Samsung System LSI Business

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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

**Smartphone**

- **2012**: 0.8 Premium, 0.5 Mid + Low
- **2013**: 1.0 Premium, 0.5 Mid + Low
- **2014 (E)**: 1.2 Premium, 0.6 Mid + Low
- **2015 (E)**: 1.3 Premium, 0.7 Mid + Low

* Source: Gartner, Strategy Analytics, 2013 3Q

**Tablet**

- **2012**: 0.1 Premium, 0.07 Mid + Low
- **2013**: 0.2 Premium, 0.12 Mid + Low
- **2014 (E)**: 0.3 Premium, 0.06 Mid + Low
- **2015 (E)**: 0.4 Premium, 0.09 Mid + Low

* Source: Gartner, 2013 3Q
Computing Power

- New applications require higher computing/bandwidth
Display Trend

- Higher resolution

<table>
<thead>
<tr>
<th>Year</th>
<th>Display Type</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>HD</td>
<td>(1,280x720)</td>
</tr>
<tr>
<td>2013</td>
<td>FHD</td>
<td>(1,920x1,080)</td>
</tr>
<tr>
<td>2015(E)</td>
<td>FHD</td>
<td>(1,920x1,080)</td>
</tr>
<tr>
<td></td>
<td>WQHD</td>
<td>(2,560x1,440)</td>
</tr>
<tr>
<td></td>
<td>UHD</td>
<td>(3,840x2,160)</td>
</tr>
</tbody>
</table>

FHD-class Display

HD-class Display
Camera Sensor Trend

- Image quality enhancement is also improving
System Semiconductor Industry

Samsung System LSI : Now

Looking Forward
Three business areas

SOC
AP Connectivity

LSI
Image Sensor
Display Driver IC
Smart Card IC
Power Management IC

Foundry
Display Driver IC
Smart Card IC
Power Management IC

Foundry
Product Portfolio

- Powerful CPU/GPU
- Low Power

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

- Smartphone
- IoT

- Pixel Leadership
- Slim Solution

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

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

- Display Driver IC
- PMIC
- NFC
- SIM
- WiFi/BT GPS
- T-Con
- Camera Sensor
1. AP (Application Processor)

- Focusing on high performance with low power consumption

**CPU Leadership**

Game changing technology:

big.LITTLE octa core

**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

+ 20%

big.LITTLE
Conventional

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

Energy

Lower is Better

-15 ~ 20%

big.LITTLE
Conventional

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

*Conventional: big CPU only
Advanced Silicon Process

• Leadership in low-power, advanced silicon process

14nm
1st Gen FinFET
1st Gate Last HK/MG
10nm
2nd Gen FinFET
20nm
2nd Gen HK/MG
32nm
1st Gen HK/MG
45nm
ULK
Strained Si
90/65nm

Vdd

2006, 2009
2010
2012
2013
2014(E)

1.2V
1.1V
1.0V
1.0V
0.9V
0.8V
0.7V

* 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.
• 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

**ISOCELL**
- No light loss

**Back-side illumination**
- Remove metal layer reflection

**Front-side illumination**
- Back-side illumination

*Without color interference*
*With color interference*
New Products for 2014-15

• 16Mpx 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

Dedicated Support Teams

Customers

Technology & Capacity
IP & Design Support
Service
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
Technology & Capacity

ISDA: International Semiconductor Development Alliance

- Samsung
- IBM
- STMicro.
- GlobalFoundries

Locations:
- Giheung, KR
- Austin, Texas, USA
- Hwaseong, KR

* ISDA: International Semiconductor Development Alliance
System Semiconductor : Introduction

Samsung System LSI : Now

Looking Forward
1. "Widcon" & TSV (Through Silicon Via)

2. 64-bit CPU

3. FinFET Process
“Widecon” 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 1\textsuperscript{st} AP using Widcon & TSV

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

![Diagram showing FinFET structure and advantage comparison between FinFET and 20nm Planar processes](image.png)
New Business

1. ModAP (Cellular Modem + AP)
2. IoT
3. Foundry 2.0
• Dual tracks for modem collaboration
  - High-end: 2-chip strategy with Tier-1 modem suppliers
  - Mid/low-end: ModAP using system company’s modem
• System LSI’s 1st ModAP was shipped in 3Q’13
2. **IoT (Internet of Things)**

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

• Early EUV Adoption

*SRD: Semiconductor Research & Development
• 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!