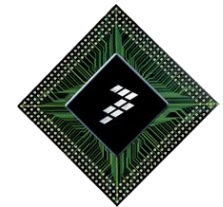


November, 2010

# Introducing a New System-on-Module Offering Based on the i.MX5x Processor



Andrew Webster

- ▶ **Markets**
- ▶ **Freescale i.MX51 EVK Development System overview**
  - i.MX51EVK at a glance
  - Memory Considerations
  - Video & LCD Interface
- ▶ **i.MX51 Device Architecture**
  - i.MX51 Internal Block Diagram
- ▶ **Key Features**
  - High level of Integration
  - High Performance
  - Low Power
  - Software support
- ▶ **Third Party Solutions**
- ▶ **Software considerations**
- ▶ **Reference Material**

## Portable Consumer

- ▶ Smartbook
- ▶ E-book
- ▶ Smartphone
- ▶ Portable Media Player
- ▶ Personal Navigation



## Automotive Infotainment

- ▶ Audio
- ▶ Connectivity and Telematics
- ▶ Video and Navigation



Low-Power  
High Integration  
Advanced Performance  
Platform Software

## Home Consumer

- ▶ Media Phone/Terminal
- ▶ iPod accessories
- ▶ Remote controls
- ▶ Digital Photo Frame
- ▶ Appliances



## Industrial

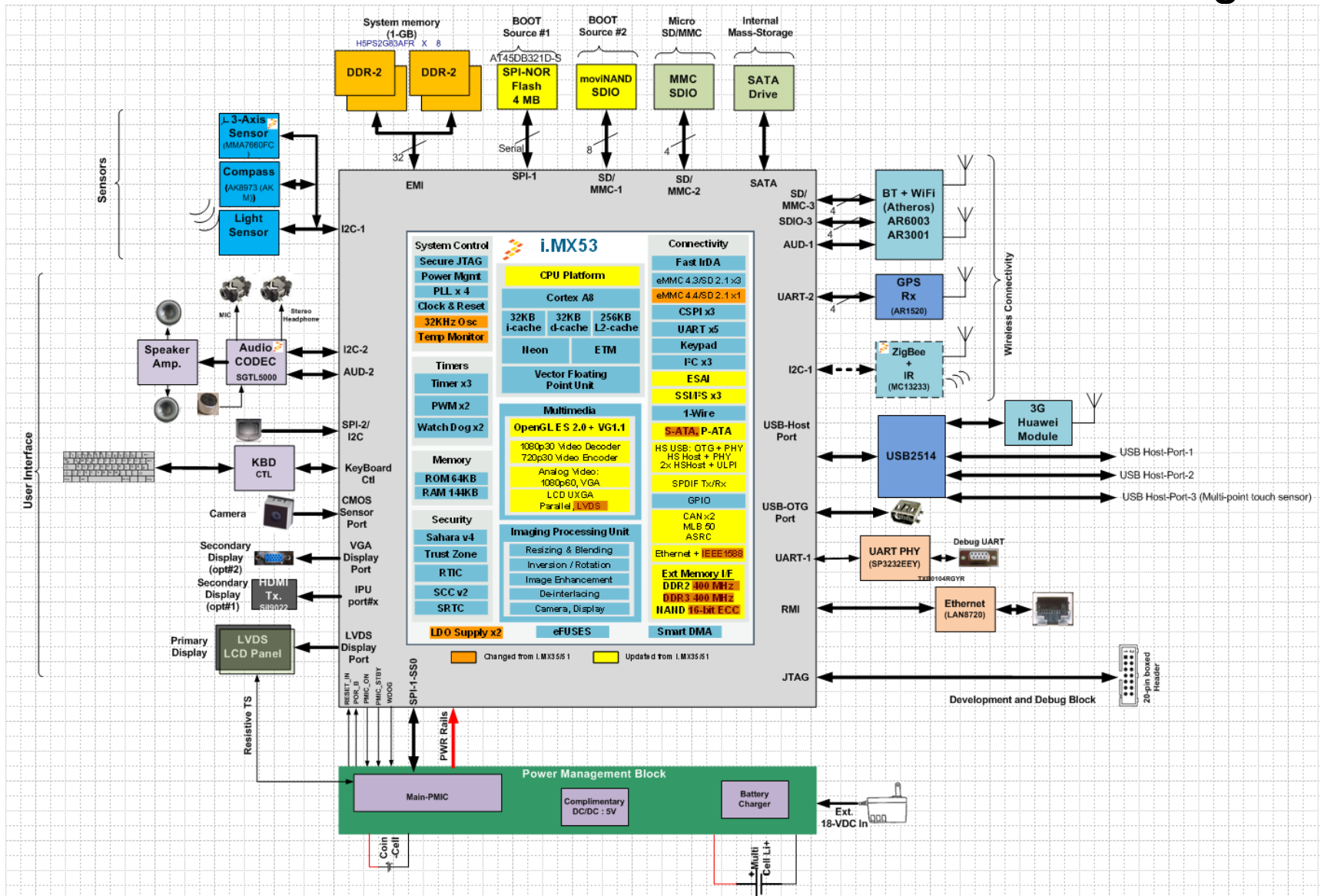
- ▶ POS/Scanners
- ▶ Security and Surveillance
- ▶ Industrial HMI
- ▶ Medical
- ▶ Metering



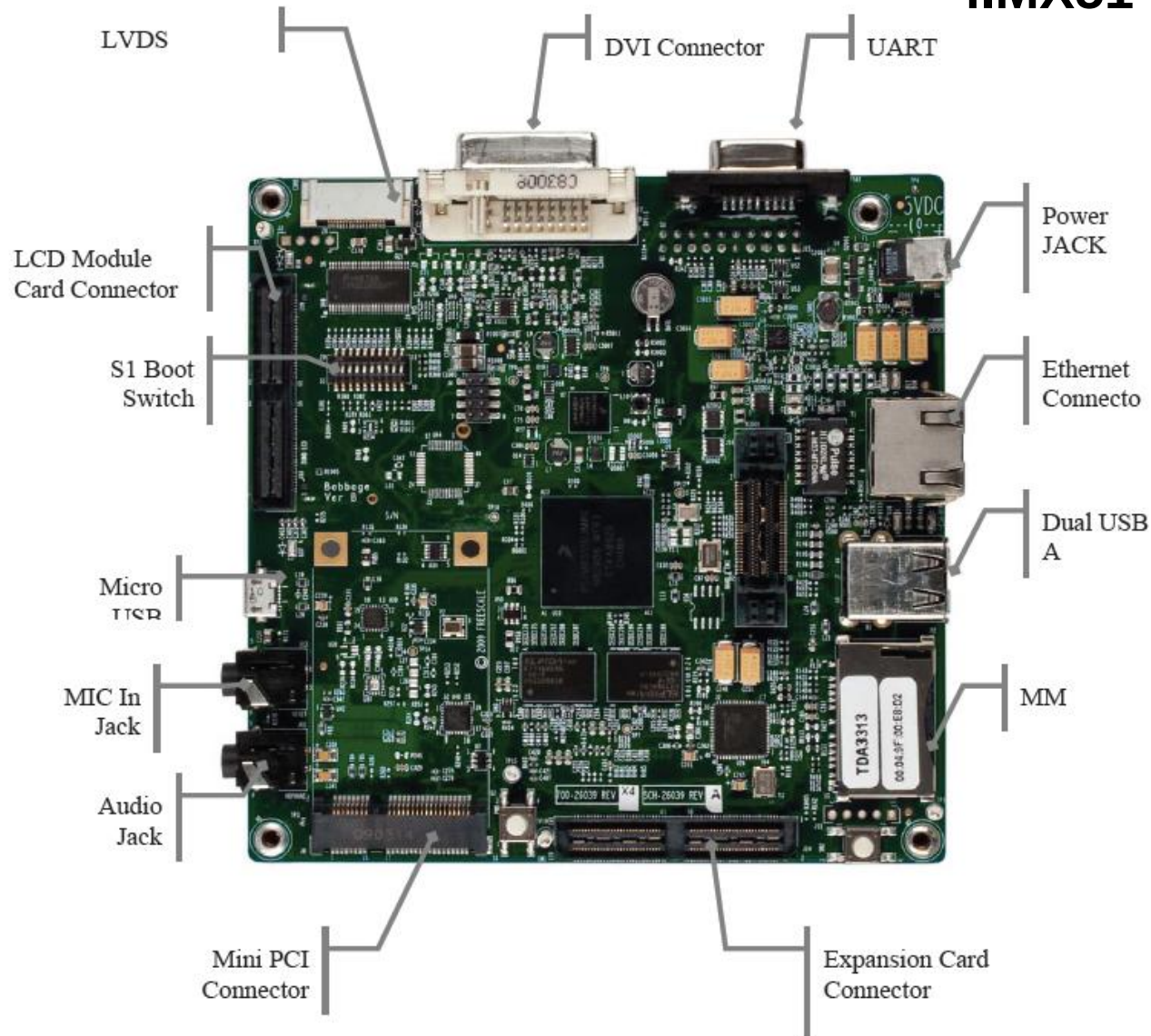
- ▶ The i.MX5x family based on the Arm Cortex A8 is targeted for
  - Consumer - Mobile Internet Device (MID), Netbooks and Smartphone
  - Low power applications
  - High integration, low system component count
  - Fan-less applications (runs cooler than an Atom processor)
  - Single and Dual Video support
  - HDMI and DVI outputs (720p for i.MX51 and 1080p for i.MX53)
  - 512Mbyte DDR2 memory (2Gbyte available in i.MX53)
  
- ▶ Industrial - Logic Controller and HMI's
  
- ▶ Commercial – Video Intercom and residential gateways

- ▶ Key Features of the i.MX51EVK
  - 7" WVGA touch screen LCD display (add-on module)
  - Two LVDS connectors
  - DVI-I connector
  - Two SD/MMC card slots
  - USB host x2/USB OTG x1
  - Ethernet port
  - Mini PCI Express®
  - 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
  - Expansion board (add-on module) with
  - camera, TV out, keypad and UART

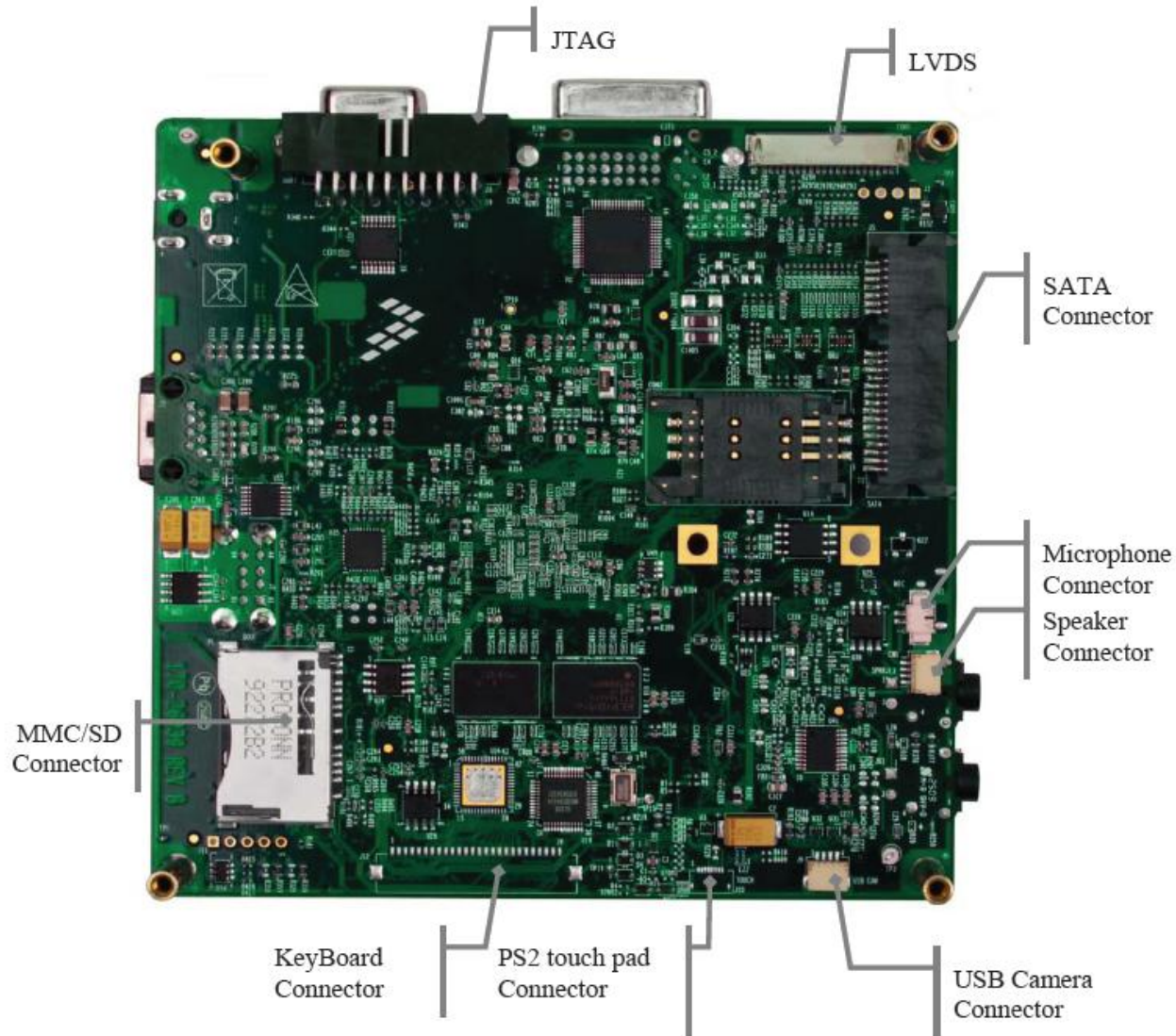
# General Block Diagram



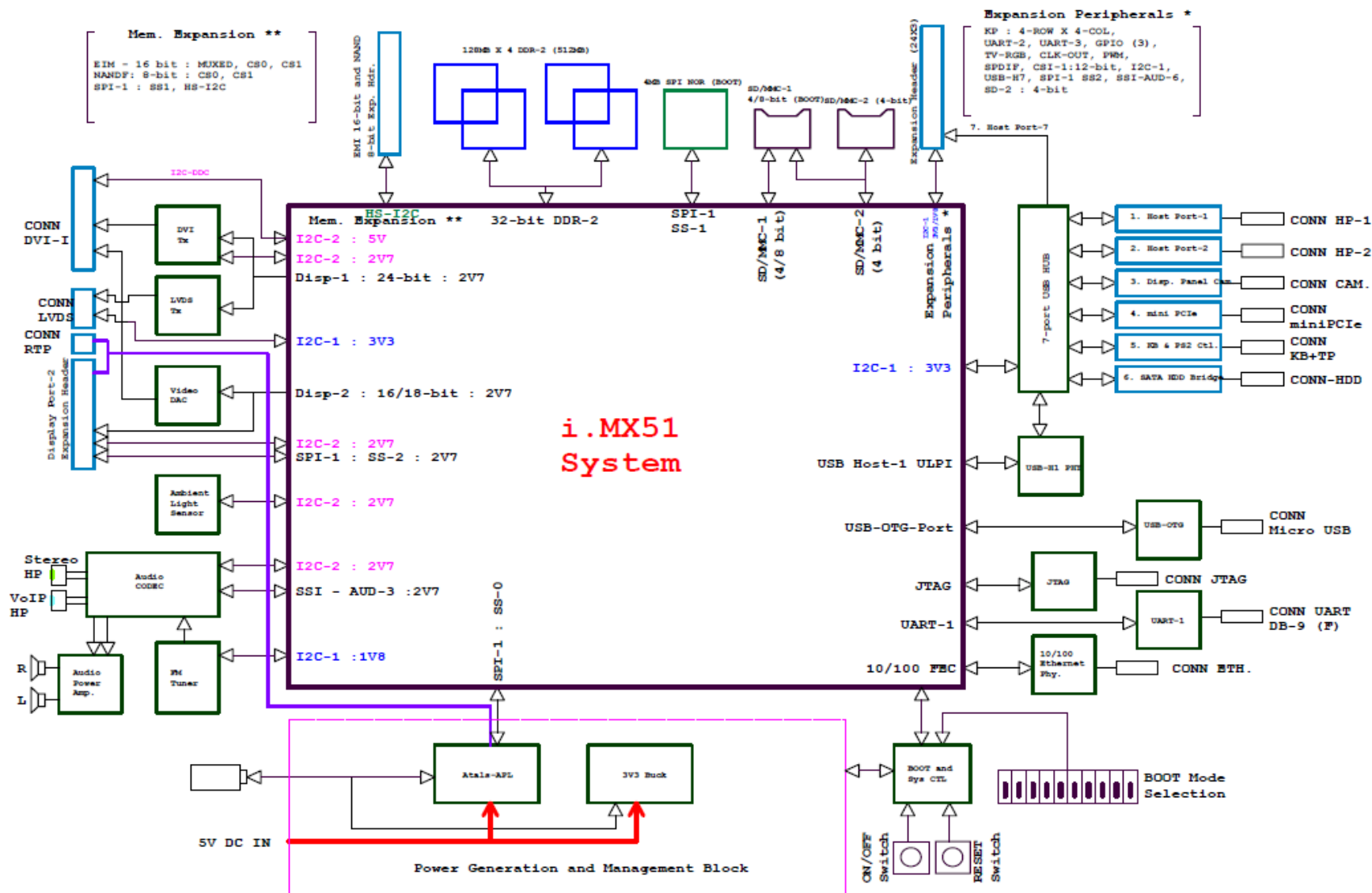
# i.MX51 EVK (topside)



# i.MX51 EVK (bottomside)



# i.MX51 EVK Block Diagram



## ► Memory considerations

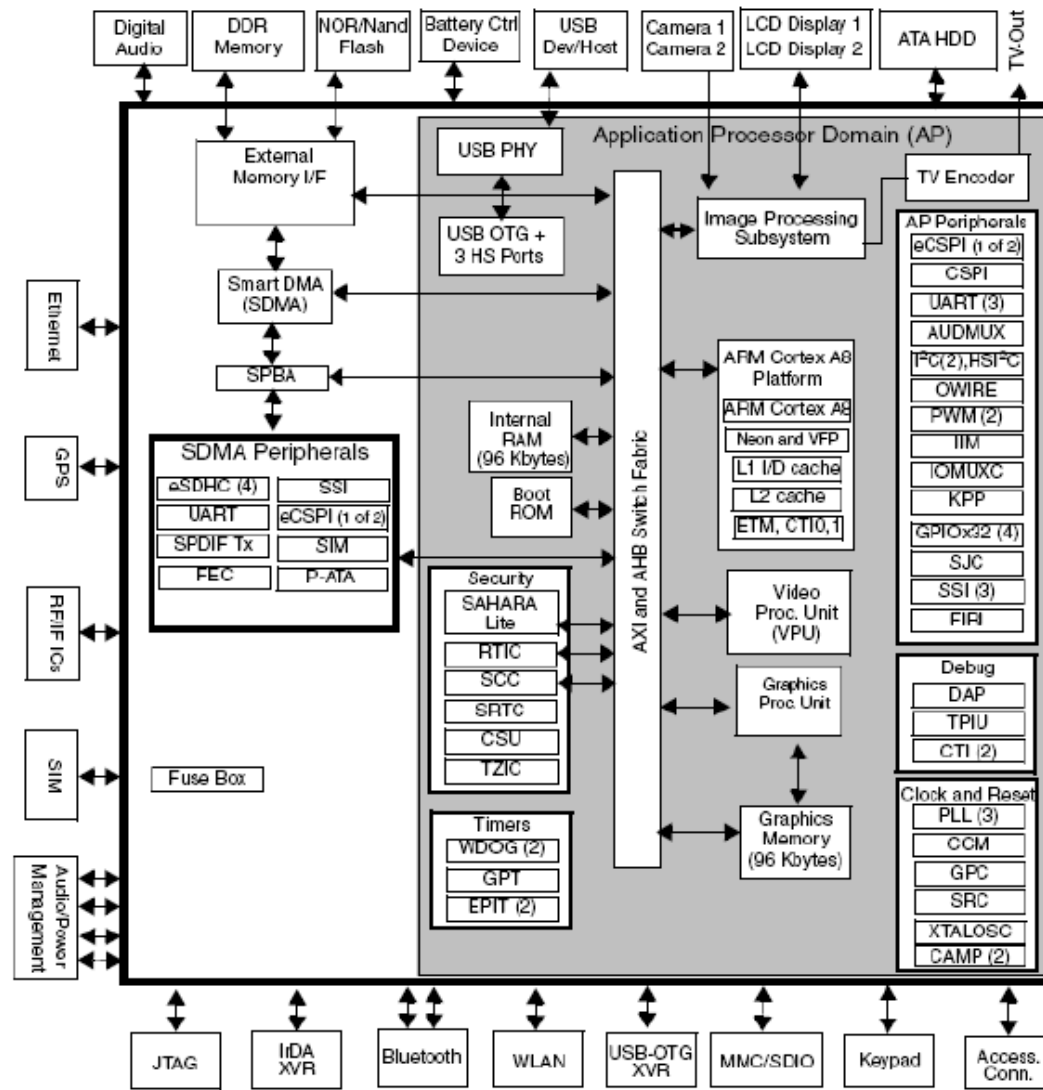
- Both mDDR and DDR2 are supported
- DDR2 output buffers have 4 programmable drive strengths for 15, 50, 75 and 150 Ohms
- No need for termination resistors provided you can tolerate the slew rate and minimal loads

## ► Video Considerations

- A high-performing video processing unit (VPU), which covers many SD-level
- video decoders and SD-level encoders as a multi-standard video codec engine
- as well as several important video processing such as rotation and mirroring.
- VPU Features:
  - MPEG-4 decode: 720p, 30 fps, simple profile and advanced simple profile
  - MPEG-4 encode: D1, 25/30 fps, simple profile
  - H.263 decode: 720p, 30 fps, profile 3
  - H.263 encode: D1, 25/30 fps, profile 3
  - H.264 decode: 720p, 30 fps, baseline, main, and high profile
  - H.264 encode: D1, 25/30 fps, baseline profile
  - MPEG-2 decode: 720p, 30 fps, MP-ML
  - MPEG-2 encode: D1, 25/30 fps, MP-ML (in software with partial acceleration in hardware)
  - VC-1 decode: 720p, 30 fps, simple, main, and advanced profile
  - DivX decode: 720p, 30 fps versions 3, 4, and 5
  - RV10 decode: 720p, 30 fps
  - MJPEG decode: 32 Mpix/s
  - MJPEG encode: 64 Mpix/s
  - 1280×720 x 30 hz ~ 28 Mpix/sec.

- ▶ **Powerful Graphics Acceleration**—Graphics is the key to mobile game navigation, web browsing, and other applications. The i.MX51 processors provide two independent, integrated Graphics Processing Units: OpenGL ES 2.0 3D graphics accelerator (27 Mtri/s, 166 Mpix/s) and OpenVG 1.1 2D graphics accelerator (166 Mpix/s).
- ▶ The GPU provides hardware acceleration for 2D and 3D graphics algorithms with sufficient processor power to run desk-top quality interactive graphics applications on displays up to HD720 resolution. It supports color representation up to 32 bits per pixel.
- ▶ The GPU with its 128 KByte memory enables high performance mobile 3D and 2D vector graphics at rates up to 27 Mtriangles/sec, 166 Mpixels/sec, 664 Mpixels/sec (Z).
- ▶ GPU2D Graphics Processing Unit-2D Ver. 1 Multimedia Peripherals - The GPU2D provides hardware acceleration for 2D graphic algorithms with sufficient processor power to run desk-top quality interactive graphics applications on displays up to HD720 resolution.
- ▶ Peripheral supply voltage High Performance Mode (HPM) The clock frequencies are derived from AXI and AHB buses using 133 or 166 MHz (as needed). The DDR clock rate is 200 MHz.
- ▶ **Note:** For detailed information about the use of 133 or 166 MHz clocks, refer to the *i.MX51 Multimedia Applications Processor Reference Manual* (MCIMX51RM).

# i.MX51 Internal Block Diagram



## ► Why use a SOM over a Board

- Pros:
  - Allows one to add their own additional hardware with the least effort
  - Shorter time to market
  - Pre-certified for EMI and 802.11
  - Board Support taken care of
- Cons:
  - SOM pricing is fairly flat, 10pcs and 500pcs pricing is close
  - Premium for connectors
  - No LINUX !!

## ► Make vs Buy

- Volumes
- Time to Market

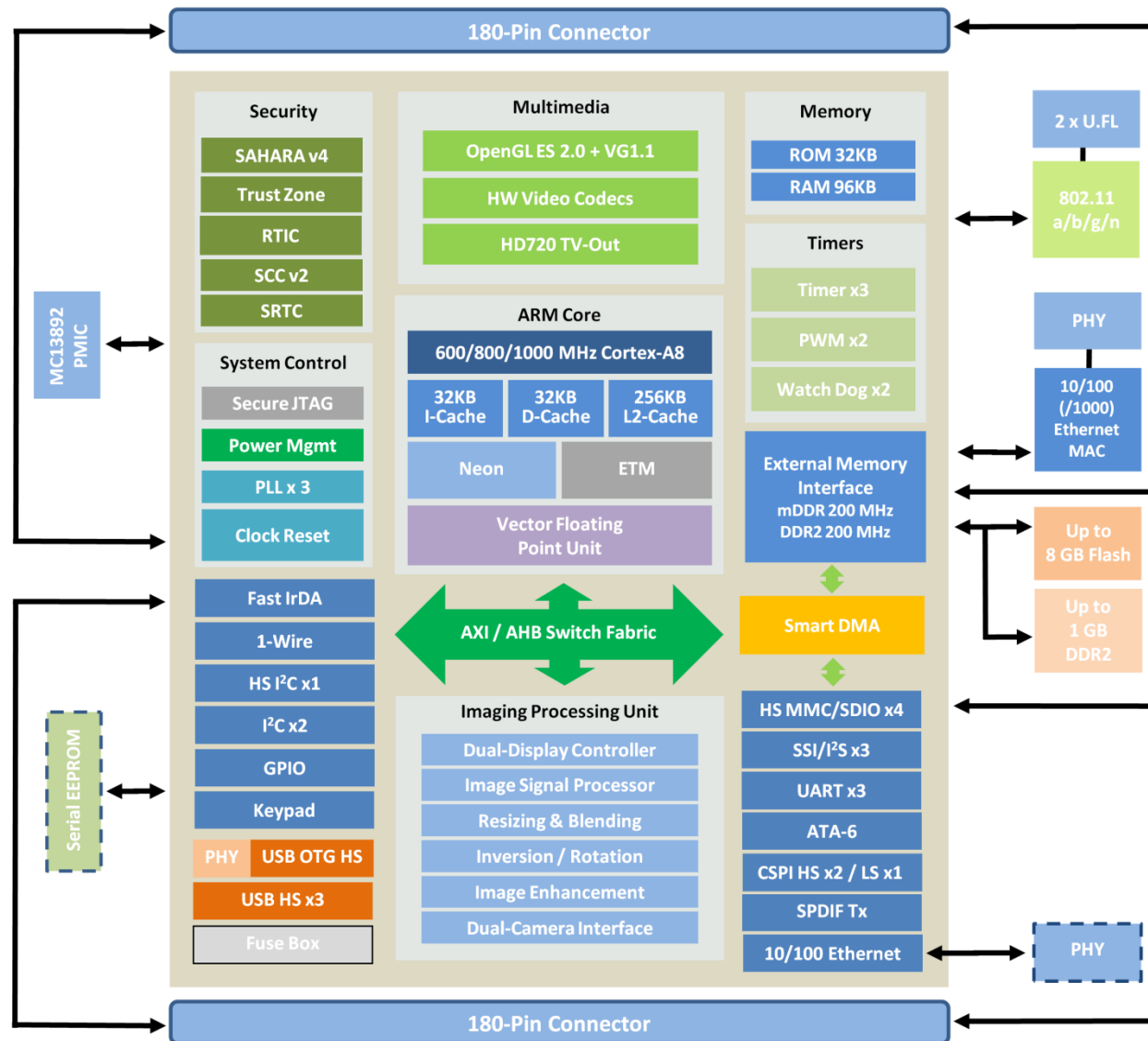
## ► Software Effort

- Current trend for i.MX5x products more SW than HW effort

## ► Available third party solutions for development and product integration

- Digi - ConnectCore i.MX51 (SOM)
  - Currently the only SOM available
  - WinCE, but no LINUX support
  - Pre-certified 802.11 a/b/g/n
  - -40C to +85C
- Genesi – Efika MX Smarttop & Efika MX Smartbook
  - Includes plastics
  - WinCe and LINUX support
- BoundryDevices - Nitrogen Board
  - Many available form factors
  - WinCE and LINUX support
- Bluetechnix - SBC-i.MX51
- theobroma-systems - imx51epc

# Digi's ConnectCore™: Wi-MX51



- ▶ BOOT FLASH is NOR based for reliability, where system firmware is stored in NAND flash
- ▶ Firmware located in FLASH is typically uncompressed and run in RAM
- ▶ Software Platforms
  - Windows CE
  - Linux
  - Android (ie LINUX)
  - QNX

## ► Freescale Website

## ► Other related Seminars at DwF Toronto

- AMF-ENT-T0664 - Hands-on Workshop: Demo of Freescale's i.MX51 Linux® Package
- AMF-CON-T0657 - Android for i.MX Solutions
- AMF-CON-T1115 Hands-on Workshop: i.MX51: Developing with Windows Embedded CE 6.0

## ► Interesting Presentations and AppNotes

- FTF-CON-F0596 - i.MX5x Modular Design Platform:
- FTF-ENT-F0666 - i.MX Product Portfolio 101
- AE135 – “Birds of a Feather: High Speed Board Level Design with i.MX Processors”
- AN4054 - Interfacing mDDR and DDR2 Memories with the i.MX51
- AN3992 - i.MX51 DDR/mDDR Calibration Procedure

- ▶ performance critical hardware/software designs
- ▶ apps requiring remote devices and centralized processing connectivity
- ▶ offer in house design, prototype and manufacture



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- ▶ High End professional Customers
- ▶ Mission statement, to build an  
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