

Welcome to

ELECTRONICS AND OPTOELECTRONICS

RESEARCH LABORATORIES (EOL)

■
known as ERSO, a Lab. of

Industrial Technology Research Institute (ITRI)



Worldwide Presence of Taiwan's Industries

IC

NO.1

Foundry : US\$ 11,931M (67.6%)

Mask ROM : US\$ 265M (91.1%)

IC Packaging : US\$ 4,689M (41.0%)

NO.2

IC Design : US\$ 7,808M (28.2%)

NO.3

DRAM : US\$ 5,790M (21.6%)

Networking Products

NO.1

NIC :US\$ 116M (60%); 36,193kPcs (93%)

SOHO Router :US\$ 988M (61%); 28,123KSets (75%)

Hub : US\$ 28M (100%); 11,840KPorts (100%)

Wireless LAN : US\$ 1,539M; 56,800KPcs (95%)

DSL CPE :US\$ 979M (70%); 23,319KSets (76%)

Cable Modem : US\$371M (50%) ; 7,868KSets (53%)

Analog Modem: US\$206M; 19,646KSets(72%)

Ethernet LAN Switch : US\$ 724M (12%);

105,052KPorts(38%)

Computer & Peripheral Devices

NO.1

CD-RW Drive : US\$527M(47%); 24.54MStes (51%)

CD-R Disk : US\$1,082M(60%); 8,655MPcs (58%)

CD-RW Disk : US\$90M(88%); 224.6MPcs (88%)

DVD R Disk : US\$825M(74%); 1,917.95.9MPcs(77%)

DVD RW Disk : US\$175M(70%); 174.81MPcs (72%)

Notebook PC : US\$ 21,831M; 33,406KPcs (72.4%)

LCD Monitor : US\$ 14,402M; 46,100KPcs(68%)

CDT Monitor : US\$ 3,492M; 34,584KPcs(56.7%)

Mother Board : US\$ 6,228M;

107,9874KPcs(77.9%)

PDA: 6,001KSets(63%)

NO.2

DSC : 20,722KPcs(30%)

Server: US\$1,837; 2,108KPcs(33%)

CD-ROM Drive : US\$251M(31%); 19.95MPcs (36%)

DVD-ROM Drive : US\$505M(43%); 20.36MPcs (43%)

DVD-W Drive : US\$1,261M(26%); 17.2MPcs (28%)

COMBO Drive : US\$746M(31%); 17.16MSets (32%)

Small&Medium Scale TFT-LCD module : US\$ 1,229M (12%)

Large Scale TFT-LCD Panel : US\$ 13,158M (38%)

TN/STN LCD module : US\$ 1,456M (24%)

NO.3

PDP : 80.5MPcs(3.8%)

B:Billion

M:Million

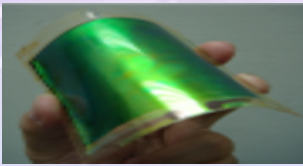
K:Thousand

M.T :Metric Ton

() : World Penetration

R&D Activities

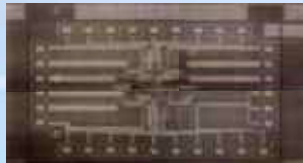
Flexible Electronics



Advanced Packaging



Nanoelectronics



Optical Storage



Optical Design & Manufacturing

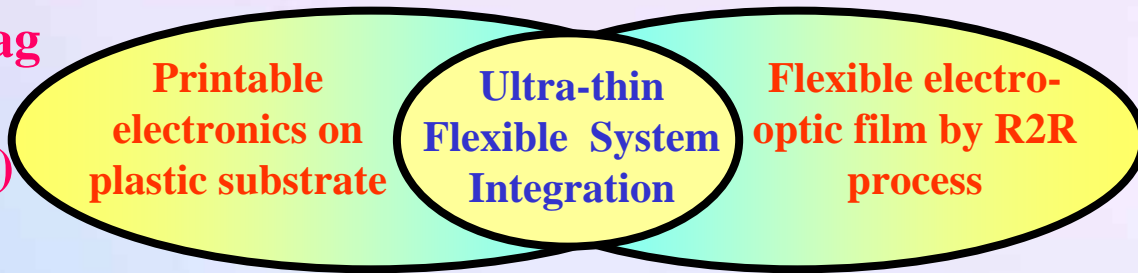


Optoelectronic Semiconductor & Systems



Flexible Electronics (1/2)

**Printed Smart Tag
(Printed RFID +
display + sensors)**

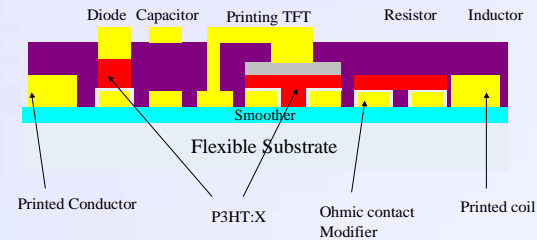


**Electronic Shelf
Label, e-POP,
e-paper**

Flexible Organic Non-volatile Memory (ONVM)



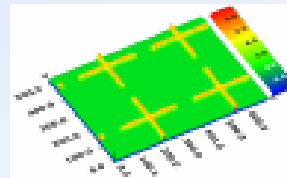
**Integrated Platform of Printable
Electronics on Plastic Substrate**



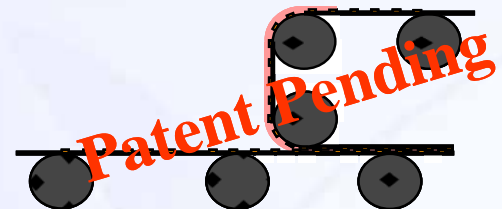
Display Medium



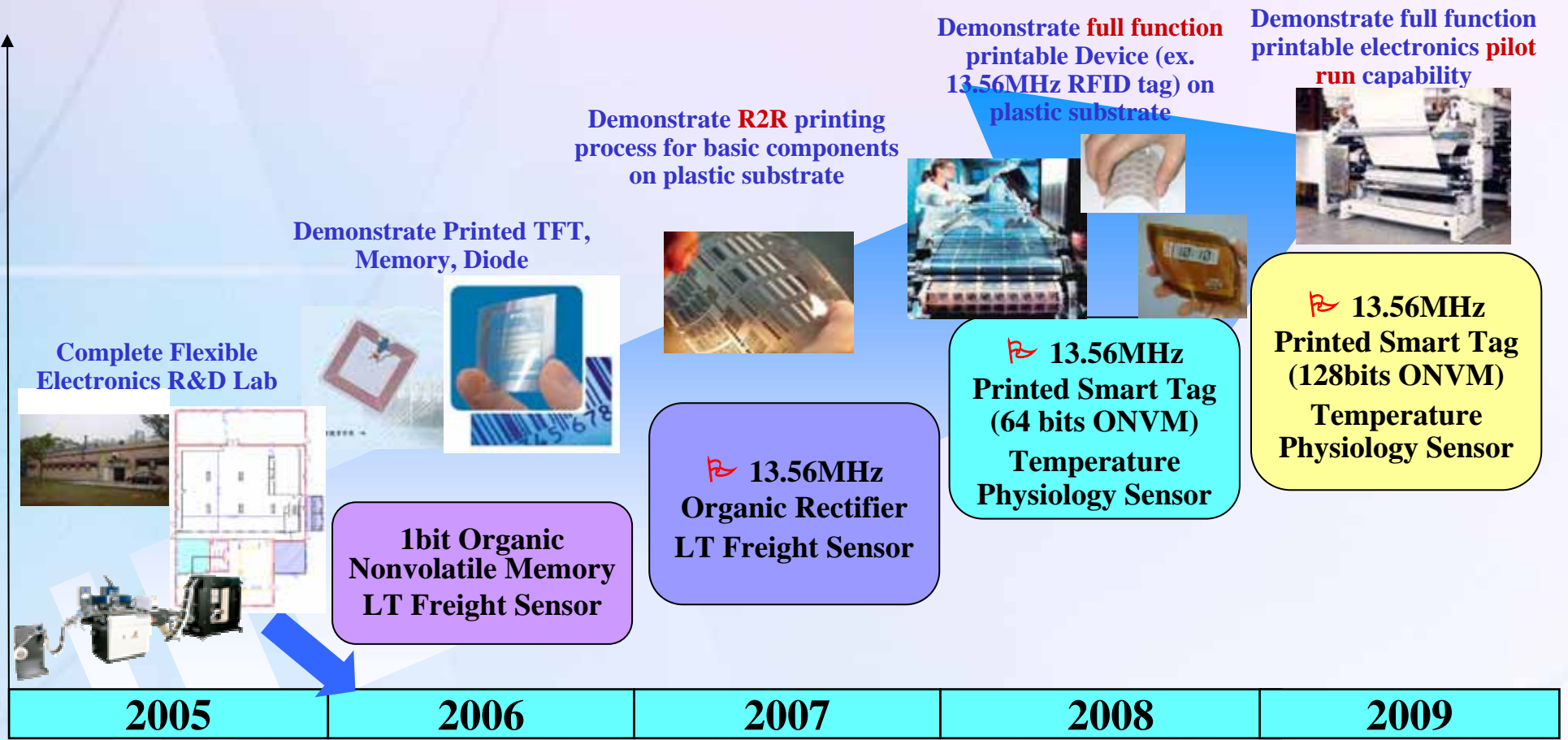
Micro-Cell Technology



**Continuous Flexible Electro-
Optic Film Platform**



Flexible Electronics (2/2)



Electronic Packaging Technology

Chip Protection

Integration

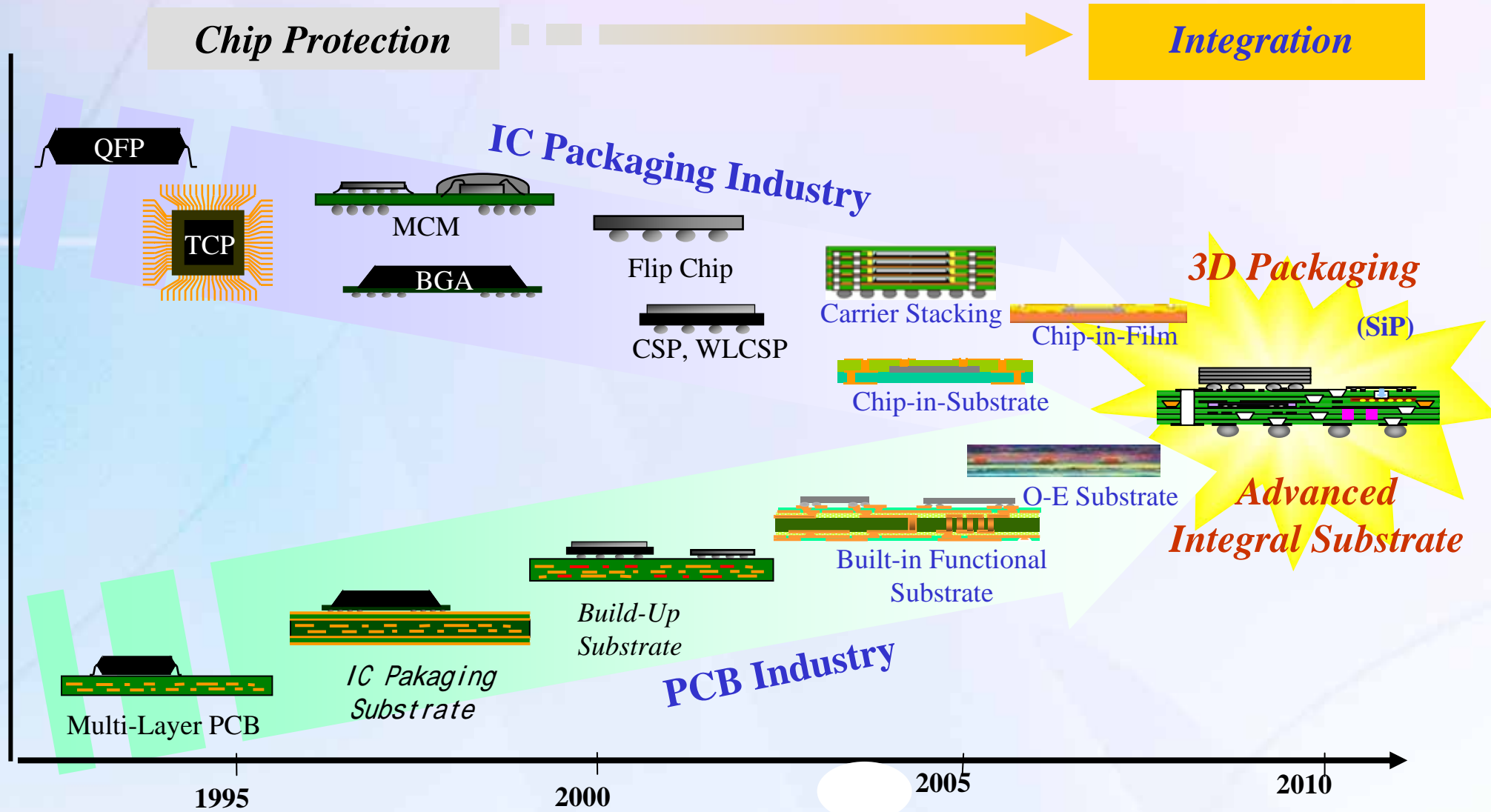
IC Packaging Industry

PCB Industry

3D Packaging

(SiP)

*Advanced
Integral Substrate*



1995

2000

2005

2010



Advanced Packaging Technology

□ Packaging Design Tech.

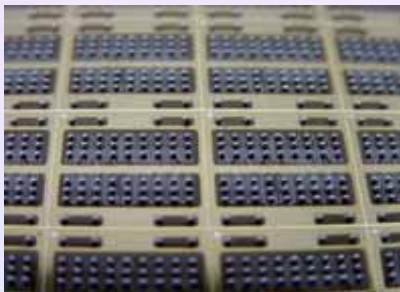
☞ Thermal & Stress Design

☞ High Speed Electrical Design

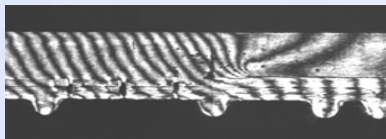
☞ Rapid Prototyping

☞ Micro-Module Design

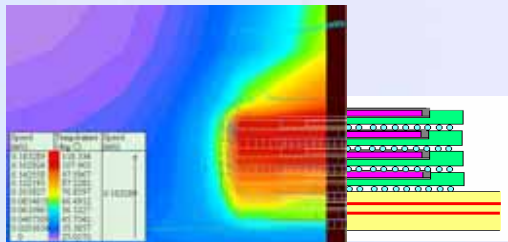
☞ SiP Design



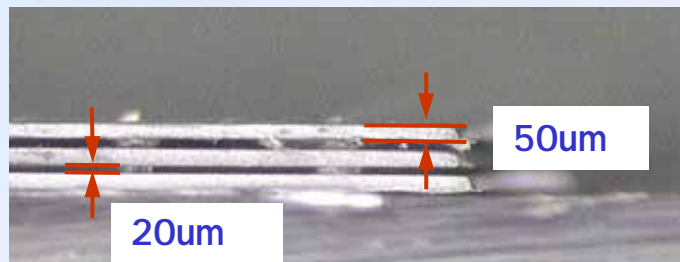
Wafer Level CSP



Morie μ -Stress Analysis



3D Package



3D IC Stacking

□ Packaging Process Tech.

☞ Wafer-Level Packaging

☞ Flip Chip, Wafer-Level CSP

☞ Cu & Al Wafer packaging

☞ Gold bump, Low cost bumping

☞ 3D Package

☞ 3D IC(3D vertical interconnect)

☞ Chip in Substrate packaging

☞ FPD packaging (COF, COG)

☞ Failure mode analysis

☞ IC, Packaging, TFT, PCB

Nanoelectronics – Emerging NVM

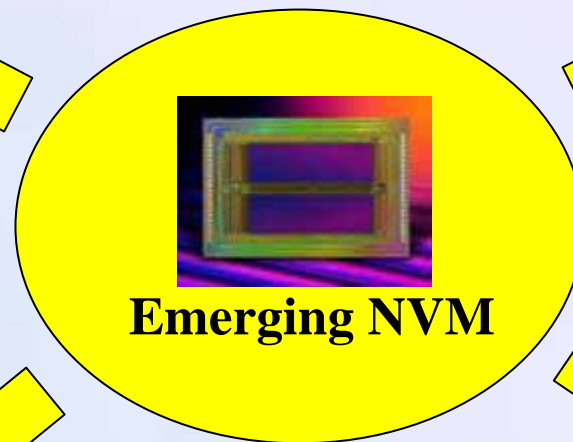


“Instant On”

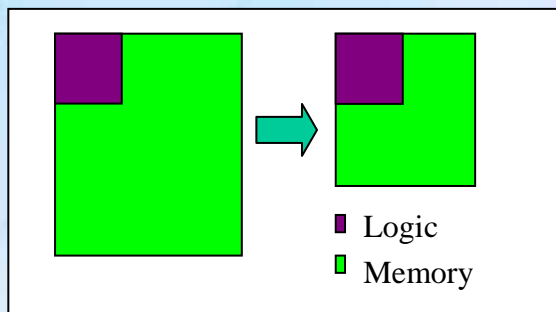


Ref.
Philips Xenium
9@9

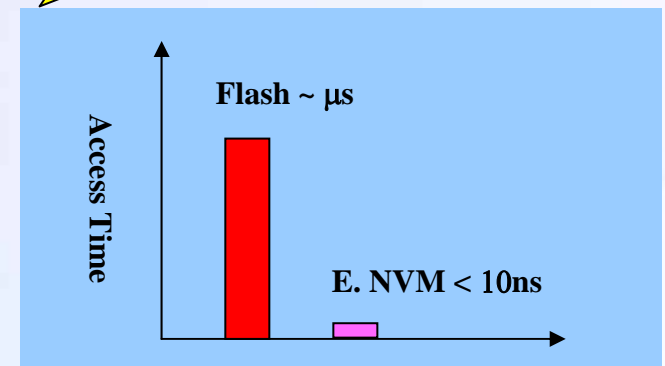
Standby power ~ 1/10



Chip area shrinkage ~ 50%



Access Time ~ 1/100

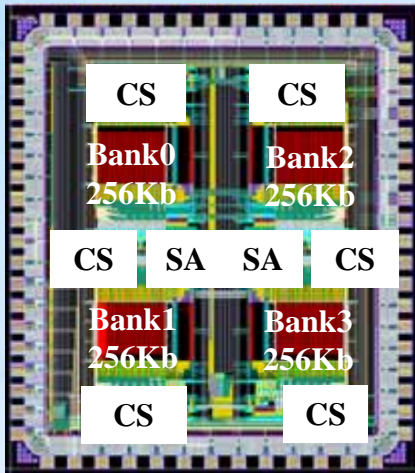


□ New Non-Volatile Memory

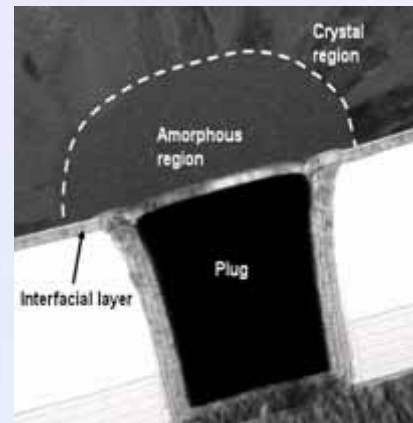
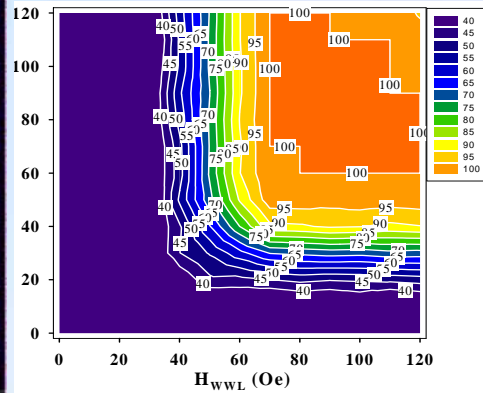
- ☞ MRAM
- ☞ PCM
- ☞ 3D-memory

□ New Materials/Structures

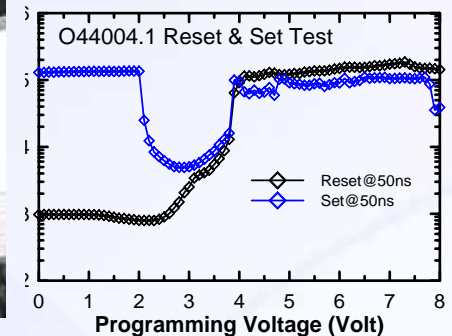
- ☞ High K MIM for DRAM
- ☞ Nanocrystal for Flash



1Mb MRAM, ITRI



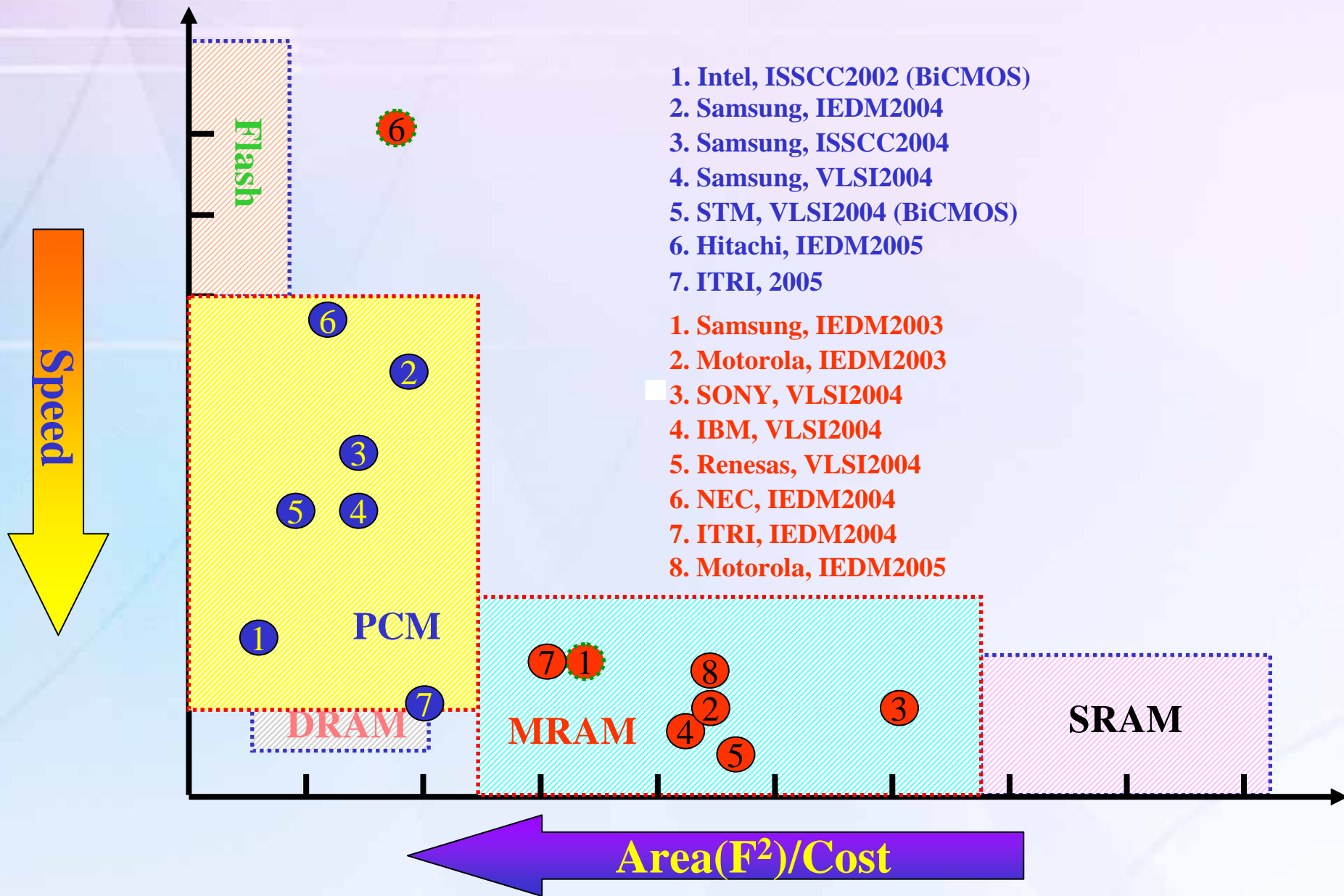
Phase change memory, ITRI





ITRI

Memory Technology Benchmark



- 1. Intel, ISSCC2002 (BiCMOS)
- 2. Samsung, IEDM2004
- 3. Samsung, ISSCC2004
- 4. Samsung, VLSI2004
- 5. STM, VLSI2004 (BiCMOS)
- 6. Hitachi, IEDM2005
- 7. ITRI, 2005

- 1. Samsung, IEDM2003
- 2. Motorola, IEDM2003
- 3. SONY, VLSI2004
- 4. IBM, VLSI2004
- 5. Renesas, VLSI2004
- 6. NEC, IEDM2004
- 7. ITRI, IEDM2004
- 8. Motorola, IEDM2005

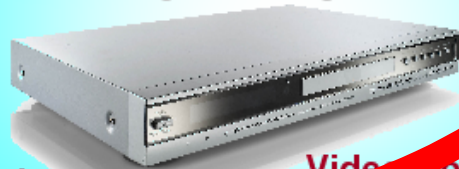
From FVD to HVD

**Holographic
300GB~1.6TB**

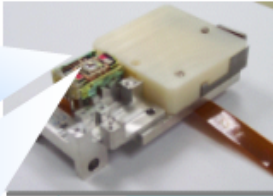
Major Impacts

- New Optical design
- 2D coding scheme
- High efficient recording media
- Miniaturization of holographic system

Blue Laser HD-DVD Player System



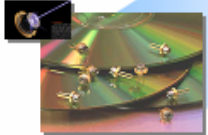
HD-DVD Pick-up Head



Lens



Laser Diode



Disc Format Design



Mastering/Disk

System Integration Technology



Read/Write Channel Technology

DVD/HD-DVD/SD Verification Technology



A-class Verification Lab.

Video Compression Technology



WMV-9 Compression Technology

Optical Design & Manufacturing

✓ LED BLM

- Customer : UPEC Electronics Corp, Genii....
- State : To accomplish 42" LED Backlight TV



Optical Design & Manufacturing

✓ Handy Projector

- Customer : ERSO
- State : To achieve Himax 0.62" LCOS Mini-Projector, HOYA 0.52" T-LCOS Mini Projector prototype



✓ Most zoom lens model

- Customer : Kodak, Ability
- State : To design aspheric 6x zoom lens without glass



✓ Hard Coating

- Customer : Kallex, Genius, Aptek
- State : The protective film used an alloy film of precious metal or a nitride film. The dies did not crack after press-molded process more than 3,200 times with Boro Silicate Crown Glass, such as L-BSL7 (OHARA)





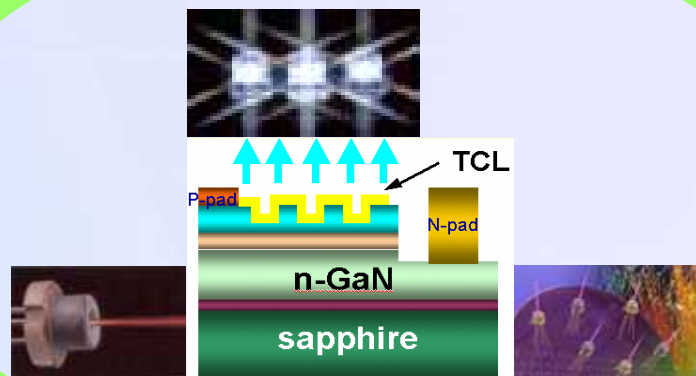
High Power Package

- LED-Based portable Image Projection and Printing Device
- White LED Source for Automotive Lighting
- High Power LED for Biomedical Engineering
- LED Backlight TV



Light extraction

- Polarized & collimation design
- Photonic Crystal LED
- Phosphor materials



Applications

- New encapsulate for HB LED
- High power LED packaging
- AC LED



Internal Quantum Efficiency

- HVPE GaN substrate, AlN buffer layer
- Deep UV LED
- Non-polar GaN
- Quantum Dot Super LED