

# **A Win-Win Strategy in 450mm Collaboration Buildup**

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姜常俊

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# Agenda

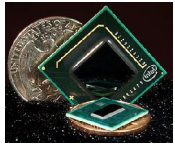
- New Opportunity in 2015
- Challenges in 450mm
- Facts of 450mm Memory
- 450mm: A Platform....

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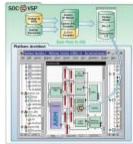
- **New Opportunity in 2015-2025**
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# 2015-2025 ICT Emerging from Giga to Tera Billion PC-Chip; Trillion Flash SSD

x86  
(atom, nano)



RISC  
(ARM...)



Low power, Low cost (\$10/set)  
SOC/CPU/MPU anywhere

Logic



Memory

SSD (Flash)



VS.

Hard disk



Low power, Low cost (\$1/GB)  
Mobile Storage anywhere

x10-50 450mm Mega Fabs

**50% WW Population Penetration  
(20%, 2008)  
3.5B/year by 2025**

**Mobile Smart Devices - US\$100 ASP**

Telecom Handheld  
1.3B units - 2008

IT Computing  
0.3B units - 2008



\$30-50  
low cost  
disposable



\$100-400  
Smartphone



UMPC  
MID  
\$100-300



PND  
GPS



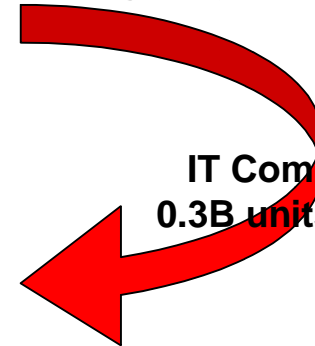
Netbook  
Nettop  
\$300-800



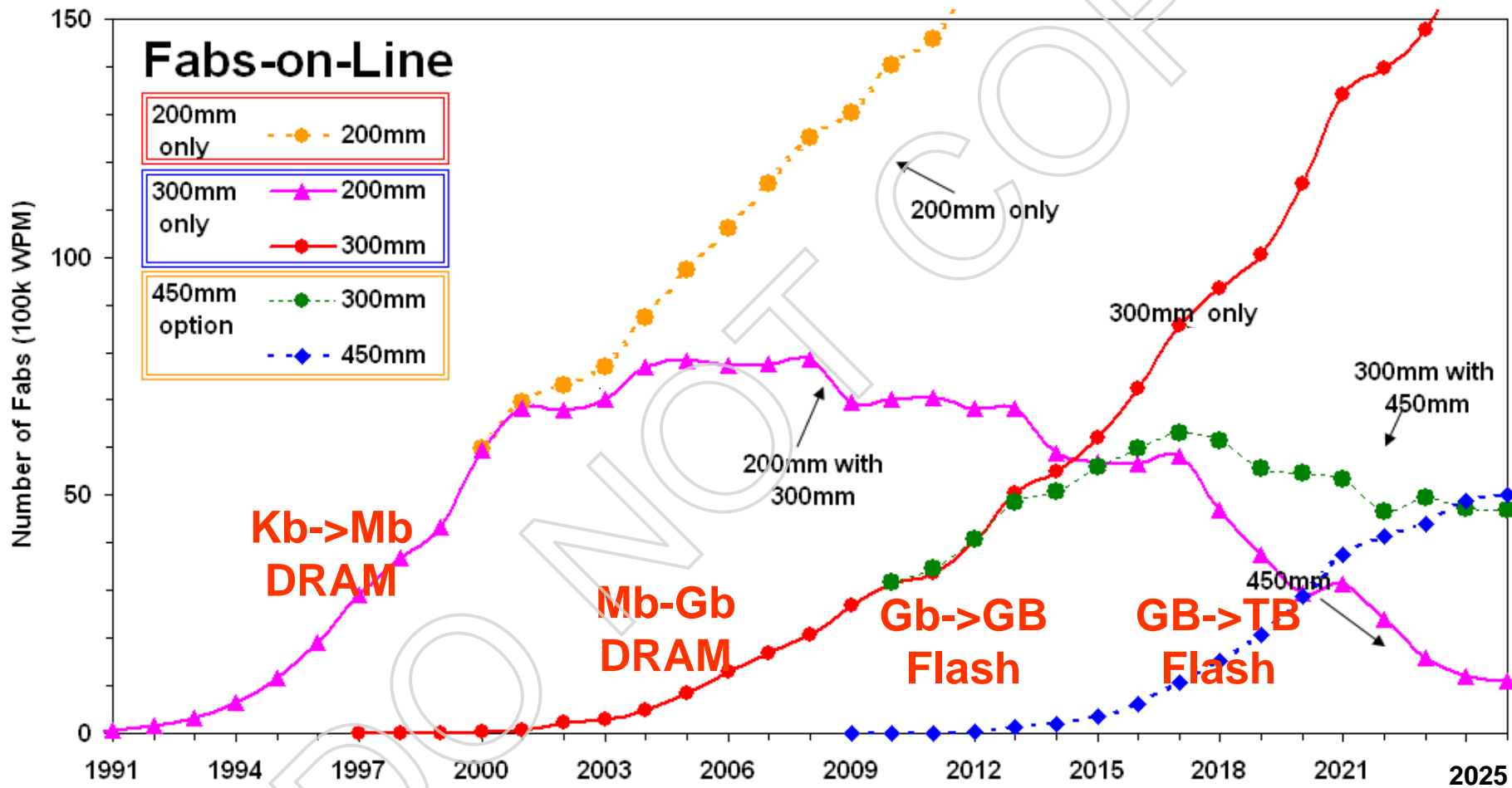
NB  
\$500-3000



DT, Server  
\$500-?

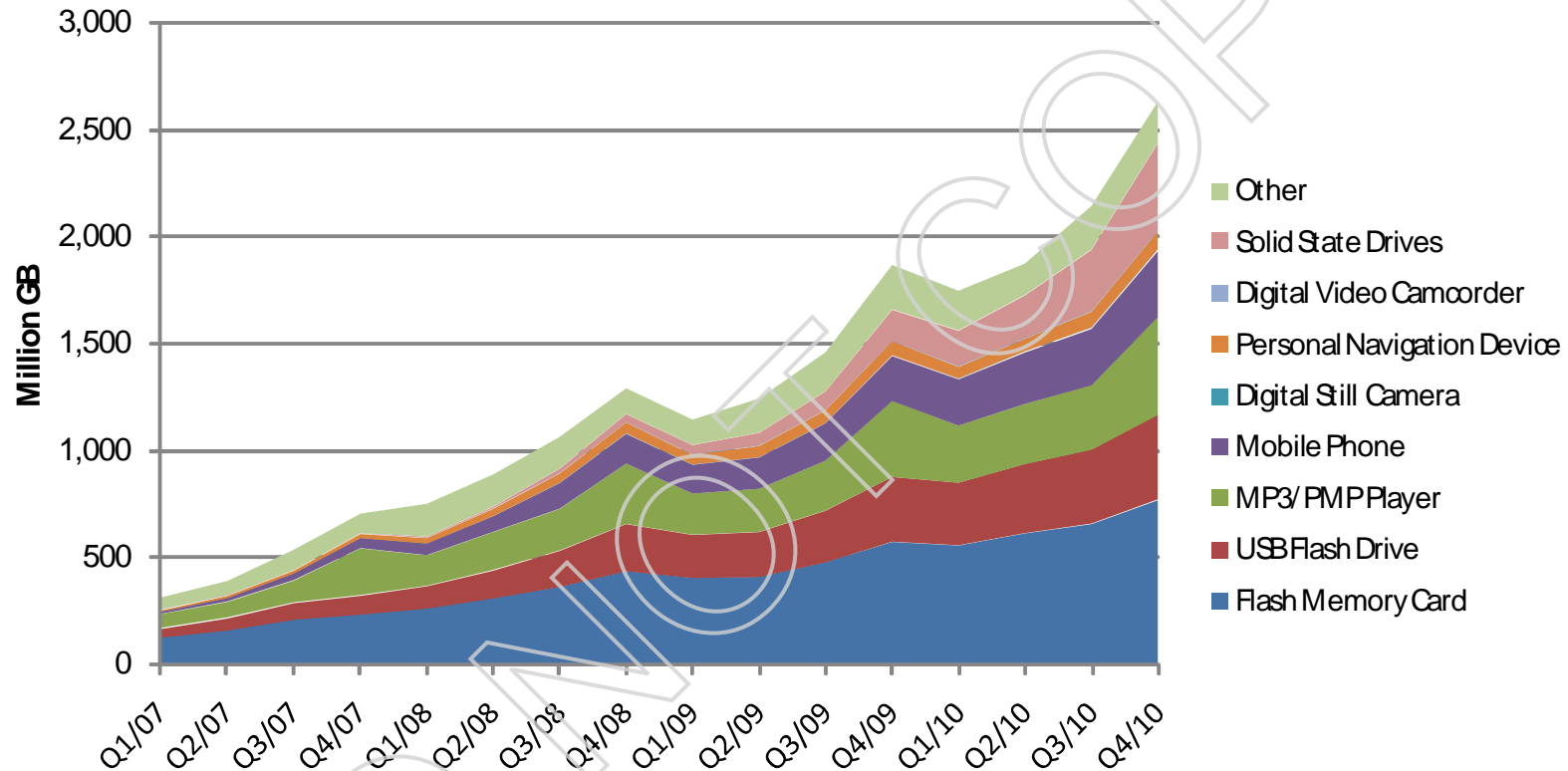


# Fabs On-line Trend by Killer Chips



# NAND Flash Demand

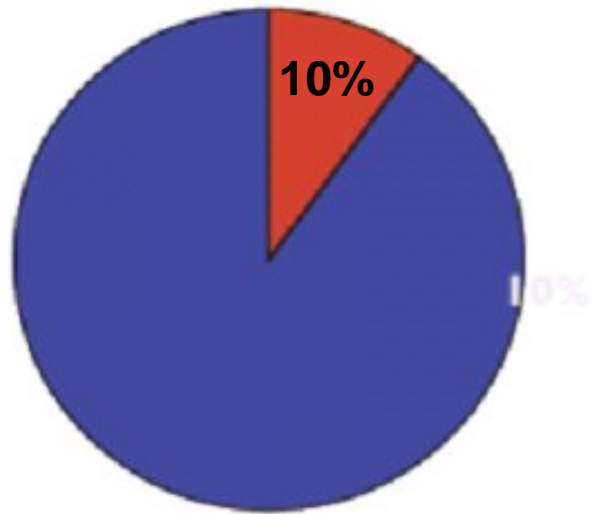
## NAND Flash Demand



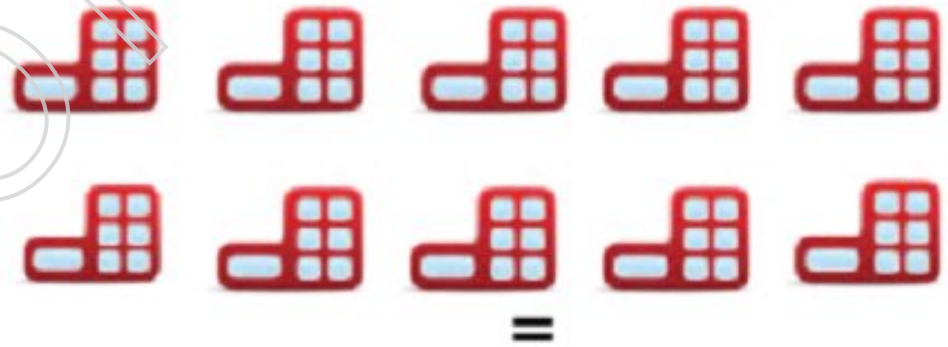
Note: Flash memory card includes all formats for all applications, DSC, mobile embedded only

- weak end market demand
- SSD adoption scaled back due to price trend and vendors' quest for profitability

# Huge Rise in Flash Demand



**300mm wafers  
~12.5M wafers/year**



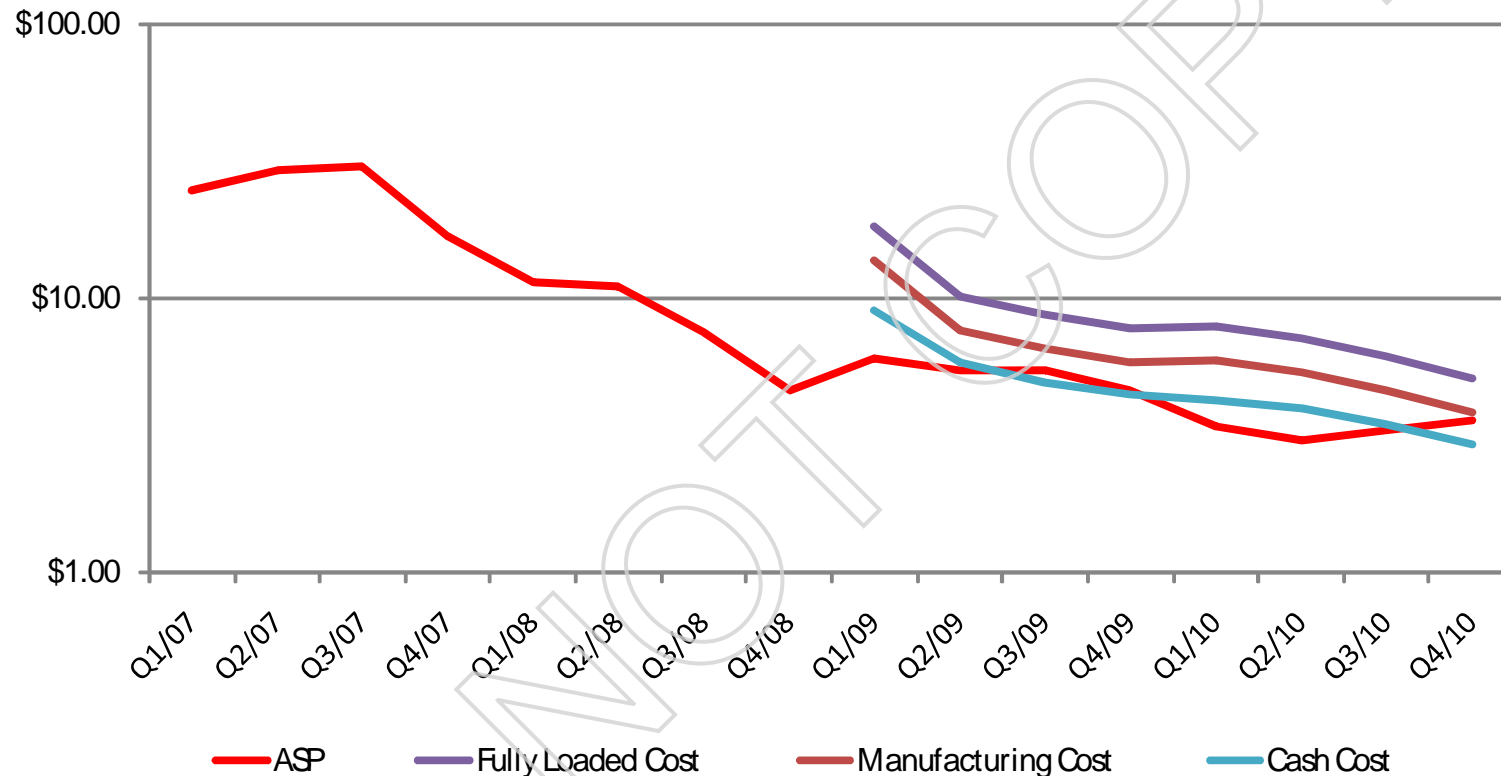
**10 New Flash Mega-fabs**

**HDD Total Storage  
~ 500,000,000 TB/year  
~2012/2013**

**100% HDD = x100 12" 100KWPM mega-fabs**

# 32Gb MLC NAND Flash

## 32Gb MLC NAND Flash ASP & Cost



Note: Historical pricing includes QDP/DDP

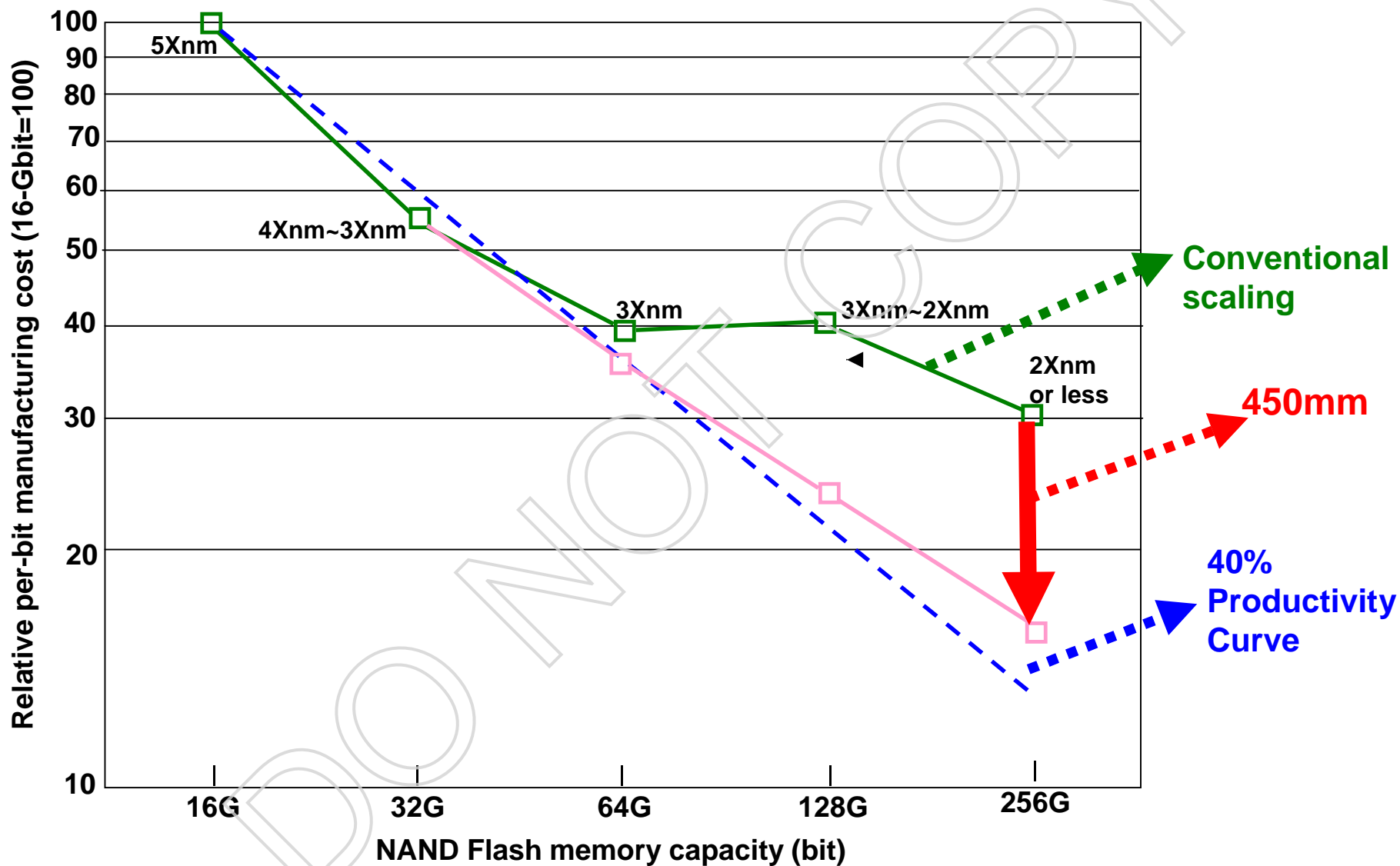
- Main producers to start monolithic 32Gb MLC production in 2H/09



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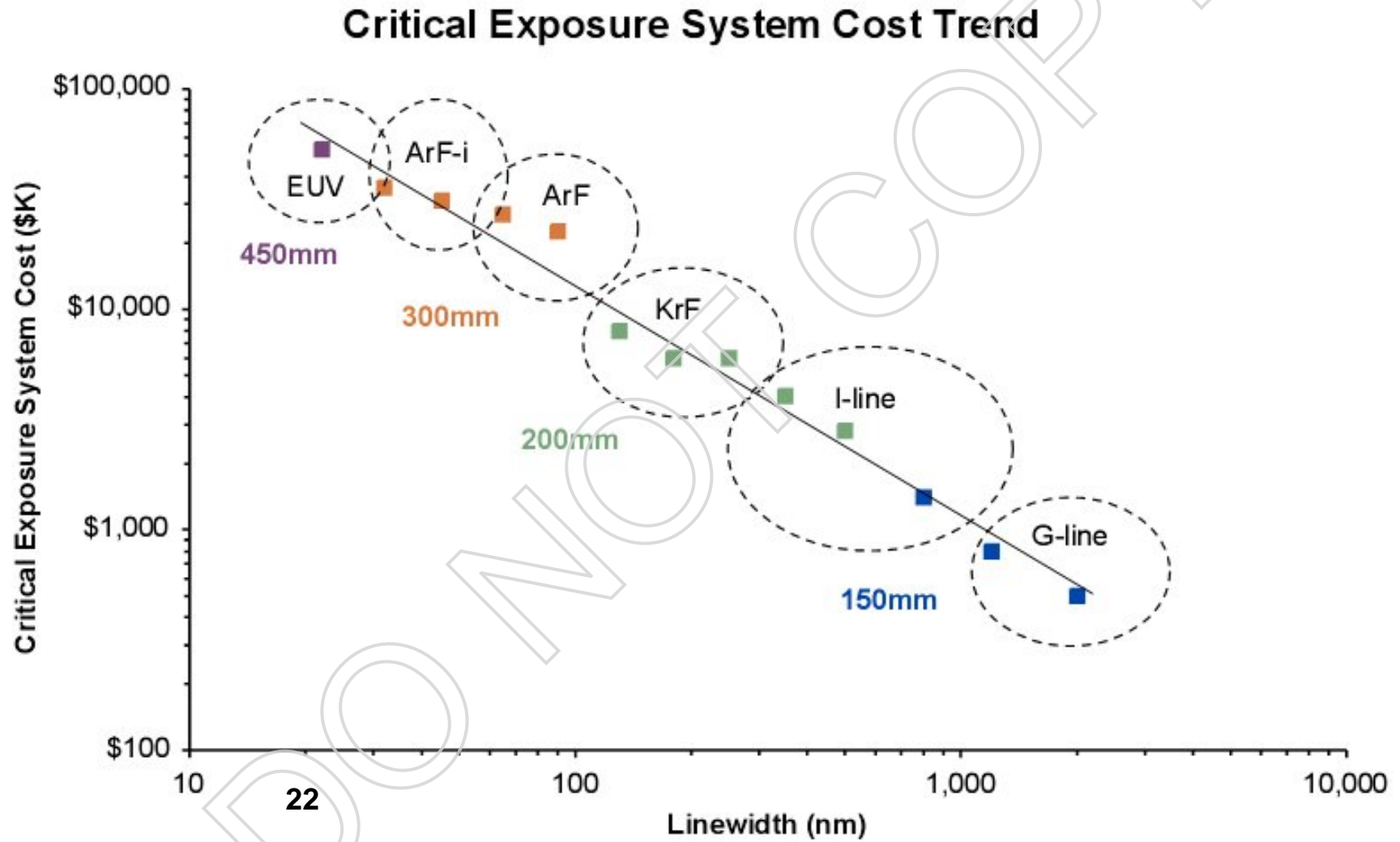
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# 450mm for Cost Reduction



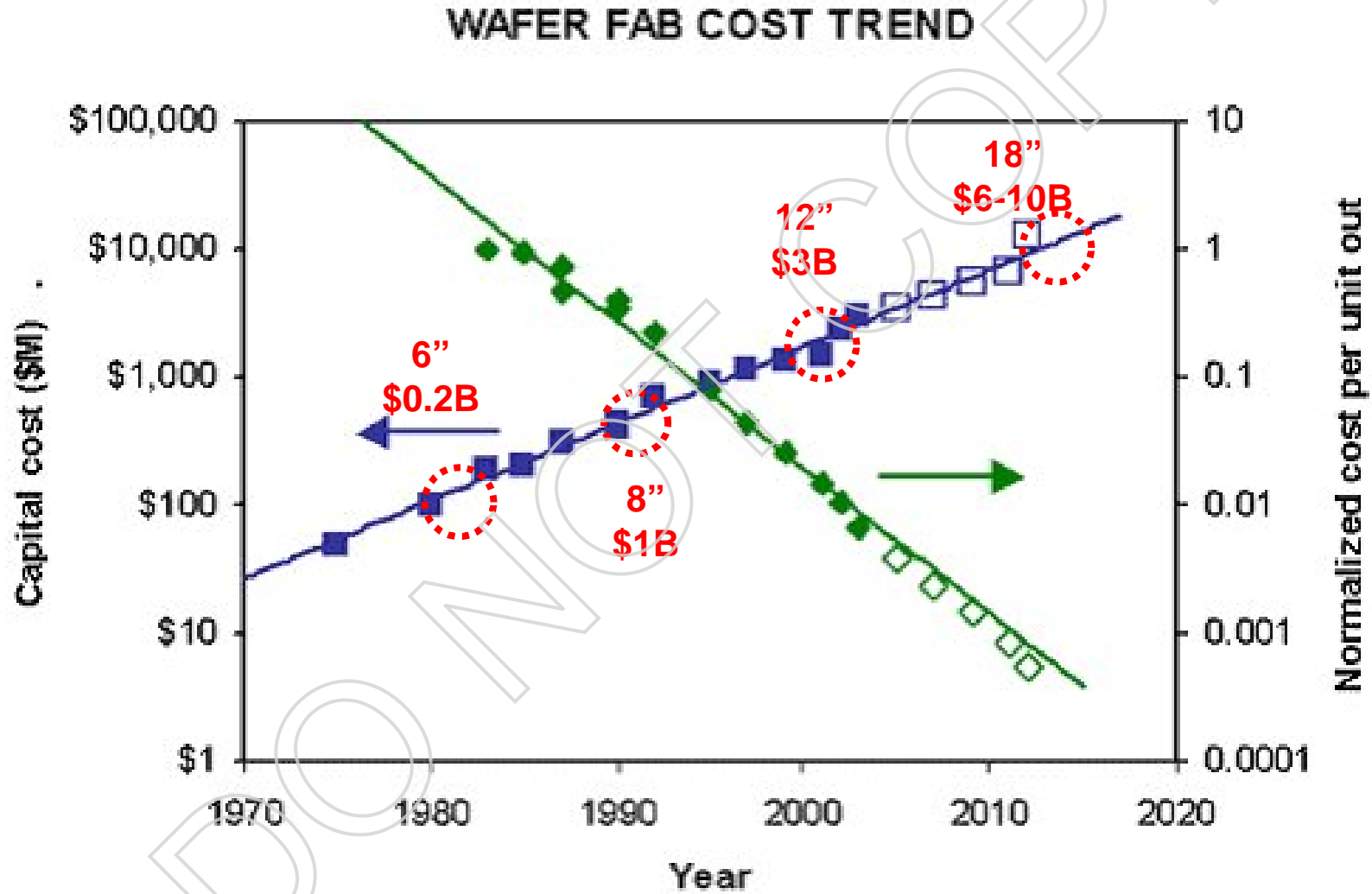
Source: Nikkei Electronics Asia (04/2007)

# Costly 22nm: EUV US\$60-100M



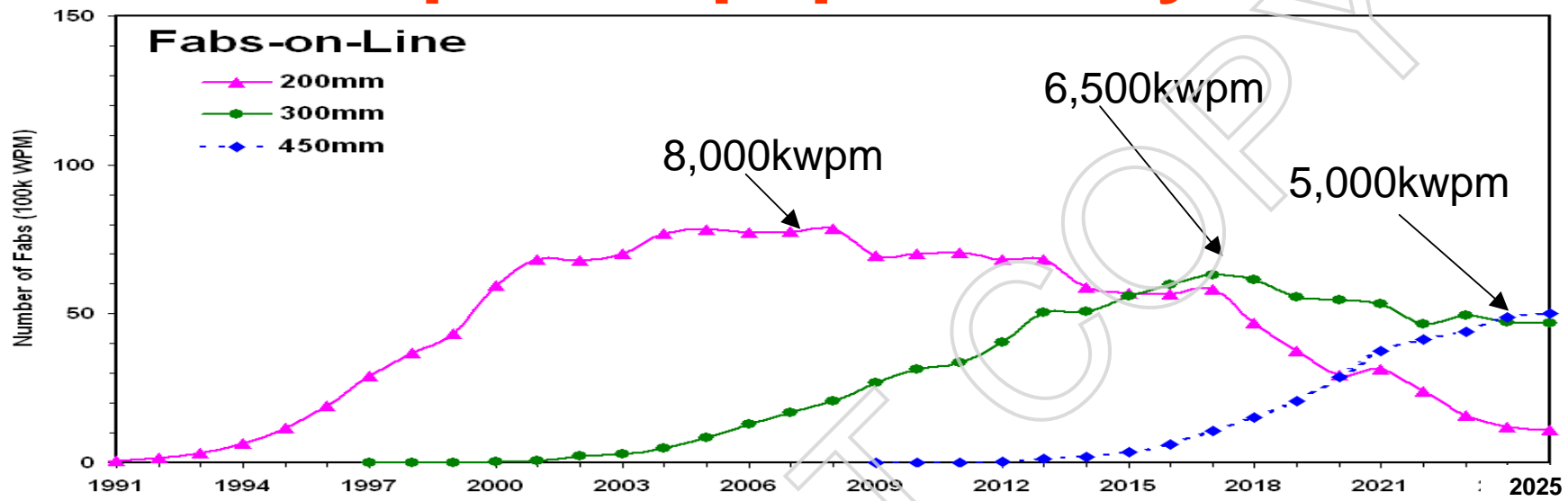
Source: IC-Insights(01/2009); IEK/ITRI(03/2008)

# US\$6-10B per 450mm Fab (Entry Barrier)



Source: IC-Insights(01/2008); IEK/ITRI(03/2008)

# Capital Equipment Cycles

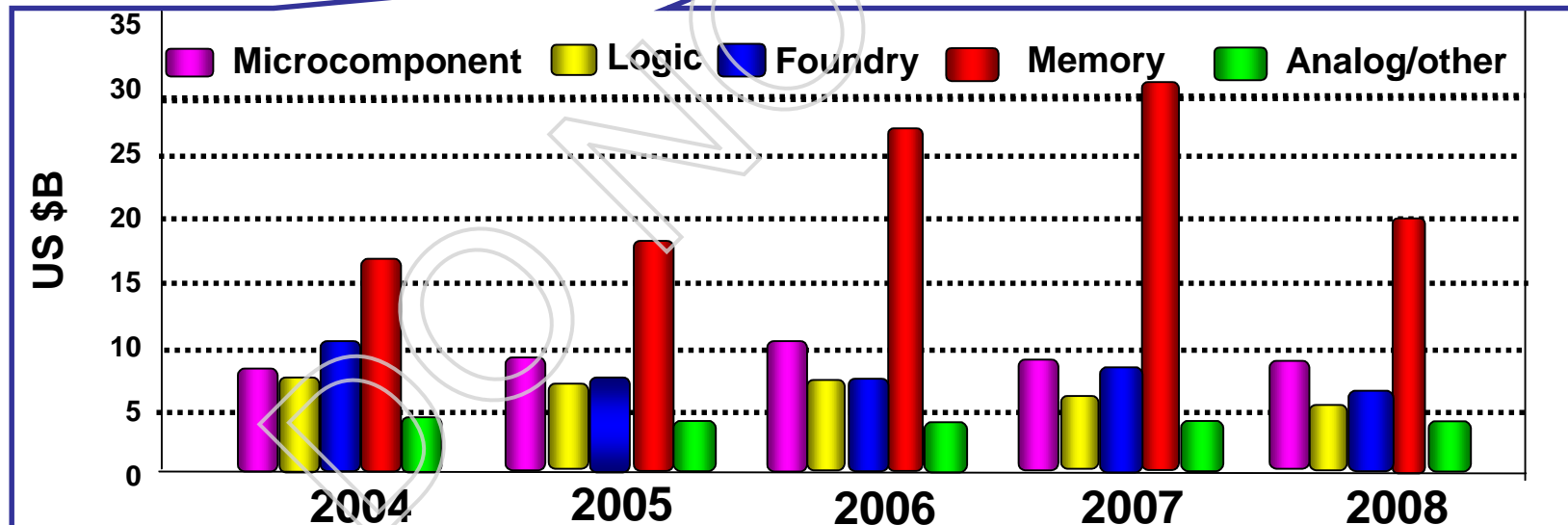
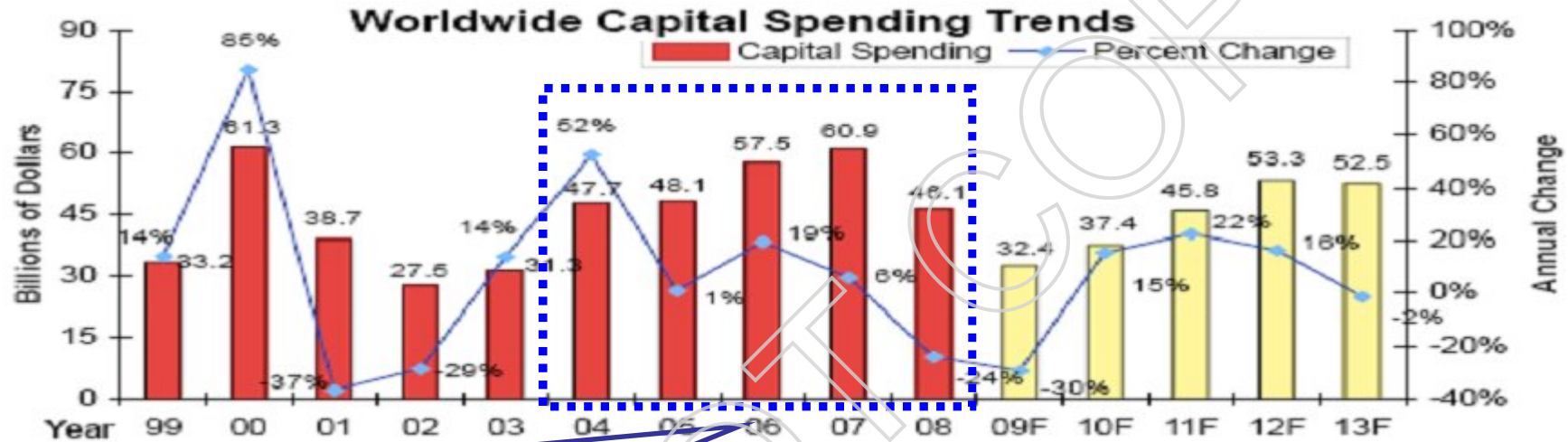


	Peak year	Max numbers of fab (KWPM)	Equipment cost (compare to 8" fab)	Equiv. 8" fab tool market	Tool market scale (compare to 8" fab)
8" fab	2005	80 (8,000)	X1	80	1
12" fab	2018	65 (6,500)	X1.5	97.5	1.2
18" fab	2025?	50 (5,000)	X2.25	112.5	1.4

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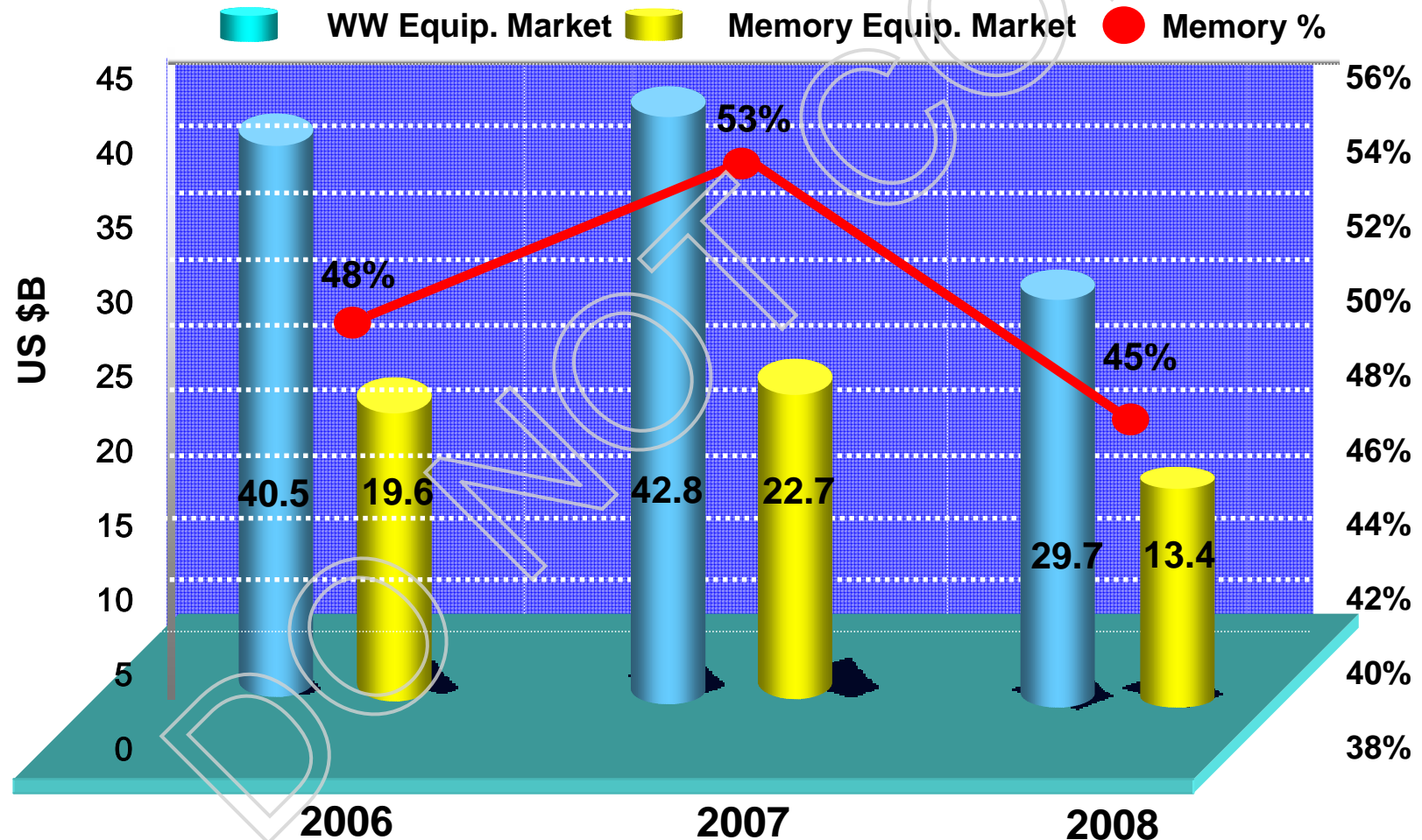
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# 50% CAPEX spending in Memory



Resources: IC-Insight(03/2009) ; IEK/ITRI(03/2009)

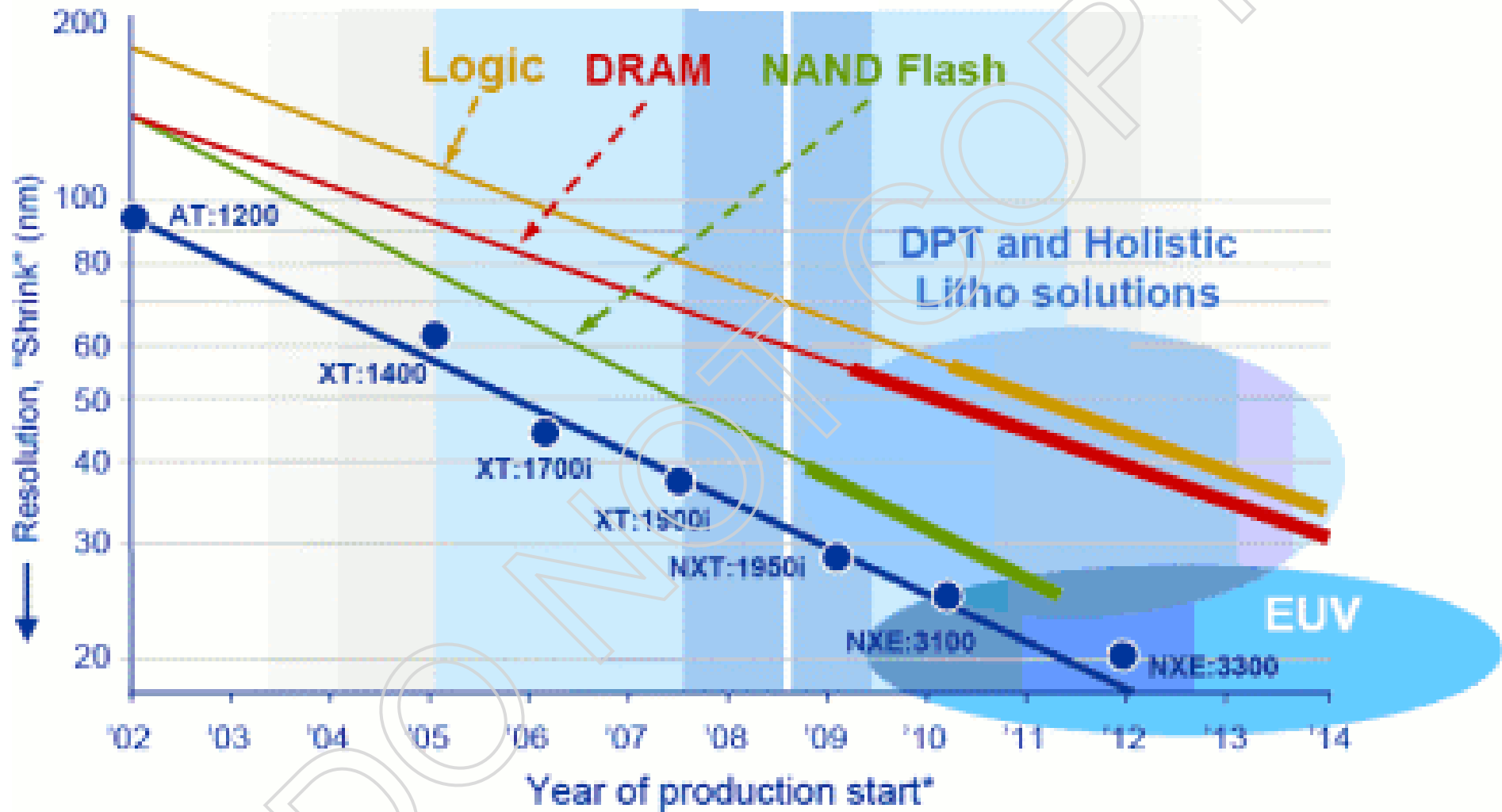
# 50% Tools in Memory



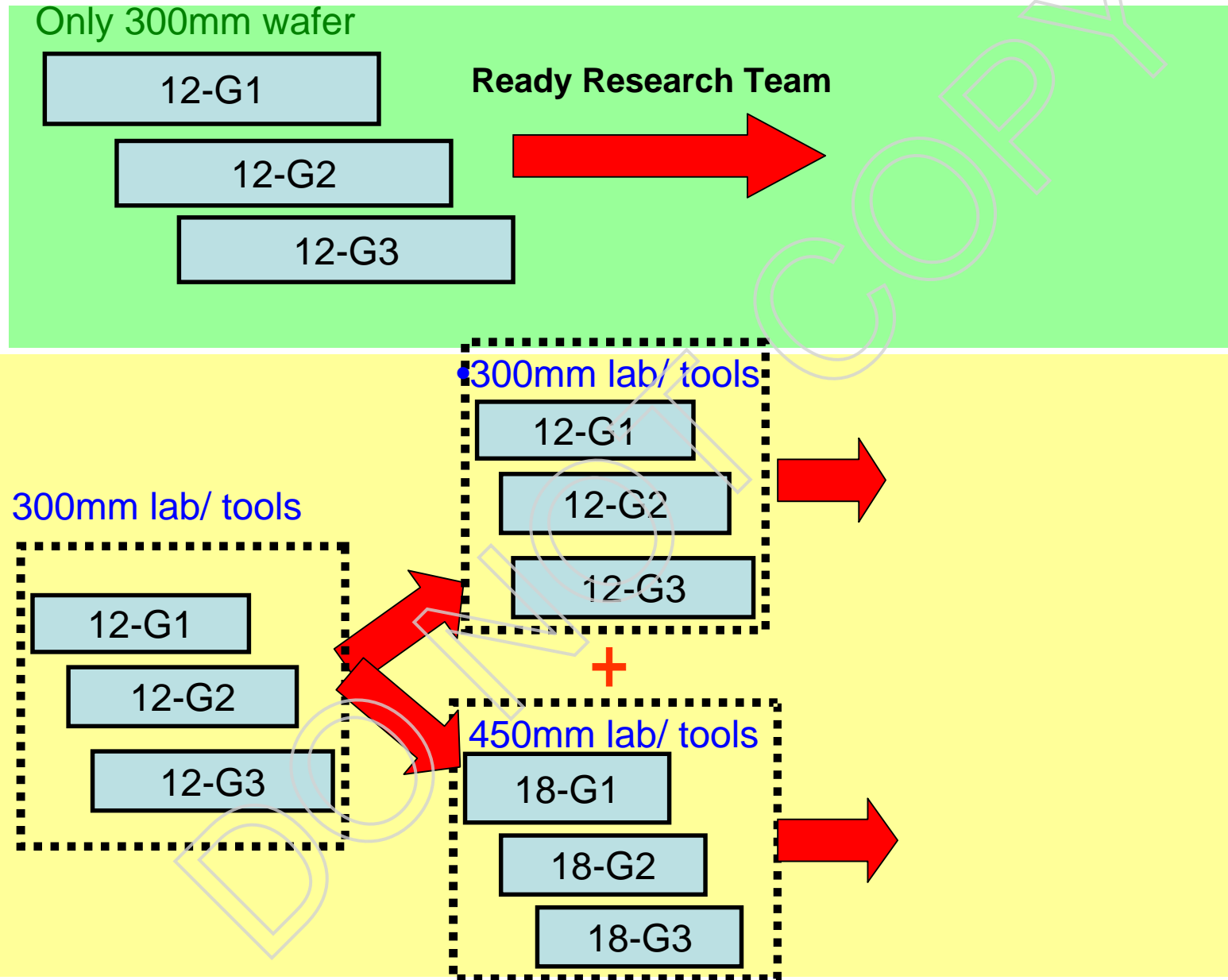
Resources: SEMI(01/2009); VLSI Research; IEK/ITRI(03/2009)



# Flash Drives Scaling



# Challenges of 3 generation of process developing : Cost & Risk Increasing largely



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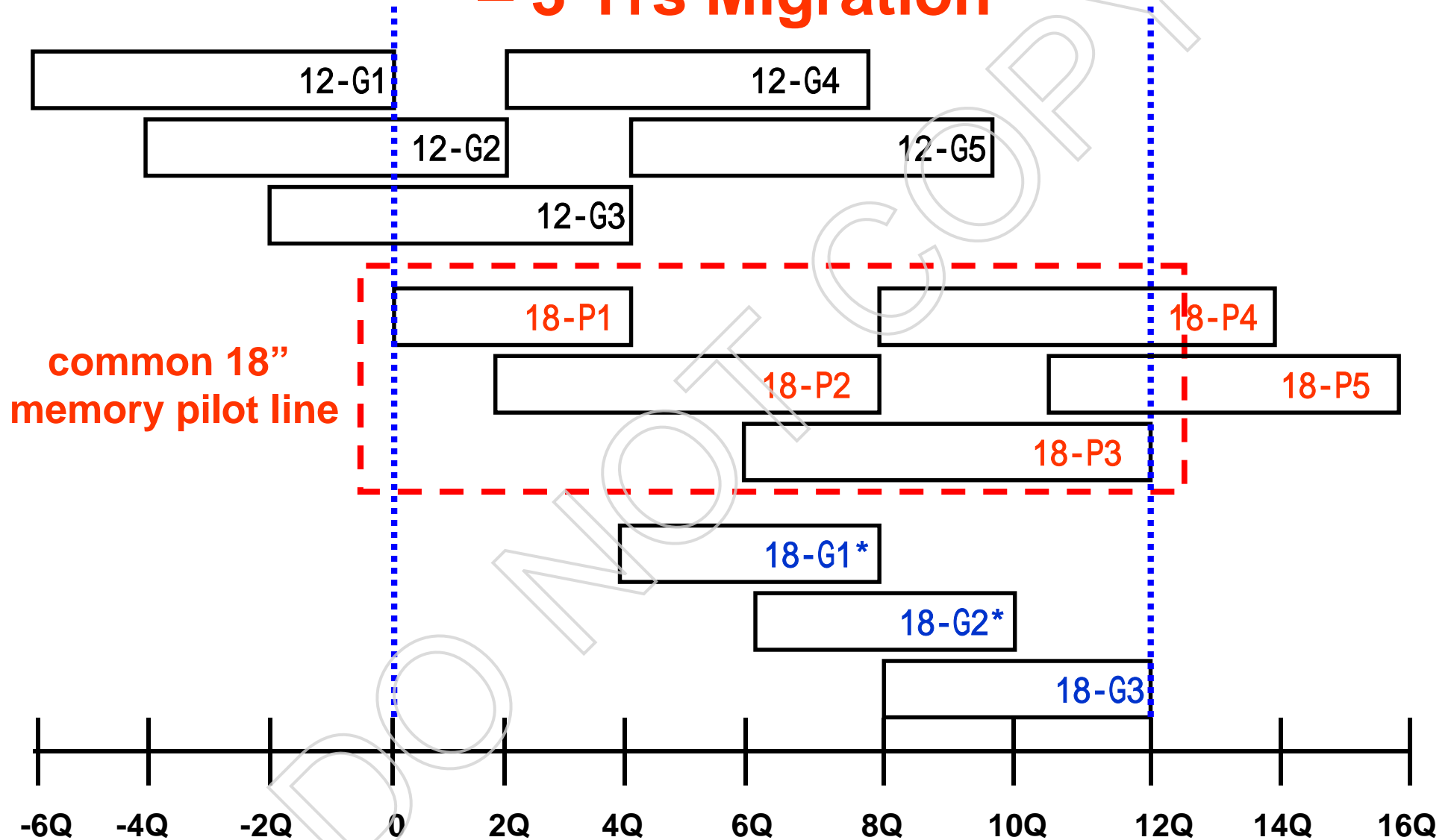
# Less Than 5 to Build 450nm

## The "Billion Dollar Club" for Capital Spending

Rank	2000	2001	2002	2003	2004	2005	2006	2007
1	Intel	Intel	Intel	Intel	Samsung	Samsung	Samsung	Samsung
2	TSMC	TSMC	Samsung	Samsung	Intel	Intel	Intel	Intel
3	ST	Samsung	TSMC	Sony	UMC	Hynix	Hynix	Hynix
4	Samsung	TI	IBM	Toshiba	TSMC	Toshiba	Toshiba	Micron
5	UMC	ST	UMC	ST	ST	TSMC	Micron	Toshiba
6	TI	Infineon	—	TSMC	Toshiba	Elpida	Powerchip	TSMC
7	Motorola <b>X</b>	IBM	—	Micron	SMIC <b>X</b>	Infineon	TSMC	Nanya
8	NEC	Micron	—	Renesas <b>X</b>	Infineon	ST	AMD	Powerchip
9	Hitachi	UMC	—	—	Micron	AMD	Infineon*	Infineon*
10	Fujitsu	—	—	—	NEC <b>X</b>	TI	ST <b>X</b>	ProMOS
11	Infineon	—	—	—	Hynix	Powerchip	Sony	AMD
12	Toshiba	—	—	—	AMD	Sony	TI <b>X</b>	SanDisk
13	Philips <b>X</b>	—	—	—	Sony	Micron	Elpida	Elpida
14	Hynix	—	—	—	TI	—	SanDisk	Sony
15	Sony	—	—	—	Elpida	—	Fujitsu <b>X</b>	UMC
16	IBM	—	—	—	IBM <b>X</b>	—	UMC	—
17	Mitsubishi <b>X</b>	—	—	—	—	—	—	—
18	Micron	—	—	—	—	—	—	—
<b>Amount Spent (\$B)</b>	<b>\$43.2</b>	<b>\$20.1</b>	<b>\$10.1</b>	<b>\$14.4</b>	<b>\$31.8</b>	<b>\$30.7</b>	<b>\$40.1</b>	<b>\$41.7</b>
<b>% of Total Cap Ex</b>	<b>72%</b>	<b>53%</b>	<b>38%</b>	<b>48%</b>	<b>69%</b>	<b>66%</b>	<b>73%</b>	<b>73%</b>
<b>Avg. Spent per Co. (\$B)</b>	<b>\$2.40</b>	<b>\$2.23</b>	<b>\$2.02</b>	<b>\$1.80</b>	<b>\$1.99</b>	<b>\$2.36</b>	<b>\$2.51</b>	<b>\$2.78</b>

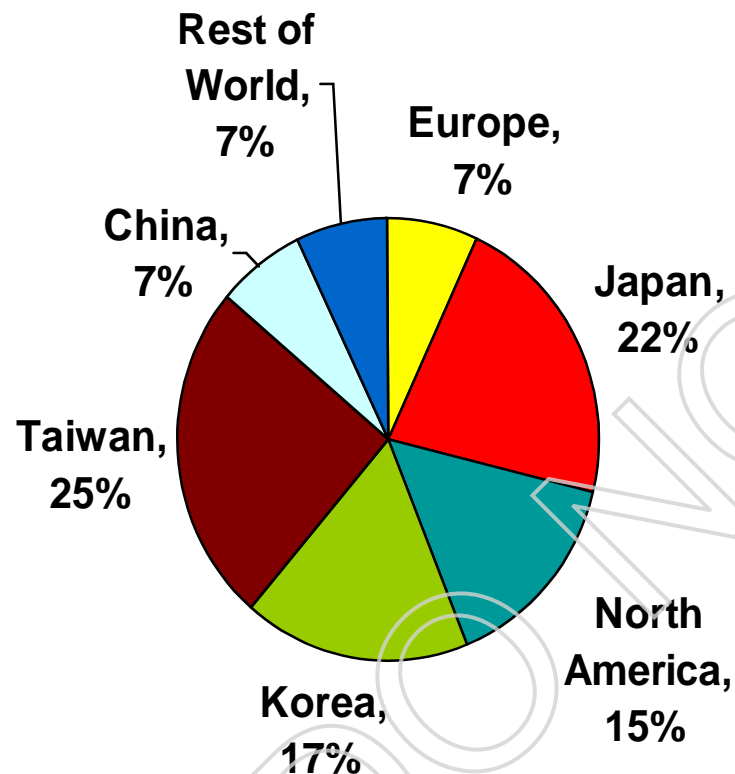
\*Includes Qimonda spending

# 450mm Research Consortium – 3 Yrs Migration

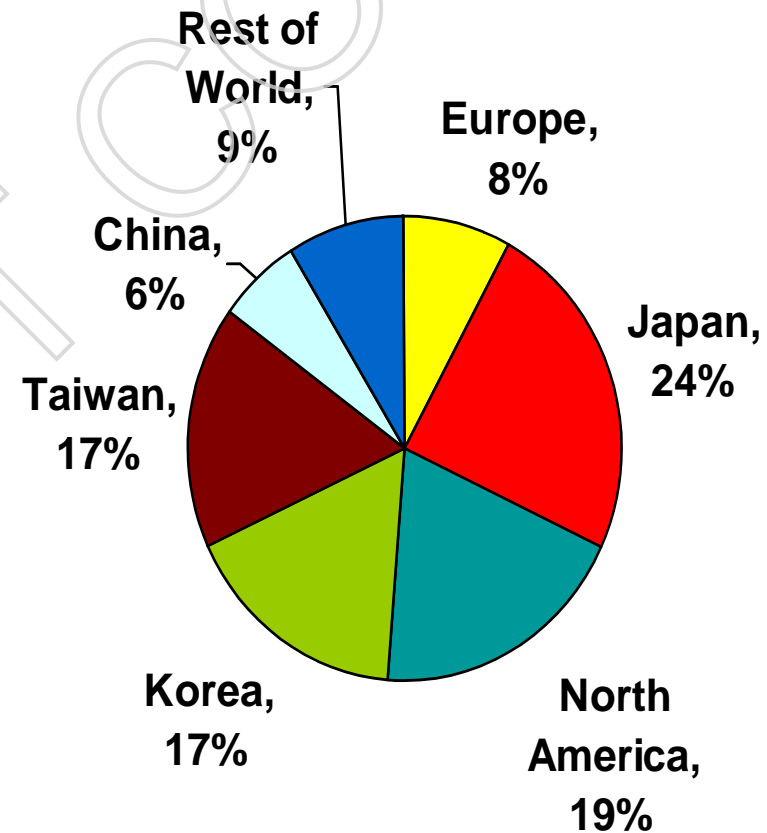


# Semiconductor Equipment Markets (Market Billings)

2007: UD \$42.77B



2008: US\$ 29.7B



# Emerging Collaboration Hub



# 450mm: A Disruptive Platform.....

- **Self competitiveness for expansion (Flash SSD)**
- **Novel Innovation to leading positions**
- **Oligopoly Industry for fewer players and selective partners**
- **Collaborated Business Model (Open Lab, JV, Foundry, Consortium....)**



**“Dig Your Well before You're Thirsty”**

**Q&A**

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