SAMSUNG
ANALYST DAY 2013

Samsung System LSI Business

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Samsung Electronics

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DISCLAIMER

The materials in this report include forward-looking statements which can generally be identified by phrases such as Samsung Electronics (SEC) or its management "believes," "expects," "anticipates," "foresees," "forecasts," "estimates" or other words or phrases of similar implications. Similarly, such statements that describe the company's business strategy, outlook, objectives, plans, intentions or goals are also forward-looking statements. All such statements are subject to certain risks and uncertainties that could cause actual results to differ materially from those in the presentation files above.

For us, particular uncertainties which could adversely or positively affect our future results include:

- The behavior of financial markets including fluctuations in exchange rates, interest rates and commodity prices
- Strategic actions including dispositions and acquisitions
- Unanticipated dramatic developments in our major businesses including CE (Consumer Electronics), IM (IT & Mobile communications), DS (Device Solutions)
- Numerous other matters at the national and international levels which could affect our future results

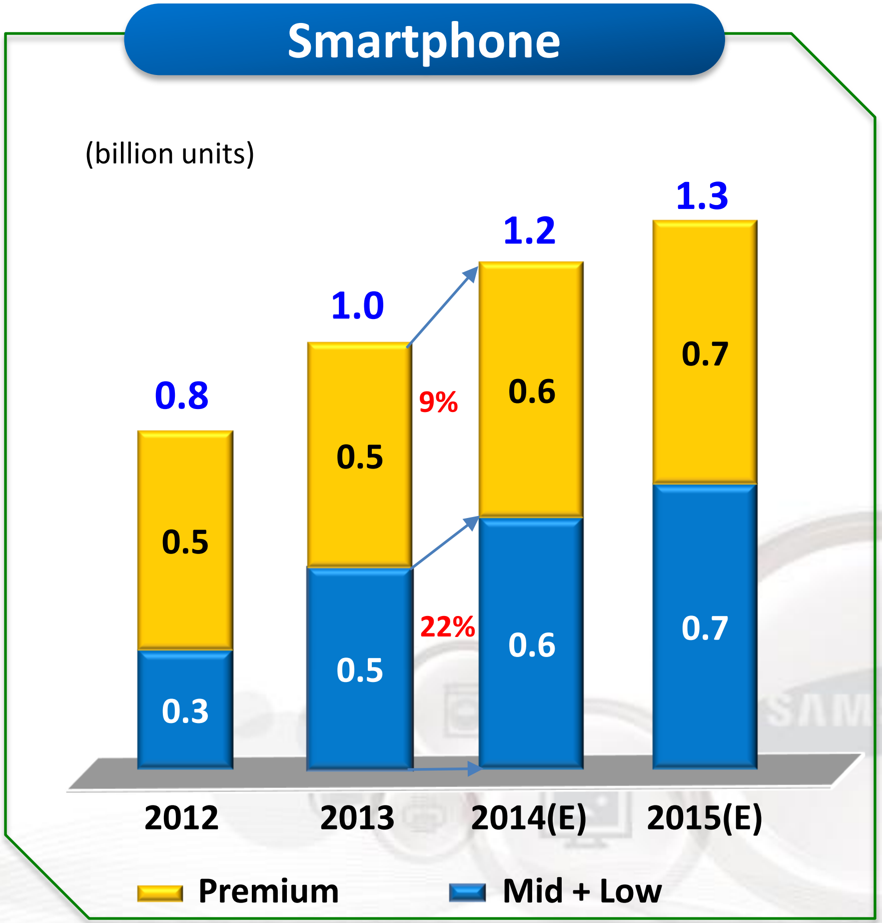
These uncertainties may cause our actual results to be materially different from those expressed in this report.

System Semiconductor Industry

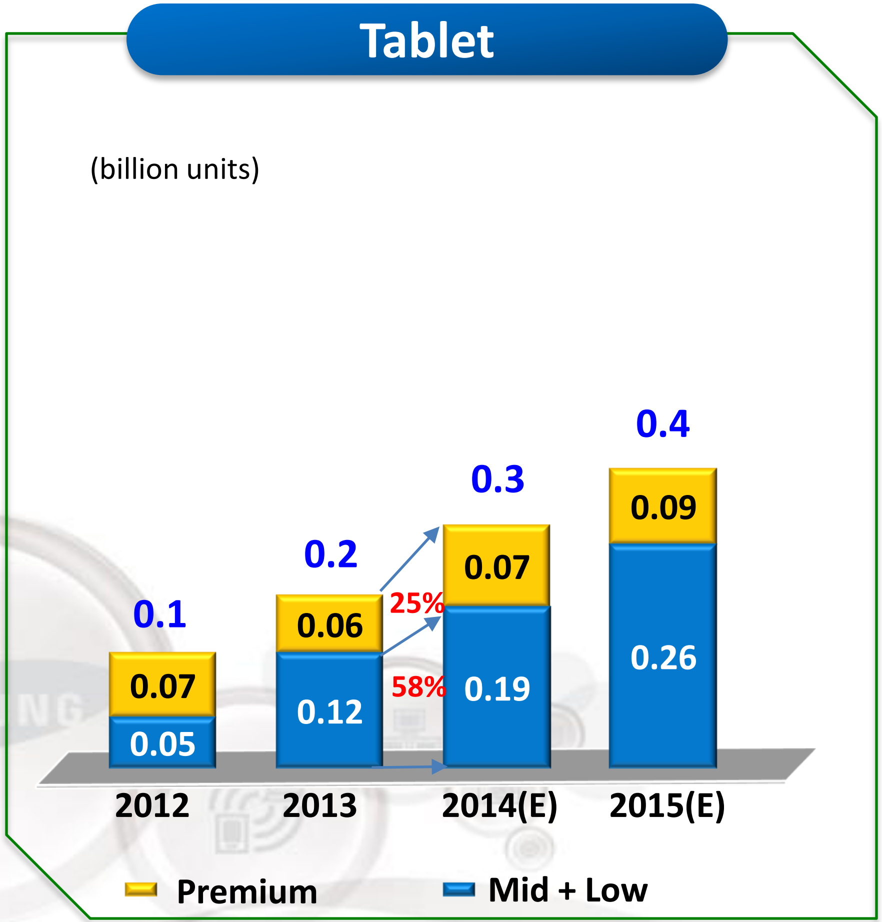
Samsung System LSI : Now

Looking Forward

Market of Mobile Device



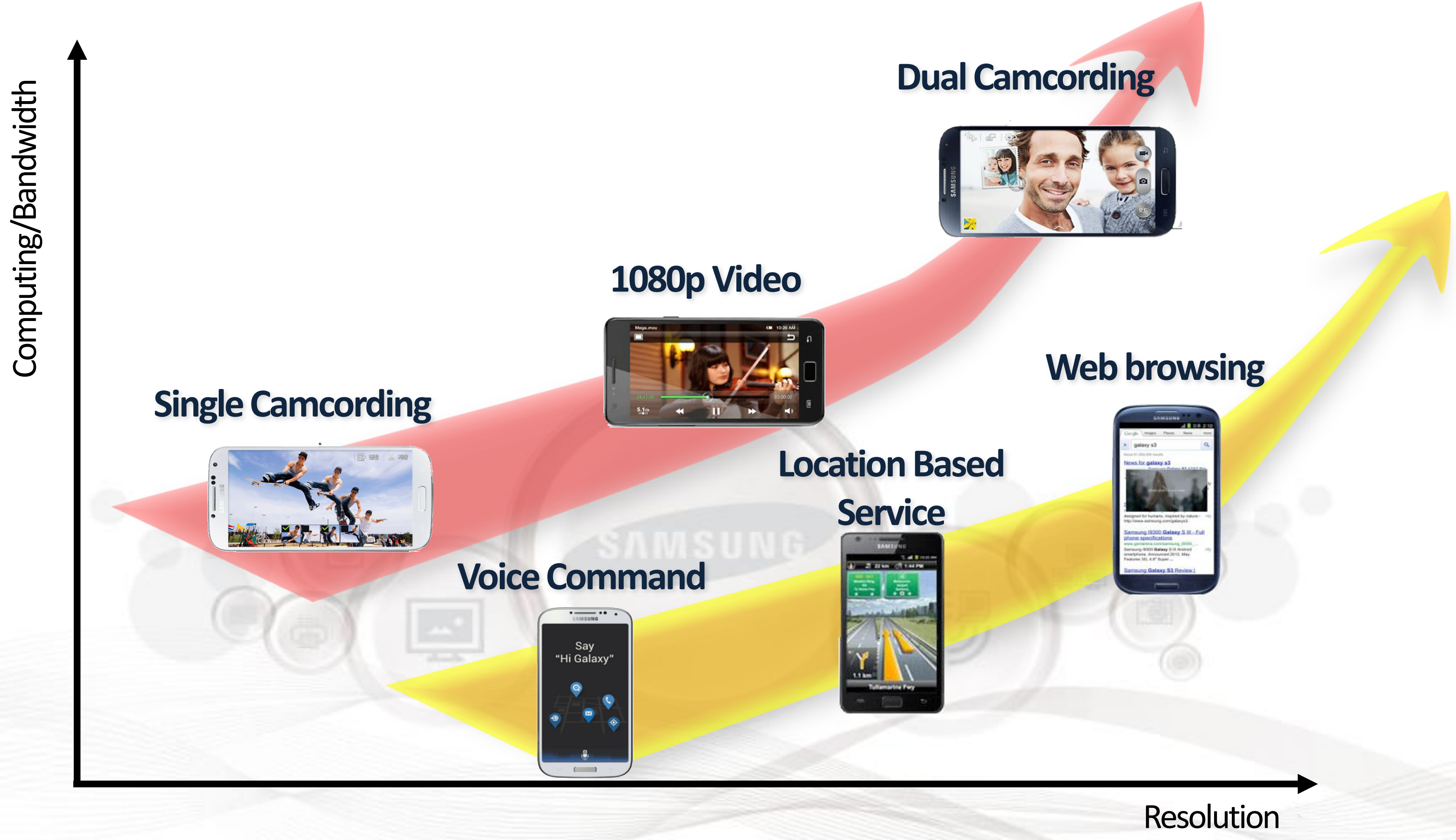
* Source : Gartner, Strategy Analytics, 2013 3Q



* Source : Gartner, 2013 3Q

Computing Power

- New applications require higher computing/bandwidth



Computing/Bandwidth

Dual Camcording

1080p Video

Single Camcording

Web browsing

Location Based Service

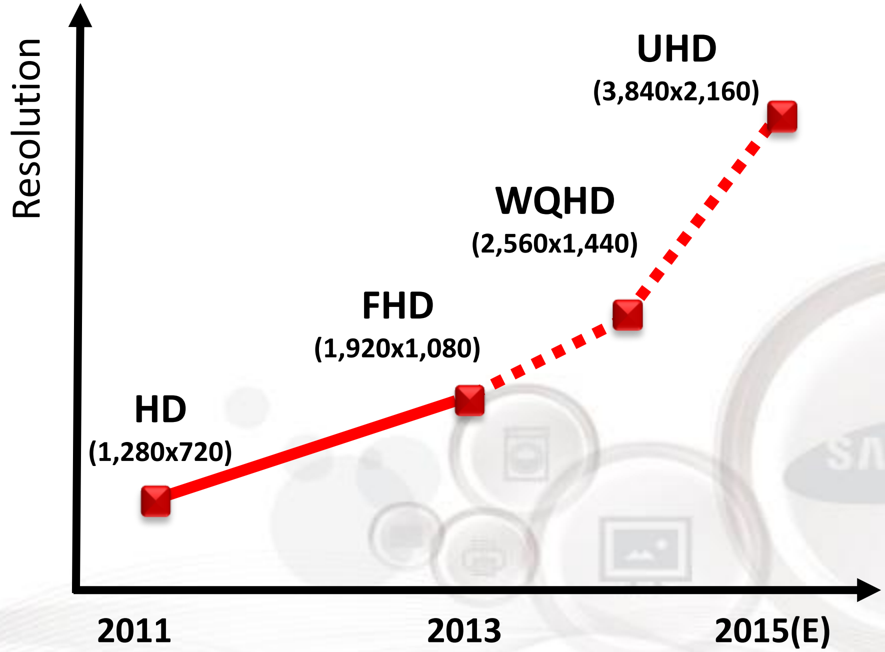
Voice Command

Resolution

Display Trend

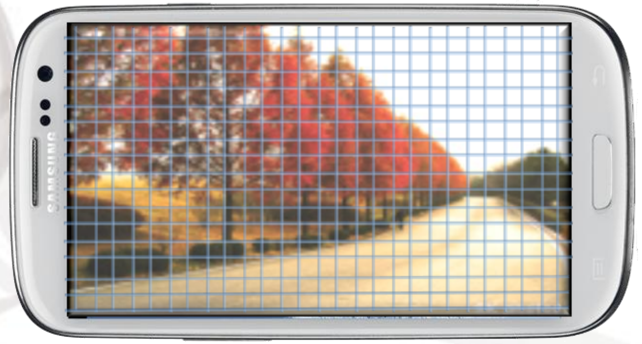
- **Higher resolution**

Display



FHD-class Display

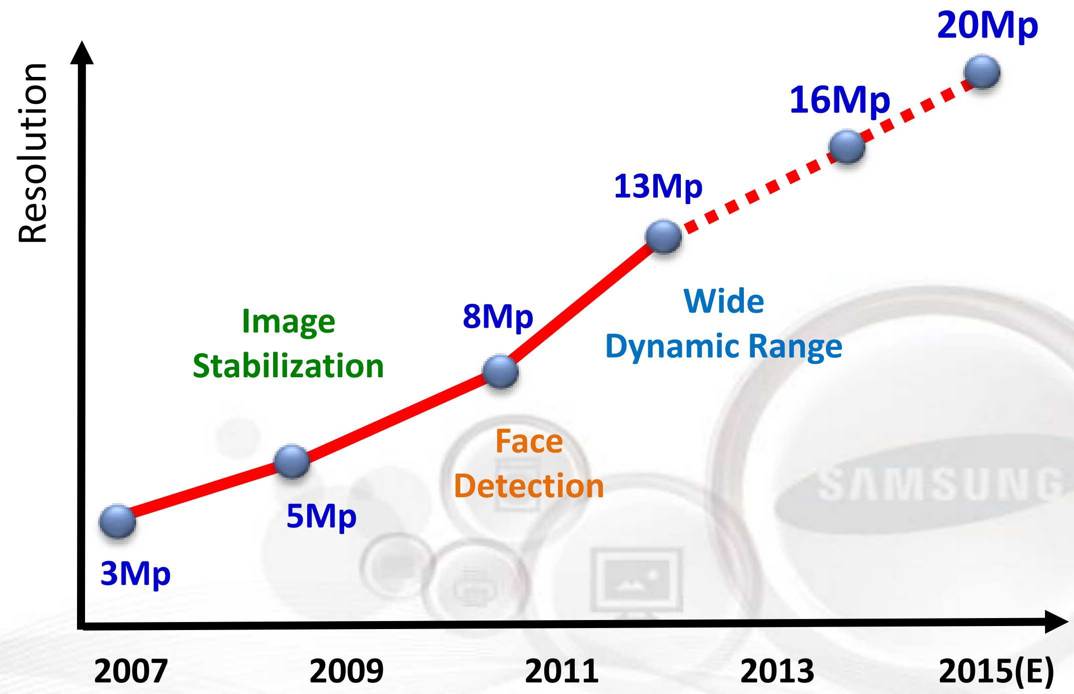
HD-class Display



Camera Sensor Trend

- **Image quality enhancement is also improving**

Camera Sensor



Wide Dynamic Range

Face Detection

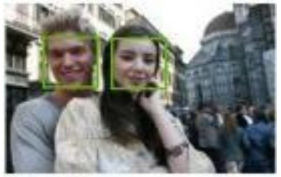
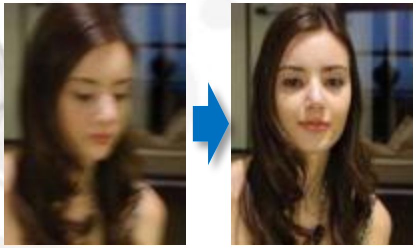


Image stabilization

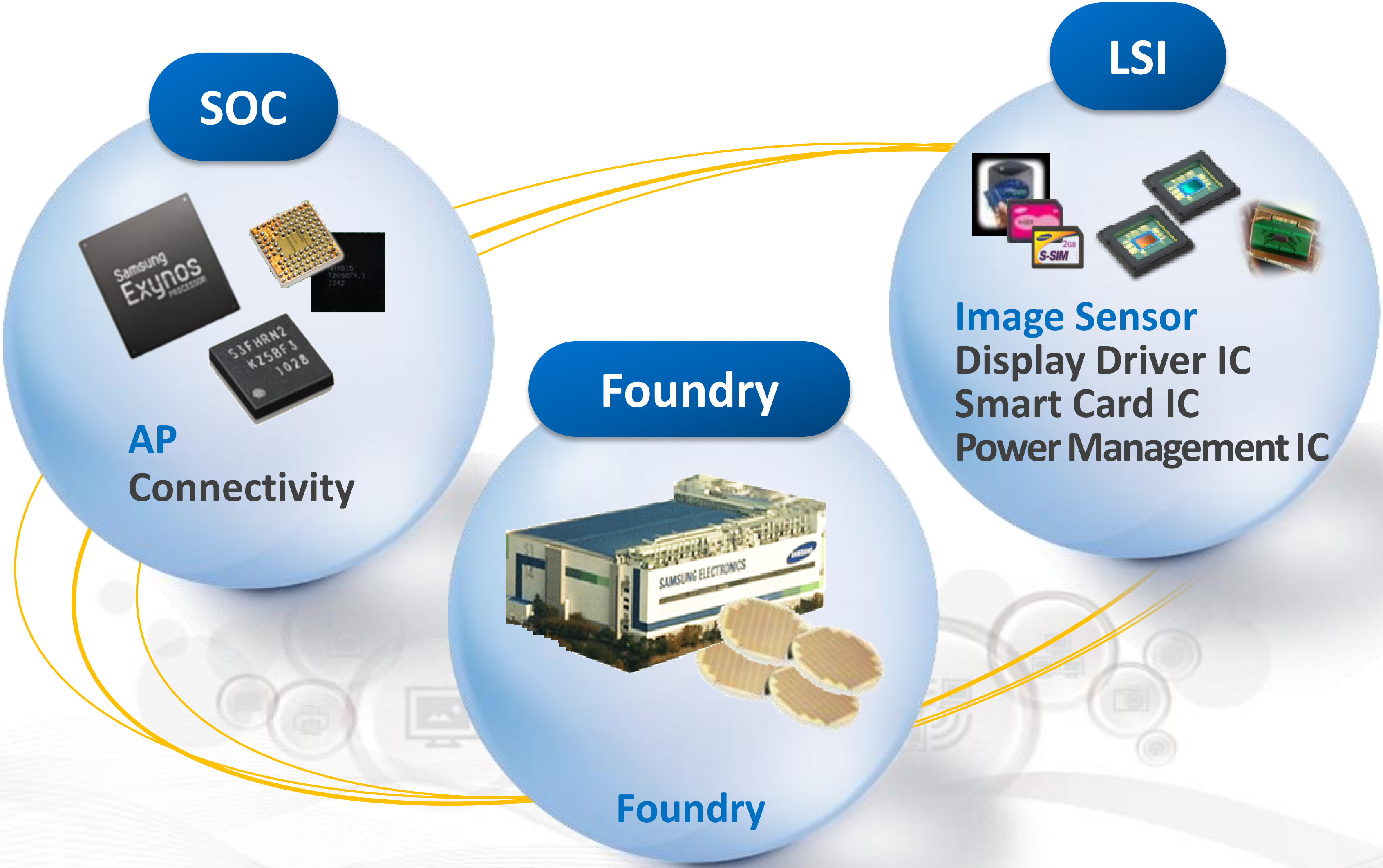


System Semiconductor Industry

Samsung System LSI : Now

Looking Forward

Three business areas



SOC

AP
Connectivity

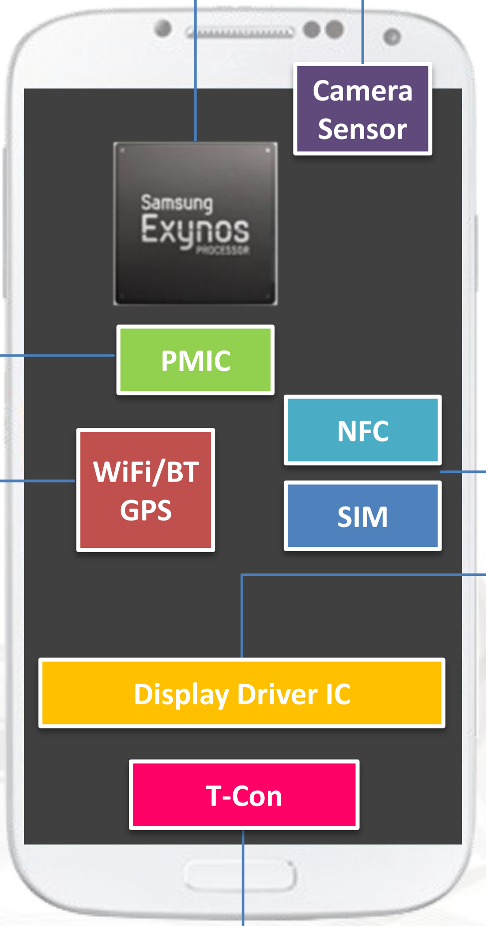
Foundry

Foundry

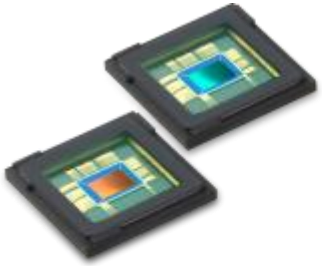
LSI

Image Sensor
Display Driver IC
Smart Card IC
Power Management IC

Product Portfolio



- Powerful CPU/GPU
- Low Power



- Pixel Leadership
- Slim Solution

Power Sequence Control
&
I2C Interface

- PMIC line: AP & OLED
- High Efficiency
- High Accuracy

- World's Best Performance
- Low Power Consumption
- High Density e-SE Module

NFC

- Smartphone
- IoT

- Full line up for next FHD
- Lower Power solution
- Fast Speed (New Architecture)

eDRAM
T-con
Backlight control

1. AP (Application Processor)

- **Focusing on high performance with low power consumption**

CPU Leadership

Game changing technology :

big.LITTLE octa core

big

LITTLE

Powerful GPU

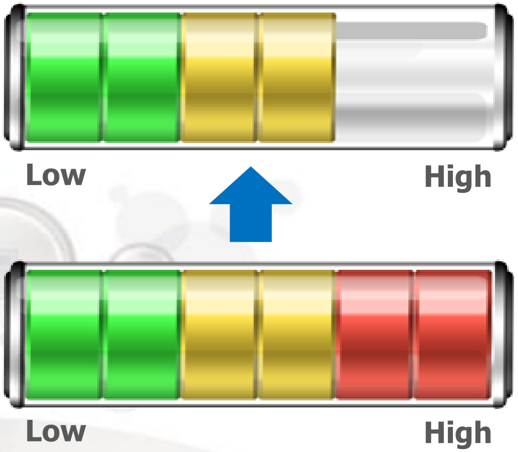
Richer 3D graphics with

Energy efficiency

Low Power

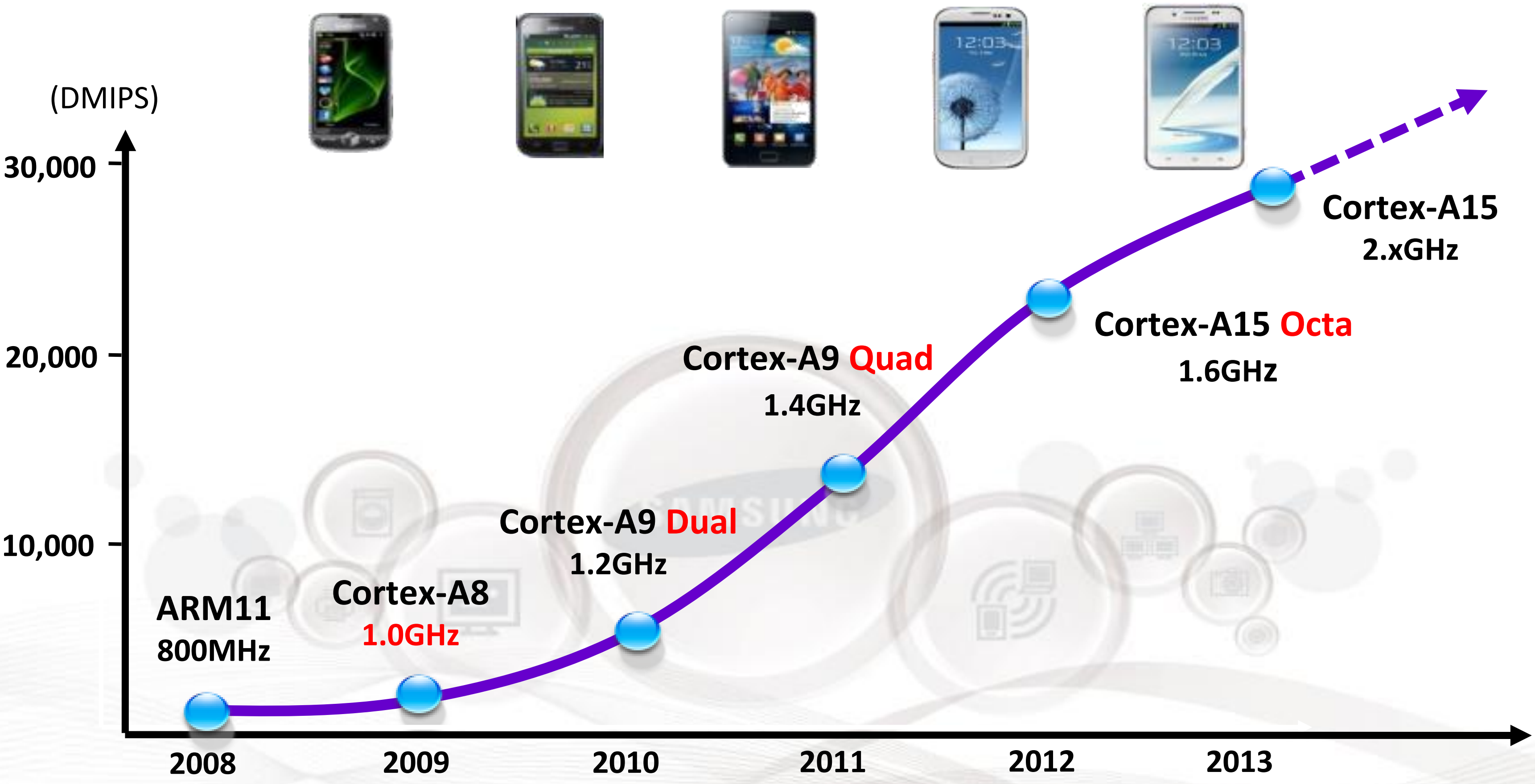
Advanced mobile process &

design methodologies



Computing Power

- **Has been leading AP industry since 2009**
  - **Innovation in both Architecture & Silicon Technology**

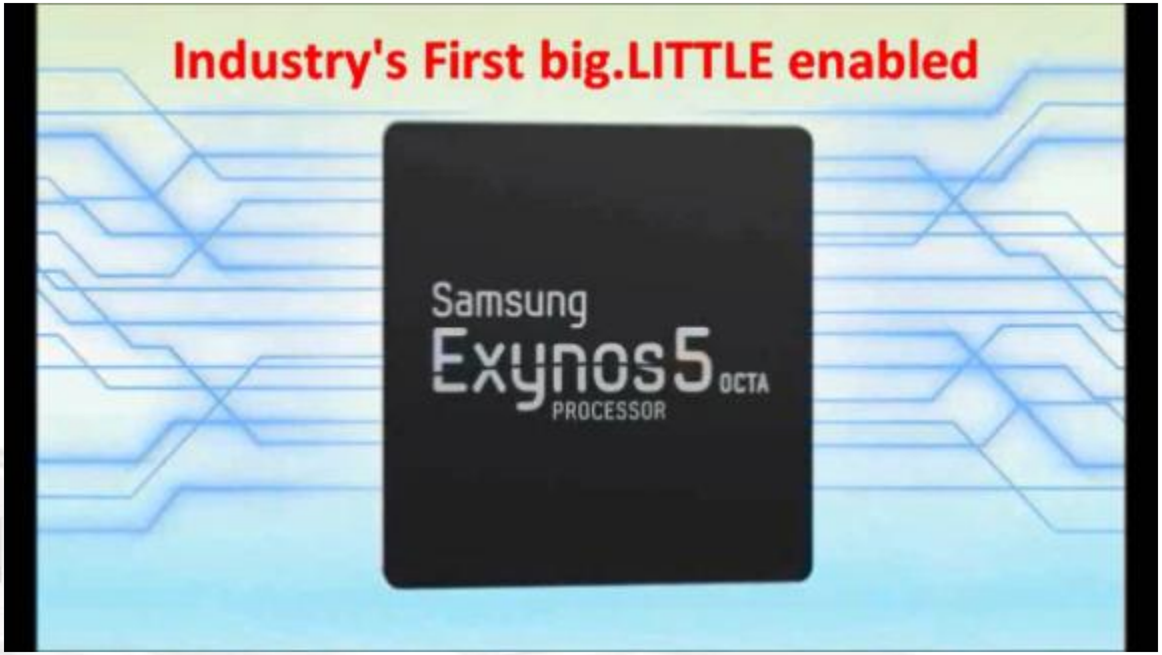


* Source : Samsung Electronics Co., Ltd., ARM

**DMIPS : Dhrystone Million Instructions Per Second*

big.LITTLE Architecture

- **Best of both worlds: high performance and low energy**
  - **Heterogeneous architecture for energy efficiency**

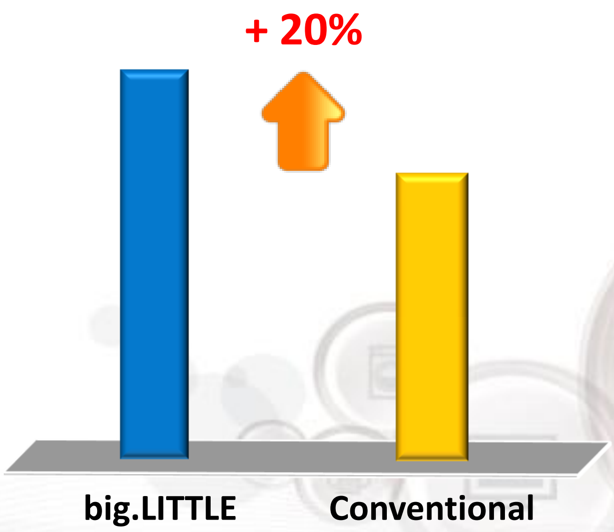


big.LITTLE Architecture

- 20% gain at performance and energy, respectively

Performance

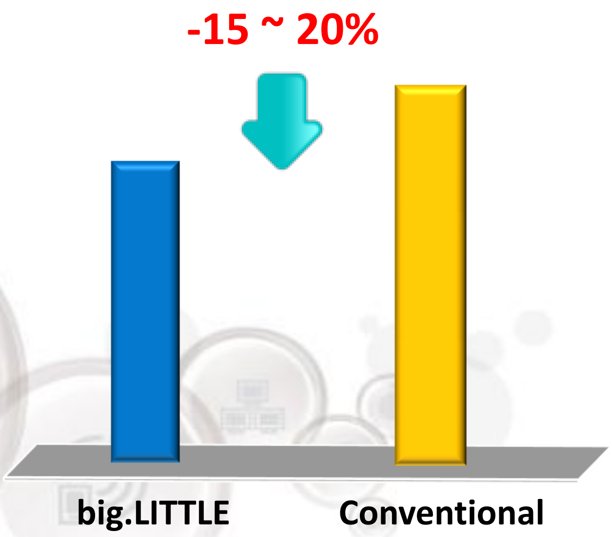
Higher is Better



*Source : Samsung Electronics Co., LTD, 2013 2Q

Energy

Lower is Better

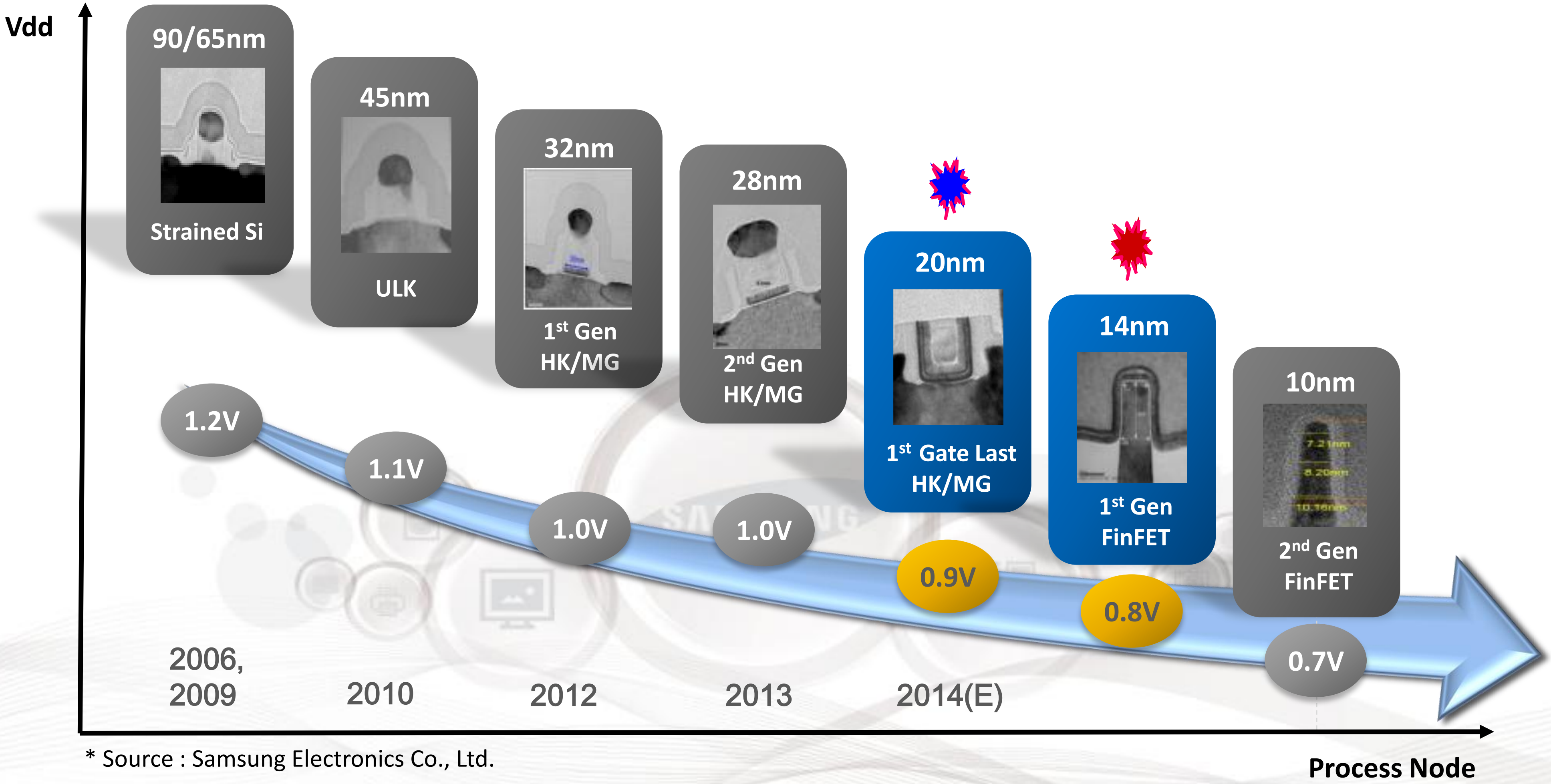


*Source : Samsung Electronics Co., LTD, 2013 2Q

*Conventional : big CPU only

Advanced Silicon Process

- **Leadership in low-power, advanced silicon process**

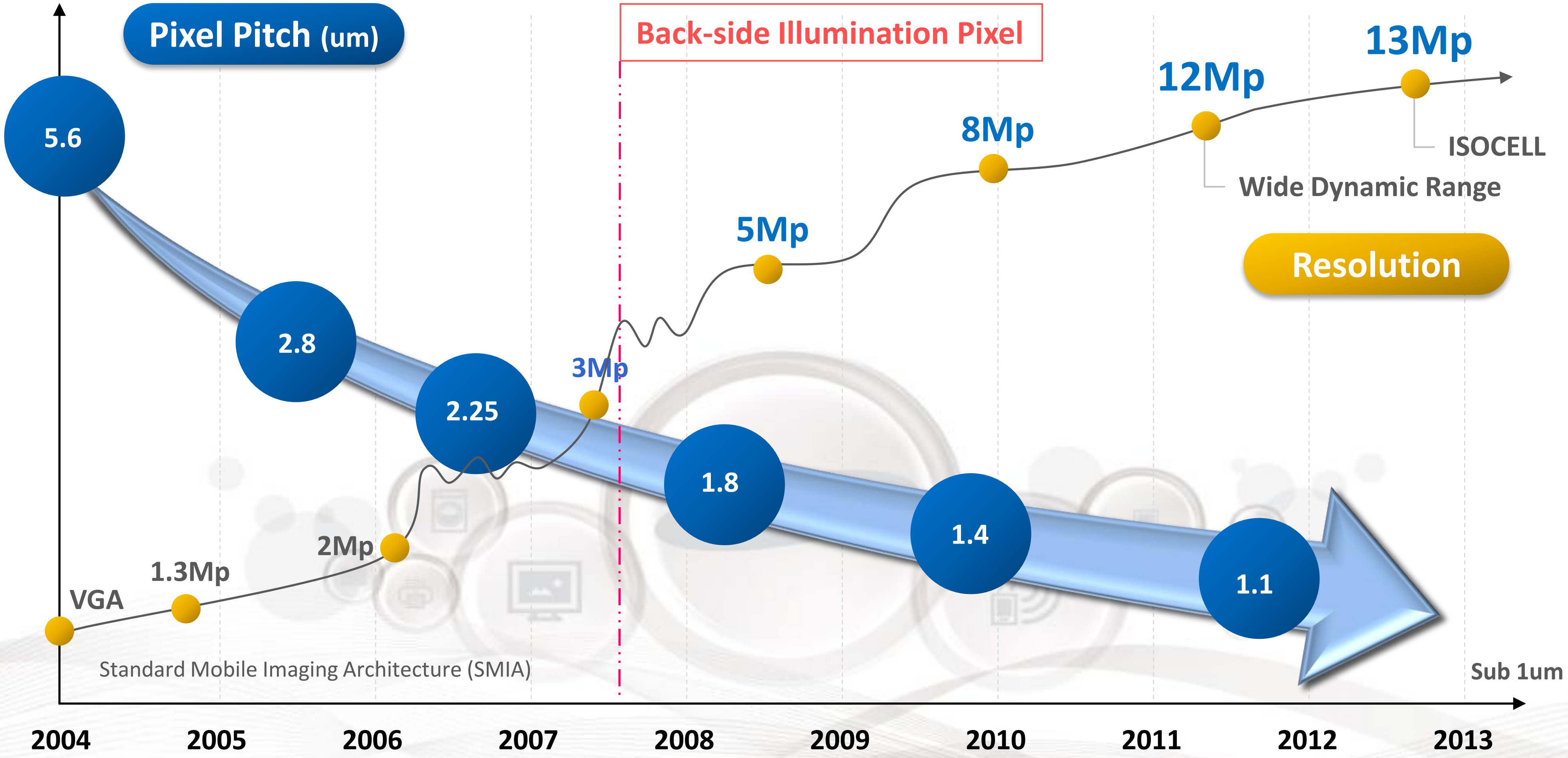


* Source : Samsung Electronics Co., Ltd.

*Vdd : Supplying voltage of drain

2. Image Sensor

- **Higher resolution & smaller pixel have driven sensor industry**



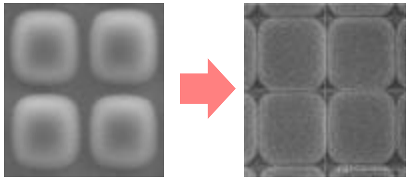
* Source : Samsung Electronics Co., Ltd.

Pixel Architecture

- To increase sensitivity and decrease light loss & crosstalk

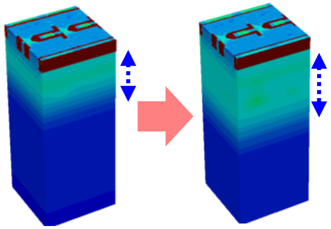
Gap-less u-lens

Increase sensitivity



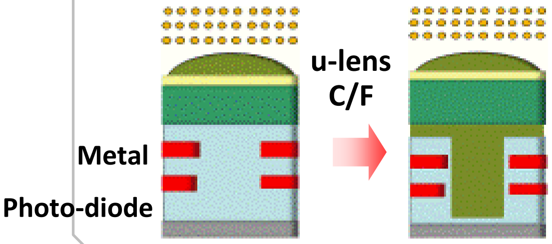
Deep PD

Reduce loss in Si



Light-guide

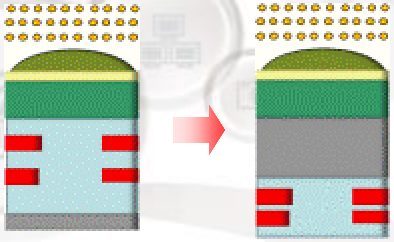
Reduce metal layer reflection



Conventional Light-guide

Back-side illumination

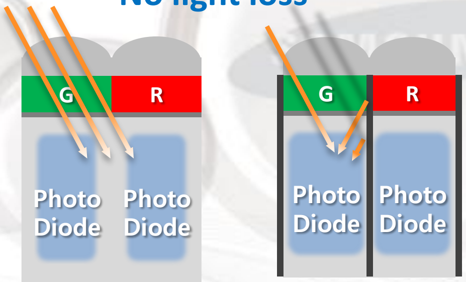
Remove metal layer reflection



Front-side illumination Back-side illumination

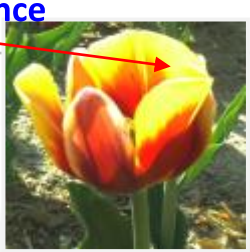
ISOCELL

No light loss



Back-side illumination ISOCELL

Without
color interference

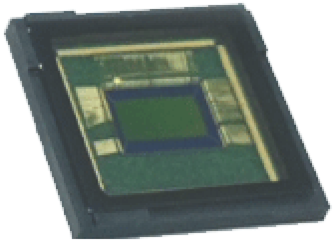


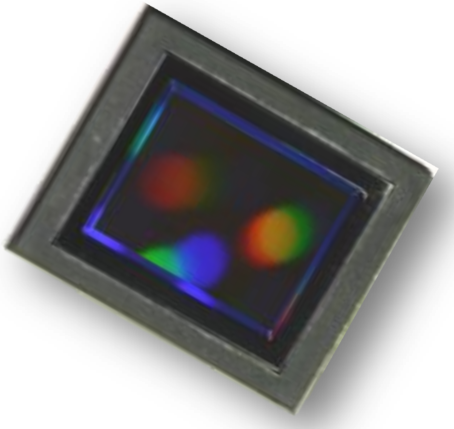
With
color interference

New Products for 2014-15

- **16Mp ISOCELL Sensor with 1.12um pixels**

  - Main sensor for smartphones
  - Wide dynamic range & Auto focus

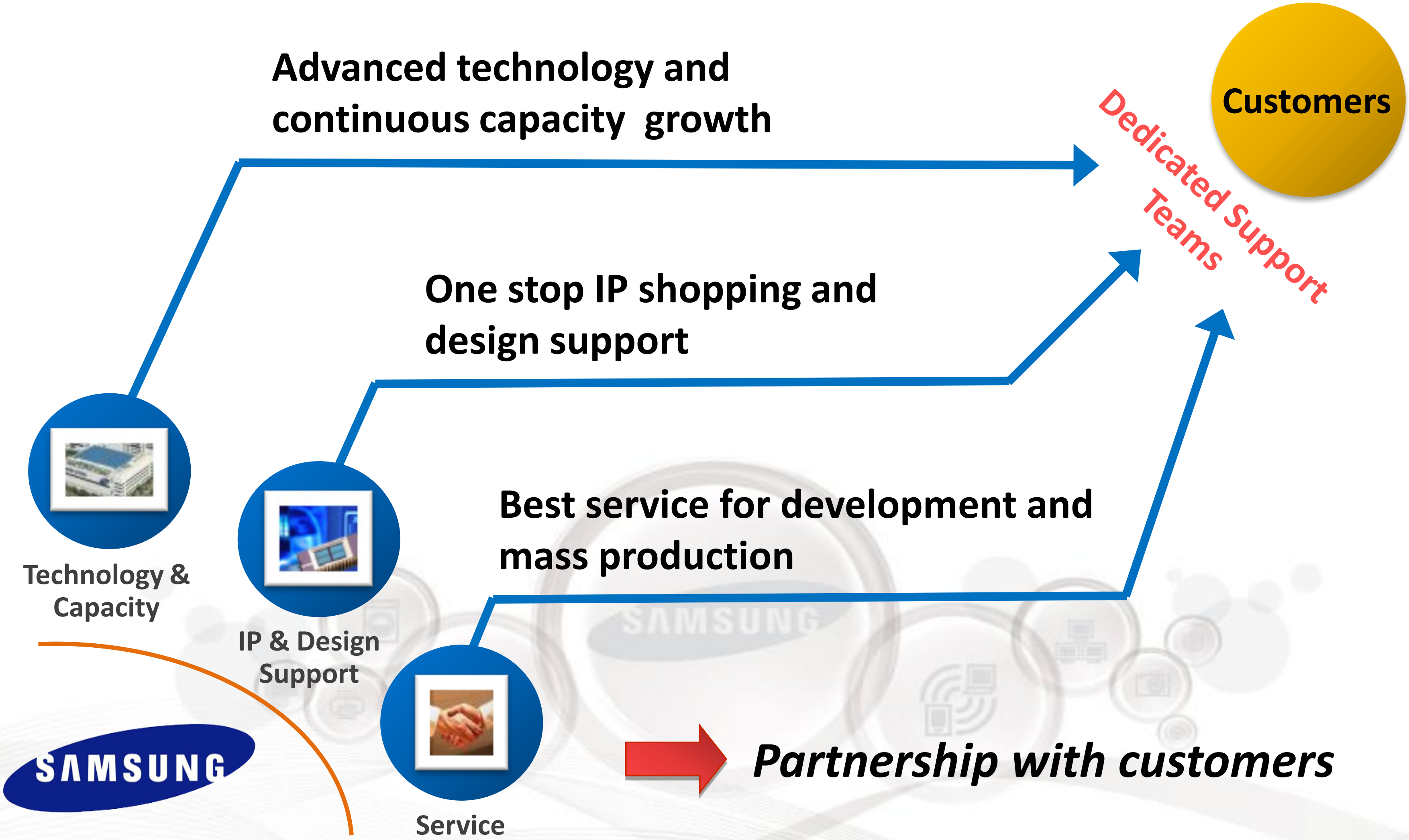




- **Next APS-C sensor**

  - Sensor for mirror-less cameras

3. Foundry



Advanced technology and continuous capacity growth

One stop IP shopping and design support

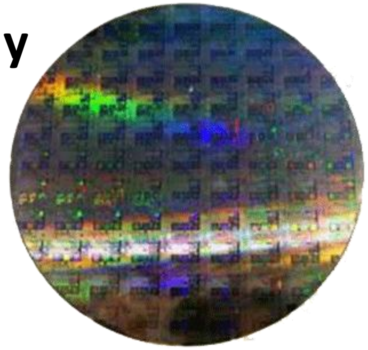
Best service for development and mass production

Partnership with customers

14nm Achievement

- **World's leading 14nm FinFET solution via collaboration**

Samsung : **14nm FinFET test sample & Design Infrastructure ready**



ARM , Cadence, Synopsys & Mentor

- **FinFET Design Enablement Platform**
- **First Cortex-A7 implementation**

EE Times EE Life

Samsung and partners create 14nm FinFET test chips

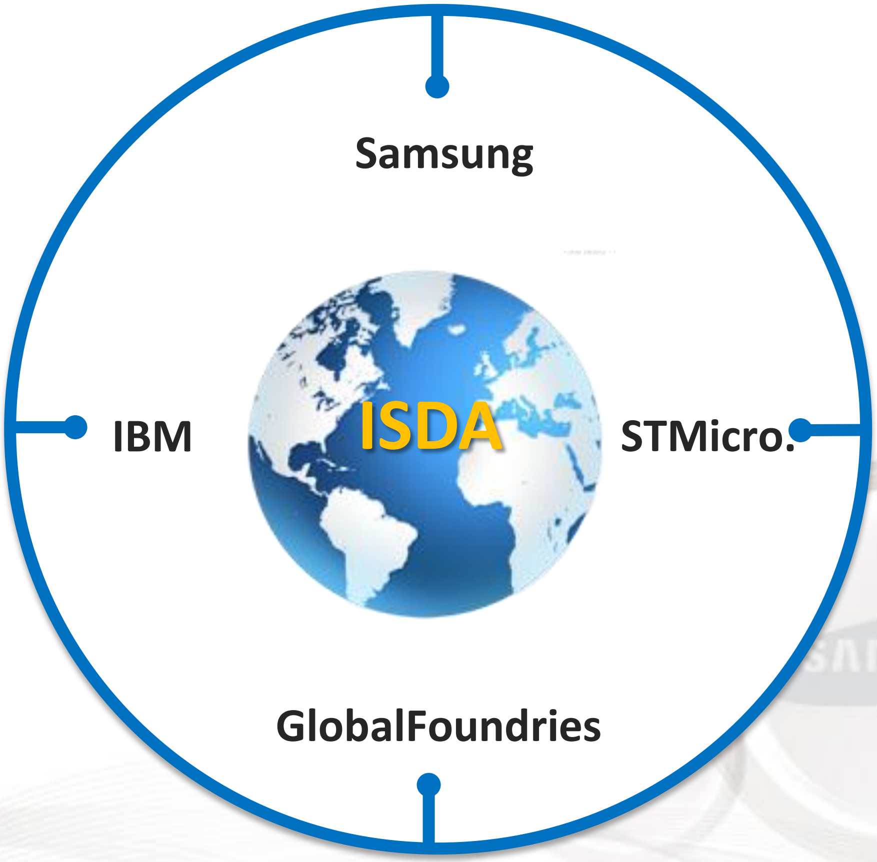
Brian Bailey

12/21/2012 11:45 AM EST

Over the past couple of days there have been a string of press releases related to the tape-out of a test chip from Samsung at 14nm using FinFETs. This is a condensation of those releases from Samsung, ARM, Cadence, Synopsys and Mentor.

Samsung announced that a milestone in the development of 14-nanometer (nm) FinFET process technology with the successful tape-out of multiple development vehicles in collaboration with its key design and IP partners. In addition, Samsung has signed an agreement with ARM® for 14nm physical IP and libraries. As part of

Technology & Capacity



Samsung

IBM

ISDA

STMicro.

GlobalFoundries

* ISDA : International Semiconductor Development Alliance

Giheung, KR

Austin, Texas, USA

Hwaseong, KR

System Semiconductor : Introduction

Samsung System LSI : Now

Looking Forward

1. ***"Widcon" & TSV** (Through Silicon Via)*
2. ***64-bit CPU***
3. ***FinFET Process***

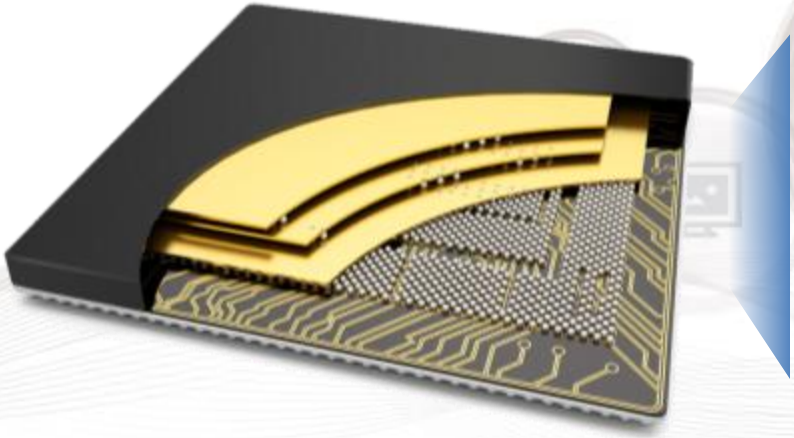
“Widcon” with TSV

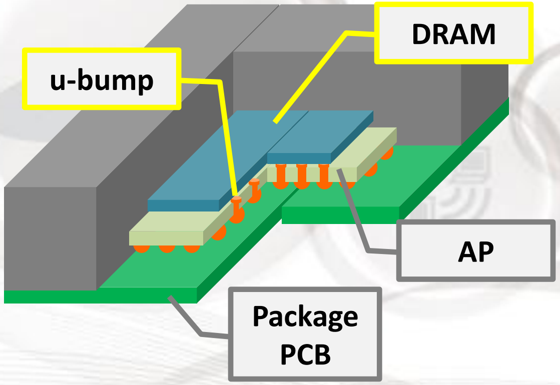
- **Wide connection between logic and memory**
  - **Higher bandwidth, lower power consumption**

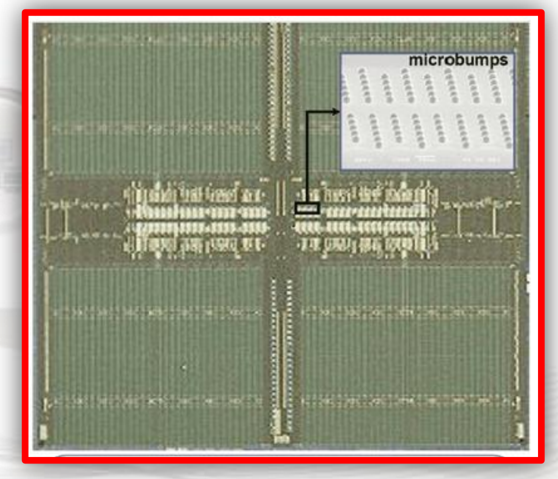
Memory Stacking with TSV

Short Connection with TSV

Micro Bump

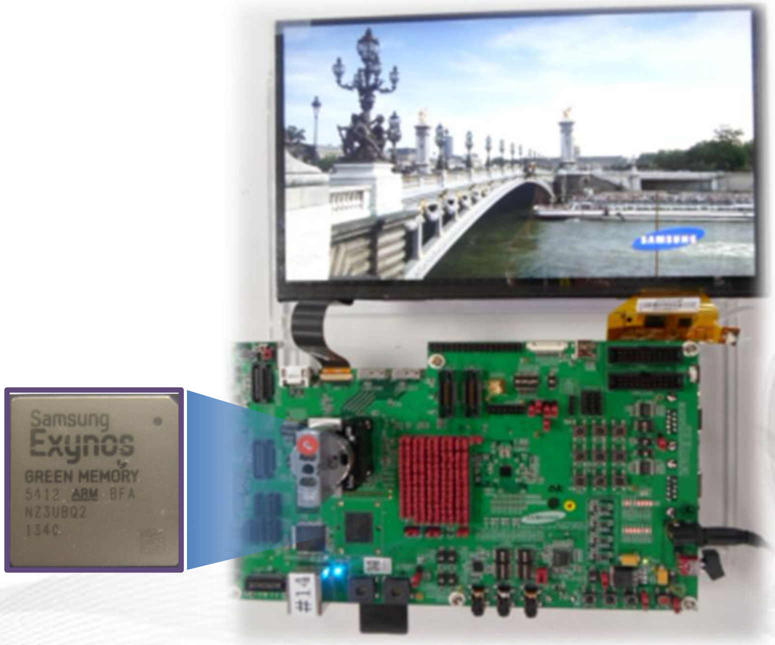


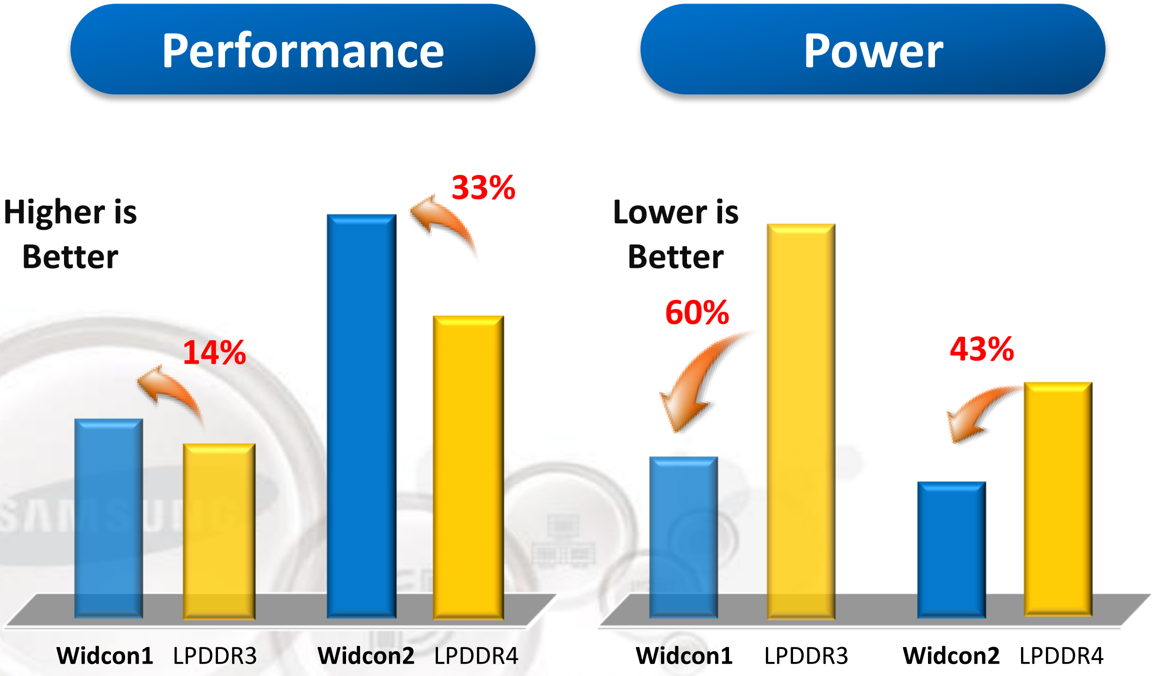




Widcon in reality

- World’s 1st AP using Widcon & TSV

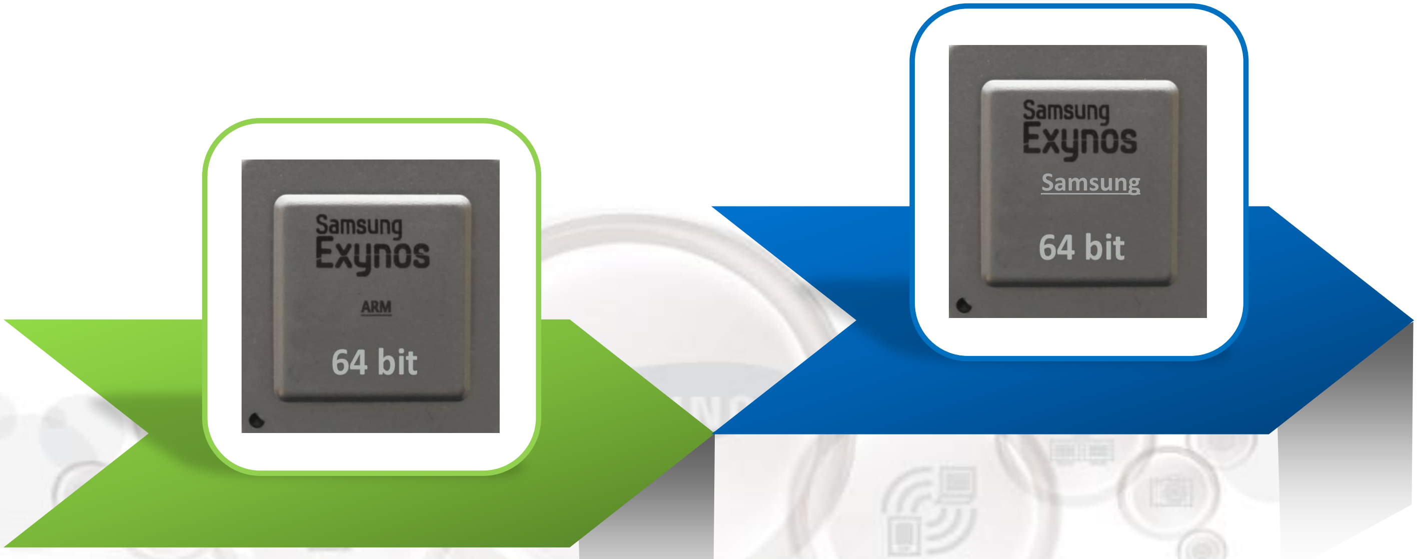




*Source : Samsung Electronics Co., Ltd., JEDEC, 2013 1Q

64-bit CPU core for Smart Devices

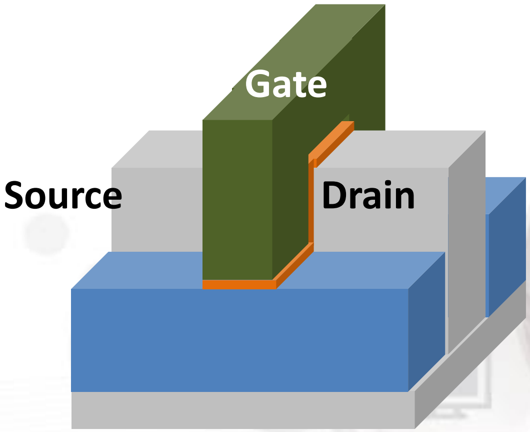
- **2-step approach:**
  - AP with ARM's 64-bit core
  - AP with Samsung's own 64-bit core



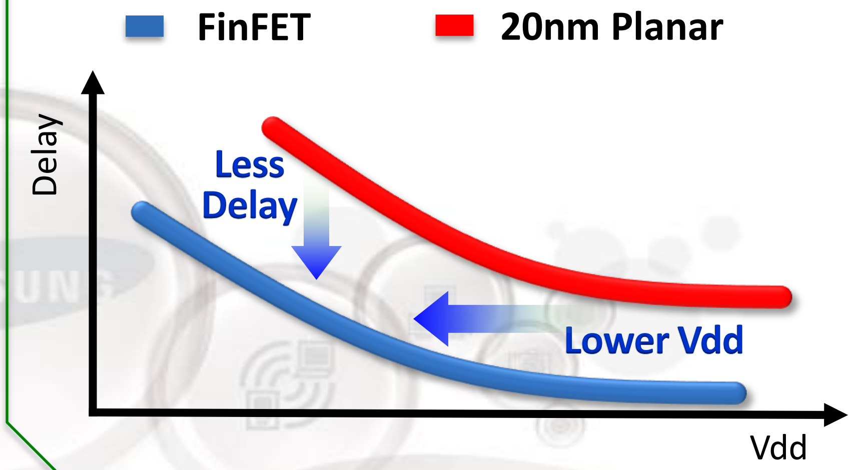
14nm FinFET Technology

- **FinFET technology leadership**
  - Lower Vdd and delay than a planar process

Structure



Advantage

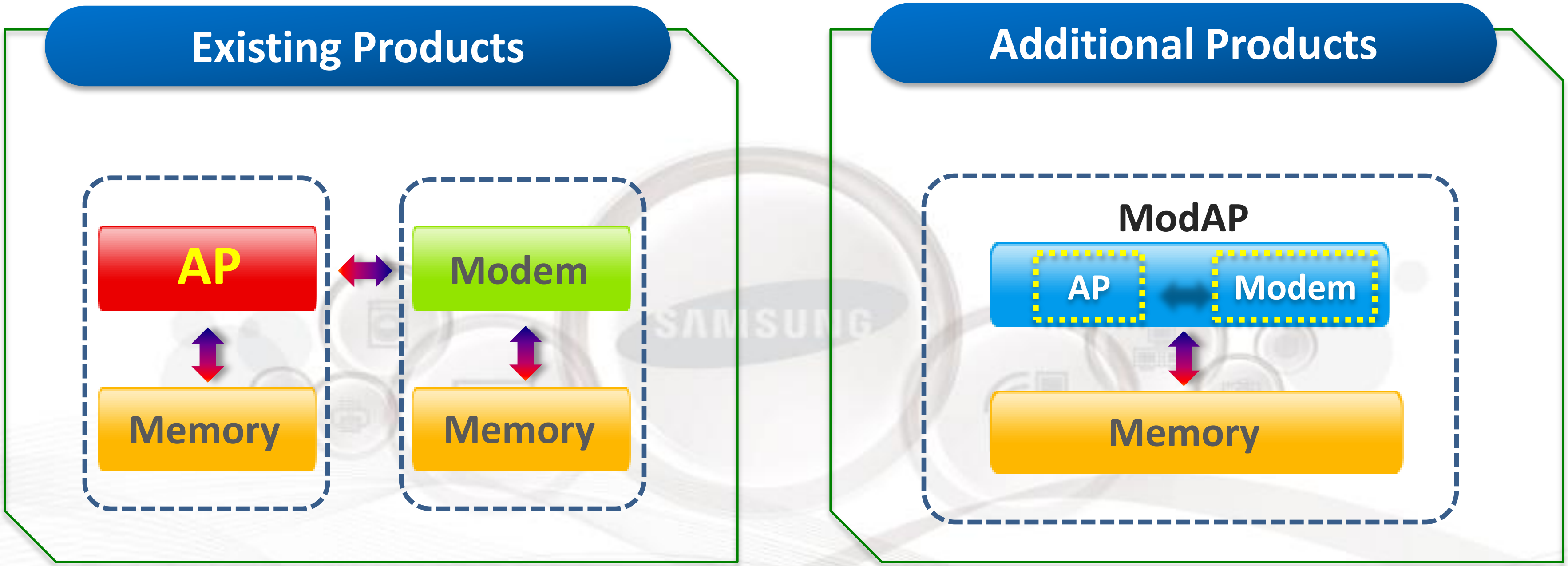


New Business

1. *ModAP (Cellular Modem + AP)*
2. *IoT*
3. *Foundry 2.0*

1. ModAP (Modem + AP)

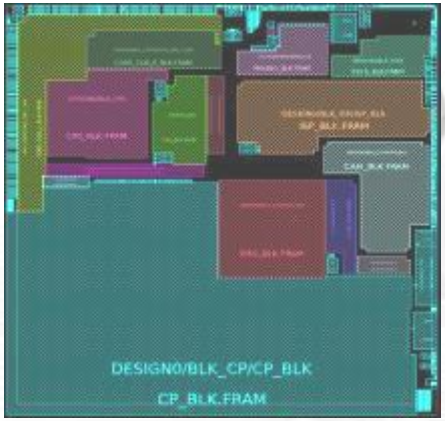
- **Dual tracks for modem collaboration**
  - High-end : 2-chip strategy with Tier-1 modem suppliers
  - Mid/low-end : ModAP using system company's modem



ModAP

- **System LSI's 1st ModAP was shipped in 3Q'13**

**Exynos 4 Quad +
System Company's Modem**



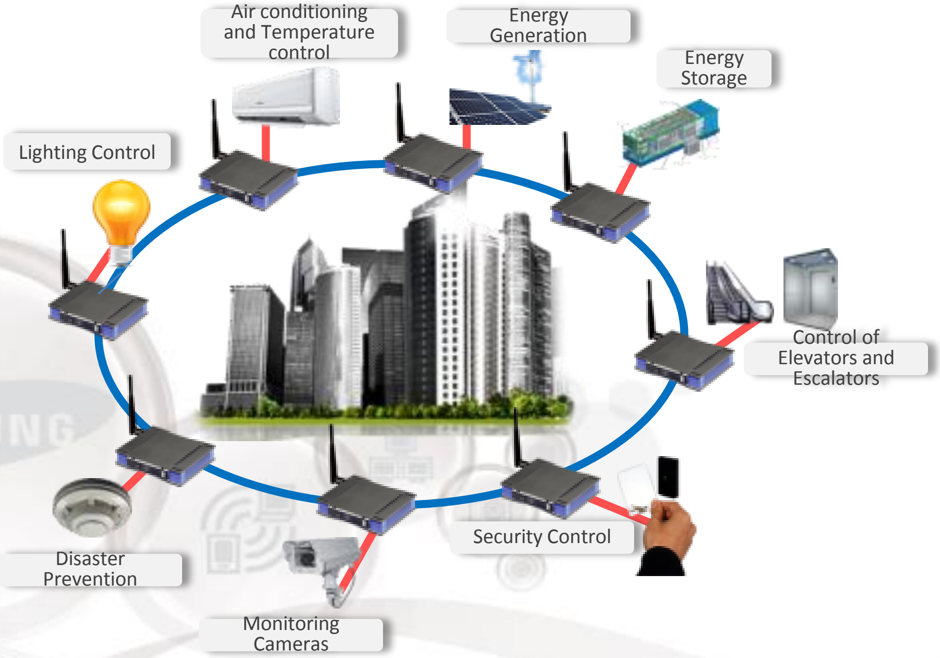
2. IoT (Internet of Things)

- **Smart building, Smart community, . . .**
- **Total connectivity solutions**

Total Solutions

Wi Fi

NFC



3. Foundry 2.0

- **Technical leadership … 14FF and beyond**

Foundry 2.0

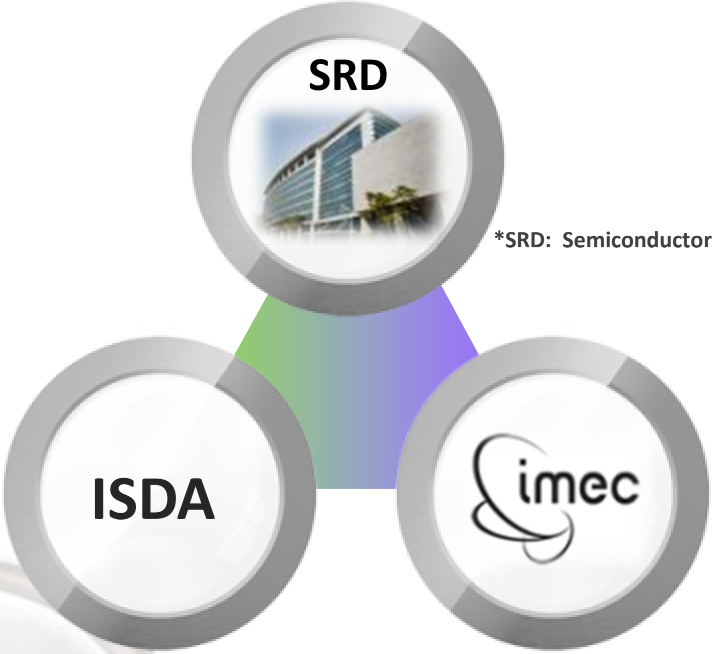
1 Follower → Technology *Leadership*

2 Tier 1 only → Tier 1 + *Tier 2/3*

3 Silicon → Silicon + *IP* Provider

Foundry 2.0

- **10nm FinFET Leadership**
  - Schedule
  - Performance, power and area



*SRD: Semiconductor Research & Development

- **Early EUV Adoption**

Concluding Remarks

- Samsung S.LSI provides total solution for connected world
  - Mobile AP (Application Processor)
  - Image Sensor
  - ModAP
  - IoT
- Samsung S.LSI offers attractive foundry solution
  - Leading-edge technology: 14FF
  - Capacity

Thank You!