Gartner

12th Annual

Asia Pacific Semiconductor Roadshow

The Outlook of Semiconductor Packaging Industry

Name: Tom Yu
Designation: Principal Analyst
Email address: tom.yu@gartner.com

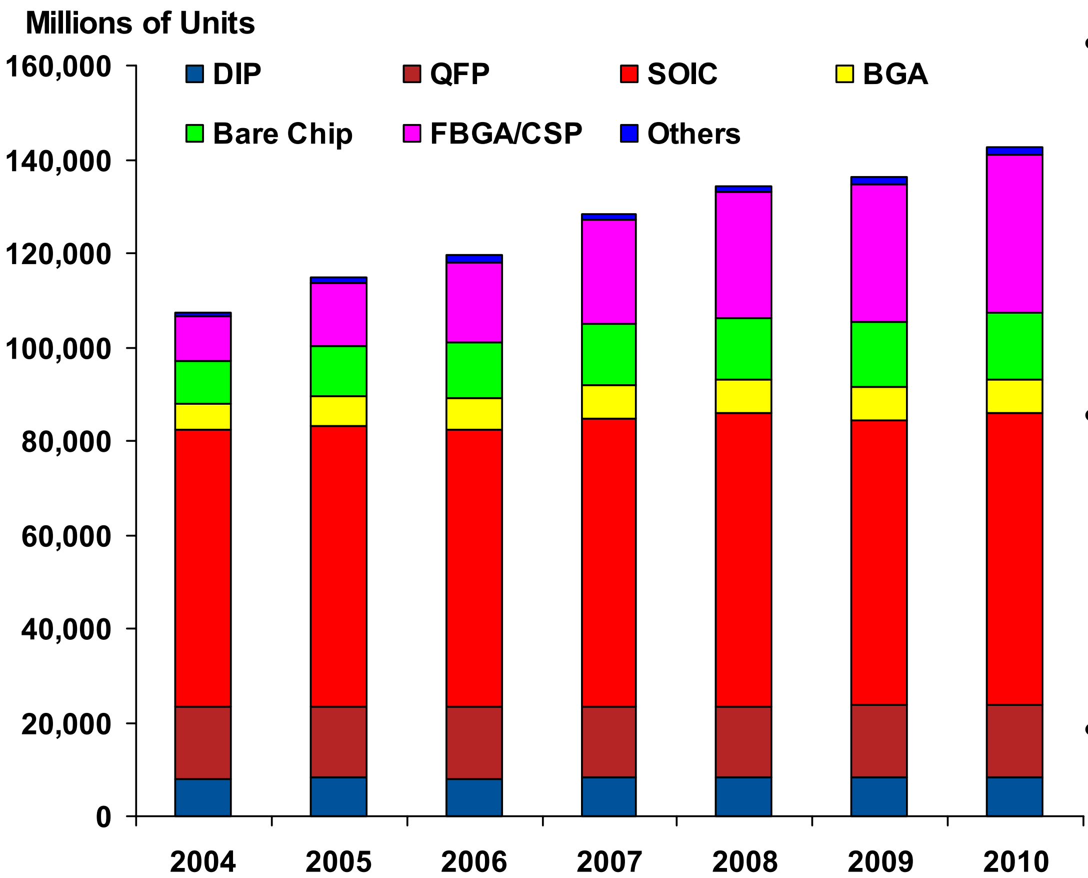
Date, Location: May 16th, Taipei

Gartner

Key Issues

- What is the outlook for packaging assembly and test market?
- Where are the greatest opportunities in packaging market?
- What is the competitive structure of SATS industry in China and what are the implications for industry participants?

Worldwide Semiconductor IC Package Forecast

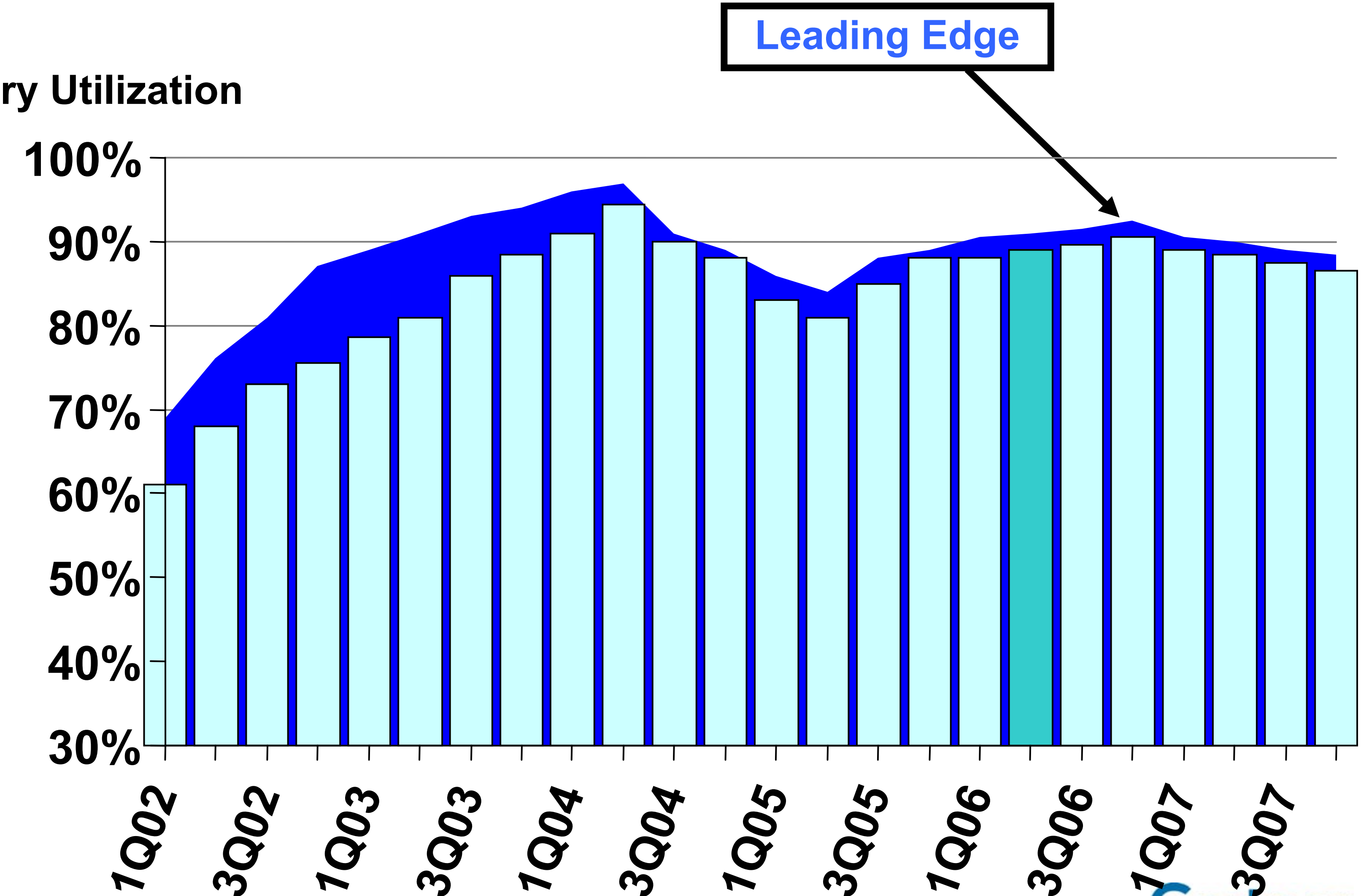


- Worldwide unit shipments of semiconductor IC packages will grow 4.1% in 2006, compared to 6.8% in 2005. The market will increase at a CAGR of 4.4% from 2005 through 2010
- Demand for more DRAM in mobile phones and digital audio players contributed to the growth of IC package unit shipments in 2005
- Demand for ASSPs, LCD drivers, and image sensors drives the growth of IC package shipments

Source: Gartner Dataquest, May 2006

Gartner

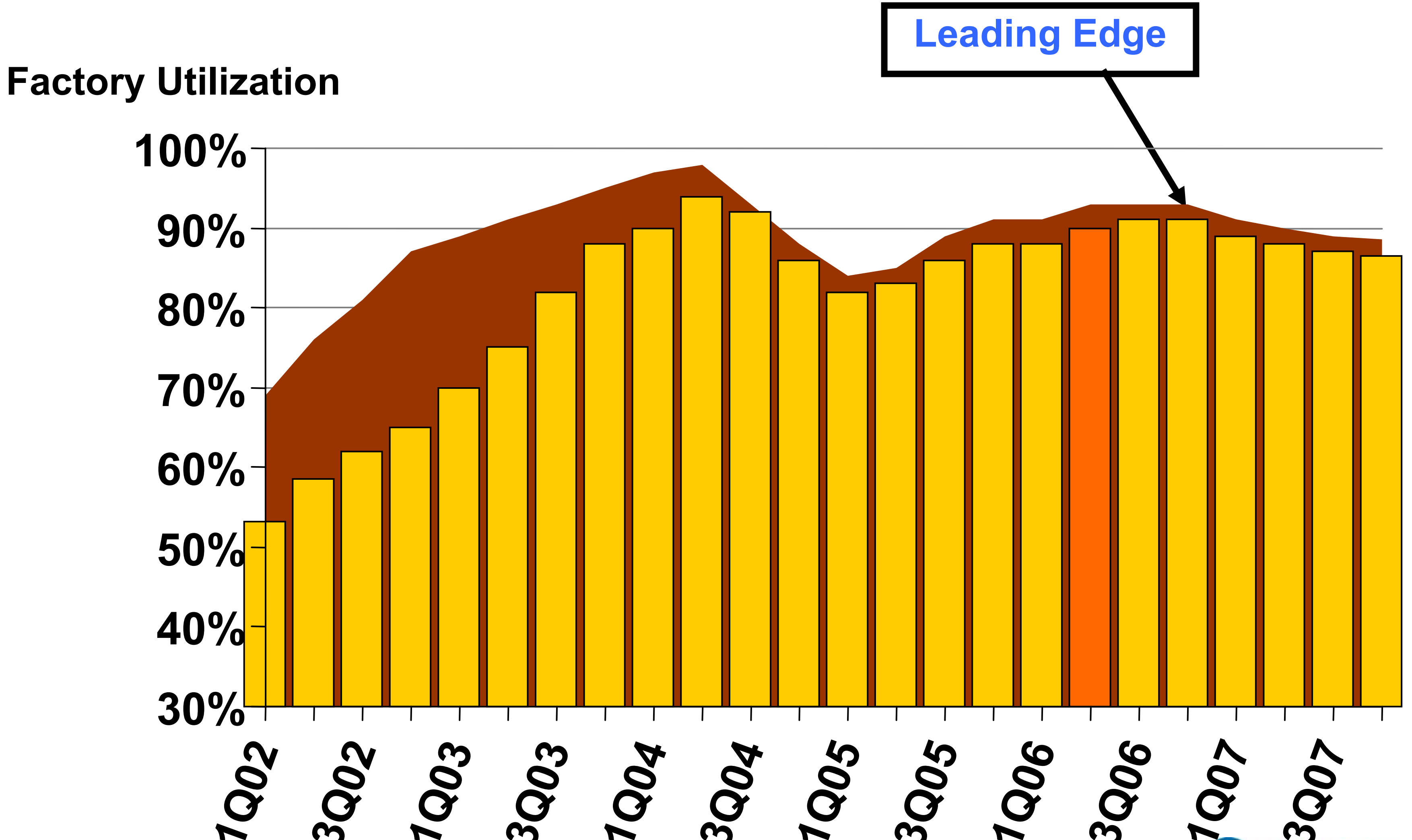
DQ P&A Utilization Index



Source: Gartner Dataquest, May 2006

Gartner

DQ SATS Utilization Index

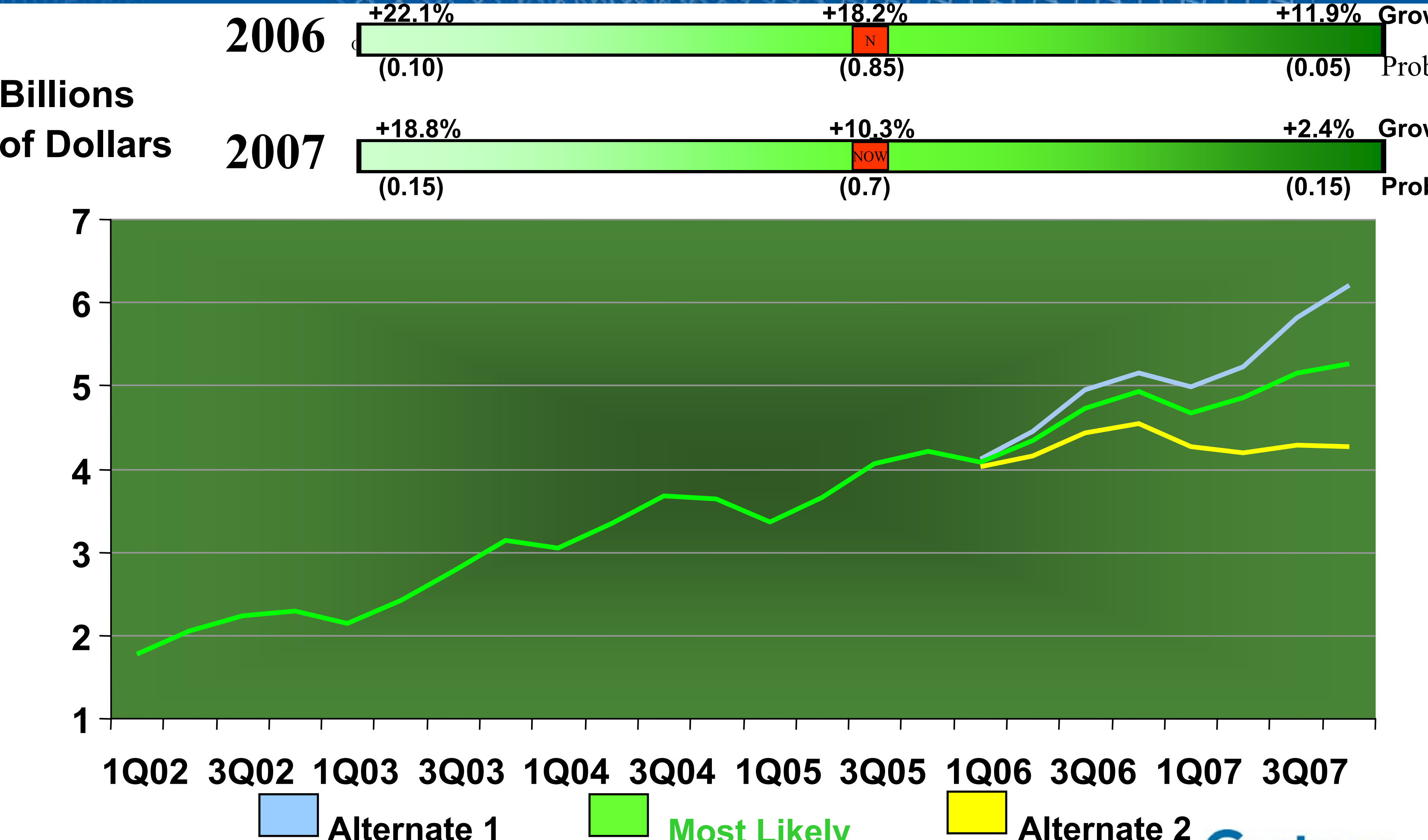


Source: Gartner Dataquest, May 2006

Note: Leading edge is define as BGA, CSP, Flip Chip, 3D and SIP

Gartner

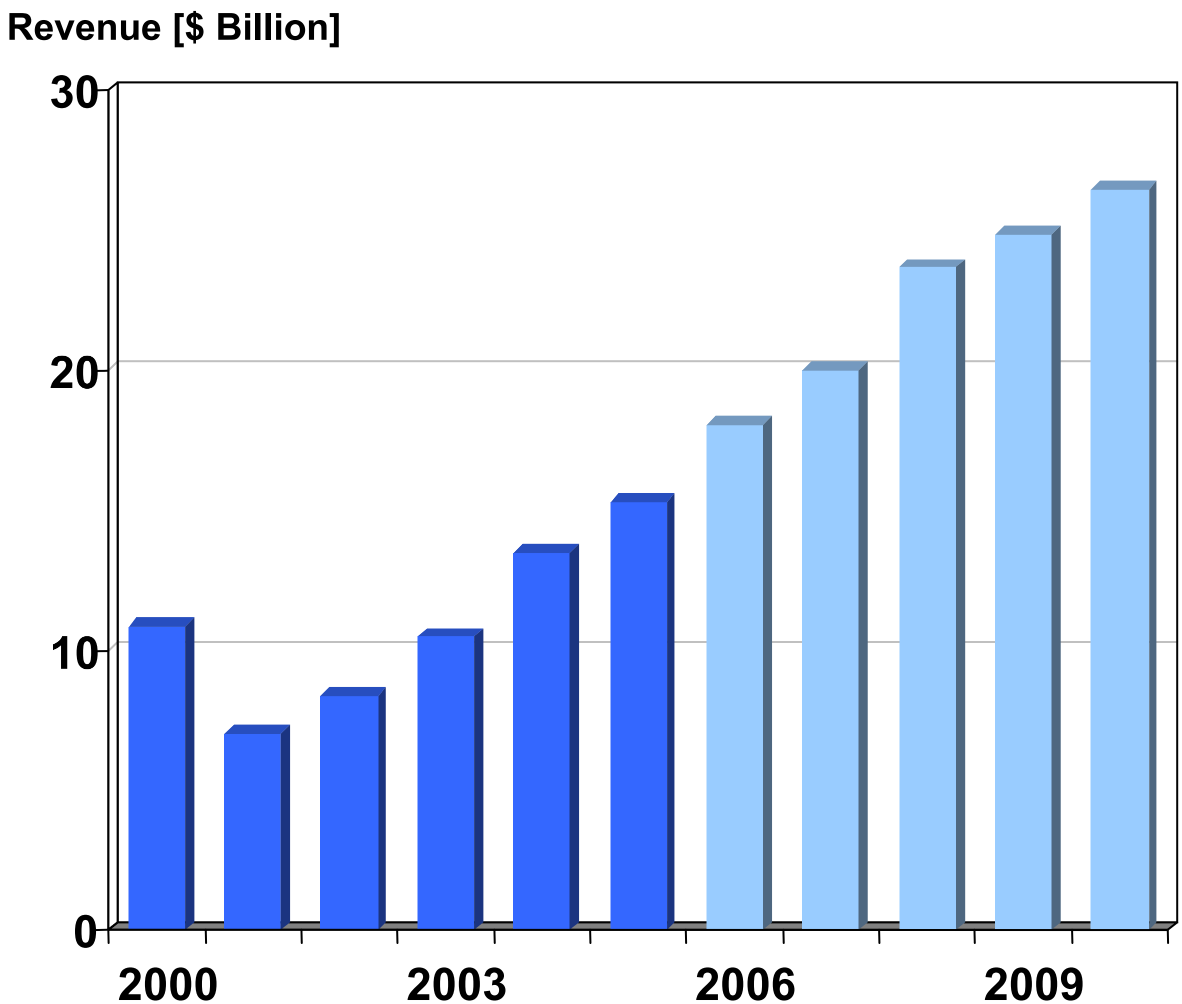
SATS Quarterly Revenue Forecast Scenarios



Source: Gartner Dataquest, May 2006

Gartner

SATS Annual Revenue Forecast



- 2006: WLP, Flip Chip and 3D-stacked die/package growth
- 2007: System-on-Package
- 2008: Stacked Wafers & Semi Industry Growth
- 2009-10: Moderated Outsourcing Growth

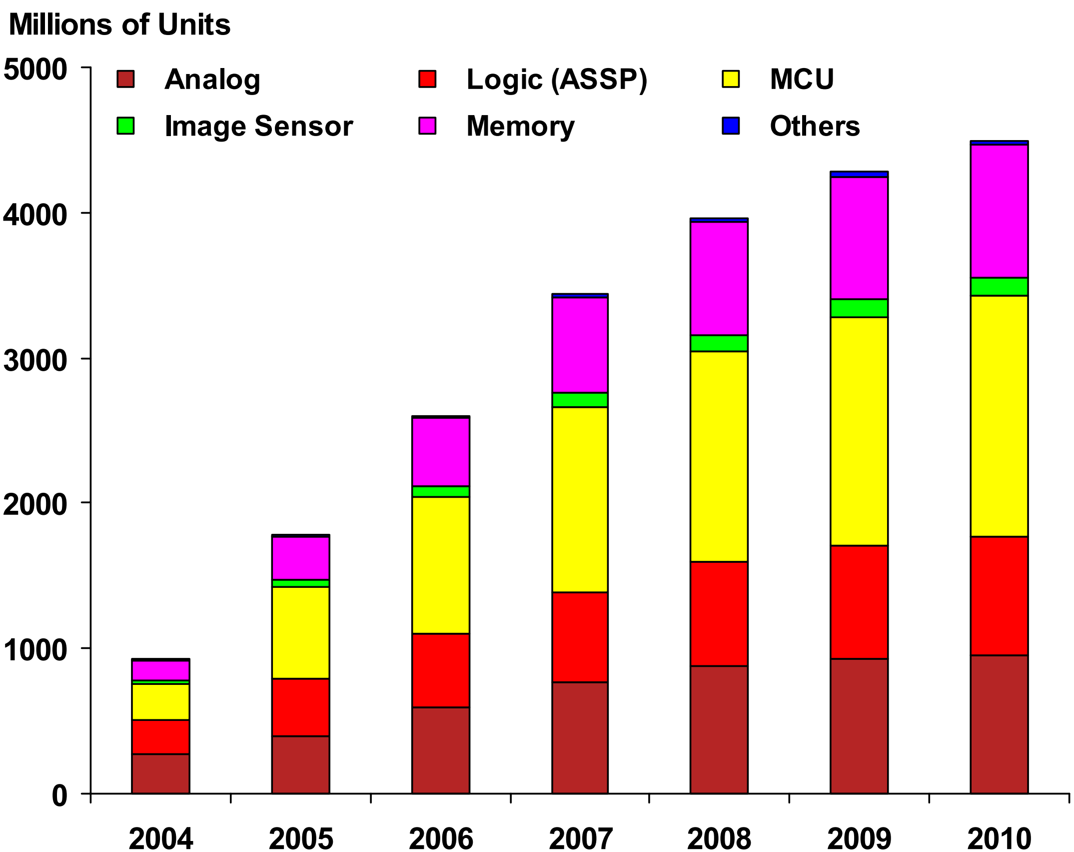
Source: Gartner Dataquest, May 2006

Gartner

Key Issues

- What is the outlook for packaging assembly and test market?
- **Where are the greatest opportunities in packaging market?**
- What is the competitive structure of SATS industry in China and what are the implications for industry participants?

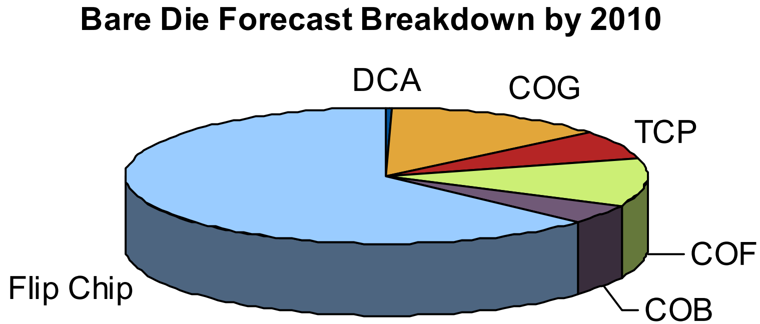
Worldwide WLP Forecast by Device Types

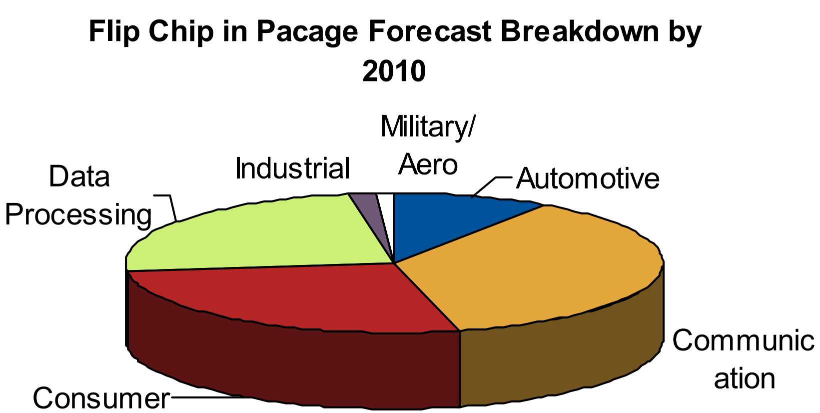


Source: Gartner Dataquest, May 2006

- Unit shipments of WL-CSP semiconductors, including passive components, will grow at a CAGR of 20.3% from 2005 through 2010
- Along with the increasing popularity of WLP, MCUs will continue to be the largest user of the technology in semiconductor ICs in the forecasting period
- WLP offers advantages in mobile and handheld applications because of the inherent lower cost, improved electrical performance and lower power requirements

Worldwide Bare Chip & Flip Chip Forecast

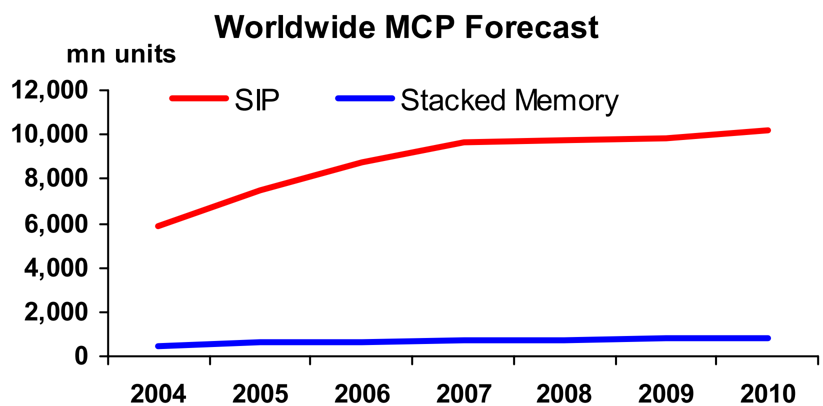


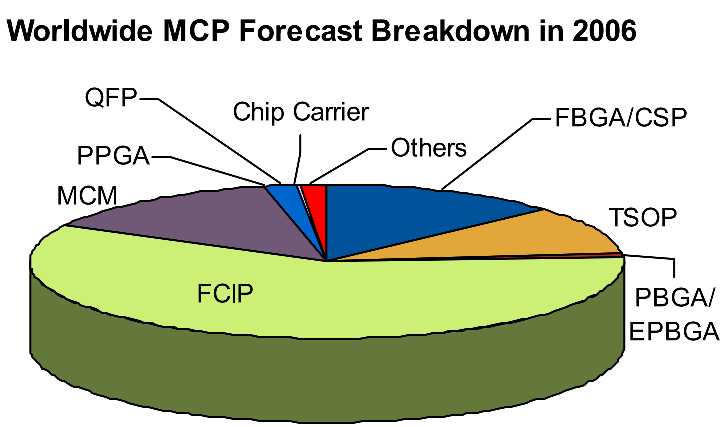


Source: Gartner Dataquest, May 2006

- Though unit shipments of bare chips only grow at a mid single digit CAGR, unit shipments of FCIP will register a CAGR of 10.8% from 2004 through 2010 mainly because of the expansion of the ASSP and ASIC market
- Unit shipments of FCIP in communication equipment will be the largest segment by 2010
- ASSPs are and will still be the major devices demanding flip-chip interconnection in their packages.
- FCIP will eventually become the preferred interconnection for IC packages as the front-end technology scales to 90-nanometer and finer processes

Worldwide MCP Forecast





Source: Gartner Dataquest, May 2006

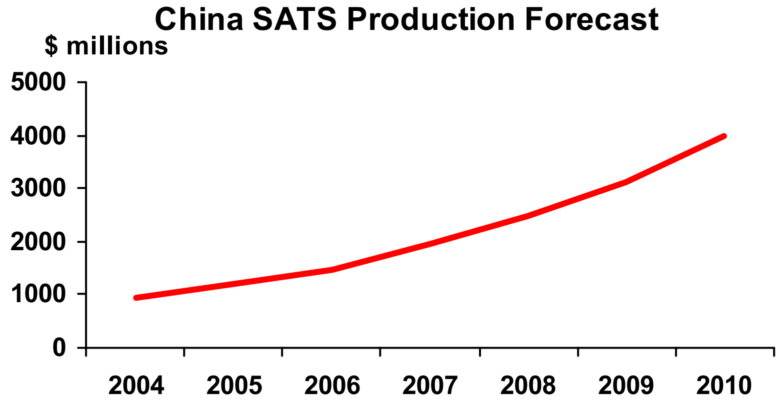
- Unit shipments of stacked-memory MCPs and SiPs is estimated to grow 16.8% in 2006. The segment will continue to grow at a CAGR of 6.5% from 2005 to 2010
- As the front-end manufacturing technology continues its advancement and incremental improvements in traditional packaging technology will not be sufficient, SiP is one of the new technologies to meet market requirements.
- In addition, the technology enables electronics makers to deal with the challenge of the increasing I/O count through flip-chip interconnection and high-density substrate technology

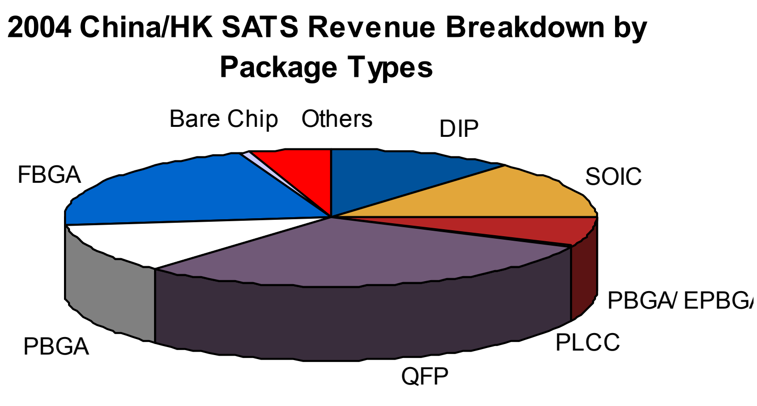
Key Issues

- What is the outlook for packaging assembly and test market?
- Where are the greatest opportunities in packaging market?
- **What is the competitive structure of SATS industry in China and what are the implications for industry participants?**

Gartner

China SATS Market



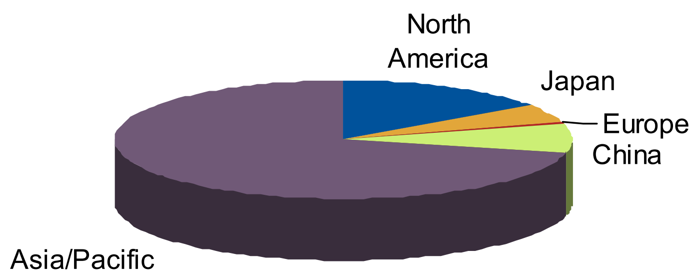


Source: Gartner Dataquest, May 2006

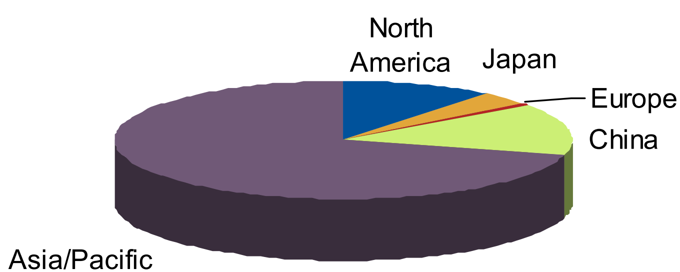
- China/HK will continue its growth at a CAGR of 26.8% from 2005 through 2010
- Most of China/HK SATS companies focus on the low-end market such as DIP and SOIC
- A couple of SATS companies have the ability to offer advanced packaging technologies such as BGA and FBGA/CSP.

Worldwide Regional SATS Revenue Breakdown

2005 Regional SATS Revenue Breakdown



2010 Regional SATS Revenue Breakdown

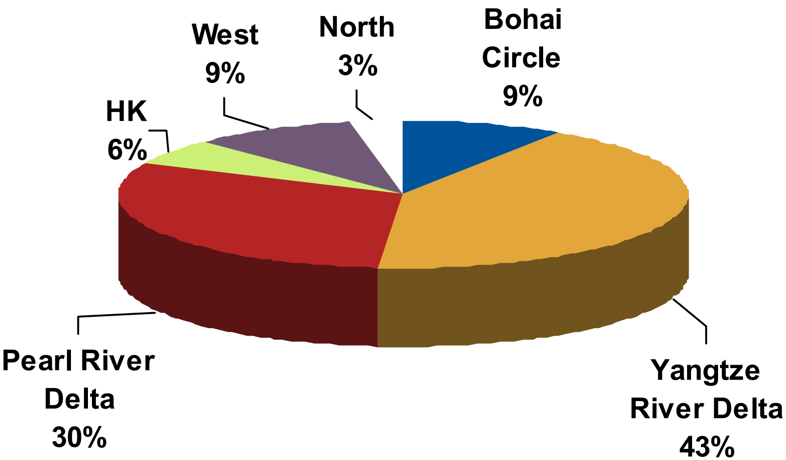


- The outsourcing of packaging and test services will continue to grow during 1H06. the diverse range of products and customers served by SATS companies provide a hedge against the severe volatility that characterizes certain segments of the semiconductor market
- China/HK will lead in terms of growth rate in the forecasting period, while Taiwan leads in market revenue

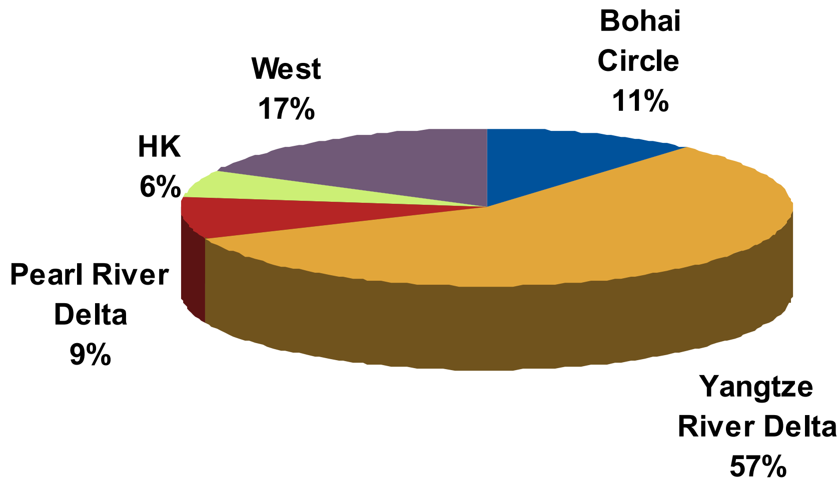
Source: Gartner Dataquest, May 2006

China/HK SATS Company Breakdown by Geographical Area

China Discrete SATS Company Regional Distribution



China IC SATS Company Regional Distribution

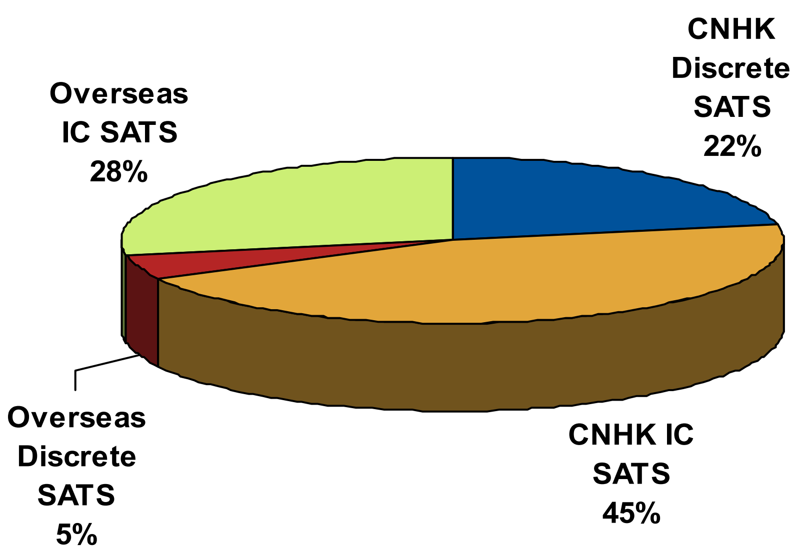


- Most of the Discrete SATS companies are located in Yangtze River Delta and Pearl River Delta
- Most of the IC SATS companies are located in Yangtze River Delta and West China

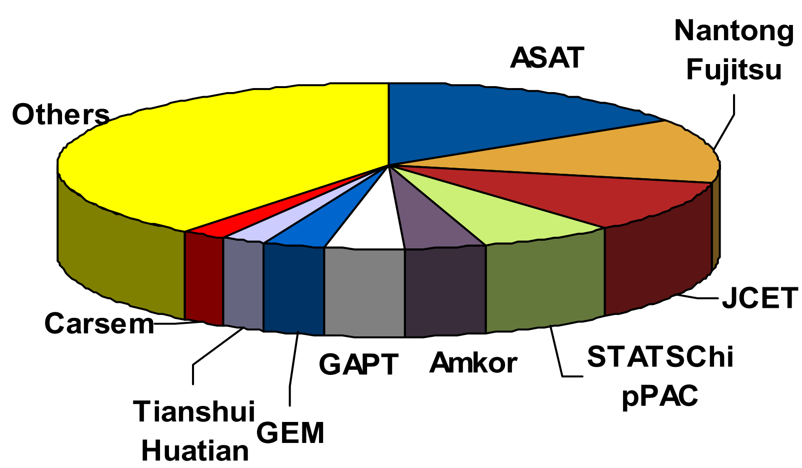
Source: Gartner Dataquest, May 2006

China/HK SATS Production Value Breakdown

2004 SATS Production Breakdown by Business Type



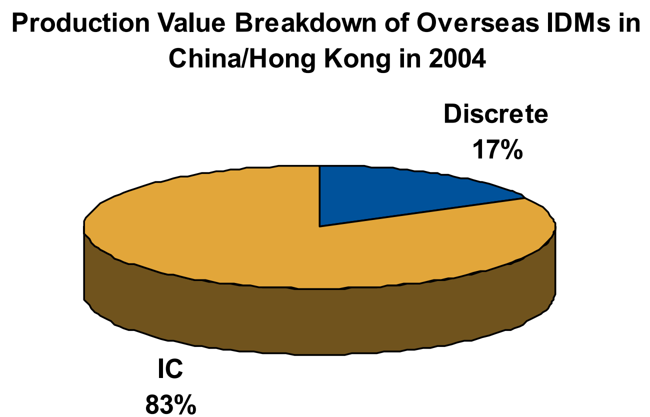
2004 SATS Production Breadown by Companies

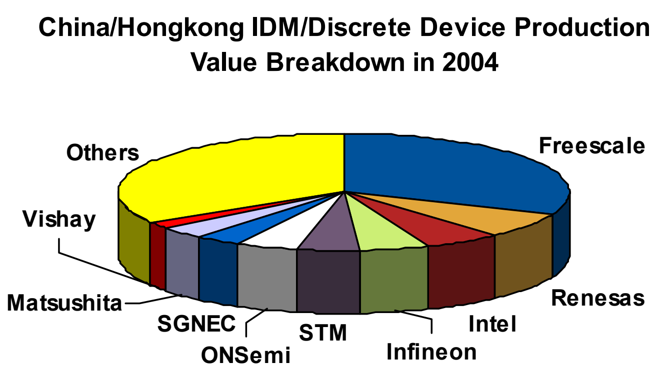


- There are numerous SATS companies engaging in discrete packaging business in China
- Chinese companies are still leading in local production value in China

Source: Gartner Dataquest, May 2006

Foreign IDMs' Production Value in China





- Foreign IDMs has packaged $2635.7 million of ICs and $542.5 million of discrete devices in China
- Most of the major IDMs have back-end packaging facilities in China
- As major SATS companies build packaging facilities in China, IDMs are expected to count on outsourcing services more in the future

Source: Gartner Dataquest, May 2006

Conclusion

- Unit Shipments of semiconductor IC packages will continue its growth at mid single-digit CAGR from 2005 through 2010. The slower growth rate is because of the increasing adoption of MCPs and the likely increases in the number of dies in each MCP.
- WLP and SiP will receive more market attention as the integration and complexity level of systems and subsystems increase, while FBGA/CSP packages continue to grow at a doubt-digit CAGR.
- Semiconductor packaging industry continues to move toward low-cost manufacturing areas.
- China continues to grow its infrastructure for the packaging and assembly demands of the semiconductor industry.
- Not only has demand continued the expansion by IDMs and OEMs, China has also increased growth activity of native China-based packaging and assembly companies.

Gartner

Thank You
Q&A