ReRAM for Fast Storage Application
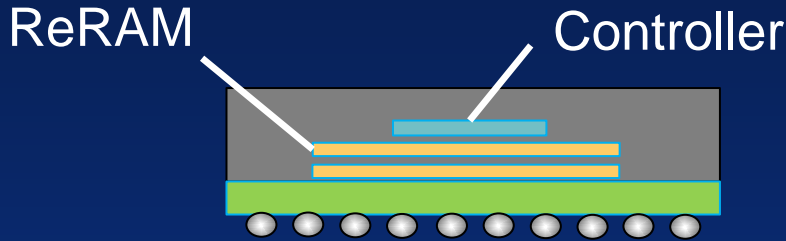
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Cu+ source layer

CuTe

Thin insulator

Lower Electrode

Cupper filament (Φ< 10nm)

Upper Electrode

Word Line

NMOS Transistor

Bit Line
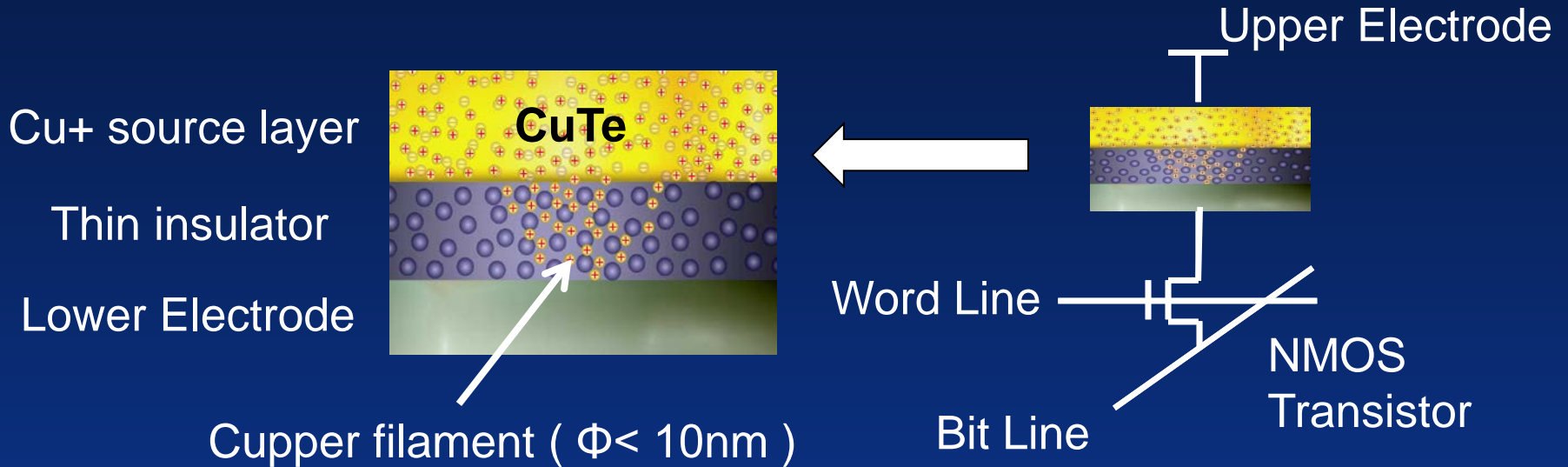
- ✓ **Cost:** **< DRAM**
- ✓ **Capacity: > 10Gbit**
- ✓ **Read:** **> 1GB/s,** **Program:** **> 200MB/s**
- ✓ **Program Endurance:** **> 10^5 cycles**
- ✓ **Data Retention:** **> 10 years**

ReRAM System Module
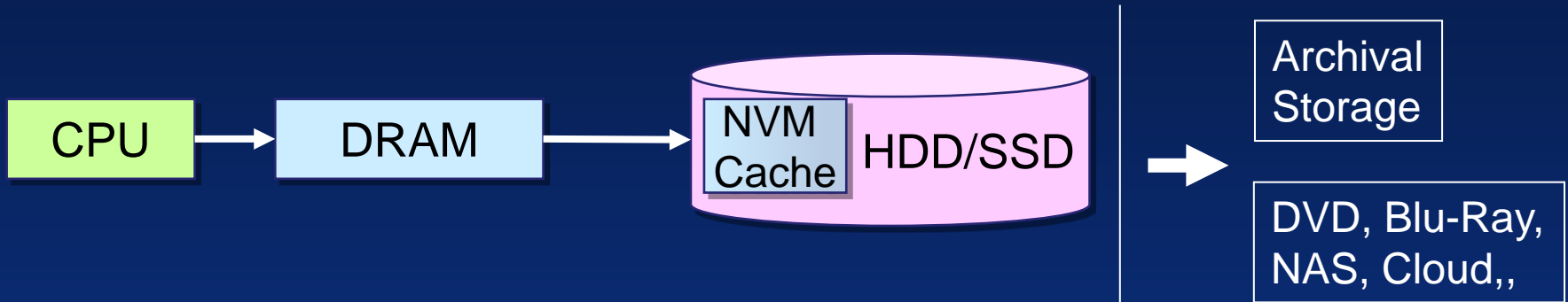
ReRAM   Controller

Package type

Small board type

- ✓ **Capacity: 4GB ~ 8GB (multi dies)**
- ✓ **Access: 512B**
- ✓ **Host IF: PCIe, or any high speed IF**
- ✓ **Read: 2 ~ 4GB/s, 2 ~ 4us latency**
- ✓ **Write: 400 ~ 800MB/s, 6 ~ 12us latency**
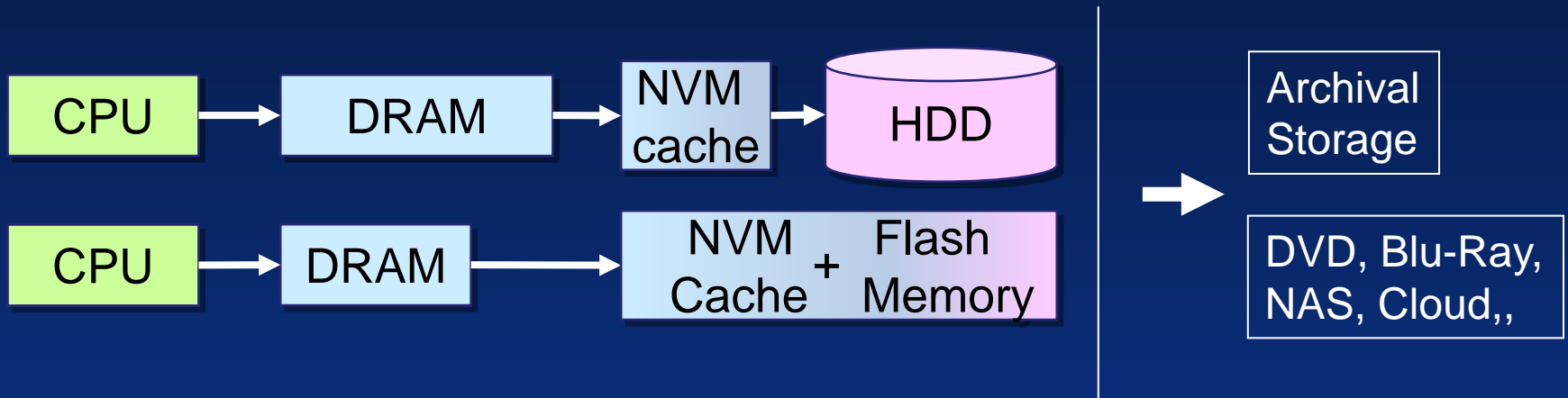
NVM cache & tier application (1)

- **DRAM replacement: low power, high throughput**
  - **Throughput is originally depend on HDD and NAND speed)**

Chuo Univ. Dr. Takeuchi on VLSI symposium 2012
"Hybrid ReRAM/MLC NAND SSDs by Data Fragmentation Suppression"
x11 Performance, x6.9 Endurance, 93% Energy Reduction

NVM cache & tier application (2)

- **SSD replacement: low power, high throughput**
  - **Download OS & main application beyond ultrabook**

- **DRAM & Storage replacement: ultra low power, low cost**
  - **SNS is main storage**
  - **high speed NVM cover small DRAM capacity**

Thank you!

For questions, please contact

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