

Semiconductor Market Update

October 13, 2011

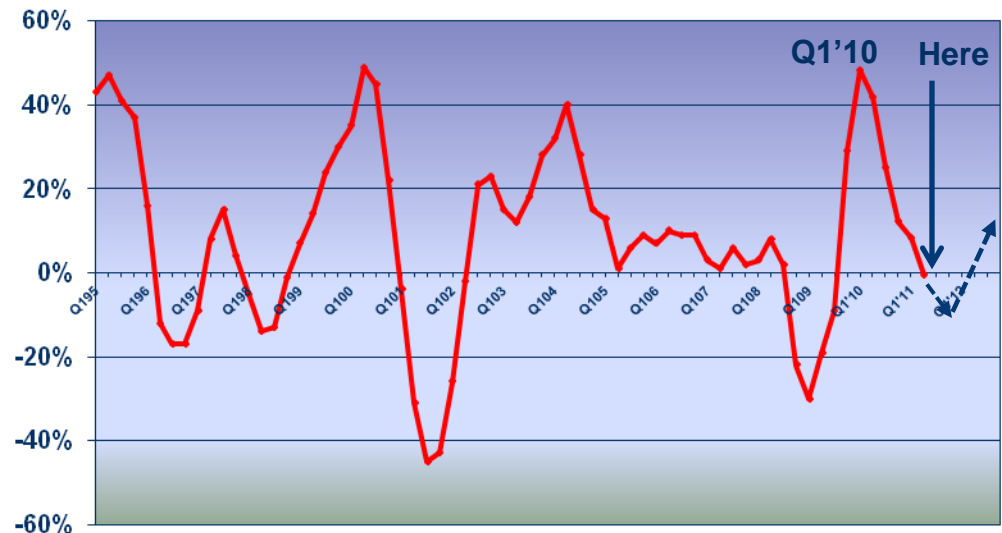
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- **Semiconductor Market Forecast**
- **Memory Market Forecast**
- **PC Semiconductor Market Forecast**
- **Mobile Phone Semiconductor Market Forecast**
- **Media Tablet/eReader Semiconductor Market Forecast**
- **Takeaway Points**

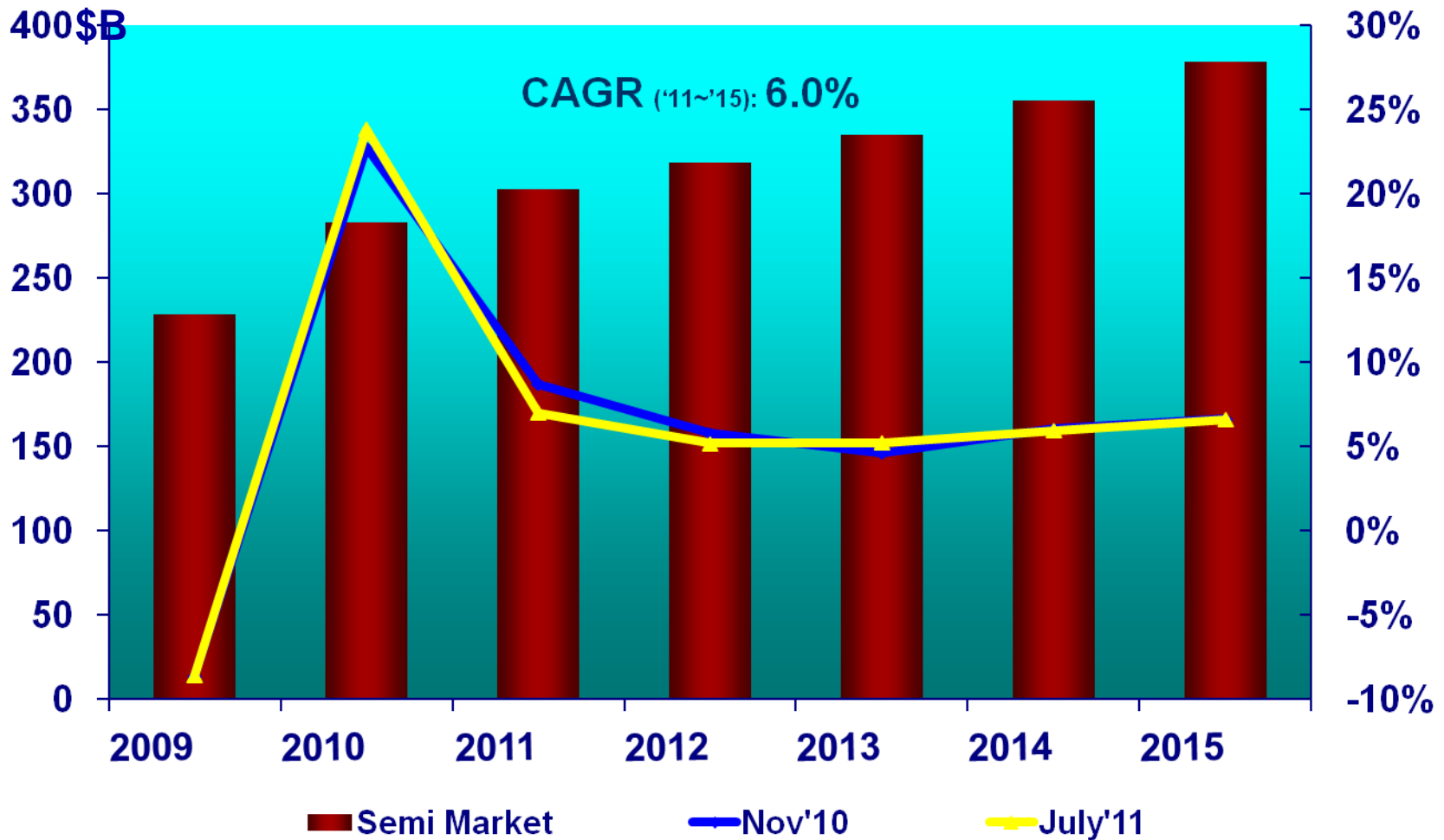
State of the Semiconductor Market: Facing Slow Growth

- Market is suffering from low demand, heavily depending on commercial only. Only gradual enterprise cycle expected in near future.
- Inventory build-up after Japan quake and capacity expansion after 2H10, are pushing down whole supply chain, leading low pricing and low utilization.
- APAC and Rest of world compensate EMEA and US. Global economic uncertainty impacting 2H investment and possible '12 plan
- Q1'10 was actual growth peak of Semi cycle (YoY basis) which will bottom around 1H'12. Expecting < 5% revenue growth against < 7% of this year.
- Key growth coming from Server, Smartphone, Media Tablet and Automotive segments

Semi. Quarterly Revenue Growth , Q1'95~ Q2'11 (YoY)

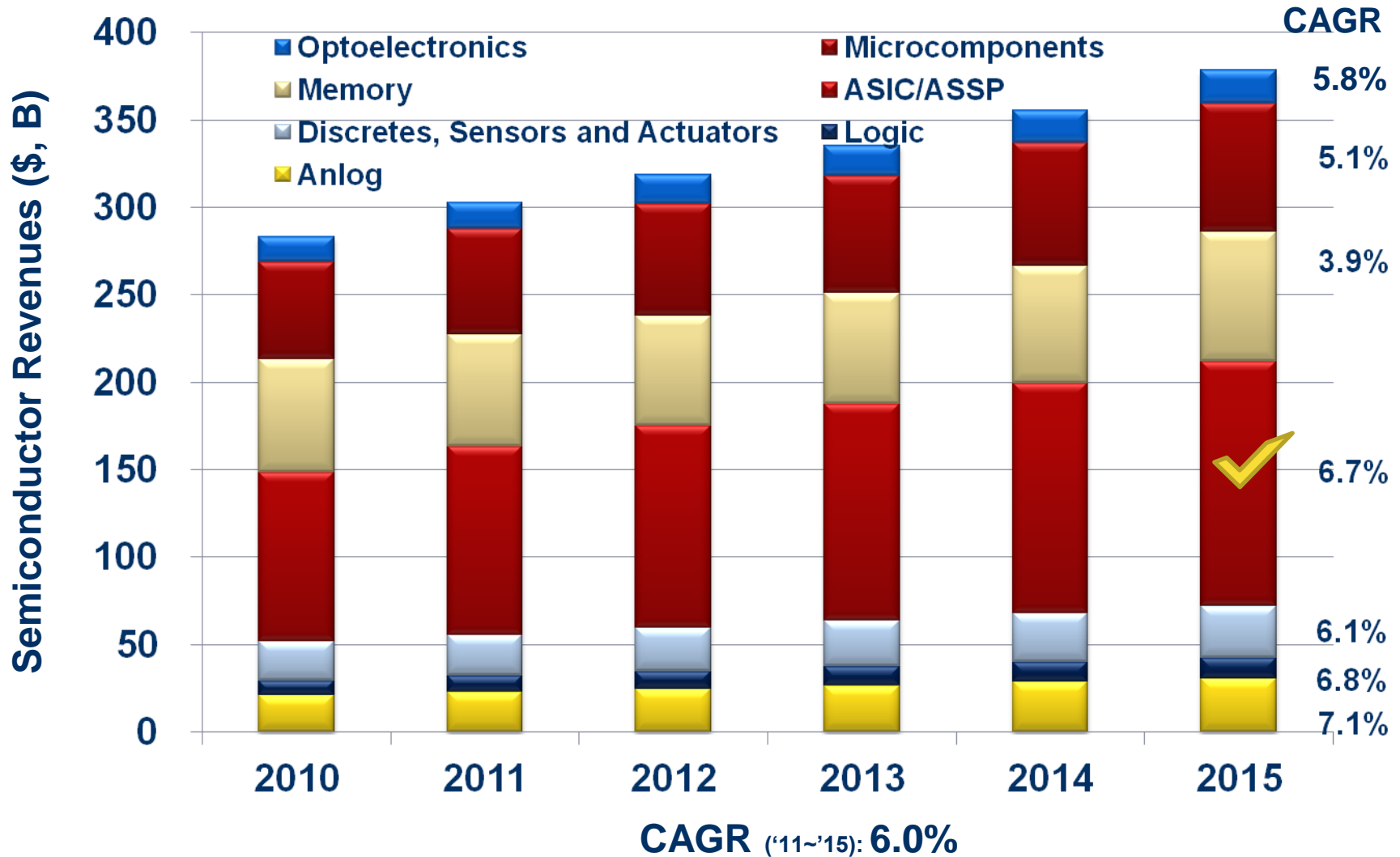


Semiconductor Market Forecast



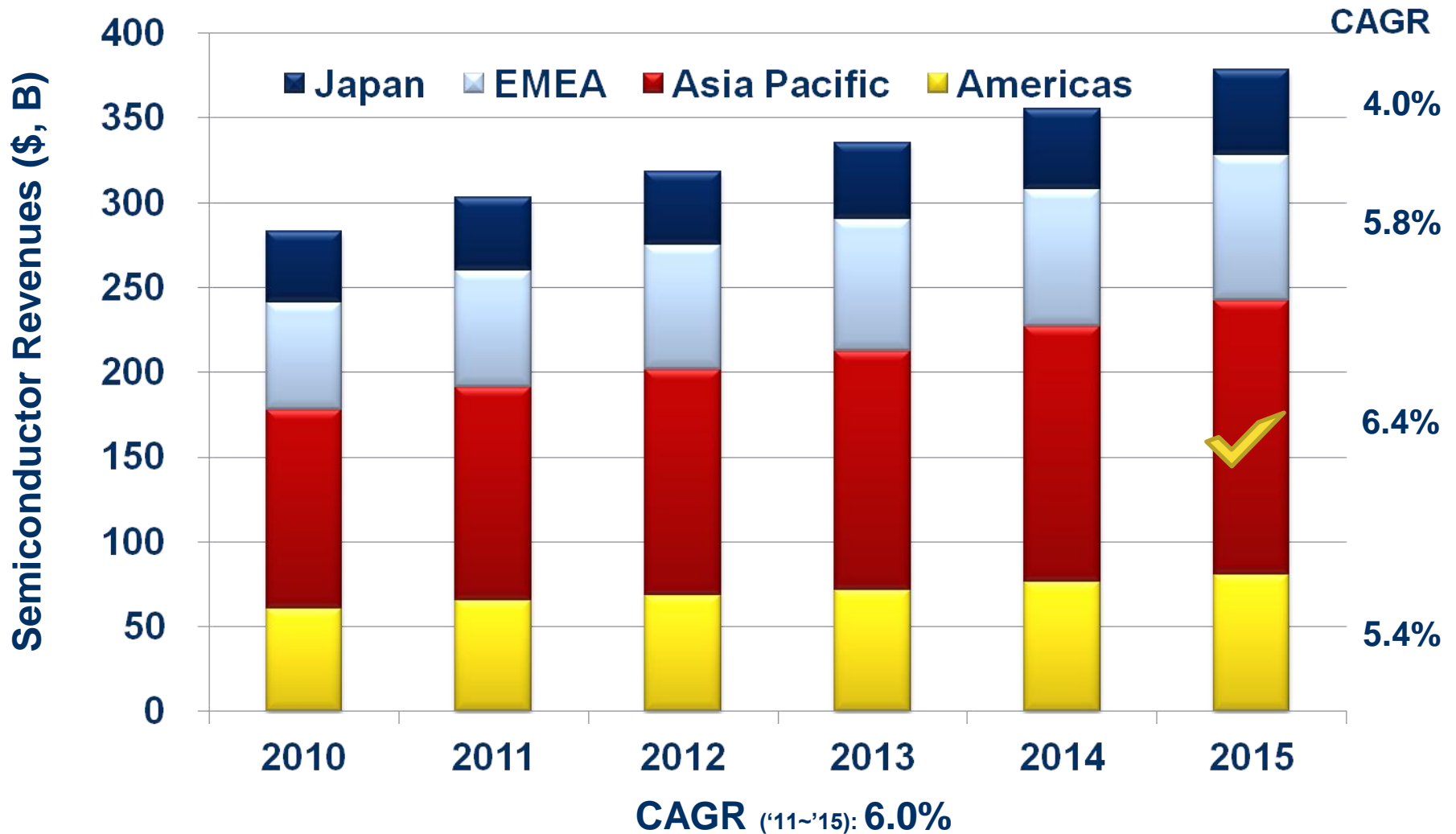
Source: IDC WW Semiconductor Applications Forecaster , July 2011

Forecast by Semiconductor Device



Source: IDC Semiconductor Applications Forecaster , July 2011

Forecast by Region



Source: IDC Semiconductor Applications Forecaster , July 2011

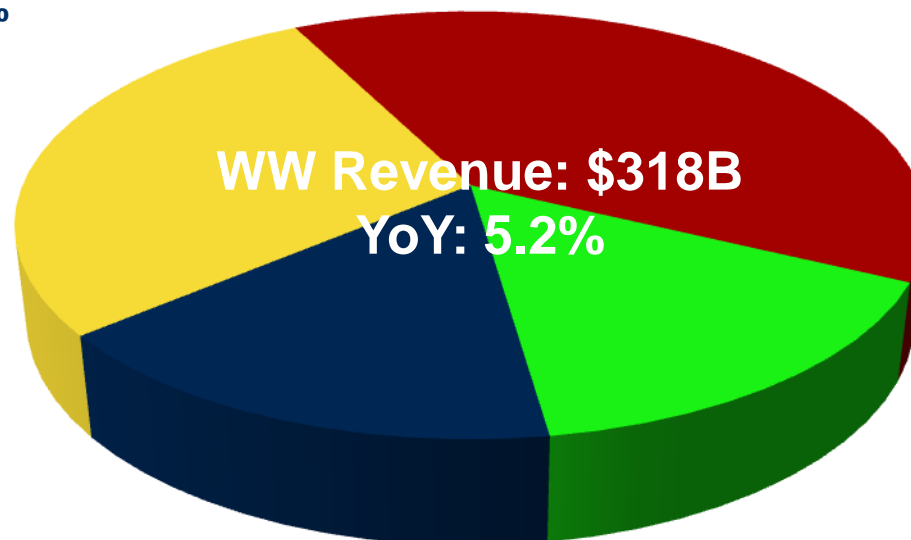
'12 Forecast by Industry

Communication ✓ (Wired/Wireless)

- Revenues (2012): \$97.3B
- SOM (2012): 30.6%
- YoY (2012): 7.0%
- CAGR (2010-15): 6.6%

Computing

- Revenues (2012): \$120.0B
- SOM (2012): 37.7%
- YoY (2012): 3.7%
- CAGR (2010-15): 5.0%



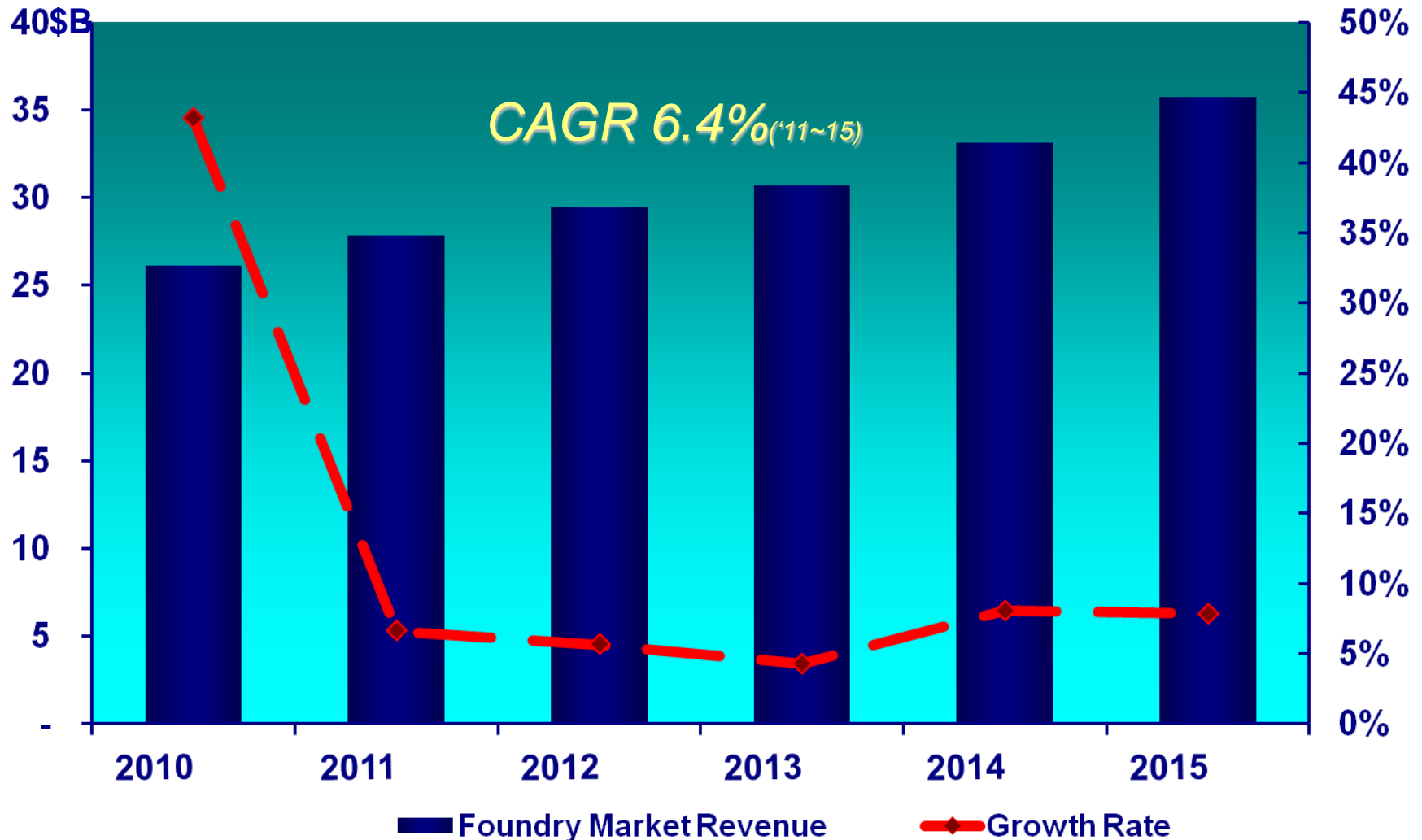
Industrial, Auto & Other

- Revenues (2012): \$49.8B
- SOM (2012): 15.6%
- YoY (2012): 5.1%
- CAGR (2010-15): 7.7%

Consumer

- Revenues (2012): \$51.4B
- SOM (2012): 16.1%
- YoY (2012): 5.4%
- CAGR (2010-15): 5.6%

Dedicated Foundry Market Forecast



Source: IDC Preliminary, September 2011

DRAM

- Revenue \$27.2M('12) ← \$29.0M('11)
- Growth - 6% ← - 26 %
- ASP Change - 36% ← - 50%
- PC Growth + 9% ← + 4 %
- PC Growth will return in '12 after a historical low of '11.
- DRAM ASP under cost will recover temporary in 2H'11, but struggling with Inventory
- Mobile demands surges ; 9 → 13% → 15% , 1Gb~4Gb Mobile DRAM, 4Gb generation comes earlier
- Samsung leading technology in 2x nm race. 3x DRAM will hit bit supply in '11
- DRAM Seasonality will return in '12
- Stabilization in '12

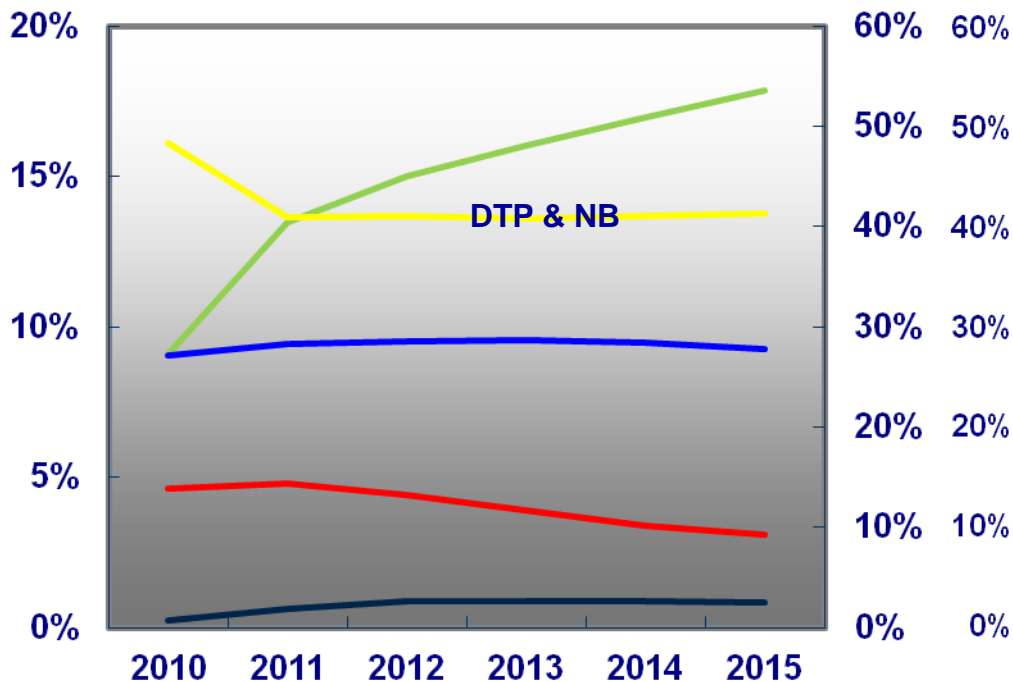
Source: IDC, September 2011

NAND

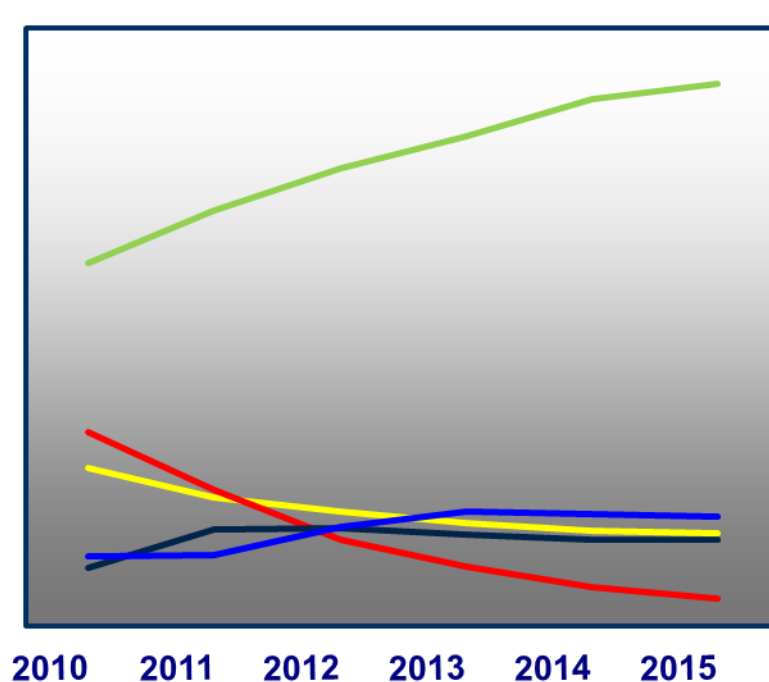
- Revenue \$19.3M ← \$19.8M
- Growth - 3% ← + 15 %
- ASP Change - 45% ← - 35%
- Mobile Growth +9% ← + 11%
- Mobile GB/system (Smart Phone)
8.3GB(9.0G) ← 4.6G(5.1G)
- Growth +78% ← +84%
- In overall slow demand, supply chain has no inventory, keeping price sensitive
- Smartphone and Media Tablet leads demand with 32/64Gb NAND for storage.
- Micron is leading 64Gb race but all are toward low 2x nm
- New Fabs will cause market correction by mid'12, then market will slide to balance.

Demand Drivers for Memory

DRAM



NAND

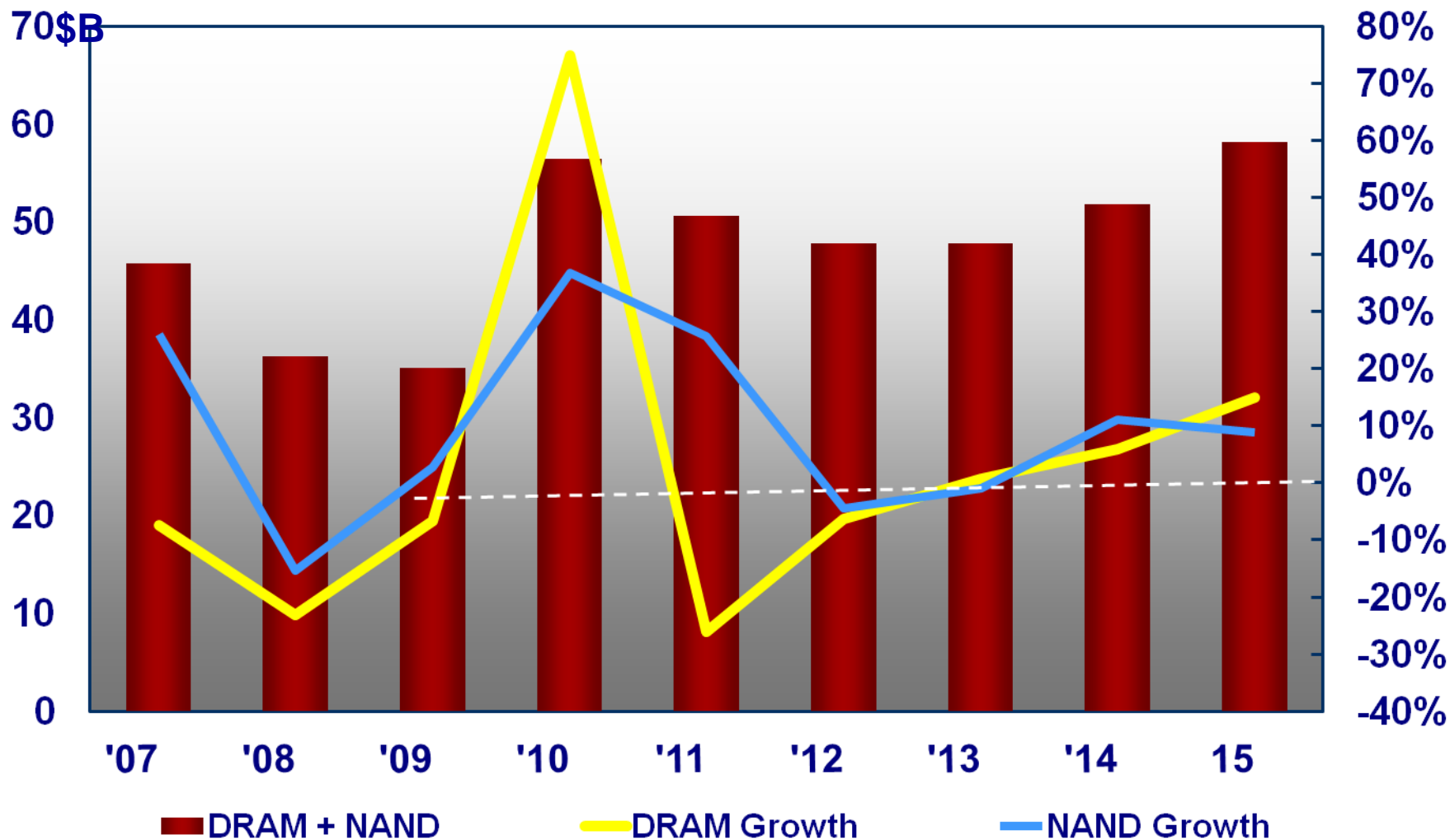


- Graphic
- Mobile
- Media Tablet
- Server
- PC

- DSC
- PMP(F)
- Mobile
- Media Tablet
- SSD

Notes : Bit share
Source: IDC , September 2011

Memory Market Forecast



Source: IDC, September 2011

WW PC semiconductor revenue will grow at only 3% in 2011 but gradually recover to 5%~10% growth in 2012 and after.

- IDC has reduced 2011 WW PC system forecast (7.1% growth → 4.2% → 2.9%), based on increasing economic concerns in US, EMEA, and Japan. But IDC forecasts recovery of growth to near 10% from 2012 and after.
- A significant disagreement in 2011 outlook between PC systems (demand) and PC microprocessors (supply) exists

PC supply chain is still very reactive.

- OEMs and ODMs aggressively fill inventories when demand is assured and aggressively clear inventories when demand wavers

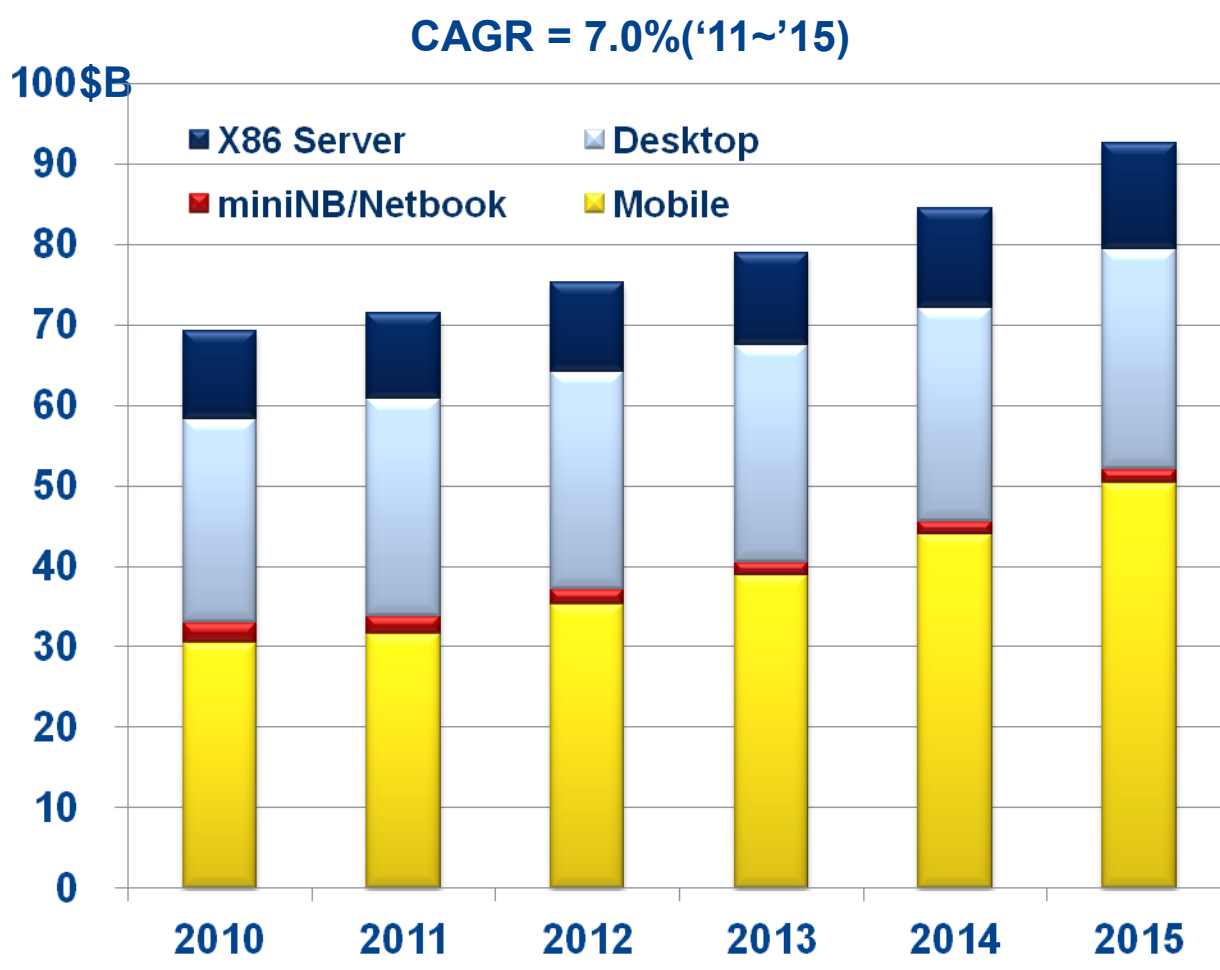
Media tablets growth has eroded netbook growth by a small amount

- Long-term Prospects for media tablet's cannibalization of PC is based on keyboard-enabled design that enables overlap in usage model

Dual attachment of GPU cores will continue to lead semiconductor content growth

- >60% of GPUs are on MPU(Sandybridge, Fusion) but discrete will be still popular

PC Chip Revenue Forecast



Revenue to rise 5% next year

Mobile PCs continue to drive PC chip revenue

- 2011: 44% of total
- 2015: 54% of total

For netbooks, subsiding system unit growth and anemic semi content means little ability to drive PC semiconductor growth

Processors, connectivity, and SSDs(Ultrabook) are long-term growth areas

Source: IDC Semiconductor Applications Forecaster , July 2011

Mobile Phone Semiconductor Market Trends

Market growth will slow down by '15 after moderate 10% of this year

- Global economy setback impacts semi growth to only 5.9% of CAGR('11~'15)
- Phenomenal adoption of Smartphone will demand more mobility, media processing and connectivity as key market drivers; 29% this year to 48% in '15, of all system unit shipment

LTE starts to emerge while 3.5G will hold strong

- 3.5G revenue matched legacy 2.5G last year and will take up >50% in near future
- LTE infrastructure rolling out continues and 4G contribution will start this year to reach 16% of phone semi market by '15

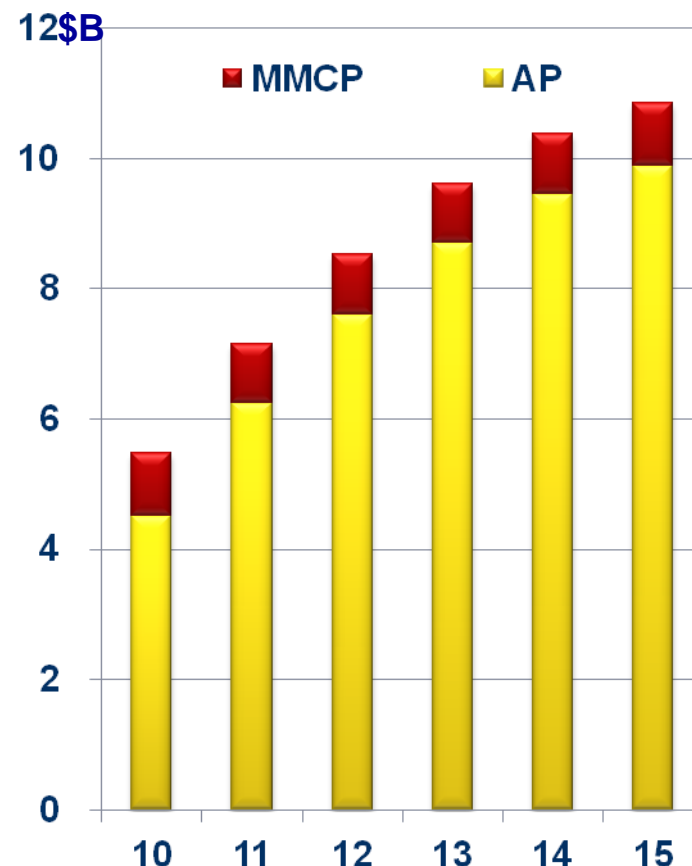
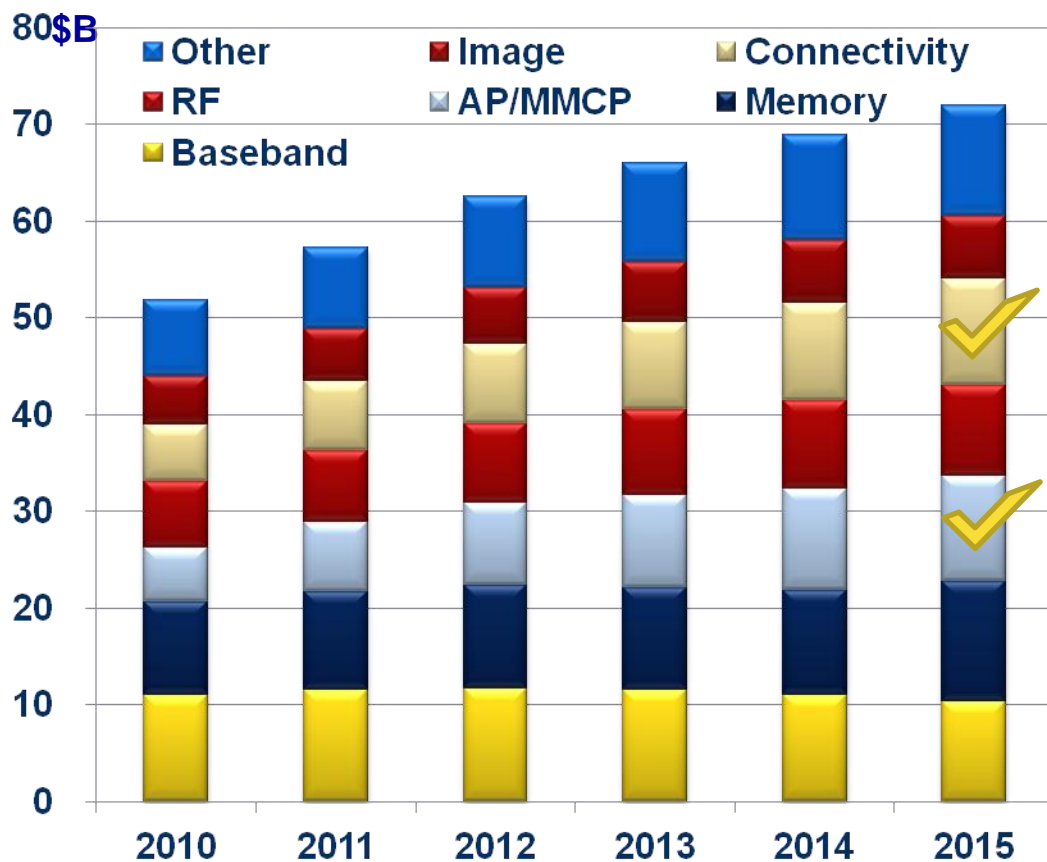
Mobile phone BOM cost pressures will continue

- Design companies are getting squeezed out by chipset suppliers and EMS providers,
- EMS providers are offering more cost competitive design and manufacturing solutions
- Phone BOM cost will decline at 4.9% of CAGR by such competition in supply chain

Connectivity and media processing will be intensified

- Shifting to leading-edge technologies (3.5G, 4G)
- Focusing on connectivity (WiFi, FM, BT, mobile TV, GPS,NFC.) and graphic/applications processing (MMCPs, APs) for higher margins and differentiation

Mobile Phone Semiconductor Market Forecast



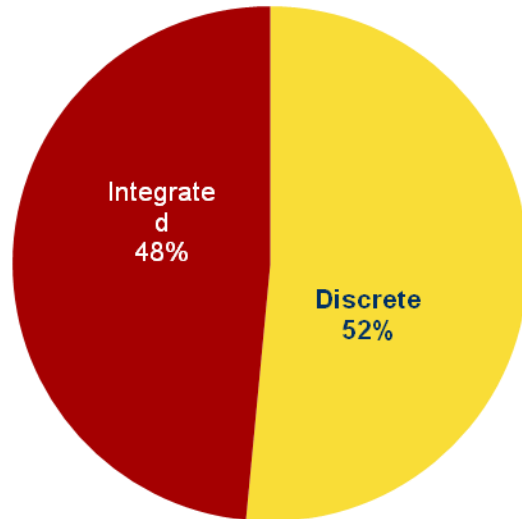
Notes: MMCP= MultiMedia Co-Processor
 AP= Application Processor = Discrete + Integrated

CAGR	Base band	RF	AP/ MMCP	Memory	Connectivity	Image	Other	Total
2011-15	-2.8%	6.5%	11.0%	5.1%	11.4%	4.5%	7.8%	5.9%

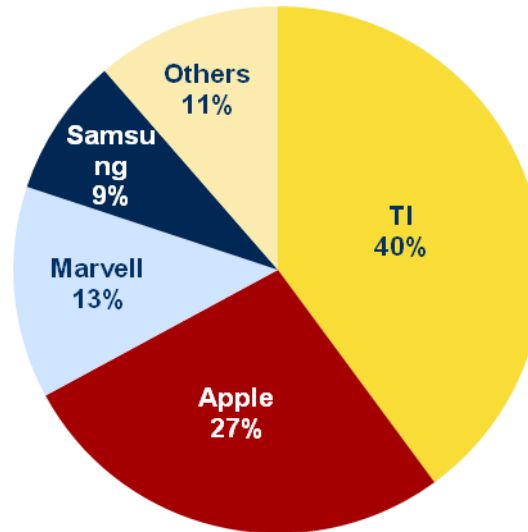
Source: IDC, May 2011

Smart Phone Application Processor

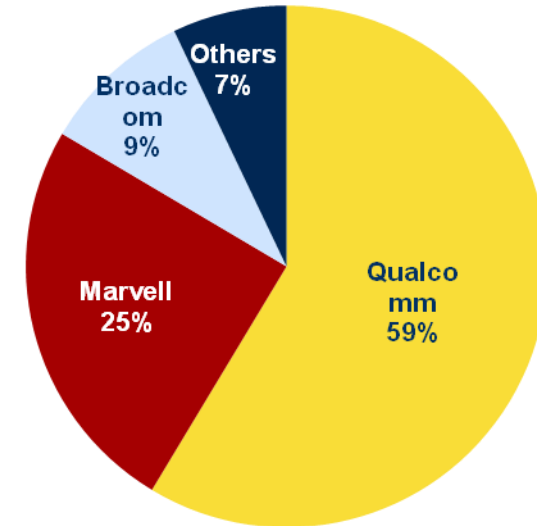
Total for CY2010



Discrete AP



Integrated AP



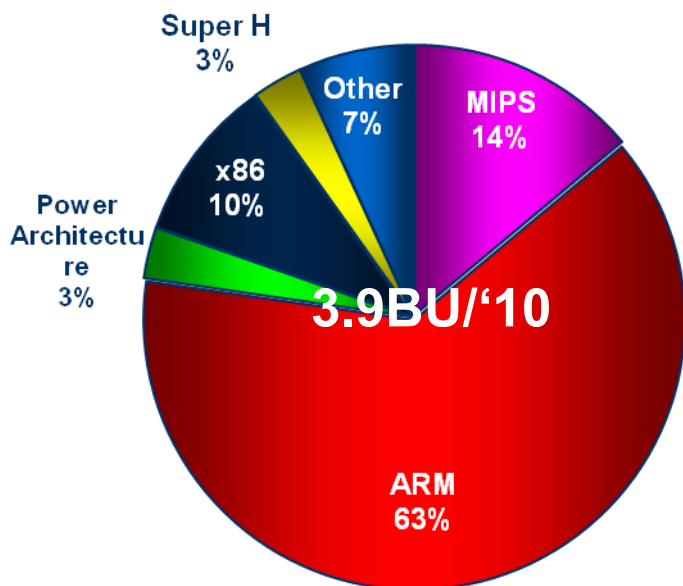
Notes: Unit Share

Source: IDC, March 2011

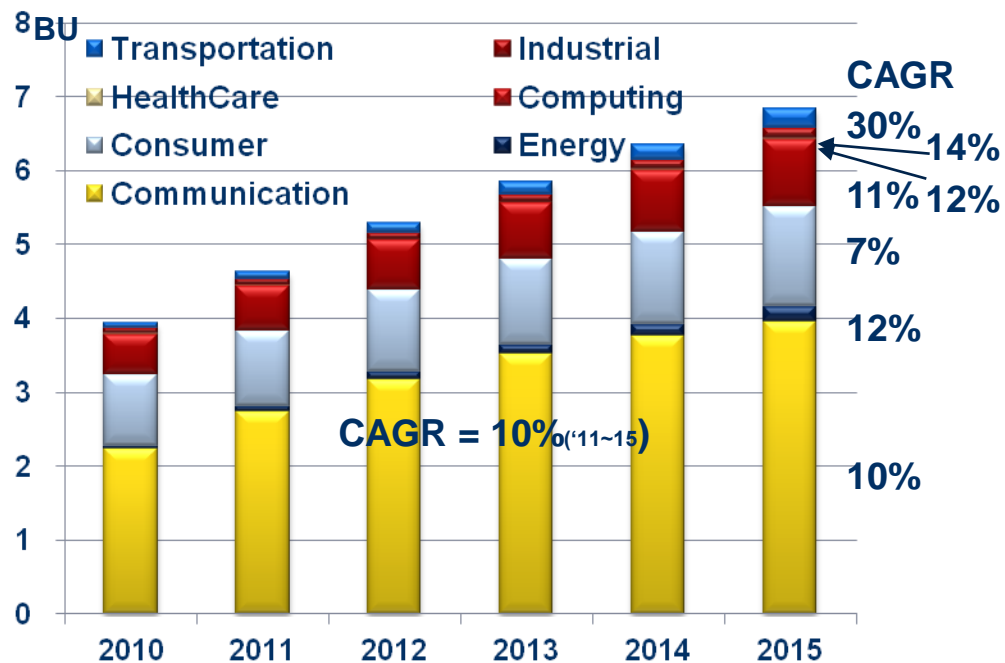
- All are ARM-based
- Improving Clock Speed
- Multiple Cores: Dual Cores(A5, Tegra2, Exynos, OMAP 4/5) → Quad Cores(Tegra 3) → Octal Cores
- Better Power Efficiency(4xnm → 2xnm process), More Video(1080P HD), Imaging (20MP.)

Embedded processor core market will grow 11% to 4.6BU this year and will continue robust growth with a CAGR of 10%

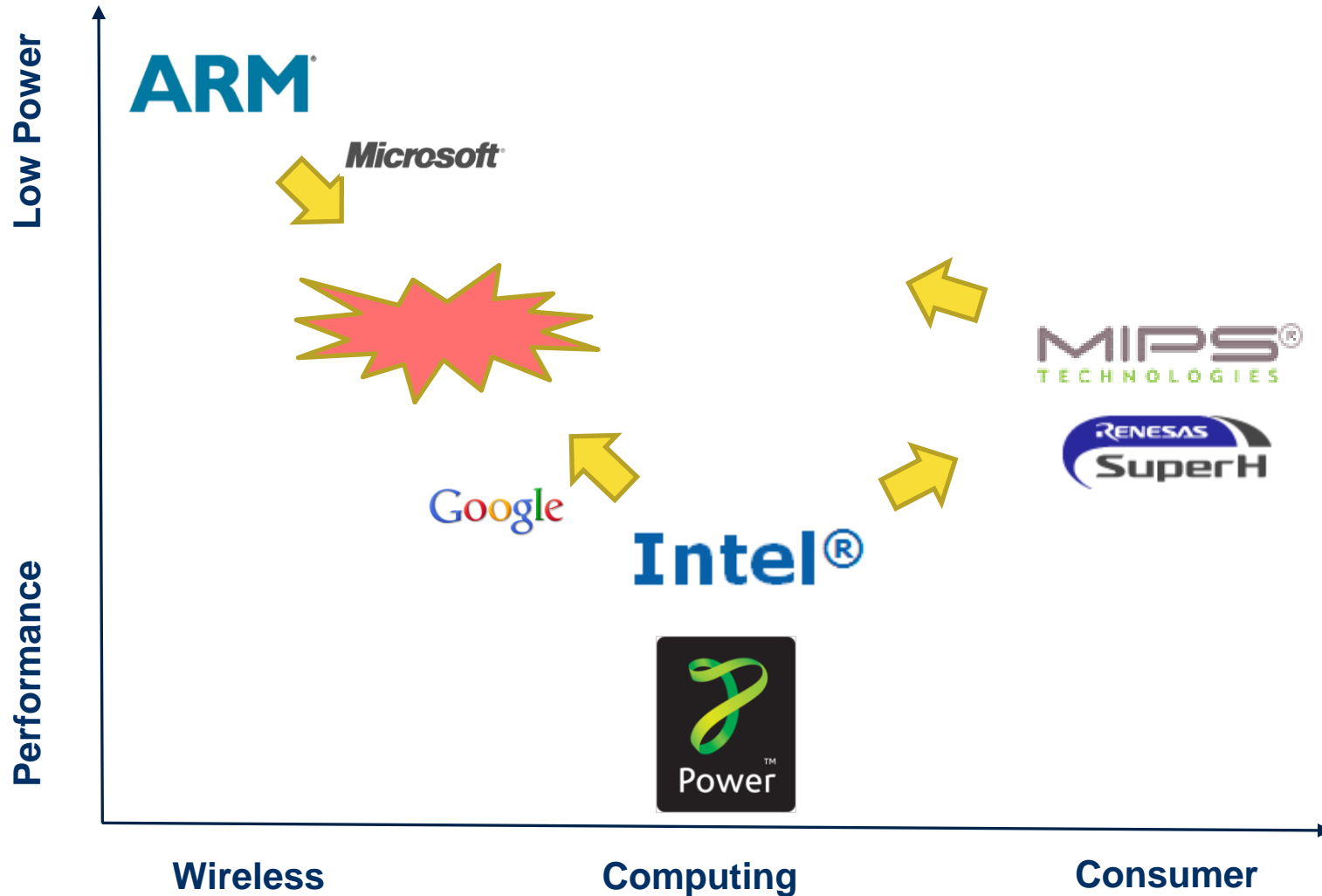
- ARM, MIPS and Power Architecture dominate market with about 90% share
- Communication (mostly Wireless) is major usage by taking about 60% share, but energy, healthcare and industrial become a new horizon for future investment
- ASSP takes 3 out of 4 embedded cores
- Multiple core era began to meet increasing bandwidth ; Dual, Quad, Octal...



Source: IDC, August 2011



Embedded Processor Competition Landscape



Source: IDC, September 2011

Media Tablet/eReader Semiconductor Market Trends

Media Tablet(MT)/eReader semiconductor market will grow double to \$7.3B this year and will expand with a CAGR of 15% ('11~'15)

- Apple dominates eco-system; platform, OS, contents, chips supply chain
- but non-Apple products are increasing visibility in strong competition of chip makers and system makers

Connectivity is a key driver to MT semi market growth with a CAGR of 19%

- Heavily depends on Wi-Fi or Combo with optional support of baseband; Atheros (Qualcomm), Broadcom, Infineon, Marvell...compete
- more growth expected from home-networking proliferation or corporate adoption

Application processor is led by nVidia(MT) and Freescale(eReader)

- Rapidly shift to multiple core(mostly ARM base) from chip-vendors; Broadcom, Marvell, Qualcomm, Samsung, TI
- Low Power requires most advanced process like 2xnm

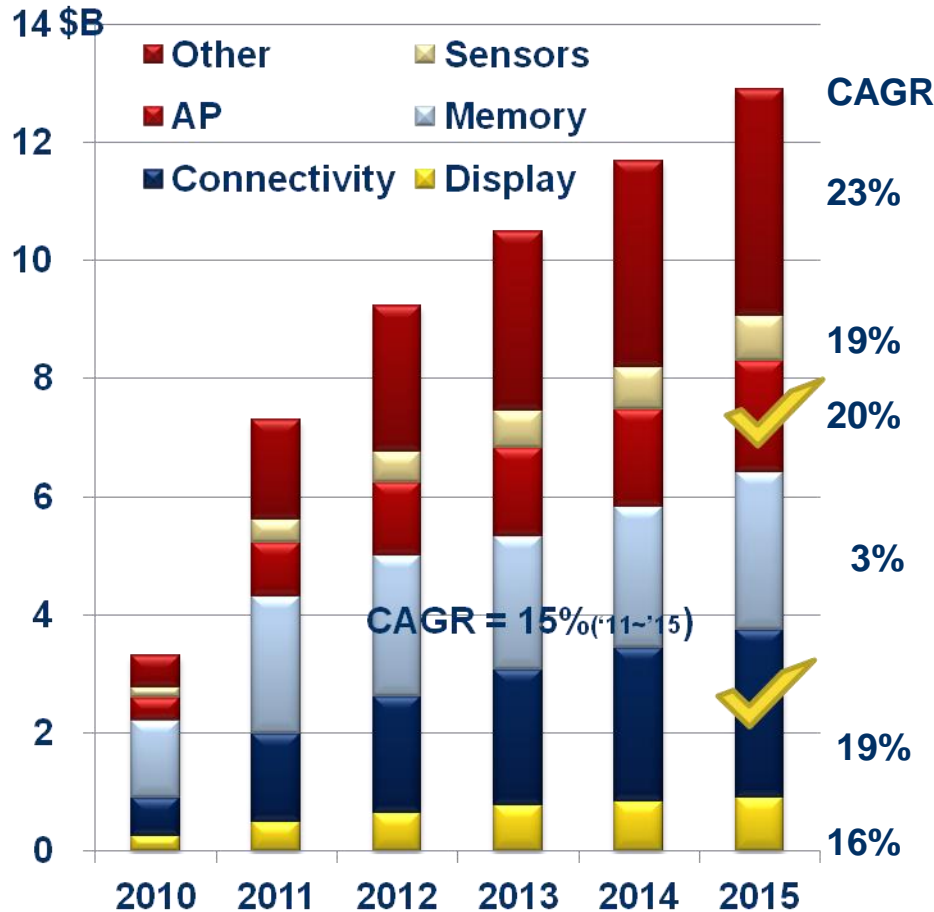
Memory focuses on NAND with mobile DRAM to HD Quality graphics but growth will be limited as mid-low end products penetration increase

Innovative sensor ICs creates brand-new experience with platform addiction

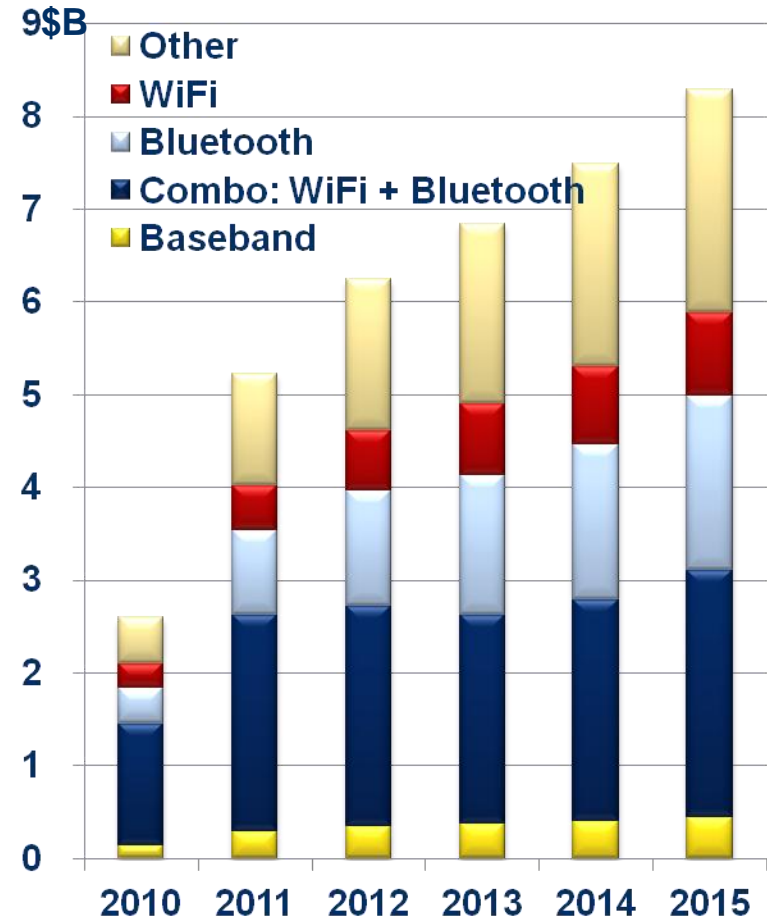
- touch/rotating screens controller, ambient light sensors, gyroscopes, magnetometers

Media Tablet Semiconductor Revenue Forecast

Total Market



Connectivity



Source: IDC Semiconductor Applications Forecaster, July 2011

- ✓ **Semiconductor market growth will bottom next year and gradually recover at 6% CAGR by '15**
 - ASSP/ASIC, APEC, Wireless will continue to be concerns
- ✓ **Memory market will turn into stabilization next year but pricing pressure will stay**
 - DRAM into stabilization but NAND will need a correction in 1H'12.
- ✓ **PC semiconductor market will gradually recover from next year as new platform comes and portable penetration increases**
- ✓ **Mobile phone semiconductor market will still keep solid at about 10% growth this & next year but its growth will slow down by '15**
 - Smartphone share up and slow 4G penetration
- ✓ **Media Tablet/eReader semiconductor market will expand at strong 15% CAGR but competition will be tougher in both chip makers and system vendors standpoint**

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