

Technical Brief

KIOXIA BiCS FLASH Generation 10 Technology Builds on Proven Innovation

Pathway for Today's and Tomorrow's Storage Requirements

NAND flash memory is an integral part of our daily lives that touches many applications. It is high-density, non-volatile storage technology used to hold data in enterprise and consumer SSDs, smartphones and tablets, USB thumb drives, Secure Digital (SD) and microSD memory cards and automotive infotainment systems and Advanced Driver Assistance Systems (ADAS), to name a few. KIOXIA has long been an innovator, inventing NAND flash and 3D flash memory that helped establish a foundation for today's storage industry. This legacy continues with each new generation of KIOXIA BiCS FLASH™ 3D flash memory that addresses the growing storage demands for higher capacity, faster performance and improved operational efficiencies.

The current KIOXIA BiCS FLASH generation 8 technology is a proven, scalable and high-performing NAND flash memory. It is well suited for current storage requirements across enterprises, clients, mobile and embedded applications. For future storage requirements, KIOXIA BiCS FLASH generation 10 technology is aimed at higher densities, even faster performance and higher scalability when compared to its predecessor. Together, these generations represent a balanced storage strategy optimized for today's broad market needs as well as the next wave of data-intensive storage applications.

Both flash technologies offer quad-level cell (QLC) memory as it enables density increases over triple-level cell (TLC) memory that are critically important to modern data environments. This technical brief presents both KIOXIA BiCS FLASH generations and how they provide a pathway for addressing today's and tomorrow's storage requirements.

KIOXIA BiCS FLASH 3D Flash Memory

KIOXIA BiCS FLASH technology represents a long-term commitment to innovation with capabilities over generations that have steadily improved architecture, layer counts, I/O speeds, densities and manufacturing efficiencies. The technology is utilized in a wide range of flash storage-intensive applications that include:

- **Enterprise SSDs:** Performance and reliability are essential
- **Client SSDs:** Responsiveness and value are necessary
- **UFS and Mobile Storage Devices:** Compact design and low power are priorities
- **Hyperscale and Cloud Data Centers:** Efficient scaling, consistent performance and reduced operating costs matter
- **Gaming and Consumer Devices:** Responsiveness and value are necessary
- **Embedded and Automotive Platforms:** Reliability and integration are critical

As data volumes continue to grow, workloads are more complex, and users expect faster access to information. It is essential for NAND flash memory to evolve with this growth, not only to provide more capacity, but also to improve power efficiency, cost structure and deployment flexibility. The KIOXIA approach of evolving NAND flash memory generationally is well positioned to advance the technology in ways that not only meet immediate user demands but also prepare users for what comes next.

One such technological milestone introduced in KIOXIA BiCS FLASH generation 8 memory (also included in generation 10) is CMOS directly Bonded to Array (CBA) technology. CBA uses advanced wafer bonding to connect the CMOS circuitry directly to the memory cell array, rather than building both in a more conventional monolithic structure. As a result, each part of memory can be better optimized independently (see Figure 1), improving the potential for higher density, better performance and greater manufacturing efficiency. This breakthrough technology also creates a highly scalable architectural foundation for future generations as demands for capacity, speed, power efficiency and cost effectiveness increase.

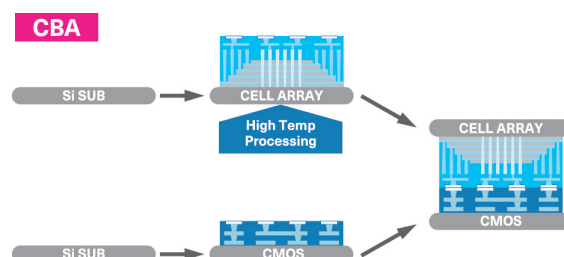


Figure 1: Representation of CBA technology
Source: KIOXIA Corporation

Flash for Today's Storage Demands

KIOXIA BiCS FLASH™ generation 8 memory delivers a strong balance of performance, reliability and scalability to meet the requirements of today's storage market. Its advanced 3D memory design optimizes die size, interface capabilities and production efficiency and supports flash cell technologies, such as QLC. The implementation of QLC is especially important for increasing density as it stores more bits per cell than TLC and multi-level cell (MLC) alternatives and makes it possible to deliver more capacity within a given physical footprint.

Architecturally, KIOXIA BiCS FLASH generation 8 memory is designed with a 218 layer cell array that supports up to both a 1 terabit² (Tb) die and 2 Tb die in a single, 32-die stack package (see Figure 2). The 1 Tb die supports 128 gigabytes³ (GB) of raw storage, or up to 4 terabytes³ (TB) capacity, while the innovative 2 Tb die supports 256 GB of raw storage, or up to 8 TB capacity, both within a single NAND flash memory package. SSDs built with this flash memory generation adhere to industry standards like PCIe® 5.0 and NVMe™ 2.0 and support common form factors such as E1.S, E3.S, E3.L and U.2 (2.5-inch). This compatibility allows IT professionals to rapidly integrate new flash memory into existing storage platforms.

A toggle interface (IF) circuit is designed into this 3D flash generation that functions as a high-speed Double Data Rate (DDR) I/O subsystem. It manages the bidirectional flow of commands, addresses and data between the memory array and host SSD controller at speeds up to 3.6 gigabits per second⁴ (Gb/s) with KIOXIA BiCS FLASH generation 8 memory. This advanced toggle IF circuit operates within the dedicated CMOS logic layer to ensure high-speed signal integrity while isolating high-voltage array operations from sensitive low-voltage I/O logic resulting in flash memory with higher throughput and lower power consumption.

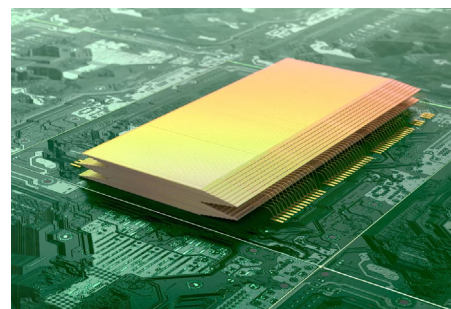
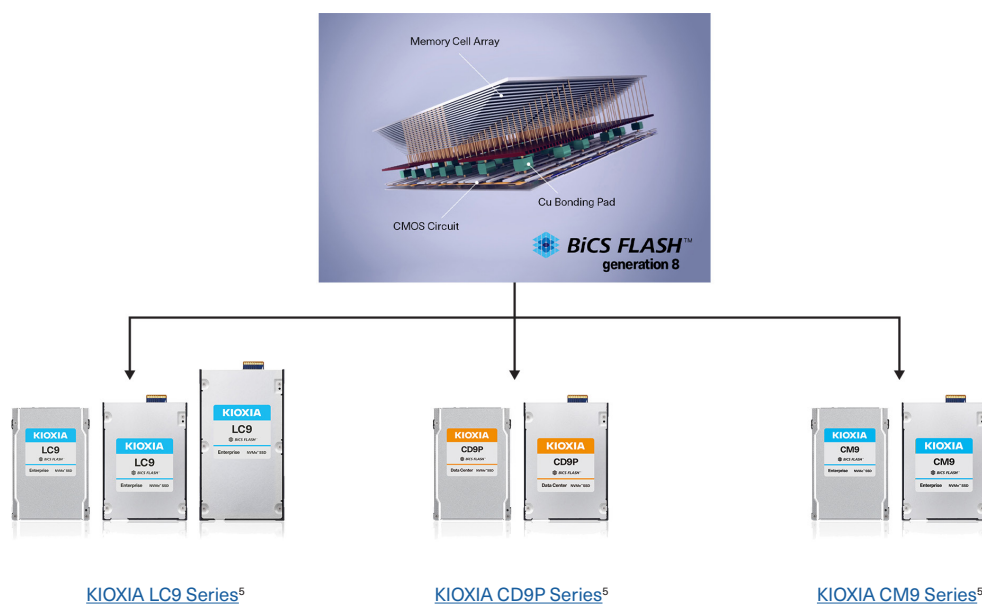


Figure 2: Representation of 32-die stack
Source: KIOXIA Corporation

KIOXIA BiCS FLASH generation 8 memory is driving a new generation of high-capacity KIOXIA SSDs, all geared to meet the demanding needs of AI, ML, analytics and other data-intensive applications.



KIOXIA BiCS FLASH™ generation 8 technology delivers performance⁴, capacity and power efficiency improvements in the same form factors as prior generation SSDs but with upgraded NAND flash memory to boost performance:

Specification	KIOXIA BiCS FLASH Generation 8 Technology
NAND I/O Speed	up to 3.6 Gb/s
Bit Density	>23 gigabits per millimeter (Gb/mm ²)
Write Performance ⁴	>200 megabytes per second (MB/s)
Read Latency ⁴ (at 1 Tb)	up to 42 microseconds (μs)
Maximum Package Capacity	8 TB (QLC 32-die stack)

For today's storage requirements, KIOXIA BiCS FLASH generation 8 technology is a robust and proven solution where maturity is a major advantage as many organizations need trusted flash memory that can be deployed confidently at scale. In AI environments, it provides practical value for storing and accessing large datasets efficiently, or high-performance storage for inference workloads.

The Next Step in Flash Memory Evolution

KIOXIA BiCS FLASH generation 10 technology represents the next evolutionary phase of flash memory. It is designed to support advances in layer count, density and overall capabilities. This high-density 3D flash memory scales upwardly to 37 Gb/mm² utilizing 332 stacked layers and a new layout optimization technique. Though it uses the same CBA architecture as KIOXIA BiCS FLASH generation 8 memory, KIOXIA BiCS FLASH generation 10 memory is designed with four planes arranged in a vertical direction (see Figure 3).

The 332 layers are expected to further improve the attributes that matter most - storing more data in less space, increasing data transfer performance and improving operational efficiency as flash memory scales. Advances to the toggle IF circuit (defined in the Toggle DDR 6.0 specification) realized 4.8 Gb/s data transfer rate⁶ and 33% improvement over BiCS FLASH generation 8 technology⁷. Actively stacking 332 layers yields a 52% improvement in lateral density. There are expected improvements to read energy consumption of 30%⁷ and write energy consumption of 18%⁷ that can greatly reduce power consumption at data centers and enterprise infrastructure scale, and are valuable to hyperscale, AI and edge deployments as storage demands increase.

Built within KIOXIA BiCS FLASH generation 10 memory is support for the Separate Command Address (SCA) protocol (defined in the Open NAND Flash Interface (ONFI) consortium working group). This ONFI v5.2 interface specification for NAND flash memory separates command and address traffic from the data bus that enables the host to send new commands while old data transfers complete. Traditional NAND flash memory interfaces use the same bus to transmit both commands and data which can cause bottlenecks and delays. SCA support in KIOXIA BiCS FLASH generation 10 memory introduces a dedicated bus for command and address inputs, allowing both buses to operate in parallel, which in turn, increases data transfer throughput. This SCA capability is being attributed with several specific improvements: scalability, operational efficiency, system integration, streamlined architecture, signal, power management and data transfers.

Built on KIOXIA BiCS FLASH generation 8 memory technology, generation 10 represents a commitment to the future of NAND flash memory, delivering QLC density advantages and the capabilities needed for next-generation storage solutions.

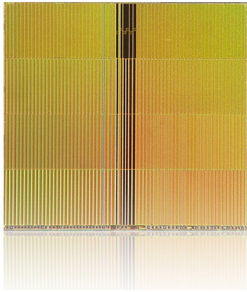


Figure 3: KIOXIA BiCS FLASH generation 10⁵
Source: KIOXIA Corporation

Technology Advances with Each New Generation

The practical aspects of using KIOXIA BiCS FLASH™ generation 8 memory today and preparing for generation 10 tomorrow can be understood across several key areas:

Category	BiCS FLASH Generation 8 Memory	BiCS FLASH Generation 10 Memory
Interface Performance	3.6 Gb/s (Toggle DDR 5.1)	4.8 Gb/s (Toggle DDR 6.0)
NAND Package Densities	TLC = 1 TB, 2 TB, 4 TB QLC = 8 TB	TLC = 1 TB, 2 TB, 4 TB QLC = 8 TB
Areal Die Densities	18 Gb/ mm² (1 Tb TLC) 23 Gb/mm² (2 Tb QLC)	29 Gb/mm² (1 Tb TLC) 37 Gb/mm² (2 Tb QLC)
Cell Technology	16/32 die stacks 218 memory cell layers	16/32 die stacks 332 memory cell layers
Die Size	1 Tb supports TLC & QLC dies 2 Tb supports high-capacity QLC dies	1 Tb supports TLC & QLC dies 2 Tb supports high-capacity QLC dies
Key Innovation	CBA technology	CBA technology, SCA support (ONFI v5.2)

Applications and Use Cases: Today and Tomorrow

KIOXIA BiCS FLASH generation 8 memory is well suited for applications such as enterprise storage, client devices, automotive systems and mobile phones. It is compelling in data center deployments where proven technology and scalability are key and especially important in AI environments that benefit most from reliable, high-capacity storage for large datasets with sound economics. Today’s AI workloads are well supported by KIOXIA BiCS FLASH generation 8 memory.

On the horizon, KIOXIA BiCS FLASH generation 10 technology will be ready to address changing requirements in:

- **AI/ML workloads** with larger models and datasets
- **Hyperscale data centers** seeking higher density and efficiency
- **Edge computing/high performance computing** environments
- **Future consumer devices** including augmented reality, virtual reality and extended reality platforms
- **Advanced IoT** systems that drive operational efficiencies and improve performance

Conclusion: KIOXIA’s Continual Innovation Leadership

The KIOXIA BiCS FLASH technology roadmap gives customers, partners and the broader ecosystem a clear message: the company is advancing flash memory in a way that is both practical and forward-looking. KIOXIA BiCS FLASH generation 8 memory remains the proven, trusted mainstream platform for broad deployment today. KIOXIA BiCS FLASH generation 10 technology is positioned to deliver density, power and performance improvements to next-generation applications and use cases.

QLC remains one of the most important innovations for KIOXIA BiCS FLASH technology, enabling density gains over TLC that matter across enterprise, hyperscale, and consumer markets alike. Together, these advances reinforce KIOXIA leadership in flash memory innovation and its commitment to helping customers choose the right solution for each application - today and into the future.

More information is available [here](#).

FOOTNOTES:

¹ Universal Flash Storage (UFS) is a product category for a class of embedded memory products and devices built to the JEDEC® UFS standard specification. The v5.0 specification is the current release issued by JEDEC and announced in February 2026.

² Product density is identified based on the density of memory chip(s) within the Product, not the amount of memory capacity available for data storage by the end user. Consumer-usable capacity will be less due to overhead data areas, formatting, bad blocks, and other constraints, and may also vary based on the host device and application. For details, please refer to applicable product specifications. The definition of 1 KB = 2^{10} bytes = 1,024 bytes. The definition of 1 Gb = 2^{30} bits = 1,073,741,824 bits. The definition of 1 GB = 2^{30} bytes = 1,073,741,824 bytes. 1 Tb = 2^{40} bits = 1,099,511,627,776 bits. 1 TB = 2^{40} bytes = 1,099,511,627,776 bytes.

³ Definition of capacity: KIOXIA Corporation defines a megabyte (MB) as 1,000,000 bytes, a gigabyte (GB) as 1,000,000,000 bytes, a terabyte (TB) as 1,000,000,000,000 bytes and a petabyte (PB) as 1,000,000,000,000,000 bytes. A computer operating system, however, reports storage capacity using powers of 2 for the definition of 1 Gbit = 2^{30} bits = 1,073,741,824 bits, 1GB = 2^{30} bytes = 1,073,741,824 bytes, 1TB = 2^{40} bytes = 1,099,511,627,776 bytes and 1PB = 2^{50} bytes = 1,125,899,906,842,624 bytes and therefore shows less storage capacity. Available storage capacity (including examples of various media files) will vary based on file size, formatting, settings, software and operating system, and/or pre-installed software applications, or media content. Actual formatted capacity may vary.

⁴ Read and write speed may vary depending on various factors such as host devices, software (drivers, OS, etc.) and read/write conditions.

⁵ All product images shown are representations of the design models and not accurate product depictions.

⁶ Based on preliminary specifications provided by KIOXIA Corporation, and subject to change, and this published technology topic: <https://www.kioxia.com/en-jp/rd/technology/topics/topics-83.html>.

⁷ Based on preliminary specifications provided by KIOXIA Corporation, and subject to change, and this published technology topic: <https://www.kioxia.com/en-jp/about/news/2026/20260703-1.html>.

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