IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

BITMICRO LLC, Plaintiff, v. KIOXIA AMERICA, INC. and KIOXIA CORPORATION, Defendants.	Case No. 6:23-cv-00461 **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff BiTMICRO LLC ("Plaintiff" or "BiTMICRO"), through its attorneys, for its Complaint against KIOXIA America, Inc. and KIOXIA Corporation (collectively, "Defendants" or "KIOXIA"), demands a trial by jury and alleges as follows:

FACTUAL INTRODUCTION

1. The novel inventions disclosed in the Asserted Patents in this matter were invented by BiTMICRO Networks, Inc. ("BNI"). BNI was founded in 1995 and was a leader in enterprise storage for mission-critical computing, particularly for military applications. BNI's storage devices are best known for exceeding the extreme performance and data integrity required for enterprise, industrial, and military environments.

2. BNI made critical advances in the solid state drive ("SSD") and integrated circuit technology that is embodied in the Asserted Patents. Innovation was one of the keys to the success at BNI. The company was involved with research and development projects in the SSD industry

for about 20 years, over which time it accumulated over 50 U.S. patents, all of which are now owned by BiTMICRO.

THE PARTIES

3. BiTMICRO is the current owner and assignee of the Asserted Patents and holds all rights necessary to bring this action.

4. BiTMICRO is a Delaware limited liability company with its principal place of business located at 11921 Freedom Drive, Suite 550, Reston, Virginia 20190.

5. Defendant KIOXIA America, Inc. is a corporation organized and existing under the laws of California that maintains an established place of business at 801 E. Old Settlers Blvd., Suite 110, Round Rock, Texas 78664. Prior to around October 2019, KIOXIA America, Inc. operated under the name Toshiba Memory America, Inc.

6. KIOXIA America, Inc. is registered to do business in the State of Texas and has been since at least October 2017. KIOXIA America, Inc. may be served by serving its registered agent, C T Corporation System, 1999 Bryan St., Ste. 900, Dallas, TX 75201-3136.

7. Defendant KIOXIA Corporation is a corporation organized and existing under the laws of Japan that maintains an established place of business at 3-1-21, Shibaura, Minato-ku, Tokyo 108-0023, Japan. Prior to around October 2019, KIOXIA Corporation operated under the name Toshiba Memory Corporation.

8. KIOXIA Corporation may be served pursuant to Rule 4(h) of the Federal Rules of Civil Procedure, including but not limited to the means authorized by the Hague Convention on the Service Abroad of Judicial and Extrajudicial Documents in Civil or Commercial Matters.

9. KIOXIA America, Inc. is a wholly-owned subsidiary of KIOXIA Corporation.

JURISDICTION AND VENUE

10. This action arises under the patent laws of the United States, Title 35 of the United States Code. Subject matter jurisdiction is proper in this Court pursuant to 28 U.S.C. §§ 1331 and 1338(a).

11. This Court has personal jurisdiction over KIOXIA in accordance with due process and/or the Texas Long Arm Statute because, in part, KIOXIA "recruits Texas residents, directly or through an intermediary located in this state, for employment inside or outside this state." *See* Tex. Civ. Prac. & Rem. Code § 17.042.

12. This Court also has personal jurisdiction over KIOXIA because it has committed and continues to commit acts of direct and/or indirect infringement in this judicial district in violation of at least 35 U.S.C. §§ 271(a), (b), and (c). In particular, on information and belief, KIOXIA has made, used, offered to sell, and/or sold the accused products in this judicial district, and has induced others to use the accused products in this judicial district.

13. This Court also has personal jurisdiction over KIOXIA because, *inter alia*, KIOXIA (1) has substantial, continuous, and systematic contacts with this State and this judicial district; (2) owns, manages, and operate facilities in this State and this judicial district; (3) enjoys substantial income from its operations and sales in this State and this judicial district; (4) employs Texas residents in this State and this judicial district; and (5) solicits business and markets products, systems and/or services in this State and judicial district including, without limitation, those related to the infringing accused products.

14. Venue is proper in this District pursuant to at least 28 U.S.C. §1319(b)-(c) and §1400(b), at least because KIOXIA, either directly or through its agents, has committed acts within

this judicial district giving rise to this action, and continues to conduct business in this district, and/or has committed acts of patent infringement within this District giving rise to this action.

FACTUAL ALLEGATIONS

BiTMICRO Patents

15. The BiTMICRO inventions contained in the Asserted Patents in this case relate to groundbreaking improvements to secure SSDs and memory system networks as will be further described below.

U.S. Patent No. 7,716,389

16. On May 11, 2010, the U.S. Patent and Trademark Office duly and lawfully issued United States Patent No. 7,716,389 ("the '389 Patent"), entitled "Direct Memory Access Controller with Encryption and Decryption for Non-Blocking High Bandwidth I/O Transactions." A true and correct copy of the '389 Patent is attached hereto as **Exhibit A**.

17. BiTMICRO is the owner and assignee of all right, title, and interest in and to the '389 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it.

18. The '389 Patent describes, among other things, enhancing direct-memory access operations between multiple IO devices and a storage controller by adding a data processing core ("DPC") that performs data encryption and decryption operations. *See* Ex. A at Abstract, 1:9-12.

19. Prior to the invention of the '389 Patent, most encryption algorithms such as Advanced Encryption Standard (AES), Data Encryption Standard (DES) and Blowfish, which require a large amount of computing resources, could not be performed simultaneously on multiple data transfer requests. *See* Ex. A at 2:20-22. Accordingly, an architecture that could perform

multiple encrypt/decrypt operations simultaneously was needed to service multiple transfer requests, without a negative impact on the speed of transfer and processing. *See id.* at 2:22-26.

20. As described in the '389 Patent, a DMA controller with an encryption and decryption processor is able to service simultaneous data transfer requests and can eliminate the need for extra memory to memory transfers. *See id.* at 2:27-35.

21. The novel features of the invention are recited in the claims. For example, claim 19 of the '389 Patent recites:

> 19. A direct memory access controller for transferring data to or from a memory, and for encrypting or decrypting said data upon receiving a data processing request, the direct memory access controller comprising:
>
> a means for performing a DMA data transfer, said means for performing a DMA data transfer including at least one DMA engine configured for transferring data;
>
> a means for performing data processing coupled to said means for performing a DMA data transfer, said data processing includes encrypting or decrypting said data in response to a DPC hit signal by at least using a DPC channel to intercept said data, causing said data to be transferred to said means for performing data processing.

Ex. A at 10:50-63. Claim 19 of the '389 Patent describes claim elements individually or as an ordered combination, that were non-routine and unconventional at the time of the invention in 2006 and an improvement over prior art, as it provided a novel memory controller architecture for performing encrypt/decrypt operations efficiently without negatively affecting the speed of data transfer and processing. *See* Ex. A at 2:20-64.

U.S. Patent No. 9,875,205

22. On January 23, 2018, the U.S. Patent and Trademark Office duly and lawfully issued United States Patent No. 9,875,205 ("the '205 Patent"), entitled "Network of Memory Systems." A true and correct copy of the '205 Patent is attached hereto as **Exhibit B**.

23. BiTMICRO is the owner and assignee of all right, title, and interest in and to the '205 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it.

24. The '205 Patent describes, among other things, novel systems for connecting memory devices in a network, such as an apparatus comprising a plurality of flash memory modules interconnected with other flash memory modules and to at least one system controller via a point-to-point communication bus topology. *See* Ex. B at Abstract. Around the time of the invention of the '205 Patent, flash memory devices were becoming increasingly used in networked environments requiring large memory capacities, such as servers, workstations, and other computing devices. *See id.* at 1:27-38. To achieve such large memory capacities, data storage solutions increasingly included larger numbers of flash memory modules stacked together, requiring new ways of interconnecting those modules to maintain fast data retrieval speeds as well as the reliability of those interconnections. *See id.* at 1:38-58. The '205 Patent addresses these problems by providing improved architectures for connecting system controllers to flash memory modules. *See id.* at 2:6-44.

25. The novel features of the '205 inventions are recited in the claims. For example, claim 1 of the '205 Patent recites:

> 1. An apparatus comprising:
>
> a communication bus interface;
>
> a flash memory module coupled to the communication bus interface via a communication bus;
>
> a system controller coupled to the communication bus interface via an external communication bus; and
>
> wherein the system controller performs a memory transaction via the communication bus interface to the flash memory module.

Ex. B at 19:29-37. Claim 1 of the '205 Patent describes claim elements individually or as an ordered combination, that were non-routine and unconventional at the time of the inventions in 2013 and an improvement over prior art, as it provided an improved memory network architecture wherein a system controller separate from a flash memory module can control memory transactions involving the memory module through an external communication bus. *See id.* at 2:6-43; 3:53-4:10, 12:14-47.

KIOXIA's Use of the Patented Technology

26. KIOXIA is a worldwide supplier of flash memory and solid state drives (SSDs). KIOXIA was formerly a business unit focused on memory products within the Japanese multinational conglomerate Toshiba Corporation, and which was spun off into a separate company in 2017. Specific examples of KIOXIA's infringing products made, sold, and/or offered for sale in the United States, and/or imported into the United States are discussed in further detail below.

27. KIOXIA makes, uses, sells, and/or offers to sell in the United States, and/or imports into the United States (or has made, used, sold, offered for sale, and/or imported into the United States) SSDs with encryption capabilities, which infringe one or more claims of the '389 Patent, either literally or under the doctrine of equivalents. Such SSDs include, for example, at least KIOXIA's CM series, PM series, FL Series, CD series, XD series, BG series, XG Series SSDs, and Legacy EOL SSDs.

Security and Encryption Options Available for KIOXIA SSDs

Category	Enterprise	Data Center				Client
KIOXIA SSD Series	› FL6 CM7-V (2.5-inch) CM7-R (2.5-inch) CM7-V (E3.S) CM7-R (E3.S) › CM6-V › CM6-R › PM7-V › PM7-R › PM6-M › PM6-V › PM6-R	› CD6-V › CD6-R	CD8-V CD8-R	› XD6 (E1.S)	› CD7-R (E3.S) › CD7-R (2.5-inch)	› BG5 › BG4 › XG6 › XG6-P › XG8
Sanitize Instant Erase (SIE)	✓	✓	✓	-	✓	-
Self Encrypting Drive (SED)	✓	✓	✓	✓	-	✓
FIPS	✓	✓	-	-	-	-

KIOXIA web page, "KIOXIA SSD Security and Encryption."[1] *See also* KIOXIA web page, "Legacy EOL SSDs with FIPS 140-2 Validations."[2]

28. KIOXIA makes, uses, sells, and/or offers to sell in the United States, and/or imports into the United States (or has made, used, sold, offered for sale, and/or imported into the United States) SSDs for use in Ethernet Bunch of Flash ("EBOF") systems, which infringe one or more

[1] Available at https://americas.kioxia.com/en-us/business/ssd/solution/security.html

[2] Available at https://americas.kioxia.com/en-us/business/ssd/solution/security/eol.html

claims of the ’205 Patent, either literally or under the doctrine of equivalents. Such SSDs include, for example, at least KIOXIA’s EM6 Series SSDs.

Notice and Marking

29. As set forth below, KIOXIA has been on constructive and/or actual notice of the Asserted Patents.

30. BiTMICRO has complied with 35 U.S.C. § 287 with respect to the Asserted Patents. BiTMICRO has not made, offered for sale, sold, or imported into the United States any products that are covered by any of the Asserted Patents. Thus, there are no BiTMICRO products that would require marking under 35 U.S.C. § 287 with respect to the Asserted Patents.

31. On information and belief, the previous owner of the Asserted Patents, BNI, did not make, offer for sale, sell, or import into the United States any products that are covered by any of the Asserted Patents. Thus, there are no BNI products that would have required marking under 35 U.S.C. § 287 with respect to the Asserted Patents.

32. The Asserted Patents have been widely cited by the industry and by the U.S. Patent and Trademark Office (“PTO”) during the prosecution of other patents. For example, the ’389 Patent has been cited in patents and/or applications by Intel, Samsung, IBM, and other well-known industry participants. In addition, as set forth in greater detail below, the ’389 Patent was even cited during the prosecution of a patent application of Defendant KIOXIA Corporation.

FIRST COUNT

(INFRINGEMENT OF U.S. PATENT NO. 7,716,389)

33. BiTMICRO incorporates by reference the allegations set forth in paragraphs 1-32 as though fully set forth herein.

34. On information and belief, KIOXIA has directly infringed and continues to directly infringe one or more claims of the '389 Patent, including at least claim 19 of the '389 Patent, in the state of Texas, in this judicial district, and elsewhere in the United States by, among other things, making, using, selling, offering for sale, and/or importing into the United States products that embody one or more of the inventions claimed in the '389 Patent, including but not limited to the above-identified SSDs with encryption capabilities, and all reasonably similar products ("the '389 Accused Products"), in violation of 35 U.S.C. § 271(a).

35. Each of the '389 Accused Products include "a direct memory access controller for transferring data to or from a memory, and for encrypting or decrypting said data upon receiving a data processing request." For example, the XG6 Series SSDs include a TC58NCP090GSD controller chip that can directly access memory and can transfer data to or from memory locations within the SSD, as well as encrypt or decrypt that data:

Product	Toshiba XG6 256GB	Toshiba XG6 512GB	Toshiba XG6 1TB
Pricing	N/A	N/A	N/A
Capacity (User / Raw)	256GB / 256GB	512GB / 512GB	1024GB / 1024GB
Form Factor	M.2 2280 S2 (Single-sided)	M.2 2280 S2 (Single-sided)	M.2 2280 S2 (Single-sided)
Interface / Protocol	PCIe 3.1 x4 / NVMe 1.3a	PCIe 3.1 x4 / NVMe 1.3a	PCIe 3.1 x4 / NVMe 1.3a
Controller	TC58NCP090GSD	TC58NCP090GSD	TC58NCP090GSD
DRAM	NANYA LPDDR3	NANYA LPDDR3	NANYA LPDDR3
Memory	Toshiba BiCS FLASH 96-layer 3D TLC	Toshiba BiCS FLASH 96-layer 3D TLC	Toshiba BiCS FLASH 96-layer 3D TLC
Sequential Read	Up to 3,180 MB/s	Up to 3,180 MB/s	Up to 3,180 MB/s
Sequential Write	Up to 2,960 MB/s	Up to 2,960 MB/s	Up to 2,960 MB/s
Random Read	Up to 355,000 IOPS	Up to 355,000 IOPS	Up to 355,000 IOPS
Random Write	Up to 365,000 IOPS	Up to 365,000 IOPS	Up to 365,000 IOPS
Encryption	TCG Pyrite and OPAL 2.01 as an option (TCG Pyrite: x = 0, TCG OPAL: x = A)		

Toshiba XG6 M.2 NVMe SSD Review: Higher Density and Improved Efficiency.[3] *See also* KIOXIA White Paper, "Delivering Improved Performance and Power Efficiency with NextGeneration BG4 Series Client NVMe™ SSDs":[4]

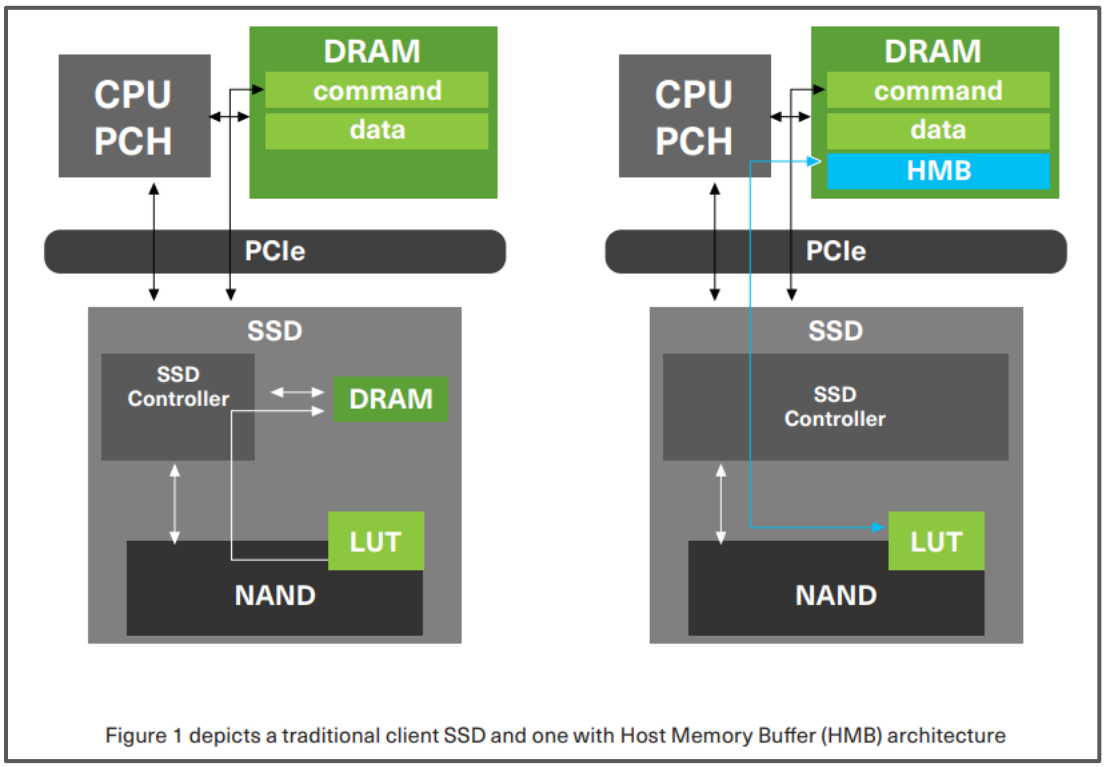


Figure 1 depicts a traditional client SSD and one with Host Memory Buffer (HMB) architecture

36. KIOXIA provides three SSD security options in the '389 Accused Products: Sanitize Instant Erase (SIE) drives, Self-Encrypting Drives (SEDs), and Federal Information Processing Standards (FIPS)-certified drives. *See* KIOXIA Technical Brief, "Data Security in Enterprise and Data Center SSDs":[5]

[3] Available at https://www.tomshardware.com/reviews/toshiba-xg6-nvme-ssd,5782.html

[4] Available at https://www.kioxia.com/content/dam/kioxia/shared/business/ssd/client-ssd/asset/whitepaper-cSSD-BG4.pdf

[5] Available at https://americas.kioxia.com/content/dam/kioxia/en-us/business/ssd/asset/productbrief/KIOXIA_Enterprise_DataCenter_SSD_Security_Tech_Brief.pdf

SIE Drives	Self-Encrypting Drives	FIPS 140-2-Certified Drives
Enables Cryptographic Erase to quickly facilitate making data unreadable when an SSD is taken out of commission or repurposed.	*Encrypts/decrypts data written to and retrieved from an SSD via a password-protected alphanumeric key, (continuously encrypting and decrypting the data).*	*Validates that an SSD's cryptographic module is in compliance with the FIPS 140-2 standard developed by NIST through its rigorous CMVP certification process.*

37. Encryption is the key capability featured in the three SSD security options (SIE drives, SEDs and FIPS-certified drives) which rely on a Media Encryption Key (MEK) as part of the encryption/decryption processes. *See id.* Encryption occurs on all user data sent to the AES7-256 cryptographic module within the drive, enabling data to be encrypted and stored on the drive:

Self-Encrypting Drives

Similar to an SIE drive, an SED uses the MEK to encrypt data within the drive itself. User data is sent to the drive, which uses an AES-256 cryptographic module to encrypt data and store it securely. However, an SED provides an additional layer of protection requiring an authentication step before the drive can be accessed. Encryption/decryption requires a password-protected alphanumeric key. Once accessed, data written to and retrieved from the SSD is continuously encrypted/decrypted, protecting user data.

Host-side authentication can be used by assigning an Authentication Key (AK) to each authorized user. This key is required to lock/unlock access to the user's drive data prior to being processed through the AES cryptographic module. This process requires security commands as defined by the Trusted Command Group® (TCG) which dictate the management, activation and provisioning of user data. The specifications include data structures and mechanisms for managing and configuring the authentication credentials and access controls.

For SAS SSDs (KIOXIA PM6 Series), the command set is TCG-Enterprise
For NVMe® SSDs (KIOXIA CM6 / CD6 Series), the command set is TCG Opal

SEDs are designed for most applications and regulations that require data-at-rest to be encrypted. Without the password-protected alphanumeric key employed, and SED behaves like an SIE drive.

Id.

38. The '389 Accused Products uses on-board crypto processors, which work with the direct memory access controller to cryptographically encrypt and decrypt data as it is written to/read from the SSD. *See, e.g.*, KIOXIA web page, "KIOXIA SSD Security and Encryption."[6]

39. Each of the '389 Accused Products includes a cryptographic module. KIOXIA has validated multiple cryptographic modules for its SSD products through the Cryptographic Module Validation Program of the National Institute of Standards and Technology ("NIST"):

[6] Available at https://americas.kioxia.com/en-us/business/ssd/solution/security.html

Certificate Number	Module Name	Status
3983	KIOXIA TCG OPAL SSC Crypto Sub-Chip TC58NC1132GTC	Active
3965	KIOXIA TCG Enterprise SSC Crypto Sub-Chip TC58NC1132GTC	Active
3688	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX04S model) Type C1	Active
3605	KIOXIA TCG OPAL SSC Self-Encrypting Solid State Drive CD5 Series	Active
3509	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX04S model) Type B1	Active
3508	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX04S model) Type A1	Active
3290	KIOXIA TCG Enterprise SSC Crypto Sub-Chip	Active
3006	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX05S model) Type C2	Historical
3001	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX05S model) Type C1	Historical
2822	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX05S model) Type B	Historical
2819	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX05S model) Type A	Historical
2769	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX model) Type C	Historical
2709	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX model) Type A	Historical
2521	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX04S model) Type A	Historical
2520	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX04S model) Type B	Historical
2410	KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX model NA02, NA04, NA05)	Historical

Source: search results for KIOXIA modules in NIST Cryptographic Module Validation Program.[7]

40. KIOXIA also has cryptographic modules that are in the process of being validated according to the Federal Information Processing Standards ("FIPS") standard, as listed in the following table:

Module Name	Status
KIOXIA TCG Enterprise SSC Crypto Sub-Chip TC58NC1040GTB	FIPS 140-3
KIOXIA TCG OPAL SSC Crypto Sub-Chip TC58NC1137GTC/TC58NC1138GTC	FIPS 140-3
KIOXIA TCG OPAL SSC Self-Encrypting Solid State Drive XD6 Series	FIPS 140-3

NIST Cryptographic Module Validation Program, Modules in Process List.[8] Additionally, KIOXIA's TCG Enterprise SSC Crypto Sub-Chip TC58NC1132GTC, TCG OPAL SSC Crypto Sub-Chip TC58NC1030GTB, and TCG OPAL SSC Crypto Sub-Chip TC58NC1132GTC are on NIST's Implementation Under Test List.[9]

41. The '389 Accused Products further include "a means for performing a DMA data transfer, said means for performing a DMA data transfer including at least one DMA engine configured for transferring data." For example, controller chip in each of the '389 Accused Products

[7] Available at https://csrc.nist.gov/projects/cryptographic-module-validation-program/validated-modules/search?SearchMode=Advanced&Vendor=KIOXIA&CertificateStatus=Active&ValidationYear=0; https://csrc.nist.gov/projects/cryptographic-module-validation-program/validated-modules/search?SearchMode=Advanced&Vendor=KIOXIA&CertificateStatus=Historical&ValidationYear=0

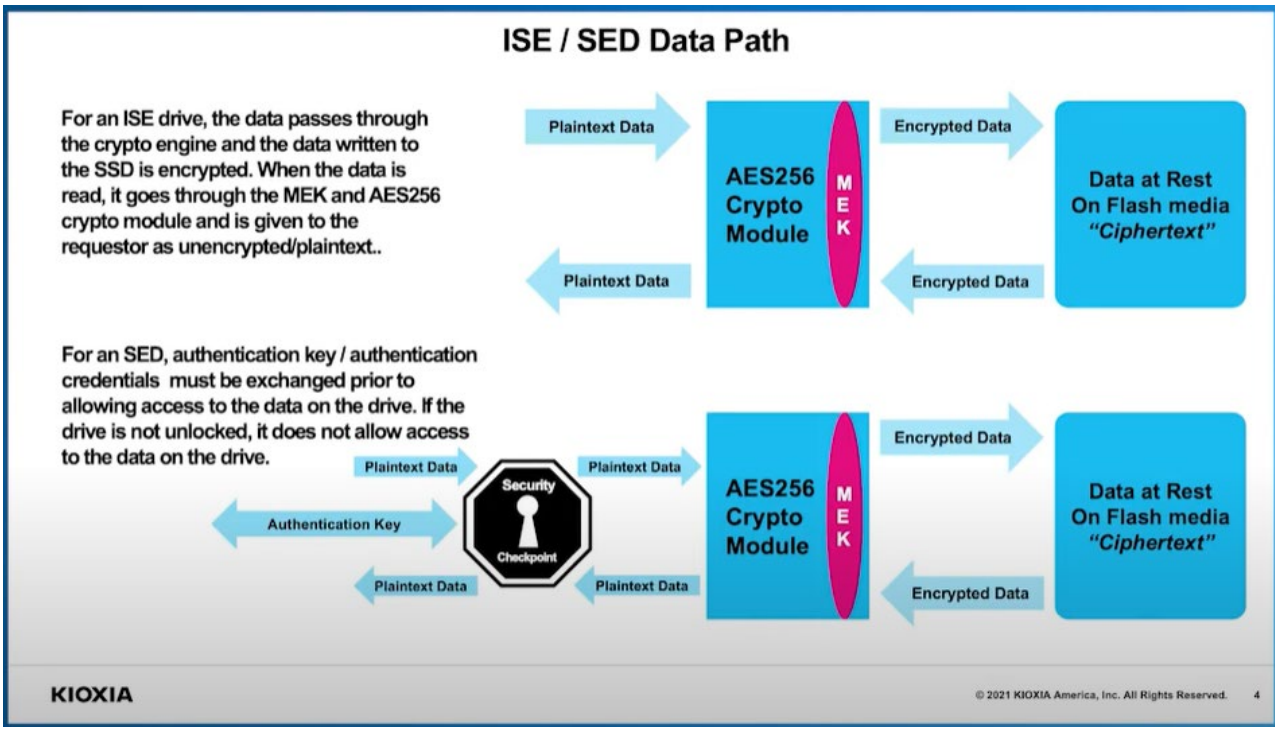
[8] Available at https://csrc.nist.gov/Projects/cryptographic-module-validation-program/modules-in-process/Modules-In-Process-List#d11408

[9] Available at https://csrc.nist.gov/Projects/Cryptographic-Module-Validation-Program/Modules-In-Process/IUT-List

includes a DMA engine that performs data transfers directly to and from memory locations within the SSD. *See, e.g.,* "Understanding NAND Flash-Based SSD Drives and the Flash Controller."[10] ("NAND flash controller hardware is made up of multiple parts: . . . **Direct Memory and Flash Access**: Also known as DMA and DFA, these buffers increase throughput by allowing transfers to and from RAM and flash without intervention from the CPU.").

42. The '389 Accused Products further include "a means for performing data processing coupled to said means for performing a DMA data transfer, said data processing includes encrypting or decrypting said data in response to a DPC hit signal by at least using a DPC channel to intercept said data, causing said data to be transferred to said means for performing data processing." For example, each of the '389 Accused Products includes a cryptographic module, such as Crypto Sub-Chip TC58NC1132GTC, that encrypts or decrypts data in response to a DPC hit signal by using a DPC channel of the cryptographic module:

[10] Available at https://www.delkin.com/blog/understanding-nand-flash-based-ssd-drives-and-the-flash-controller/



KIOXIA video presentation, "Security in the Fast Lane,"[11] at 9:11. *See also* FIPS 140-2 Non-Proprietary Security Policy for KIOXIA TCG Enterprise SSC Crypto Sub-Chip TC58NC1132GTC;[12] NIST Cryptographic Module Validation Program, Certificate #3965 for KIOXIA TCG Enterprise SSC Crypto Sub-Chip TC58NC1132GTC;[13] FIPS 140 – 2 Non-Proprietary Security Policy for KIOXIA TCG Enterprise SSC Self-Encrypting Solid State Drive (PX05S model) Type C1");[14] NIST Cryptographic Algorithm Validation Program,

[11] Available at https://www.youtube.com/watch?v=TVXlkqiwJYw

[12] Available at https://csrc.nist.gov/CSRC/media/projects/cryptographic-module-validation-program/documents/security-policies/140sp3965.pdf

[13] Available at https://csrc.nist.gov/projects/cryptographic-module-validation-program/certificate/3965

[14] Available at https://csrc.nist.gov/csrc/media/projects/cryptographic-module-validation-program/documents/security-policies/140sp3001.pdf

TC58NC1132GTC HW Algorithms;[15] FIPS 140-2 Non-Proprietary Security Policy for KIOXIA TCG OPAL SSC Crypto Sub-Chip TC58NC1132GTC.[16] As an example, in KIOXIA's Opal SSC cryptographic chips, DPC hit signals are used in the selection of the appropriate MEK to use for encryption/decryption for a particular locking range of the memory. *See* Trusted Computing Group and NVM Express Joint White Paper: TCG Storage, Opal, and NVMe (Aug. 2015),[17] at 5 ("Opal SSC provides a full featured device implementation profile, with a variety of features that can be taken advantage of through Opal management software. . . . • The Storage Device can be subdivided into multiple 'Locking Ranges'. Each of these is a range of continuous LBAs. • Each Locking Range is encrypted with a different Media Encryption Key. • Each Locking Range can be unlocked independently of the others.").

43. By making, using, offering for sale, and/or selling products in the United States and/or importing products into the United States, including but not limited to the '389 Accused Products, KIOXIA has injured BiTMICRO and is liable to BiTMICRO for directly infringing one or more claims of the '389 Patent, including without limitation claim 19 pursuant to 35 U.S.C. § 271(a).

44. On information and belief, KIOXIA has had knowledge of the '389 Patent since at least 2017 through the prosecution of U.S. Patent Application No. 14/674,739 ("the '739 Application"), which issued as U.S. Patent No. 10,120,580. The '739 Application, titled "Method

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[15] Available at https://csrc.nist.gov/projects/Cryptographic-Algorithm-Validation-Program/details?source=C&number=1925

[16] Available at https://csrc.nist.gov/CSRC/media/projects/cryptographic-module-validation-program/documents/security-policies/140sp3983.pdf

[17] Available at https://trustedcomputinggroup.org/wp-content/uploads/TCGandNVMe_Joint_White_Paper-TCG_Storage_Opal_and_NVMe_FINAL.pdf

and Design for Dynamic Management of Descriptors for SGL Operation," was filed in the PTO by Kabushiki Kaisha Toshiba on March 30, 2015. In 2017, while the '739 Application was still pending in the PTO, Kabushiki Kaisha Toshiba transferred ownership of the '739 Application as well as control over the prosecution of the application to Toshiba Memory Corporation, which was later renamed KIOXIA Corporation.

45. During the prosecution of the '739 Application, the patent examiner issued an Office Action on February 10, 2017 rejecting all of the pending claims in the application under 35 U.S.C. § 103 as obvious in light of the '389 Patent in combination with two other prior art patents. In response, the applicant submitted an amendment to the claims on May 10, 2017 to overcome the patent examiner's rejection. On June 2, 2017, the patent examiner issued a second Office Action maintaining its rejection of all of the pending claims in the application under 35 U.S.C. § 103 based on the '389 Patent in combination with the two other prior art patents. On October 24, 2017, the applicant submitted further amendments to the pending claims in order to overcome the patent examiner's rejection. After further discussions and further amendments to the claims, the examiner eventually allowed claims in the application to issue in July 2018.

46. On information and belief, based on the extensive discussions of the '389 Patent during the prosecution of the '739 Application, KIOXIA had knowledge of the '389 Patent as well as its relevance to the '389 Accused Products. KIOXIA has also had knowledge of the '389 Patent and BiTMICRO's allegations of infringement regarding the '389 Patent since at least the filing and/or service date of the Complaint in this action. Despite this knowledge, KIOXIA has continued to directly infringe one or more claims of the '389 Patent as described above. Thus, on information and belief, KIOXIA's infringement of the '389 Patent has been willful.

47. On information and belief, KIOXIA is also inducing and/or has induced infringement of one or more claims of the '389 Patent, including at least claim 19, as a result of, amongst other activities, instructing, encouraging, and directing its customers on the use of the '389 Accused Products in an infringing manner in violation of 35 U.S.C. § 271(b). Through its website, instructional guides, and manuals, KIOXIA advertises the '389 Accused Products and provides its customers with detailed explanations, instructions, and information on how to use and implement the '389 Accused Products which demonstrate active steps taken to encourage direct infringement. *See, e.g.*, KIOXIA web page, "KIOXIA SSD Security and Encryption";[18] KIOXIA Technical Brief, "Data Security in Enterprise and Data Center SSDs."[19] On information and belief, KIOXIA has had knowledge of the '389 Patent since at least 2017 as set forth above, and also as of the filing and/or service date of this Complaint. Despite this knowledge, KIOXIA has continued to engage in activities to encourage and assist its customers in the use of the '389 Accused Products. Thus, on information and belief, KIOXIA (1) had actual knowledge of the patent; (2) knowingly induced its customers to infringe the patent; and (3) had specific intent to induce the patent infringement.

48. On information and belief, by using the '389 Accused Products as encouraged and assisted by KIOXIA, KIOXIA's customers have directly infringed and continue to directly infringe one or more claims of the '389 Patent, including at least claim 19. On information and belief, KIOXIA knew or was willfully blind to the fact that its actions would induce its customers' direct infringement of the '389 Patent.

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[18] Available at https://americas.kioxia.com/en-us/business/ssd/solution/security.html

[19] Available at https://americas.kioxia.com/content/dam/kioxia/en-us/business/ssd/asset/productbrief/KIOXIA_Enterprise_DataCenter_SSD_Security_Tech_Brief.pdf

49. KIOXIA's infringement of the '389 Patent has been and continues to be deliberate and willful, and this is therefore an exceptional case warranting an award of enhanced damages and attorneys' fees and costs pursuant to 35 U.S.C. §§ 284-285.

50. On information and belief, KIOXIA will continue to infringe the '389 Patent unless enjoined by this Court.

51. As a result of KIOXIA's infringement of the '389 Patent, BiTMICRO has suffered monetary damages, and seeks recovery, in an amount to be proven at trial, adequate to compensate for KIOXIA's infringement, but in no event less than a reasonable royalty with interest and costs. KIOXIA's infringement of BiTMICRO's rights under the '389 Patent will continue to damage BiTMICRO, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

SECOND COUNT

(INFRINGEMENT OF U.S. PATENT NO. 9,875,205)

52. BiTMICRO incorporates by reference the allegations set forth in paragraphs 1-51 as though fully set forth herein.

53. On information and belief, KIOXIA has directly infringed and continues to directly infringe one or more claims of the '205 Patent, including at least claim 1 of the '205 Patent, in the state of Texas, in this judicial district, and elsewhere in the United States by, among other things, making and using products that embody one or more of the inventions claimed in the '205 Patent, including but not limited to EBOF systems that include KIOXIA's EM6 Series NVMe over Fabrics ("NVMe-oF") SSDs, and all reasonably similar products ("the '205 Accused Products"), in violation of 35 U.S.C. § 271(a).

54. As an example, KIOXIA works in partnership with Ingrasy Technology Inc. to incorporate its EM6 Series SSDs into Ingrasy EBOF systems such as the Ingrasys ES2000/ES2100 products. These products are each an "apparatus" as recited in claim 1 of the '205 Patent.

Ingrasys ES2000/ES2100 Datasheet.[20]

55. Each Ingrasys ES2000/2100 product can include up to 24 KIOXIA EM6 Series SSDs. For example, KIOXIA has advertised: "KIOXIA America, Inc. today announced the production availability of its EM6 Series Enterprise NVMe-oF™ solid state drives (SSDs) for Ethernet Bunch of Flash (EBOF) systems. . . . KIOXIA EM6 Series drives are available now through Ingrasys – a subsidiary of Foxconn, in its ES2000 EBOF platform. ES2000 is a 2U storage system that holds up to 24 2.5-inch form factor drives and can be configured with multiple network connections for increased throughput and redundancy." KIOXIA press release, "KIOXIA Announces Production Availability of Native Ethernet Flash-Based SSDs."[21]

56. The Ingrasys ES2000/ES2100 products include "a communication bus interface" for facilitating communications to and from each of the EM6 Series SSDs within the system. *See, e.g.,*

[20] Available at https://www.ingrasys.com/assets/files/Datasheet_ES2000_202210.pdf

[21] Available at https://americas.kioxia.com/en-us/business/news/2021/ssd-20211111-1.html

KIOXIA press release, "KIOXIA Announces Production Availability of Native Ethernet Flash-Based SSDs"[22] ("Using the Marvell® 88SN2400 NVMe-oF SSD converter controller that converts an NVMe® SSD into a dual-ported 25Gb NVMe-oF SSD, KIOXIA EM6 Series drives expose the entire SSD bandwidth to the network."). *See also* Ingrasys ES2000/ES2100 Datasheet:[23]

57. The Ingrasys ES2000/ES2100 products include "a flash memory module coupled to the communication bus interface via a communication bus." For example, each of the KIOXIA EM6 Series SSDs in the Ingrasys ES2000/ES2100 product constitutes a flash memory module coupled to the communication bus interface in the ES2000/ES2100 via a communication bus. *See, e.g.,* KIOXIA press release, "KIOXIA Announces Production Availability of Native Ethernet Flash-Based SSDs"[24] ("Using the Marvell® 88SN2400 NVMe-oF SSD converter controller that converts an NVMe® SSD into a dual-ported 25Gb NVMe-oF SSD, KIOXIA EM6 Series drives expose the entire SSD bandwidth to the network."). *See also* "Ethernet SSDs – Hands-on with the Kioxia EM6 NVMeoF SSD":[25]

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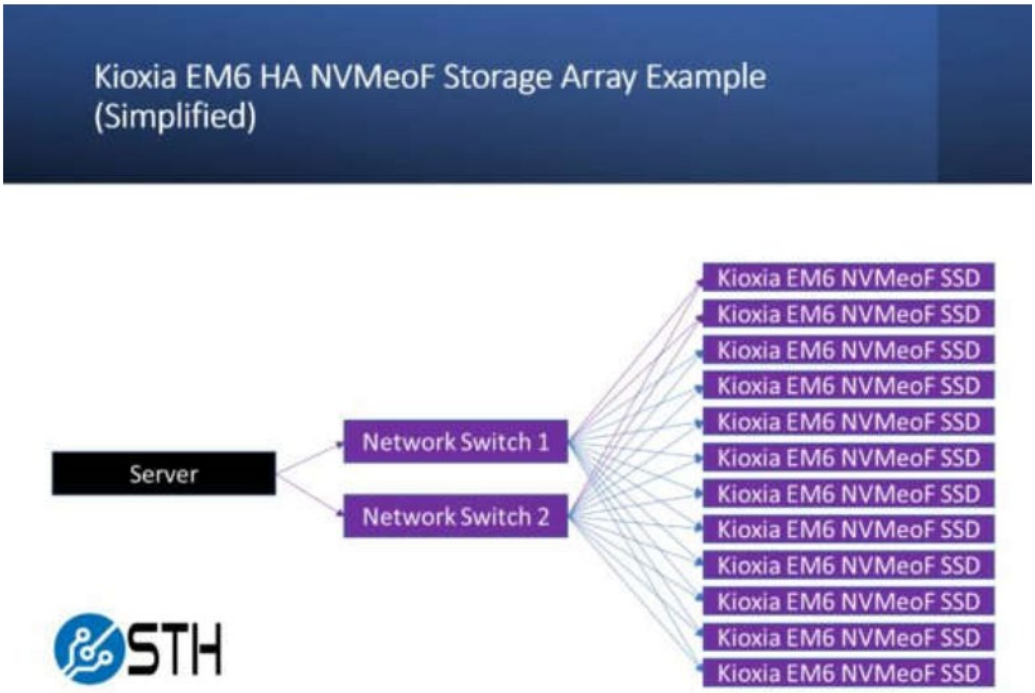
[22] Available at https://americas.kioxia.com/en-us/business/news/2021/ssd-20211111-1.html

[23] Available at https://www.ingrasys.com/assets/files/Datasheet_ES2000_202210.pdf

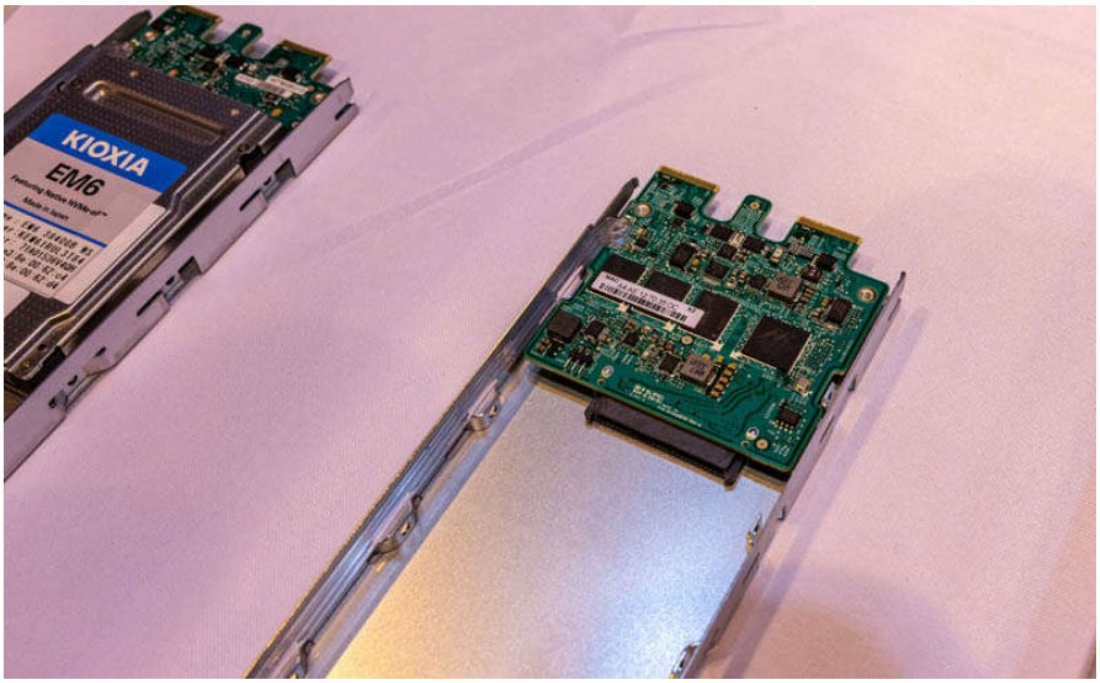
[24] Available at https://americas.kioxia.com/en-us/business/news/2021/ssd-20211111-1.html

[25] Available at https://www.servethehome.com/ethernet-ssds-hands-on-with-the-kioxia-em6-nvmeof-ssd/2/



See also "Ethernet SSDs – Hands-on with the Kioxia EM6 NVMeoF SSD"[26] ("For those wondering, there is a Marvell 88SN3400 Adapter card that connects a traditional NVMe SSD to Ethernet so it can be used in this chassis."). *See also id.*:

[26] Available at https://www.servethehome.com/ethernet-ssds-hands-on-with-the-kioxia-em6-nvmeof-ssd/



Ingrasys ES2000 And Kioxia EM6 NVMe To 25GbE EDSFF Bridge

58. The Ingrasys ES2000/ES2100 products include "a system controller coupled to the communication bus interface via an external communication bus." For example, the ES2000 includes an Intel Atom C3538 management processor and a Marvell 98EX5630 ethernet switch, while the ES2100 includes an Intel Atom C3538 management processor and NVIDIA Spectrum-2 ethernet switch. Each of these chips, either alone or in combination, constitute a system controller coupled to the communication bus interface via an external communication bus. *See, e.g.,* "Ethernet SSDs – Hands-on with the Kioxia EM6 NVMeoF SSD"[27] ("There is also a control plane for the switch under the black heatsink. This is powered with an Intel Atom C3538 CPU along with a M.2 SSD and 8GB of DRAM."). *See also* Ingrasys ES2000/ES2100 Datasheet:[28]

[27] Available at https://www.servethehome.com/ethernet-ssds-hands-on-with-the-kioxia-em6-nvmeof-ssd/

[28] Available at https://www.ingrasys.com/assets/files/Datasheet_ES2000_202210.pdf

59. In the Ingrasys ES2000/ES2100 products, "the system controller performs a memory transaction via the communication bus interface to the flash memory module." For example, the system controller handles memory operations on the EM6 Series SSDs within the ES2000/ES2100, such as setting up and managing filesystems on those SSDs and coordinating data read and write operations to and from those SSDs. *See, e.g.,* "Ethernet SSDs – Hands-on with the Kioxia EM6 NVMeoF SSD"[29] ("There is also a control plane for the switch under the black heatsink. This is powered with an Intel Atom C3538 CPU along with a M.2 SSD and 8GB of DRAM. . . . These switches, stacked one above the other allow each drive to access both switch networks simultaneously providing a redundant path to the drives."). *See also* "Ethernet SSDs – Hands-on with the Kioxia EM6 NVMeoF SSD"[30] ("Next, we set up a single drive. We can see that we go from no NVMe devices in the workstation and can discover the EM6 devices over the network. . . .

[29] Available at https://www.servethehome.com/ethernet-ssds-hands-on-with-the-kioxia-em6-nvmeof-ssd/

[30] Available at https://www.servethehome.com/ethernet-ssds-hands-on-with-the-kioxia-em6-nvmeof-ssd/2/

We can then connect to the drive, mount the NVMeoF drive, make a filesystem, and then start transferring data to it.").

60. On information and belief, KIOXIA has directly infringed and continues to directly infringe one or more claims of the '205 Patent, including at least claim 1, as a result of, amongst other activities, making and using (jointly in partnership with Ingrasys Technology Inc.) infringing Ingrasys ES2000/ES2100 products that include KIOXIA's EM6 Series SSDs. These activities include, for example, the development and testing of the infringing Ingrasys ES2000/ES2100 products that include KIOXIA's EM6 Series SSDs.

61. On information and belief, KIOXIA is also inducing and/or has induced infringement of one or more claims of the '205 Patent, including at least claim 1, as a result of, amongst other activities, selling or otherwise providing its EM6 Series SSDs for use in the infringing EBOF systems such as the Ingrasys ES2000/ES2100 products, and promoting and advertising to both Ingrasys as well as customers the use of its EM6 Series SSDs in those infringing products. Through its website, for example, KIOXIA advertises the availability and use of its EM6 Series SSDs in the infringing Ingrasys ES2000/ES2100 products. *See, e.g.,* KIOXIA press release, "KIOXIA Announces Production Availability of Native Ethernet Flash-Based SSDs"[31] ("KIOXIA EM6 Series drives are available now through Ingrasys – a subsidiary of Foxconn, in its ES2000 EBOF platform. ES2000 is a 2U storage system that holds up to 24 2.5-inch form factor drives and can be configured with multiple network connections for increased throughput and redundancy."). And KIOXIA sells and/or provides its EM6 Series SSDs to Ingrasys for incorporation into the ES2000/ES2100 products.

[31] Available at https://americas.kioxia.com/en-us/business/news/2021/ssd-20211111-1.html

62. On information and belief, KIOXIA has had knowledge of the ’205 Patent since at least the filing and/or service date of the Complaint in this action. Despite this knowledge, KIOXIA has continued to engage in activities to sell, provide, promote, and advertise to Ingrasys as well as customers its EM6 Series SSDs for use in the infringing ES2000/ES2100 products. Thus, on information and belief, KIOXIA (1) had actual knowledge of the patent; (2) knowingly induced Ingrasys as well as customers to infringe the patent; and (3) had specific intent to induce the patent infringement.

63. On information and belief, by making, using, selling, offering for sale, and/or importing into the United States the ES2000/ES2100 products containing the KIOXIA EM6 Series SSDs, Ingrasys directly infringes one or more claims of the ’205 Patent, including at least claim 1. Customers who purchase the ES2000/ES2100 products containing the KIOXIA EM6 Series SSDs also directly infringe one or more claims of the ’205 Patent, including at least claim 1, when they use those products.

64. On information and belief, KIOXIA knew or was willfully blind to the fact that its actions would induce Ingrasys as well as customers’ direct infringement of the ’205 Patent.

65. On information and belief, KIOXIA is also contributorily infringing one or more claims of the ’205 Patent, including at least claim 1, as a result of, amongst other activities, selling, offering for sale, and/or importing into the United States its EM6 Series SSDs for use in the infringing EBOF systems such as the Ingrasys ES2000/ES2100 products. The EM6 Series SSDs are components that are a material part of the infringing Ingrasys ES2000/ES2100 products, which KIOXIA knows to be especially made or especially adapted for use in the infringing ES2000/ES2100 products, and are not a staple article or commodity of commerce suitable for any substantial non-infringing use.

66. KIOXIA's infringement of the '205 Patent has been and continues to be deliberate and willful, and this is therefore an exceptional case warranting an award of enhanced damages and attorneys' fees and costs pursuant to 35 U.S.C. §§ 284-285.

67. On information and belief, KIOXIA will continue to infringe the '205 Patent unless enjoined by this Court.

68. As a result of KIOXIA's infringement of the '205 Patent, BiTMICRO has suffered monetary damages, and seeks recovery, in an amount to be proven at trial, adequate to compensate for KIOXIA's infringement, but in no event less than a reasonable royalty with interest and costs. KIOXIA's infringement of BiTMICRO's rights under the '205 Patent will continue to damage BiTMICRO, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

PRAYER FOR RELIEF

WHEREFORE, BiTMICRO prays for judgment and seeks relief against KIOXIA as follows:

A. For judgment that KIOXIA has infringed and/or continue to infringe one or more claims of the Asserted Patents, directly, and/or indirectly by way of inducement and/or contributory infringement;

B. For a permanent injunction against KIOXIA and its respective officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all other acting in active concert therewith from infringement of the Asserted Patents;

C. For an accounting of all damages sustained by BiTMICRO as the result of KIOXIA's acts of infringement;

D. For a mandatory future royalty payable on each and every future sale by KIOXIA of a product that is found to infringe one or more of the Asserted Patents and on all future products which are reasonably similar to those products found to infringe;

E. For a judgment and order finding that KIOXIA's infringement is willful and awarding to BiTMICRO enhanced damages pursuant to 35 U.S.C. § 284;

F. For a judgment and order requiring KIOXIA to pay BiTMICRO's damages, costs, expenses, and pre- and post-judgment interest for its infringement of the Asserted Patents as provided under 35 U.S.C. § 284;

G. For a judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285 and awarding to BiTMICRO its reasonable attorneys' fees; and

H. For such other and further relief in law and in equity as the Court may deem just and proper.

DEMAND FOR JURY TRIAL

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, BiTMICRO hereby demands a trial by jury of this action.

Dated: June 22, 2023

Respectfully submitted,

/s/ B. Russell Horton

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