

Enable Your Success in 3G Era

- Samsung Mobile Solution

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**Mobile Solution Development
System LSI Division
Samsung Electronics**

Contents

I

Mobile Industry Trend

II

Samsung's Strategy

III

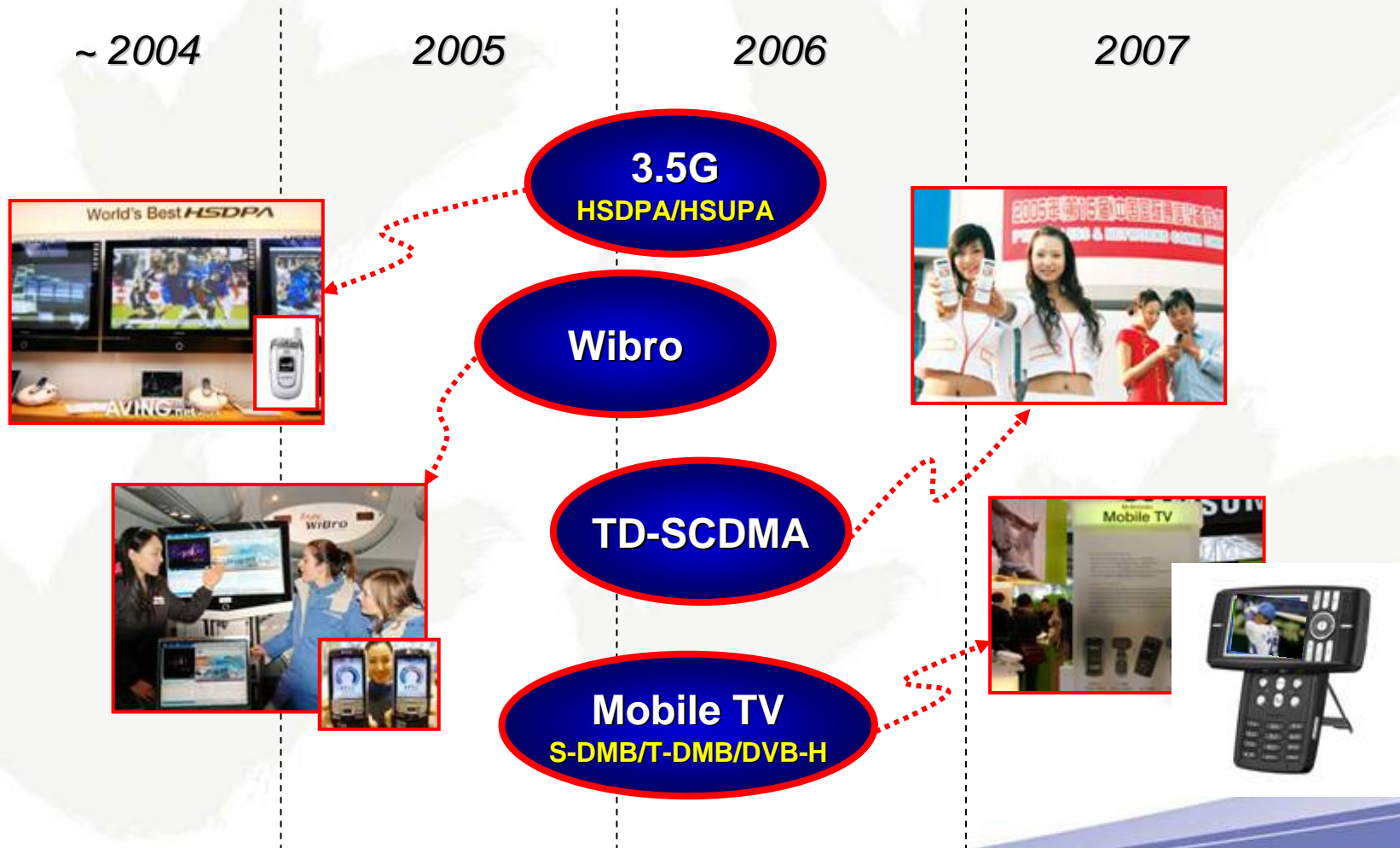
AP/MC Roadmap & Specification

IV

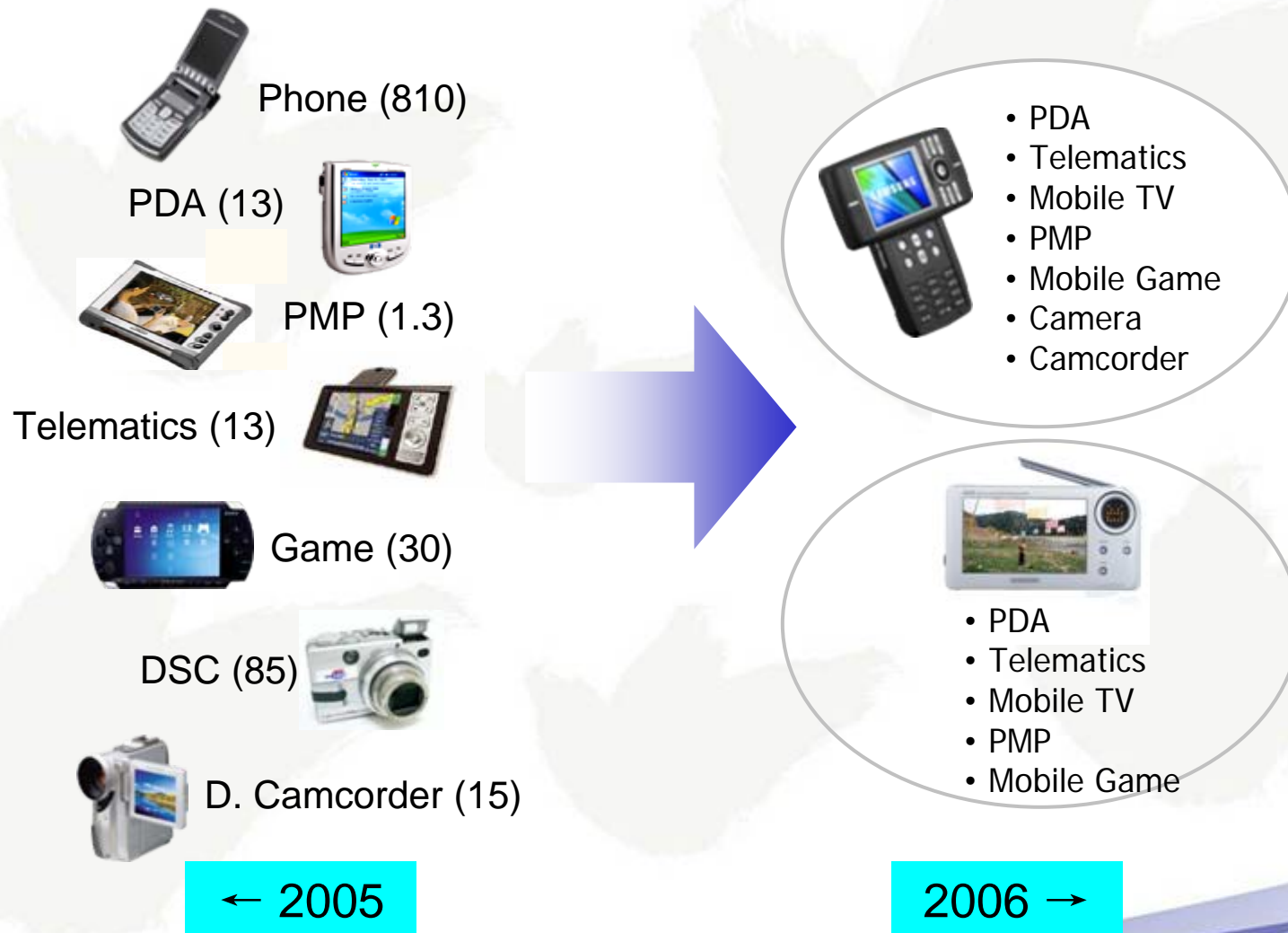
AP/MC Solution – S/W, Mobile TV, Ref.

Mobile Industry Trend

Communication Trend



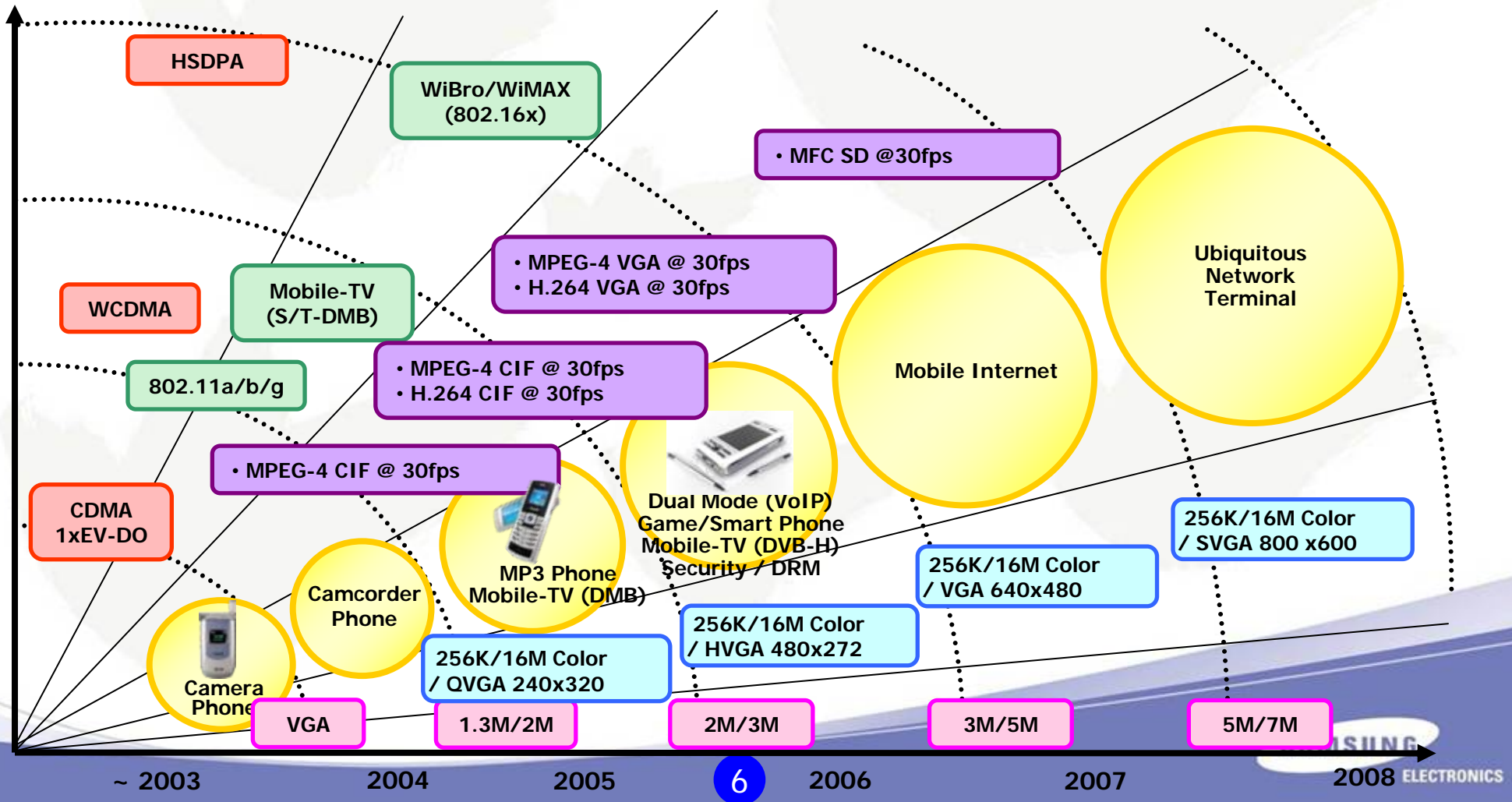
Mobile Terminal Trends



(M set) w/w quantity @2005

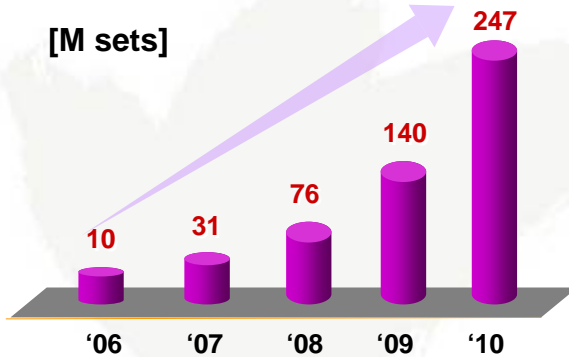
Mobile Space Trend

- Convergence of Cellular and Broadcasting in Mobile Handset
- Bigger Display Size (QCIF → VGA), Higher Camera Resolution
- New Multimedia Applications using various CODEC

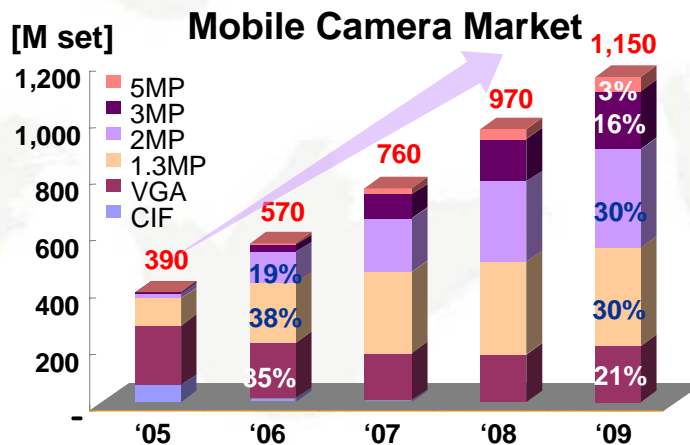


Application Trend

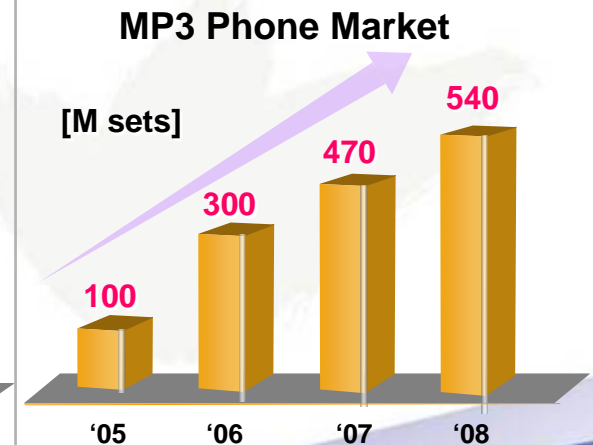
• Mobile TV



• High Resol. Camera



• MP3 Phone



Smart Phone – Next Hit Product



Imagine...

<i>Work Efficiently</i>	<i>Enjoy Entertainment</i>
2D/3D animation, connect to DLP Projector with XGA resolution	3D game (on/off line), Java game
High-speed send/receive email with attachment	Music playback, store thousands of hours music, Instant message.
Video conference, 30fps@VGA, network broadcasting	HD quality video playback, DVD quality camcorder
Multi-task operation, make excel file during video conference	12M pixel picture capture, listening mp3 music meanwhile.

Benefits...

Users:

Rich 3rd party applications, Easy to update, All in One, Easy to carry

Phone makers:

Jump out of the pitched battle, Higher profit margin, Increase R&D ability via S.Phone design, Move to high-end market, Change brand image

Telecom operators:

High ARPU



W/W Converged Mobile Device Market

Worldwide Converged Mobile Device Shipments by Operating System,
2005–2010
(Smart Phone and PDA Phone)

	2005	2006	2007	2008	2009	2010	2005–2010 CAGR (%)
Operating system mix (%)							
Palm OS	3.5	2.2	1.9	1.7	1.7	1.6	
Microsoft Pocket PC Phone Edition	3.2	4.1	7.1	7.5	7.5	7.3	
Microsoft Smartphone	2.0	3.8	5.8	8.6	10.1	11.2	
Linux	21.6	18.2	14.4	12.8	11.8	11.3	
Symbian (pen-based UIQ, Series 80)	4.6	5.2	6.6	7.2	7.1	6.6	
Symbian (keypad-only UIQ, Series 60)	56.9	59.2	57.6	56.0	56.0	56.5	
Other	8.1	7.4	6.7	6.2	5.8	5.4	
Total	100.0	100.0	100.0	100.0	100.0	100.0	
Shipments (000)							
Palm OS	2,011	1,953	2,341	2,659	3,204	3,781	13.5
Growth (%)	64.8	-2.9	19.9	13.6	20.5	18.0	
Microsoft Pocket PC Phone Edition	1,837	3,674	8,742	11,940	14,513	17,182	56.4
Growth (%)	85.0	100.0	137.9	36.6	21.5	18.4	
Microsoft Smartphone	1,153	3,421	7,136	13,630	19,564	26,288	86.9
Growth (%)	21.9	196.6	108.6	91.0	43.5	34.4	
Linux	12,218	16,322	17,691	20,237	22,757	26,414	16.7
Growth (%)	849.8	33.6	8.4	14.4	12.5	16.1	
Symbian (pen-based UIQ, Series 80, Series 90)	2,632	4,638	8,123	11,430	13,674	15,484	42.5
Growth (%)	107.2	76.2	75.1	40.7	19.6	13.2	
Symbian (keypad-only UIQ, Series 60)	32,249	53,173	70,846	88,679	107,881	132,476	32.7
Growth (%)	162.8	64.9	33.2	25.2	21.7	22.8	
Other	4,591	6,618	8,212	9,822	11,191	12,703	22.6
Growth (%)	54.3	44.2	24.1	19.6	13.9	13.5	
Total	56,691	89,800	123,090	158,398	192,784	234,328	32.8
Growth (%)	170.5	58.4	37.1	28.7	21.7	21.5	

Windows Mobile will increase its M/S very rapidly and be a major player in 2010 (M/S:19%).

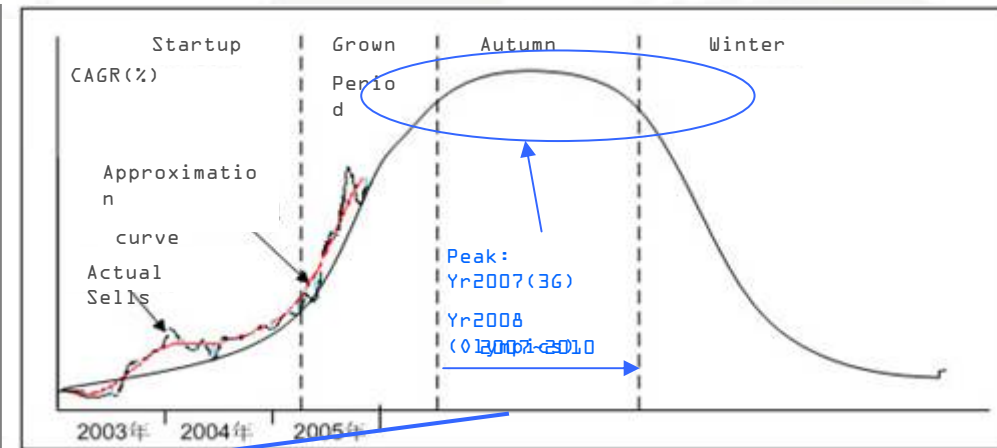
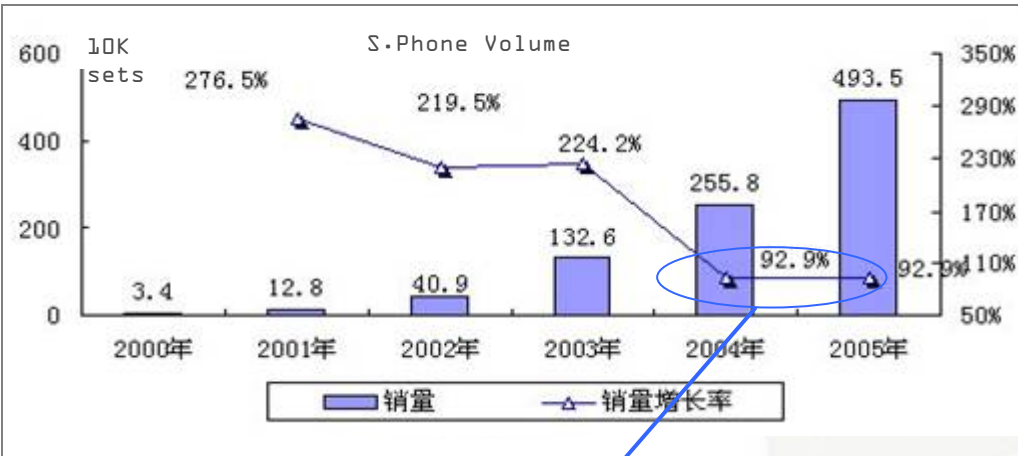
Symbian will remain its NO.1 position, but it has big risk that its M/S heavily relies on Nokia's smart phone shipment.

Windows Mobile represents very high CAGR.

Converged Mobile Device represents very high CAGR (Normal Mobile Phone 2005-2010 CAGR: 6.1%) and will become the mainstream in 3G era.

Source: IDC, February 2006

China Smart Phone Market

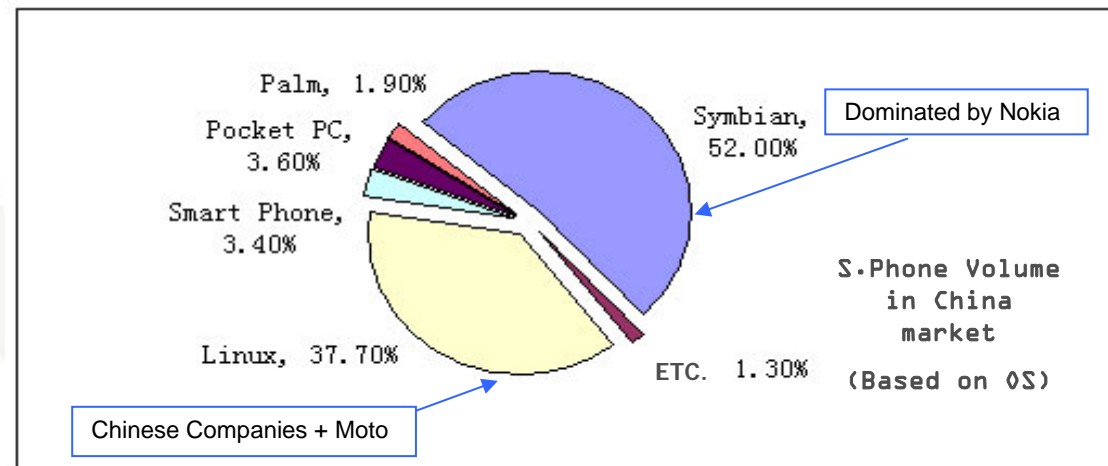


China smart phone market CAGR around 100% is expected in the next 4 years. (2007~2010)

S/P in CN MKT	05'1Q	05'3Q
models	24	51
M/S	2.6%	5%
ASP (Yuan)	5100	2900

2010' 20%

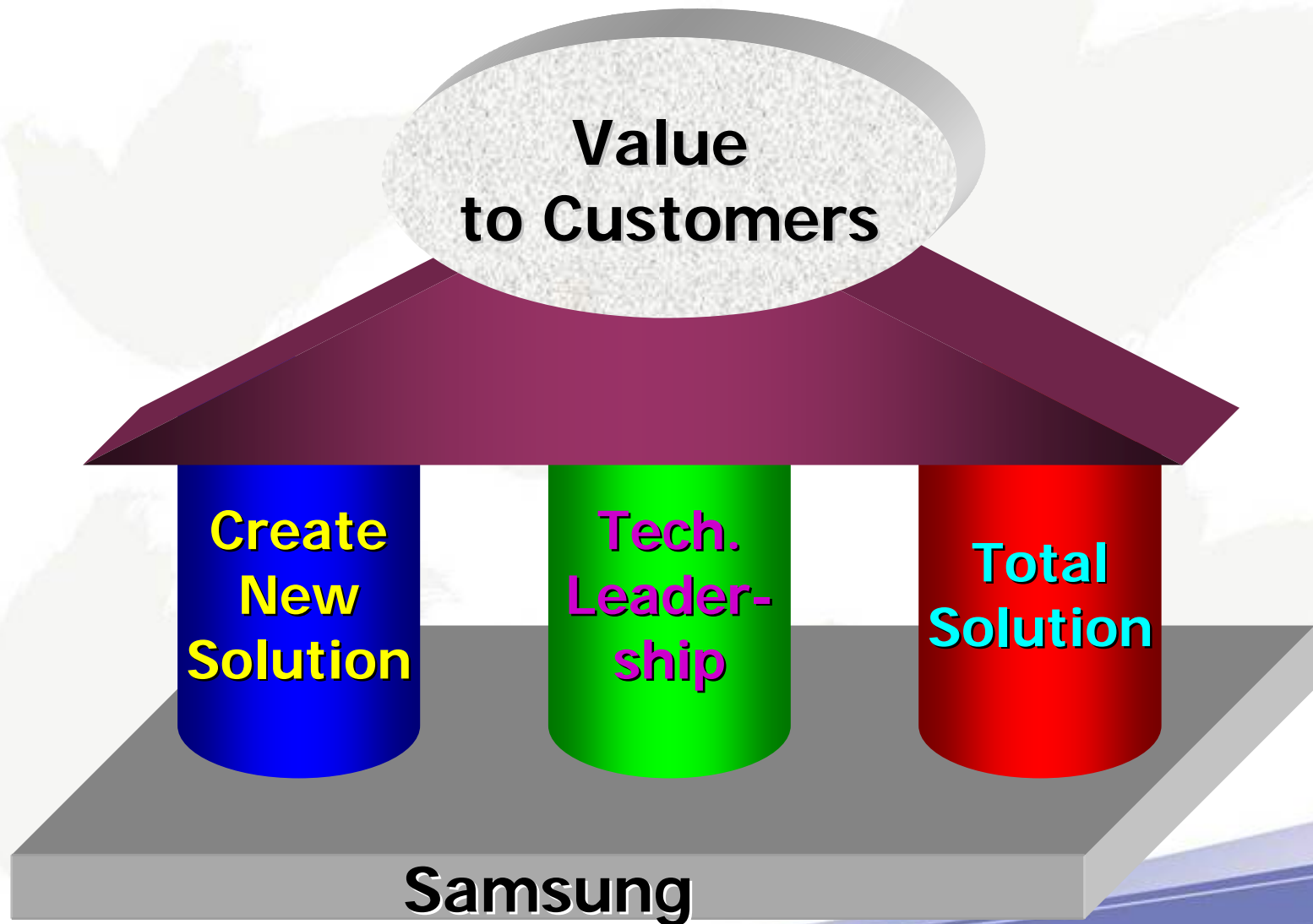
Source: CCID & BDA China



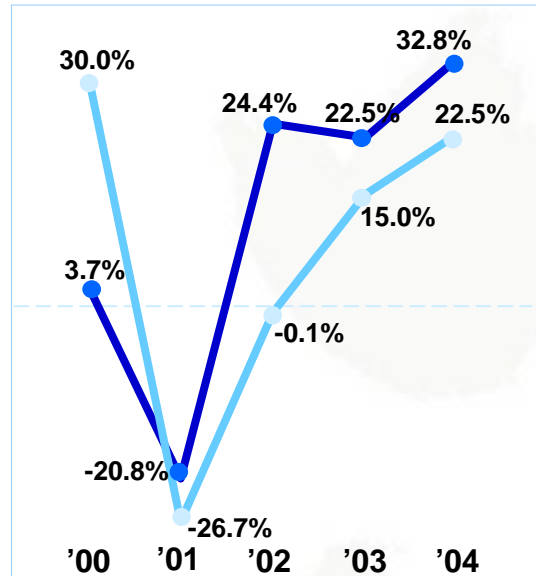
As price decreased, it is expected that smart phone will become popular in China from 2006.

Samsung's Strategy

Samsung Semiconductor Strategy : SLSI



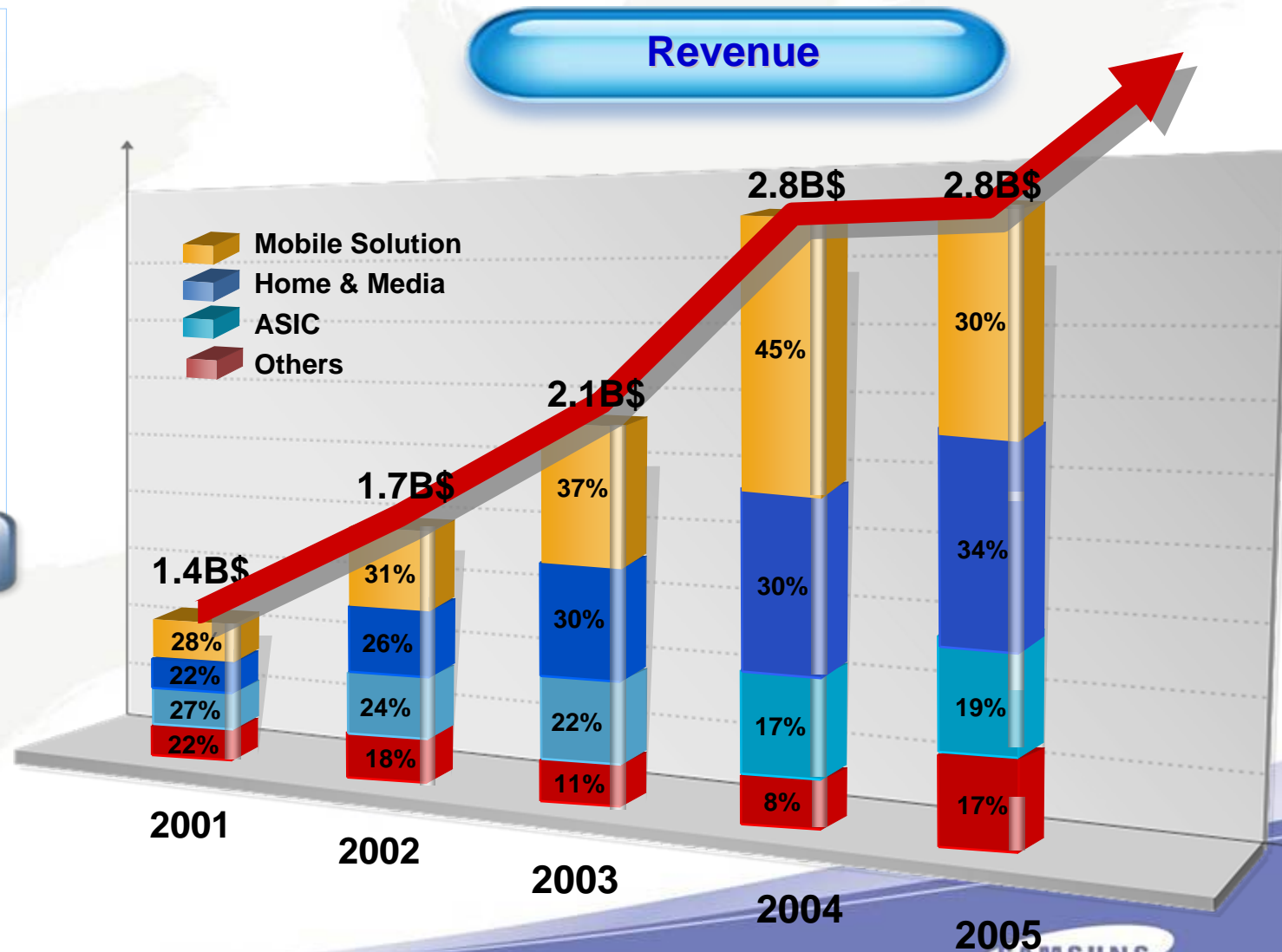
System LSI Revenue



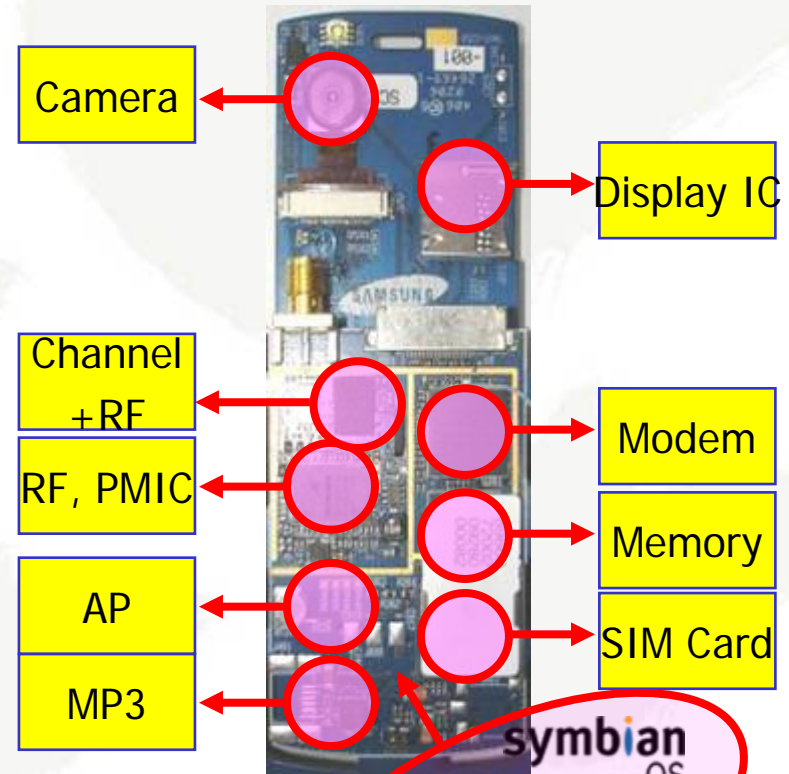
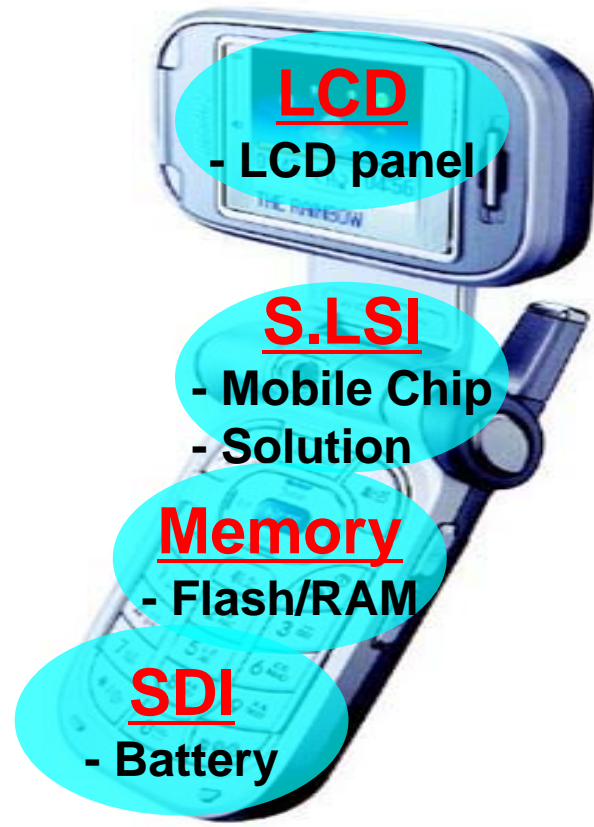
Growth Rate

WSTS, S. LSI Marketing ('05)

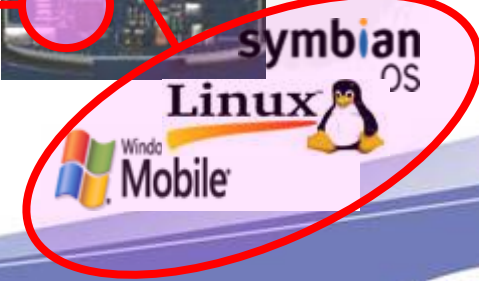
SAMSUNG Growth Rate ———
WW S. LSI Growth Rate ———



Samsung Mobile Solution

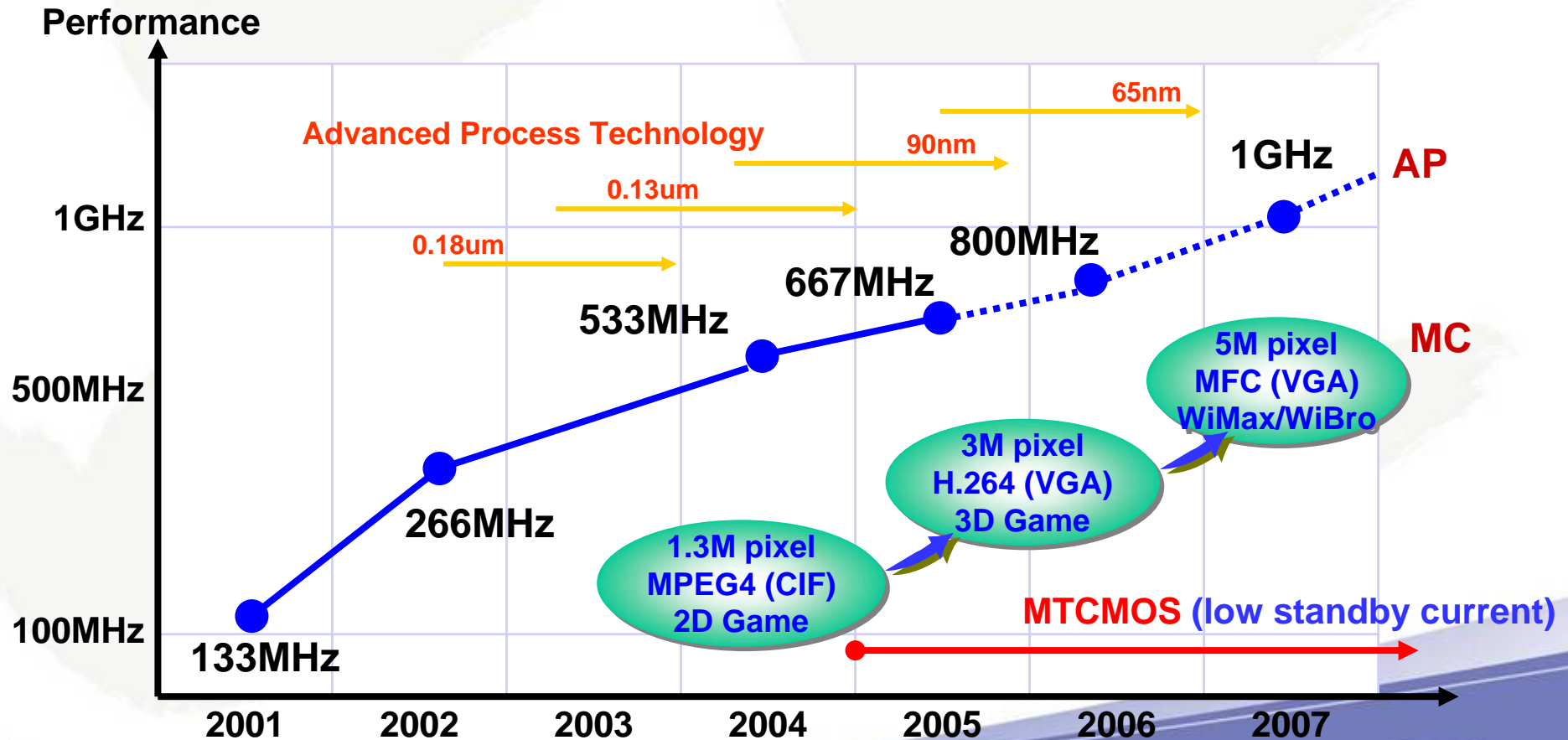


- Samsung Provides Total Solution



AP/MC Technology Migration

- Higher Speed AP : 533MHz ('04) → 667MHz ('05) → 800MHz ('06)
- Rich-featured MC : CIF MPEG-4 ('04) → VGA H.264 ('06) → HD MFC ('08)



*AP=Application Processor, MC=Multimedia Coprocessor, MTCMOS=Multi Threshold-voltage CMOS

Mobile Camera Solutions

- Create New Products
- Keep Technology Leadership

2005. 3

- Products

VGA
(1/5.8")

1.3M
(1/3.2")

- Samples

2M
(1/3")

3M, 5M
In 4Q05

- Pixel Size : 2.8um

2006. 3

- Products

VGA
(1/5.8")

1.3M
(1/3.2")

VGA
(1/8")

1.3M
(1/4")

2M
(1/3.2")

2M
(1/4")

3M
(1/3")

- Samples

5M
(1/2.5")

8.4M
(1/2.5")

1.3M
(1/5")

VGA
(1/10")

- Pixel Size : 2.8um, 2.25um,
1.75um

AP/MC Roadmap & Spec.

Application Processors in Products

- Phone



- Navigator



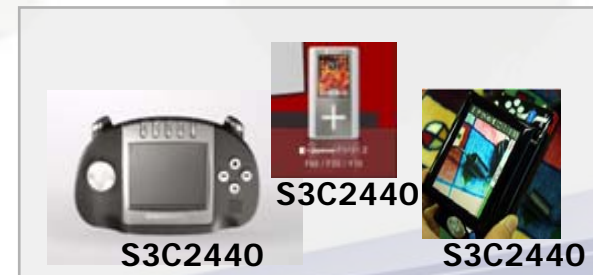
- PDA



- Photo Printer

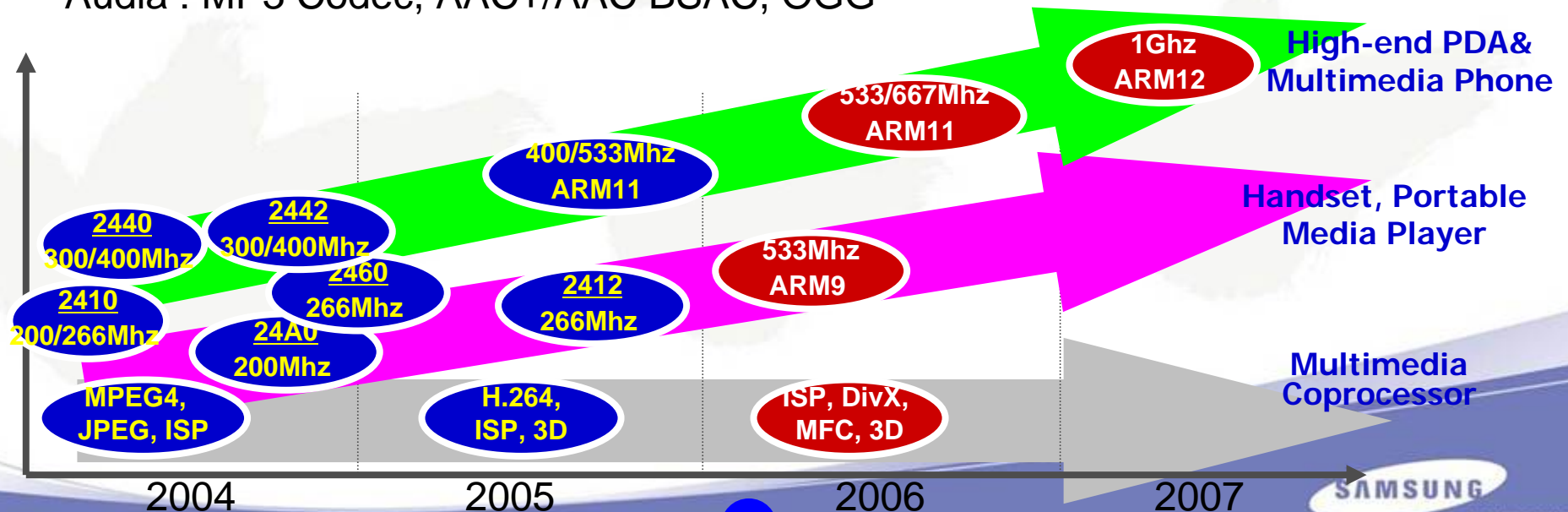


- Mobile Game



Application Processor

- ARM1176-based Mobile Processor w/ high level OS
- Integrated Solution via Advanced Packaging
 - PoP, SiP, Solution
- High-Level OS Support
 - WinCE(Photon), Linux(2.6.1), Symbian(v9.2)
- Multimedia SW Solution
 - Video : MPEG4/H.264/DivX(D1 @30fps), 3D Graphics
 - Audia : MP3 Codec, AAC+/AAC BSAC, OGG



Samsung AP/MC Hot Chips

ARM1176 Leadership



S3C6400

MC for 3G & Mobile TV



S3CA4C0

MSP(POP) Solution



S3C2442

533MHz General Purpose



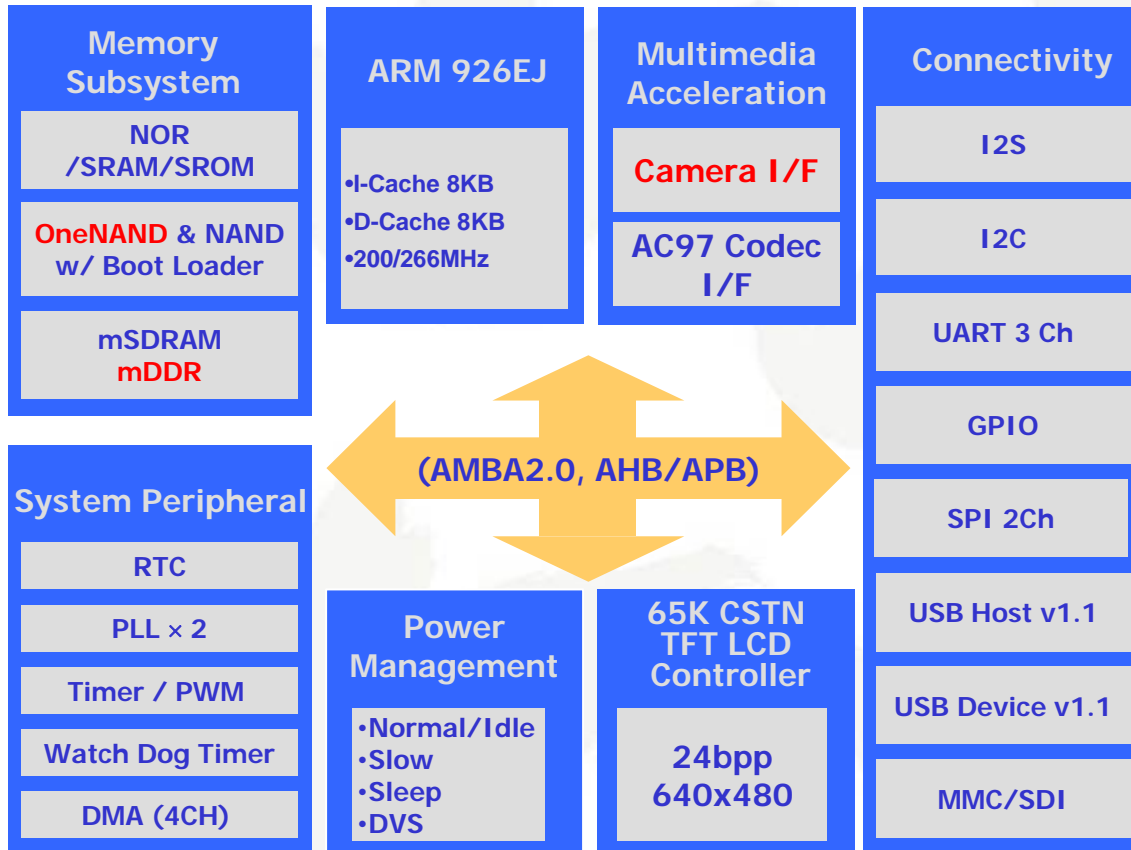
S3C2443

Entry General Purpose



S3C2412/13

S3C2412/S3C2413

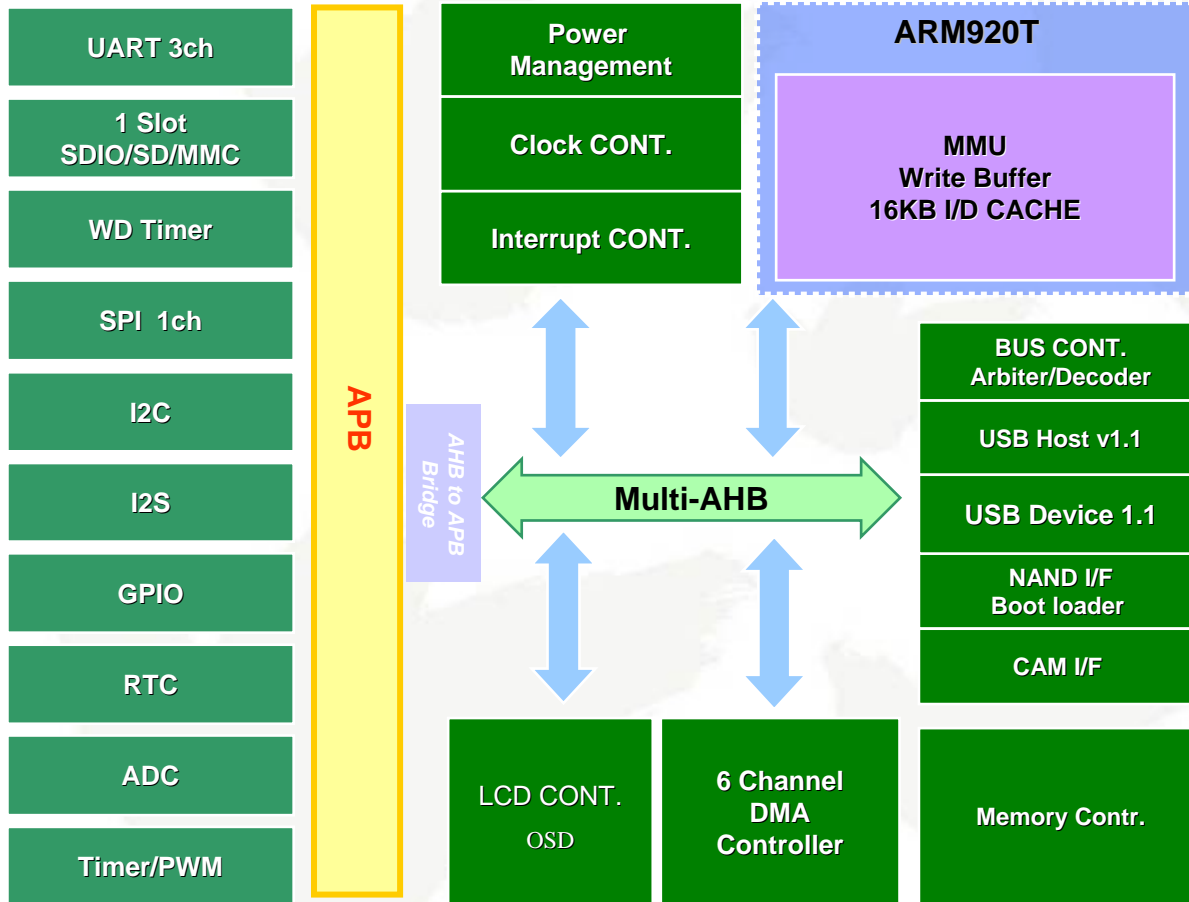


General Purpose Entry Level AP

- ARM926EJ core, 200/266Mhz
- USB Host 1.1 and Device 1.1
- mSDRAM & mDDR SDRAM Controller
- 2ch SPI
- 65K CSTN LCD Controller
- S3C2412 : 272pin, FBGA 14X14
- S3C2413 : 289pin, FBGA 14X14

S3C2442(MSP)

MSP Solution



- NAND Flash Bootloader/Controller
- LCD Controller
- Camera Interface
- USB Host/Device Interface
- UARTs
- Multi-master I2C-Bus Interface
- I2S-Bus Interface for audio
- 16-bit PWMs and 16-bit Timer for OS
- 2-channel SPIs
- SD Host & MMC Interface v1.1

FS : Available

Processor + 32MB mobile SDRAM + 64MB NAND Flash

Processor + 32MB mobile SDRAM + 128MB NAND Flash

Processor + 64MB mobile SDRAM + 128MB NAND Flash

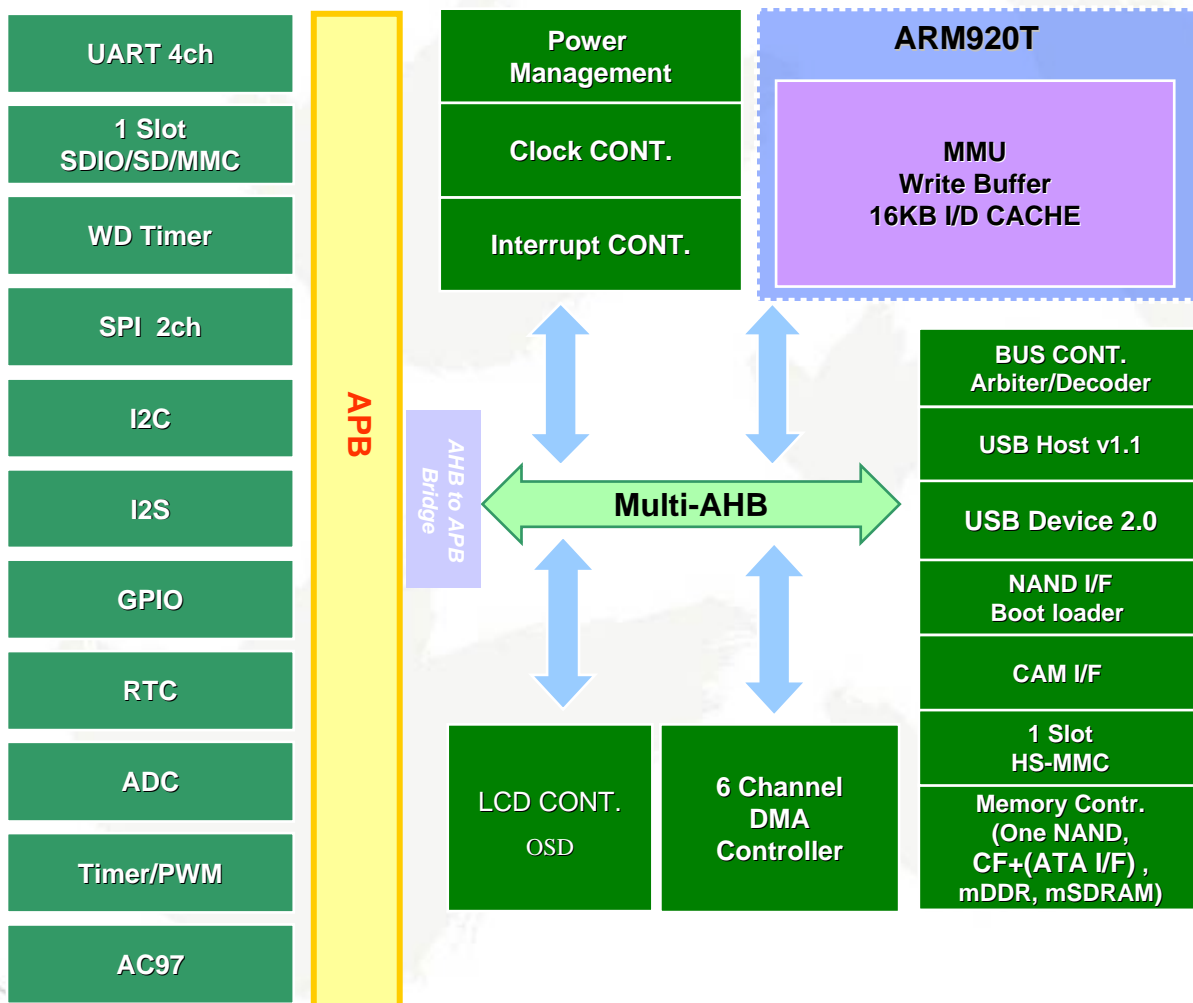
Processor + 64MB mobile SDRAM + 256MB NAND Flash

SAMSUNG

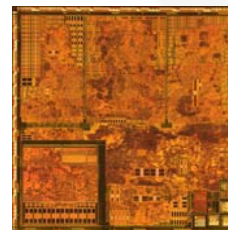
ELECTRONICS

S3C2443X01

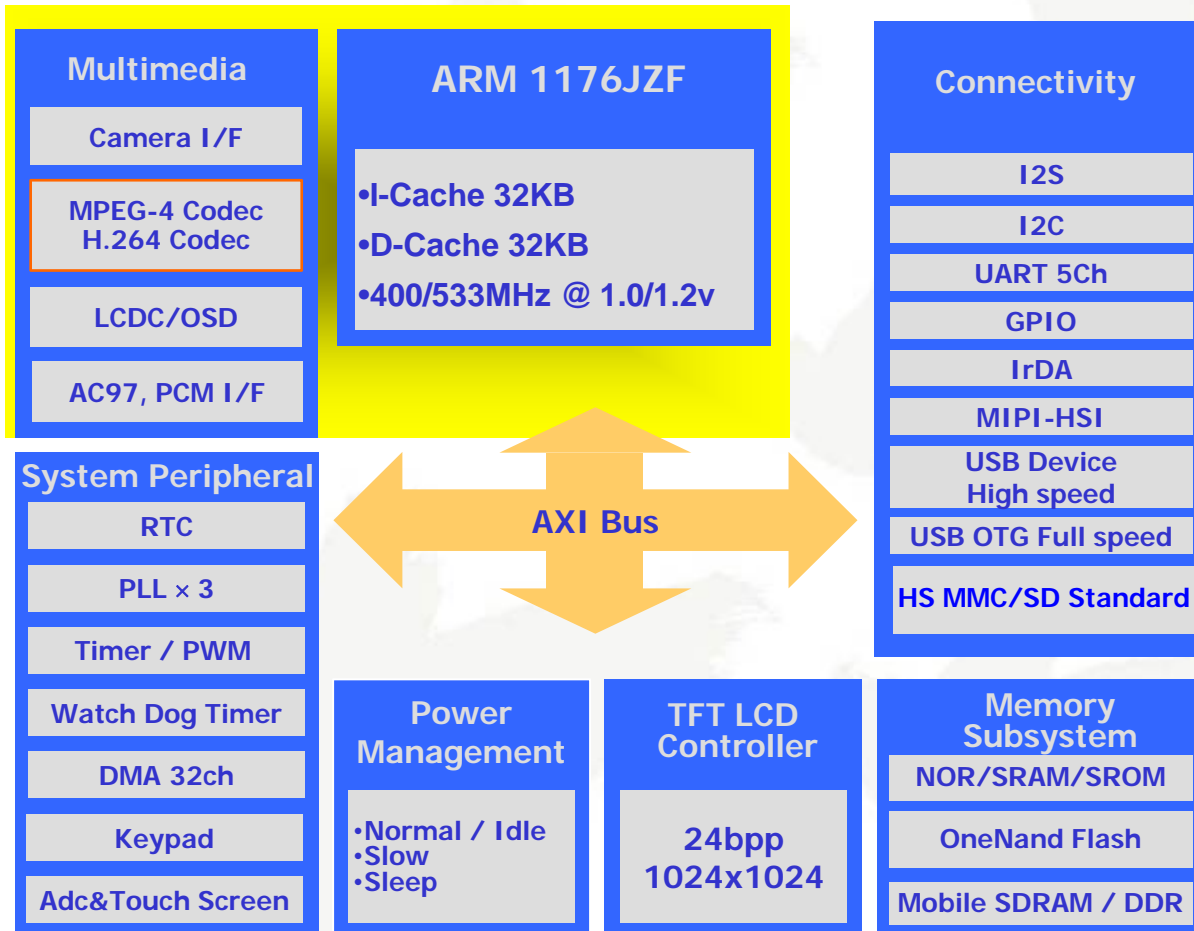
533MHz General Purpose AP



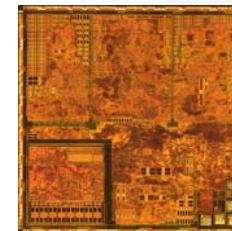
- ARM920T Core
- 130nm High Speed process
- 533MHz @TBD
- Support CF+(ATA I/F), One-NAND
- Camera I/F
- USB 2.0 Device (High Speed)
- High Speed SPI
- HS-MMC/SDIO



ARM1176 Leadership Product

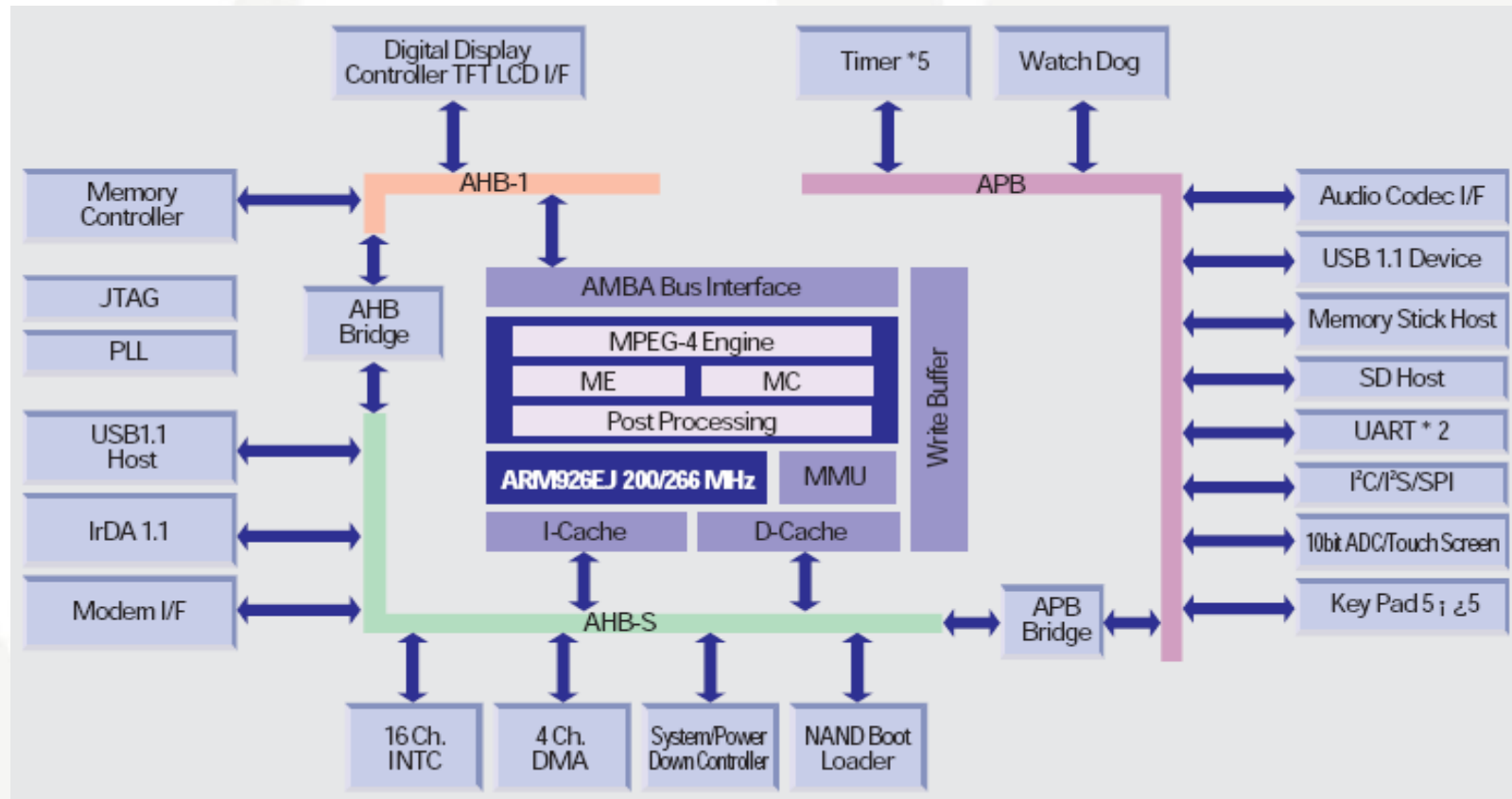


- ARM1176 JZF Core
- 90nm MtCMOS
- 400MHz @1.0v, 533 MHz @1.2v
- Multi-Media
 - MPEG-4 Codec : D1 30fps
 - H.264 Codec : D1 30 fps
 - VC1 Codec: D1 30fps
- USB 2.0 Device (High Speed)
- USB OTG (Full Speed)
- HS-MMC/SDIO



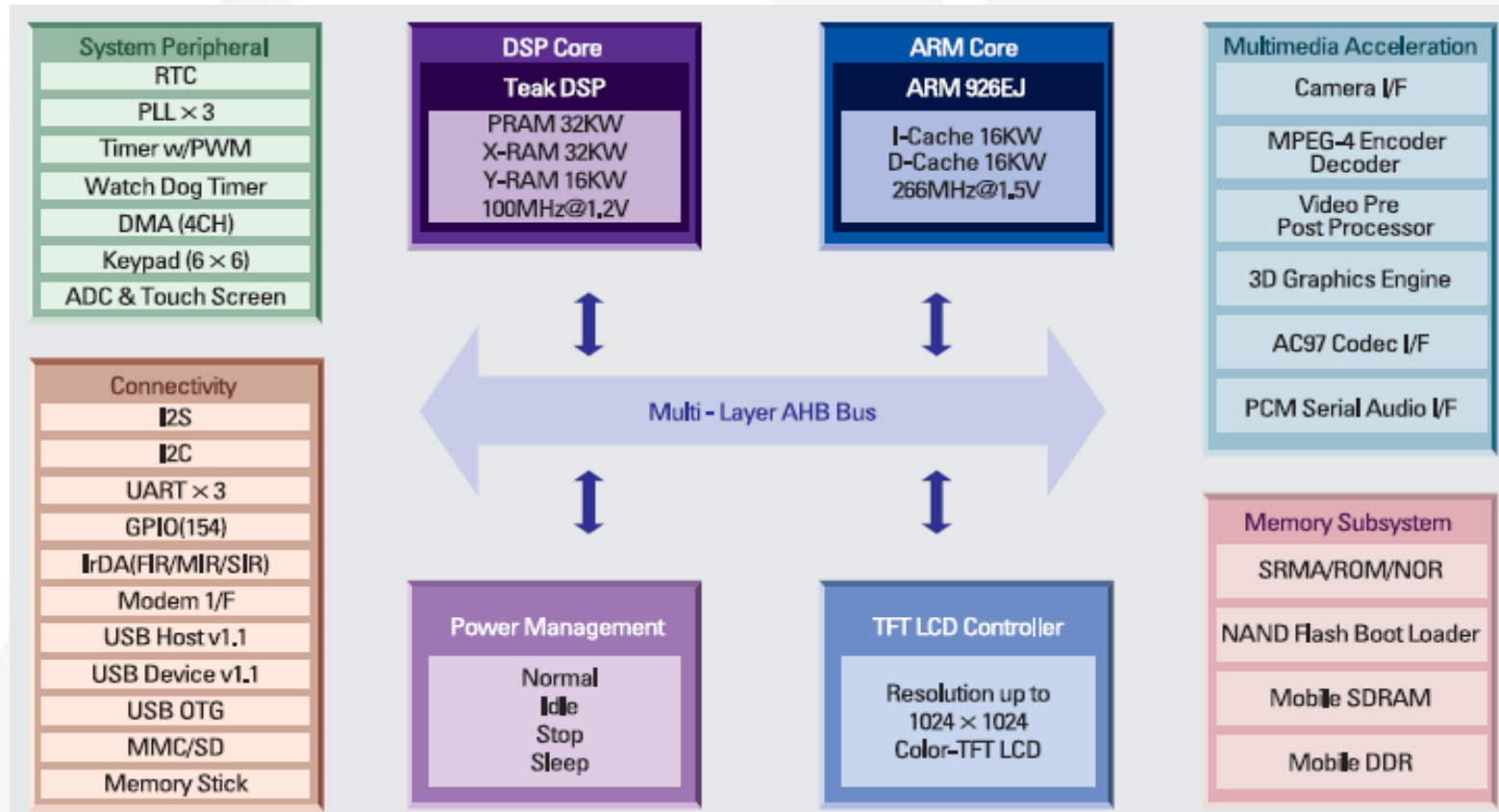
S3C24A0

- AP for Mobile Communication



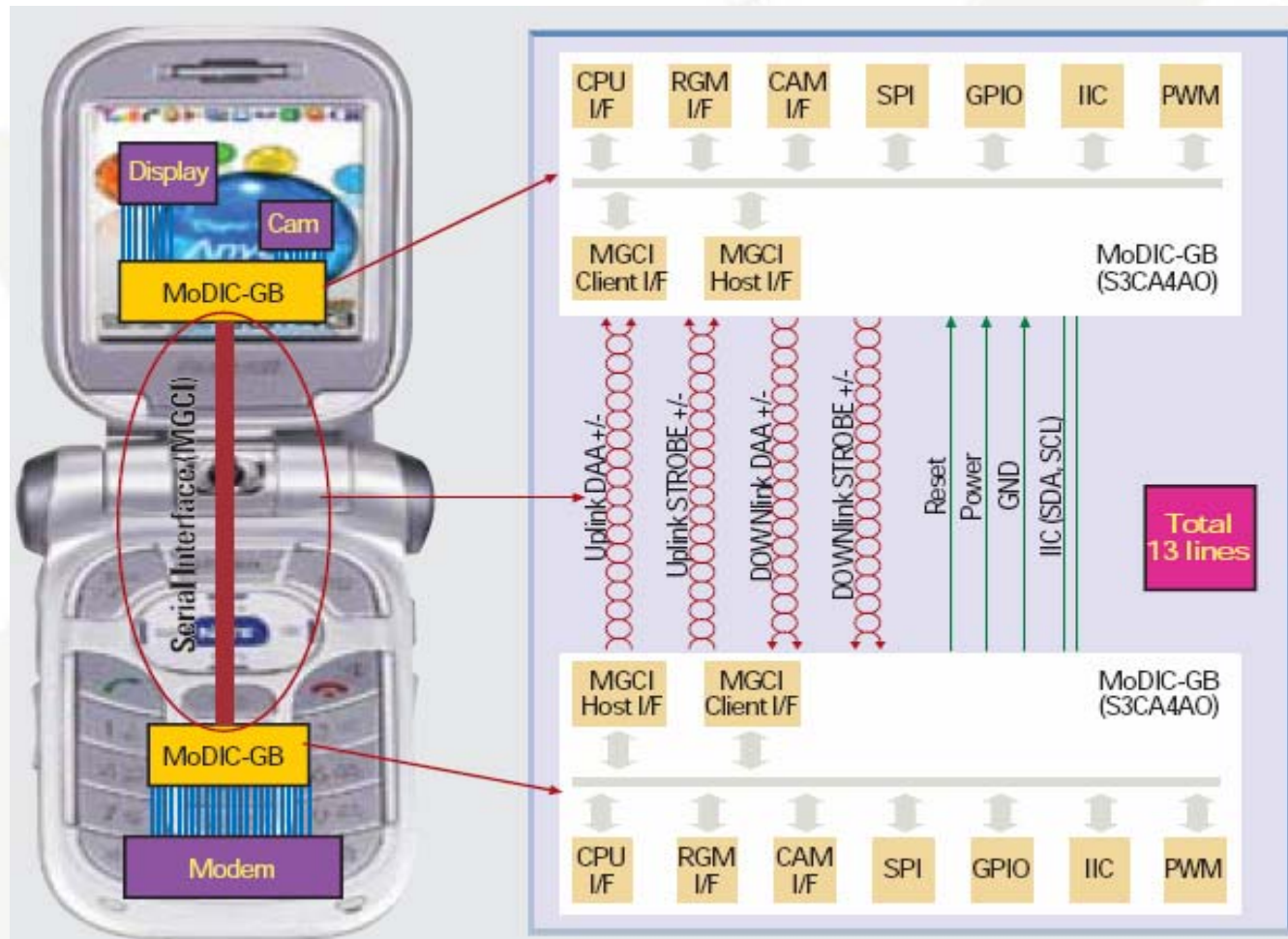
S3C2460

- AP for Mobile TV Phone with PMP/Game Feature



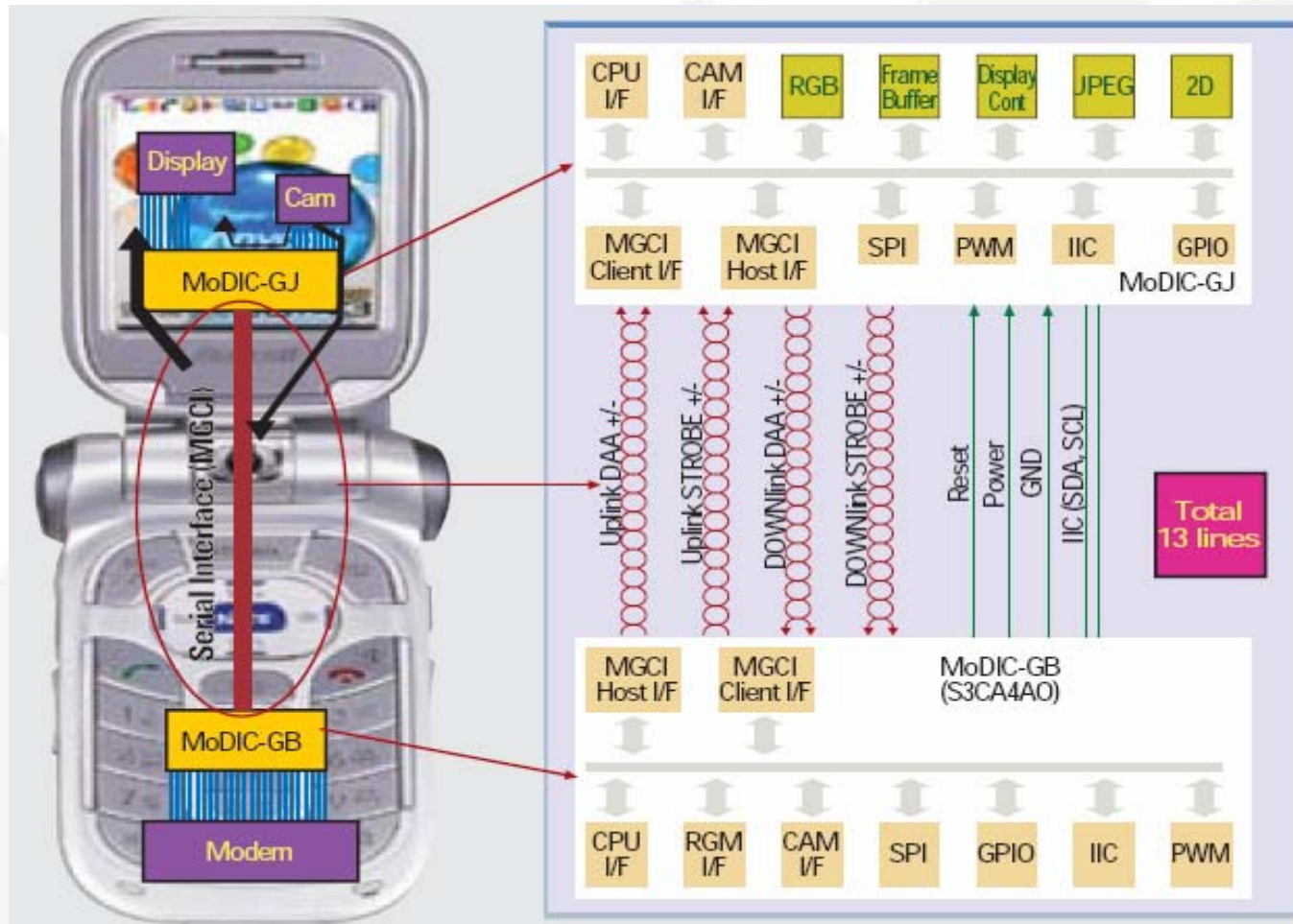
S3CA4A0

- Mobile Display & Image Coprocessor

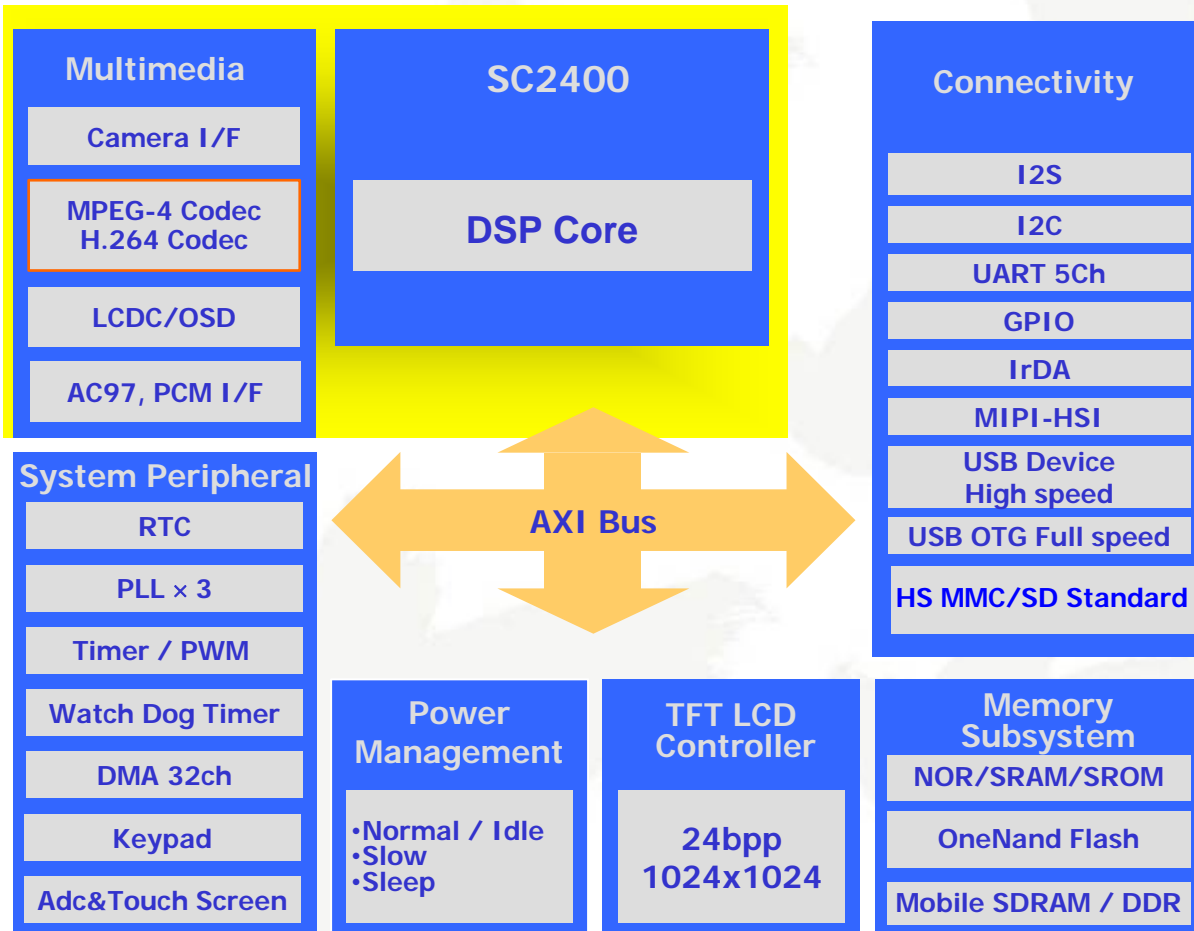


S3CA4B0

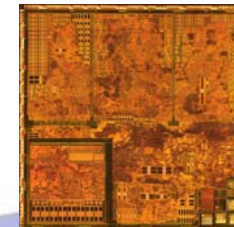
- Mobile Display & Image Coprocessor



MC for 3G & Mobile TV

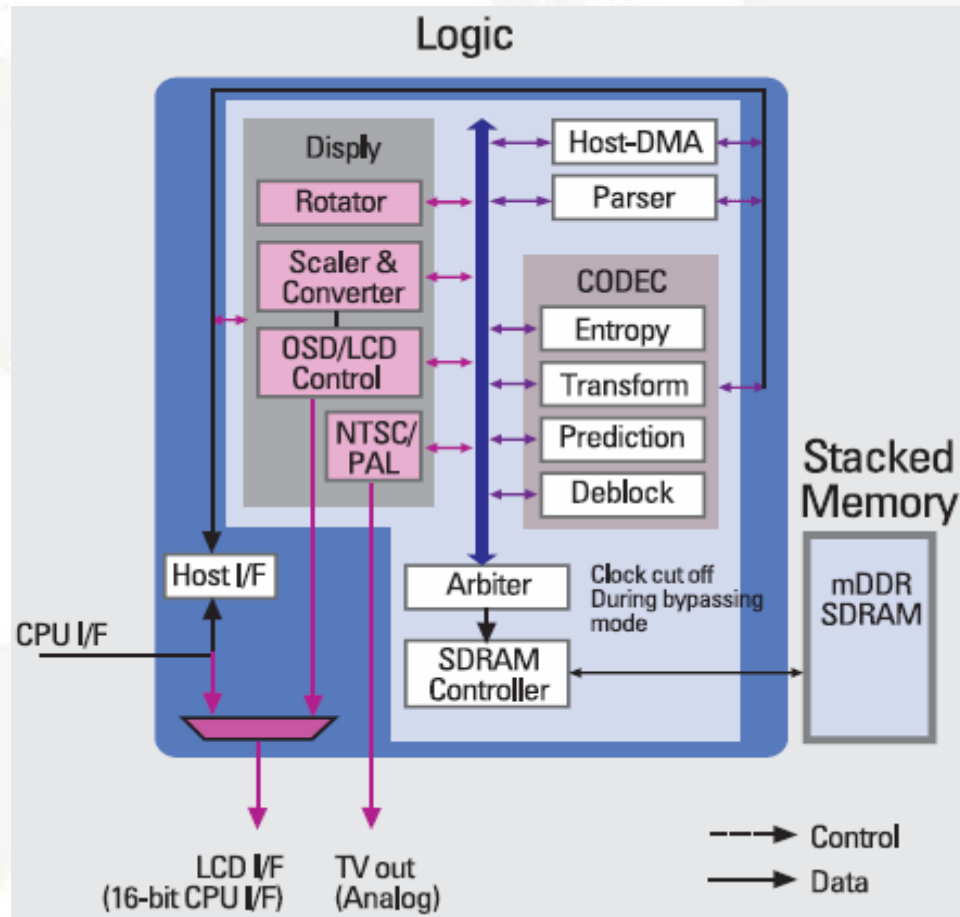


- StarCore SC2400 DSP Core
- 90nm MtCMOS
- Embedded memory for low-power
- Multi-Media
 - ✓ MPEG-4 Codec : VGA @ 30fps
 - ✓ H.264 Codec : VGA @ 30fps
 - ✓ VC1 Decoder : VGA @ 30fps
- USB OTG (Full Speed)
- HS-MMC/SDIO
- HS Serial I/F : 600Mbps @Tx, Rx
- Low Power : 10mA @MP3 Dec.
- Application : Camcorder Phone
3G VT-Phone
DVB-H, T-DMB, S-DMB



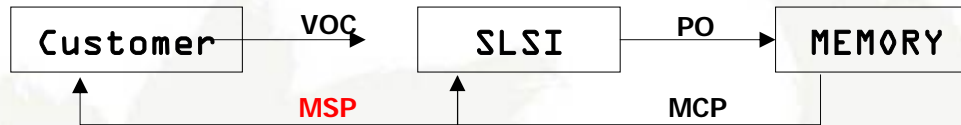
SA3A480

- H.264 H/W Decoder for Mobile TV Solution



MSP Solution

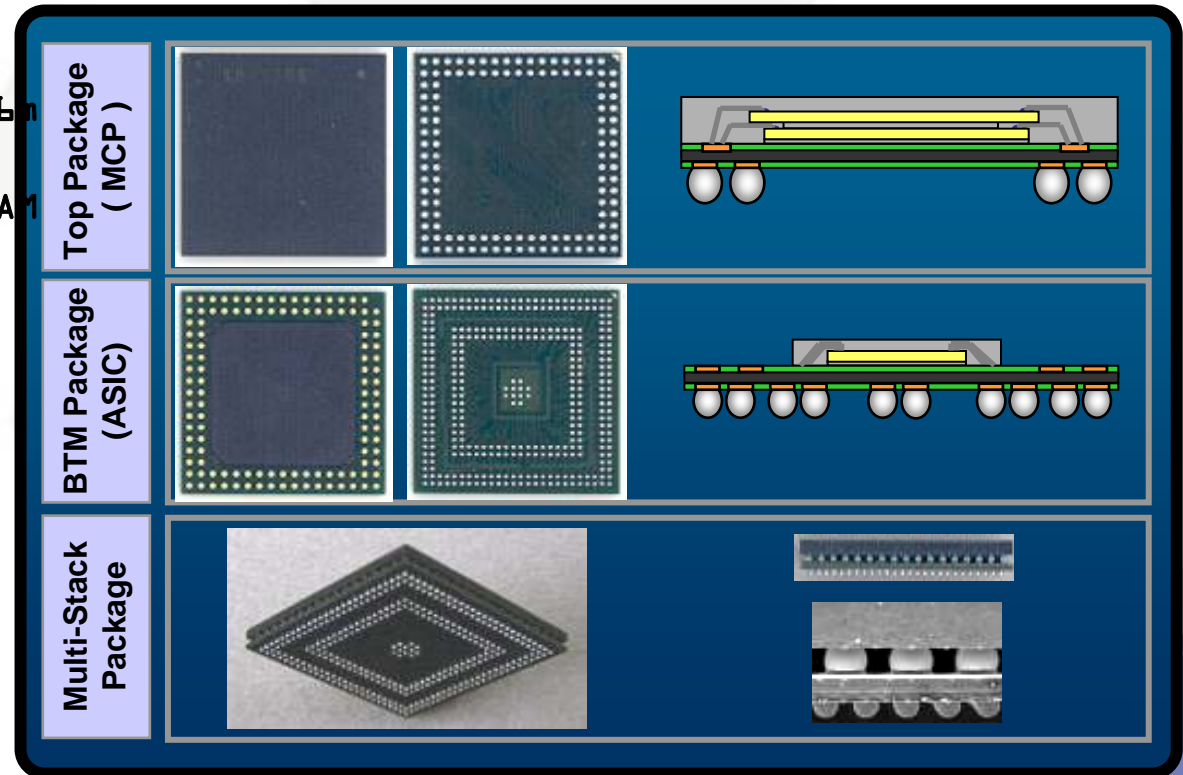
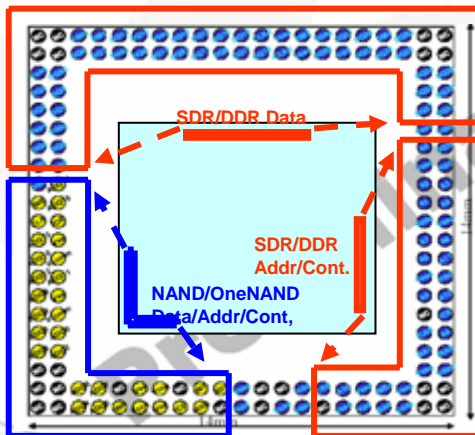
- Activate **MSP** Business with Memory & SLSI strategic synergy policy



- SLSI can provide diverse Memory combination
ex) NAND Flash+SDRAM, DRAM+DRAM, Nor Flash+UtRAM, ...

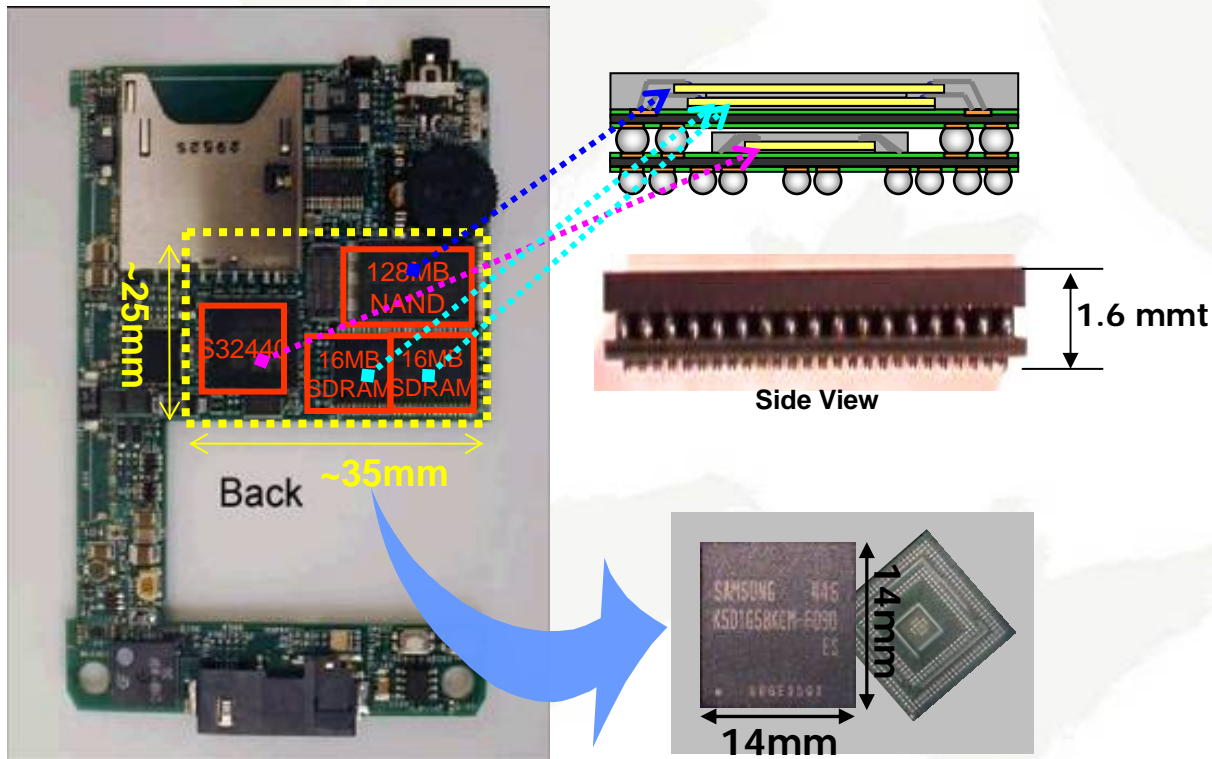
- MSP Platform Experience

- (1) Body Size : 14mm x 14mm x 1.6mm
- (2) Ball count: 332 balls
- (3) Combination: AP + NAND + SDRAM
- (4) Design Flexibility

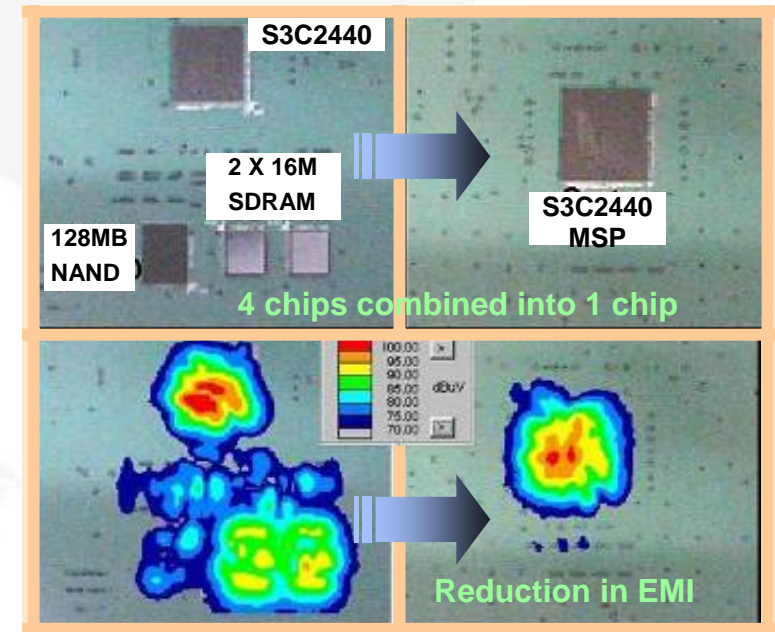


Benefits of MSP Solution

- Samsung MSP technology can give you Competitive solution & Time to market



Area reduction by 60%

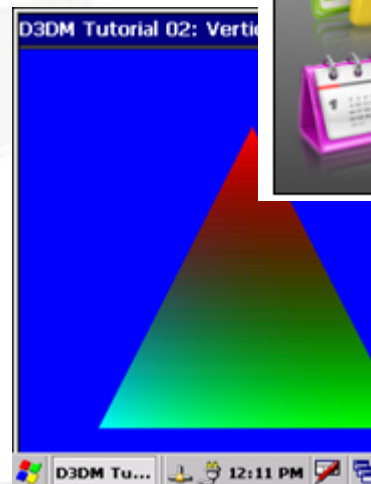
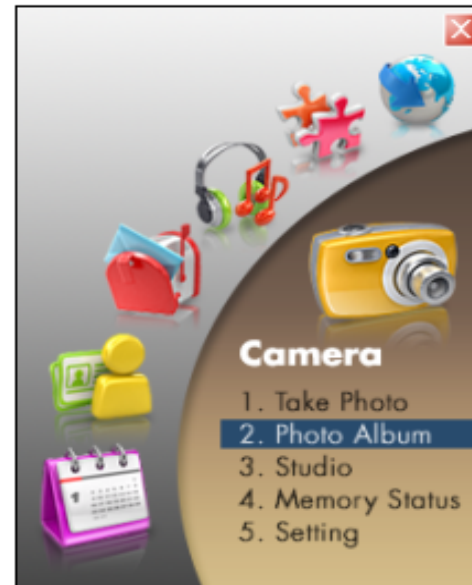


EMI improvement

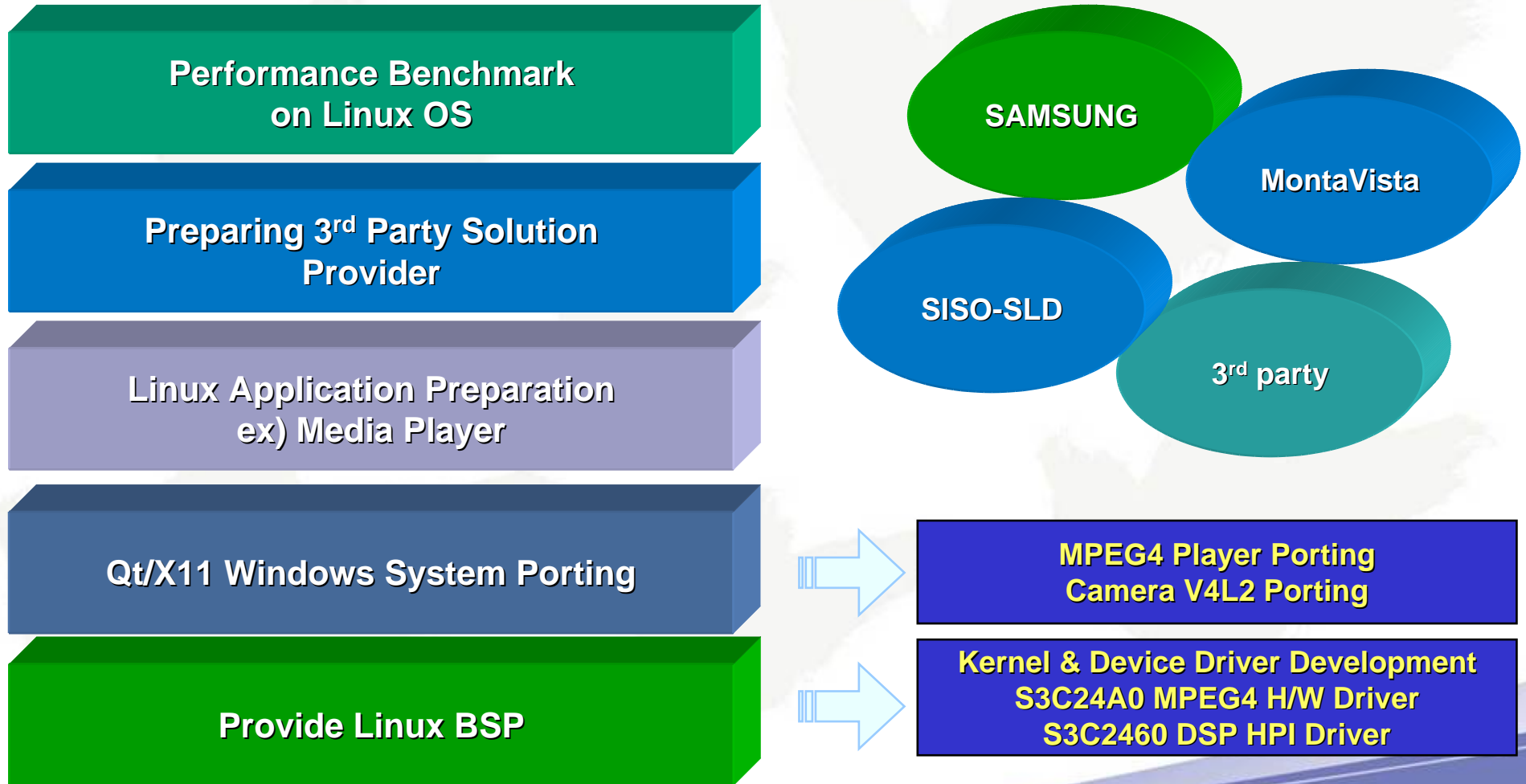
AP/MC Solution - Software

AP Solution – WinCE Solution

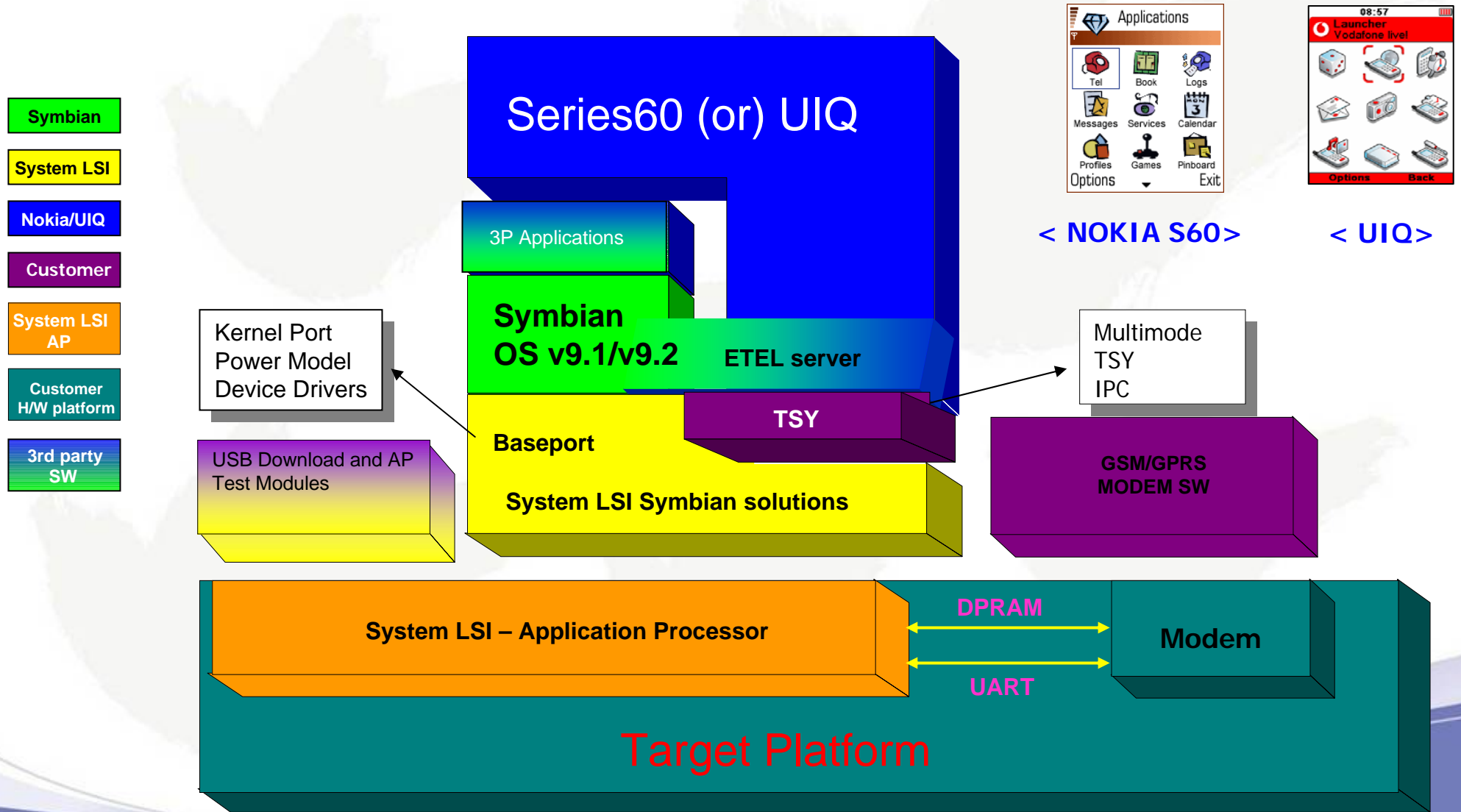
- Supported BSP (Board Support Packages)
 - WinCE .NET 4.2 and 5.0
 - Ozone Update PPC/SP, Magneto PPC/SP
- Application
 - PIMs
 - WMP
 - Camcorder
 - D3D Mobile
 - BT Profile
- 3rd Party solution
 - WinCE5.0 Phone
 - GPS Application



AP Solution – Linux Solution

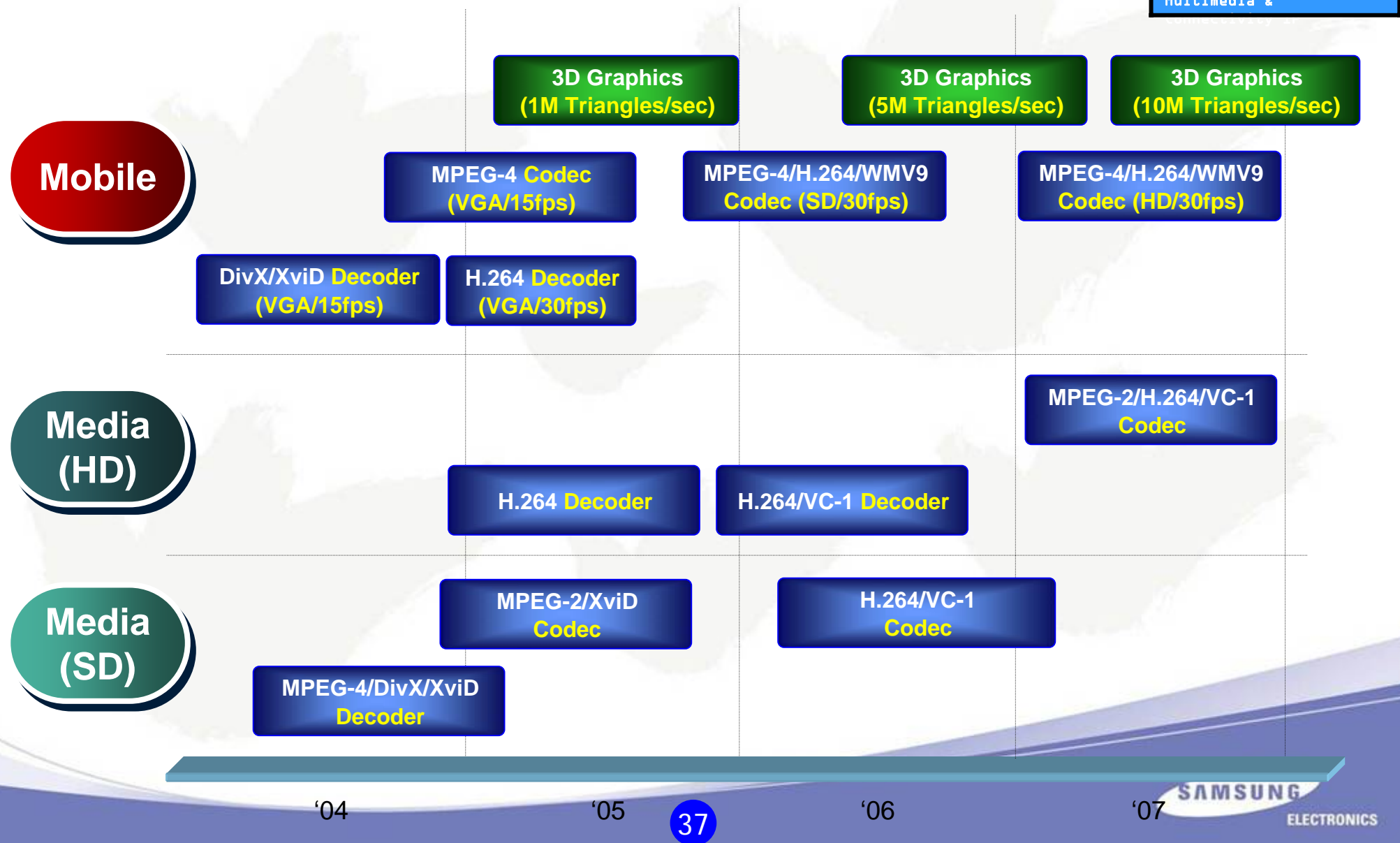


AP Solution – Symbian Solution



Multimedia Codec Solutions

Multimedia &



3rd Party MM Provider

Multimedia Codec & Applications

Helix
COMMUNITY

real

packetvideo

emuzed

Ittiam

3D Sound

BEATNIK

DiMAGIC

SRS

Q
QSOUND

Mobile 3D game & Flash

HI CORPORATION

REAKOSYS

SUPERSCAPE

Fathammer

enjoy the mobile
NCO MTEL

SINJISOFT

DMB Solutions

PIXTREE
TECHNOLOGIES

tmi

onTimetek
A NEW WAY TO SEE THE WORLD

SAMSUNG

ELECTRONICS

< System LSI >

Samsung AP Advantages

- Samsung AP Advantage
 - Wide Mobile Application Spectrum
 - Multimedia Application
 - High speed computing Application
 - Low cost Solution
 - MSP
 - Customer Support
 - On-site support
 - Real time support from HeadQtr (Same Time Zone)
 - Hardware / Software Total support (1 team)
 - Reference Platform
 - PDA
 - Smartphone
 - Mobile TV

AP/MC Solution - Mobile TV Solution

W/W Mobile TV Market

DVB-H

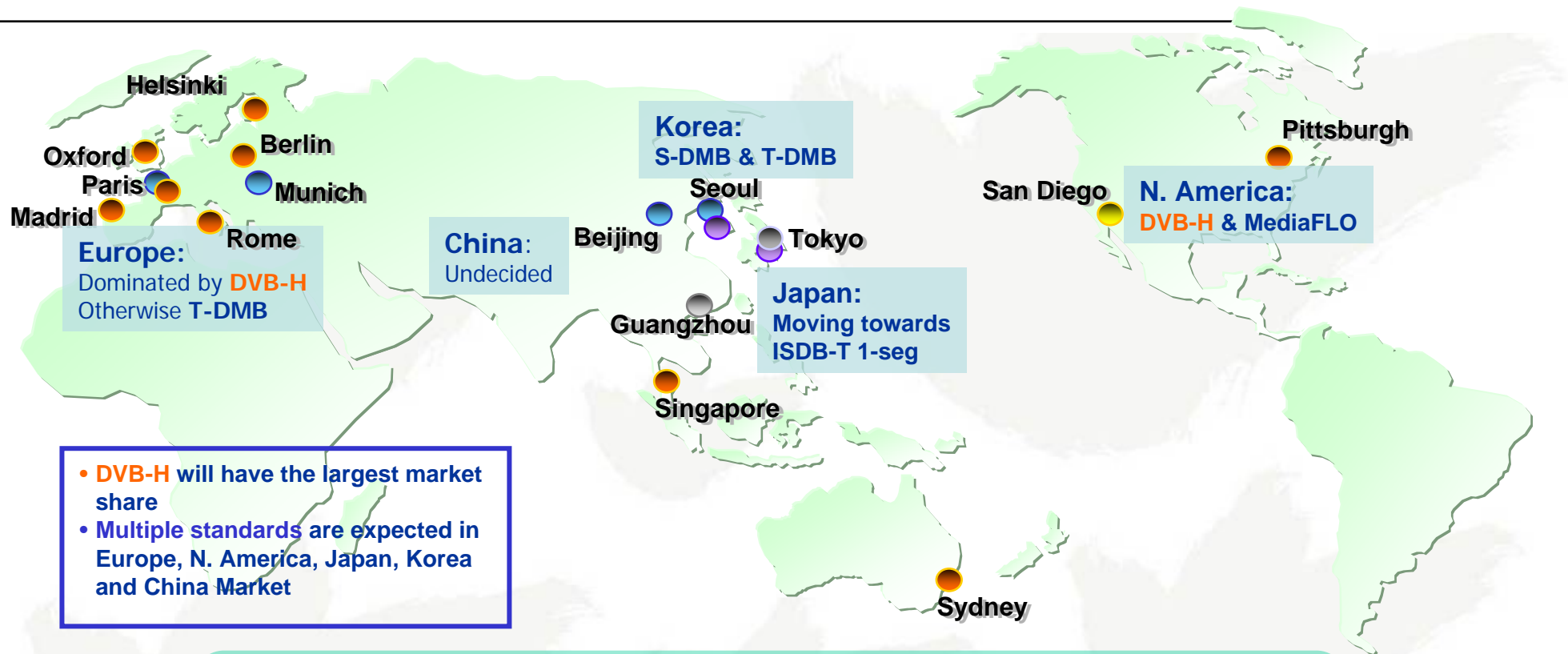
T-DMB

S-DMB

ISDB-T 1/13

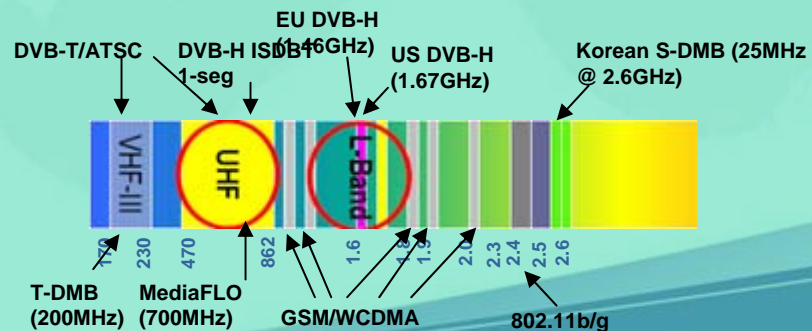
MediaFLO

Etc.



- **DVB-H** will have the largest market share
- Multiple standards are expected in Europe, N. America, Japan, Korea and China Market

Spectrum Licensing by Technology

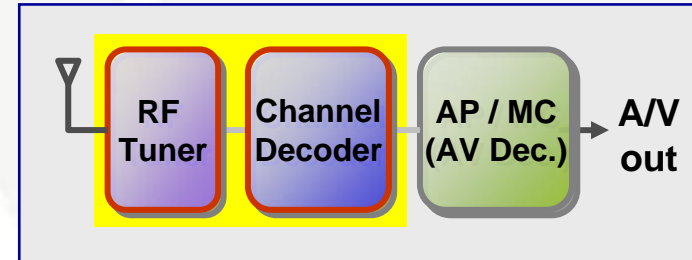


Mobile TV : Status

- Chipset Solution for DVB-H

- RF receiver --- 3-band (UHF, US L, L1)
- Channel decoder --- on-chip SRAM
- Source Decoder --- H.264, no ext. memory

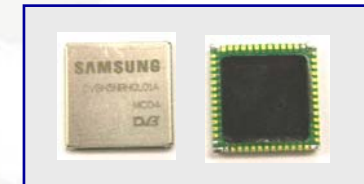
Mobile TV Receiver Module



- DVB-H Module

- RF receiver + Channel decoder + Other Components
- Size : 11x11x1.9t → 9x9x1.1t

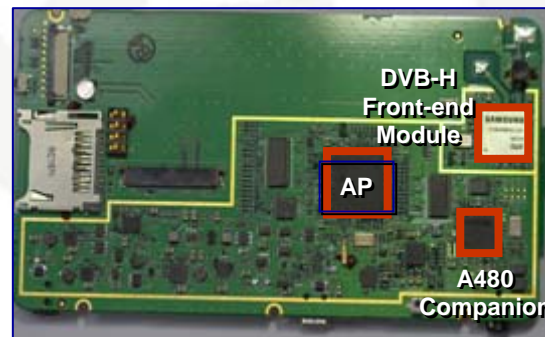
DVB-H Module



- Fully Tested Solution

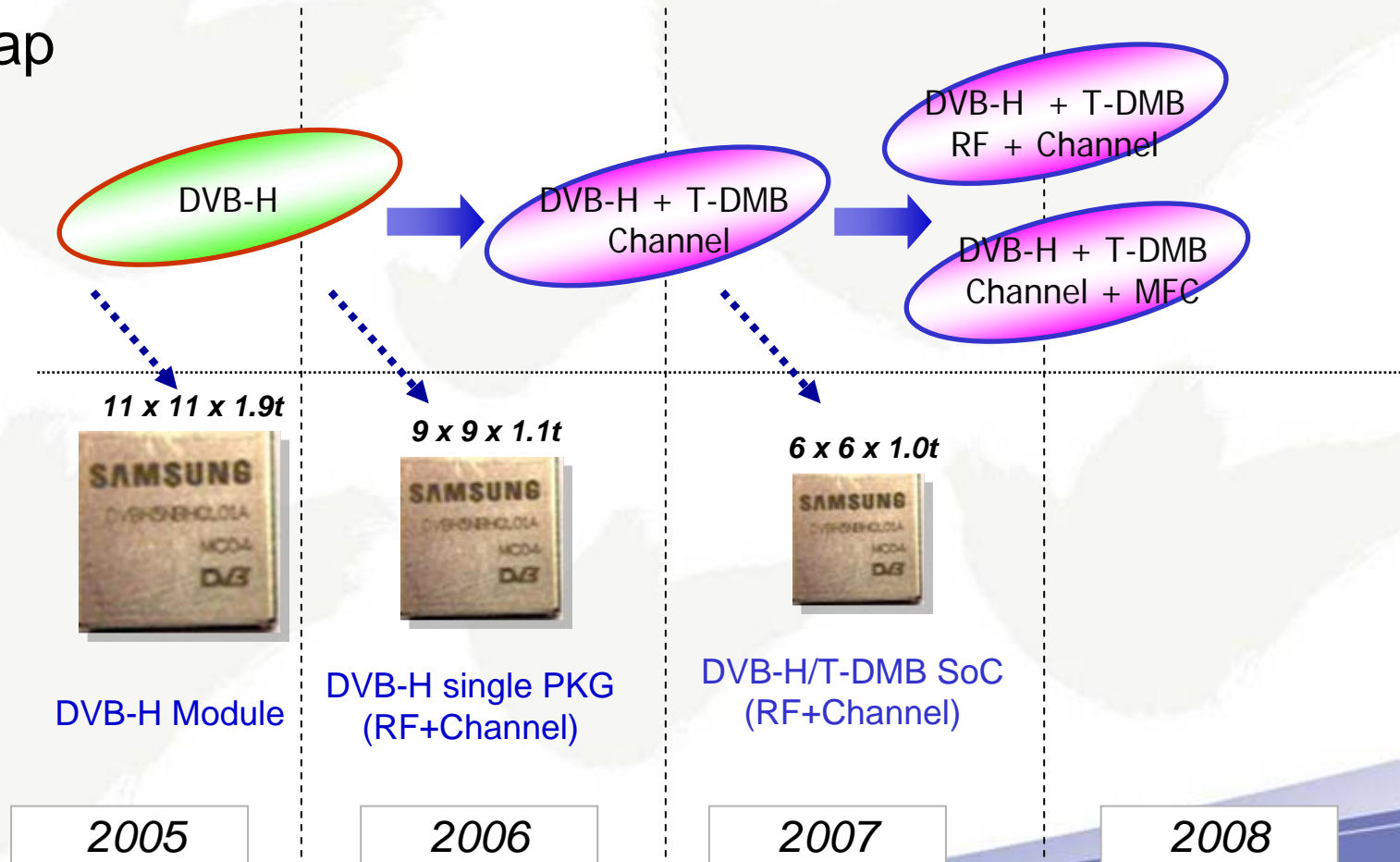
- Video streams
- Over-the-air transmission

DVB-H Reference Platform



Mobile TV : Plan

- Roadmap



Providing Total Solution

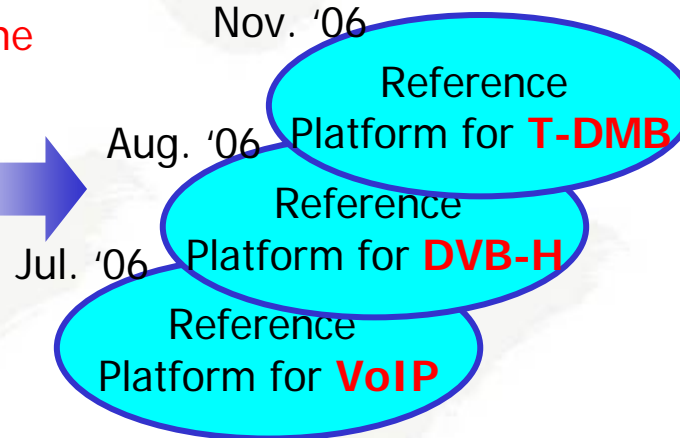
- Samsung Provides Total AP Solution

- Chip solution --- low power, high performance, low cost
- SW solution --- high level OS, MM application SW
- Reference platform --- real-form factor design

- ✓ Reference Platform for
Smart Phone & PDA Phone

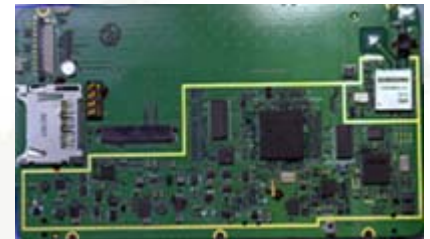


2005



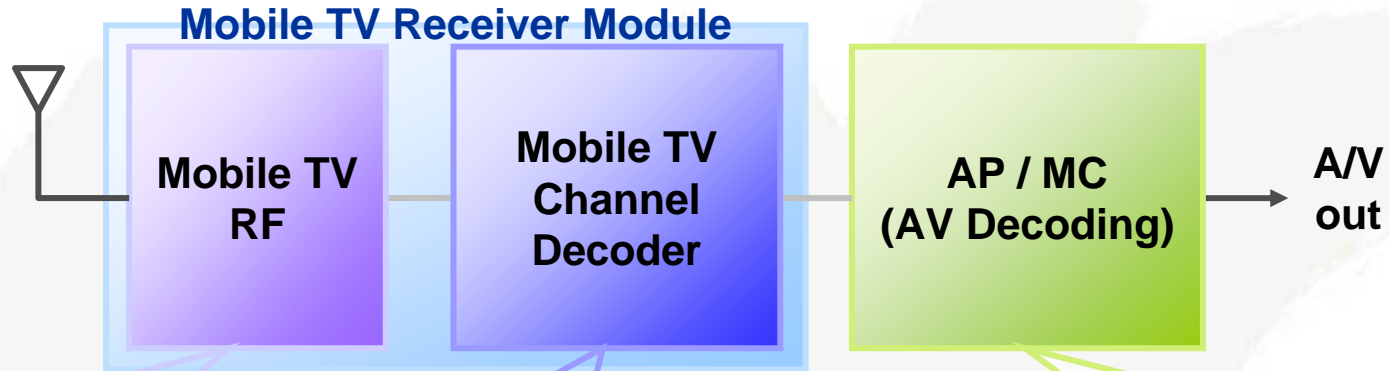
2006

- ✓ DVB-H Reference Platform



- WinCE support
- Device Driver SW
- Application SW

Samsung DVB-H Total Solution



S5M8600

- Fully integrated CMOS zero-IF DVB-H tuner
- Supports worldwide DVB-H frequencies
 - UHF and US/EU L-band
- Minimized number of external components
- Samples available

S3C4F10

- Fully compliant to DVB-H and DVB-T standards
- PHY + LINK supported
- All required memory integrated on the chip
- Samples available

Software

- Physical Layer control
- Link Layer software

Samsung AP&MC

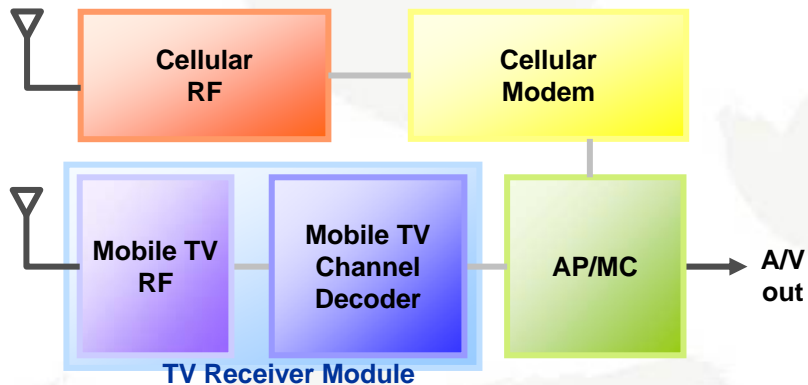
- S3C2442
 - ARM9-based AP
- mDirac III +
 - ARM11-based AP with hardware video codec
- SA3A480
 - H.264 decoding MC
- MoDIC-GM
 - Multi-standard A/V codec MC

Software

- DVB-H chip set driver
- DVB-H protocol stack
- A/V decoding

Samsung Mobile TV Roadmap Directions

Current Mobile-TV-Enabled Handset Architecture



Single Chip Direction for Size and Cost Optimization

- (1) Channel + Multi-Format AV Dec.
- (2) RF + Channel

Multi-Standard Support

- (1) Multi-mode RF
- (2) Multi-standard Channel (DVB-H, T-DMB and ISDB-T)

Total Solution Provider

- (1) Various chip configurations for various applications and markets
- (2) Unified software solution support for various OS and environments

Samsung Roadmap Direction (or Development Priority) could be adjusted according to the Customer's Preferences

AP/MC Solution - Reference Platform

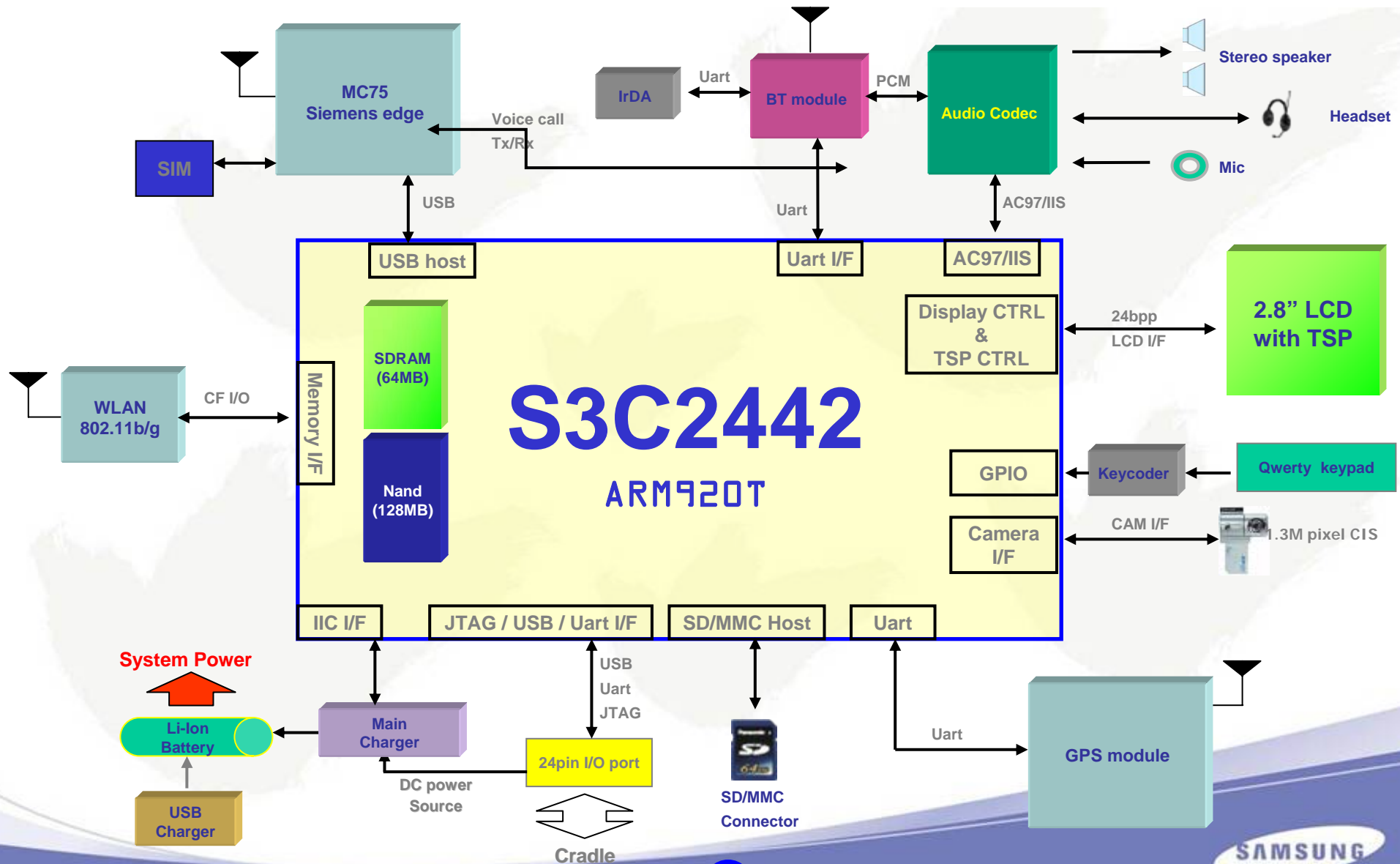
Kingfish III feature set



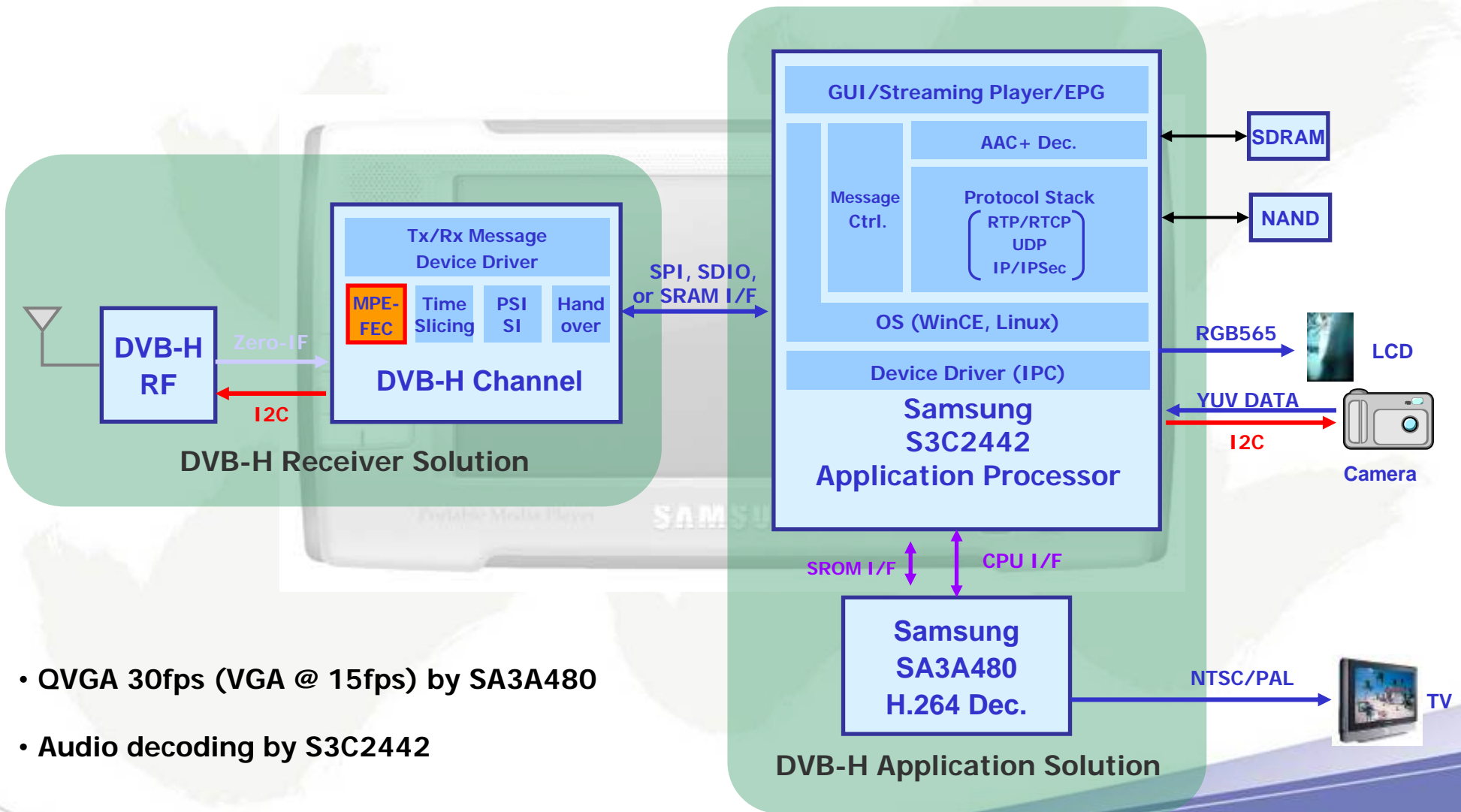
Key Features

- S3C2442 (400MHz, ARM920T)
- 128MB Samsung NAND flash memory (K9K1G0FU0B)
- 64MB Samsung Mobile SDRAM (K4S513233F)
- 320*240 pixel(2.8") Samsung TFT-LCD with touch screen panel(LTP280QV-ED)
- AC 97 Audio Codec (WM9714L)
- SD/MMC Card Socket
- 1.3 Mega-pixel Samsung camera module
- Built-in SEMCO Bluetooth module based on Broadcom chipset
- Built-in SEMCO WLAN 802.11b module based on Marvell chipset
- Built-in SEMCO GPS module based on SiRF chipset
- Built -in IrDA 1.0
- 24 Pin I/O Connector(USB Device, UART, DC Power)
- QWERTY Keypad and Application Keys

Kingfish III Block Diagram



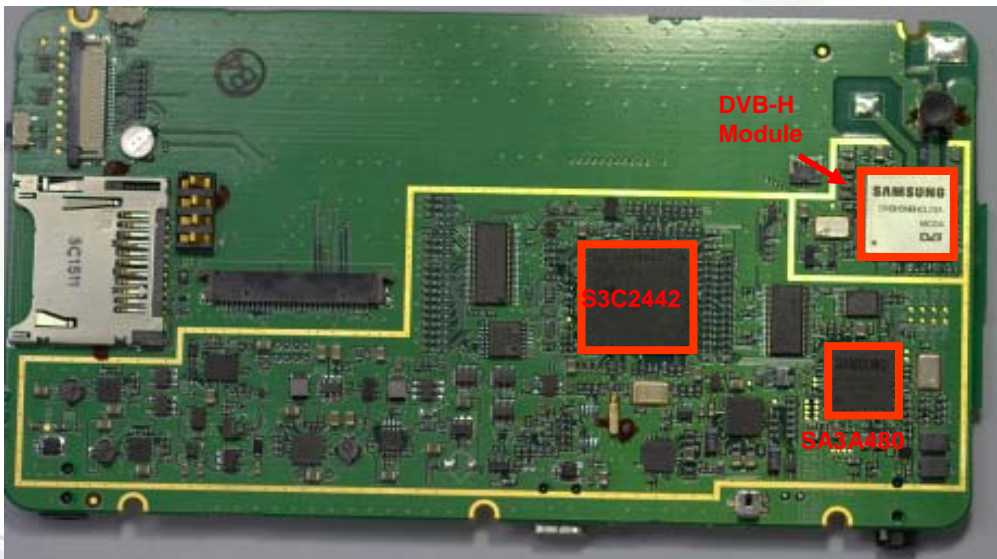
DVB-H Platform Solution



- QVGA 30fps (VGA @ 15fps) by SA3A480
- Audio decoding by S3C2442

DVB-H Reference Platform

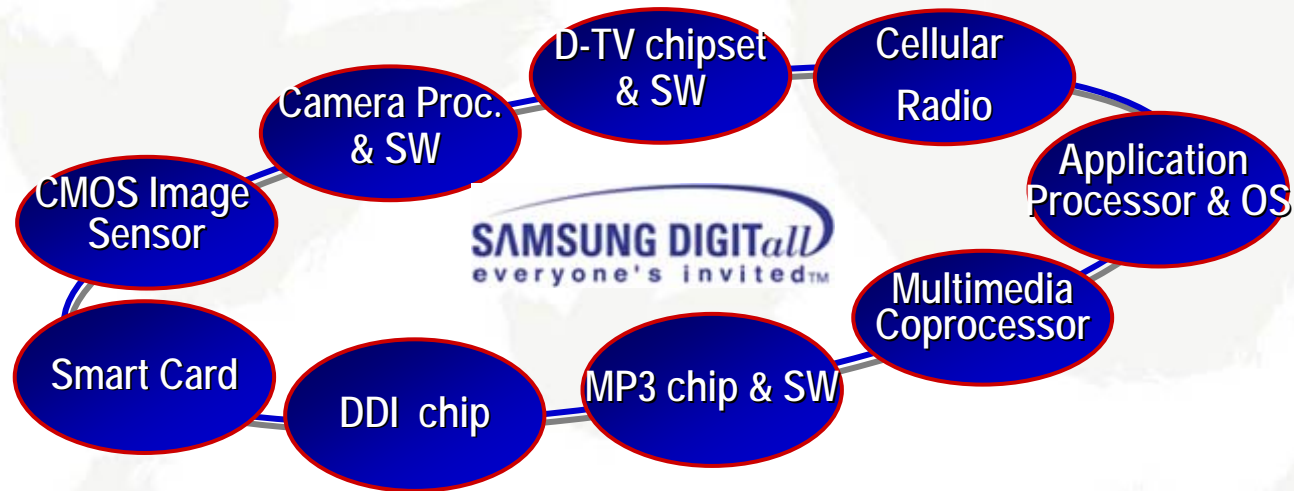
- Samsung is developing a complete PMP-DVB-H platform
- Project started in Sept 2005
- Completion date: End of Jan. 2006
- H/W Design already finished
- S/W porting including O/S (WinCE Ver. 5.0) done
- Full IPDC streaming data completed / IPDC information control on going



Concluding Remarks

Samsung Semiconductor's Value Proposition

❖ Wide Spectrum of Products for Mobile Solution



❖ Industry-leading Products

- ARM1176-based Application Processor
- 1/4" 2Mp CIS SoC
- 1.75um Pixel-based 8.4Mp CIS



Thank You !