



Press Release

KIOXIA Begins Mass Production of Industry's First QLC UFS Ver. 4.0 Embedded Flash Memory Devices

New 512GB Device Brings the Higher Bit Density of QLC to UFS



Düsseldorf, Germany, 30 October 2024 – [KIOXIA Europe GmbH](#), today announced that it has begun mass production of the industry's first^[1] Universal Flash Storage (UFS)^[2] Ver. 4.0 embedded flash memory devices with 4-bit-per-cell, quadruple-level cell (QLC) technology.

QLC UFS offers a higher bit density than traditional TLC UFS, making it ideal for mobile applications that require higher storage capacities. Advancements in controller technology and error correction have enabled QLC technology to achieve this while maintaining competitive performance. KIOXIA's new 512 gigabyte (GB) QLC UFS achieves sequential read speeds of up to 4,200 megabytes per second (MB/s) and sequential write speeds of up to 3,200 MB/s, taking full advantage of the UFS 4.0 interface speed.



KIOXIA QLC UFS is well-suited for smartphones and tablets, as well as other next-generation applications where higher storage capacity and performance are key considerations - including PCs, networking, AR/VR, IoT, and AI.

Key Features include:

- Supports High Speed Link Startup Sequence (HS-LSS) features: With conventional UFS, Link Startup (M-PHY® and UniPro® initialization sequence) between device and host is performed at low-speed PWM-G1 (3~9 megabits per second), but with HS-LSS, it can be performed at a faster HS-G1 Rate A (1,248 megabits per second). This is expected to reduce the time for Link Startup by approximately 70% compared to the conventional method.
- Enhances security: By utilizing Advanced RPMB (Replay Protected Memory Block) for improved read and write access to security data, such as user credentials on RPMB area, and RPMB Purge to ensure discarded data may be sanitized securely and rapidly.
- Supports Extended Initiator ID (Ext-IID): Intended to be used with Multi Circular Queue (MCQ) at the UFS 4.0 host controller for improved random performance.

KIOXIA was the first to introduce UFS technology^[3], and continues to develop new innovative flash products. The new QLC UFS Ver. 4.0 device integrates the company's innovative BiCS FLASH 3D flash memory and a controller in a JEDEC standard package. UFS 4.0 incorporates MIPI® M-PHY® 5.0 and UniPro® 2.0 and supports maximum theoretical interface speeds of up to 23.2 gigabits per second (Gbps) per lane or 46.4 Gbps per device. UFS 4.0 is backward compatible with UFS 3.1.

“KIOXIA first sampled 512 gigabyte QLC UFS 3.1 in 2022, and we are very excited to bring the first QLC UFS Ver. 4.0 version to mass production, expanding our UFS Memory product range while showing our commitment to storage technology development and enabling customers to meet growing storage demands,” comments Axel Störmann, Chief Technology Officer & VP at KIOXIA Europe GmbH. “QLC technology delivers higher densities and cost efficiencies, and is, as a result, especially suited for data-intensive applications that are demanding superior interface performance.”



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Notes

1: Industry first claim based on KIOXIA survey of publicly available information as of October 29, 2024

2: Universal Flash Storage (UFS) is a product category for a class of embedded memory products built to the JEDEC UFS standard specification. Due to its serial interface, UFS supports full duplexing, which enables both concurrent reading and writing between the host processor and UFS device.

3: KIOXIA Corporation's first sample shipment, as of February 8, 2013.

<https://www.kioxia.com/en-jp/business/news/2013/20130208-1.html>

In every mention of a KIOXIA product: 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 1KB = 2^{10} bytes = 1,024 bytes. The definition of 1Gb = 2^{30} bits = 1,073,741,824 bits. The definition of 1GB = 2^{30} bytes = 1,073,741,824 bytes. 1Tb = 2^{40} bits = 1,099,511,627,776 bits.

Read and write speeds are the best values obtained in a specific test environment at KIOXIA and KIOXIA warrants neither read nor write speeds in individual devices. Read and write speed may vary depending on device used and file size read or written.

PWM-G1 communication speed depends on the host and the device.

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About KIOXIA Europe GmbH

KIOXIA Europe GmbH (formerly Toshiba Memory Europe GmbH) is the European-based subsidiary of KIOXIA Corporation, a leading worldwide supplier of flash memory and solid-state drives (SSDs). From the invention of NAND flash memory to today's breakthrough BiCS FLASH™, KIOXIA continues to pioneer innovative memory solutions and services that enrich people's lives and expand society's horizons. The company's innovative BiCS FLASH™ 3D flash memory technology is shaping the future of storage in high-density applications, including advanced smartphones, PCs, SSDs, automotive and data centers.

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