex-A9
- Intelligently designed with connectors on only two sides of board to eliminate 'octopus effect' on lab tables
- Evaluate the smartly integrated features of the i.MX 6Quad processor including an LVDS controller, USB PHYs, HDMI PHYs, SATA, PCI Express®, on-board power management and Ethernet

## i.MX 6SoloLite Evaluation Kit

- i.MX 6SoloLite 1 GHz ARM Cortex-A9
- Integrated E Ink® display controller
- Enables EPD and/or LCD or HDMI display, touch control and audio playback, and the ability to add WLAN, a 3G modem or Bluetooth technology
- E Ink display available separately

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# 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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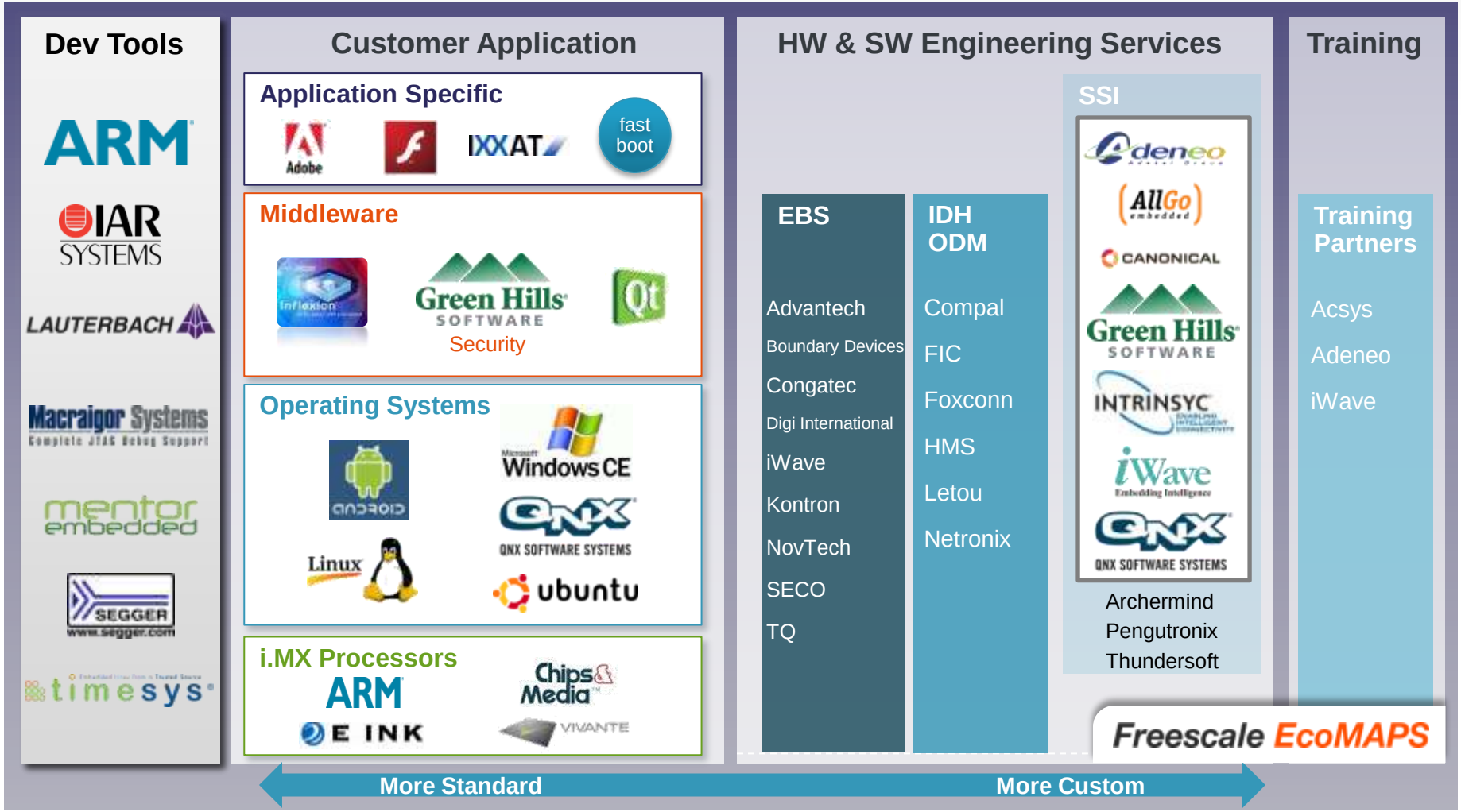
# Freescale EcoMAPS for i.MX Architectures




**IDE:** Integrated Development Environment
**BDM:** Background Debug Module

**EBS**: Embedded Board Solutions

**IDH**: Independent Design House
**ODM** Original Design Manufacturer

**SSI**: Software & Solution Integrators


## www.imxcommunity.org

**A Freescale supported open web community of developers sharing common interest in transforming i.MX applications processors into practically anything imaginable.**

## Community Facts at a Glance

- Over 3,800 members and over 200 Freescale engineers and marketers interacting with you
- Support and enablement for i.MX processors and software
- Forums, Groups and Blogs Posts
- News, Photos and Videos
- Training, Events and Promotions

# Backup

# SABRE Board for Smart Devices (SDB)

**i.MX 6Quad 1Ghz Cortex-A9 Processor**
- Can be configured as i.MX 6Dual
- Freescale MMPF0100 PMIC
- 1 GB DDR3 memory (non terminated)
- 3” x 7” 8-layer PCB

**Display connectors**
- 2x LVDS connectors
- Connector for 24 bit 4.3” 800x480 WVGA with 4-wire touch screen
- HDMI Connector

**Audio**
- Wolfson Audio Codec
- Microphone and headphone jacks

**Expansion Connector**
- Camera CSI port signals
- I2C, SSI, SPI signals

**Part Numbers:** MCIMX6Q-SDB ($399)

**Display (9.7”):** MCIMX-LVDS1 ($499)
**Display (4.3”):** MCIMX28LCD ($199)

**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

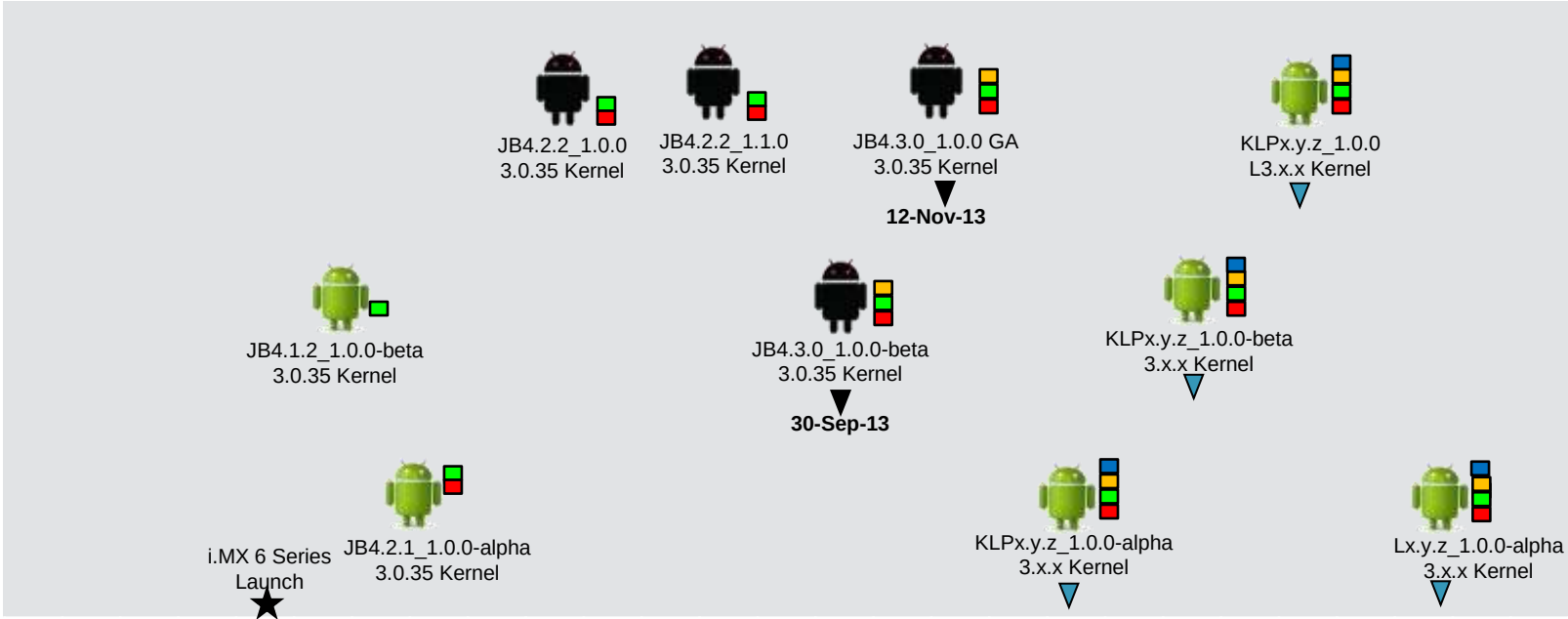
**Additional Features**
- 3-axis Freescale accel
- eCompass
- Power supply
- No battery charger

**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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# History of Android Development

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