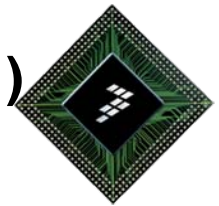


June, 2010

Using Freescale Linux[®] Package to Take Full Advantage of the Rich Hardware Acceleration Blocks of the i.MX51 (Part 1)



FTF-ENT-F0665

Gerald Vahe & Marsha Chang

Field Applications Engineer & Product Marketer

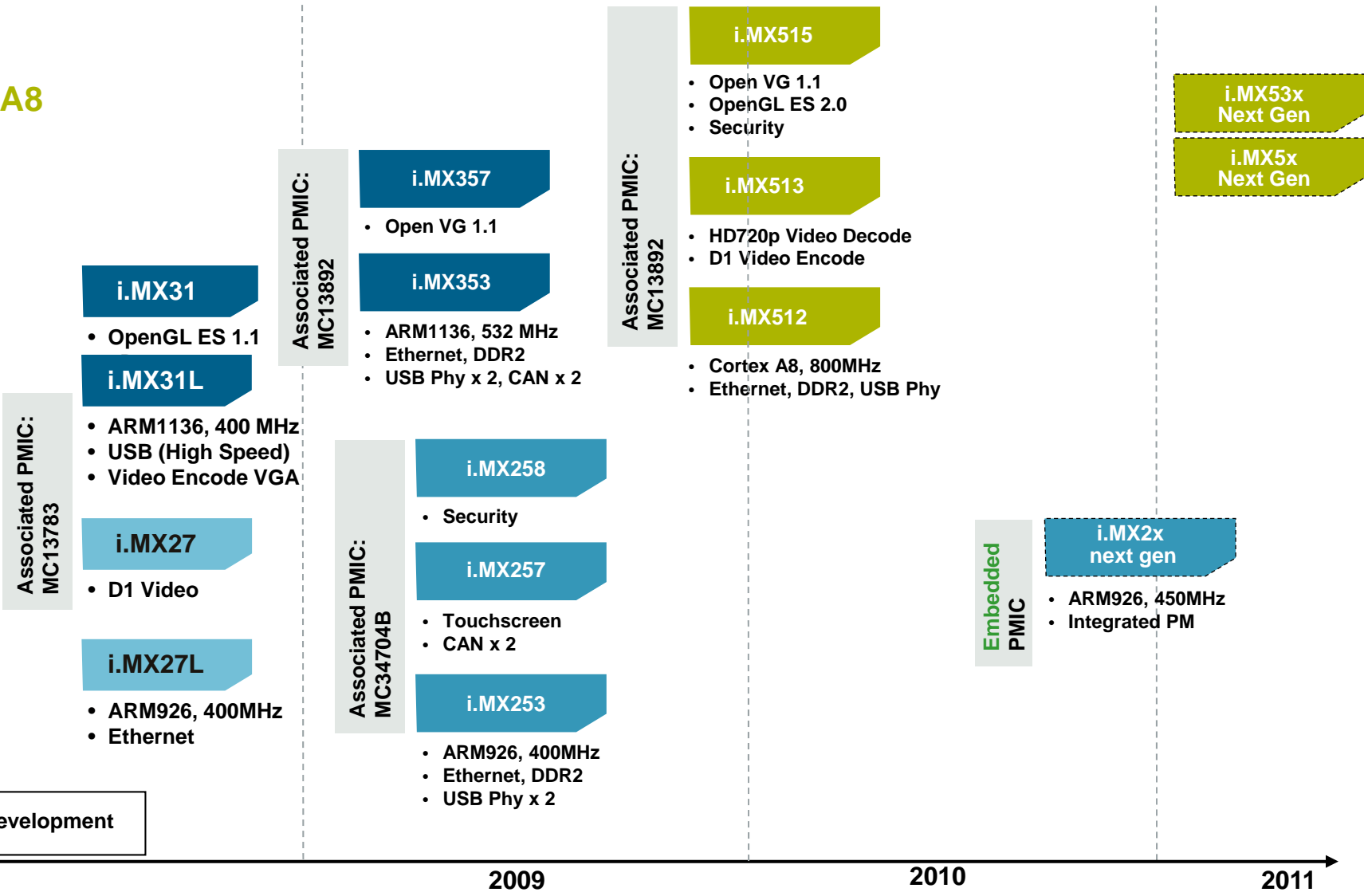
- ▶ Introduction
- ▶ Roadmap
- ▶ i.MX51 Markets and Focus
- ▶ Why Freescale's ARM?
- ▶ i.MX51 Variants
- ▶ Graphics Acceleration & Demo
- ▶ Video Acceleration & Demo
- ▶ Development System ... i.MX51EVK
- ▶ Software Enablement
- ▶ Partners/Third Party Ecosystem
- ▶ Conclusion
- ▶ Questions?

Cortex A8

ARM11

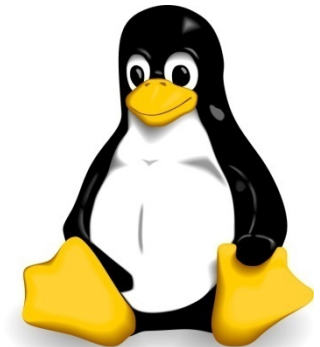
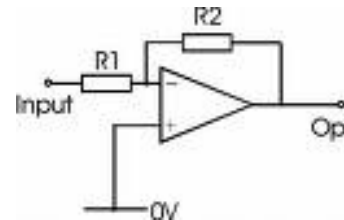
ARM9

In Development



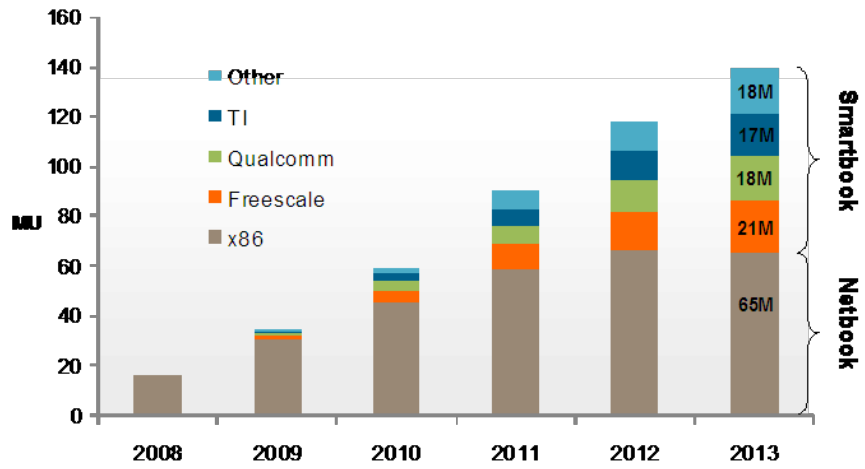
Freescale Applications Processor Value Proposition

- ▶ Performance
(MHz and Memory Efficiency)
- ▶ Low Power (Audio < 18 mW system, HD720 Video < 250 mW)
- ▶ State-of-the-art Audio, Video, Graphics and Codecs
- ▶ Consistent and scalable architecture
- ▶ Complete OS/SW platform
- ▶ Mixed signal integration



Freescale Mobile Consumer Leadership

- ▶ Pioneer in the portable media player market
- ▶ #1 market share in eBook application processors
- ▶ Shaping the smartbook product category



Source: ABI Research April 2009

- ▶ Product Launch
November 4, 2009

- ▶ The i.MX51 brings a new level of performance and integration to the i.MX family from Freescale, while maintaining the family's commitment to low power consumption, product accessibility and device longevity.

Consumer	Industrial	Automotive
<ul style="list-style-type: none"> • Smartbooks • eBooks • Portable Media Player • Media Phone/Terminal • Digital Photo Frame • High-End Appliances • Digital Signage • Printers 	<ul style="list-style-type: none"> • Security and Surveillance • Advanced HMI • Medical • Factory Automation 	<ul style="list-style-type: none"> • Infotainment Systems • Navigation • Telematics • Instrument Cluster

Freescale extends its i.MX51 family to new markets with four processors based on ARM Cortex™-A8 technology

AUSTIN, Texas – Nov. 4, 2009

► Performance

- The i.MX51 family of processors runs on the powerful ARM Cortex-A8 core at speeds up to 800 MHz, which allows for roughly 2 MIPS per MHz. In addition, the i.MX51 processor offers flexible memory support for mDDR, SDRAM, SLC/MLC NAND, popular lower-cost DDR2, a NEON™ co-processor and VFPU. The high performance of the i.MX51 family of processors enables life-like video and 3-D graphics reproduction and quick response times needed for advanced user interfaces and sophisticated video processing - the building blocks to power the next great applications.

► Integration

- The i.MX51 products integrates five engines including the ARM Cortex-A8 processor, Open VG™, OpenGL®-ES, D1 video encode/HD720 decode and ARM NEON™ technology. Depending on the intended application, different engines are enabled to achieve maximum performance/power ratios for each application space. This exceptional integration simplifies and shortens design time.

► Low Power Consumption

- The i.MX51 delivers extreme performance and low power consumption helping developers design products that meet today's demands for energy efficiency. Advanced power management features used throughout the i.MX51 processor enable a rich suite of multimedia features and peripherals while maintaining minimal system power consumption in both active and low-power modes, which provides device end-users with long, long play times for hours of work or entertainment use.

▶ What is an ARM processor?

- Advanced RISC Machines (ARM): 32-bit RISC processor architecture developed by ARM Limited widely used in embedded designs
- RISC – Reduced Instruction Set Computer
- Common open architecture

▶ The benefits of ARM:

- Fixed 32-bit instruction size instead of variable
- Pipelined execution
- Best MIPS to Watts and MIPS cost ratio in the industry
- Power-saving features enable low power consumption
- Performance to meet demand for computing
- Smaller die sizes translate to lower costs and reduced power consumption
- Simple prototyping and development platform
- Extensive third party support system

The ARM logo is displayed in a large, bold, blue sans-serif font. A registered trademark symbol (®) is located at the top right of the letter 'M'.

- ▶ High performance and low power
 - ARM Cortex-A8
 - HW Acceleration of HD Video/Imaging path
 - Dual OpenVG and OpenGL graphics cores

- ▶ Low power
 - C65LPGP technology
 - HW acceleration
 - Advanced power management (DVFS)
 - Video Playback power (720p to WVGA): **~150mW**
 - Audio Playback power (128kbps WMA): **~16mW**

- ▶ Reduced BOM
 - Chipset price
 - DDR2 memory
 - Six-layer PCB, 0.8mm SoC and PMIC

- ▶ Enablement collateral
 - Complete BSPs targeting multiple operating systems
 - Complete Audio/Video codecs
 - Complete reference designs

- ▶ Future roadmap
 - Continued investment in i.MX5x and beyond
 - No proprietary DSP/other solutions, native ARM forward/backward compatibility

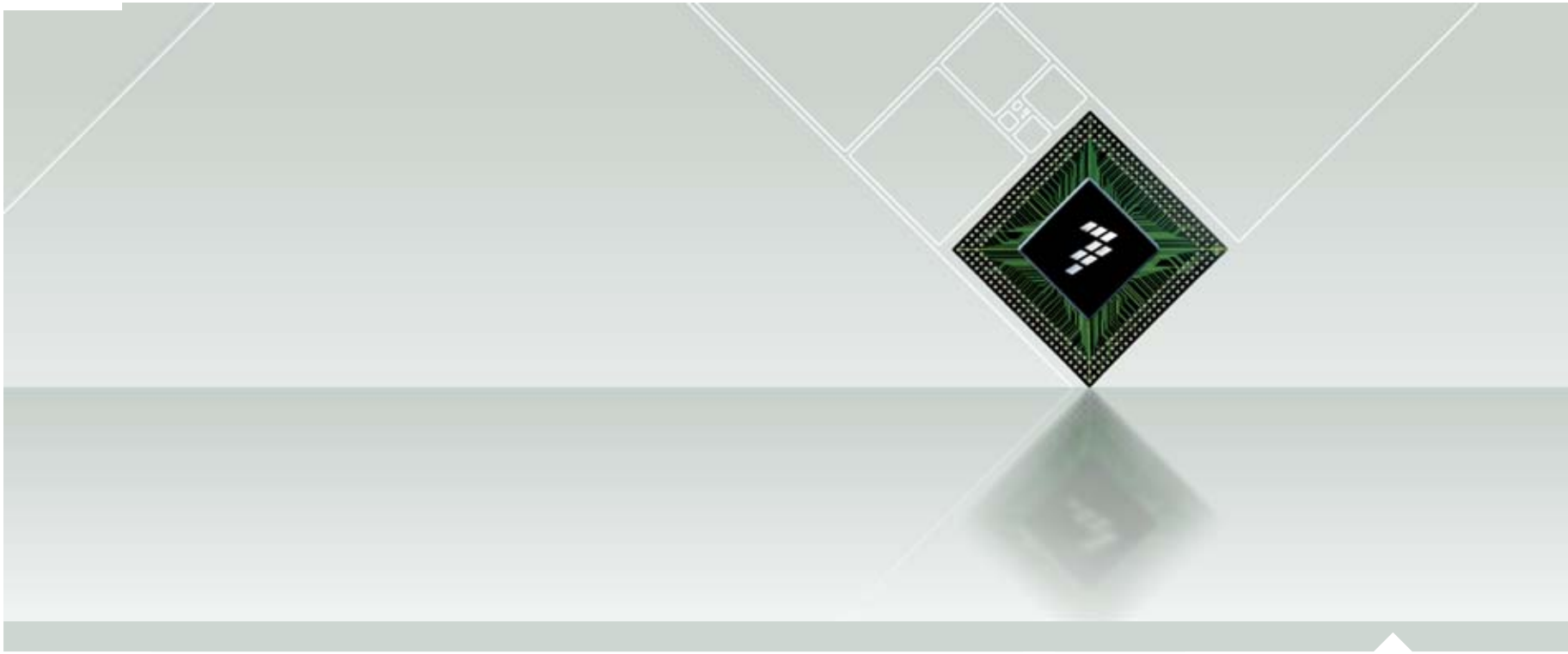
- ▶ Deep experience developing and deploying Consumer/Automotive/Industrial/Military devices

- ▶ Product Longevity/Automotive Ties

Freescale Introduces Product Longevity Program

- ▶ The embedded market needs **long-term product support**
- ▶ Freescale has a long-standing 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





i.MX51 Family

i.MX51 Family: 3-Digit Part Numbering

Feature	i.MX512	i.MX513	i.MX514	i.MX515	i.MX516
Target Markets	Consumer, Industrial	Consumer, Industrial	Automotive	Consumer, Industrial	Automotive
Target Segments	<ul style="list-style-type: none"> Factory Automation (Ethernet) HMI Portable/Tethered Printers Medical Devices Ebooks 	<ul style="list-style-type: none"> IP Camera Media Phones Digital Signage HMI (home appliances, etc.) Medical Devices 	<ul style="list-style-type: none"> Navigation Advanced HMI Instrument Cluster Telematics 	<ul style="list-style-type: none"> Smartbook Mobile internet devices PMPs Secure Devices Advanced HMI High-End PDAs 	<ul style="list-style-type: none"> Infotainment Rear Seat Entertainment
Core	Cortex™-A8	Cortex™-A8	Cortex™-A8	Cortex™-A8	Cortex™-A8
CPU Speed	Consumer: up to 800 MHz Industrial: up to 600 MHz	Consumer: up to 800 MHz Industrial: up to 600 MHz	Up to 600 MHz	Consumer: up to 800 MHz Industrial: up to 600 MHz	Up to 600 MHz
Key Differences	<ul style="list-style-type: none"> DDR2 Integrated USB Phy's Integrated Ethernet Vector Floating Point HD 720 TV-Out 	<ul style="list-style-type: none"> i.MX512 + HW Video Codec: Multi-format D1 video encode & multi-format HD720 decode 	<ul style="list-style-type: none"> i.MX512 + OpenGL ES 2.0 3D accelerator OpenVG 1.1 graphics accelerator Security: Sahara v4 & Trust Zone 	<ul style="list-style-type: none"> i.MX513 + OpenGL ES 2.0 3D accelerator OpenVG 1.1 graphics accelerator Security: Sahara v4 & Trust Zone 	<ul style="list-style-type: none"> i.MX514 + HW Video Codec: Multi-format D1 video encode & multi-format HD720 decode
Package	0.8mm 529BGA 0.5mm 527BGA	0.8mm 529BGA 0.5mm 527BGA	0.8mm 529BGA 0.5mm 527BGA	0.8mm 529BGA 0.5mm 527BGA	0.8mm 529BGA 0.5mm 527BGA
Positioning	High-End processor	Video supported	Automotive support for graphics and security	Full featured: Video, graphics and security	Full featured: Video, graphics and security
10KU Suggested Disty Resale 2010	\$18.96 – \$22.11	\$19.40 – \$22.29	Contact Freescale Sales	\$21.63 – \$25.59	Contact Freescale Sales
OS	Linux, WinCE , Android RTOS	Linux, WinCE , Android RTOS	Linux, WinCE , Android RTOS	Linux, WinCE , Android RTOS	Linux, WinCE , Android RTOS
General Availability	Now	Now	Now	Now	Now

► Specifications

- **CPU:** Cortex A8, up to 800MHz
- **Process:** 65nm, LP/GP
- **Core Voltage:** 0.85-1.1V
- **Package:** 19x19 0.8mm
- **Temp Range:** -20 to 70C* (Consumer), -40 to 85C* (Industrial), -40 to 85C* (Auto)
- See Datasheet for case/junction temperatures

► Key i.MX515 Features and Advantages

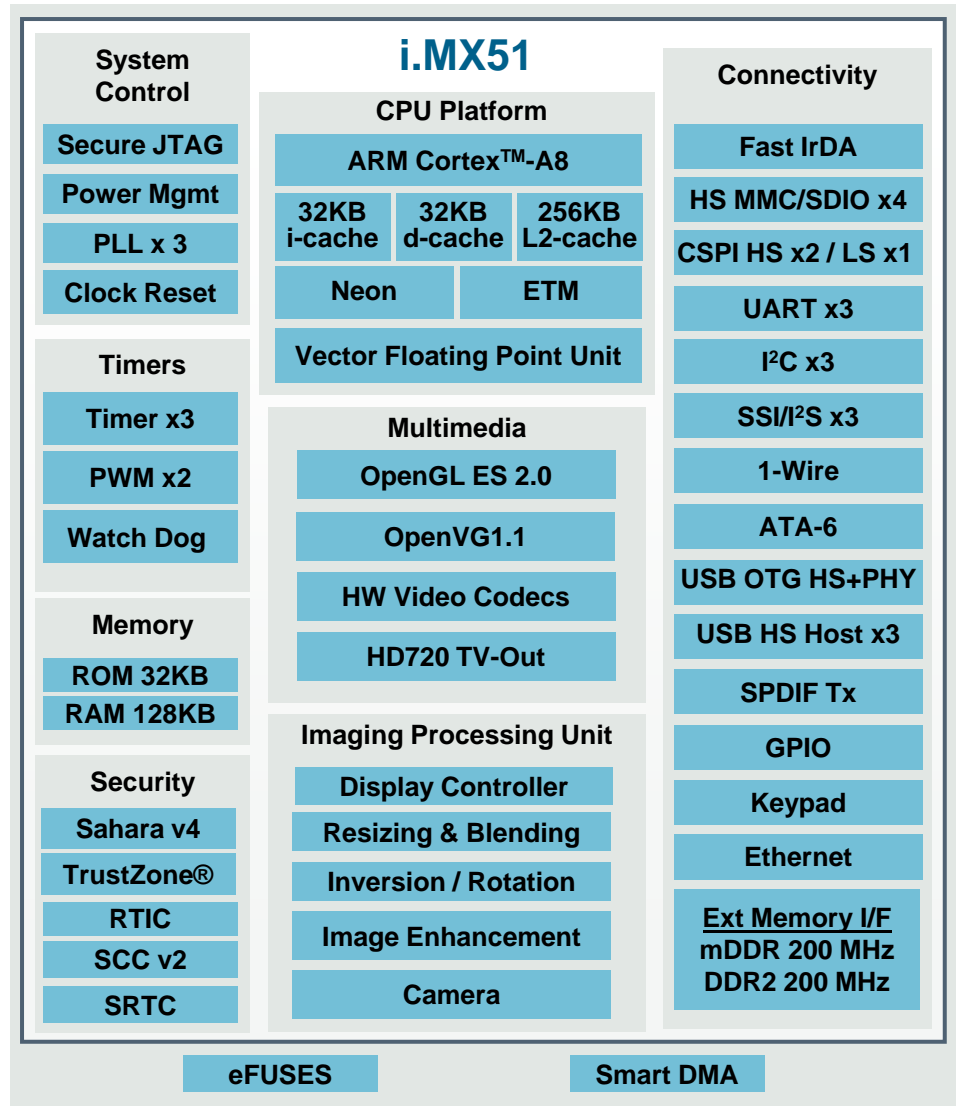
- High performance CPU: Cortex A8
- Low power multimedia
- Delivers rich graphics and UI in HW
 - OpenGL ES 2.0 3D accelerator (AMD Z430)
 - OpenVG 1.1 graphics accelerator (AMD Z160)
 - Neon Vector floating point co-processor
 - Display up to WXGA
- Drives high resolution video in HW
 - Multi-format D1 video encode
 - Multi-format HD720 video decode
- Mixed signal integration - HD720 TV out and high speed USB with embedded PHY

► Available Parts

- i.MX512, i.MX513, i.MX514, i.MX515, i.MX516

► Availability

- **Market:** Consumer, Industrial and Auto
- **Sample:** Now
- **Production:** Now



► Specifications

- **CPU:** Cortex A8, up to 800MHz
- **Process:** 65nm, LP/GP
- **Core Voltage:** 0.85-1.1V
- **Package:** 19x19 0.8mm
- **Temp Range*:** -20 to 70C* (Consumer)
-40 to 85C* (Industrial)

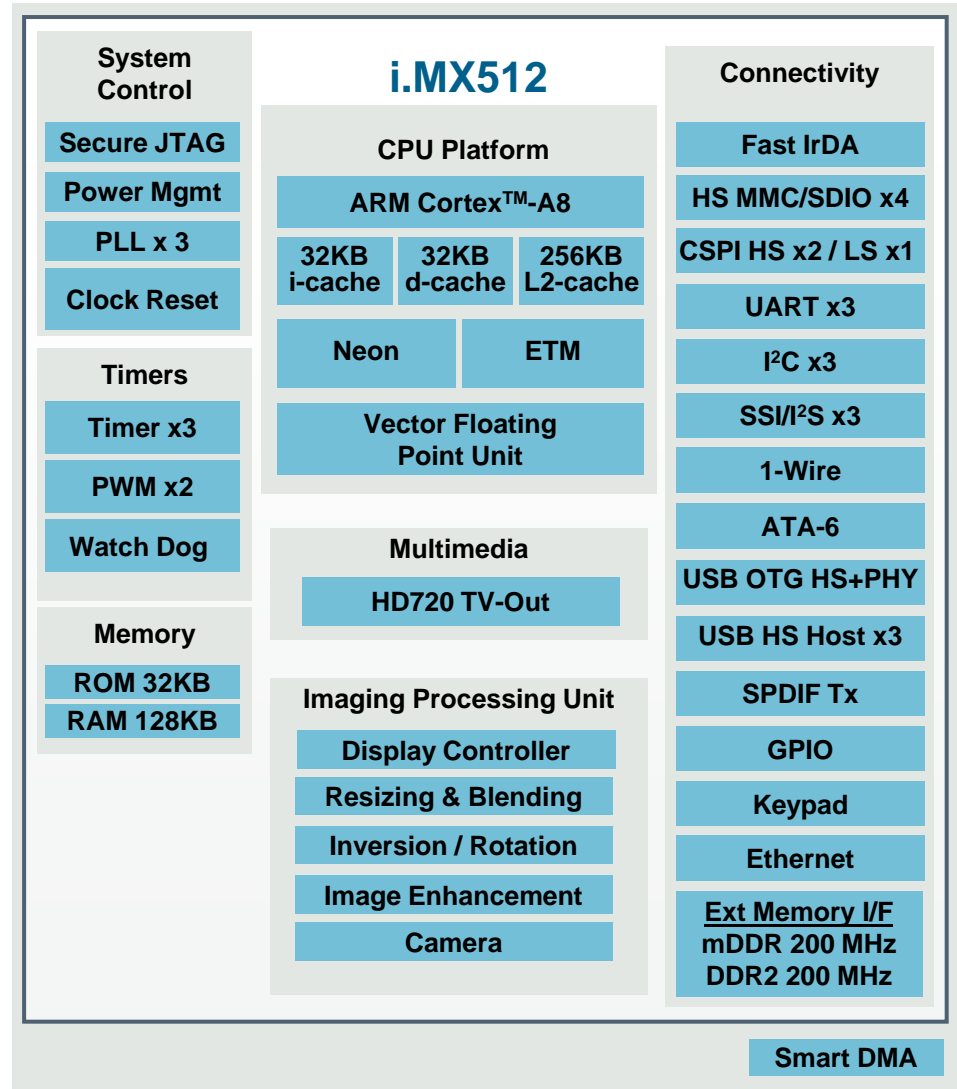
* See Datasheet for case temperatures

► Key i.MX512 Features and Advantages

- High performance CPU: Cortex A8
- Mixed signal integration – HD720 TV out and high speed USB with embedded PHY

► Availability

- **Market:** Consumer, Industrial
- **Sample:** Now
- **Production:** Now



► Specifications

- **CPU:** Cortex A8, up to 800MHz
- **Process:** 65nm, LP/GP
- **Core Voltage:** 0.85-1.1V
- **Package:** 19x19 0.8mm
- **Temp Range*:** -20 to 70C* (Consumer)
-40 to 85C* (Industrial)

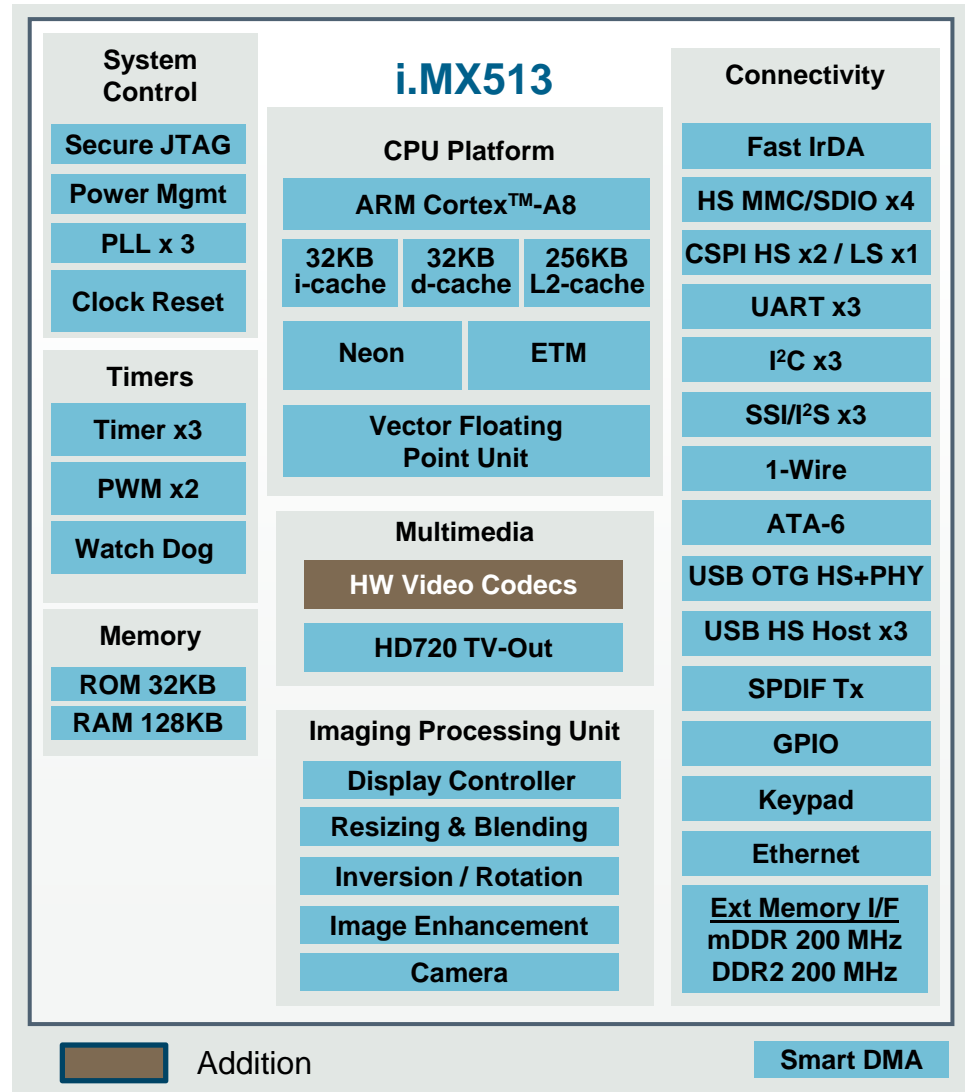
* See Datasheet for case temperatures

► Key i.MX513 Features and Advantages

- High performance CPU: Cortex A8
- Low power multimedia
- Drives high resolution video in HW
 - Multi-format D1 video encode
 - Multi-format HD720 video decode
- Mixed signal integration – HD720 TV out and high speed USB with embedded PHY

► Availability

- **Market:** Consumer, Industrial
- **Sample:** Now
- **Production:** Now



► Specifications

- **CPU:** Cortex A8, up to 800MHz
- **Process:** 65nm, LP/GP
- **Core Voltage:** 0.85-1.1V
- **Package:** 19x19 0.8mm
- **Temp Range*:** -20 to 70C* (Consumer)
-40 to 85C* (Industrial)

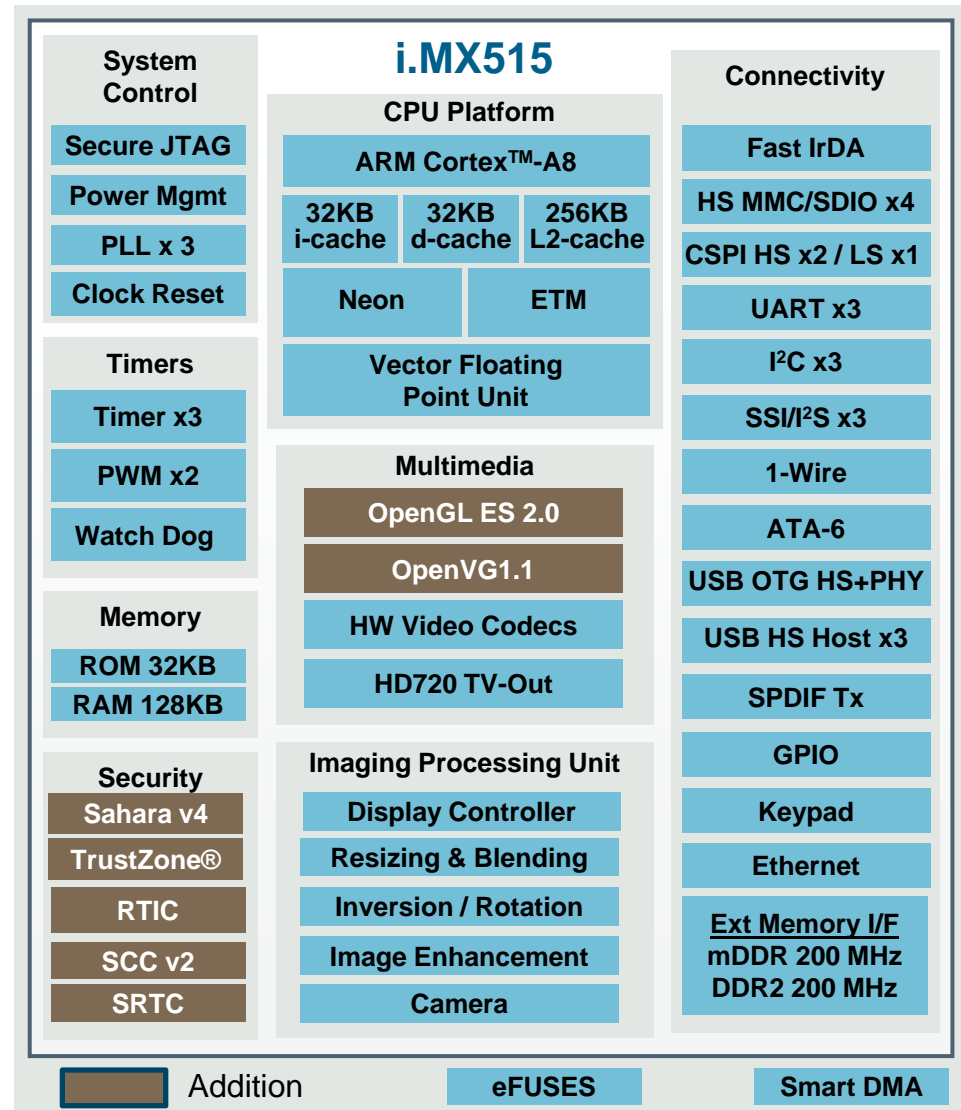
* See Datasheet for case temperatures

► Key i.MX515 Features and Advantages

- High performance CPU: Cortex A8
- Low power multimedia
- Delivers rich graphics and UI in HW
 - OpenGL ES 2.0 3D accelerator (AMD Z430)
 - OpenVG 1.1 graphics accelerator (AMD Z160)
 - Neon Vector floating point co-processor
 - Display up to WXGA
- Drives high resolution video in HW
 - Multi-format D1 video encode
 - Multi-format HD720 video decode
- Mixed signal integration – HD720 TV out and high speed USB with embedded PHY

► Availability

- **Market:** Consumer, Industrial
- **Sample:** Now
- **Production:** Now



- ▶ CPU
 - ARM Cortex-A8 w/ Neon
 - 32KB L1 (Instruction and Data cache)
 - 256KB L2 cache

- ▶ Multimedia *
 - Encode – D1 30fps (MPEG4 SP, H.264 BP, MJPEG)
 - Decode – HD720 30fps (MPEG2 MP, MPEG4 ASP, H.264 HP, VC-1 AP, DivX, RV10)
 - Graphics – OpenVG1.1, OpenGL ES 2.0 @ 27M Tri/sec
 - TV Encoder – Component, Composite or S-Video out at 720p

- ▶ Camera
 - Camera sensor I/F (x2)
 - Up to 8Mpixel @ 15fps, Up 133Mpixel/sec
 - Resizing, Inversion, Rotation
 - Color Space conversion, video/graphics combining

- ▶ Display
 - Up to WXGA display – 24 bit @ 60fps
 - Secondary Display Support

- ▶ Connectivity
 - High speed USB OTG w/ embedded Phy, Host HS x3
 - MobileDDR, DDR2 (Up to 200MHz bus speed)
 - SLC/MLC NAND Flash 8/16-bit, NAND/NOR
 - High speed MMC\SDIO, UART, I2C, SPI
 - ATA-6
 - 3.3V support on HD, SDIO, and SIM I/F
 - Ethernet controller

- ▶ Security *
 - TrustZone
 - AES, DES/3DES, SHA-1, SHA-224, SHA-256
 - Run time integrity checker (RTICv3)
 - Secure High Assurance Boot
 - Security Controller (SCC), including Secure RAM and Security Monitor
 - Random Number Generator Accelerator (RNGA)
 - Secure JTAG Controller (with electrical fuses)
 - Secure real-time clock
 - Universal Unique Identification
 - Tamper Detection

- ▶ Power Management
 - Advanced power management (DVFS)
 - State retention power gating
 - Multiple independent clock and power domains

* Dependent on processor

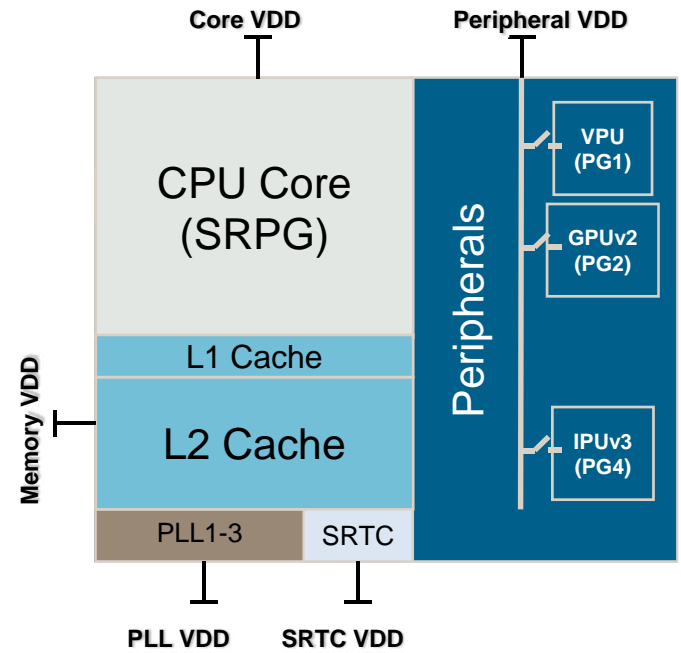
Best-in-Class Balance of High Performance and Low Power

- ▶ **SoC**
 - 65nm technology
 - Mix of Low Power (low leakage) and General Purpose (high performance) transistors
 - Allows high performing CPU with minimal SoC power consumption
 - Hardware acceleration of all performance intensive multimedia tasks independent of CPU

- ▶ **ARM CPU design**
 - High speed (up to 800MHz @ 1.1V)
 - Low operating voltage (down to 0.85V, 167MHz)
 - State Retention Power Gating to reduce leakage in GP process
 - L2 cache for minimized access to external memory, reducing the power consumption and increasing performance

- ▶ **Dynamic Voltage & Frequency Scaling (DVFS)**
 - Two independent domains with h/w monitoring: CPU, Peripherals

- ▶ **Hardware Accelerator Power Gating**
 - Unused accelerators can be dynamically power gated to reduce leakage current



▶ **Native OpenGL ES 2.0** 3D based on ATI/AMD Unified Shader Architecture

- **Same architecture and same content tools** as in **Xbox 360** and AMD's PC graphics chips
- Licensed by several industry leaders, providing for a strong foundation for a content creation ecosystem
- Binning architecture provides for low memory/power requirements
- 27 M triangles/sec
- 166 M pixels/sec raw performance (1 pixel/clock)
 - 500 M pixels/sec (effective w/3x overdraw)



▶ **A native OpenVG 1.1** 2D hardware implementation

- Driving high-quality UIs and Flash based internet browsing with extremely low power consumption
- Free 16x antialiasing for very high-quality fonts and graphics
- Capable of delivering a full 3D user interface experience beyond anything on the market today with a fraction of the power consumption compared to any other solution
- 166 M pixels/sec raw performance (1 pixel/clock)



ARM1176 v. Cortex-A8: Key Differentiators

Freescale ARM1176	Freescale ARM-Cortex-A8 (As implemented on i.MX51)
<ul style="list-style-type: none"> ▶ Maximum frequency = 532 MHz ▶ 32-bit SIMD Instruction Set ▶ Single instruction pipeline execution ▶ Compiler support 	<ul style="list-style-type: none"> ▶ Maximum frequency = 800 MHz (consumer) ▶ NEON instruction set extension (64-bit SIMD Instruction set with improved DSP support) ▶ Dual instruction pipeline execution ▶ Availability of Open-Consortium Khronos OpenMAX libraries and SIMD vectorizing compiler for accelerated optimized SW development

▶ Summary

- ARM Cortex A8 with Neon significantly improves the performance of multimedia applications compared to ARM1176
- Cortex-A8 Dhrystone MIPS are about 50% better than ARM11 core. (If the ARM-Cortex A8 compiler is allowed to utilize NEON, the benchmark is a 1.8x improvement of ARM-Cortex A8 more than ARM1176)

- ▶ Summary Results – Similar tests of performance between the SoC-ARM1176 and the i.MX51-ARM-Cortex-A8 were done for a variety of codecs.

	SoC-ARM1176	i.MX51-ARM-Cortex-A8
WMA-v10 decoder, 44.1K, 320Kb/s	16MHz	9MHz
MPEG2 Encoder @ D1 resolution @ 30fps	1800MHz	600MHz
Video De-interlace @ D1 resolution @ 30fps	100MHz	50MHz

▶ Conclusion

- When factoring in the dual instruction set architecture of the ARM-Cortex-A8, the NEON 64-bit SIMD-DSP instruction set architecture of the ARM-Cortex-A8 and a more efficient memory subsystem ...

... the i.MX51 Applications processor is about 1.8x-2.0x more MIPS efficient than an ARM1176 based applications processor with smaller caches when running low level optimized codec code.

	Format	Profile	Resolution	Bitrate
HW Decoder	MPEG-2	Main-High	HD720p	20Mbps
	MPEG-4	SP	HD720p	20Mbps
	MPEG-4	ASP	HD720p	20Mbps
	DivX	3/4/5/6	HD720p	20Mbps
	H.263	P0/P3	HD720p	20Mbps
	H.264	BP/MP/HP	HD720p	20Mbps
	VC1	SP/MP/AP	HD720p	20Mbps
	RV10	8/9/10	HD720p	20Mbps
	MJPEG	Baseline	32Mpixels	
HW Encoder	MPEG-4	Simple	D1	8Mbps
	H.263	P0/P3	D1	8Mbps
	H.264	Baseline	D1	10Mbps
	MJPEG	Baseline	64Mpixels	

Multimedia System – Video and Graphics and Display i/f

- ▶ The i.MX51 multimedia system, is mainly composed of HW accelerators which handle most tasks autonomously. Notable advantages include:
 - Cortex core processing is free to execute/run application code
 - Lower power consumed (dedicated HW modules)
 - Optimize data path – reduce DDR load, allow use of 32-bit DDR Memories for the task

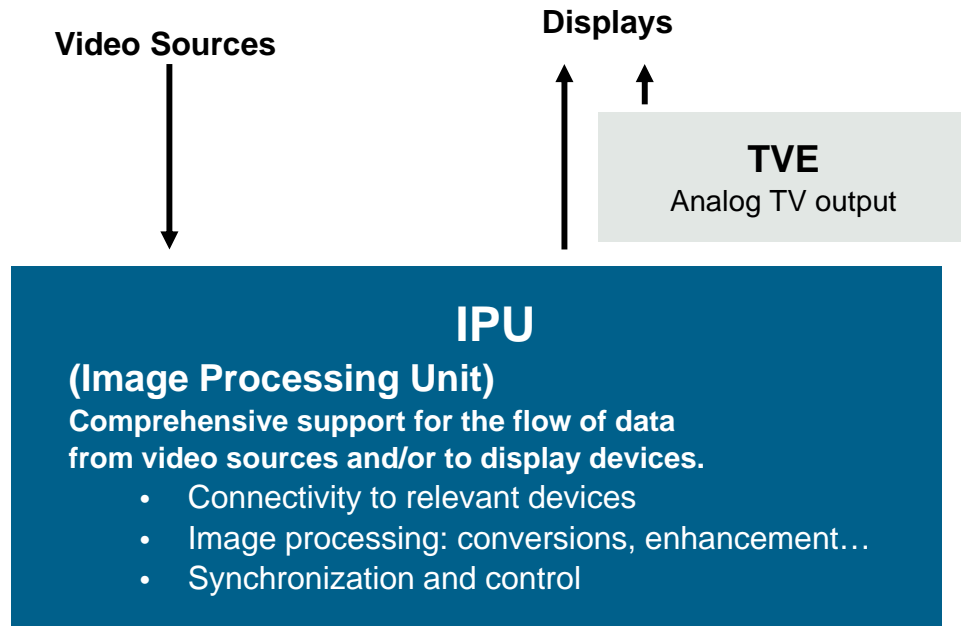
- ▶ IPU – Image Processing Unit
 - Serve as Display controller to LCD/TV out devices.
 - Used for image manipulations and processing
 - Manages Camera interface
 - Much more ...

- ▶ VPU (Video Processing Unit) – Video CODEC
 - Multiple compression formats
 - Rate: up to 720p decode, D1 two-way

- ▶ GPUs (Graphics Processing Units) – Graphics Generation
 - 3D: OpenGL-ES 2.0
 - 2D: OpenVG 1.1

- ▶ TVE (Analog TV output)

The Video and Graphics System in i.MX51



VPU
(Video Processing Unit)
Video encoding and decoding

GPU
(Graphics Processing Unit)
Graphics generation

Full HW support
The CPU does not have to touch pixels

The IPU in i.MX51 (IPUv3EX) – Dual-Display Capabilities

► Notes

- Maximal peak rate (including blanking overhead)
 - Single display: 110 MP/sec
 - Total: 120 MP/sec
- For TV, the peak rate (and blanking overhead) is fixed by the standards: SDTV: 13.5 MP/sec, 720p/1080i: 74.25 MP/sec
- For LCDs
 - The assumed screen refresh rate is 60 Hz
 - “Marginal support” – Depends on the display, requires a more careful evaluation

Second Display First Display	WQVGA (400x240)	SDTV 480i30/576i25	WVGA	WSVGA	HDTV 720p60/1080i30
WVGA (800x480 ~ 0.4 MP)	Yes	Yes	Yes	Yes	Yes
WSVGA (1000x600 ~ 0.6 MP)	Yes	Yes	Yes	Yes	Marginal
WXGA (1366x768 ~ 1.0 MP)	Yes	Yes	Yes		
SXGA (1280x1024 ~ 1.3 MP)	Yes				

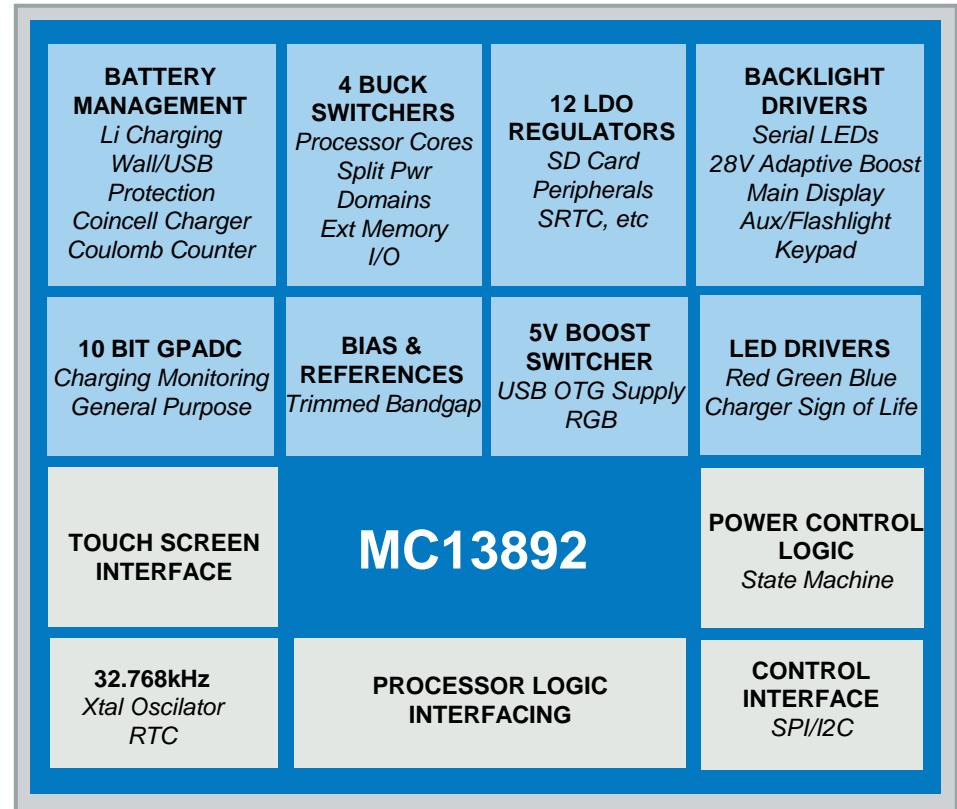
MC13892 Power Management and User Interface IC

▶ POWER and BATTERY

- 4 multi-mode buck switchers – 1.05A, 3x800mA programmable outputs, 2 with DVS/DPTC interface
- 2 boost switchers – 5V, 28V adaptive
- 12 LDO regulators, 4 GPOs, power gating
- Main battery and coin cell chargers, GP ADC
- Series WLED backlight drivers (main/aux, keypad)
- 1 bank RGB drivers, charger LED drive
- Standalone battery charging with auto disable if battery is out of temperature range
- Standby/user off configurations
- Coulomb counter

▶ INTERFACE and CONTROL

- SPI/I2C control and register interface
- Resistive touch screen
- 32KHz crystal oscillator, real time clock/ calendar alarms
- Package
 - 7x7mm BGA, 0.5mm pitch, 139 pins
 - 12x12mm BGA, 0.8mm pitch, 186 pins



Part Numbers

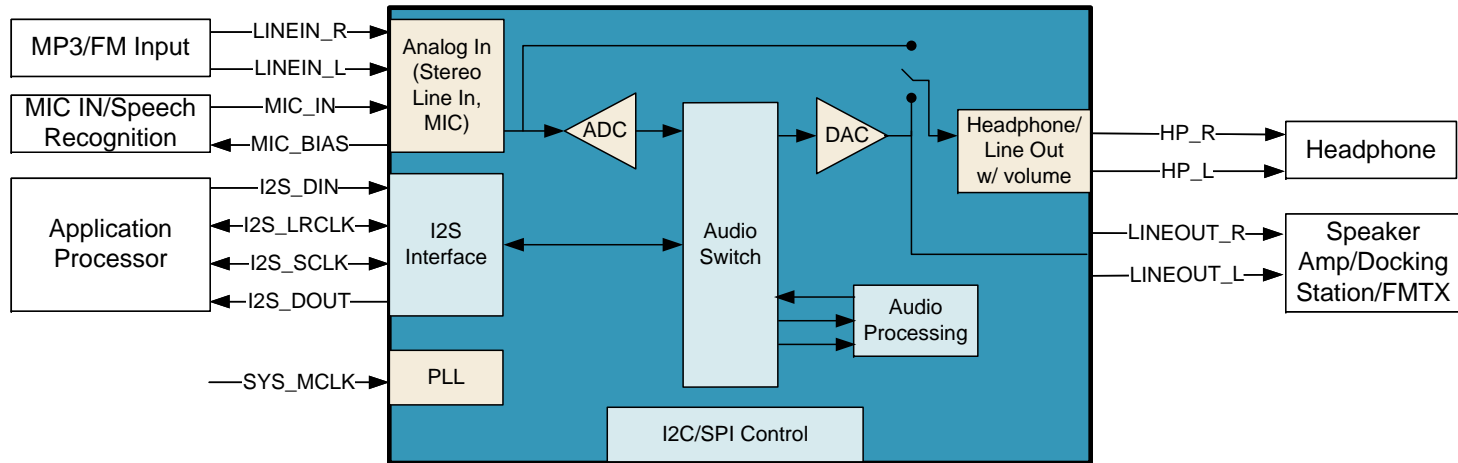
MC13892JVK 7x7 mm
 MC13892JVL 12x12 mm

Questions? Please contact your local Freescale sales person.

MC13892 Key Features, Advantages and Benefits

Features	Advantage	Benefit
High level of integration	Reduces size, weight and design time for speed time to market. Integrates both user interface and power functions	Reduces the need for separate design. Allows the use of cost effective display technologies
Optimized for use with the i.MX family of processors	Freescale's mixed signal process technology allows for analog, digital and power circuitry on the same IC	Created with input from i.MX design engineers, the device is ideal for use with i.MX35 and i.MX51 applications processors. Meets systems expectations for power and software.

SGTL5000: Stereo Codec w/Headphone Amp



▶ Playback performance:

- 98dB Dynamic Range (AWtd) @ < 4mW power, < -80dB THD+N
- Quiescent power, I2S->DAC->HP, VDDA = 1.8V

▶ ADC performance:

- 85dB Dynamic Range (AWtd), -70dB THD+N, VDDA=1.8V
- 92dB Dynamic Range (AWtd), -78dB THD+N, VDDA=3.3V

▶ Headphone output: 9mW (32ohm, 1.8V) to 45mW (16ohm, 3.3V)

- -80dB THD+N at full scale output

▶ PSRR > 80dB (1kHz)

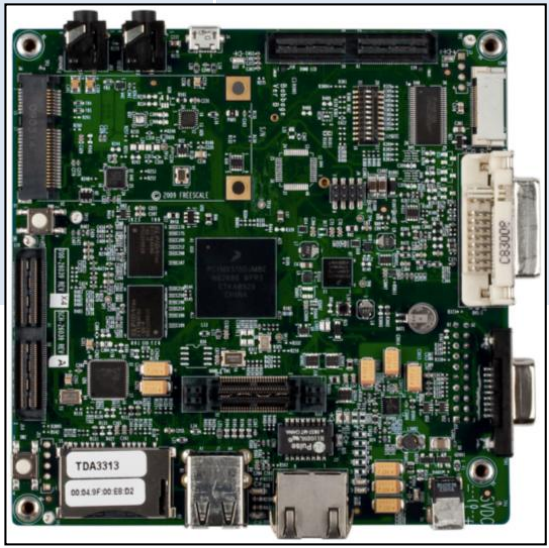
▶ Footprint: 20QFN, 3mm x 3mm (32QFN 5mm x 5mm available)

i.MX51 Evaluation Kit (EVK) – \$699 Resale

Single Board Development Platform—Price, Performance, Personality

i.MX51 Evaluation Kit Features

- | | | |
|---|---|---|
| <ul style="list-style-type: none"> • i.MX51 Applications Processor (529 BGA) • 4 x 128MB DDR2 • 4MB SPI NOR • PMIC – Atlas APL (MC13892JV or MC13892JVL) • NAND and EIM Header | <ul style="list-style-type: none"> • Debug Serial Port • JTAG • Reset, boot switches • Debug LED • Power Source • Power on/off button • Power Measurement Header | <ul style="list-style-type: none"> • 7" WVGA Touchscreen LCD Display (add-on module) • Expansion board (add-on module) • 2 LVDS connectors • DVI-I connector • 2 SD/MMC Card Slots • USB Host x2/USB OTG x1 • Ethernet Port • Mini PCIe • SATA HDD connector • SIM Card connector • Keyboard connector • Mic input, stereo headphone output (jack), V2IP Headphone • Speaker connector • USB Camera connector • PS-2 TP connector • RGB output through DVI-I connector • Expansion Header • Ambient light sensor footprint • FM receiver footprint |
|---|---|---|



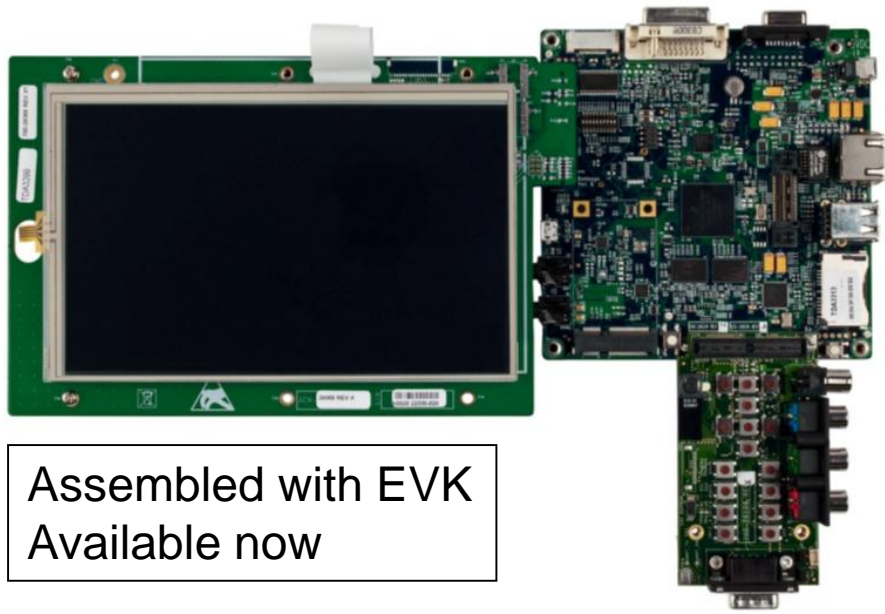
Board size =
5" x 5"

MCIMX51EVKJ
www.freescale.com/imx51evk

i.MX51 LCD & Expansion Board

- ▶ i.MX51 LCD module
- ▶ MCIMX51LCD
- ▶ \$250 Resale
- ▶ CPT 7" WVGA with resistive touch screen

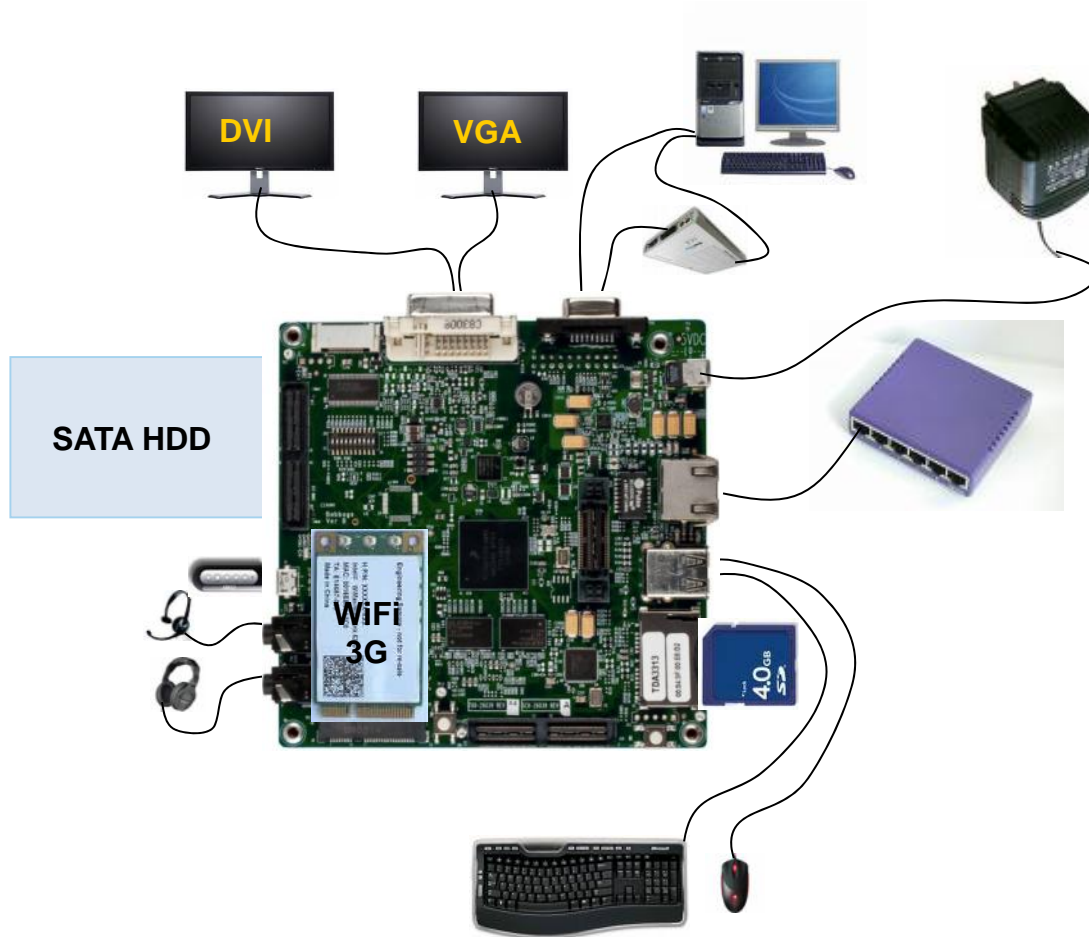
- ▶ i.MX51 Expansion Board
- ▶ MCIMX51EXP
- ▶ \$200 Resale
- ▶ Features
 - CMOS Camera
 - TV out
 - Keypad
 - UART



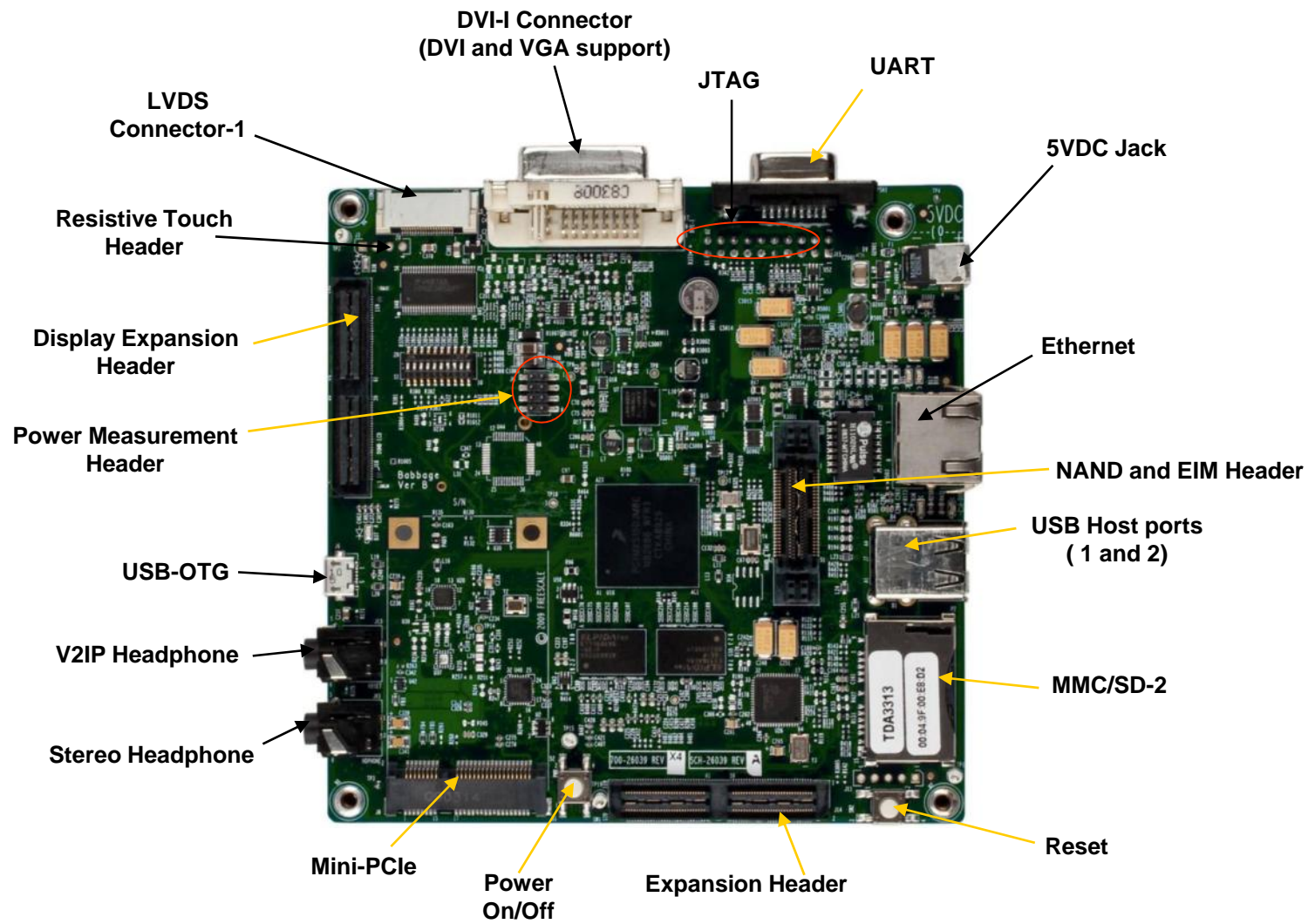
Assembled with EVK
Available now

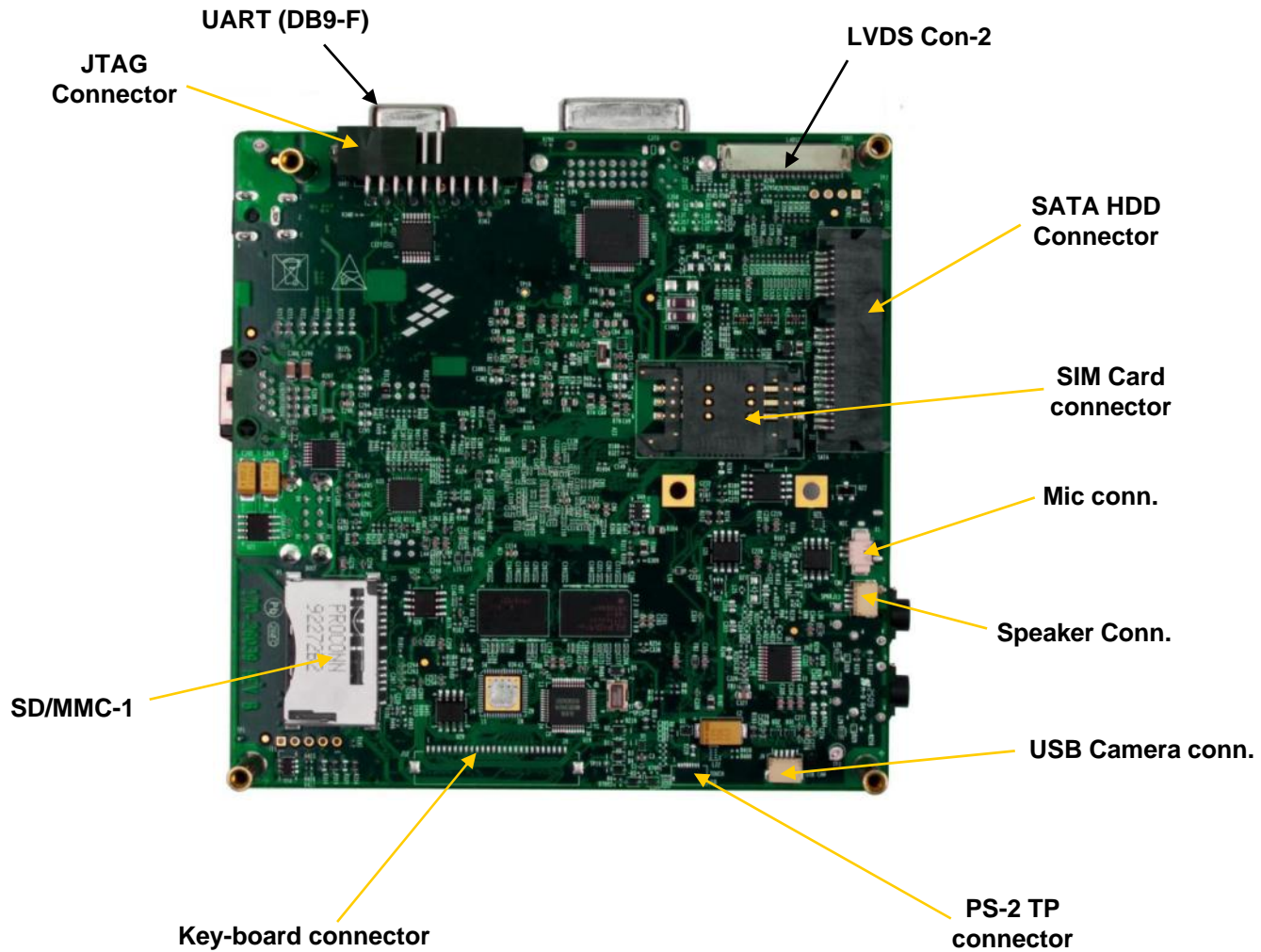


MCIMX51EVKJ – A True Single Board Computer (SBC)



MCIMX51EVKJ – PCB Top





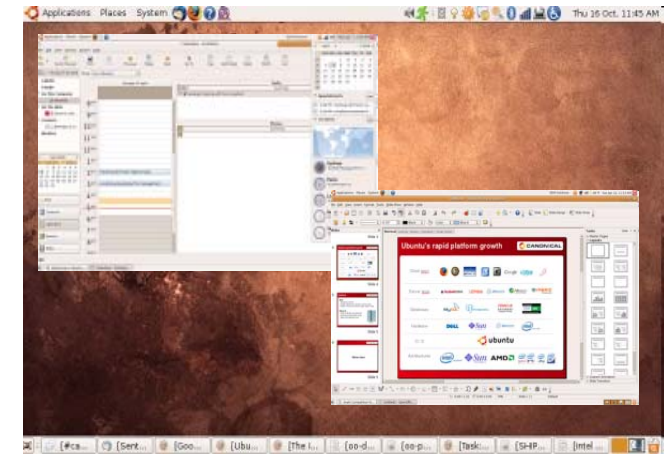
Software	Description
<p>Linux BSP SDK 0912 L2.6.31 Available Now</p>	<p>Display/Imaging & Graphics: LCD display driver for CPT 7" WVGA, Touchscreen Frame buffer, DVI monitor, VGA monitor, WVGA, LVDS, GPU (2D/3D)</p> <p>Multimedia: IPU V3, V4L2 Output/Capture, Camera, TV Out, VPU Video Post-process: De-interlace</p> <p>Power Management: PMIC (MC13892), Low power mode, DVFS-core, CPU Freq, XEC</p> <p>Sound: S/PDIF, Asoc (SSI/AUDMUX), SGT5000</p> <p>Memories: MobileDDR, DDR2 (Up to 200MHz bus speed) SLC/MLC NAND Flash 8/16-bit, NAND, SPI NOR MMC/SD/SDIO Harddrive by USB mass storage</p> <p>Other: Redboot, U-Boot Input: Keypad, Touch Panel Ethernet (FEC) USB Host, USB Device, USB OTG (ID pin detect) Security, MMC/SD/SDIO SRTC, Watchdog, I2C, SPI, 1-wire, PWM GPIO, Serial, WiFi (Atheros WiFi SDIO card)</p>
<p>Codecs</p>	<p>Video decode: MPEG2, MPEG4, H.263, H.264, VC-1, RV, DivX Video encode: MPEG4, H.263, H.264 Audio decode: MP3, AACLC, HE-AAC, WMA10 Std, WMA10 Pro, WMA9 Lossless, AC-3, RA-6, FLAC, BSAC, Ogg Vorbis Audio encode: MP3, WMA-8 Speech encode/decode: G.711, G.723.1, G.726, G.729AB, NB_AMR, WB_AMR Image decoder: JPG, PNG, BMP, GIF Image encoder: JPEG</p>

Software	Description
<p><u>WinCE 6.0 R3</u> <u>SDK 0912</u> <u>Available</u> <u>Now</u></p>	<p><u>Display/Imaging:</u> DVI, VGA analog, LVDS, TV Out (PAL, NTSC, 720P, 1080i)</p> <p><u>Multimedia:</u> IPU Display , Camera, VPU DirectDraw Video Post-process: De-interlace</p> <p><u>Graphics:</u> IP wrapper for Z160 2D / Z430 3D hardware acceleration - OpenGL/ES, OpenVG</p> <p><u>Power Management:</u> PMIC (MC13892) DVFS</p> <p><u>Sound:</u> S/PDIF Audio CODEC (SGTL5000)</p> <p><u>Other:</u> X-Loader, Bootloader - Boot from SPI NOR, MMC/SD - Image download over ethernet or USB KITL – ethernet, USB Input: Touch screen, Keypad, USB Keyboard, Soft input panel HS OTG Host / Device (ID pin detect) and USB HS HOST1 1-Wire, Ethernet (FEC), SRTC, MMC/SD/SDIO, Watchdog, I2C, HSI2C, eCSPI, GPIO, Notification LED, Serial</p>
<p><u>Codecs</u></p>	<p>Video decode: WMV playback with Microsoft CODEC, DivX, H.263, H.264, MJPEG, MPEG2, MPEG4, RV, VC-1 Video encode: H.263, H.264, MJPEG, MPEG4 Audio decode: AAC, aacPlus, AC3, AMR, MP3, RA, WMA Standard, WMA Pro, WMA Lossless, FLAC, Ogg Vorbis Audio encode: MP3, WMA Speech encode/decode: SBC, G.711, G.723.1, G.726, G.729AB, NB_AMR, WB_AMR Image decoder: JPEG, PNG, BMP, GIF</p>

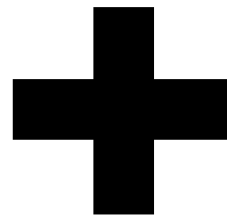
- ▶ Full Desktop Support on i.MX515
 - Gnome-based desktop UI
 - Full open office support document, presentation and spreadsheet SW
 - Support for multiple browsers (incl. Opera, Mozilla, etc)
 - Large pool of applications (instant messaging, etc.)

- ▶ Popular commercial Ubuntu Desktop Edition was released for ARM in April 2009

- ▶ Enablement of All-Day Computing devices

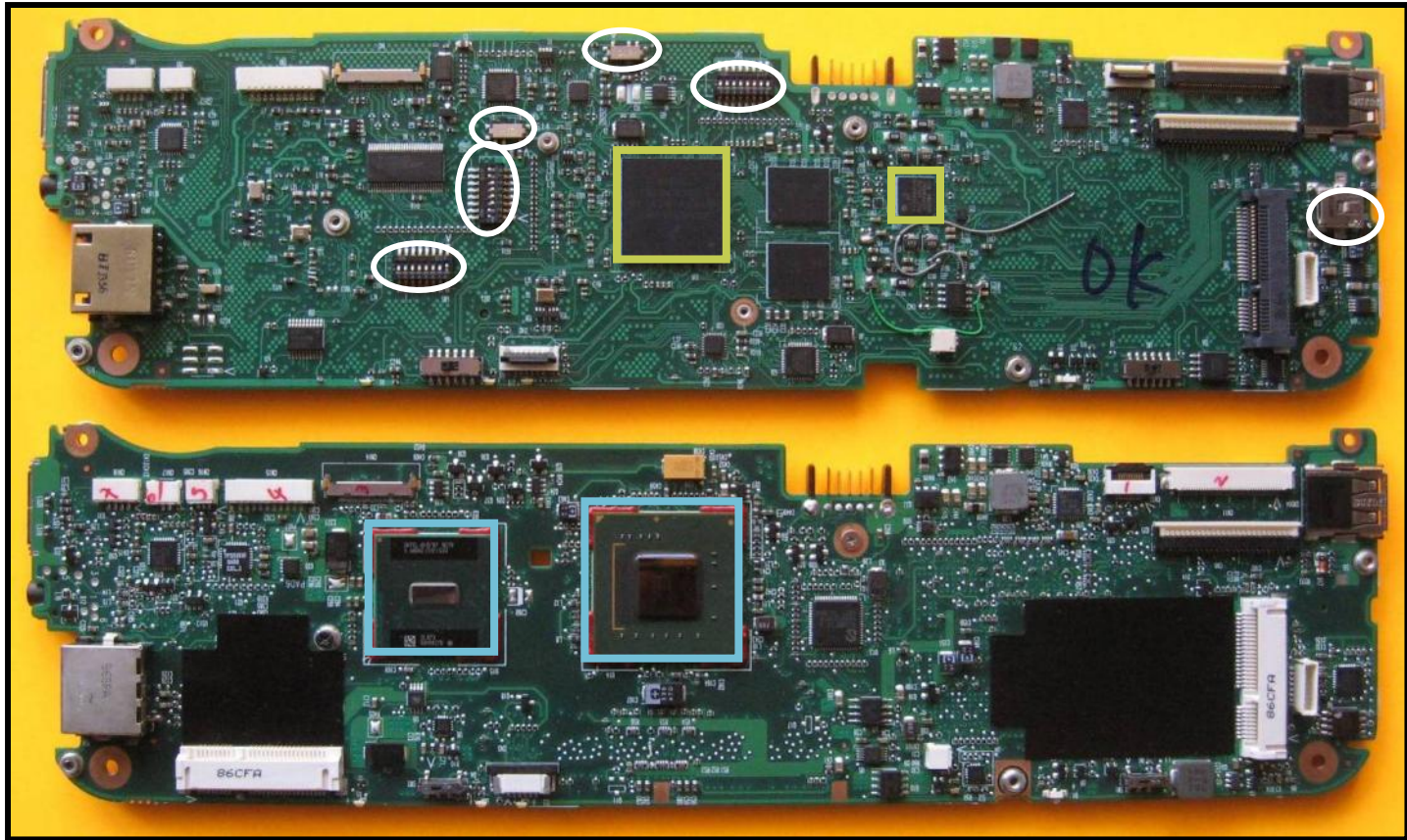


Freescale Partners With Google on Android



Package Area: 218 – 410 mm²
Complexity: 646 pins

Package Area: 667 mm²
Complexity: 1690 pins









* Circled components are for debug and can be removed for production.



Company	Type	Contact	URL	Product
Allgo Systems	H/W	Aji Anirudhan - aji@allgosystems.com	www.allgosystems.com	IDH
Pegatron	H/W	Jeremy Shu - jeremy_shu@pegatroncorp.com	www.pegatroncorp.com	ODM
Wuxi Sitek Hengke Electronics Co. Ltd	H/W, S/W	Shark Wu - wusf@sitek.cn	www.ihanker.com/en/index.html	IDH
Skytone	H/W, S/W	Nixon Ng - Nixon@skytone.net.cn	www.skytone.net.cn	IDH
Portalinks Technology Co	H/W	Paul Chang - paul@portalinks.com.tw	www.portalinks.com.tw	IDH
Industrial Technology Research Institute (ITRI)	H/W, S/W	Jun-Lin Liu - junlin@itri.org.tw	www.itri.org.tw/eng	IDH
M2Coretech Co, Ltd	H/W, S/W	James Jeong - james@m2coretech.com	www.m2coretech.com	IDH
CodeSourcery	Tools	N/A	www.codesourcery.com	Linux tools: compiler / debugger / profiler

i.MX ARM Cortex A8 Third Party Development Boards

Device	Partner	Focus	URL	Key Board Features	Other Info
i.MX51	Digi	<ul style="list-style-type: none"> Design capabilities BSPs: WinCE 	www.digi.com	Integrated 802.11a/b/g/n	
i.MX51	Karo	<ul style="list-style-type: none"> BSPs: WinCE & Linux Development services 	www.karo-electronics.de	SoM only 26mm	
i.MX51	Eukrea	<ul style="list-style-type: none"> Designs hardware and software solutions optimized for embedded Linux 	www.eukrea.com	SoM + dev board	
i.MX51	Bluetechnix	<ul style="list-style-type: none"> High-quality, easy-to-use Linux distribution (Ubuntu) 	www.bluetechnix.com	Single board computer	
i.MX51	Boundary Devices	<ul style="list-style-type: none"> Maximizing multimedia performance while minimizing the power consumption. 	www.boundarydevices.com	Single board computer	
i.MX51	Micro/Sys	<ul style="list-style-type: none"> Interchangeable peripheral modules CAN supported Zigbee add-on module 	www.embeddedsys.com	Single board computer solutions	

- ▶ Newest members of the industry-leading i.MX51 family of processors deliver performance, integration and energy efficiency required for automotive, industrial and consumer markets.
- ▶ i.MX51 simplifies the development and design process by integrating industry leading graphics accelerators and hardware accelerated video codecs.
- ▶ i.MX51's unique architecture design enables the development of cost efficient solutions for a wide range of applications.
- ▶ For more information visit www.freescale.com/imx51

