

# After the 2010 Boom – Now What?

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# Three Key Trends Shaping Forecast

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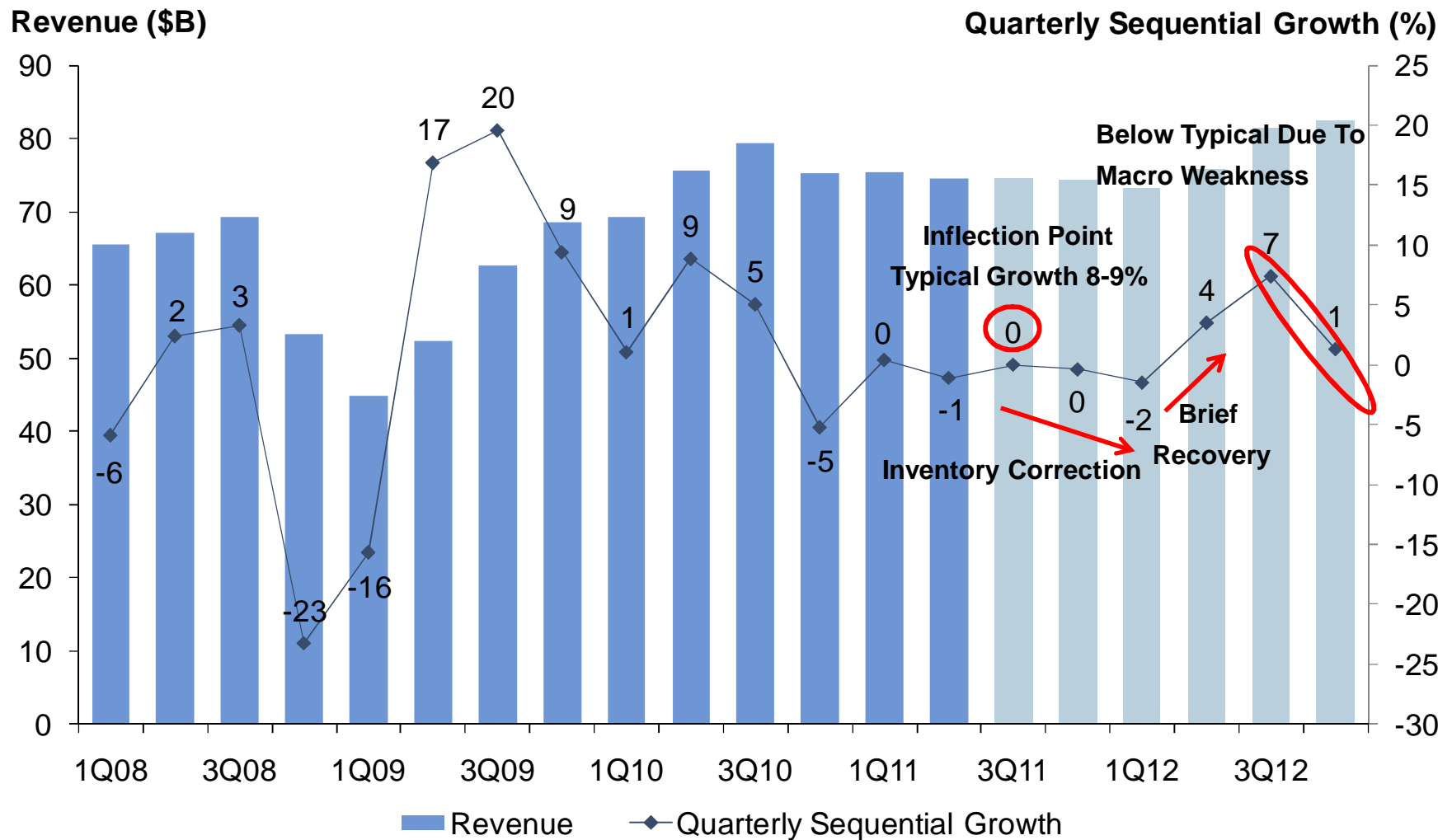
- Inventory correction
- Foundry and DRAM overcapacity
- Macro economic trends affecting demand

# Facts Exposing 3Q11 Inflection Point

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- Semiconductor companies 3Q11 guidance well below seasonal norm and starting to see downward revisions
  - Current guidance points to flat 3Q11 when typical is up 8-9%
  - TI, Altera, Fairchild, and Vishay recently cut 3Q guidance by 5-10%
- Supply chain showing significant slowdown
  - TSMC's original 3Q guidance was negative 6-8% when typical is closer to plus 8-10%
  - Packaging and silicon wafer companies reporting significant slowdown
- Semiconductor related inventory levels still elevated
- Consumer confidence at 30 year low
- Global Insights says odds of double-dip recession rose from 25 to 40% in one month.

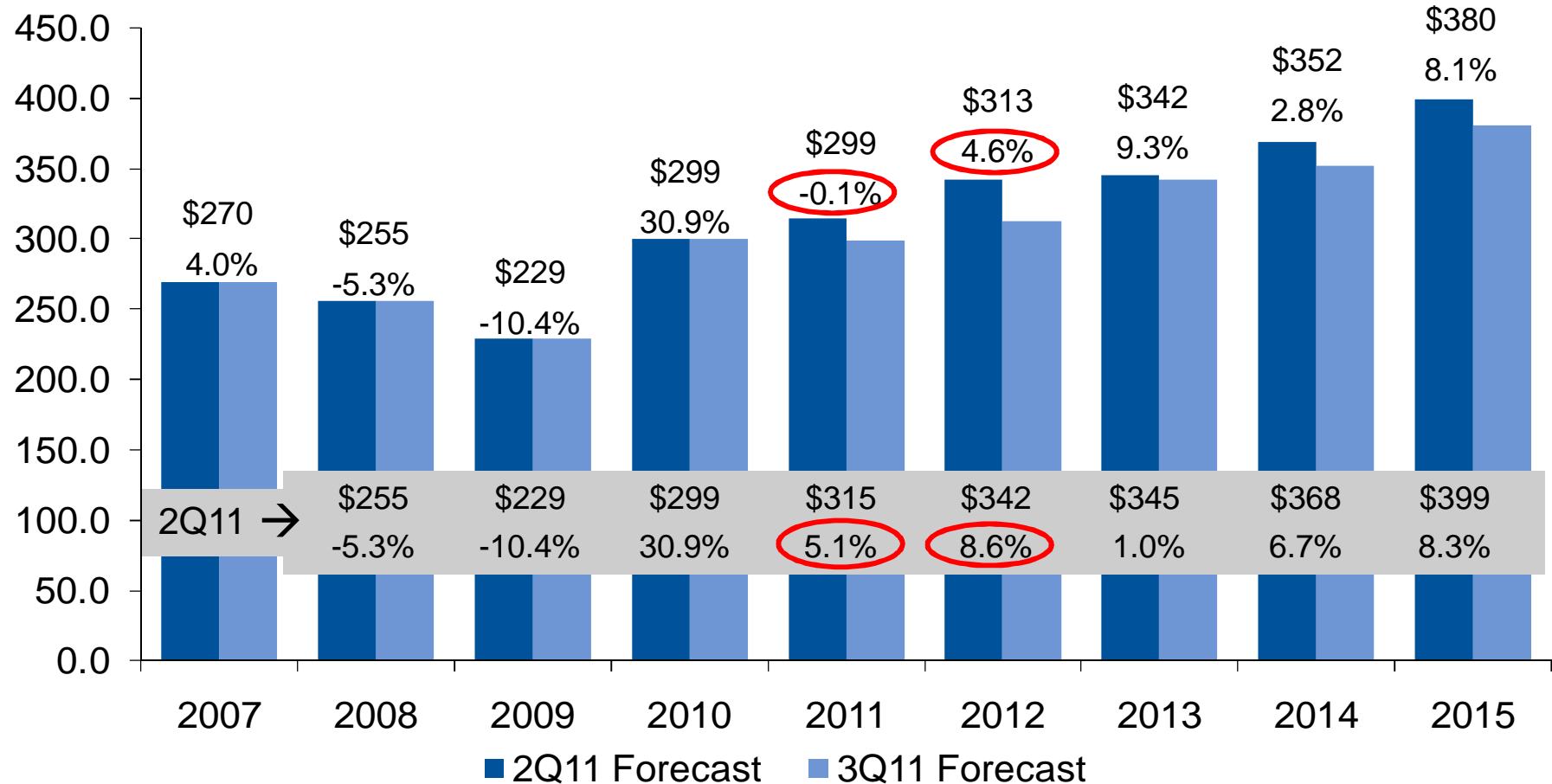
# Semiconductor Quarterly Revenue Profile, 3Q11 Update: Correction and Brief Respite



Source: Gartner (September 2011)

# Worldwide Semiconductor Revenue Forecast: Reduction in 2011/12, Monitoring 2012

Billions of Dollars and Revenue Growth



# Key Semiconductor Assumptions

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- PC 2011 production unit growth in 3Q11 forecast was significantly decreased from 9.5% to 3.4%.
- Mobile phone 2011 production unit growth decreased slightly from 12.9% to 11.5%.
- Media tablet production forecast decreased from 71.6M to 67.1M in 2011, still growing 266% over 2010.
- DRAM impacted hard by reduced PC demand and falling prices, worst performing device in 2011 with 26.6% decline
- NAND flash and data processing ASIC fastest growing devices areas in 2011 with about 20% growth in part due to strong growth in smartphones and iPads
- Foundry overcapacity, inventory correction, and slowing demand hitting all at once reducing growth expectations for 2011 and 2012.

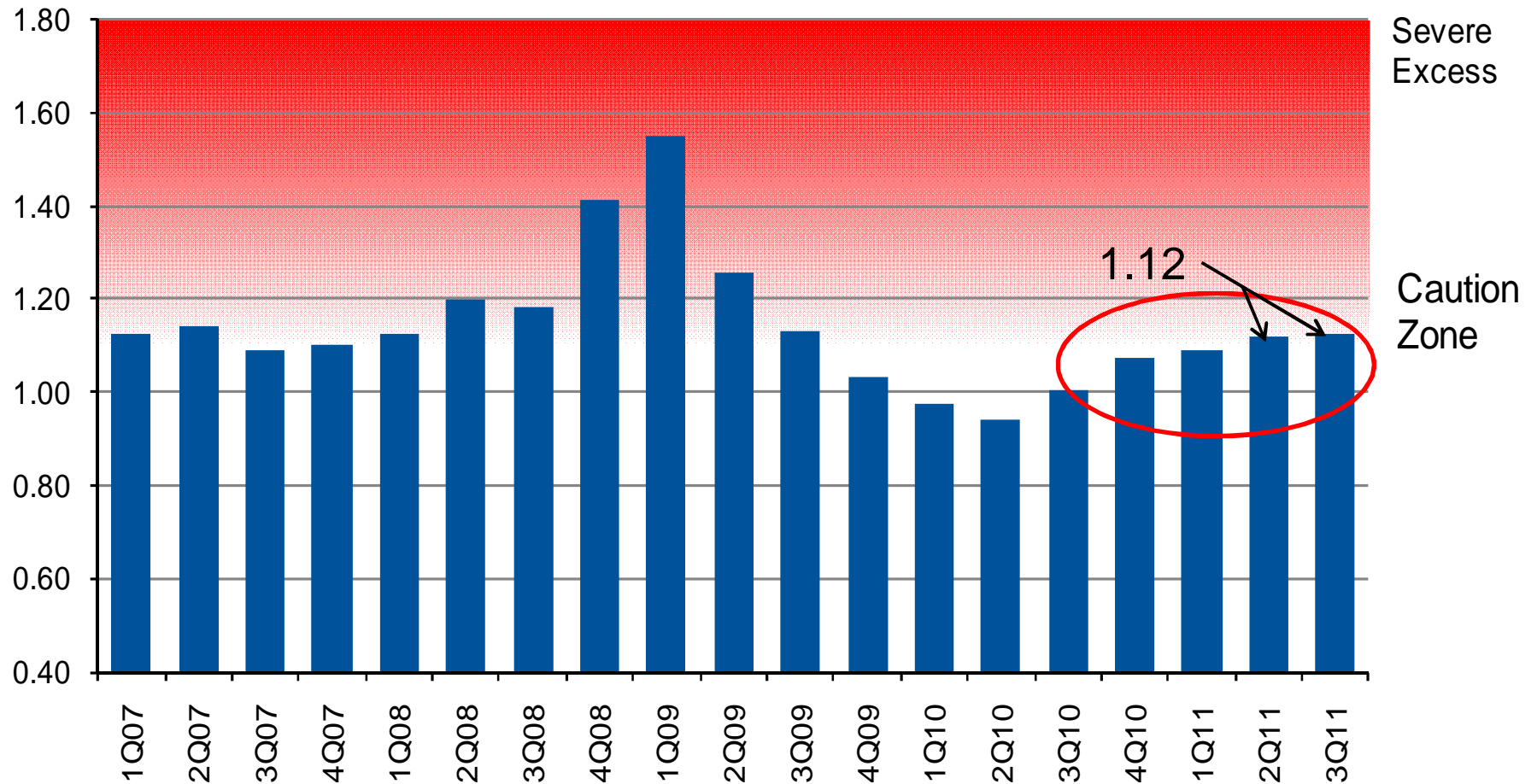
## PCs and Mobile Phones Accounted for Lions Share of Reduction (Memory Market Woes lead to Half of Downside)

<b>Applications</b>	<b>2011 Change from Last Quarter (\$B)</b>	<b>% of Total Decline</b>
PC	-6.0	38%
Mobile Phone	-3.2	21%
Consumer	-2.3	15%
Automotive	-0.8	5%
Media Tablet	-0.5	3%
All Other Applications	-2.8	18%
<b>Total Applications</b>	<b>-15.6</b>	<b>100%</b>

Source: Gartner (September 2011)

# After Japan Recovery, Inventory Correction Continues as Economic Headwinds Mount

Semiconductor Inventory Index

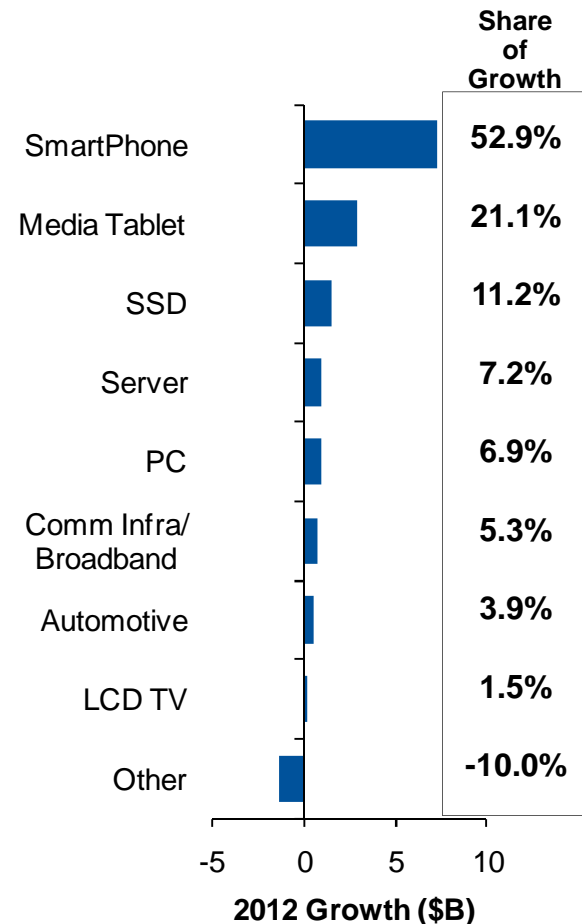




# Application Growth in 2012

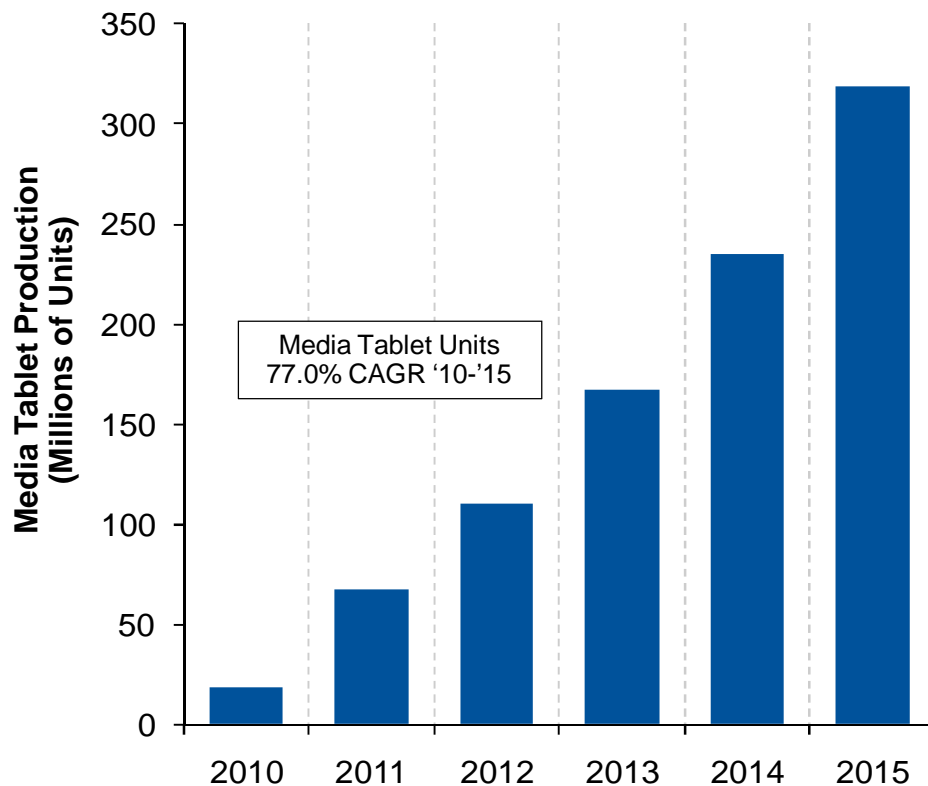
- As **smartphones** ramp in volume, they dominate 2012 semiconductor market growth
- **Media tablets** continue their rapid rise as Apple builds on success and competition tries to find successful formula
- **SSD** grows 40% after doubling in 2011
- **Server** growth fueled by cloud computing
- **PC** semiconductor market returns to growth as DRAM recovers
- **Communications infrastructure** pressured by enterprise spending and pricing for next generation carrier upgrades
- **Automotive** market grows modestly but subject to economic weakness
- **LCD TV** mature market with strong pricing pressure as LED backlighting saturates

## Contribution to 2012 Growth



# Media Tablets, 3Q11 Update: Slight downward revision, but long-term still very strong

	2010	2011	2012	2013	2014	2015	CAGR '10-'15
Semis(\$B)	2.0	6.0	9.0	12.9	15.5	19.9	57.8%
Yr/Yr Growth		197%	48.3%	43.8%	20.1%	28.7%	



Source: Gartner (September 2011)

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- Apple still firmly in command, will control over 50% of the Media Tablet Market through to 2014
- Operating systems morphing into ecosystem plays
- Concerns that competitors have not been able to compete with Apple
- Patent litigation and a weak ecosystem holding Android back
- Rumored Amazon media tablet entry could have a positive impact
- We expect Microsoft to bring to market a tablet-specific version of Windows 8 in 2012
- Significant opportunity for semiconductors but Apple market share limits success to select suppliers

# Application Summary

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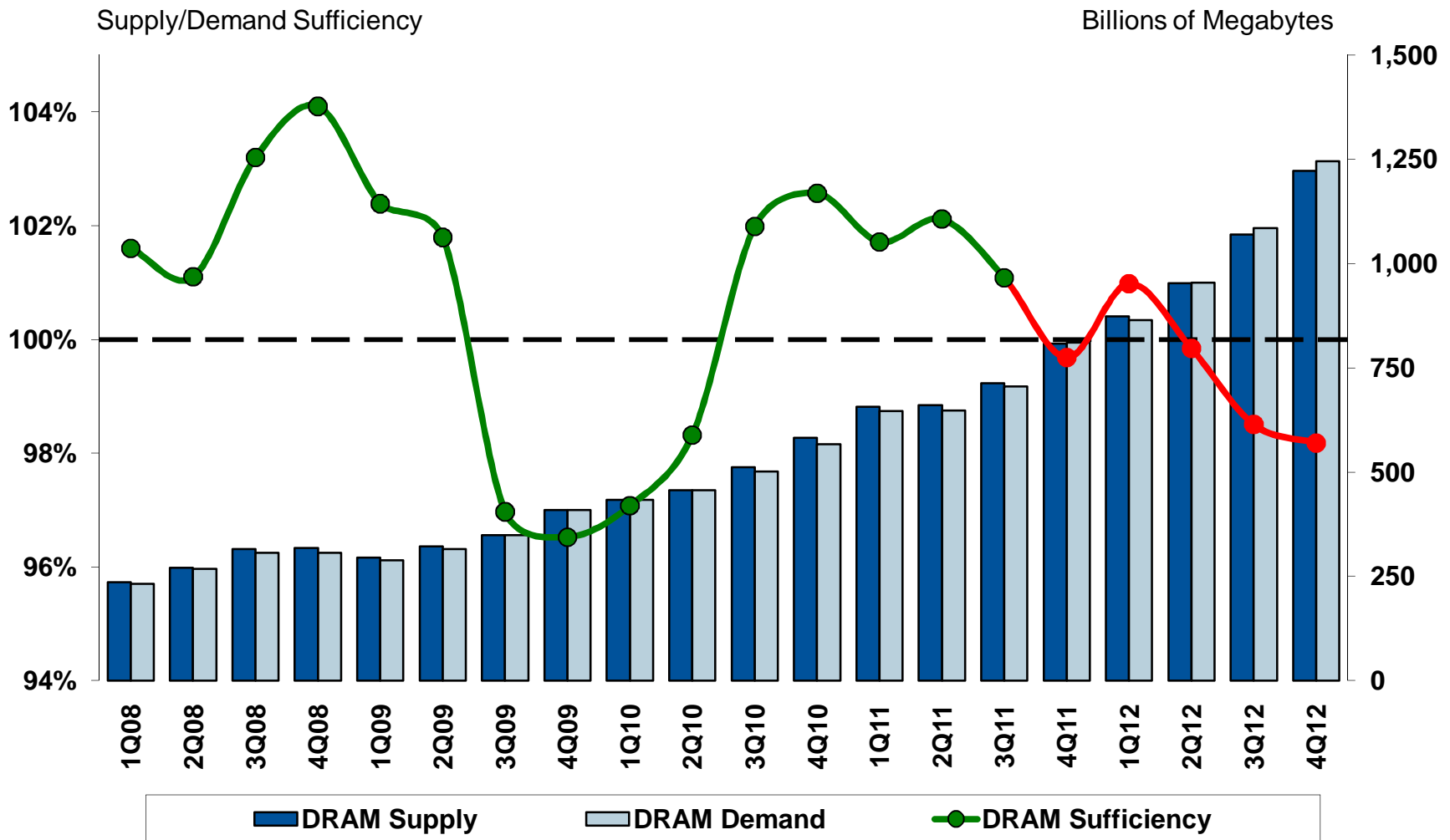
- Consumer spending focused on computing but attention is moving away from PCs to alternatives including media tablets and smartphones
- Large ecosystems will continue dominate the consumer and enterprise mobile markets
- As Apple's market share in electronics increases, it reduces the growth opportunity for semiconductor vendors without Apple design wins
- As users adopt more devices, they are using them in a complementary fashion across similar content or applications. These distinctions will keep substitution between devices to a minimum.
- Weakness in the PC market led to almost 40% of the reduction in 2011 semiconductor forecast
- With weakening economy enterprises will continue to find ways to extend the life of aging PCs and delay upgrading to Windows 7
- Nearly 85% of 2012 semiconductor growth will come from just 3 applications – out of over 100 applications tracked; big 3 represent 70% of growth through 2015

# 3Q11 DRAM Forecast

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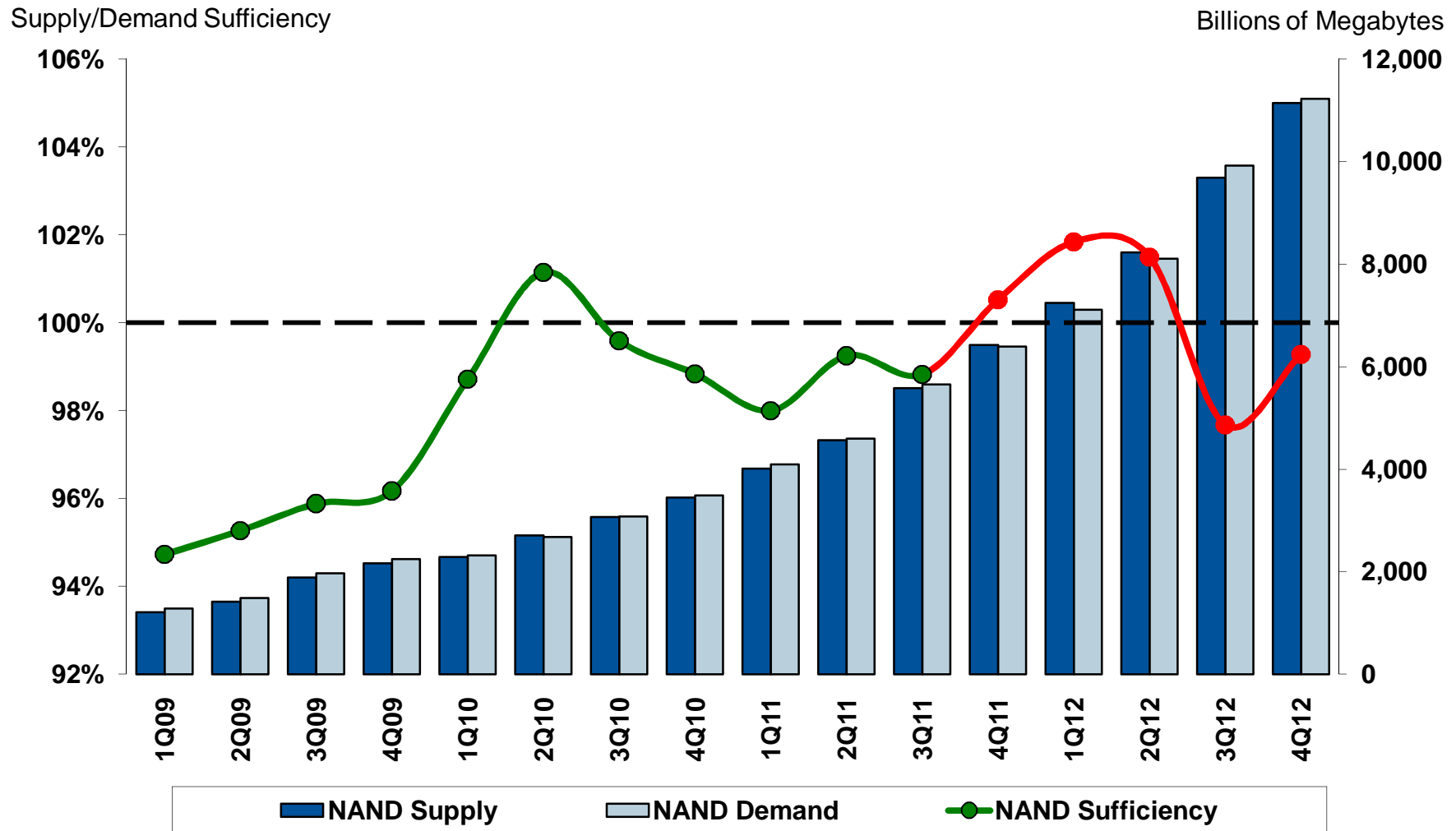
- Significant changes to DRAM forecast over the next couple of years
- Faltering economy and slowdown in demand, especially in PCs, once again tipped the market into oversupply and pricing collapse
- Mainstream device pricing now close to or below variable cost for least efficient manufacturers
- We expect pricing to bottom-out and even increase slightly before year end due to mild seasonal demand & channel inventory correction
- Higher DRAM content growth in PCs and stronger production growth though 2012 will move the market back into undersupply
- Further mild increase in pricing in 2012 will move the vendors back into profitability
- Capacity expansion decisions will be delayed until mid 2012 with little or no new capacity coming online before 2014

# Worldwide DRAM Supply & Demand



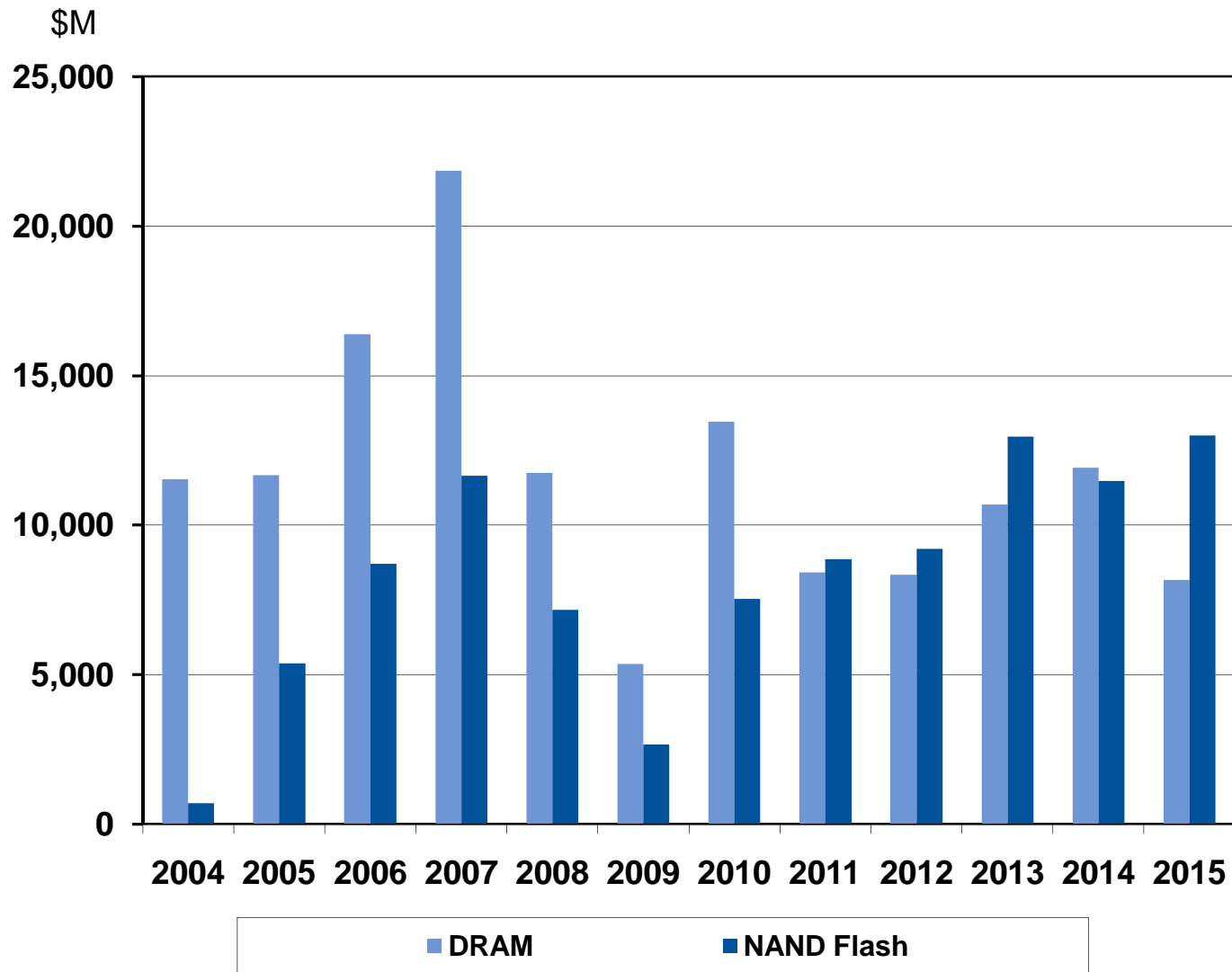
Source: Gartner, September 2011  
 "Forecast: DRAM Supply and Demand, Worldwide, 1Q10-4Q12, 3Q11 Update" [G00217351]

# Worldwide NAND Supply & Demand



Source: Gartner, September 2011  
 "Forecast: NAND Flash Supply and Demand, Worldwide, 1Q10-4Q12, 3Q11 Update" [G00217368]

# Memory Spending: NAND Passes DRAM in 2011



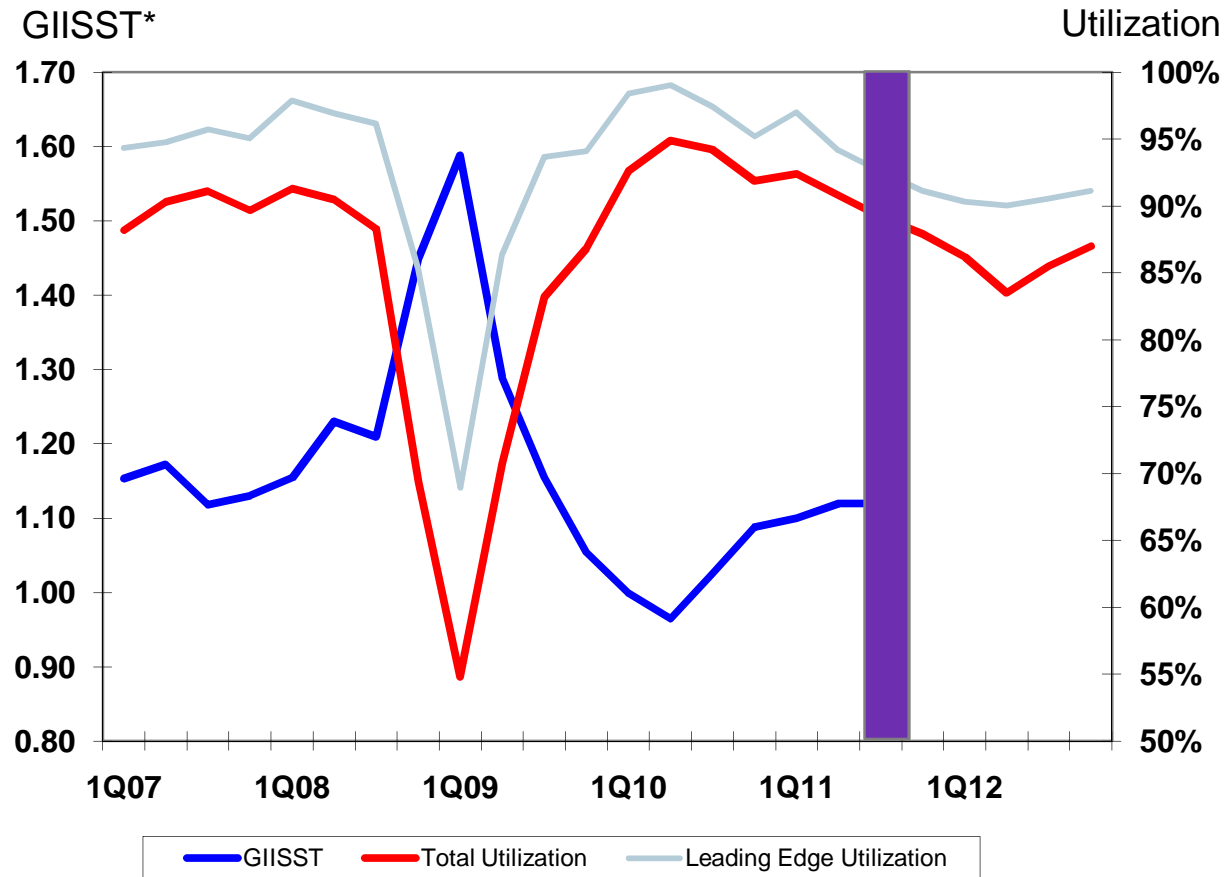
Source: Gartner (September 2011)

# Top Semiconductor Capital Spenders, 2010 and 2011: Concentration Continues

2011 Rank	2010 Rank	Company	2010	2011	Change (%)	Share (%)
1	3	Intel	5,207.0	10,300.0	97.8%	16.7%
2	1	Samsung	11,000.0	8,200.0	-25.5%	13.3%
3	2	TSMC Group	5,936.0	7,300.0	23.0%	11.8%
4	5	Globalfoundries	2,750.0	4,900.0	78.2%	7.9%
5	4	Hynix Semiconductor	2,942.8	3,000.0	1.9%	4.9%
6	9	Micron Technology	1,255.0	2,650.0	111.2%	4.3%
7	7	United Microelectronics Group	1,800.0	1,800.0	0.0%	2.9%
8	6	Toshiba	2,079.3	1,784.0	-14.2%	2.9%
9	19	Sony	577.6	1,784.0	208.9%	2.9%
10	13	SanDisk	1,052.0	1,400.0	33.1%	2.3%
11	14	STMicroelectronics	1,034.0	1,100.0	6.4%	1.8%
12	21	Infineon Technologies	550.0	1,100.0	100.0%	1.8%
13	11	Texas Instruments	1,200.0	900.0	-25.0%	1.5%
14	16	SMIC	728.0	800.0	9.9%	1.3%
15	23	Nichia Chemical	502.5	780.5	55.3%	1.3%
16	10	Elpida Memory	1,212.9	738.1	-39.1%	1.2%
17	12	Advanced Semiconductor Engineering	1,100.0	700.0	-36.4%	1.1%
18	8	Inotera Memories	1,746.0	568.5	-67.4%	0.9%
19	17	Rohm	635.3	559.7	-11.9%	0.9%
20	15	Nanya Technology	729.0	550.0	-24.6%	0.9%
		<b>Top 20 Companies' Total*</b>	<b>44,037.5</b>	<b>50,914.9</b>	<b>15.6%</b>	<b>82.3%</b>
		<b>Total Worldwide Capital Spending</b>	<b>56,526.2</b>	<b>61,832.1</b>	<b>9.4%</b>	<b>100.0%</b>
		<b>Top Companies (Percent)</b>	<b>77.9%</b>	<b>82.3%</b>		



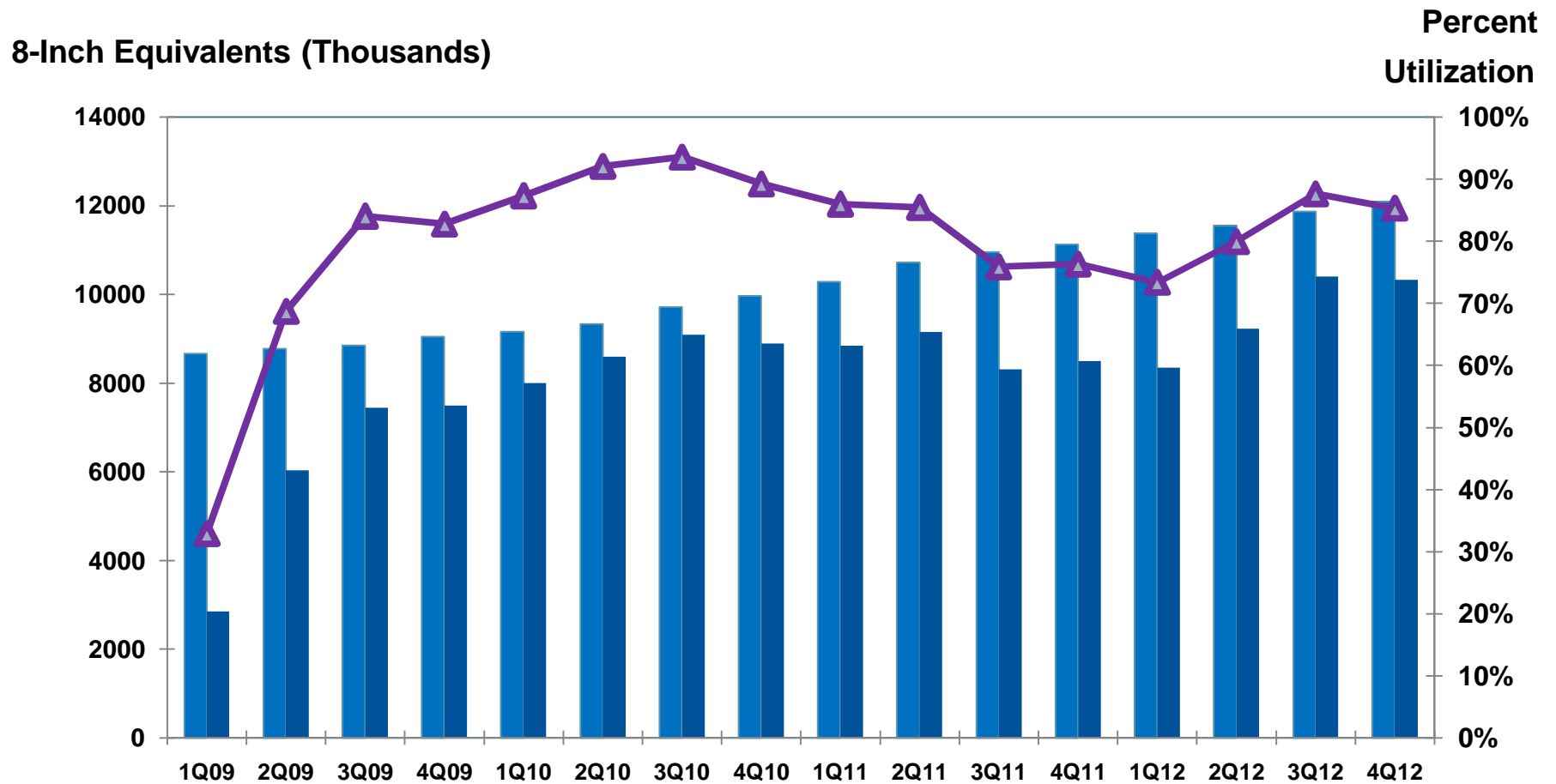
# Inventory Index vs. Total Utilization: Excess Inventory Pushes Utilization Down



- Utilization drops in 2011 as Semiconductor inventories stay high
- Investments in new capacity in 2011 depress utilization rates as production drops in response to excess inventory
- Utilization inches upward in 2012 in response to reduced investments.

\*Gartner Index of Inventory Semiconductor Supply-chain Tracking

# Foundry Wafer Shipment, Capacity and Utilization Rate



Source: Gartner (September 2011)

# SATS (OSAT) Market Overview

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- The transition from gold to copper bonding will become widespread as gold approaches \$2,000 oz.
- Move to lower cost Flip Chip (Cu Pillar) increasing as gold price increases.
- Utilization rates decreasing: Q2 was around 80% for most of the major SATS firms. Q3 to be same or slightly lower.
- Increased use of outsourcing model for capital conservation will be a major driver throughout forecast period.
- Advanced processes including flip chip, WLP and TSV will provide increased value-add for SATS providers.

# The Rise of SATS

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- Since 1997, the revenue growth of the SATS market has more than quadrupled from \$5.1 Billion to \$23.6 Billion in 2010.
- During this period, the SATS share of the total semiconductor packaging market grew from 19.6% to 48.7% in 2010.

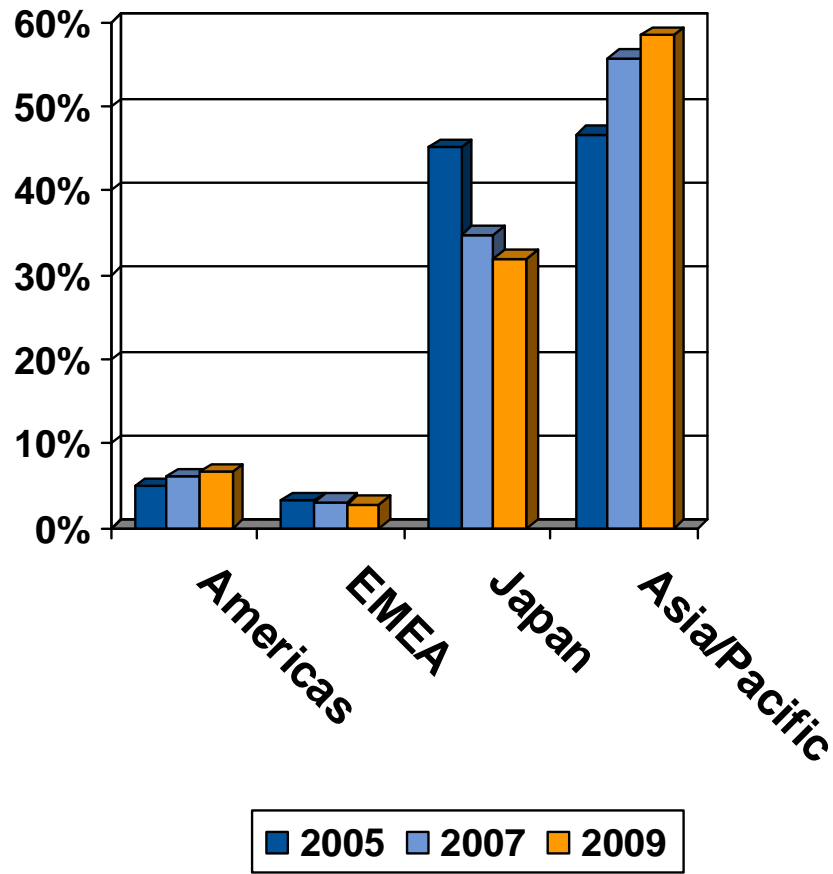
# Packaging/Test Revenue Market Forecast, 2010-2015 (Millions of Dollars)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	CAGR 2010- 2015
<b>Packaging and Test Market (IDM)*</b>	<b>25039</b>	<b>26744</b>	<b>25407</b>	<b>20793</b>	<b>24898</b>	<b>24192</b>	<b>24000</b>	<b>26173</b>	<b>26779</b>	<b>28755</b>	<b>2.9%</b>
Packaging Revenue Only	19556	21203	19889	16368	19621	19082	19030	20781	21263	22831	3.1%
Test Revenue Only	5483	5541	5517	4425	5277	5110	4971	5392	5517	5923	2.3%
<b>Outsourcing Market (SATS)</b>	<b>19181</b>	<b>20600</b>	<b>20101</b>	<b>17150</b>	<b>23593</b>	<b>24132</b>	<b>25120</b>	<b>28137</b>	<b>30205</b>	<b>32707</b>	<b>6.8%</b>
Packaging Revenue Only	14936	16134	15513	13365	18115	18234	18980	21147	22633	24508	6.2%
Test Revenue Only	4245	4466	4588	3785	5478	5898	6140	6991	7572	8199	8.4%
<b>Ratio of Outsourced Market</b>	<b>43.4%</b>	<b>43.5%</b>	<b>44.2%</b>	<b>45.2%</b>	<b>48.7%</b>	<b>49.9%</b>	<b>51.1%</b>	<b>51.8%</b>	<b>53.0%</b>	<b>53.2%</b>	
SATS Growth Rate	26.4%	7.4%	-2.4%	-14.7%	37.6%	2.3%	4.1%	12.0%	7.3%	8.3%	

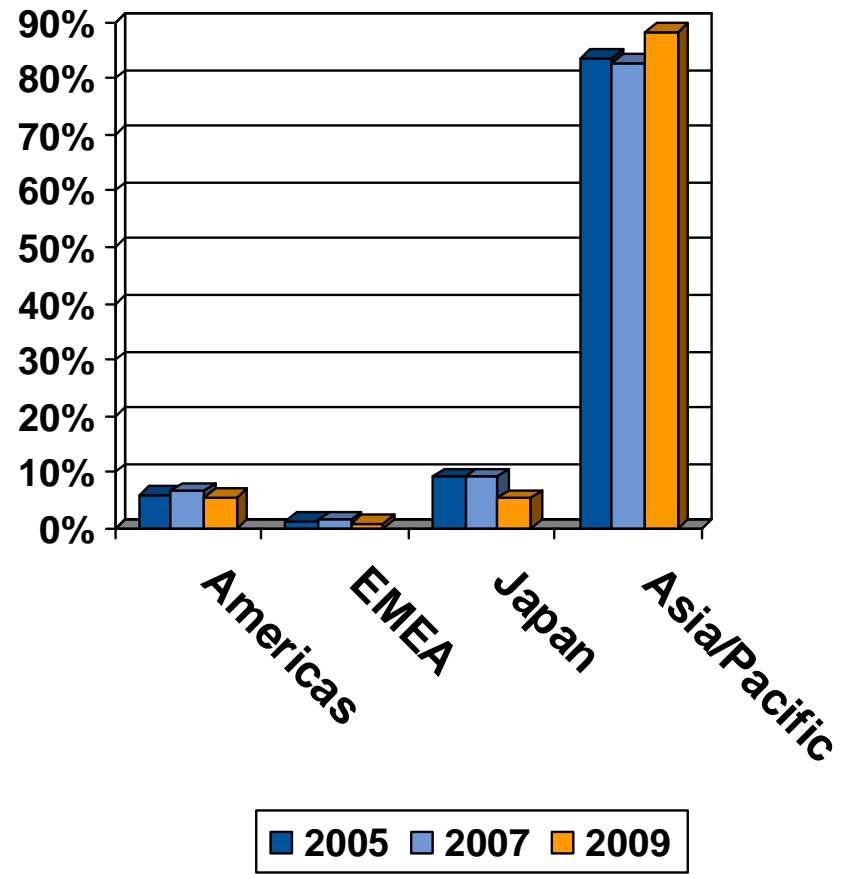
Source: Gartner (September 2011)

# Percentage of WW Capacity: SATS vs. IDM

Percentage of WW IDM  
Capacity 2005-09



Percentage of WW SATS  
Capacity 2005-09



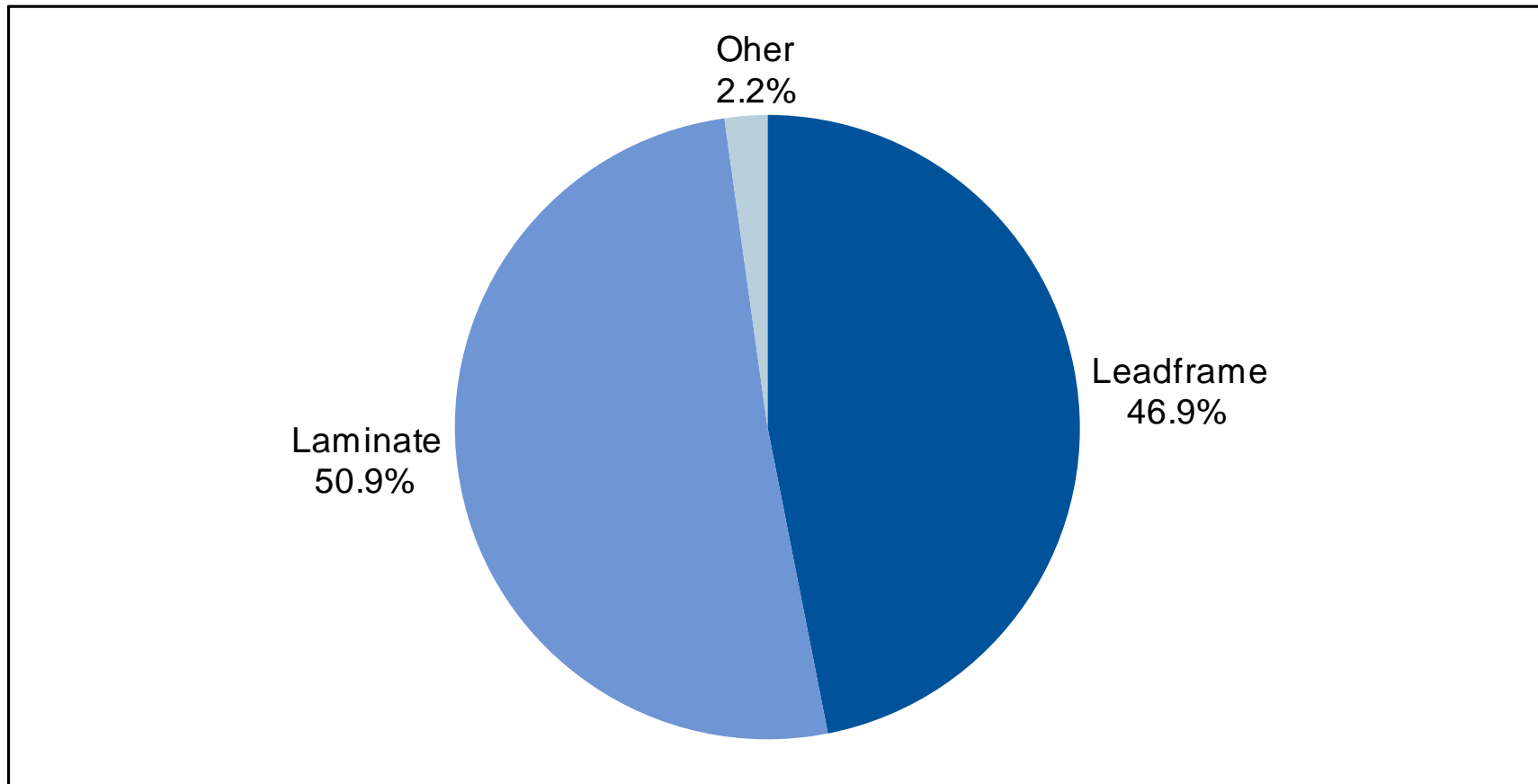
# SATS Market Share for 2010

(Millions of US Dollars)

2009 Rank	2010 Rank	Change in Rank	Company	2009 Revenue	2010 Revenue	Change 2009-2010 (%)	2010 Market Share (%)
1	1	0	ASE	2,547.0	3,902.7	53.2	16.5
2	2	0	Amkor Technology	2,179.1	2,939.0	34.9	12.5
3	3	0	SPIL	1,761.2	2,104.0	19.5	8.9
4	4	0	STATS ChipPAC	1,326.0	1,677.8	26.5	7.1
5	5	0	Powertech Technology	947.0	1,173.0	23.9	5.0
6	6	0	UTAC	601.0	925.0	53.9	3.9
19	7	12	J-Devices	165.0	600.0	263.6	2.5
7	8	-1	ChipMOS Technologies	380.3	590.6	55.3	2.5
8	9	-1	Jiangsu Changjiang Electronics Technology	347.0	531.0	53.0	2.3
9	10	-1	King Yuan Electronics	318.0	490.0	54.1	2.1
10	11	-1	Unisem	300.0	433.3	44.4	1.8
17	12	5	Chipbond Technology	170.0	431.0	153.5	1.8
11	13	-2	Carsem Semiconductor	275.0	394.0	43.3	1.7
12	14	-2	Formosa Advanced Technologies	271.0	375.0	38.4	1.6
13	15	-2	Greatek	267.0	324.0	21.3	1.4
16	16	0	STS Semiconductor	180.0	322.0	78.9	1.4
18	17	1	Walton Advanced Engineering	168.3	260.0	54.5	1.1
15	18	-3	Nantong Fujitsu Microelectronics	181.0	253.6	40.1	1.1
26	19	7	Hana Micron	129.0	230.0	78.3	1.0
25	20	5	Hana Microelectronics	130.5	219.4	68.1	0.9
<b>Top 20 Total</b>				<b>12,643.4</b>	<b>18,175.3</b>	<b>43.8</b>	<b>77.0</b>
Other Companies				4,506.6	5,417.2	20.2	23.0
<b>Total Market</b>				<b>17,150.0</b>	<b>23,592.5</b>	<b>37.6</b>	<b>100.0</b>

# 2010 SATS Revenue by Package Type

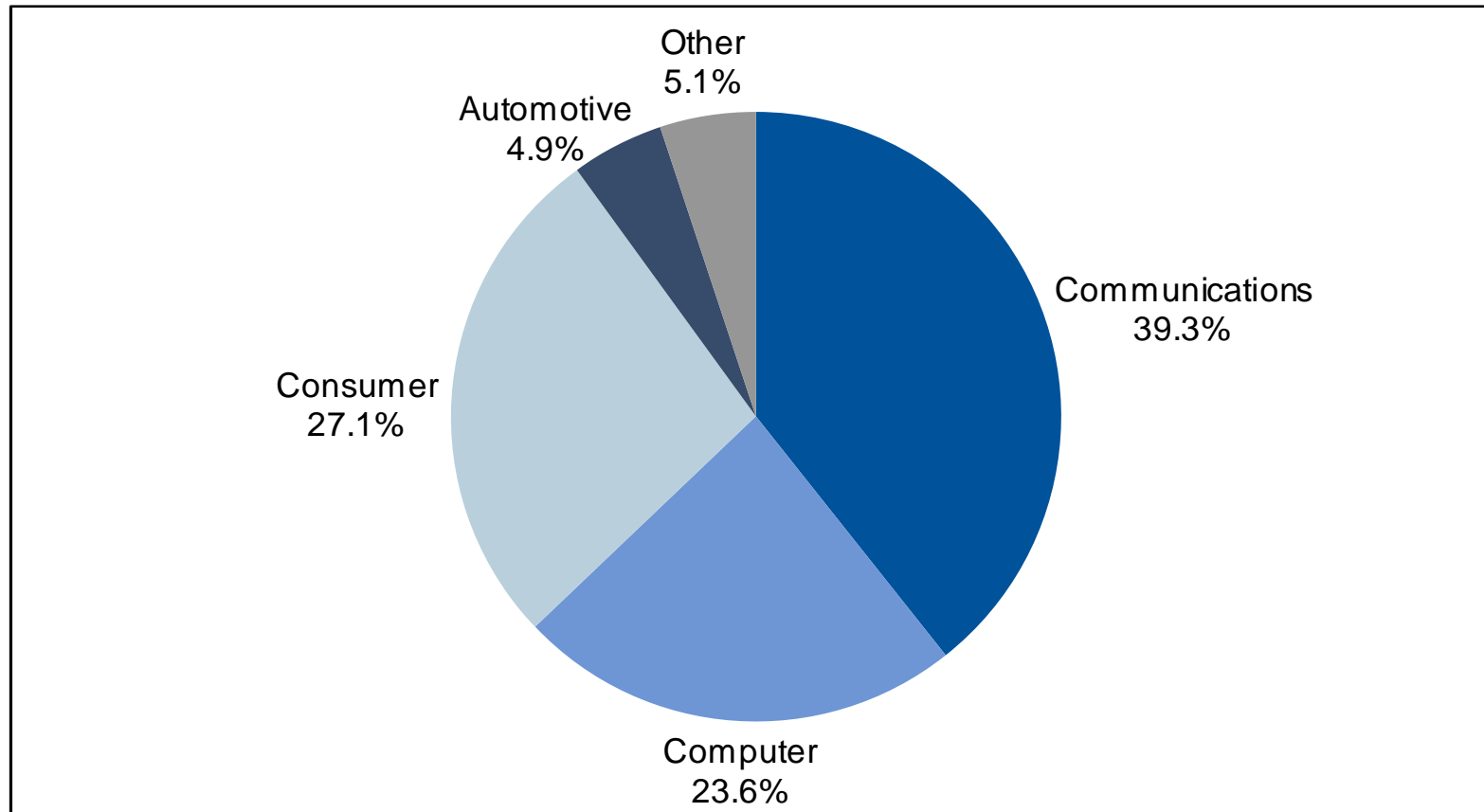
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# 2010 SATS Revenue by Application

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# Top 10 SATS Capital Spenders

(Millions of Dollars)

2011 Rank	2010 Rank	Companies	2010	2011	Growth	Share
1	1	Advanced Semiconductor Engineering	1,100.0	900.0	-18.2%	20.6%
2	2	SPIL	500.0	533.0	6.6%	12.2%
3	3	Amkor Technology	445.7	450.0	1.0%	10.3%
4	4	Powertech Technology	400.0	368.0	-8.0%	8.4%
5	5	STATS ChipPAC	286.0	260.0	-9.1%	5.9%
6	6	UTAC	235.0	254.7	8.4%	5.8%
7	10	Formosa Advanced Technologies	156.0	160.6	3.0%	3.7%
8	12	Jiangsu Changjiang Electronic (JCET)	115.2	124.9	8.4%	2.9%
9	11	Chipmos Technology Bermuda	145.4	105.0	-27.8%	2.4%
10	13	KYEC	105.0	105.0	0.0%	2.4%
		Other Companies	1,311.1	1,114.3	-15.0%	25.5%
		<b>Total SATS Capex</b>	<b>4,799.4</b>	<b>4,375.6</b>	<b>-8.8%</b>	<b>100.0%</b>

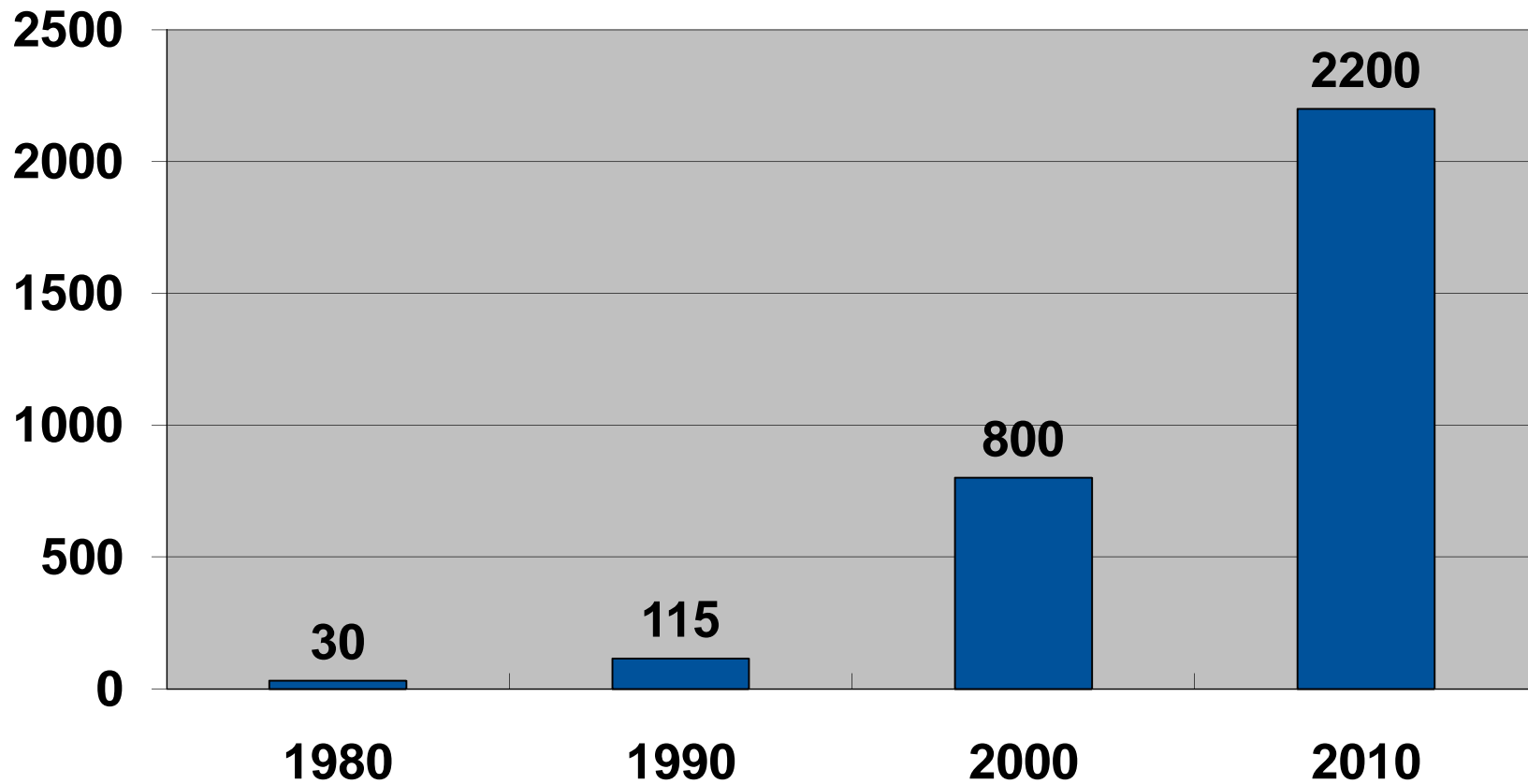


Source: Gartner (June, 2011)

# Package Selection Growth

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## Number of Packages



Source: Gartner (June, 2011)

# I.C. Package Forecast

Millions of Units	2009	2010	2011	2012	2013	2014	CAGR 2009-2014
Plastic DIP	7,720	8,300	7,587	7,178	7,065	7,359	-1.0%
QFP	13,585	15,010	15,355	15,521	16,559	17,170	4.8%
Ceramic Chip Carrier	435	480	499	504	563	625	7.6%
SOIC Total	55,032	59,726	61,418	58,203	56,962	56,907	0.7%
Ceramic BGA	35	36	35	35	38	40	2.7%
Plastic BGA	6,869	7,932	8,454	8,536	9,052	9,321	6.3%
Bare Chip	17,189	21,156	25,290	29,101	36,429	43,416	20.4%
Leadless-Leadframe*	20,239	26,852	33,238	41,712	52,325	61,077	24.7%
FBGA/CSP	16,080	20,993	25,651	29,489	37,091	44,397	22.5%
Others	1,438	2,255	3,115	3,729	4,698	4,976	28.2%
<b>Total</b>	<b>138,620</b>	<b>162,740</b>	<b>180,642</b>	<b>194,009</b>	<b>220,782</b>	<b>245,289</b>	<b>12.1%</b>

\*Includes quad flat no lead (QFN), small outline no lead (SON), dual flat no lead (DFN) and bumped chip carrier (BCC) packages

Note: IC package units include multichip packages (MCPs); totals may differ from IC die units.

Source: Gartner (October 2010)

# Q3 Forecast Growth Scorecard Summary

	2011			2012		
	-6 Mos	-3 Mos	Now	-6 Mos	-3 Mos	Now
<b>Revenue Growth (%)</b>						
Global Real GDP	+3.5	+3.3	+2.9	+3.5	+3.7	+3.3
U.S. Real GDP	+3.2	+2.7	+1.6	+2.9	+2.9	+1.9
Elec. Equipment <sup>1</sup>	+7.4	+7.5	+6.5	+7.0	+7.3	+6.2
Semiconductor <sup>2</sup>	+6.2	+5.1	-0.1	+9.1	+8.6	+4.6
Foundry	+10.2	+9.0	+4.2	+11.1	+11.2	+6.1
SATS	+11.3	+8.0	+2.3	+10.5	+10.3	+4.1
Capital Spending	+11.9	+11.9	+9.4	-2.7	-2.6	-16.7
Equip. Spending	+12.4	+10.2	+7.1	-6.0	-6.1	-19.2
WFE	+13.2	+11.7	+9.4	-5.7	-3.3	-19.6
PAE	+9.6	+3.6	-1.4	+6.8	-15.5	-17.5
ATE	+10.1	+6.9	+0.4	+8.0	-18.7	-18.1
Silicon (MSI)	+6.9	+4.2	+0.2	+8.7	+10.0	+3.4

<sup>1</sup> Production revenue

<sup>2</sup> Excluding solar

Source for GDP data: IHS Global Insight

Source: Gartner (September 2011)

# Conclusions

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- Inventory correction and reduced holiday build having major impact in 3Q11
- Short-term growth impacted as all three major events are hitting at once (inventory correction, overcapacity, and slowing demand)
- Macroeconomic picture will need to be watched closely to rebalance 2012 supply with demand
- Most-likely semiconductor growth for 2011 and 2012 to negative 0.1% and 4.6%, respectively
- Risk in 2011/2012 if economy takes a turn for the worse – negative case is -2.2% for 2011 and -4.9% for 2012
- 2013 rebounds as ASPs recover

# Upcoming Gartner Semiconductor Events

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## Semiconductor Asia Pacific Roadshow

- Singapore – 3 October 2011
- Taipei – 6 October 2011
- Seoul – 11 October 2011

For more information and to register, please visit

<https://www.eiseverywhere.com/ehome/index.php?eventid=27998&>

**Save the dates!**

## Gartner Semiconductor Local Briefings:

- 1 November 2011, Egham, Surrey, U.K.
- 3 November 2011, DoubleTree Hotel, San Jose, California

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