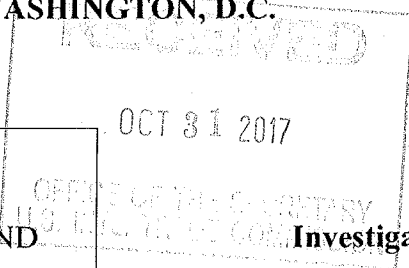


UNITED STATES INTERNATIONAL TRADE COMMISSION  
WASHINGTON, D.C.



In the Matter of

CERTAIN MEMORY MODULES AND  
COMPONENTS THEREOF

Investigation No. 337-TA-\_\_\_\_\_

COMPLAINT OF NETLIST, INC. UNDER  
SECTION 337 OF THE TARIFF ACT OF 1930, AS AMENDED

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## TABLE OF SUPPORTING MATERIALS

### EXHIBITS

<b>Exhibit No.</b>	<b>Description</b>
1	Certified U.S. Patent No. 9,606,907
2	Certified U.S. Patent No. 9,535,623
3	Certified Assignment Records for U.S. Patent No. 9,606,907
4	Certified Assignment Records for U.S. Patent No. 9,535,623
5	Hynix Q1'2017 Databook
6	Hynix DDR4 Module Product List
7	List of Foreign Counterparts
8	List of Licensees for the Asserted Patents
9	Hynix HMA84GL7AMR4N-UH Datasheet
10	Hynix DDR4 Device Operation
11	Infringement Claim Chart for U.S. Patent No. 9,606,907 (LRDIMM)
12	Hynix HMA42GR7AFR4N-UH Datasheet
13	Infringement Claim Chart for U.S. Patent No. 9,535,623 (LRDIMM)
14	Infringement Claim Chart for U.S. Patent No. 9,535,623 (RDIMM)
15	Documents detailing purchase of Hynix DDR4 LRDIMM, part number HMA84GL7AMR4N-UH
16	Photograph of Hynix DDR4 LRDIMM, part number HMA84GL7AMR4N-UH
17	SK Hynix Label Decoder
18	Documents detailing purchase of Hynix DDR4 RDIMM, part number HMA42GR7AFR4N-UH
19	Photograph of Hynix DDR4 RDIMM, part number HMA42GR7AFR4N-UH
20	Domestic Industry Claim Chart for U.S. Patent No. 9,606,907 <b>[CONFIDENTIAL]</b>
21	Domestic Industry Claim Chart for U.S. Patent No. 9,535,623 <b>[CONFIDENTIAL]</b>
22	Declaration of Gail Sasaki, Chief Financial Officer, Netlist, Inc. <b>[CONFIDENTIAL]</b>

## APPENDICES

<b>Appendix Item</b>	<b>Description</b>
A	Certified Prosecution History for U.S. Patent No. 9,606,907
B	Certified Prosecution History for U.S. Patent No. 9,535,623
C	Cited References for U.S. Patent No. 9,606,907
D	Cited References for U.S. Patent No. 9,535,623

## PHYSICAL EXHIBITS

<b>Physical Exhibit No.</b>	<b>Description</b>
1	Exemplary Hynix DDR4 LRDIMM Memory Module
2	Exemplary Hynix DDR4 RDIMM Memory Module
3	Exemplary HybriDIMM Memory Module

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**I. INTRODUCTION**

1. This Complaint is filed by Netlist, Inc. (“Netlist”) for violation of Section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, by proposed respondents SK hynix Inc., SK hynix America Inc. and SK hynix memory solutions Inc. (collectively “Respondents” or “Hynix”).

2. The violation is based on the unlawful importation into the United States, the sale for importation, or the sale within the United States after importation of certain memory modules and components thereof by Respondents, including Hynix DDR4 RDIMMs (Registered Dual In-Line Memory Modules) (the “accused RDIMM products”) and Hynix DDR4 LRDIMMs (Load-Reduced Dual In-Line Memory Modules) (the “accused LRDIMM products”) (collectively the “accused products” or the “accused LRDIMM and RDIMM products”). As set forth in detail below, Respondents’ memory modules and components thereof are covered by and infringe one or more claims of United States Patent No. 9,606,907 (“the ’907 patent”), and United States Patent No. 9,535,623 (“the ’623 patent”) (collectively “the asserted patents”). Certified copies of the asserted patents are attached as Exhibits 1 and 2. The presently asserted claims of the asserted patents are as follows:

<b>TABLE 1</b>		
<b>U.S. Patent No.</b>	<b>Independent Claims Asserted</b>	<b>Dependent Claims Asserted</b>
9,606,907	1, 16, 30, 43, 58	2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 15, 17, 18, 19, 20, 21, 22, 24, 25, 27, 29, 31, 32, 33, 34, 35, 38, 44, 45, 47, 48, 50, and 52
9,535,623	1, 12, 21	2, 3, 4, 5, 7, 8, 9, 10, 11, 13, 14, 15, 17, 18, 19, 20, 22, 23, 24, 25, 27, and, 29

3. Netlist is the owner by assignment of the asserted patents. Certified copies of the assignment records of the asserted patents are attached as Exhibits 3 and 4.

4. A domestic industry as required by 19 U.S.C. §§ 1337(a)(2) and (3) exists relating to the Netlist products protected by each of the asserted patents, and Netlist's significant and substantial investments in plant, labor, capital, equipment, research and development, and engineering related to inventing the patented technology and developing Netlist's domestic industry products to implement that technology.

5. A domestic industry as required by 19 U.S.C. §§ 1337(a)(2) and (3) is in the process of being established relating to Netlist products protected by each of the asserted patents. Netlist's significant and substantial investments in plant, labor, capital, equipment, research and development, and engineering and exploitation of the asserted patents constitute active engagement in necessary and tangible steps to establish the exploitation of Netlist's intellectual property rights. As a result of these significant and substantial investments, there is a significant likelihood that the domestic industry requirement as to Netlist's domestic industry products will be satisfied in the future.

6. Netlist seeks as relief a limited exclusion order permanently excluding from entry into the United States the Respondents' infringing memory modules and components thereof. Netlist also seeks a cease and desist order prohibiting Respondents' importation, sale, offer for sale, soliciting of the sale, advertising, marketing, demonstrating, promoting, supporting and servicing of the infringing memory modules and components thereof, covered by the claims of the asserted patents. Netlist also seeks the imposition of a bond during the 60-day Presidential review period to prevent further injury to Netlist's domestic industry relating to each of the asserted patents.

## **II. THE PROPOSED PARTIES**

### **A. Complainant Netlist**

7. Netlist is a corporation organized and existing under the laws of the State of Delaware, having a principal place of business at 175 Technology Drive, Suite 150, Irvine, California 92618.

8. Since its founding in 2000, Netlist has been a leading innovator in high-performance memory module technologies. Netlist designs and manufactures a wide variety of high-performance products for the cloud computing, virtualization and high-performance computing (HPC) markets. Netlist's technology enables users to derive useful information from vast amounts of data in a shorter period of time. These capabilities will become increasingly valuable as the volume of data continues to dramatically increase.

9. Netlist has a long and exceptional track record of innovation. Netlist has twice before introduced disruptive new products that have changed the direction of the server memory industry, creating entirely new product categories that previously did not exist. Netlist's latest breakthrough product, HybriDIMM, is poised to change the industry again.

10. In 2009, Netlist announced the industry's first LRDIMM, HyperCloud, demonstrating what was previously thought to be impossible—that a server could be fully loaded with memory and still operate at the highest system speeds. Using conventional server memory, RDIMM, server systems slow down as more memory is added. Most applications do not require a large amount of memory relative to the maximum memory capacity of the server. RDIMM is a satisfactory solution for these applications and is less expensive than LRDIMM. However, certain applications, such as big data analytics and high-frequency trading, do require large amounts of memory operating at the highest possible speeds. LRDIMM satisfies these demands, and it is Netlist's novel distributed buffer architecture and load reduction technologies that make



this performance possible. The asserted '907 patent, for example, is directed to aspects of these critical technologies. Faced with the decisive advantages of Netlist's technology, the industry adopted Netlist's distributed buffer architecture and load reduction technologies wholesale in the latest generation JEDEC standard implementation of LRDIMM. Today, every LRDIMM sold in the market is based on Netlist's patented technology.

11. The development of HyperCloud was a massive undertaking requiring more than nine years and tens of millions of dollars investment in research and development. Netlist engineers had to overcome many technical challenges in the course of this product development, particularly given HyperCloud's novel architecture and the strict timing requirements of the high-speed memory channel. Netlist sought patent protection for many of these early designs, resulting in patents such as the '623 patent, as well as the '907 patent, each of which arose out of Netlist's lineage of patented technology now essential to the DDR4 JEDEC standards. Years later, the industry adopted many of Netlist's HyperCloud solutions as it struggled to address similar technical challenges in the latest generation LRDIMM and RDIMM products.

12. In 2013, HyperCloud began shipping in volume to major server manufacturers, including IBM and HP. For example, HyperCloud was qualified on HP's ProLiant Gen8 servers, the DL360p and DL380p. HyperCloud was also the highest performing memory offered in IBM's System x3650 M4 and was selected by IBM as the default memory option for that platform. These HP and IBM servers were among the highest volume models on the market. HyperCloud was also adopted by smaller manufacturers targeting the high-performance computing market, such as CIARA's Atlas servers and Titan graphics processing unit systems.

13. Netlist's patented LRDIMM technology will only become more critical as server systems struggle to meet the ever-increasing demands placed on data centers. Upcoming

generations of server CPUs will reach speeds that likely cannot be supported by standard RDIMM. Netlist's patented technologies allow more memory modules to be used in the server without slowing down the server or allow the server to operate at faster speeds using the same number of memory modules.

14. Netlist again changed the direction of the industry when it brought Flash memory to the memory channel with the introduction of the first NVDIMM (Non-Volatile DIMM), called NVvault. NVDIMM combines the low cost and non-volatility of Flash with the high-speed and durability of DRAM. NVDIMM leverages this unique combination of semiconductor raw materials to provide fast access to critical data while protecting the data in the event system power is lost. Netlist introduced a memory channel NVDIMM in 2012 that was based on its earlier designs from 2007. The industry again took note and moved to adopt Netlist's technology.

15. Netlist is yet again on the verge of changing the face of the computing industry with the world's first true storage class memory (SCM) product, HybriDIMM. HybriDIMM (also referred to by its internal project name, HyperVault) sets the new standard for delivering fast, inexpensive, persistent system memory.

16. HybriDIMM combines DRAM and Flash into a single persistent memory, running at near DRAM speed but with memory capacities usually associated with traditional storage. Netlist achieved these milestones by building upon its many years of research and development and product know-how. HybriDIMM combines the power of NVvault, taking even greater advantage of the high density and persistence of Flash, with HyperCloud's distributed buffer topology and related technologies implemented in the DDR4 LRDIMM architecture for high-speed access via the memory channel. Netlist also drew upon its broad experience and

patented technology developed as part of its LRDIMM and NVDIMM efforts, such as establishing the critical timing parameters necessary to the operation of high-performance DIMMs. Netlist's asserted '623 patent is one example of these fundamental timing-related patented technologies. Certain of these technologies are widely used in the latest generation DIMMs available on the market today to enable high-speed operation on the memory channel, including RDIMM, LRDIMM, NVDIMM, as well as HybriDIMM.

17. Underscoring the promise of this new technology, in November 2015, Netlist and Samsung Electronics Co., Ltd. announced that they had entered into a Joint Development and License Agreement ("JDLA") to bring the HybriDIMM technology to market. Under the agreement, Samsung and Netlist agreed to a broad collaboration including a five-year joint development to produce and facilitate broad industry adoption of new SCM products such as HybriDIMM. As an important strategic partner and the undisputed leader in memory, Samsung lent its considerable technical and marketing expertise to Netlist's SCM product efforts. The JDLA included a variety of elements designed to facilitate the joint development. For example, Samsung agreed to supply Netlist with its industry leading DRAM and Flash products which is important to the joint development effort. The parties also entered into a patent cross-license to facilitate the joint development, providing Netlist with access to Samsung's worldwide patent portfolio which includes the single largest collection of U.S. patents.

18. As a major step in Phase One of the joint development effort with Samsung, Netlist first publicly demonstrated HybriDIMM at the premier annual event for the Flash industry, the Flash Memory Summit, which was held August 9-11, 2016, in Santa Clara, California. Since that time, Netlist continued to invest heavily in refining its proprietary technology, including manufacturing multiple prototypes at its own production facilities. As part

of these ongoing efforts for the JDLA development effort, Netlist provided full real-time demonstrations of HybriDIMM's functionality to personnel from the International Trade Commission in April of 2017. Netlist also provided a similar demonstration to a large market participant in June of 2017.

19. Later in the summer, at the 2017 Flash Memory Summit in early August, Netlist demonstrated the HybriDIMM for a number of industry participants. This demonstration showcased two widely used open-source databases running concurrently on a Storage Class Memory (SCM) solution: MongoDB exercised HybriDIMM's in-memory channel block storage capabilities, while the Redis in-memory database utilized memory semantics to achieve a true persistent memory solution. To Netlist's knowledge, this was the first public demonstration of such complete SCM functionality running in the memory channel by anyone, anywhere in the world.

20. Building on this success, Netlist provided another demonstration, along with a hands-on evaluation opportunity, to a large market participant in early October 2017. Around the same time, Netlist engineers also provided a demonstration of HybriDIMM to personnel from another large market participant. Each of these entities subsequently expressed significant interest in the promise of the HybriDIMM technology. Most recently, Netlist began in earnest Phase Two of its HybriDIMM development and commercialization effort, including negotiating a next-phase partnership with Samsung. In fact, Netlist recently shipped customer evaluation samples of the HybriDIMM product to multiple industry participants, including, for example, an original design manufacturing giant.

21. The ingenuity underlying Netlist's products reflects Netlist's deep commitment to research and development. With growing demand for its new server memory technologies,

Netlist's business grew rapidly and allowed the company to conduct an initial public offering (IPO) in November 2006. Its common stock began trading on the NASDAQ Global Market under the trading symbol "NLST" on November 30, 2006. In total, since 2008, Netlist has invested more than \$80,000,000 in research and development. Since the company's inception, more than 75% of Netlist's over \$700 million in revenue resulted from the sale of high performance memory modules to global Original Equipment Manufacturers such as Dell, HP, IBM, and Apple.

22. Netlist's memory technologies are developed for applications in which high-speed, high-capacity memory, enhanced functionality, small form factor and heat dissipation are key requirements. These applications include tower servers, rack-mounted servers, blade servers, storage appliances, high-performance computing clusters, engineering workstations, and telecommunications. Netlist's expanding and innovative Flash product portfolio continues to address space constraints that occur in cloud datacenter and enterprise class servers, storage, and embedded systems.

23. Netlist has continually invested in the equipment, facilities, and personnel necessary to productize the valuable results of its research and development efforts. Hundreds of dedicated professionals have contributed to Netlist's success over the years. Netlist's world-class team of engineers focuses on the original design and development of its products. Substantially all of this research and development has been conducted by Netlist's employees located in the company's headquarters in Irvine, California. Netlist's engineering and marketing teams work together with Netlist's diversified customer base to identify unmet needs in the marketplace, and then design innovative new products that meet those needs. Netlist built its own dedicated facility in Suzhou, China, where Netlist's products are manufactured and then

shipped back into the United States for testing, further development, and integration into customer platforms.

24. Netlist has protected its innovative solutions by, among other things, filing and procuring patents. Netlist's growing patent portfolio, which includes the asserted patents, consists of over 70 issued patents and over 30 pending patent applications. Netlist's portfolio reflects years of Netlist's investment in research and development, as well as a relentless commitment to bring to market novel products in the high performance modular memory industry. These patents cover, among other things, core features of LRDIMM and RDIMM.

25. Netlist uses the technologies covered by the asserted patents in the United States as described in Section IX below. In connection with the exploitation of these technologies, Netlist has made and continues to make significant investment in the United States in facilities, equipment, labor and capital, also as described in Section IX below.

26. Netlist researched and developed the technology that is protected by the asserted patents. Netlist has made and continues to make significant investment in the design and development of products protected by the asserted patents, as described in Section IX below.

#### **B. The Proposed Respondents**

27. On information and belief, proposed respondent SK hynix Inc. is a corporation organized and existing under the laws of the Republic of Korea ("Korea"), having a principal place of business at 2091, Gyeongchung-daero, Bubal-eub, Icheon-si, Gyeonggi-do, Korea. On information and belief, SK hynix Inc. is the worldwide parent corporation for the other Respondents, and is responsible either directly or indirectly through subsidiaries for the Respondents' infringing activities.

28. On information and belief, proposed respondent SK hynix America Inc. is a corporation organized and existing under the laws of California, having a principal place of

business at 3101 North 1st Street, San Jose, CA 95134, United States. On information and belief, SK hynix America Inc. is a wholly owned subsidiary of SK hynix Inc. and is a United States operating company for SK hynix Inc. On information and belief, SK hynix America Inc. provides support for sales, technical, and customer/client relationship operations.

29. On information and belief, proposed respondent SK hynix memory solutions Inc. is a corporation organized and existing under the laws of California, having a principal place of business at 3103 North 1st Street, San Jose, CA 95134, United States. On information and belief, SK hynix memory solutions Inc. is a wholly owned subsidiary of SK hynix Inc. and is a United States operating company for SK hynix Inc. On information and belief, SK hynix memory solutions Inc. provides to its customers controller hardware and flash management systems and firmware for devices.

30. Respondents manufacture, import, sell for importation, sell after importation, and/or service and repair certain memory modules and components thereof, including the accused LRDIMM and RDIMM products. The accused products manufactured, imported and sold by the Respondents incorporate, without license, technologies developed by Netlist and protected by patents issued to and owned by Netlist, including the asserted patents.

31. Netlist accuses all Hynix DDR4 RDIMMs and LRDIMMs of infringing the asserted patent claims. The accused LRDIMM and RDIMM products include but are not limited to the exemplary modules identified in the Hynix Databook or Module Product List, attached as Exhibits 5 and 6 respectively.<sup>1</sup>

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<sup>1</sup> The products identified in this Complaint and/or in Exhibits 5 and 6 are exemplary only and are not intended to exclusively define or otherwise limit the category of accused products. Netlist may, if necessary, amend or modify the descriptions in this Complaint, or add additional exemplary products, as discovery progresses. Exhibit 5 is publicly available for download at <https://www.skhynix.com/static/filedata/fileDownload.do?seq=378>. Exhibit 6 is publicly available for download at <https://www.skhynix.com/products.do?lang=eng&ct1=36&ct2=42&rk=30>.

### III. THE TECHNOLOGY AND PRODUCTS AT ISSUE

#### A. The Patented Technologies

32. The technologies at issue relate generally to memory modules and components thereof, imported into and sold within the United States by or on behalf of Respondents. The technologies disclosed and claimed in the asserted patents relate generally to memory modules. Generally speaking, a memory module is a circuit board that contains DRAM integrated circuits that is installed into the memory slot on a computer motherboard. An example of a Hynix LRDIMM memory module is included below:



33. Generally speaking, the '907 patent relates to memory modules of a computer system, and more specifically to devices and methods for improving the performance, the memory capacity, or both, of memory modules. The '623 patent relates to memory modules that operate in two distinct modes and provide a notification signal to the memory controller of a host system indicating the status of the training sequence in one of those modes.<sup>2</sup>

#### B. RDIMM and LRDIMM

34. Server memory modules historically have been standardized by the standard-setting body for the microelectronics industry, JEDEC (Joint Electron Device Engineering Council). RDIMM is a JEDEC-standard memory module, which was first standardized in the

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<sup>2</sup> Any description of the patents or the related technology herein is offered for illustrative purposes only and is not meant to limit or define any claim terms or claim scope for purposes of claim construction, infringement, or otherwise.



mid-1990s. RDIMM accounted for more than 95 percent of all server memory modules shipped worldwide in 2011. Despite its longevity and prevalence, standard RDIMM has become increasingly unable to keep pace with the higher performance requirements of high-end servers.

35. LRDIMM is a different type of memory module also based on a JEDEC standard offering higher performance than RDIMM memory modules. DDR4 LRDIMM products are widely available on the market today.

36. The JEDEC RDIMM and LRDIMM memory module standards each delineate common electrical protocols and electrical and mechanical interfaces for memory modules built to implement the standards. But the JEDEC standards do not limit how each manufacturer designs or implements components of the product to conform to the standardized input and output of the memory module.

37. On or about November 22, 2010, Netlist submitted License Assurance/Disclosure Forms identifying the JEDEC LRDIMM standard for several Netlist patents and patent applications (including Netlist's U.S. Patent Application No. 12/761,179, which later issued as U. S. Patent No. 8,516,185, the parent of the '907 patent).

38. On or about April 7, 2016, Netlist submitted License Assurance/Disclosure Forms identifying the JEDEC DDR4 LRDIMM components (RCD&DB) protocol and functionality module, DDR4 RDIMM RCD, DDR4 LRDIMM, and DDR4 RDIMM standards for several Netlist patents and patent applications (including Netlist's U.S. Patent No. 8,489,837, the parent of the '623 patent).

39. Netlist has in all respects acted in a manner consistent with the JEDEC Patent Policy, as set forth in the JEDEC Manual of Organization and Procedure, which states in relevant part that "[a] license will be offered, to applicants desiring to utilize the license for the purpose of

implementing the JEDEC Standard under reasonable terms and conditions that are free of any unfair discrimination... .”

40. Netlist contacted Hynix in 2015 regarding its need for a license to Netlist’s patent portfolio, and has since been attempting in good faith to reach a resolution. In an effort to bring Hynix to the table in a more meaningful way, Netlist filed suit against Hynix in the International Trade Commission and in the Federal District Court for the Central District of California. These actions alleged infringement of certain standard-essential patents, including the parents of the patents asserted in this Complaint. Long prior to initiating any of these litigation efforts, however, Netlist offered to license the asserted patents to Hynix on reasonable terms that are free of any unfair discrimination. And throughout the course of litigation, Netlist has remained willing to honor its fair and reasonable offers to Hynix—even in the face of continued intransigence and holdout by Hynix. As a result, Hynix continues to unfairly reap enormous economic benefit of utilizing Netlist’s patented technology without authorization, despite nearly two years of substantive exchanges and negotiation.

41. Hynix’s ongoing unwillingness to attribute real value to Netlist’s standard essential intellectual property is unfortunately consistent with Netlist’s prior negotiations with Hynix. Netlist entered into discussions with Hynix twice since 2012 to explore potential business arrangements wherein the companies would work in partnership to bring cutting-edge products to market. Hynix ultimately walked away in each instance after months of negotiation.

42. In September 2012, Netlist made a detailed, formal proposal to Hynix for a high performance memory partnership related to Netlist’s HyperCloud product. This proposal included joint product development, component supply and an equity investment. The proposal also included an offer to license Netlist’s patents to Hynix. As part of the due diligence process,

a team of Hynix attorneys traveled to Netlist's headquarters in Irvine, California and conducted an in-depth review of Netlist's patent portfolio in early 2013. The discussions around a joint product development continued for several months before Hynix walked away without explanation and without concluding a deal.

43. In 2014 and 2015, Netlist entered into discussions with several candidate companies including Hynix and Samsung to partner with Netlist on its HybriDIMM product (referred to as HyperVault at that time). In October 2014, Netlist's CEO and executive team visited Korea and met with Hynix executives to kick off the discussions. Netlist made several proposals to Hynix during the negotiations for a broad partnership that combined the strength of both companies to address the emerging multi-billion dollar market for storage class memory. Netlist's proposals included joint product development, co-marketing, supply of DRAM and flash, exclusive manufacturing rights, patent licensing, and an investment by Hynix in Netlist. In April 2015, after months of negotiations and the exchange of draft terms, Hynix again terminated the negotiations. Samsung approached Netlist after the Hynix negotiations ended and began discussions that ultimately culminated in Netlist entering into the JDLA with Samsung in November 2015.

44. As discussed above, Netlist again renewed negotiations with Hynix in December 2015 by offering to license Netlist's patent portfolio. During this process, Netlist identified particular patents, including parents of the asserted patents, and provided Hynix with detailed claim charts describing how Hynix's RDIMM and LRDIMM products practice the claims of certain of Netlist's patents. On multiple occasions, Netlist employees traveled to Korea to discuss Netlist's offer to license Netlist's patent portfolio related to RDIMM and LRDIMM.

45. In June 2016, consistent with its obligations to JEDEC, Netlist sent Hynix a formal letter outlining Netlist's offer to license Netlist's patent portfolio for DDR4 RDIMMs and LRDIMMs on reasonable terms and conditions that are free of any unfair discrimination. Netlist again identified specific patents, including the parents of the asserted patents, and informed Hynix that Hynix DDR4 RDIMMs and LRDIMMs practice Netlist's standard-essential patents. Hynix did not accept Netlist's reasonable, good-faith offer.

46. In sum, Netlist has tried for years to reach agreement with Hynix, whether in the context of a broader business arrangement that would have resolved Hynix's liability under Netlist's portfolio or in negotiations focused solely on a unilateral patent license. All of these efforts have been met with Hynix's ongoing holdout and efficient infringement of Netlist's intellectual property. Instead of abiding by its lip service that it is a "willing licensee," Hynix has chosen to use Netlist's fundamental intellectual property without any compensation to Netlist. Hynix has therefore not fulfilled its obligations to remain a third-party beneficiary of the contract between Netlist and JEDEC. Netlist is now forced to take further action to protect its intellectual property rights through an exclusion order directed to the accused products.

#### **IV. THE ASSERTED PATENTS AND NON-TECHNICAL DESCRIPTIONS OF THE INVENTIONS.**

47. The following non-technical descriptions of the patented technology are provided solely for the convenience of the Commission and to comply with the Commission Rules. These descriptions are not intended to—and do not—limit, define, or otherwise affect or inform the construction and/or application of each patent's claim language and should not be understood to do so.

**A. Overview And Ownership Of The Asserted Patents.**

48. As set forth below, Netlist owns by assignment the entire right, title and interest in and to each of the asserted patents. *See* Exhibits 3 and 4.

49. Pursuant to Commission Rule 210.12(c), certified copies of the prosecution histories of each of the asserted patents have been submitted with this Complaint as Appendices A to B. Pursuant to Commission Rule 210.12(c), the cited references for each of the asserted patents also have been submitted with this Complaint as Appendices C to D.<sup>3</sup>

**C. Non-Technical Description Of The '907 Patent**

50. The '907 patent, titled "Memory module with distributed data buffers and method of operation," issued on March 28, 2017 to inventors Hyun Lee and Jayesh R. Bhakta. The '907 patent issued from United States Patent Application No. 13/970,606 filed on August 20, 2013. The '907 patent is a direct continuation, or child, of Patent No. 8,516,185 ("the '185 patent"). Netlist owns by assignment the entire right, title and interest in and to the '907 patent.

51. The '907 patent has 65 claims, six independent claims and 59 dependent claims.

52. In non-technical terms, the '907 patent discloses and claims a memory module with a central module control circuit and a distributed buffer architecture. As disclosed and claimed in the '907 patent, the memory module also includes at least two sets of memory devices, which are configured to output or receive data in response to control signals from the module control circuit. The claimed distributed buffer architecture includes a plurality of buffer circuits for facilitating, in response to control signals from the module control circuit, the communication of data between a host computer system and the memory devices. The buffer circuits claimed in the '907 patent are positioned on the memory module separate from one

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<sup>3</sup> Netlist has been unable to locate a few cited references for the asserted patents, but is continuing to work to locate those references and will provide them when possible.

another, such as distributed along the edge of the memory module. This distributed placement of the buffers reduces electrical loading on the system by buffering data signals while providing shorter, more uniform data paths between the host system and the memory devices than could be achieved with all data signal buffering performed in a central location. The innovations taught by the '907 patent provide a variety of benefits, including enhanced performance, reduced power requirements and higher speeds, among others.

**G. Non-Technical Description Of The '623 Patent**

53. The '623 patent, entitled “Memory module capable of handshaking with a memory controller of a host system,” issued to inventor Dr. Hyun Lee on January 3, 2017. The '623 patent issued from Application No. 15/169,745, filed on June 1, 2016. The '623 Patent is a child of Patent No. 8,489,837 (“the '837 patent”). Netlist owns by assignment the entire right, title and interest in and to the '623 patent.

54. The '623 patent has 29 claims, three independent claims and 26 dependent claims.

55. In non-technical terms, the '623 patent discloses and claims a memory module that can operate in at least two distinct modes: a first mode during which parity errors are driven to the memory controller of the host system, and a second mode during which the module performs one or more training sequences. Establishing the proper timing for memory modules is critically important for proper operation, and is particularly challenging given the speed of the memory channel. This includes the timing between the host memory controller and the memory module. The '623 patent discloses and claims various mechanisms that are particularly effective when setting the proper phase relationships between the system clock and the address, command, and control signals. These phase relationships must be set properly for the module to operate—otherwise, the memory module is not able to receive address, command, and control signals from the host memory controller. The claimed memory module includes a module controller that

causes the module to enter the second mode in response to signals it receives from a host system, and which provides a notification signal to the memory controller of that host system indicating a status of the training sequence. This notification signal eliminates the need for the host memory controller to poll the memory module to determine the status of the training sequence.

#### **H. Foreign Counterparts**

56. A list of foreign counterparts to the asserted patents is provided as Exhibit 7.

Netlist owns all right, title and interest in and to each of these foreign counterparts.

57. Netlist is not aware of any other counterparts or foreign counterpart applications corresponding to the asserted patents that have been issued, abandoned, denied, or which remain pending.

#### **I. Licenses**

58. Exhibit 8 includes a list of licensed entities for the asserted patents. Netlist is not aware of any other current licenses involving the asserted patents.

### **V. UNLAWFUL AND UNFAIR ACTS OF RESPONDENTS—PATENT INFRINGEMENT**

59. Respondents manufacture abroad, sell for importation into the United States, import into the United States, and/or sell within the United States after importation, memory modules and components thereof, including accused LRDIMM and RDIMM products, that infringe one or more of the asserted patents.

60. Each of the Respondents has directly infringed and continues to directly infringe the asserted patents by making, using, selling, offering for sale, and importing the articles claimed by, or practicing the claimed methods of, the asserted patents. As discussed above, on information and belief, each of the Respondents has been aware of the parents of the asserted patents since at least January 2016 when Netlist presented to the Respondents detailed claim

charts related to the '185 and '837 Patents. As discussed in more detail below, each of the Respondents has been aware of the asserted patents themselves since at least June of 2017, when Netlist filed suit against Respondents in the Central District of California, and provided Respondents with detailed claim charts related to the '907 and '623 patents.

61. On information and belief, each of the Respondents has indirectly infringed and continues to indirectly infringe the asserted patents by contributing to and/or inducing the infringement of these patents by end users of the accused products, because each of the Respondents knows that the use of the infringing memory modules and components thereof, together with instructions provided in user manuals, service manuals, guides and other materials, constitutes infringement of the asserted patents.

**B. The '907 Patent**

62. On information and belief, the accused LRDIMM products and/or the normal operation thereof infringes at least claims 1-8, 10, 12, 14-22, 24, 25, 27, 29-35, 38, 43-45, 47, 48, 50, 52, and 58 of the '907 patent. Additionally, on information and belief, users making routine use of the accused LRDIMM products infringe at least claims 1-8, 10, 12, 14-25, 27, 29-35, 38, 43-45, 47, 48, 50, 52, and 58 of the '907 patent. As set forth in Section VIII, and on information and belief, Respondents have been aware of the '907 patent since at least June 14, 2017. Further, on information and belief, each of the Respondents was aware that the accused LRDIMM products infringe at least the claims specified above of the '907 patent, and was aware that users making routine use of the accused LRDIMM products infringe those claims. On information and belief, each of the Respondents specifically intended that users of the accused LRDIMM products infringe at least claims 1-8, 10, 12, 14-25, 27, 29-35, 38, 43-45, 47, 48, 50, 52, and 58 of the '907 patent, and took actions while the '907 patent was in force intending to cause the infringing acts, including the infringing routine use of the accused LRDIMM products by users.



For example, on information and belief, Respondents provide specifications, datasheets, instruction manuals, and/or other materials that encourage and facilitate infringing use of the accused LRDIMM products by users with the intent of inducing infringement. *See, e.g.*, Exhibits 9 and 10. On information and belief, each of the Respondents contributes to the direct infringement of at least claims 1-8, 10, 12, 14-25, 27, 29, 30-35, 38, 43-45, 47, 48, 50, 52, and 58 of the '907 patent by users making routine use of the accused LRDIMM products. On information and belief, Respondents have sold, offered for sale and/or imported within the United States the accused LRDIMM products for use in a product or process that practices those claims, while the '907 patent has been in force. On information and belief, the accused LRDIMM products have no substantial noninfringing use, and constitute a material part of the patented invention. On information and belief, each of the Respondents is aware that the product or process that includes the accused LRDIMM products may be covered by a claim of the '907 patent or may satisfy a claim of the '907 patent under the doctrine of equivalents. On information and belief, the use of the product or process that includes the accused LRDIMM products infringes at least claims 1-8, 10, 12, 14-25, 27, 29, 30-35, 38, 43-45, 47, 48, 50, 52, and 58 of the '907 patent.

63. An exemplary claim chart comparing the asserted independent claims of the '907 patent to an exemplary one of the accused LRDIMM products (part number HMA84GL7AMR4N-UH) is attached as Exhibit 11.

**F. The '623 Patent**

64. On information and belief, the accused LRDIMM and RDIMM products and/or the normal operation thereof infringes at least claims 1-15, 17-25, 27, and, 29 of the '623 patent. Additionally, on information and belief, users making routine use of the accused LRDIMM and RDIMM products infringe at least claims 1-15, 17-25, 27, and 29 of the '623 patent. As set forth

in Section VIII, and on information and belief, Respondents have been aware of the '623 patent since at least June 14, 2017. Further, on information and belief, each of the Respondents was aware that the accused LRDIMM and RDIMM products infringe at least claims 1-15, 17-25, 27, and 29 of the '623 patent, and was aware that users making routine use of the accused LRDIMM and RDIMM products infringe those claims. On information and belief, each of the Respondents specifically intended that users of the accused LRDIMM and RDIMM products infringe at least claims 1-15, 17-25, 27, and 29 of the '623 patent, and took actions while the '623 patent was in force intending to cause the infringing acts, including the infringing routine use of the accused LRDIMM and RDIMM products by users. For example, on information and belief, Respondents provide specifications, datasheets, instruction manuals, and/or other materials that encourage and facilitate infringing use of the accused LRDIMM and RDIMM products by users with the intent of inducing infringement. *See, e.g.*, Exhibits 9, 10, and 12. On information and belief, each of the Respondents contributes to the direct infringement of at least claims 1-15, 17-25, 27, and 29 of the '623 patent, including the infringing routine use of the accused LRDIMM and RDIMM products by users. On information and belief, Respondents have sold, offered for sale and/or imported within the United States the accused LRDIMM and RDIMM products for use in a product or process that practices those claims, while the '623 patent has been in force. On information and belief, the accused LRDIMM and RDIMM products have no substantial noninfringing use, and constitute a material part of the patented invention. On information and belief, each of the Respondents is aware that the product or process that includes the accused LRDIMM and RDIMM products may be covered by a claim of the '623 patent or may satisfy a claim of the '623 patent under the doctrine of equivalents. On information and belief, the use of

the product or process that includes the accused LRDIMM and RDIMM products infringes at least claims 1-15, 17-25, 27, and, 29 of the '623 patent.

65. An exemplary claim chart comparing the asserted independent claims of the '623 patent to an exemplary one of the accused LRDIMM products (part number HMA84GL7AMR4N-UH) is attached as Exhibit 13.

66. An exemplary claim chart comparing the asserted independent claims of the '623 patent to exemplary one of the accused RDIMM products (part number HMA42GR7AFR4N-UH) is attached as Exhibit 14.

## **VI. SPECIFIC INSTANCES OF UNFAIR IMPORTATION AND SALE**

67. Respondents import, sell for importation and/or sell within the United States after importation the infringing articles. The specific instances of importation of infringing articles set forth below are representative examples of Respondents' unlawful importation of infringing articles.

68. An exemplary accused product, the Hynix DDR4 LRDIMM, part number HMA84GL7AMR4N-UH,<sup>4</sup> was sold in the United States on or around August 18, 2017. The receipt for this purchase is attached as Exhibit 15<sup>5</sup>. According to the product packaging/labels and a Part Number Decoder available on SK hynix's website, Korea is the country of origin for the Hynix DDR4 LRDIMM, part number HMA84GL7AMR4N-UH. *See* Exhibits 16 and 17. Thus, the Hynix DDR4 LRDIMM, part number HMA84GL7AMR4N-UH, is imported into the United States.

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<sup>4</sup> Netlist has provided an exemplary Hynix DDR4 LRDIMM as a physical exhibit to its Complaint (see Physical Exhibit 1).

<sup>5</sup> The order placed for LRDIMM HMA84GL7AMR4N-UH indicated an "option code" of T2, but an LRDIMM with option code TE was received instead. Referring to Exhibits 9 and 17, and upon information and belief, the only difference between these modules is the supplier to Hynix of the interchangeable JEDEC compliant RCD and DB components.

69. Another exemplary accused product, the Hynix DDR4 RDIMM, part number HMA42GR7AFR4N-UH,<sup>6</sup> was sold in the United States on or around August 17, 2017. The receipt for this purchase is attached as Exhibit 18.<sup>7</sup> According to the product packaging/labels and a Part Number Decoder available on SK hynix's website, China is the country of origin for the Hynix DDR4 RDIMM, part number HMA42GR7AFR4N-UH. *See* Exhibits 19 and 17. Thus, the Hynix DDR4 RDIMM, part number HMA42GR7AFR4N-UH is imported into the United States.

## **VII. HARMONIZED TARIFF SCHEDULE ITEM NUMBERS**

70. On information and belief, the accused products fall within at least the following classification of the Harmonized Tariff Schedule (“HTS”) of the United States: 8473.30.11.40. The HTS number is intended to be for illustration only and is not exhaustive of the products accused of infringement in this Complaint. The HTS number is not intended to limit the scope of the Investigation.

## **VIII. RELATED LITIGATION**

71. On June 14, 2017, Netlist filed suit against Respondents in the Central District of California, alleging infringement of the '907 and '623 patents. *Netlist, Inc. v. SK hynix Inc. et al.*, Case No. 8:16-cv-1605 Dkt. No. 1, Compl. (C.D. Cal. Aug. 31, 2016). On the same day, Netlist provided a courtesy copy of this complaint to outside counsel for Respondents. Netlist formally served SK hynix America Inc. and SK hynix memory solutions Inc. on June 19, 2017, and SK hynix Inc. waived service of the summons of Netlist's complaint on July 13, 2017.

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<sup>6</sup> Netlist has provided an exemplary Hynix DDR4 RDIMM as a physical exhibit to its Complaint (see Physical Exhibit 2).

<sup>7</sup> The order placed for HMA42GR7AFR4N-UH indicated an “option code” of T2, but an RDIMM with option code TD was received instead. Referring to Exhibits 9 and 17, and upon information and belief, the only difference between these modules is the supplier to Hynix of the interchangeable JEDEC-compliant RCD component.

72. Other than the litigation specified above, to Complainant's knowledge the Asserted Patents are not and have not been the subject of any current or prior litigation.

73. On September 1, 2016 Netlist filed a complaint at the International Trade Commission, alleging a violation of Section 337 of the Tariff act of 1930, as amended, 19 U.S.C. § 1337, by Respondents related to the infringement of, among other patents, U.S. Patent Nos. 8,516,185 and 8,489,837, each parents of the patents asserted in this Complaint. The Commission later instituted Investigation No. 337-TA-1023, *Certain Memory Modules and Components thereof, and Products Containing Same*, on the September 1, 2016 complaint.

## **IX. THE DOMESTIC INDUSTRY**

74. There is a domestic industry established, as defined under 19 U.S.C. § 1337(a)(3)(A), (B), and (C), comprising significant and substantial investments in physical operations, employment of labor and capital and exploitation of each of the asserted patents. Alternatively, a domestic industry, as required by 19 U.S.C. §§ 1337(a)(2) and (3), is in the process of being established relating to Netlist products protected by each of the asserted patents.

### **A. Netlist's Practice of the Asserted Patents**

75. Netlist's high-performance memory modules practice one or more claims of the asserted patents. In particular, Netlist HybriDIMM memory module products practice at least the asserted independent claims of the '907 patent, and the asserted independent claims of the '623 patent. Specific examples of use are described in this section, below, and are charted in Confidential Exhibits 20C through 21C.

76. The '907 patent is practiced by Netlist's memory module products, including the HybriDIMM products. A claim chart comparing Netlist's HybriDIMM product to exemplary claim 1 of the '907 patent is attached as Confidential Exhibit 20C.

77. The '623 patent is practiced by Netlist's memory module products, including the HybriDIMM products. A claim chart comparing Netlist's HybriDIMM product to exemplary claim 1 of the '623 patent is attached as Confidential Exhibit 21C.

**B. Netlist's Significant and Substantial Domestic Industry Investments.**

78. Netlist has a domestic industry that exists, or is in the process of being established, as to its next-generation product HybriDIMM, Netlist's latest breakthrough product that is currently out for customer evaluation, and Netlist's exploitation of each of the asserted patents and the patented technology incorporated into HybriDIMM.<sup>8</sup>

79. Netlist makes extensive use of the inventions claimed in the asserted patents in its HybriDIMM products. HybriDIMM was built upon Netlist's patented technology, much of which was initially patented during the development of Netlist's prior generation HyperCloud product. HybriDIMM is the evolutionary next step in Netlist's long commitment to innovation. Netlist engineers working in Irvine, California, invented the technology of the asserted patents and worked to implement the patented inventions into Netlist's HybriDIMM products, which were designed and developed in the United States. As set forth in greater detail above, HybriDIMM products practice the asserted patent claims and thus are Netlist domestic industry products.

80. Netlist engineers working in Irvine, California, started to design and develop the prior generation product, HyperCloud, in 2007. Netlist introduced HyperCloud in 2009 based upon Netlist's patented technology, along with an innovative distributed buffer architecture and other patented inventions at issue in this Investigation. IBM and HP are among the companies that qualified HyperCloud for use in their products and purchased HyperCloud.

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<sup>8</sup> Netlist has provided an exemplary HybriDIMM memory module as a physical exhibit to this Complaint (see Physical Exhibit 3).

81. Netlist engineers working in Irvine, California, started to design and develop HybriDIMM in 2013, building upon HyperCloud's then-existing design and the technology of the asserted patents. Netlist's next-generation HybriDIMM technology is designed to be compatible with the JEDEC DDR4 LRDIMM interface. HybriDIMM is an evolved architecture that combines the proven semiconductor raw materials of DRAM and NAND into a single persistent memory space. It has the same Load / Store model as DRAM, and runs at near DRAM speed, but with capacities usually associated with traditional storage. HybriDIMM can do all of this at a greatly reduced cost compared to DRAM and without system modification. Netlist recently began shipping HybriDIMM evaluation systems to select customers.

82. On November 12, 2015, Netlist entered into a JDLA with Samsung, pursuant to which Netlist and Samsung agreed to work together to jointly develop a standardized product interface for NVDIMM-P memory modules in order to facilitate broad industry adoption of Netlist's new technology. Exhibit 22C (Sasaki Decl.) at ¶ 9. Netlist received \$8 million of non-recurring engineering fees (NRE) from Samsung for the joint development. *Id.* Since executing the JDLA, Netlist and Samsung worked to bring the compelling benefits of this new technology to a large group of customers in cloud computing, big data, and server and storage markets. By using a hybrid storage solution that appears to the system as a standard LRDIMM, customers will be able to efficiently extract intelligence from large amounts of data in storage systems. Having completed Phase One of this development project, Netlist has recently begun the next stage in its efforts to bring this first-of-its-kind technology to market, including by providing full HybriDIMM evaluation systems to select customers and by initiating discussions with Samsung for a next-phase partnership.

83. Netlist has made significant and substantial investments in the United States directly related to HybriDIMM, the inventions claimed in the asserted patents, and developing HybriDIMM to implement Netlist's patented technology. Public information regarding Netlist's investments is set forth below. Detailed confidential information about Netlist's significant and substantial investments is set forth in Confidential Exhibit 22C, the Declaration of Gail Sasaki, who is Netlist's Chief Financial Officer. *See* Confidential Exhibit 22C, Sasaki Declaration.

84. Netlist has made significant domestic investments in labor and capital with respect to HybriDIMM, the technology of the asserted patents, and developing HybriDIMM to implement Netlist's patented technology. As of September 30, 2017, Netlist had 31 regular U.S. employees. Exhibit 22C (Sasaki Decl.) at ¶ 15. Approximately half of these employees are Netlist engineers working in Irvine, California on research and development, design, engineering, and testing of HybriDIMM. Since 2013, substantially all of the research and development, design, engineering and testing of HybriDIMM was done by Netlist engineers working in Irvine, California. Other employees working in jobs other than sales and marketing support Netlist's activities with respect to research and development, design, engineering, testing and production of HybriDIMM.

85. Netlist has made significant domestic investments in facilities and equipment with respect to HybriDIMM, the technology of the asserted patents, and developing HybriDIMM to implement Netlist's patented technology. Netlist's headquarters facility is located in approximately 8,200 square feet of space in Irvine, California. Exhibit 22C-1 (Netlist 10K) at 34. Netlist's total lease expenses were \$482,000 in fiscal year 2016 (ended December 31, 2016), most of which relate to lease payments for Netlist's Irvine, California, headquarters facility. Exhibit 22C-1 (Netlist 10K) at F-25. Netlist's Irvine, California headquarters are used for



research and development, product design, engineering, testing, production support and other corporate functions. As of the end of fiscal year 2016 (December 31, 2016), Netlist held over \$14 million in property and equipment (not including the value of leased facilities). Exhibit 22C-1 (Netlist 10K) at F-17.

86. Netlist has made substantial investments in engineering, research, and development related to exploitation of the asserted patents, including investments made to invent the technology claimed in the asserted patents and develop HybriDIMM to implement Netlist's patented technology. Netlist's total expenditures for research and development were approximately \$6.3 million and \$6.0 million for 2016 and 2015, respectively. Exhibit 22C-1 (Netlist 2016 10K) at 11. As reflected in confidential Exhibit 22C, Netlist's R&D efforts with respect to the technologies of the asserted patents and their incorporation into HybriDIMM began in 2013.

87. Additional confidential business information regarding Netlist's investments in plant, equipment, labor, capital, research and development, and engineering related to HybriDIMM, the technology of the asserted patents, and development of HybriDIMM to implement Netlist's patented technology, is set forth in Confidential Exhibit 22C and in the additional confidential exhibits thereto.

88. As reflected in Confidential Exhibit 22C and in the additional confidential exhibits thereto, Netlist's domestic industry investments are significant, substantial, and ongoing.

## **X. RELIEF REQUESTED**

89. WHEREFORE, by reason of the foregoing, Netlist respectfully requests that the United States International Trade Commission:

(a) Institute an immediate investigation, pursuant to Section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337(a)(1)(B)(i) and (b)(1), with respect to violations of

Section 337 based on the importation, sale for importation, and sale after importation, into the United States of Respondents' memory modules and components thereof, including the accused LRDIMM and RDIMM products made by or on behalf of Respondents, that infringe one or more asserted claims of the '907 patent and the '623 patent;

(b) Schedule and conduct a hearing on said unlawful acts and, following said hearing, determine whether there has been a violation of Section 337;

(c) Issue a limited exclusion order, pursuant to 19 U.S.C. § 1337(d), excluding from entry into the United States articles, including the accused LRDIMM and RDIMM products made by or on behalf of Respondents, that infringe one or more asserted claims of the '907 patent and the '623 patent;

(d) Issue a permanent cease and desist order, pursuant to 19 U.S.C. § 1337(f), prohibiting Respondents, and others acting on their behalf, from importing, marketing, advertising, demonstrating, warehousing inventory for distribution, distributing, offering for sale, selling, licensing, using, or transferring outside the United States for sale in the United States any memory module products and components thereof, including the accused LRDIMM and RDIMM products made by or on behalf of Respondents, that infringe one or more asserted claims of the '907 patent and the '623 patent;

(e) Impose a bond during the 60-day Presidential review period pursuant to 19 U.S.C. § 1337(e)(1) and (f)(1) to prevent further injury to Netlist's domestic industry relating to each of the asserted patents; and

(f) Grant such other and further relief as the Commission deems just and proper based on the facts determined by the investigation and the authority of the Commission.

Dated: October 31, 2017

Respectfully Submitted,



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*Counsel for Complainant*

## VERIFICATION OF COMPLAINT

I, Noel Whitley, declare, in accordance with 19 C.F.R. § 210.12(a)(1), as follows:

1. I am currently Netlist, Inc.'s Vice President of Intellectual Property and Licensing and I am duly authorized by Netlist, Inc. to verify this Complaint;
2. I have read the Complaint and I am aware of its content;
3. The Complaint is not being presented for any improper purpose, such as to harass or to cause unnecessary delay or needless increase in the cost of the investigation or related proceeding;
4. To the best of my knowledge, information and belief founded upon reasonable inquiry, claims, defenses, and other legal contentions therein are warranted by existing law or by a non-frivolous argument for the extension, modification, or reversal of existing law or the establishment of new law;
5. The allegations and other factual contentions have evidentiary support or, if specifically so identified, are likely to have evidentiary support after a reasonable opportunity for further investigation or discovery.

I declare under the penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on October 31, 2017.



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Noel Whitley  
Vice President of Intellectual Property and Licensing  
Netlist, Inc.