HYBRID MEMORY CUBE (HMC)

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"Of all the emerging memory technologies, HMC is the one that will likely have the most impact in the long run"
- Electronic Design
Hybrid Memory Cube

Micron’s Newest Memory Innovation

We’ve combined fast logic process technology and advanced DRAM designs to create an entirely new memory category. HMC will provide a revolutionary performance shift that will enrich next-generation networking and enable exaflop-scale supercomputing:

- **Reduced Power**
  - Fraction of the energy per bit

- **Reduced Footprint**
  - 90% less space than today’s RDIMM

- **Increased Bandwidth**
  - 15x performance of DDR3-1333 DIMM
Enabling Technologies

**Abstracted Memory Management**

**Memory Vaults Versus DRAM Arrays**
- Significantly improved bandwidth, quality and reliability versus traditional DRAM technologies

**Logic Base Controller**
- Reduced memory complexity and significantly increased performance
- Allows memory to scale with CPU performance

**Through-Silicon Via (TSV) Assembly**

**Innovative Design & Process Flow**
- Incorporation of thousands of TSV sites per die reduces signal lengths and reduces power
- Enables memory scalability through parallelism

**Sophisticated Package Assembly**
- Higher component density and significantly improved signal integrity
HMC Architecture

**Logic Base**
- Multiple high-speed local buses for data movement
- Advanced memory controller functions
- DRAM control at memory rather than distant host controller
- Reduced memory controller complexity and increased efficiency

**Vaults are managed to maximize overall device availability**
- Optimized management of energy and refresh
- Self test, error detection, correction, and repair in the logic base layer

**3DI & TSV Technology**

Detail of memory control
HMC Maximum Memory Bandwidth

- All links between host CPU and HMC logic layer

- Maximum bandwidth per GB capacity
  - HPC/Server – CPU/GPU
  - LLC – Last Level Cache
  - Graphics
  - Network Infrastructure
  - Test/Measurement equipment
HMC Memory Flexibility and Scaling

• Maximize Density and Scale
  ▶ Some HMC links connect to host, some to other cubes
  ▶ Scalable to meet system requirements
  ▶ Can be in module form or soldered-down
  ▶ Create your own network/fabric

• Future interfaces may include
  ▶ Higher speed electrical (SERDES)
  ▶ Optical
  ▶ Whatever the most appropriate interface for the job!
Industry Support and Momentum

Developer Member Companies

Adopters Companies: 100+ Member Companies to date!

Hybrid Memory Cube CONSortium

www.hybridmemorycube.org

About the Technology

Hybrid Memory Cube (HMC) represents an entirely new category of high performance memory, delivering unprecedented system performance and bandwidth. Learn More

About the Consortium

The HMC Consortium is a working group made up of industry leaders who build, design-in, or enable Hybrid Memory Cube (HMC) memory technology. The group works to innovate and expand the capabilities of the next generation of memory-based solutions. Learn More

Download the Specification

The HMC Specification 1.0 is now available for public download and review. Download your copy below:
Industry Validation

“...like adding a turbocharger to your computer”
- datacenteracceleration.com

“...wicked fast”
- gigaom.com

“...a complete paradigm shift”
- extremetech.com

“...unprecedented levels of memory performance”
- Electronic News

“...an entirely new category of memory”
- Tom’s Hardware

EE Times 40th Anniversary: “one of the top ten technologies expected to redefine the industry”
Thank you