# "Business Changes and Challenges in the Competitive Semiconductor Industry"

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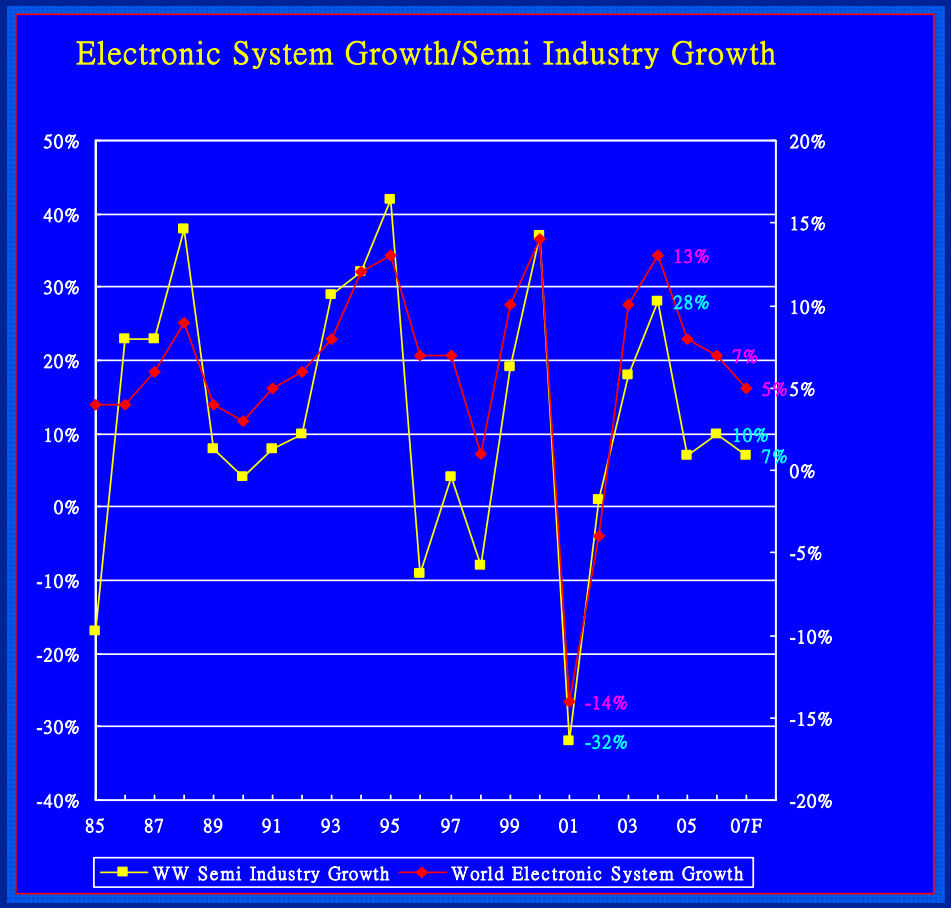
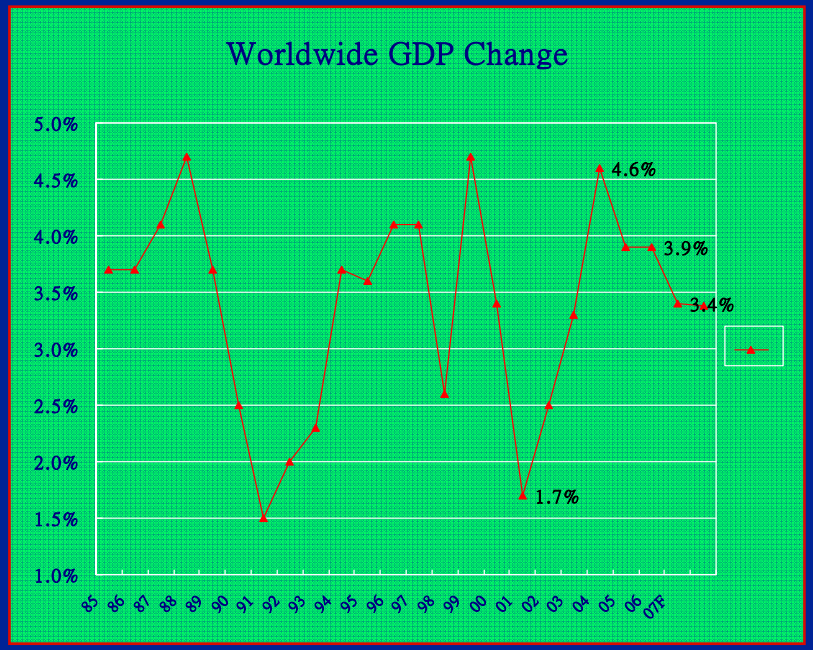
June 29 2007

# Outline

- Induction to Semiconductor Business
- Semiconductor Industry Trend
- Electronic-Product Supply Chain
- DRAM Business Trend
- ASSP/ASIC Business Trend

# Worldwide GDP Changes vs. Electronic System Growth/Semiconductor Industry Growth

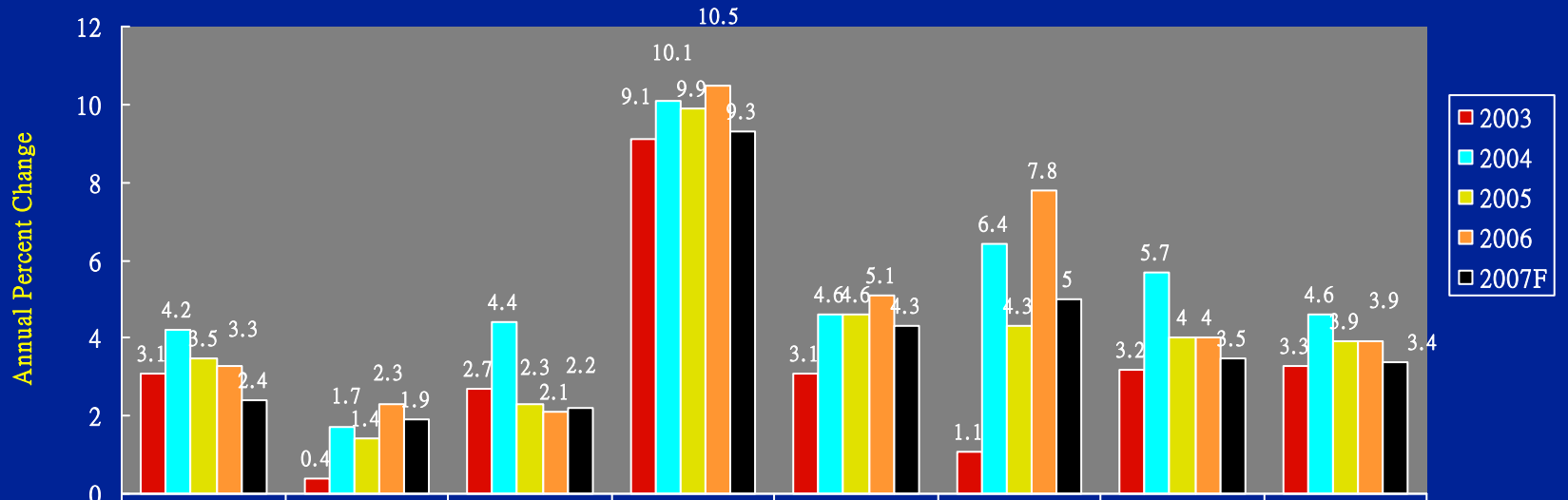



Source: IC-Insights(2007/02); ITRI/IEK(2007/03)

# GDP by Nation

## 2003-2007 GDP Trends

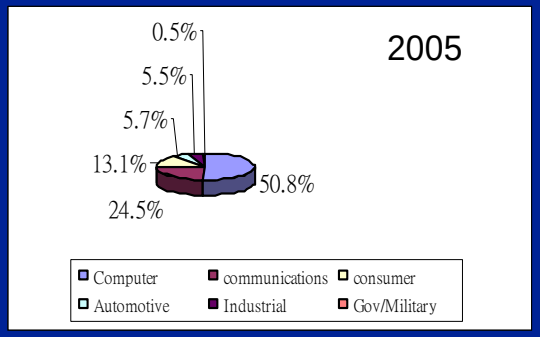


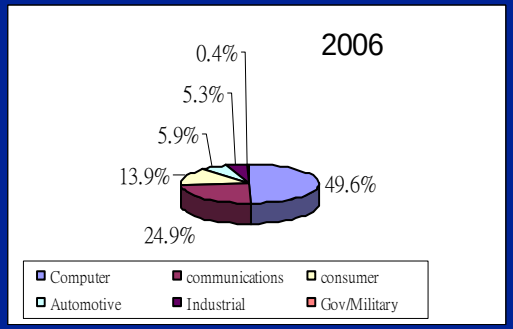

| | U.S. | Europe | Japan | China | S. Korea | Singapore | Taiwan | Worldwide |
|---|---|---|---|---|---|---|---|---|
| 2003 | 3.1 | 0.4 | 2.7 | 9.1 | 3.1 | 1.1 | 3.2 | 3.3 |
| 2004 | 4.2 | 1.7 | 4.4 | 10.1 | 4.6 | 6.4 | 5.7 | 4.6 |
| 2005 | 3.5 | 1.4 | 2.3 | 9.9 | 4.6 | 4.3 | 4 | 3.9 |
| 2006 | 3.3 | 2.3 | 2.1 | 10.5 | 5.1 | 7.8 | 4 | 3.9 |
| 2007F | 2.4 | 1.9 | 2.2 | 9.3 | 4.3 | 5 | 3.5 | 3.4 |

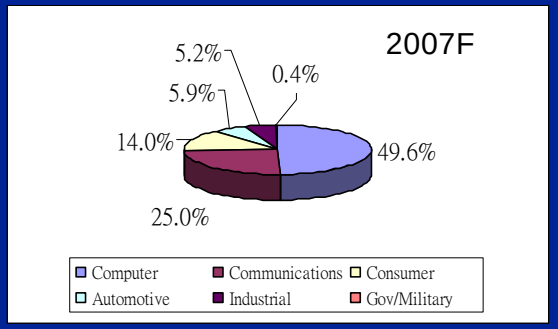
Source: IC-Insights(2007/02); ITRI/IEK(2007/03)

# Electronic System Semiconductor Content

| System Type | 2005 | % of Total | 2006 | % of Total | 2007 | % of Total |
|---|---|---|---|---|---|---|
| Computer | 97.9 | 50.8% | 103.6 | 49.6% | 110.5 | 49.6% |
| Communications | 47.2 | 24.5% | 52.1 | 24.9% | 55.7 | 25.0% |
| Consumer | 25.2 | 13.1% | 29.1 | 13.9% | 31.1 | 13.9% |
| Automotive | 10.9 | 5.7% | 12.3 | 5.9% | 13.2 | 5.9% |
| Industrial | 10.6 | 5.5% | 11.0 | 5.2% | 11.5 | 5.2% |
| Gov/Military | 0.9 | 0.5% | 0.9 | 0.4% | 0.9 | 0.4% |
| Total | 192.8 | 100.0% | 209.0 | 100.0% | 223.0 | 100.0% |

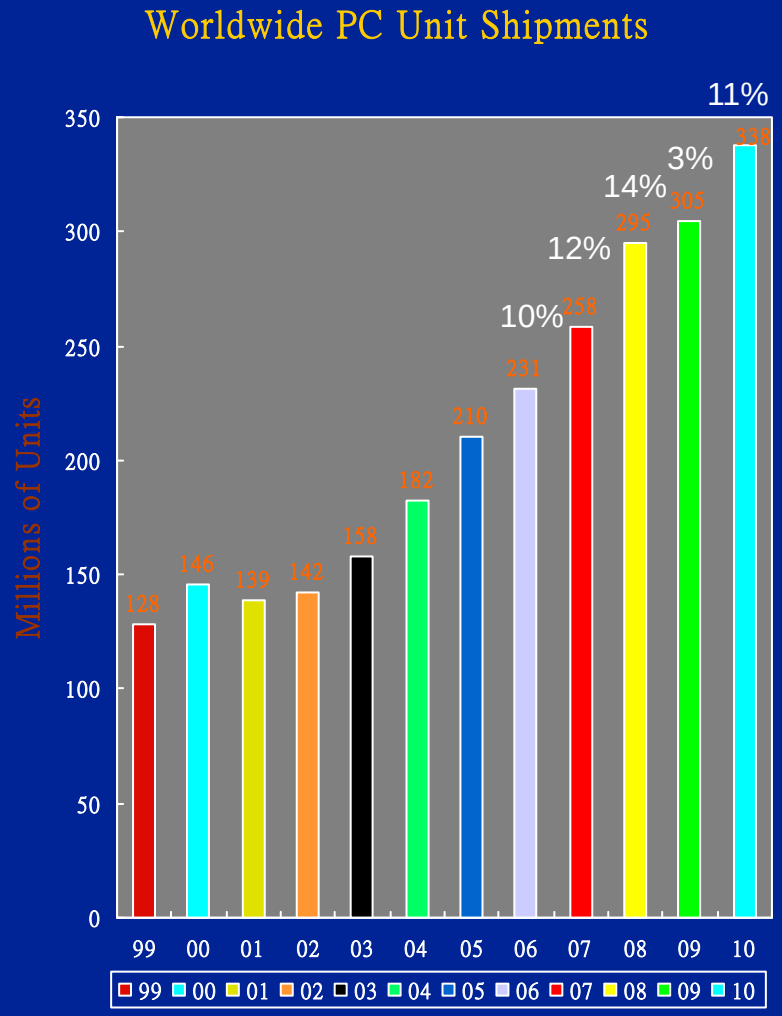


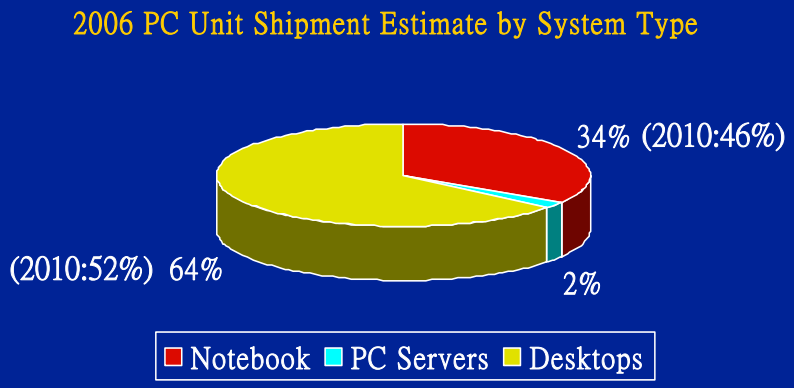



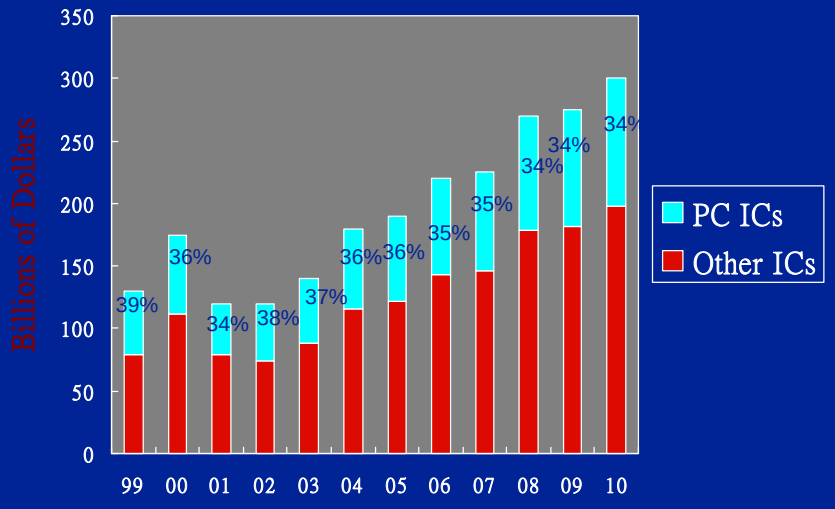




Source: IC-Insights(2007/02); ITRI/IEK(2007/03)

# Worldwide PC Shipments

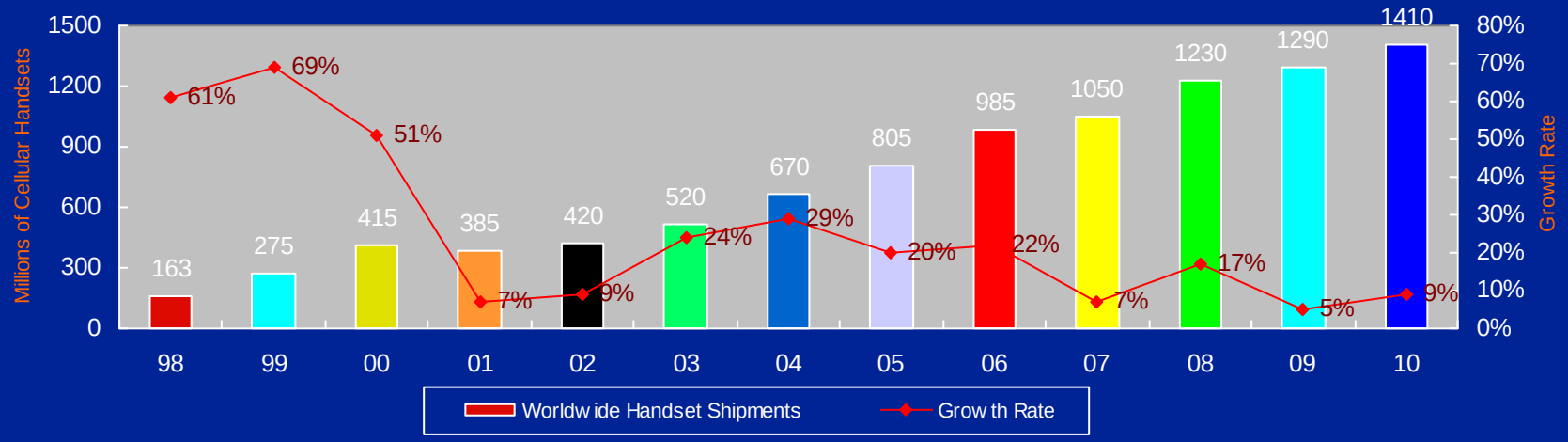



Source: IC-Insights(2007/02); ITRI/IEK(2007/03)

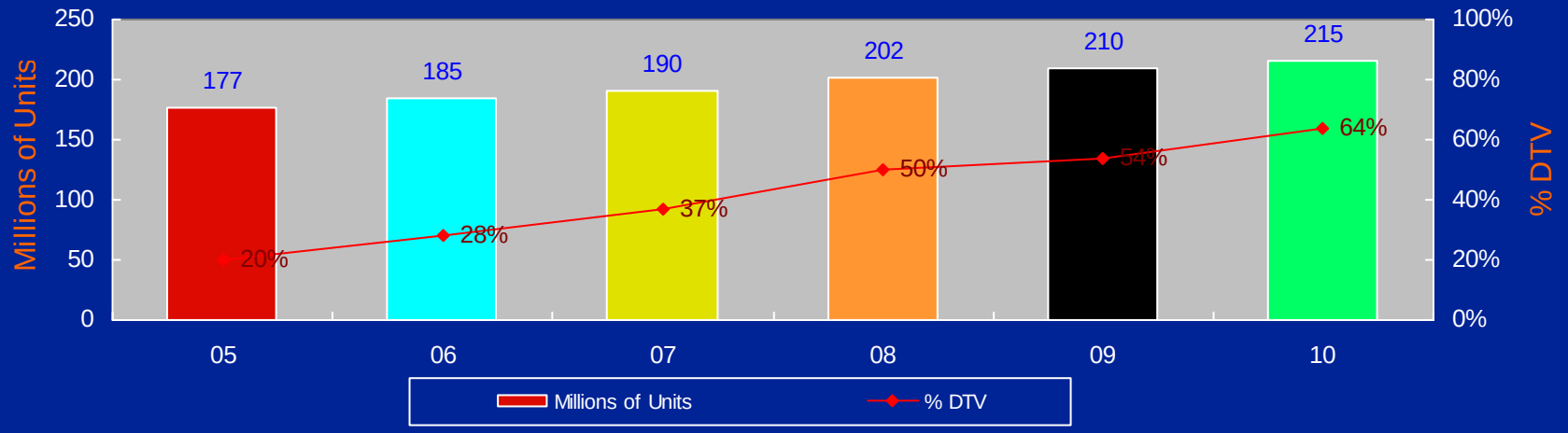
# Mobile Phone Shipments




- New ultra-low-cost phone demands for China/India/Africa:
  - 2006: 7%
  - 2010: 41%
- Camera Phones:
  - 2006: 53% (mainly<2M)
  - 2010: 78%(mainly>2M)
- 2G/2.5G GSM/GPRS/3G
  - 2006: 12%/67%/21%
  - 2010: 2%/59%/39%

Source: IC-Insights(2007/02); ITRI/IEK(2007/03)

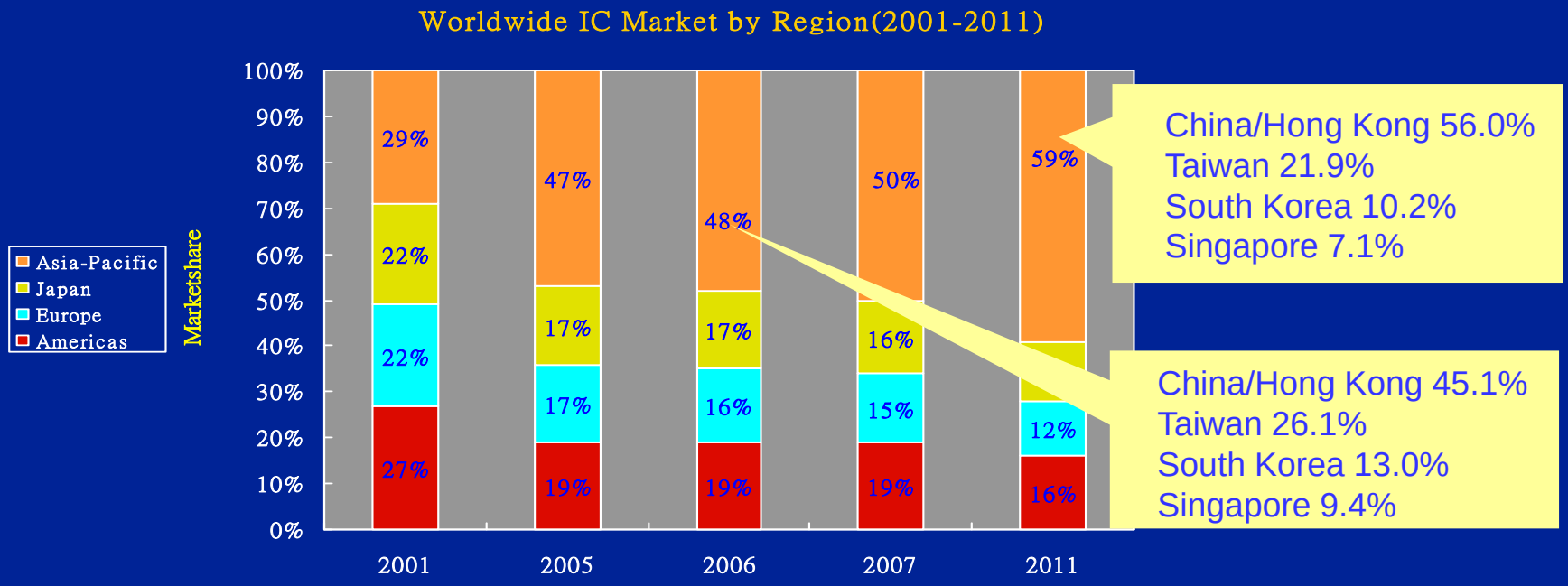
# Worldwide TV Units Shipments

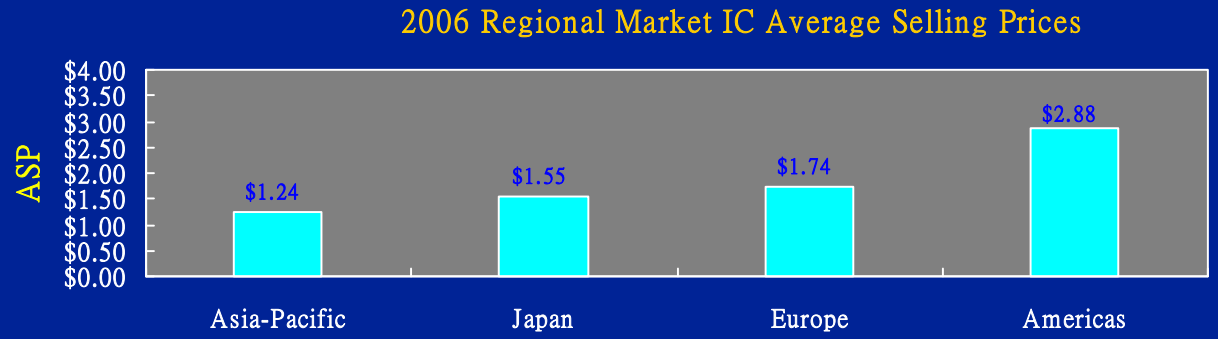



- 2006: DTV => 5M units/28% ( 77% LCD)
- 2010: DTV => 64% ( 84% LCD)
- 2007: DTV => 37% growth

Source: IC-Insights(2007/02); ITRI/IEK(2007/03)

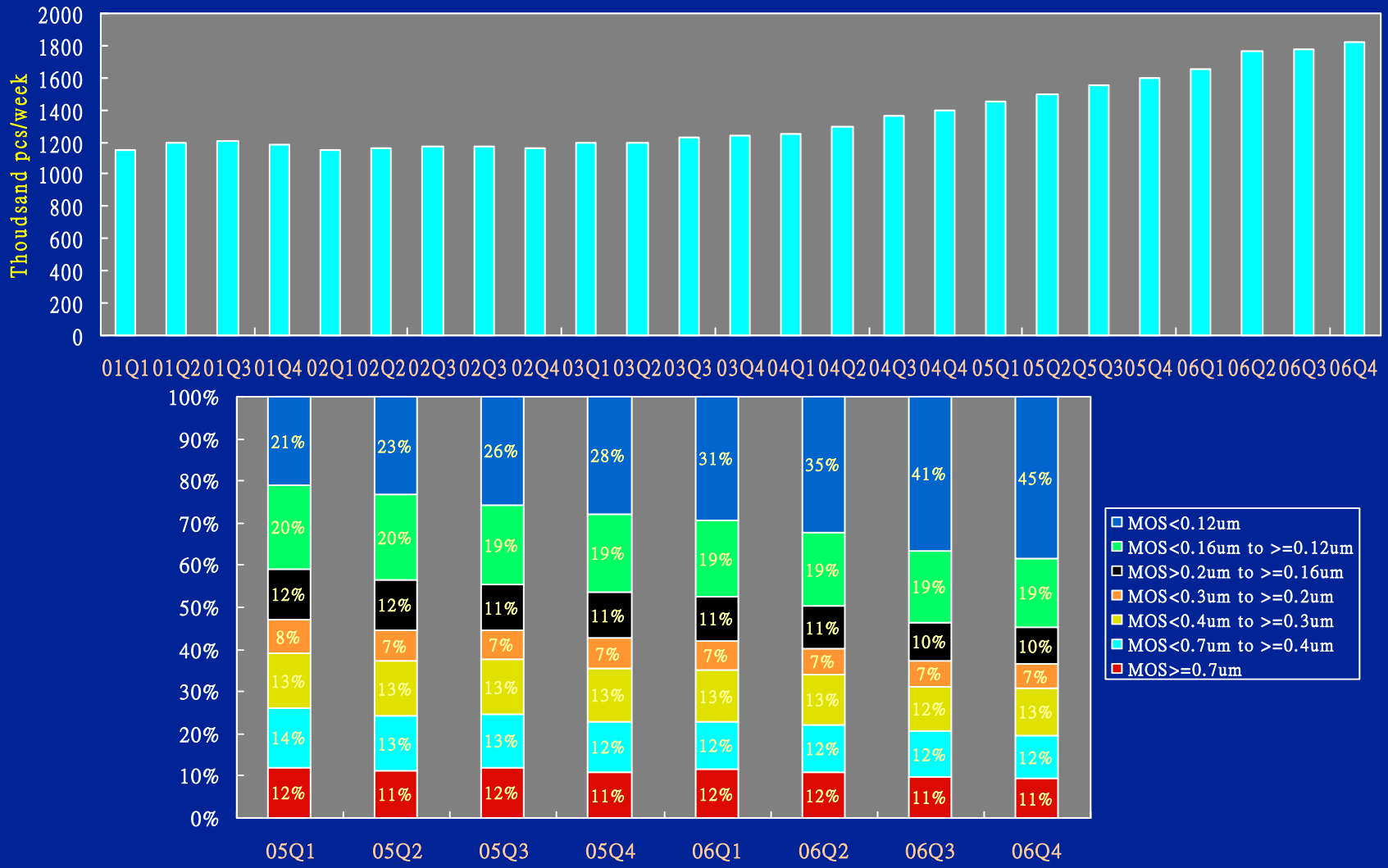
# Worldwide IC Market by Region




Source: IC-Insights(2007/02); ITRI/IEK(2007/03)

# Worldwide Semiconductor Capacities




Source: SICAS(2007/03); ITRI/IEK(2007/03)

# Outline

- Induction to Semiconductor Business
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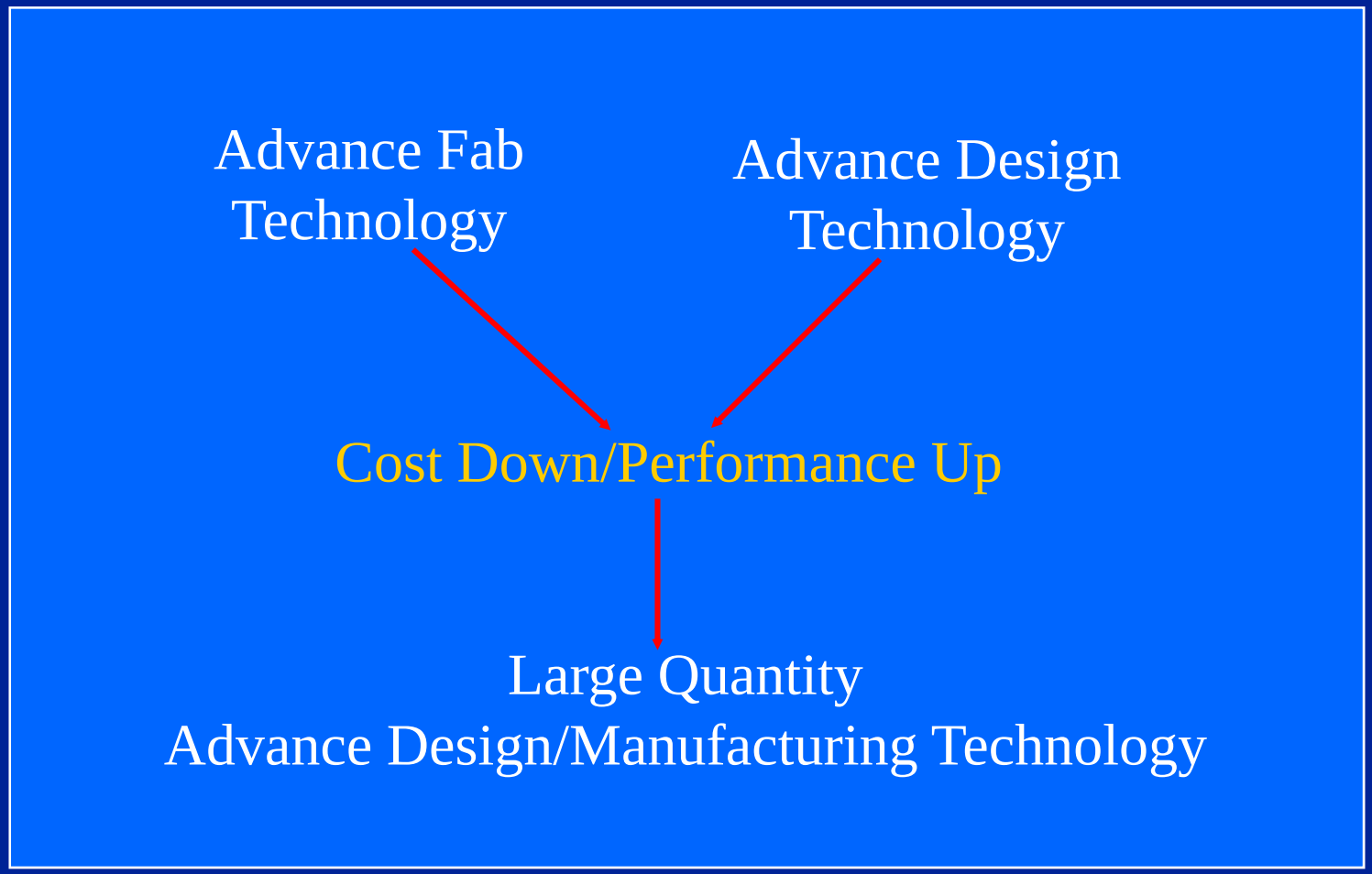
# Semiconductor Industry Trend (I)

- Moore’s law
- Continuous advance technology developments
- Cost down

# Semiconductor Industry Trend (II)



# Semiconductor Industry Trend (III)

- Does Moore's law still the driver?
  - What types of products (and the total demands) need technology of 90nm & below?
  - How many players can afford it?

# Semiconductor Industry Trend (IV)

- Technology Driven → Market Driven
  - Product competitiveness by migrating designs into advanced process technologies (more # of dies + more features => lower cost)!
  - Technology barrier among players is narrowing
  - What are the main differential points between players? TTM, Cost & Key IPs.

# Semiconductor Industry Trend (V)

- Is semiconductor industry entering the traditional industry era???
  - Mature technologies + limited applications => many players can enter the ball game and compete in the same market
  - Profit margin drops
  - Slow growth
  - The bigger is getting bigger

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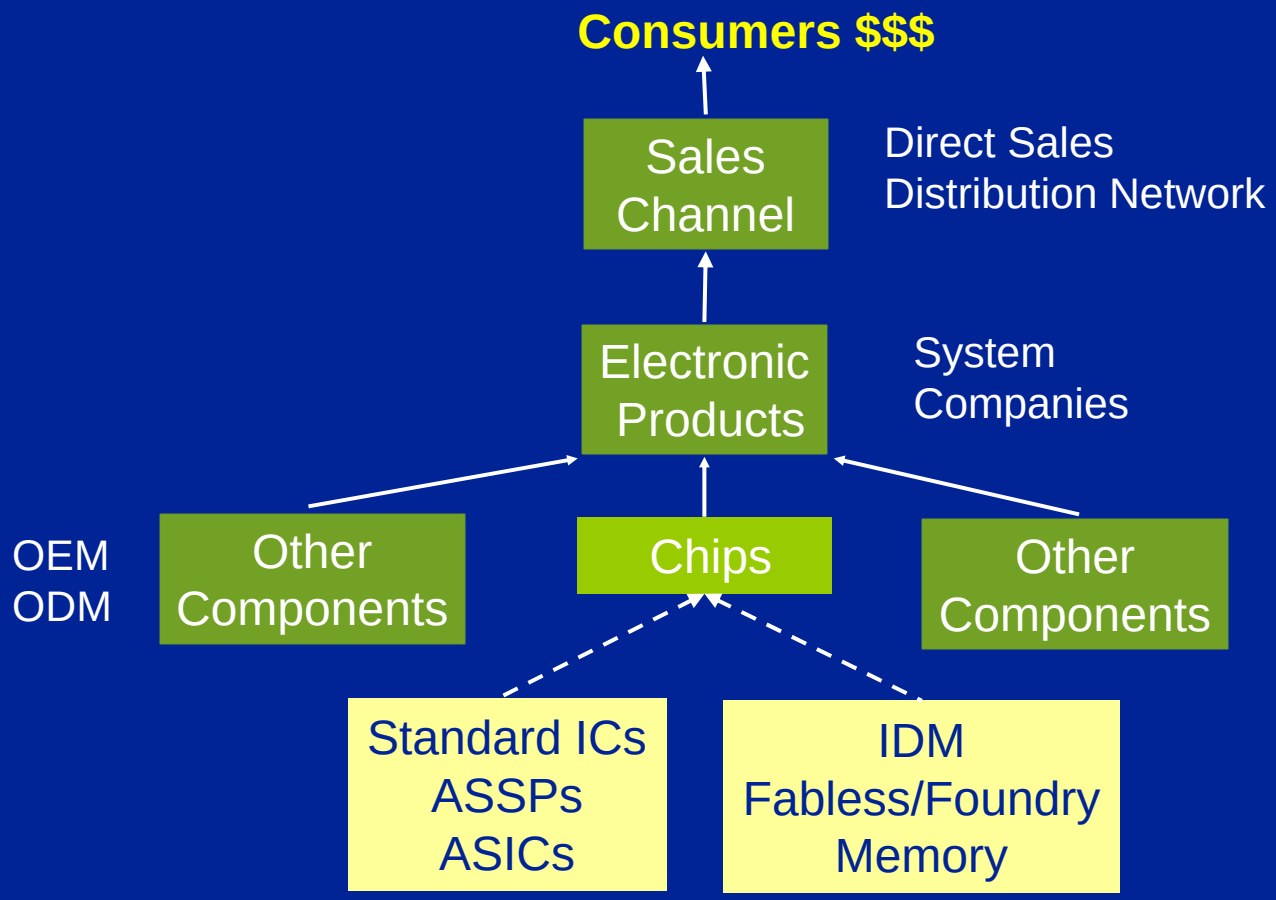
# Electronic-Products Supply Chain



# Three Major Chip Categories

- Standard ICs
  - CPU: (INTEL:INTEL:INTEL)
  - Memories: Cost is the key!
- ASSPs /ASICs
  - Design-in capability is the key!

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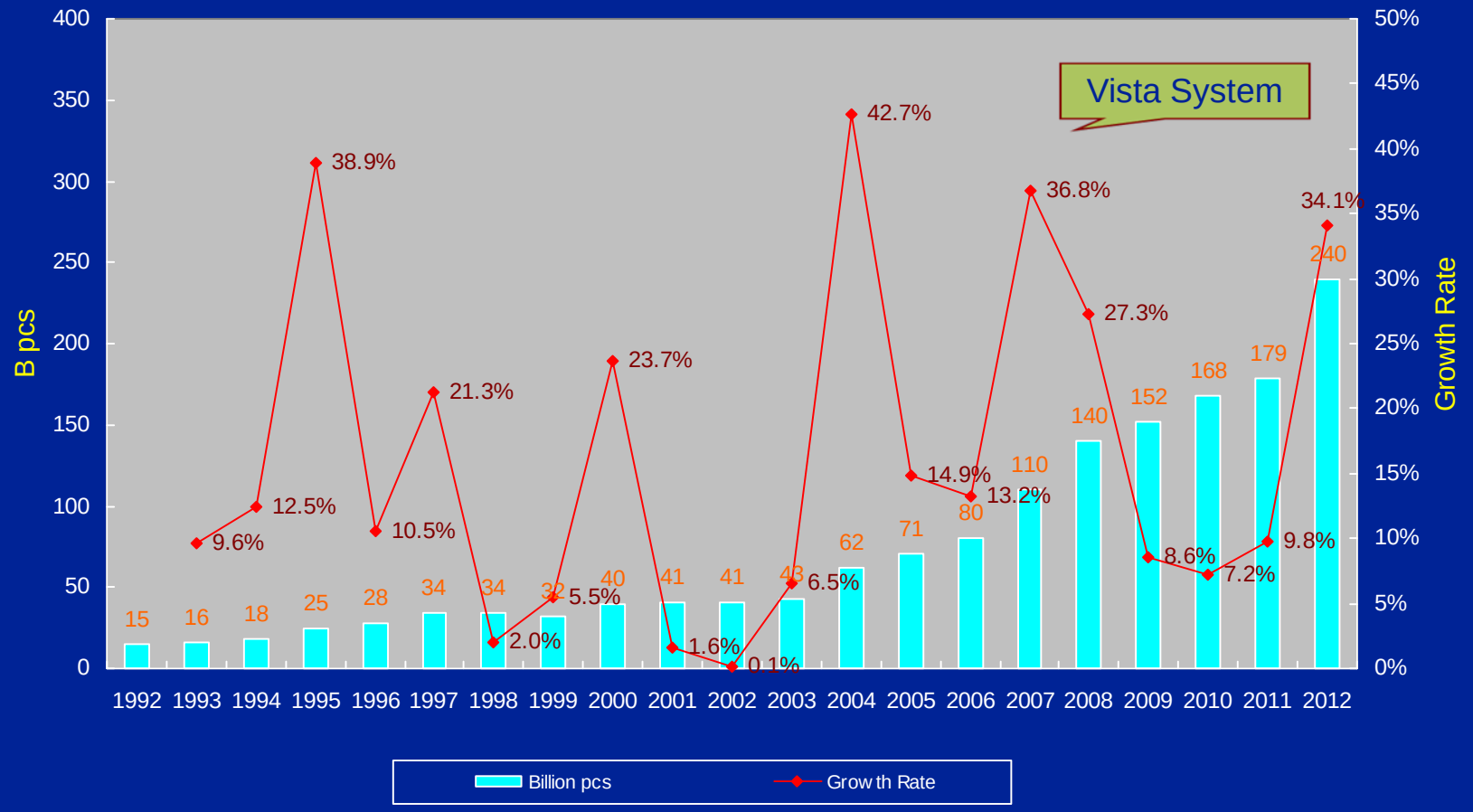
# Worldwide DRAM Market




Source: Gartner(2007/02); ITRI/IEK(2007/03)

# Worldwide DRAM Market Share

| | 1987 | Market Share |
|---|---|---|
| Total Market | 2,902 | |
| NEC | 469 | 16.2 |
| Fujitsu | 409 | 14.1 |
| Toshiba | 379 | 13.1 |
| TI | 320 | 11.0 |
| Mitsubishi | 292 | 10.1 |
| Hitachi | 279 | 9.6 |
| Samsung | 153 | 5.3 |
| OKI | 152 | 5.2 |

#1 Japan; #2 USA; #3 Korea

| | 1992 | Market Share |
|---|---|---|
| Total Market | 8,765 | |
| Samsung | 1,192 | 13.6 |
| Toshiba | 1,123 | 12.8 |
| NEC | 894 | 10.2 |
| Hitachi | 824 | 9.4 |
| TI | 667 | 7.6 |
| Mitsubishi | 628 | 7.2 |
| Fujitsu | 547 | 6.2 |
| LG Semicon | 513 | 5.9 |

#1 Samsung

| | 2004 | Market Share |
|---|---|---|
| Total Market | 26317 | |
| Samsung | 8119 | 30.9 |
| Hynix | 4288 | 16.3 |
| Micron | 4167 | 15.8 |
| Infineon | 3499 | 13.3 |
| Elpida | 1569 | 6.0 |
| Nanya | 1186 | 4.5 |
| PowerChip | 1128 | 4.3 |
| ProMOS | 900 | 3.4 |

#1 Korea; #2 Taiwan
USA/EU/Japan only 1 company left

| 2005 Rank | 2006 Rank | | 2005 | 2006 | 2005-2006 Change | 2006 Share |
|---|---|---|---|---|---|---|
| 1 | 1 | Samsung | 8,020 | 9,834 | 22.6% | 28.7% |
| 2 | 2 | Hynix | 4,111 | 5,644 | 37.3% | 16.5% |
| 4 | 3 | Qimonda | 3,181 | 5,370 | 68.8% | 15.7% |
| 3 | 4 | Micron | 3,867 | 3,697 | -4.4% | 10.8% |
| 5 | 5 | Elpida | 1,784 | 3,489 | 95.6% | 10.2% |
| 6 | 6 | Nanya | 1,440 | 2,111 | 46.6% | 6.2% |
| 7 | 7 | Powerchip | 1,027 | 1,479 | 44.0% | 4.3% |
| 8 | 8 | ProMOS | 871 | 1,462 | 67.9% | 4.3% |

- Korea #1, world market share 45.2% (Hynix: ProMOS foundry)
- Taiwan #2, world market share increases: by products 18%, by capacity 25%
- Qimonda15.7% (Nanya: foundry)
- Micron world market share drops to 10.8%
- Elpida 10.2% (PSC: foundry)

Source: Dataquest(2007/02); ITRI/IEK(2007/03)

# Worldwide DRAM Strategy Changes

- Terminated the business/Sold the fab
  - TI, IBM, Toshiba
  - Vanguard, Mosel, Winbond
- Established New Companies
  - Elpida (by NEC, Hitachi, Mitsubishi)
  - Rexchip (by Elpida, PSC)
- Merged, Purchased fab
  - Micron (TI, Toshiba)
- Capacity & Technology Cooperation
  - Infineon: Nanya, Winbond, SMIC
  - Elpida: PSC, SMIC
  - Hynix: ProMOS
- New Players
  - SMIC, Grace

# Worldwide DRAM Supply and Demand

- Demand : # of 12” fabs

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Worldwide DRAM demand (B pcs) | 79 | 110 | 141 | 154 | 166 | 181 | 210 |
| Growth rate | 17.8% | 38.3% | 28.8% | 8.8% | 7.7% | 9.1% | 16.3% |
| #12” fabs (40k wafers/month) | 23 | 31 | 35 | 40 | 47 | 52 | 57 |

- Supplier : # of 12” fabs

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Samsung | 4 | 5 | 6 | 8 | 10 | 12 | 14 |
| Hynix | 1 | 2 | 2 | 3 | 3 | 4 | 4 |
| Micro | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| Qimonda | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| Elpida | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| SMIC | 1 | 2 | 3 | 3 | 3 | 3 | 3 |
| Subtotal | 10 | 14 | 16 | 20 | 23 | 26 | 28 |
| PSC+Rexchip | 3 | 4 | 5 | 8 | 11 | 12 | 13 |
| Nanya+Inotera | 1 | 3 | 4 | 5 | 5 | 6 | 6 |
| ProMOS | 2 | 3 | 4 | 5 | 6 | 7 | 7 |
| Winbond | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12” fab in Taiwan | 7 | 11 | 14 | 19 | 23 | 26 | 27 |
| Total | 17 | 25 | 30 | 39 | 46 | 52 | 55 |

# DRAM Business Trend

- A typical commodity business
- Pricing is the key to success
- Keep pushing cost-driven advanced design and manufacturing technologies
- Market-driven penny-pinch cost-down strategy on the entire supply chain

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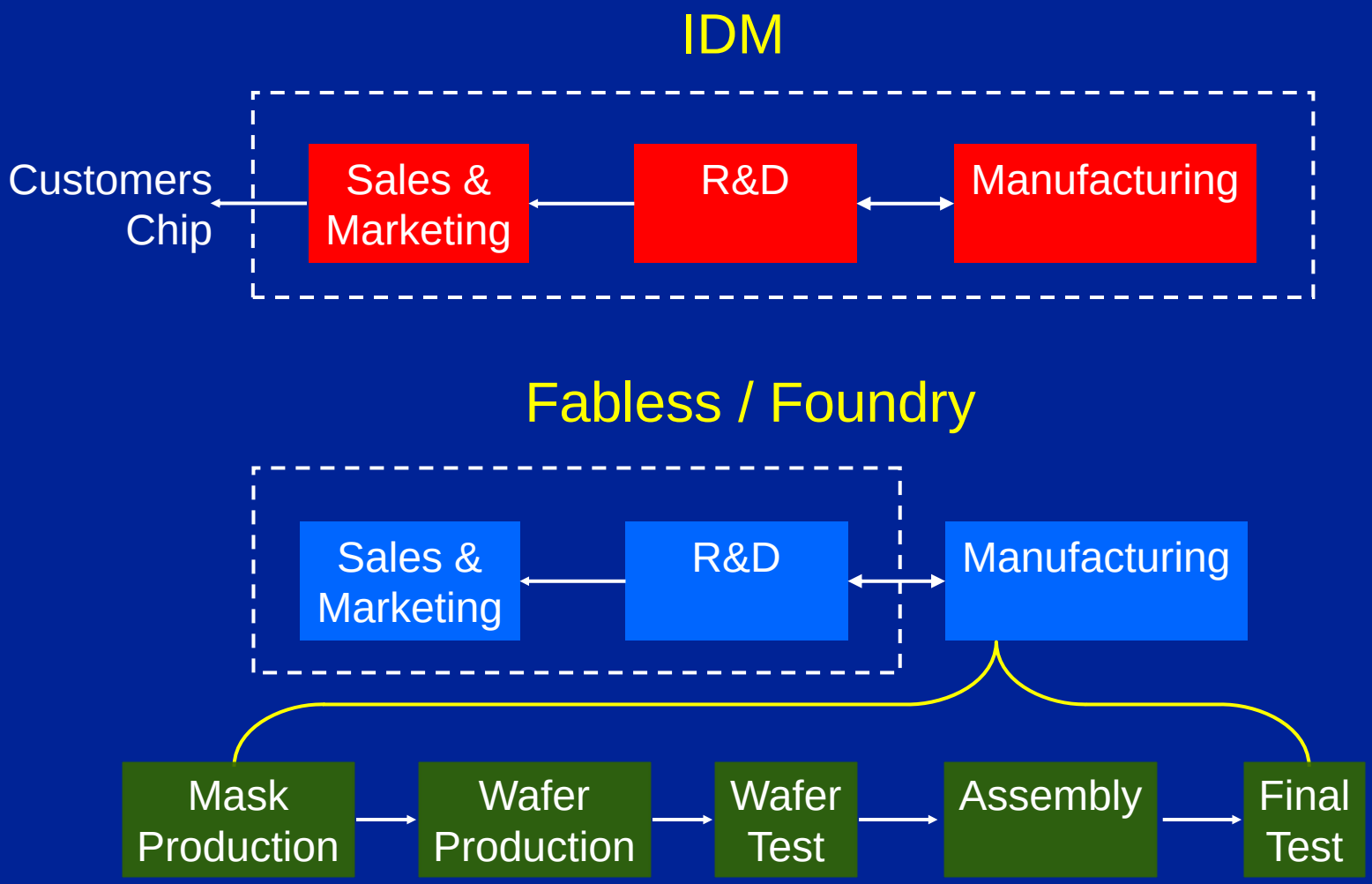
# IDM v.s. Fabless/Foundry



# Product Trend

- Two camps: luxury and low-cost items
- Lack of killer applications
- 3C(Computer, Communication, Consumer) integration: what's next?
- Hardware may not be the profit source, software and service will be the main profit sources!
  - Free phone + service
  - Cheap game box + software
  - Scanner + suppliers

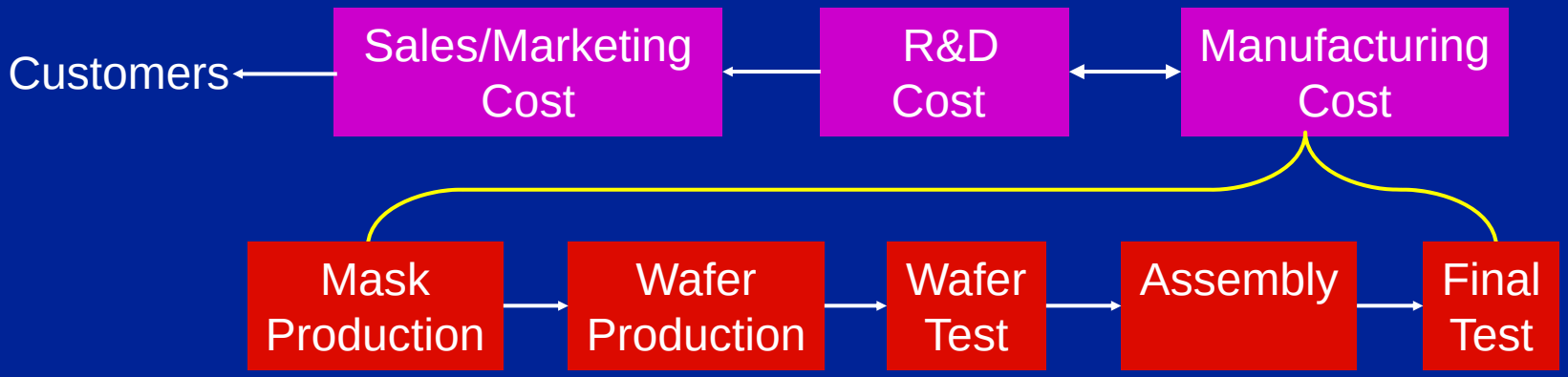
# Cost-Driven ASIC/ASSP Sales Strategy

- Reducing the overall cost by squeezing the entire supply chain
- Establishing alliances and partnerships in order to guarantee capacity and pricing
- Locality market-driven sales strategy

  => China: total solution based sales strategy

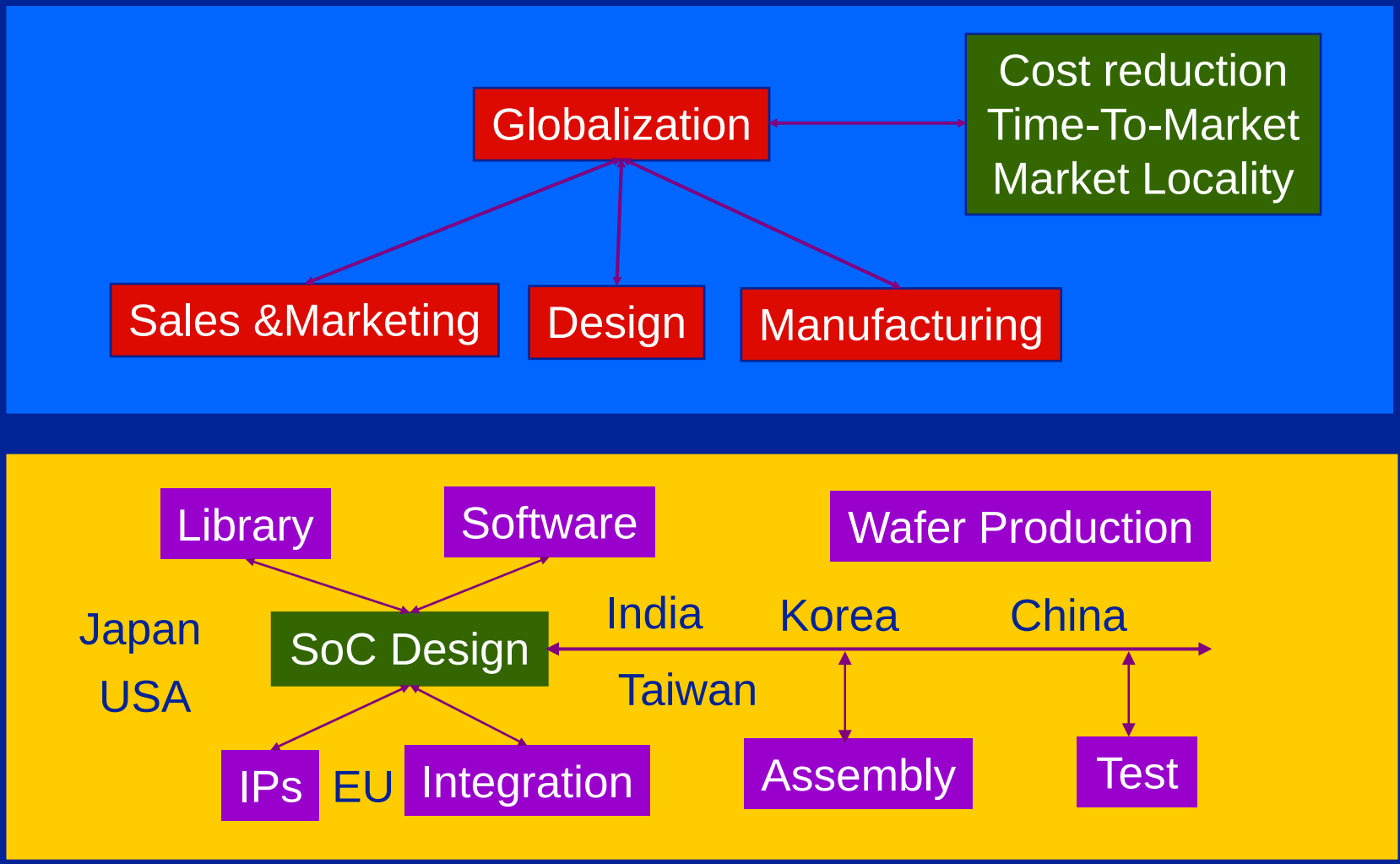
  => Japan: multiple agent and distribution channels problem!
- Strong design-in capability and service

# Cost Structure




Sales Price = Direct Cost+ Indirect Cost + Profit

# Globalization Cooperation Strategy



# Design, Manufacturing and R&D Costs of 45nm/32nm Process

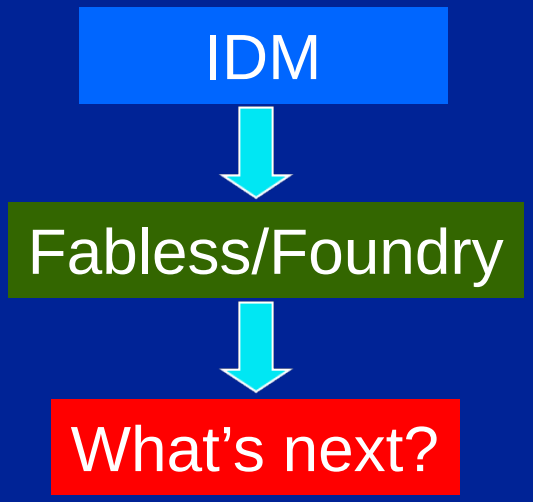
| | 45nm | 32nm |
|---|---|---|
| Fab | $3B | $5B-10B |
| Process R&D | $2.4B | $3B |
| Design | $20M-50M | $75M |
| Mask | $9M | NA |

Source: EE Times, Synopsys, VLSI Research

# Technology Trend

- Deep submicron technology(65nm up), R&D cost is very expensive
  - Co-development with foundry companies
  - Own technology
- Chip development cost is getting higher and higher
  - Only the top players will survive
  - Chip development strategy is changing

# Semiconductor Industry Evolution




" IC Industry in midst of fundamental change"
Wofgang Ziebart-Infineon CEO

# Business Trend

- Cost-down strategy
- More strategic partnerships
- Market Driven: Name-brand (Luxury items) and Non-Name-brand (Low-cost items)
- Moving toward traditional industry

# Thank You!