

# TI技术研讨会

## 嵌入式处理器解决方案

10/27~11/07 青岛 | 南京 | 厦门 | 杭州 | 广州 | 成都



# OMAP/ARM 最新技术与开发工具介绍




## - Application Processor Family Overview

讲师: Thomas Mu





Minds in Motion

# TI Embedded Processing Portfolio

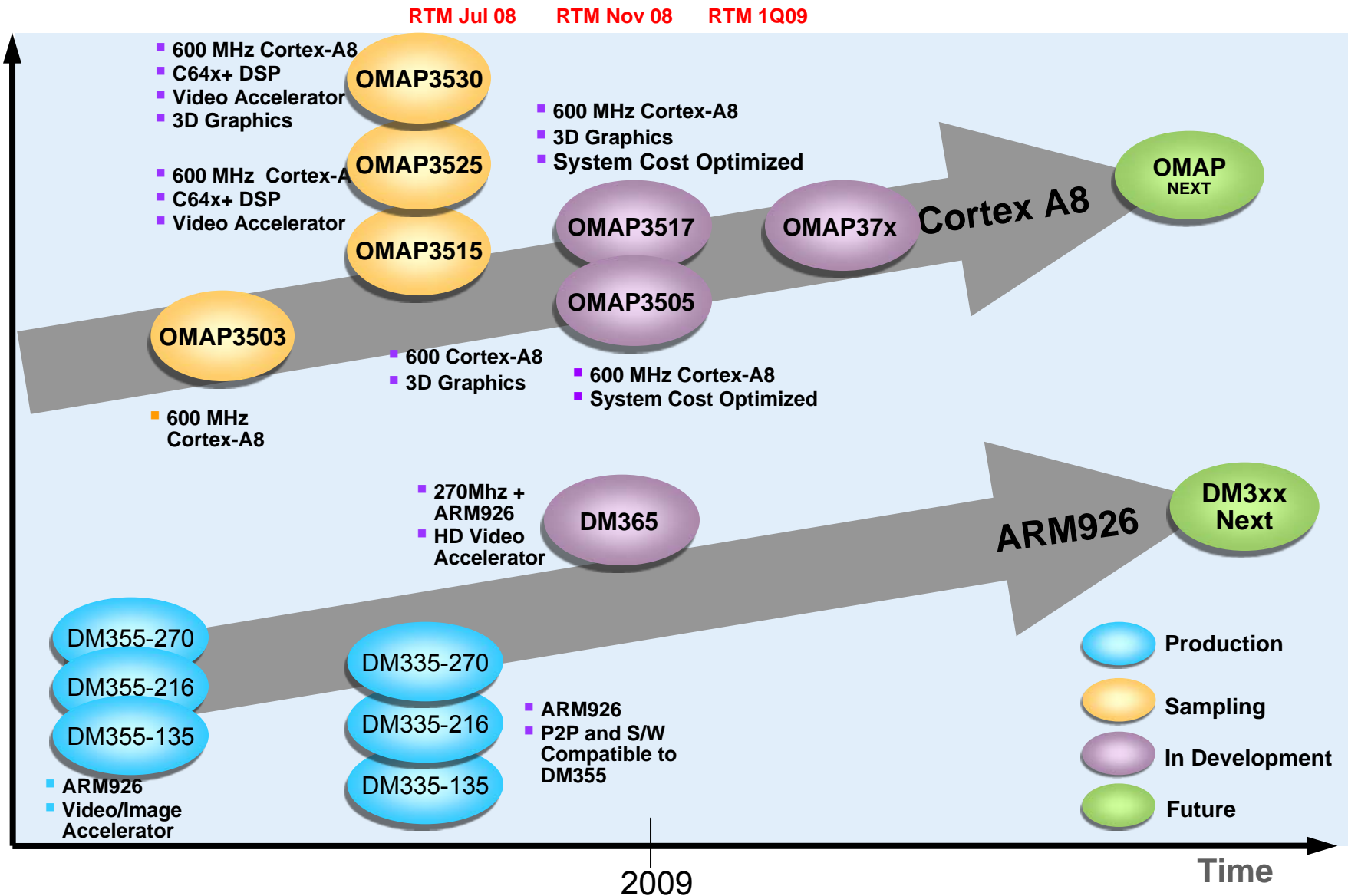
## Microcontrollers

General Purpose	ARM	Real-time Control
<b>MSP430</b>	<b>TI ARM</b>	<b>C2000</b>
Ultra-low Power	Industry Std Low Power	Fixed & Floating Point
Up to 25 MHz	< 100 MHz	Up to 300MHz
Flash 1KB to 256KB	Flash 64KB to 1MB	Flash 32KB to 512KB
Analog I/O, ADC LCD, USB, RF	USB, ENET, ADC, PWM, CAN	PWM, ADC, CAN, SPI, I <sup>2</sup> C
Measurement, Sensing, General Purpose	Industrial Host Control	Motor control, digital power, lighting
\$0.50 to \$5	\$2 - \$8	\$2 to \$20
		

## Applications Processors & DSP

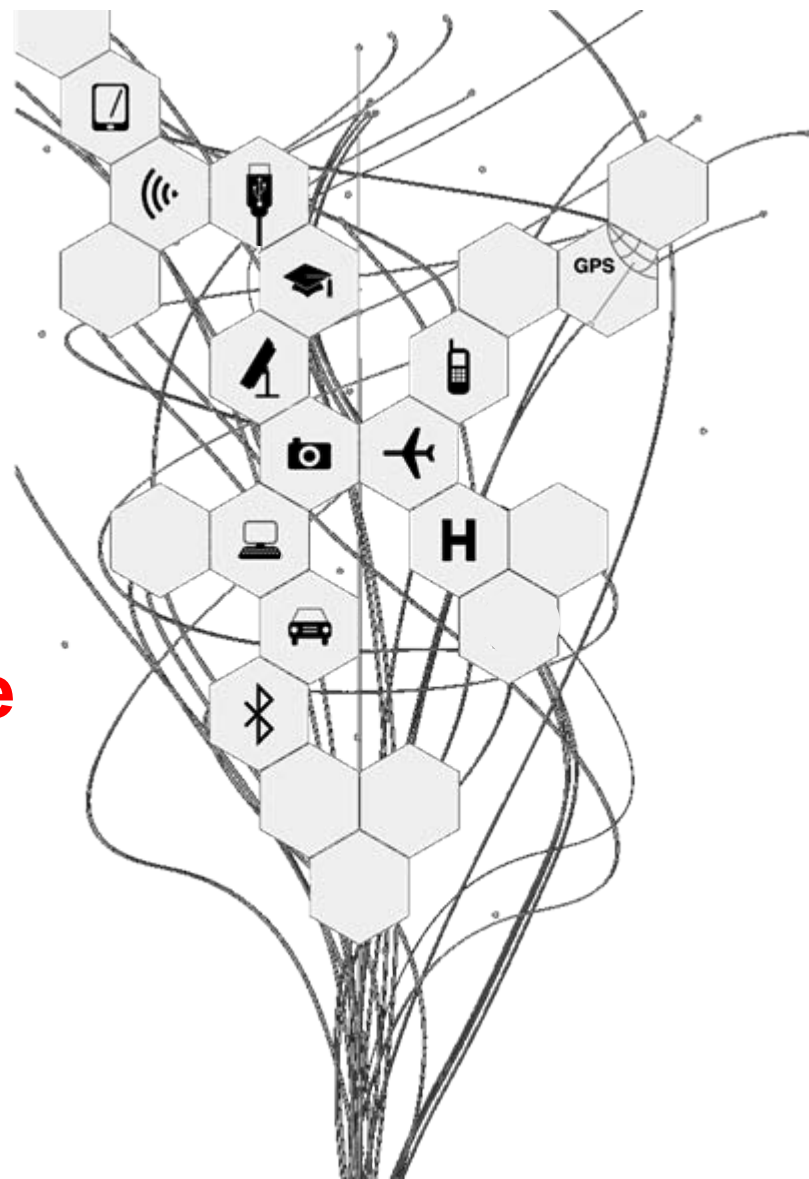
ARM9/A8	ARM+DSP	Single-Core DSP	Multi-Core DSP
<b>OMAP, DM3x</b>	<b>OMAP, DM64x</b>	<b>C5000, C6000</b>	<b>C6000</b>
Industry Std Low Power	H/W Accelerator Low Power	Fixed & Float Low Power	Highest Performance
≤ 1200 DMIPs	≤ 1200DMIPs + 4800 MMACs	9600 MMACS	28,800 MMACS
MMU	MMU, Cache	≤ 1.2 MB Mem	≤ 1.5 MB Mem
USB, LCD, MMC, ENET	VPSS, USB, ENET, MMC	USB, ENET, PCI, McBSP	ENET, SRIO, DDR2, McBSP
Lin/Win O/S User Apps	Lin/Win O/S + Video, Imag, MM	Comm, Audio, Signal Proc.	Comm, Wimax, Indust Imaging
\$5 to \$25	\$15 to \$45	\$4 to \$99	\$99+
			

# Low Power Application Processors Roadmap



# OMAP3 Update:

**OMAP35x Processors Inspire  
New Applications with  
Unprecedented Performance  
at Handheld Power Levels**



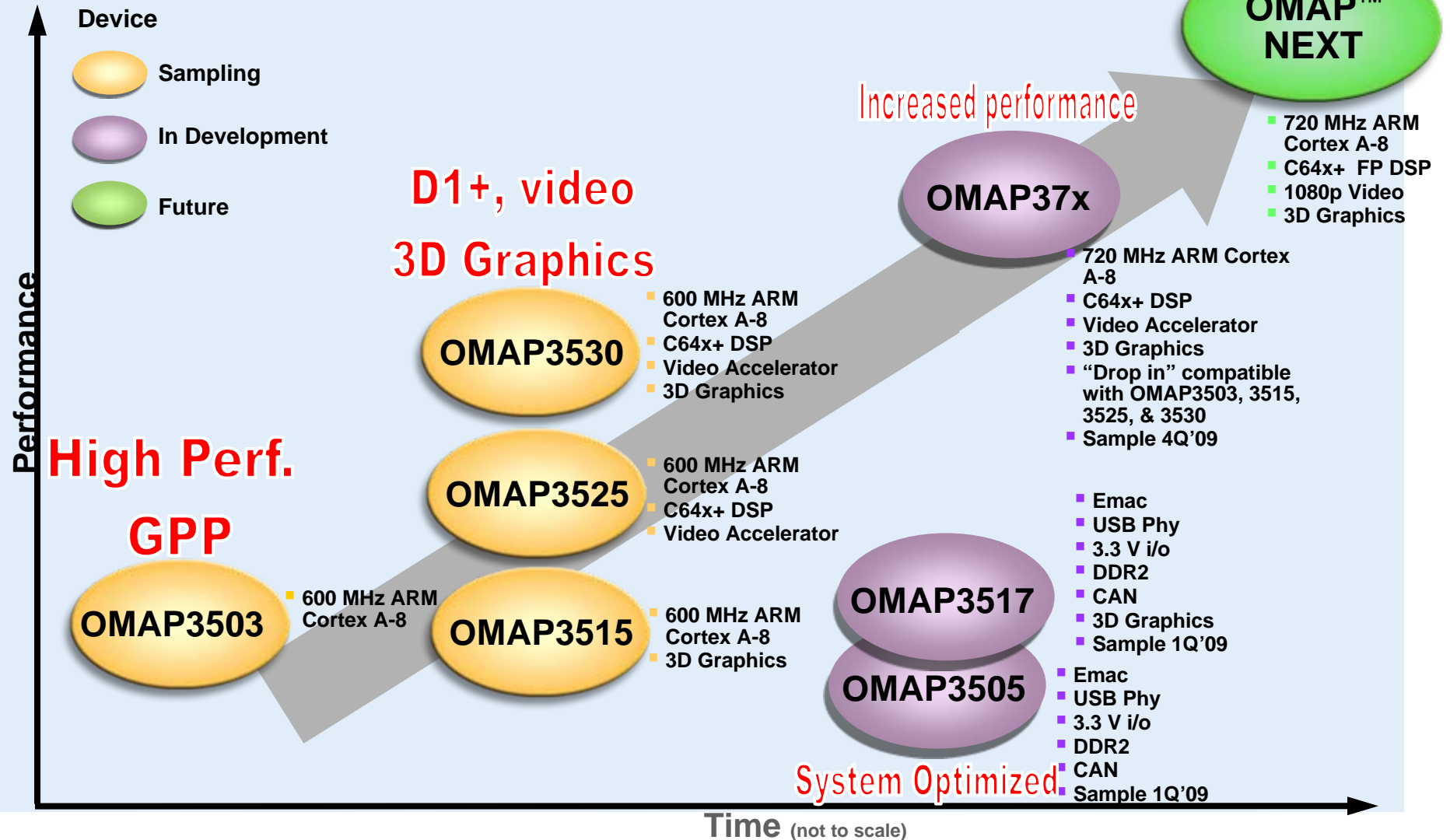
# Agenda

- OMAP35x Silicon Platform
- OMAP35x EVM Tools and Software
- OMAP35x and open source
- OMAP35x Power and Analog Solutions
- OMAP35x Block Diagram Details
- Via Channel™ Array Technology
- Common Questions

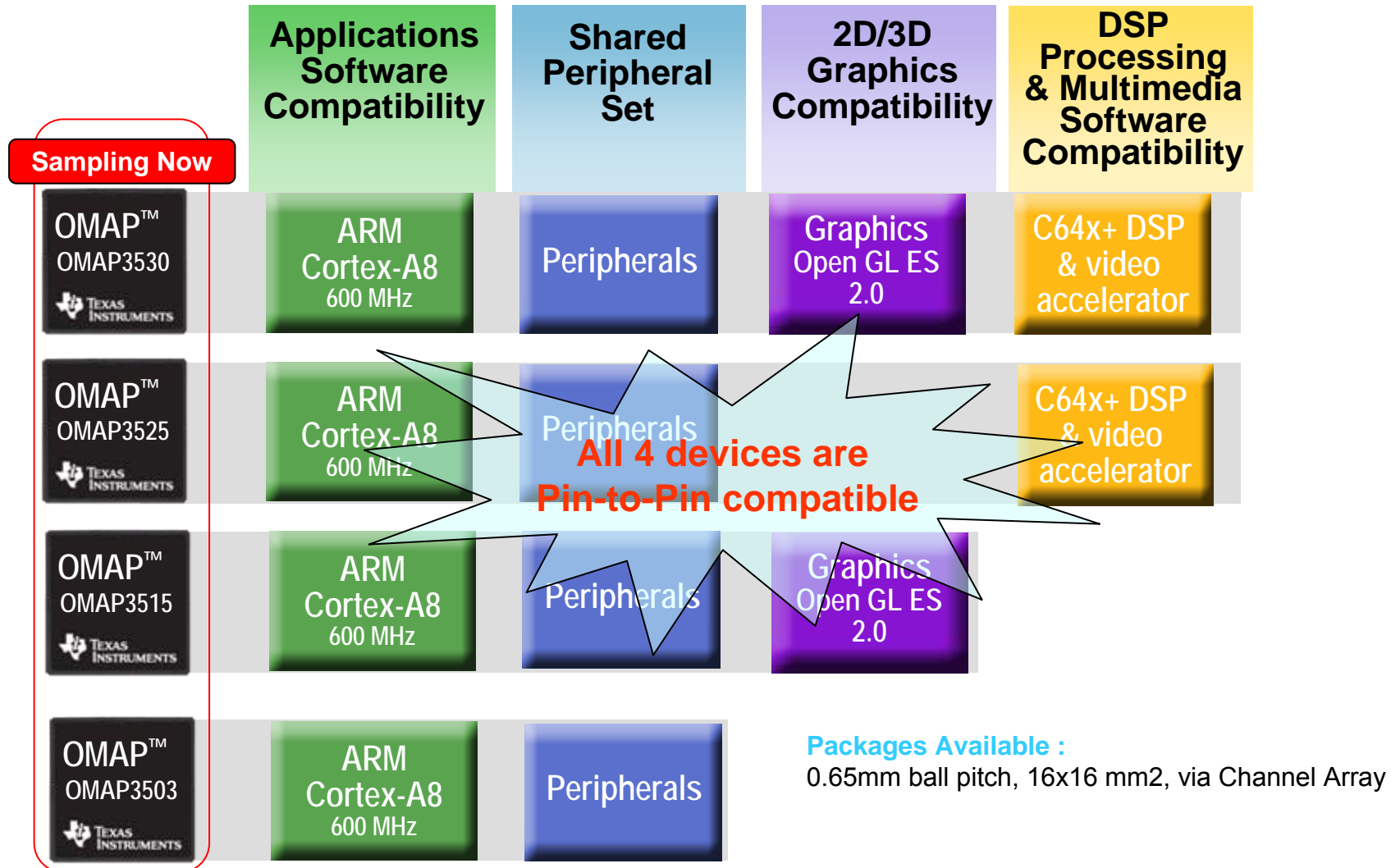
# OMAP35x Silicon Platform

# OMAP™ 3 Catalog Roadmap

Full HD



# OMAP35x Scalable Platform of Devices for Complete Product Portfolio







# OMAP35x Processor

## Laptop like Performance at Handheld Power Level

### Performance

- High-performance Superscalar ARM® Cortex™-A8 featuring NEON co-processor with immersive 2D/3D Graphics accelerator
- HD video decode utilizing TMS320C64x+ DSP and video hardware accelerators
- Low power utilizing TI's SmartReflex™ technology with option for integrated and discrete Power Management ICs

### Features

#### Cores

- Cortex A-8 with NEON™ SIMD Coprocessor / DSP-based TMS320C64x+ DSP and video accelerators (max performance only)
  - 600 MHz / 430 MHz @ 1.35V (*operating limits apply*)
  - 550 MHz / 400 MHz @ 1.27V
- 2D/3D Graphics Engine - Up to 10M polygons per second

#### Memory

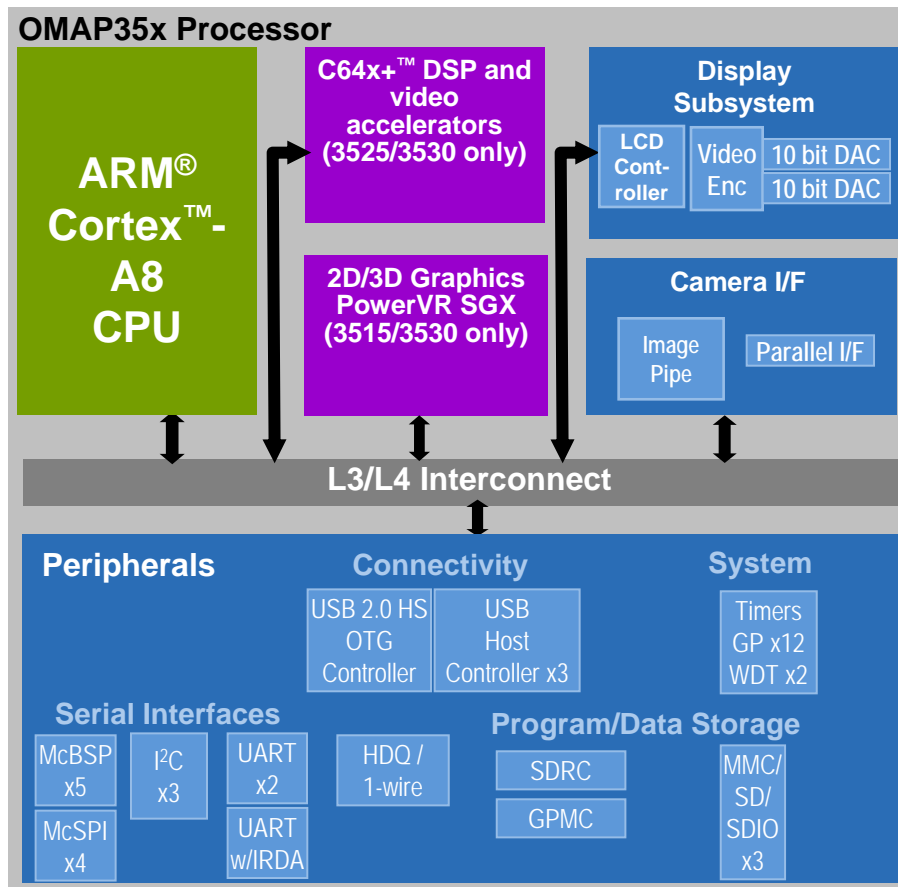
- ARM:
  - 16 kB I-Cache; 16 kB D-Cache; 256kB L2
- TMS320C64x+ DSP and video accelerators
  - L1 32kB Program Cache/32kB Data Cache + 48kB SRAM
  - L2 64kB Program / Data Cache + 32 kB SRAM; 16 kB ROM
- On Chip: 64kB SRAM; 112kB ROM

#### Peripheral Highlights

- Support for LPDDR
- Support for NOR, NAND, SRAM, Pseudo SRAM
- USB 2.0 HS Compliant OTG Controller w/ 2 additional USB Host Controllers
- Display subsystem with LCD and TV interface. Supports PIP, color space conversion, resize and rotation.
- Camera I/F with CCD controller and Image-pipe (Preview, Resize, Statistics)
- Package 1 (CBB): 12x12 mm, 0.4mm pitch, [Package On Package](#) (POP); 515 pin PBGA; samples now; production 4Q'08; can be used with discrete memory
- Package 2 (CUS): 16x16 mm 0.65 mm pitch. 423 pin PBGA; samples now; production 4Q'08. Utilizes [Via Channel™ Array Technology](#) with 0.8mm pitch plus design rules.
- Package 3 (CBC): 14x14 mm, 0.5 mm pitch POP; 515 pin PBGA; samples Sep '08; production 1Q'09; must use POP memory

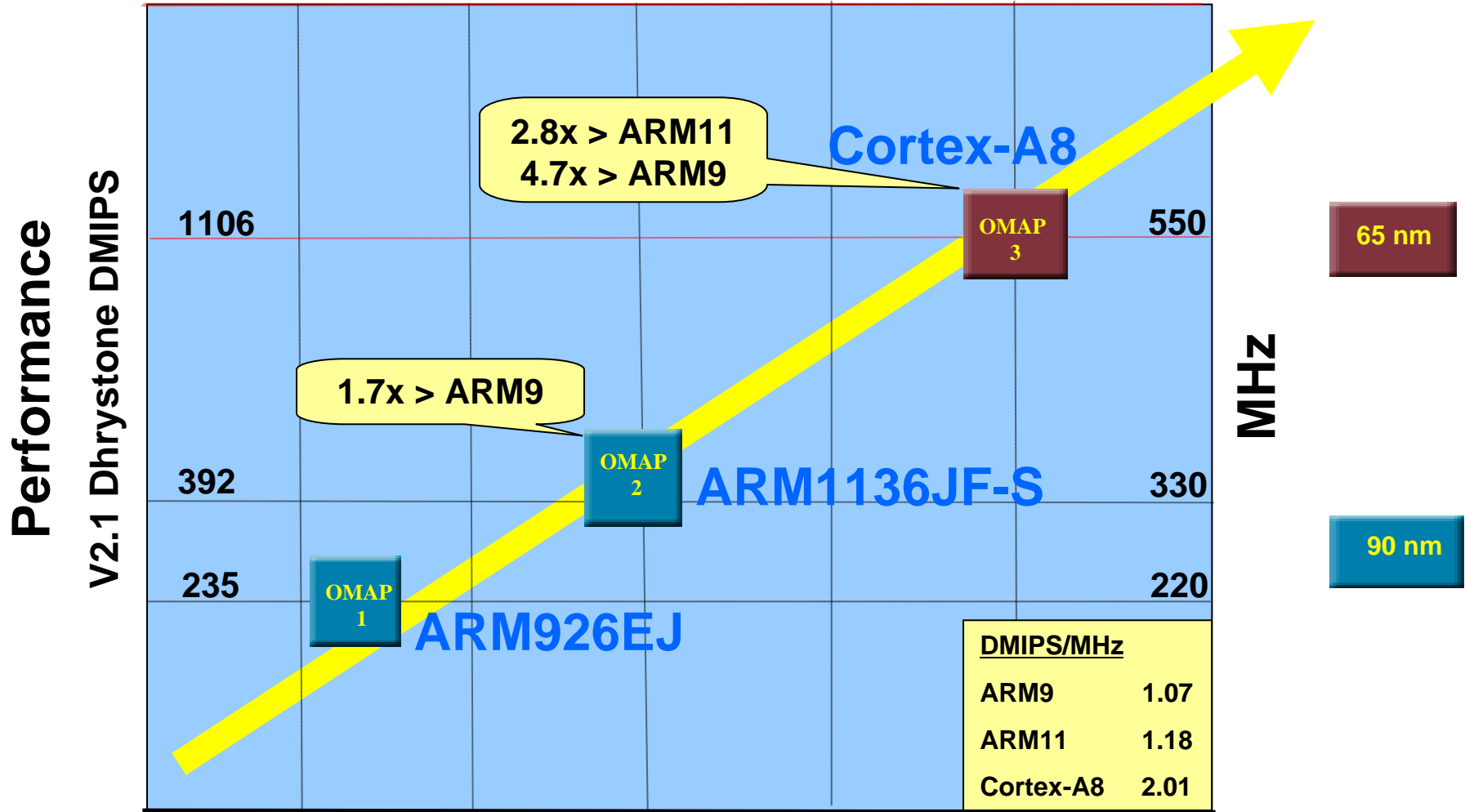
### Applications include:

- Automotive Infotainment
  - In-dash navigation
- Consumer
  - PND
  - PMP
  - Digital Video Camera
- Medical
  - Patient monitoring
  - Portable ultrasound
- Industrial
  - Point of sale
  - Smart white goods



Note: Peripheral limitations may apply among different packages

# OMAP™ ARM® Cores Performance V2.1 Dhrystone



# Best-in-Class Processing Capabilities For Evolving Market Opportunities

NEW

## First Sampling ARM<sup>®</sup> Cortex<sup>™</sup>-A8

- Advanced, Intuitive UI
- Highest-performance ARM, up to 1200 Dhrystone MIPS

## Multi-format Video Processing, up to HD

- HD video processing up to MPEG-4 SP, 720p decode at 30 fps
- Audio processing

NEW

## First with OpenGL<sup>®</sup> ES 2.0 Graphics

- Photo-realistic graphics, up to 10 million polygons per second
- Advanced, Intuitive UI

## Peripherals & Display Subsystem

- Seamless connectivity for low BOM cost
- Integration results in reduced board footprint and power
- Interface to LCDs, SDTVs, HDTVs



# OMAP35x EVM, Tools, and Software

# Availability – Software (base on EVM)

- **Software**

- ✓ Linux OS/BSP : available now with OMAP3 EVM
- WinCE OS/BSP : available in 3 phases
  - Phase 1 (Oct 08) – Kernel + Driver
  - Phase 2 (Nov 08) – Multimedia
  - Phase 3 (Jan 09) – 3D API, full DVSDK
- Audio/Video Codecs
  - Basic codecs free
  - Other codecs from TI will be free for evaluation
  - Additional codecs (or variant) available from 3P
- 3D Accelerator API : Free

# Begin Development Today with Extensible OMAP35x Evaluation Module

## Hardware

- OMAP35x Processor for evaluating all four OMAP35x devices
- 128 MB LPDDR/128 MB oneNAND Flash (or similar capacity and function)
- Touch screen LCD display
- Landscape/Portrait modes

## Software

- OMAP35x Linux BSP:
  - Kernel 2.6.22
  - Peripheral drivers
  - U-boot for boot loading
  - Busybox based root file system
- Windows® CE 6.0 BSP available 3Q08



- Evaluate capability
- Begin SW development
- Use Daughter card expansion to prototype complete system
- Easy to Upgrade to New Processors and Power Management Devices

More information available at  
[www.ti.com/omap35x](http://www.ti.com/omap35x)

## Connectivity

- Daughter card connectivity
- Ethernet, USB 2.0, SDIO, I<sup>2</sup>C, JTAG, Keypad
- SD/MMC
- S-Video output

## Development tools and support<sup>1</sup>

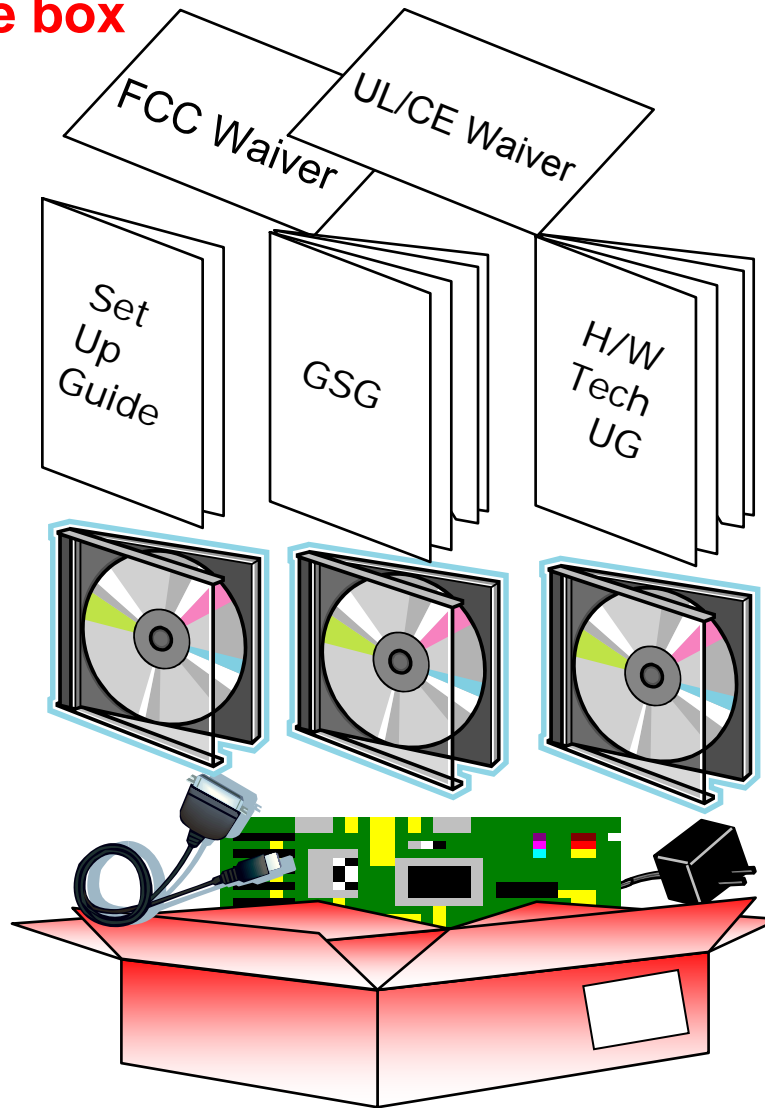
- Code Sourcery Toolchain
- Reference schematics
- Emulator support: TI XDS560

**OMAP35x EVM**  
**TMDXEVM3503**  
**\$1495**

<sup>1</sup> Additional tools support from Microsoft, ARM, GreenHills, Lauterbach, and TI(CCS) will be made available in the future

# EVM Experience Overview

## Opening the box



### Documentation

### S/W content

- Kernel, drivers, file system, and demos
- Code Sourcery compiler and debugger
- Mistral board utilities

### H/W content

- OMAP3503 Target Board
- Universal Power supply & US/Euro cords
- Serial Cable

# OMAP35x Summary Software Schedule - Linux

## Drivers/OS/Apps

- Image display sample application
- Linux Kernel version 2.6.22 (non commercial)
  - NAND/oneNAND boot (JFFS2)
  - LPDDR
  - Video Display: VGA LCD, S-Video, Rotate, Mirroring, V4FL2, Framebuffer, Touch screen
  - USB OTG Port
    - » Host: MSC, HID class
    - » Device: MSC, CDC/RNDIS(IP)
  - MMC/SD v2 (High Capacity)
  - Keypad
  - UART/I2C/SP/McBSP(I2S)
  - Timers
  - Ethernet
  - ALSA Audio
  - Power management (TWL4030 / TPS65950): CPU Idle and Dynamic Tick to enter low power states
    - » DVFS
  - USB ISO Transfer
  - S-Video<sup>1</sup>
- DSP BIOS (v5.32)
- Codec Engine (v2.2)
- BIOS Link (v1.51)
- Audio (TWL4030/TPS65950), video playback (LCD, DVI, SVideo<sup>1</sup>) demo application
- File-based Video encode example application<sup>2</sup>
- Gstreamer
- SDIO WLAN

<sup>1</sup> Addressing open quality issues with HW currently

<sup>2</sup> Will require additional hardware to support line in video recording

<sup>3</sup> Targeted performance

<sup>4</sup> Included in “basic” bundle – fees waived, supported via 3P’s

## DSP Codecs

- JPEG Encode/Decode<sup>4</sup>
- MPEG4 SP Encode/Decode(D1)<sup>3,4</sup>
- H.264 BP Encode / Decode (D1)<sup>3,4</sup>
- MPEG2 MP Decode(D1)<sup>3,4</sup>
- G.711 Encode/Decode<sup>4</sup>
- AAC LC/HE Decode
- WMA9 Decode
- MP3 Decode
- H.264 MP decode (720p)<sup>3</sup>
- WMV/VC1 Decode (720p)<sup>3</sup>

TI  
Licensing  
Fees  
Waived

## Dev. Tools

- CodeSourcery
  - GNU gcc 4.2.1
- glibc
- Build-root “busybox” filesystem
- U-boot 1.1.4

Schedule:

**Available now**

**Available now – OMAP3530 DVSDK Initial Release**

**Nov 2008 – OMAP 3530 DVSDK (Beta) – targeting GIT alignment**

**GA Release – 1Q'09**



# DVSDK – Featuring DaVinci™ Technology

- Linux 2.6.x (cpufreq, SmartReflex™ AVS and additional peripheral support)
- Windows Embedded CE 6.0 R2 (<http://www.microsoft.com/windows/embedded/eval/wince/default.msp>)
- Codec Engine 2.2 & xDAIS algorithm framework ([https://www-a.ti.com/downloads/sds\\_support/targetcontent/mfp/index.html](https://www-a.ti.com/downloads/sds_support/targetcontent/mfp/index.html))

- OpenGL ES 1.1 and 2.0 (<http://www.khronos.org/opengles/>)
- OpenVG 1.0 (<http://www.khronos.org/openvg/>)

- Codec algorithms for C64x+ DSP & video accelerator
- Accelerated DirectShow Media Objects for Windows Embedded CE 6.0 R2

	Applications Software Compatibility	Shared Peripheral Set	2D/3D Graphics Compatibility	DSP Processing & Multimedia Software Compatibility
<b>D</b> <b>V</b> <b>S</b> <b>D</b> <b>K</b>  <b>S</b> <b>D</b> <b>K</b>	<b>Sampling Now</b> OMAP™ OMAP353 ARM Cortex-A8 600 MHz	Peripherals	Graphics Open GL ES 2.0	C64x+ DSP & video accelerator
	OMAP™ OMAP352 ARM Cortex-A8 600 MHz	Peripherals		C64x+ DSP & video accelerator
	OMAP™ OMAP351 ARM Cortex-A8 600 MHz	Peripherals	Graphics Open GL ES 2.0	
	OMAP™ OMAP350 ARM Cortex-A8 600 MHz	Peripherals		

SDK available now  
 Beta1 DVSDK available now – no graphics support  
 Beta2 DVSDK available Nov.08- graphics support  
 Production DVSDK available Q1,09

# Support for Industry's Popular Software Tools

Tool / Top features	Debug	Compile	Other
	Low-level ARM and DSP	Low-level ARM (ARMv7, NEON) and DSP	Power-aware debug
	Low-level ARM	Application-level ARM (ARMv7, NEON)	
	WinCE application debug	WinCE ARM (ARMv7, NEON roadmap)	
	Low-level and app ARM and DSP	None	Extensive trace
	Linux application debug	Linux kernel/app ARM	
	Low-level and app ARM and DSP	Low-level ARM	Trace
	Linux application debug	Linux kernel/app ARM (ARMv7, NEON)	

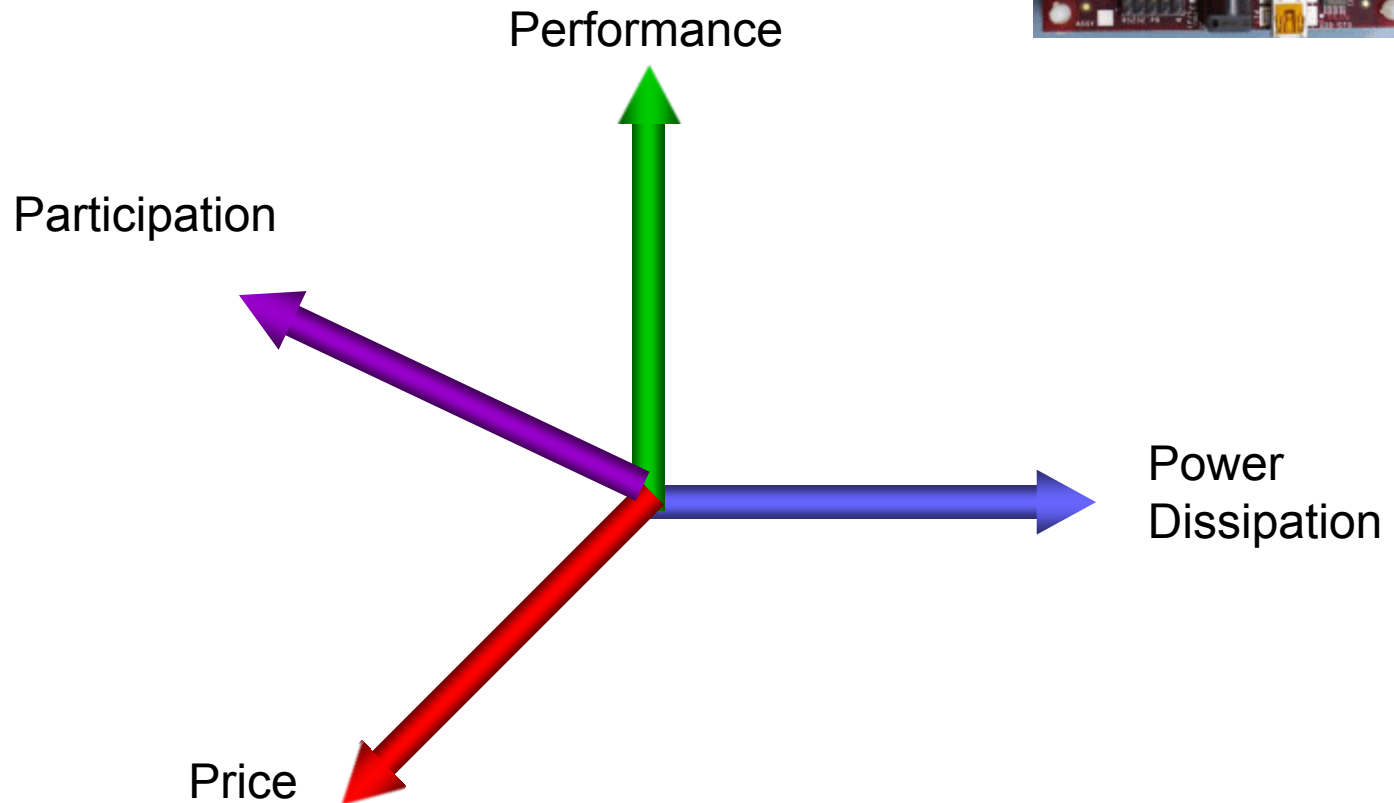
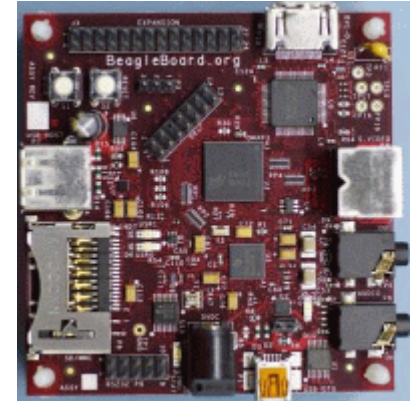
•Cortex-A8 uses ARMv7 instructions

# OMAP35x and Open Source

# OMAP35x

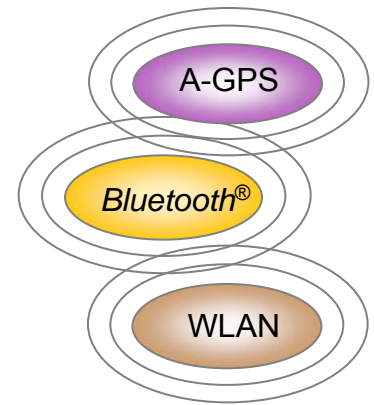
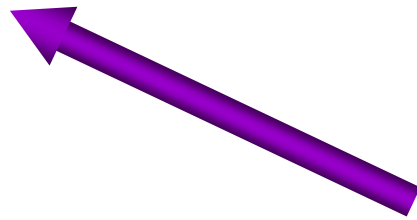
## Beagle Open Source Initiative

### The Fourth Vector of Value

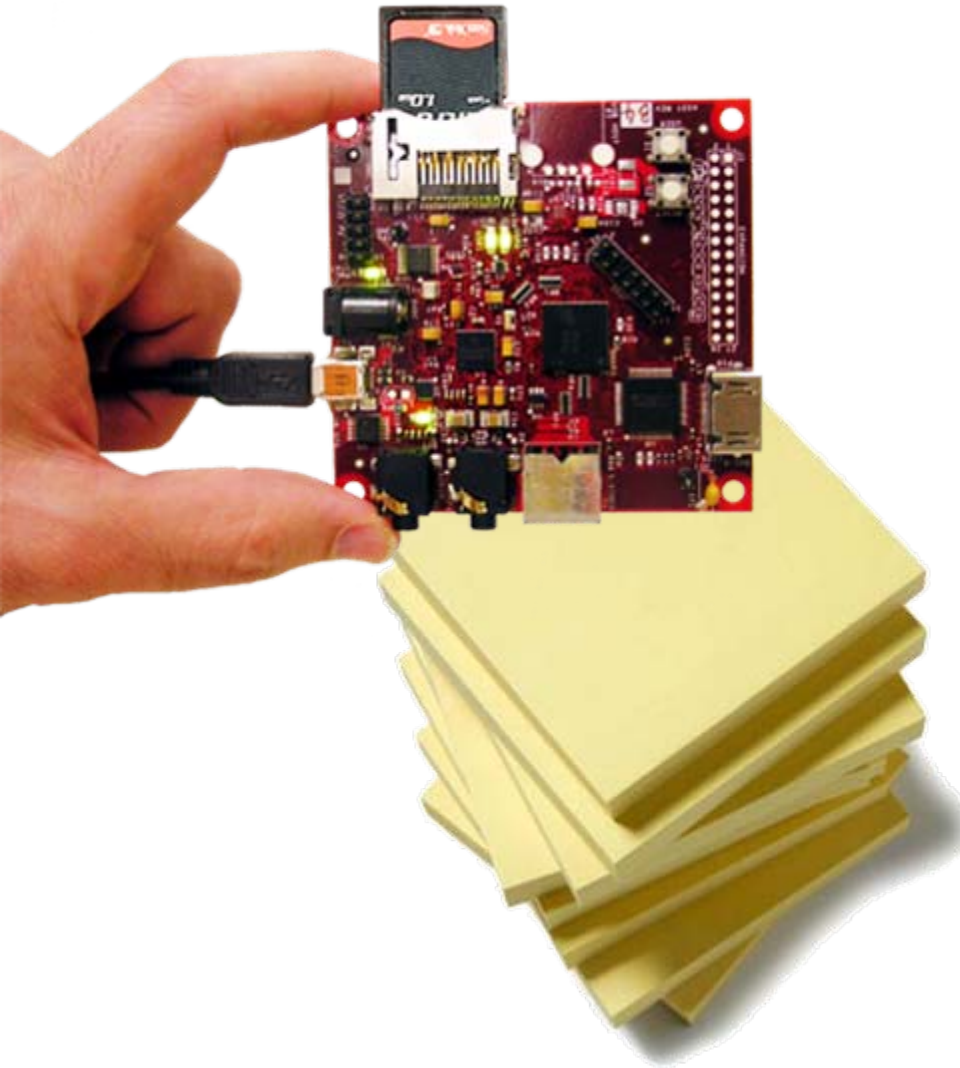


# The Fourth Vector of Value

Participation



## USB-powered Beagle Board Unleashes Community Development with Laptop-like Performance and Expansion



- USB powered board via low power OMAP3530 processor integration and minimal additional devices
- Flexible expansion through USB and standard PC peripherals
- Active and growing open source community at

[beagleboard.org](http://beagleboard.org)

[www.linuxforum.net](http://www.linuxforum.net)

Community supported

# Beagle Board – Delivering Laptop-like Performance and Flexible USB & Standard PC Expansion

## Laptop-like performance

## USB & standard PC expansion

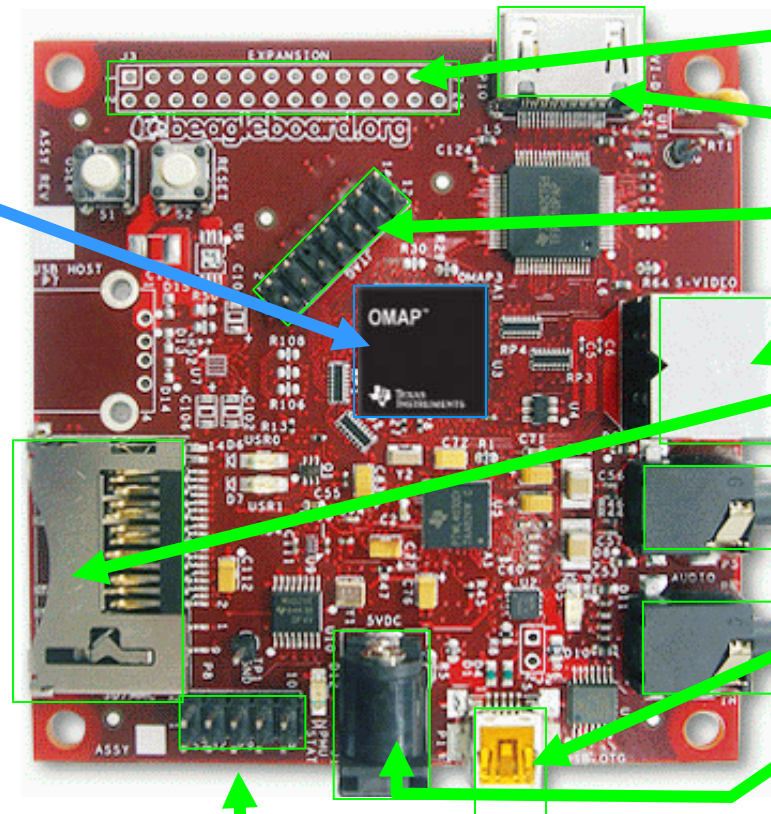
### TI OMAP3530

- 600 MHz superscaler ARM<sup>®</sup> Cortex<sup>™</sup>-A8
- More than 1200 Dhrystone MIPS\*
- Up to 10 Million polygons per sec graphics
- HD video capable C64x+<sup>™</sup> DSP core

### Memory

- 128MB LPDDR RAM
- 256MB NAND flash

← 3" →



I<sup>2</sup>C, I<sup>2</sup>S, SPI, MMC/SD

DVI-D

JTAG

S-Video

SD/MMC+

Stereo Out

Stereo In

USB 2.0 HS OTG

Alternate Power

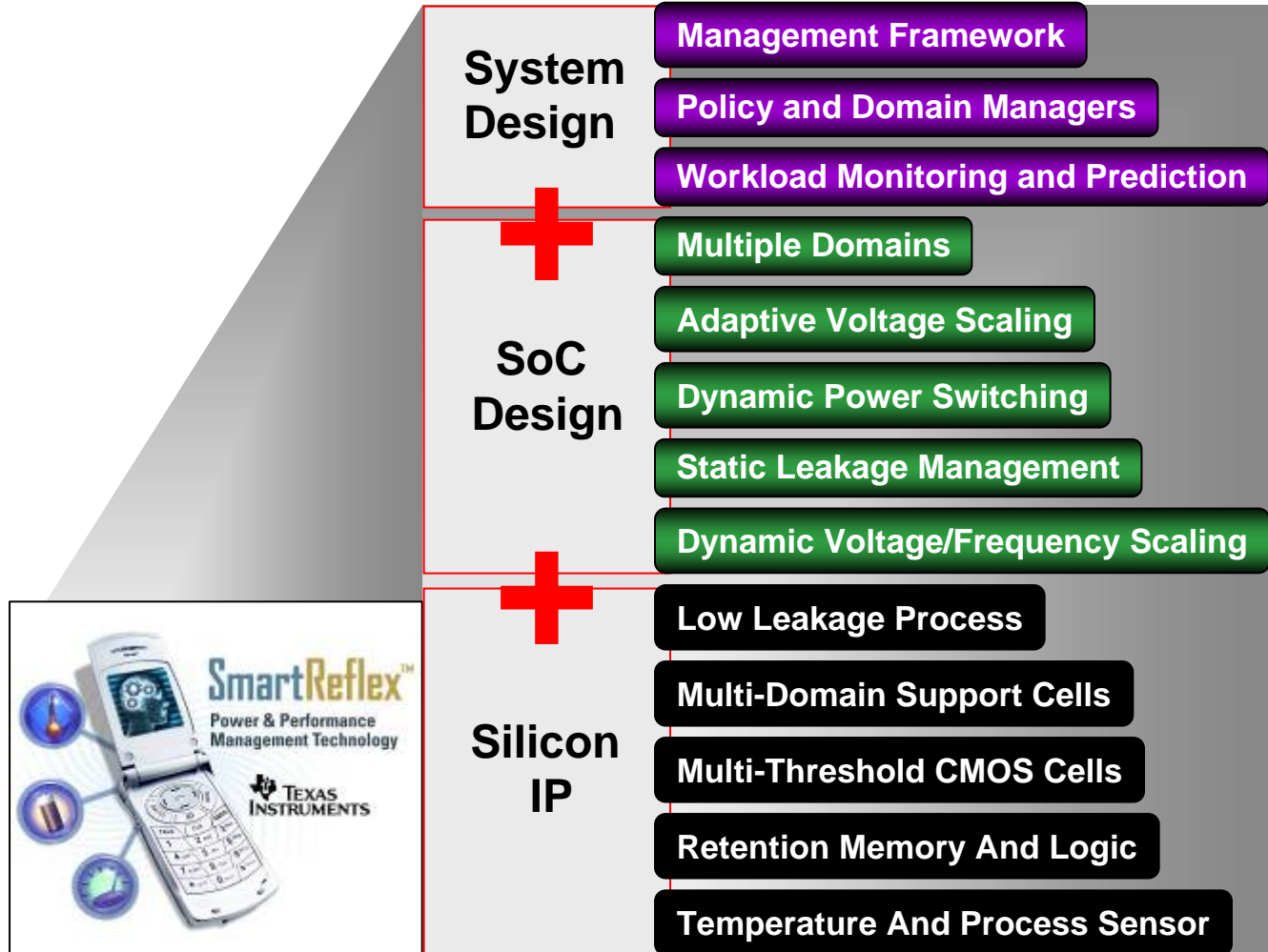
RS-232 Serial

\* Performance varies by compiler

# OMAP35x Power and Analog Solutions



# OMAP35x Offers Robust Performance at Significantly Lower Power



Additional information: [http://focus.ti.com/pdfs/wtbu/smartreflex\\_whitepaper.pdf](http://focus.ti.com/pdfs/wtbu/smartreflex_whitepaper.pdf)

# OMAP Analog Companions

TPS65950



TPS65930



TPS65920



**TPS65950<sup>1</sup>** analog companion IC has been defined and designed to work together with OMAP35x devices.

The **TPS65950** provides a **complete solution**:

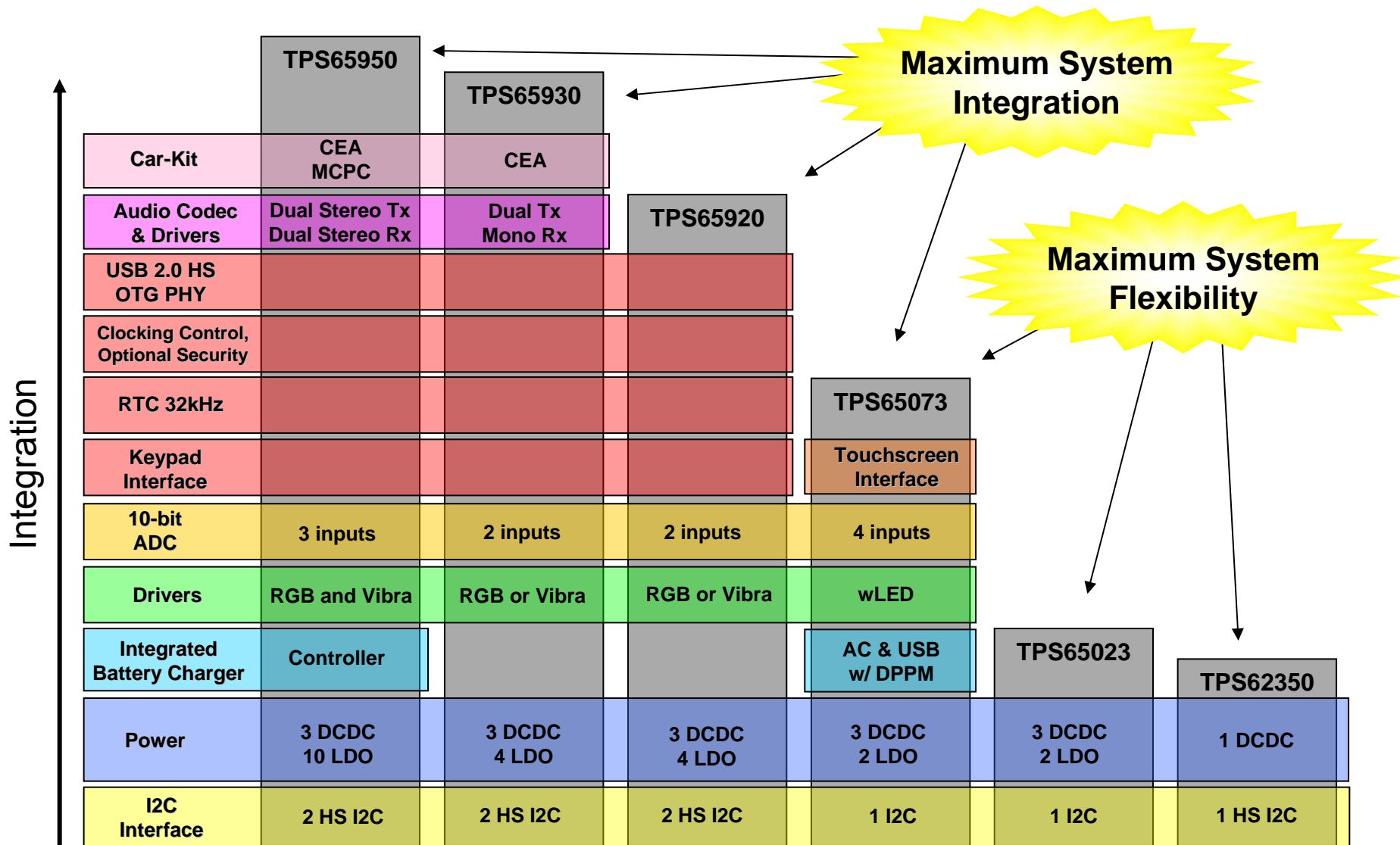
Audio, Power, Controls, Battery Charger, OTG HS USB transceiver, Monitoring, Auxiliaries.

**Software is available.**

**TPS65930** and **TPS65920** decrease PCB routing constraints while keeping most of the key benefits of TPS65950

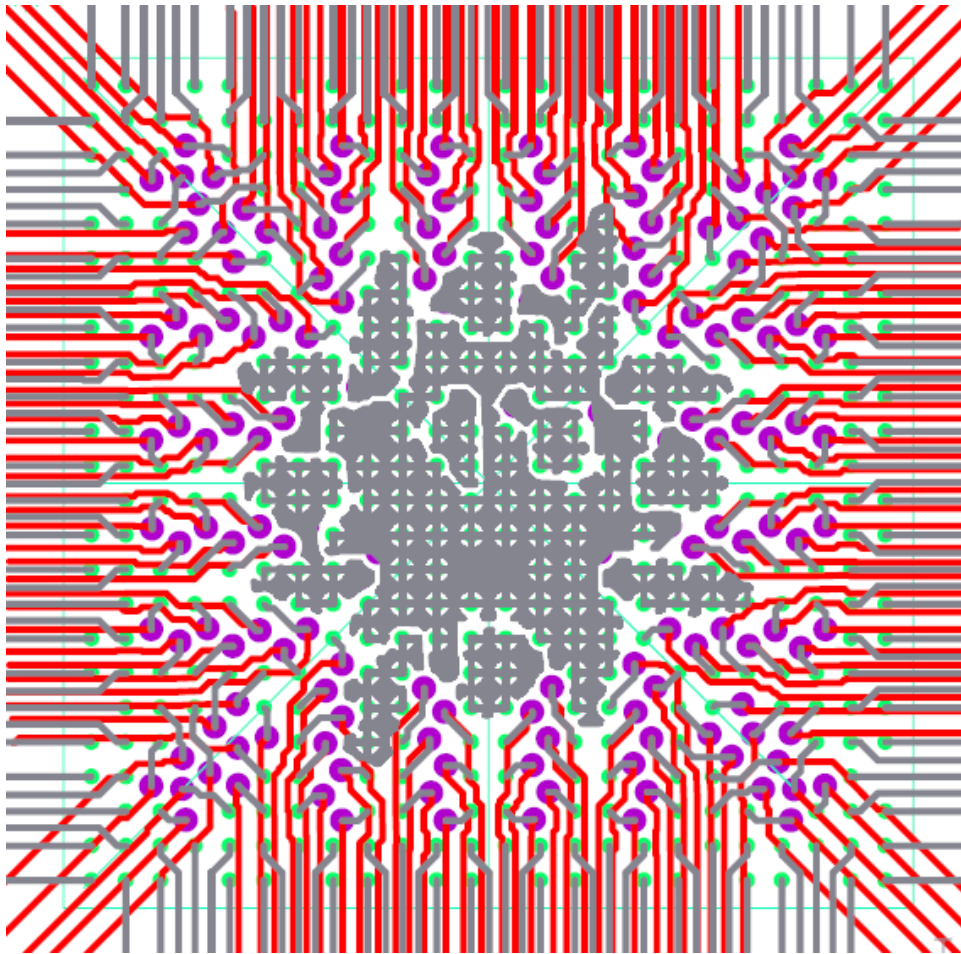
<sup>1</sup> *Software and pin compatible with TWL4030*

# Feature Overview of OMAP35x Power Options



# Via Channel™ Array Technology

# Via Channel™ Array Solution



## Package Stats:

- 0.65mm pitch, BUT
- 18 mil (0.45mm) vias
- 5 mil (0.125mm) space/trace width
- 2 layer routing

## Comparison with 0.8mm:

- Requires fewer PCB layers
- Cheaper PCB cost due to reduced layers
- Bigger via size
- Same trace width
- Same space width
- Only assembly tolerances are tighter

Final solution is the OMAP 35xx package. 423 pins routed out in only 2 signal layers with .8mm pitch PCB rules.

Additional information: <http://focus.ti.com/lit/an/spraav6/spraav6.pdf>

# 0.65mm Pitch Via Channel™ Packaging vs. 0.8mm Pitch

<u>Comparison</u>	(Competition) <u>0.8mm pitch</u>	(OMAP 35xx) <u>0.65mm p. w/Via Channels</u>
Micro Vias?	No	No
Min Trace	5 mils	5 mils
Min Space	5 mils	5 mils
Package size	17mm x 17mm (400 pins)	16mm x 16mm (423 pins)
Area	289mm <sup>2</sup>	256mm <sup>2</sup>
PCB Layers req.	6	4
Reduction from .8mm	--	11%

**Saves about \$2 vs other 0.65mm ball pitch devices**  
**Saves about \$4 - \$5 vs 0.5mm ball pitch devices**

# Common Questions

# OMAP35x Preliminary Power Estimates

- MP3 Decode (DSP) – ~34 mW<sup>1</sup>
- MPEG4 SP D1 Decode (DSP/accelerators)+MP3 (ARM) Decode – <380 mW<sup>2</sup>
- “Off Mode” – ~590 uW<sup>3</sup>
  - Lowest power mode from which OMAP35x can still wakeup autonomously
- “Standby 1” – 7mW<sup>4</sup>
  - Device state in which all non-Wakeup domains in the device are in low power retention
- ARM Cortex-A8 only – 0.52mA/MHz/V<sup>5</sup>

<sup>1</sup> Measured value; no OS; ES2.1; VDD1=0.95V(OPP1), VDD2=1.15V(OPP3); room temp; SmartReflex AVS not used.

<sup>2</sup> Measured value, Linux OS with Gstreamer framework; ES2.1; VDD1=1.27V(OPP4), VDD2=1.15V(OPP3); room temp; SmartReflex AVS not used.

<sup>3</sup> Measured value; Device is off except for wakeup domain, wakeup domain external supply voltage = 1.8V; VDD1, VDD2, VDDS\_DPLL\_DLL, VDDS\_DPLL\_PER, all 0V and disabled (for power savings in external regulators); power consumed is I/O leakage (this is application board dependent) and wakeup domain leakage; room temp.; ES2.1, might not reflect worst case silicon.

<sup>4</sup> Measured value; all power domains in retention mode with power applied; ES2.1, might not reflect worst case silicon.

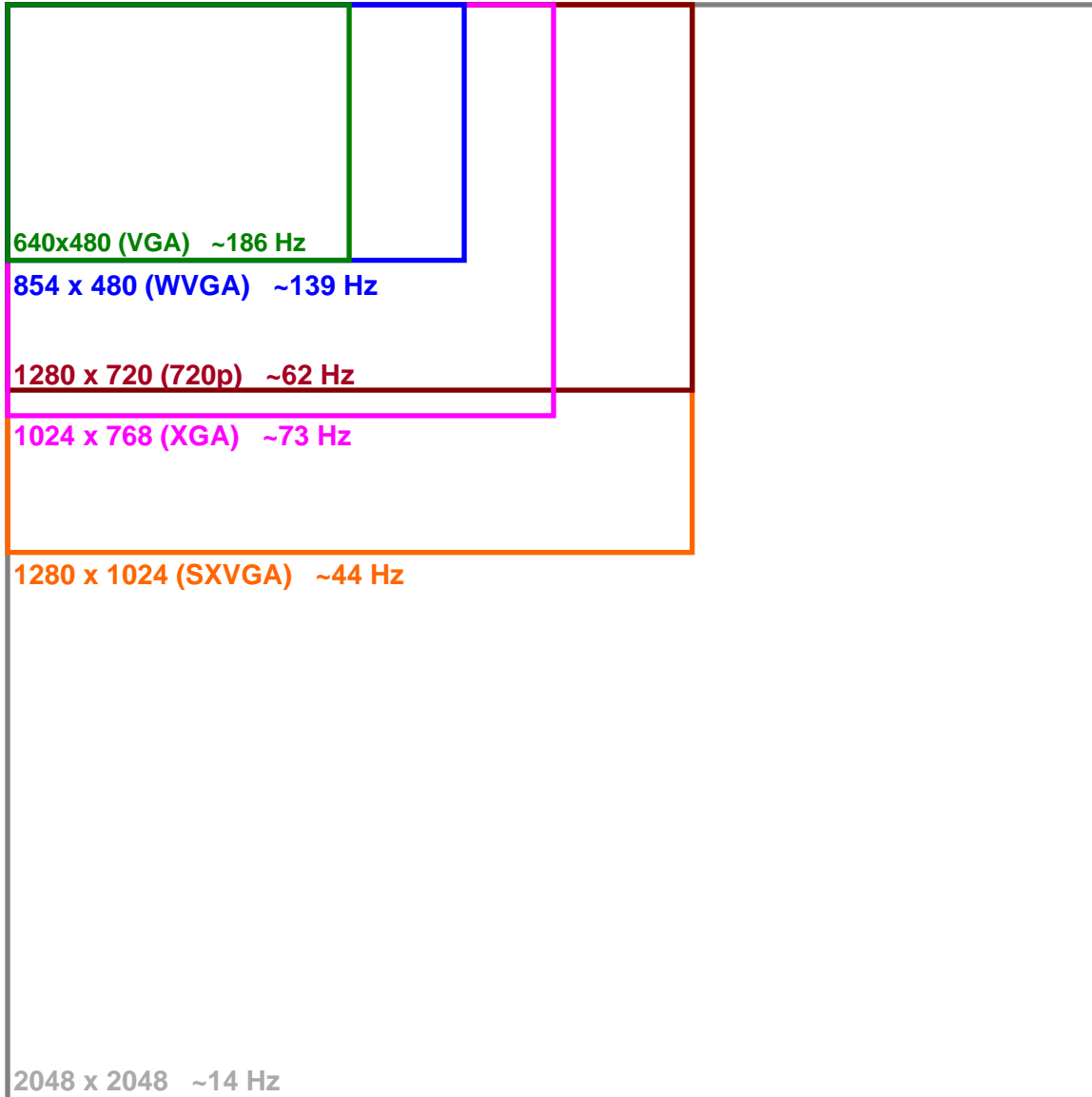
<sup>5</sup> Measured value; Power consumed on VDD1 (processor supply rail) and measured with MPU running Dhrystone 2.1 infinite loop; room temp; ES2.1 nominal unit, SmartReflex AVS not used.



# OMAP35x Display Subsystem Maximum Resolution

- LCD Output
  - LCD output can support a maximum display resolution up to 2048 x 2048 with the pixel clock limited to 74.25 MHz.
  - However, the display resolution and pixel clock will limit the maximum frame rate that can be supported. Keep in mind that the display area must also account for blanking fields which are specified by the standard being used, i.e. VESA, CEA-861-D, etc.
  - An approximation for the maximum frame rate can be obtained by: *approx max frame rate = (74250000 / (X \* Y \* 1.3))*, where the 1.3 factor is related to blanking times.
    - For direct drive LCD's the 1.3 can be replaced with a value closer to 1.
    - This is an approximation only. Care should be taken to do a more thorough analysis before a final decision is made.
- TV Output
  - TV output is always NTSC or PAL standard definition.

# Approximate, Maximum LCD Frame Rates at Select Resolutions



*For approximation purposes only.  
Not all resolutions shown.  
System factors such as decoder  
performance, resizer use, and  
LPDDR bandwidth should also  
be considered.*

# OMAP35x Extended Temperature and Reliability Information

To avoid significant device degradation for commercial temperature **OMAP35x** devices ( $0^{\circ}\text{ C} \leq T_j \leq 90^{\circ}\text{ C}$ ), the device power-on hours (POH) must be limited to one of the following:

- 100K total POH when operating across all OPPs and keeping the time spent *at* OPP5 to less than 23K POH.
- 50K total POH when operating *exclusively* at OPP5.
- 44K total POH with *no restrictions* to the proportion of these POH at operating points OPP1 - OPP5.

To avoid significant device degradation for industrial temperature **OMAP35xA** devices ( $-40^{\circ}\text{ C} \leq T_j \leq 105^{\circ}\text{ C}$ ), the following restrictions apply:

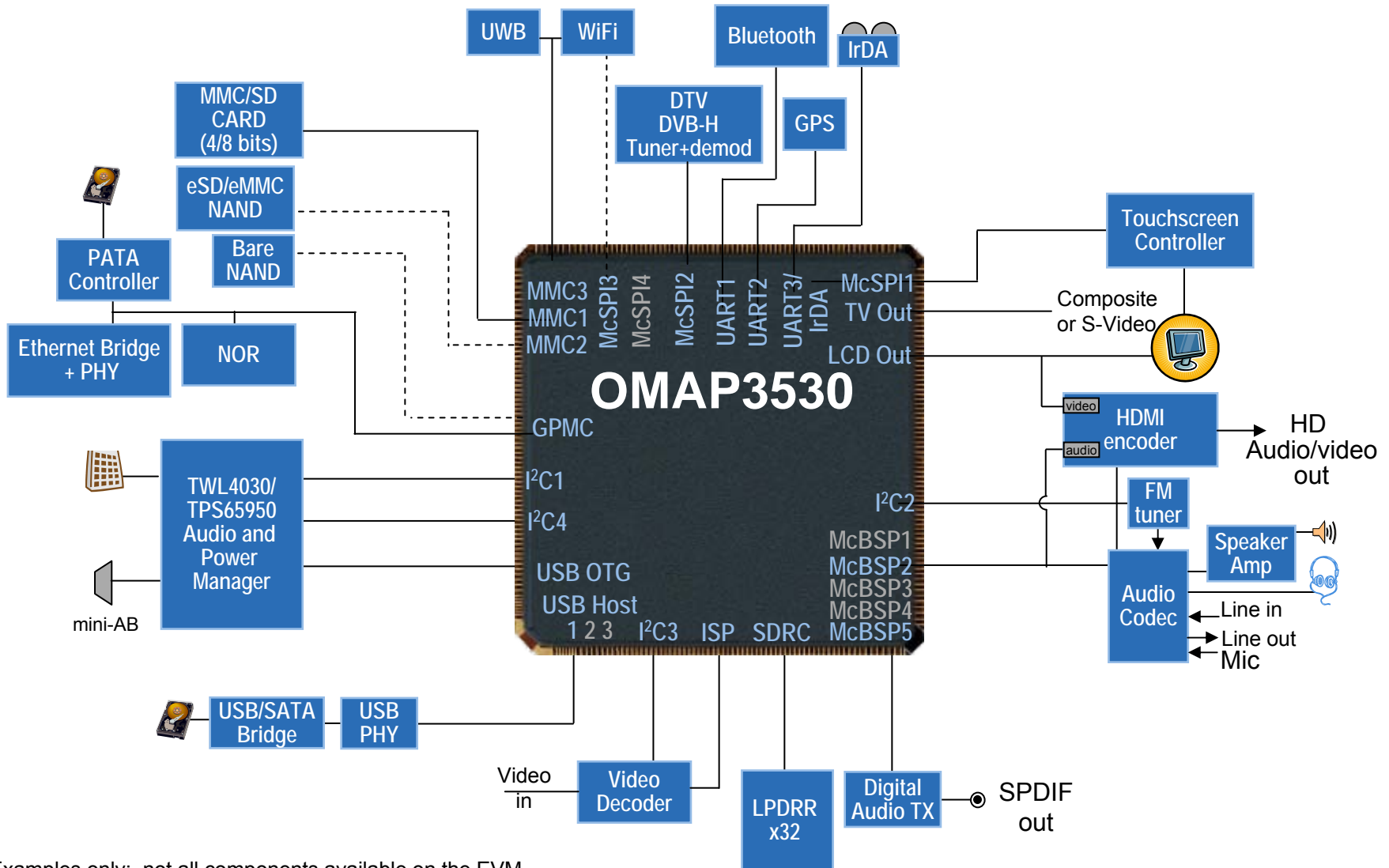
- OPP5 is not supported.\*
- The total device POH must be limited to less than 50K.\*

\*If an industrial temperature device is operated such that  $T_j$  never exceeds  $90^{\circ}\text{ C}$  ( $-40^{\circ}\text{ C} \leq T_j \leq 90^{\circ}\text{ C}$ ) then the OPP POH limits for commercial devices indicated above apply.

**Note:** Logic functions and parameter values are not assured out of the range specified in the recommended operating conditions.

$T_j$  = junction temperature  
OPP = Operating Performance Point

# OMAP3530 Connectivity Examples



Examples only: not all components available on the EVM

# OMAP3x Potential Applications

## Digital Signage



## Point of Service Terminals



## Low Power PC / Web Tablet



## Portable Industrial / SDR



## Portable Infotainment



## Industrial Panel PC/HMI

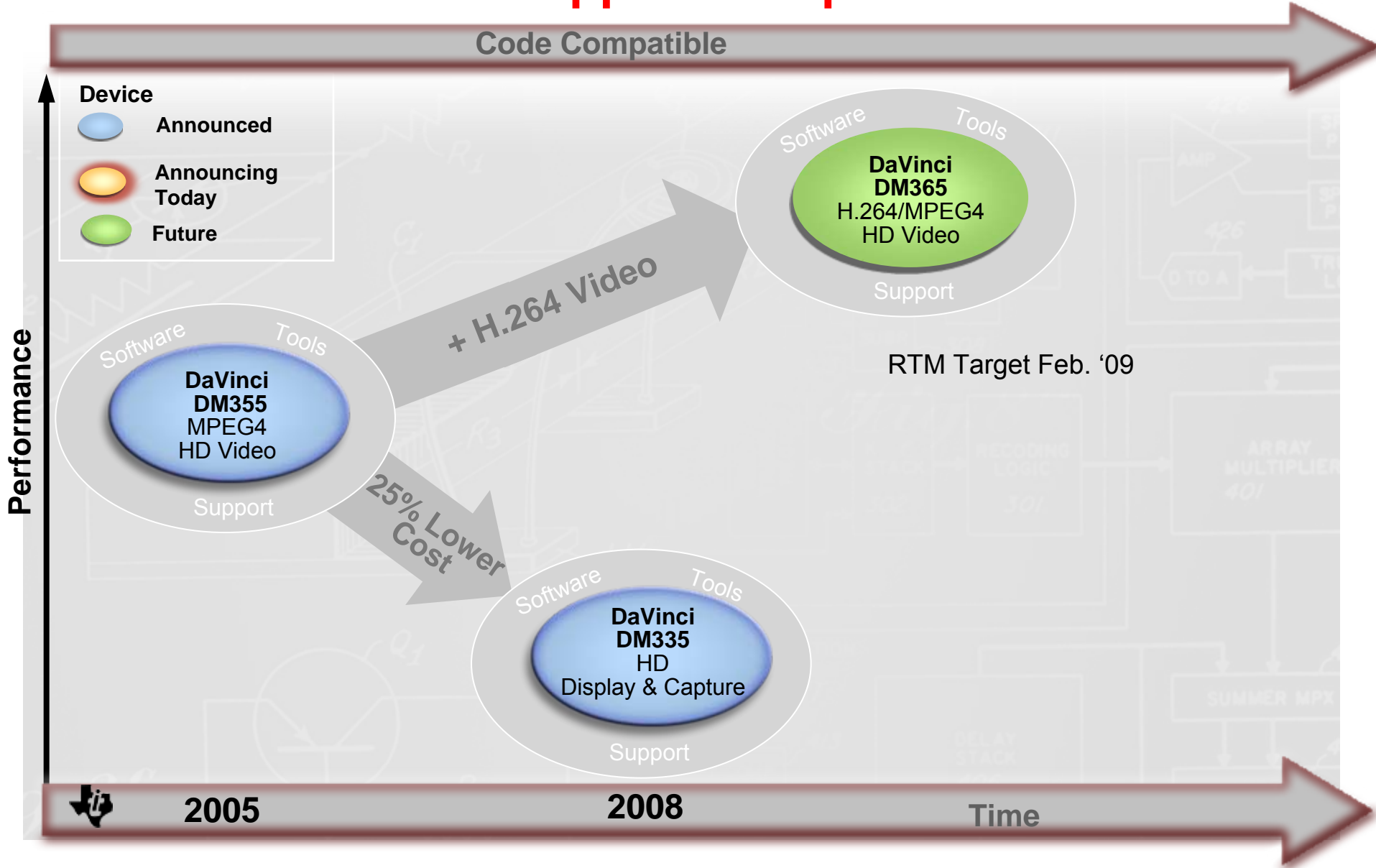


# DM3xx- ARM9 Application Processor

## Roadmap

## DM355/DM335 Production Information

# DM3xx Processors Support Complete Video Portfolio

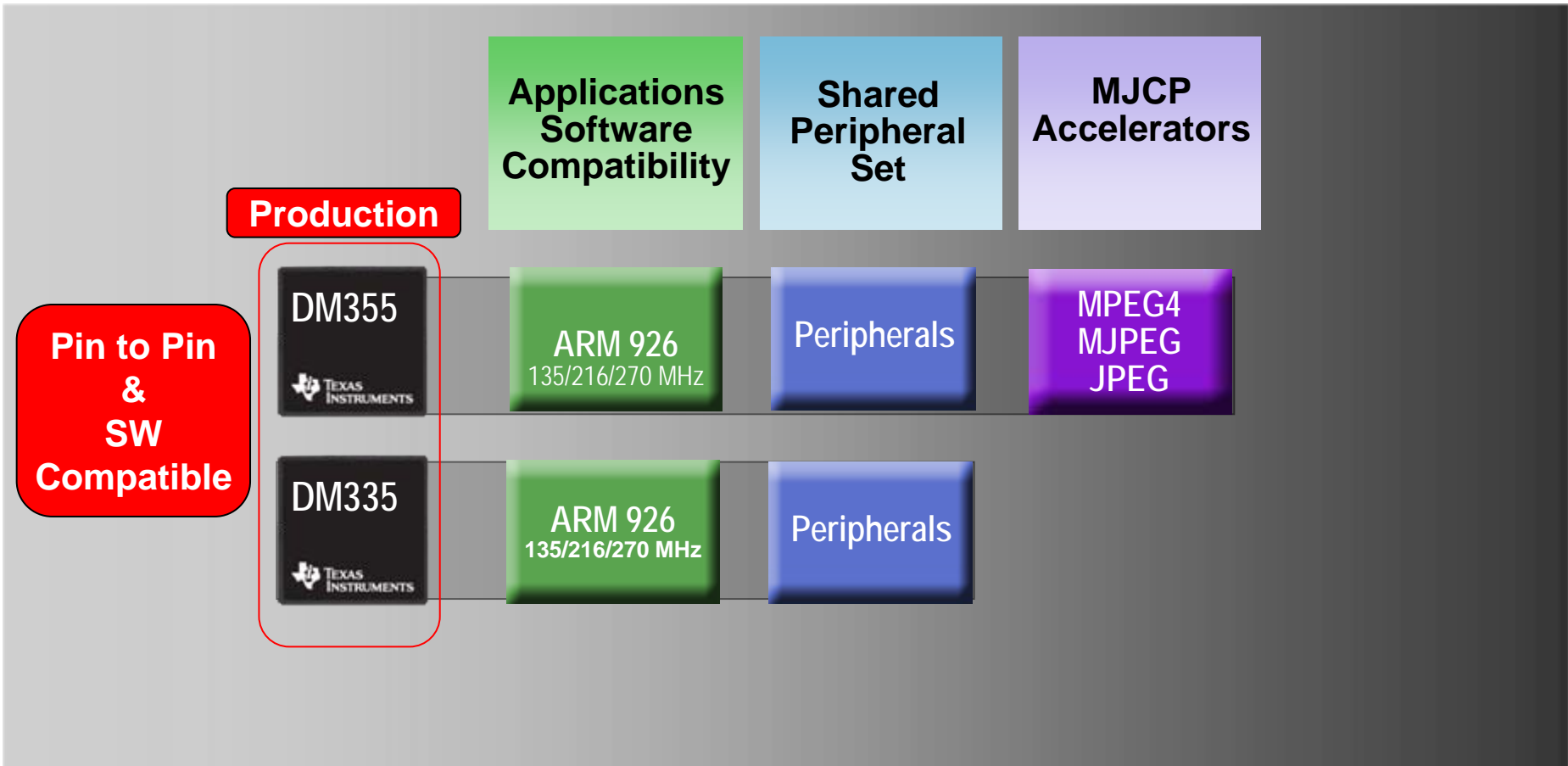


2005

2008

Time

# DM3xx Scalable Platform of Devices for Complete Product Portfolio



*Availability subject to applicable lead times*



# TMS320DM355

## Product Information

DM355 Product Family



[www.ti.com/dm355](http://www.ti.com/dm355)

# DM355 Enables HD Products At Low Power and Low Cost



**ACHIEVE:**  
HD Multi-Format Video  
Advanced Image Processing  
Multimedia  
Connectivity  
Longer Battery Life



# TMS320DM355 Processor

## High Performance Video Processing for Portable Applications

### Performance

- **HD MPEG-4 Encode or Decode @ 720p, 30 fps**
- **JPEG encode or decode at 50 MPixels/second**
- **MPEG-4 and JPEG codecs included, no royalties or license fees to TI**

### Features

#### ■ Core

- ARM926EJ-S™ Core, 216 MHz or 270 MHz
- MPEG-4 & JPEG Coprocessor (MJCP)
- Video Processing Subsystem

#### ■ Memory

- ARM: 16KB I-Cache; 8KB D-Cache; 8KB ROM; 32KB program/data

#### ■ Peripheral Highlights

- USB 2.0 HS OTG device and mini-host w/ PHY
- External memory interface (EMIF)
  - Mobile DDR/DDR2

**Package: 13 x 13 mm BGA, 329 pin, 0.65mm pitch**

**TMX320DM355ZCE135**

**TMX320DM355ZCE216**

**TMX320DM355ZCE270**

### Availability:

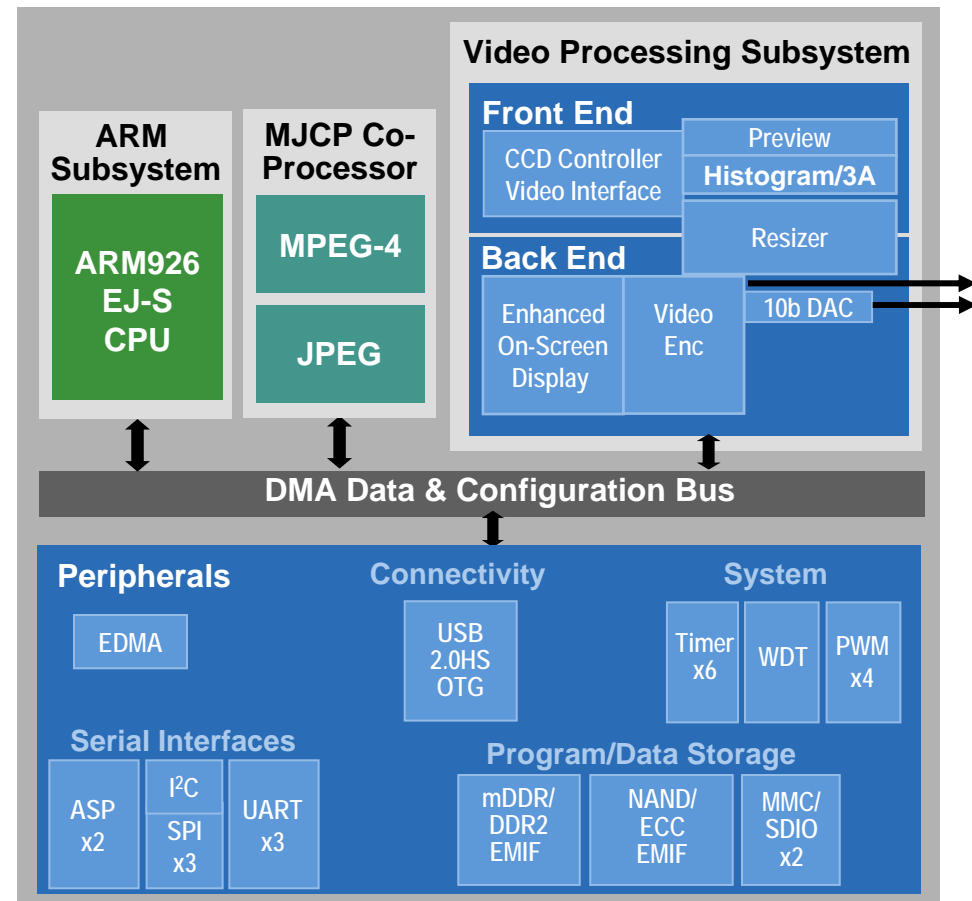
**Commercial temp (0 to 85C)** – Both 135/ 216/270MHz versions **NOW**

**Extended Temp (-45 to 105C)** - TMX320DM355ZCE216 only

- production June 2008

### Applications

- Low End Portable Media Players, Digital Photo Frames, DSC/DVC, Embedded Consumer Cameras, IP Camera, eBook, Handy KOK, Universal Remote Controller, etc.



# DM355 Power Consumption

- Standby power (deep sleep mode)
  - **<5 mW**
- Image and video preview
  - **< 200 mW without DRAM power; < 250 mW including DRAM power**
- SD video encode and playback
  - **< 250 mW without DRAM power; < 330 mW including DRAM power**
- HD video encode (720P)
  - **< 400 mW without DRAM power; < 550 mW including DRAM power**
- High speed image processing (> 50 MP/s)
  - **< 300 mW without DRAM power, < 400 mW including DRAM power**

Measured in Real Product

# DVEVM – Available Now



## DM355 Digital Video Evaluation Module

- MontaVista Linux Demonstration Version
  - Drivers for UART, I2C, SPI, EDMA, NAND, MMC, SD Card, USB Host/Gadget,
  - Video Processing Subsystem (Display, Capture, CCD Controller, Resizer, Previewer)
  - OSS Audio (ASP), GPIO, PWM, WDTIM
  - Uboot loader
- JPEG/MPEG 4 SP/G.711 Codecs
- Video Input/Output, Audio In/Out, UART, External EMAC, USB 2.0, JTAG
- Freely available ORCADs, schematics
- TMDSEVM355: \$495

# DM355 Target Markets



**Surveillance (IPNC, Multi-Ch DVR, CCTV, etc.)**

**Home (Video Door bell, Video Baby Monitor, etc.)**



**Medical (ECG Monitor, etc.)**

**High Tech Toy, Robotics**



**Portable Infotainment (PND, Portable DTV, PMP, etc)**

**Digital Photo Frame, Digital Still Camera, Smart Projector**



**TV (HMI, Games, Web-browsing)**

**PVR (Time-shift, audio/video playback, etc.)**



**Audio (Sat Radio, Inet Radio, VoIP, DECT)**

**Many More .....**

# TMS320DM335

## Product Information

DM355 Product Family



[www.ti.com/dm335](http://www.ti.com/dm335)

# Achieve Advanced Image Capture and Vibrant Display Capabilities with TI's Lowest-cost Digital Media Processor



**ACHIEVE:**  
Advanced Image and  
Display Capabilities  
Longer Battery Life  
Faster Time to Market  
Low Cost





# TMS320DM335 Processor

## High Performance Processor for Multiple Display Applications

Available TODAY



### Features

#### ■ Core

- ARM926EJ-S™ Core
  - 135/216/270MHz
- Video Processing Subsystem
  - Resize, Integrated OSD, One Video DAC

#### ■ Memory

- ARM: 16KB I-Cache; 8KB D-Cache; 8KB ROM; 32KB program/data

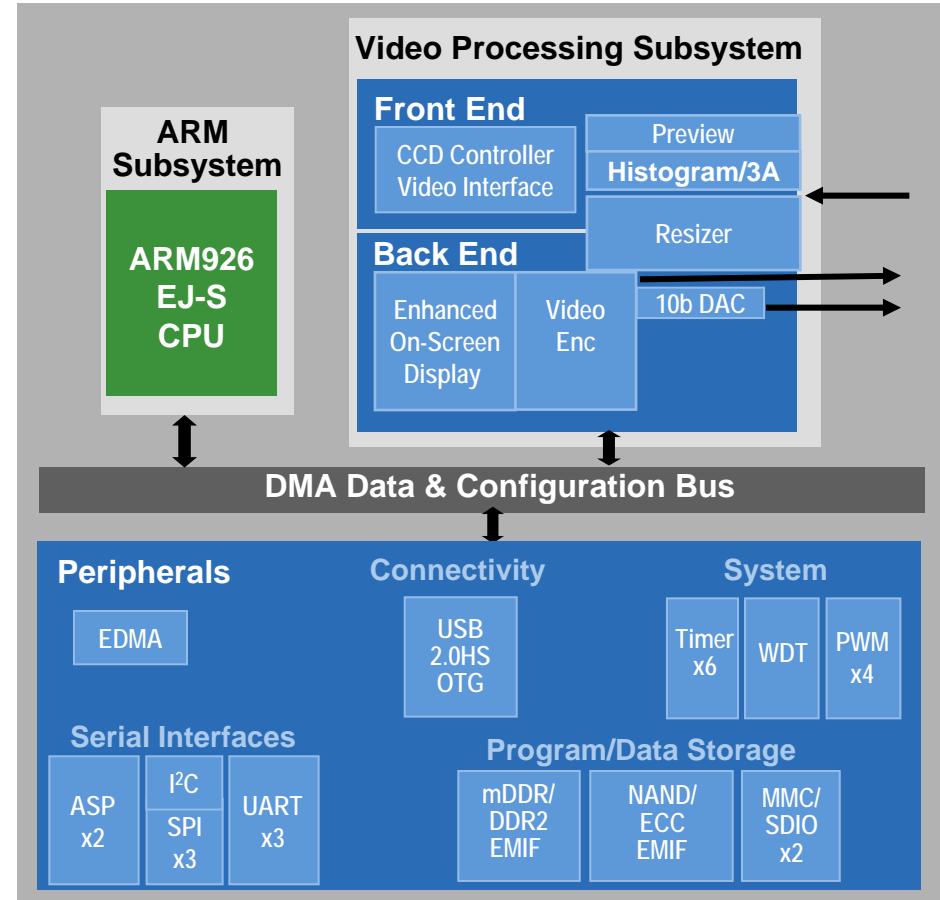
#### ■ Peripheral Highlights

- USB 2.0 HS OTG device and mini-host w/ PHY
- External memory interface (EMIF)
  - Mobile DDR/DDR2
- 2 SDIO Ports, 3 UART Ports, 3 SPI Ports
- SLC/MCL NAND Flash Support

#### ■ Pin to Pin Compatible to DM355

- TMS320DM335ZCE270
- TMS320DM335ZCE216
- TMS320DM335ZCE135
- Package: 13 x 13 mm BGA, 329 pins, 0.65mm ball pitch (ZCE suffix)

Use with DM355 EVM for only \$495



# DM355 Development Tools Compatible with DM335 - Available Today



## Develop on the DM355 Digital Video Evaluation Module

- MontaVista Linux Demonstration Version
  - Drivers for UART, I2C, SPI, EDMA, NAND, MMC, SD Card, USB Host/Gadget,
  - Video Processing Subsystem (Display, Capture, CCD Controller, Resizer, Previewer)
  - OSS Audio (ASP), GPIO, PWM, WDTIM
  - Uboot loader
- Video Input/Output, Audio Input/Output, UART, External EMAC, USB 2.0, JTAG
- Freely available ORCADs and schematics
- TMDSEVM355: \$495

# DM335 Overview

**Achieve advanced image capture and vibrant display capabilities with TI's lowest-cost digital media processor**

## Target Markets:

Diverse Range of Applications needing advanced video/imaging capture and display performance with easy to use General Purpose Processing at Low Power and Low Cost:

- Electronic Gaming
- Portable Instant Messaging
- eDictionary/eBook
- Karaoke
- Keypad Security
- Universal Remote Control
- Portable Medical
- VOIP
- Internet Radio

## Key Benefits:

The TMS320DM335 offers low cost solutions for:

- Advanced video display features including digital LCD i/f, TV out, and 4 layer On Screen Display for video in video applications
- Capture/Imaging support for CCD/CMOS image sensors with resize capability
- 32bit RISC ARM926 at 135 – 270MHz
- All while reducing time to market and development efforts with HW and SW compatibility to the DM355

# Application Processors - Summary

- **OMAP35xx** – 4 devices (pin to pin and software compatible)  
<http://focus.ti.com/docs/prod/folders/print/omap3503.html>
- **DM355/335** – 5 devices (pin to pin and software compatible)  
<http://focus.ti.com/docs/prod/folders/print/tms320dm355.html>  
<http://focus.ti.com/docs/prod/folders/print/tms320dm335.html>
- **EVMs Available Now**  
<http://focus.ti.com/docs/toolsw/folders/print/tmdxevm3503.html>  
<http://focus.ti.com/docs/toolsw/folders/print/tmdsevm355.html>
- **Free Software (with Purchase of EVM)**
  - Linux OS and BSP
  - Audio/Video Codecs and Codec Engine Framework
  - Graphics Accelerator API (OMAP35x only)

# Thank You & Question

[www.ti.com.cn/embeddedprocessing](http://www.ti.com.cn/embeddedprocessing)