



(→) SANDISK BiCS9 QLC ARCHITECTURE: PREPARING THE NEXT STAGE OF AI INFRASTRUCTURE

As artificial intelligence model sizes increase and inference becomes the dominant AI workload, storage systems must deliver far more than capacity alone. Bandwidth, responsiveness and power-efficient operation are essential for optimizing data-hungry applications.

3D NAND flash occupies a unique position within this modern computing landscape. By combining performance and exceptional storage density with scalability and cost-efficient manufacturing, NAND flash has become a preferred storage medium for hyperscale data centers, enterprise SSDs, edge AI platforms, autonomous systems, and the expanding data infrastructure that supports AI inference.

Sandisk's 9th-generation BiCS QLC 3D flash memory technology expands this foundation by enabling substantially higher bandwidth and power efficiency. BiCS9 QLC builds on more than three decades of advanced NAND design and manufacturing expertise, and as a derivative implementation of BiCS technology, BiCS9 QLC demonstrates how architectural innovation unlocks new levels of performance and manufacturing efficiency pairs a mature BiCS8 memory array with a next-generation BiCS10-like CMOS wafer.

Scaling Intelligent Architecture Beyond Layer Count

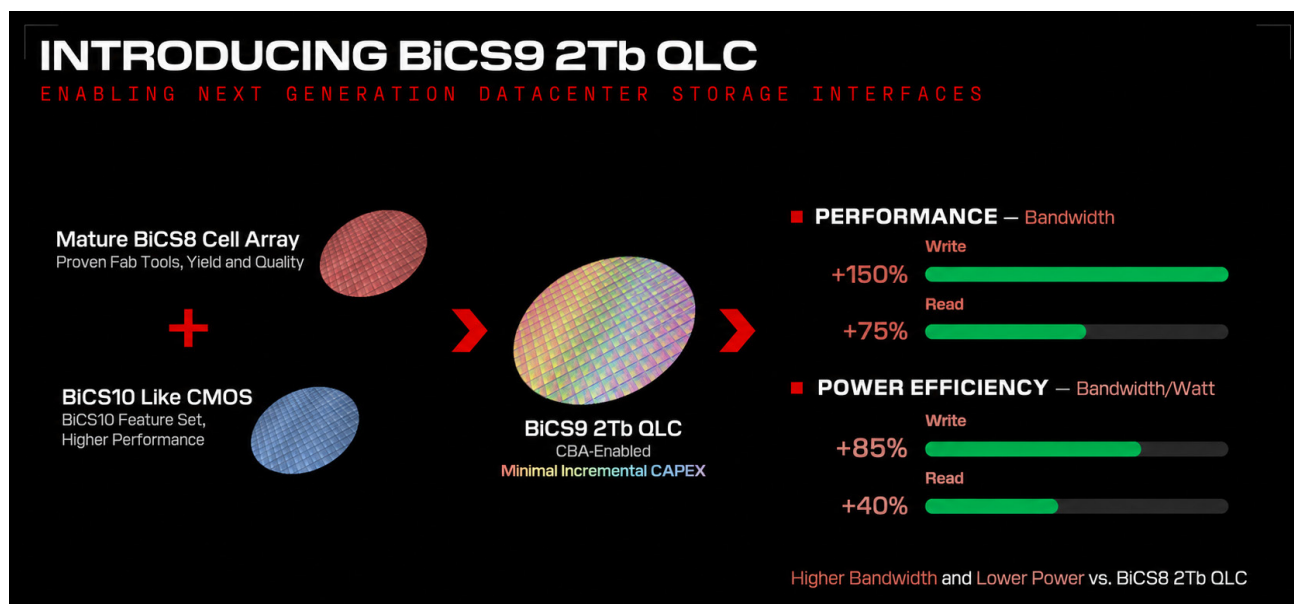
As 3D NAND technologies mature, simply adding more memory layers is no longer the only – or most effective – path to higher performance.

By innovating for manufacturability and time-to-market along four vectors – lateral, logical, vertical and architectural scaling – Sandisk designed BiCS from the beginning to enhance performance, capacity, bandwidth and power efficiency. This is achieved by separating the memory-cell array from the CMOS wafer, which allows the individual technologies to advance independently.

BiCS9 QLC: Performance Designed for AI Inference

BiCS9 QLC represents the next evolution of that strategy. BiCS9 QLC pairs a proven BiCS8 memory-cell array, along with significant design and device innovation, with a next-generation BiCS10-like CMOS wafer. This derivative approach helps preserve manufacturing maturity and capital efficiency while preserving a familiar process footing that allows innovation to occur where it delivers the greatest customer value.

BiCS9 QLC addresses AI inference storage requirements by substantially improving both bandwidth and power efficiency. Compared with BiCS8 2Tb QLC technology, BiCS9 2Tb QLC delivers up to 150% higher write bandwidth, up to 75% higher read bandwidth, up to 85% better write power efficiency¹, and up to 40% better read power efficiency¹.



Together, the performance benchmarks enabled by BiCS9 QLC allow storage systems to move data more quickly, consume less energy and more efficiently support demanding AI inference workloads.

CMOS Directly Bonded to Array: Designed for Continuous Innovation

CMOS Directly Bonded to Array (CBA) provides the underlying technology for BiCS9 QLC. Decoupling CMOS logic from memory-array scaling allows each technology to evolve independently by fabricating the CMOS circuitry and memory array on separate wafers under their respective optimal process conditions before bonding them together. This accelerates the development of derivative process nodes for AI storage and more effectively extends the BiCS roadmap into high-bandwidth and next-generation memory architectures.

BiCS9 QLC illustrates the flexibility of Sandisk's derivative design approach. By enhancing the CMOS wafer while continuing to leverage a proven memory-array platform, Sandisk introduces new NAND capabilities without requiring simultaneous redesigns.

The result is faster technology deployment, improved capital efficiency and a flexible roadmap capable of responding more rapidly to changing AI storage requirements.

**Key BiCS9 2Tb QLC features include (versus BiCS8 2Tb QLC):**

- Up to 150% higher write bandwidth
- Up to 75% higher read bandwidth
- Up to 85% write power efficiency¹
- Up to 40% read power efficiency¹
- Architectural Agility for AI Infrastructure

BiCS9 QLC advances the BiCS roadmap by accelerating the evolution of 3D NAND flash without relying solely on larger memory stacks. Its modular approach to CMOS and memory-array development enables higher performing NAND flash memory devices while establishing a flexible platform for future generations of AI-optimized storage technologies.

AI inference demands greater bandwidth, higher power efficiency and faster technology transitions. BiCS9 QLC provides the foundation that enables Sandisk to continue delivering 3D NAND flash solutions for leading-edge AI infrastructure while maintaining the capital-efficient innovation that has defined BiCS for more than a decade.

1. Based on Gigabytes per second per Watt (GBps/W).

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