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

GREENTHREAD, LLC **Plaintiff,** **vs.** **INTEL CORPORATION, DELL INC., AND DELL TECHNOLOGIES INC.;** **Defendants.**	**Civil Action No. 6:22-cv-105-ADA** **JURY TRIAL DEMANDED**

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Greenthread, LLC ("Greenthread" or "Plaintiff") files this First Amended Complaint against Intel Corporation ("Intel"), and Dell Inc. and Dell Technologies Inc. (collectively, "Dell," or "Dell Defendants," and together with Intel, "Defendants") pursuant to Local Rule CV-15, and hereby alleges as follows:

THE NATURE OF THE ACTION

1. Greenthread owns a family of patents related to transistors and other components of integrated semiconductor devices. Greenthread's patented inventions describe semiconductor devices that employ graded dopants and well regions for creating electric fields for aiding and/or limiting the movement of carriers to (or from) the semiconductor surface to (or from) the semiconductor substrate. These inventions improve semiconductor devices by (1) creating faster, more efficient, and more reliable processors, logic devices, DRAM and NAND flash, and image sensors and (2) allowing manufacturers to scale down the feature size of their semiconductor products.

2. Defendants have infringed and continue to infringe six Greenthread patents: U.S.

Patent Nos. 8,421,195 (the "'195 Patent"), 9,190,502 (the "'502 Patent"), 10,510,842 (the "'842 Patent"), 10,734,481 (the "'481 Patent"), 11,121,222 (the "'222 Patent"), and 11,316,014 (the "'014 Patent"), (collectively "the Greenthread Patents"), copies of which are attached hereto as Exhibits 1-7, respectively. Defendants have infringed and continue to infringe the Greenthread Patents by:

a. making, using, selling, offering for sale, and/or importing into the United States, semiconductor devices with infringing graded dopant regions and/or electronic products containing the same;
b. incorporating or using the above-described semiconductor devices into electronic products such as laptop computers, desktop computers, and mobile workstations.

THE PARTIES

3. Plaintiff Greenthread, LLC ("Greenthread") is a limited liability company organized and existing under the laws of Texas, having its principal place of business at 7424 Mason Dells Drive, Dallas, Texas 75230-3244.

4. Defendant Intel Corporation ("Intel") is a corporation organized and existing under the laws of the state of Delaware.

5. On information and belief, Intel owns and controls the internet domain "intel.com."

6. Intel says that it is "proud to call [Austin] Texas home."[1]

7. Defendant Dell Inc. is a corporation organized under the laws of the state of Delaware, having its principal place of business at One Dell Way, Round Rock, Texas, 78664.

8. Defendant Dell Technologies Inc. is a corporation organized and existing under the laws of Delaware, having its principal place of business at One Dell Way, Round Rock, Texas, 78682.

9. On information and belief, Dell owns and controls the internet domains "dell.com"

[1] https://www.intel.com/content/www/us/en/corporate-responsibility/intel-in-texas.html

and "delltechnologies.com."

SUBJECT MATTER JURISDICTION

10. This court has subject matter jurisdiction over the patent infringement claims asserted in this case under 28 U.S.C. §§ 1331 and 1338(a).

PERSONAL JURISDICTION, VENUE, AND JOINDER

11. Intel has a regular and established places of business in this District, including at 1300 S. Mopac Expressway, Austin, Texas 78746 and at 9442 N Capital of Texas Hwy, Bldg 2, Suite 600, Austin, Texas 78759.

12. Intel is "proud to call [Austin] Texas home."[2]

13. Intel distributes its products through, among others, Intel authorized "original equipment manufacturers" and Intel authorized "System Manufacturers" as part of the "Intel Partner Alliance."[3]

14. Dell is an Intel authorized "System Manufacturer[]," [4] an Intel authorized "original equipment manufacturer," and a "Titanium" member of the "Intel Partner Alliance."[5]

15. Intel directs persons wishing to transact business with Dell relating to Intel products (including Intel Accused Products) to contact Dell in this District at 401 Dell Way Round Rock, TX, 78664.[6]

16. Dell's principal place of business is in this District at One Dell Way, Round Rock,

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[2] https://www.intel.com/content/www/us/en/corporate-responsibility/intel-in-texas.html
[3] https://www.intel.com/content/www/us/en/partner-alliance/membership/overview.html
[4] https://www.intel.com/content/www/us/en/support/contact-intel.html?tab=system-manufacturers#
[5] https://marketplace.intel.com/s/partner/a5S3b0000016OSmEAM/dell-technologies?language=en_US&wapkw=dell
[6] https://marketplace.intel.com/s/partner/a5S3b0000016OSmEAM/dell-technologies?language=en_US&wapkw=dell

TX 78664.[7]

17. "Accused Products" are products accused of meeting the claim limitations of a Greenthread Patent in this suit.

18. "Dell Products," as used herein, means products made, used, offered for sale, or sold within the United States, and/or imported into the United States by Dell. "Dell Accused Products" are Dell Products accused of meeting the claim limitations of a Greenthread Patent in this suit, including Dell-Intel Accused Products (defined below), the Dell-Micron Accused Products (defined below), the Dell-WD Accused Products (defined below), and the Dell-Sony Accused Products (defined below). Exhibits 8-12 demonstrating how exemplary Dell-Intel Accused Products, Dell-Micron Accused Products, Dell-WD Accused Products, and Dell-Sony Accused Products meet the claim limitations of Greenthread Patents are herein incorporated by reference.

19. Dell's online retail store at Dell.com sells, offers for sale, and advertises Accused Products for sale in this District, including the accused exemplary Dell Alienware M15 R6 laptop containing the accused exemplary Intel Core i7 11800H.[8]

20. On information and belief, Dell's online retail store at Dell.com, from which it sells Dell Accused Products, is controlled by Dell from Dell's facilities in this District.

21. Best Buy is an authorized Dell retailer[9] selling and offering for sale Accused Products[10] (including Dell-Intel Accused Products containing the exemplary Intel Core i7

[7] https://www.delltechnologies.com/en-us/contactus.htm
[8] https://www.dell.com/en-us/shop/dell-laptops/alienware-m15-r6-gaming-laptop/spd/alienware-m15-r6-laptop
[9] https://www.dell.com/en-us/shop/dell/cp/reseller_store_locator
[10] "Accused Products" are all Intel Accused Products and Dell Accused Products

11800H),[11] in this District, including at 9607 Research Blvd. Suite 500, Austin, TX 78759.

22. Intel approves and authorizes sales of Dell Products through Best Buy.[12]

23. Costco is an authorized Dell retailer selling and offering for sale Accused Products (including Dell-Intel Accused Products containing the exemplary Intel Core i7 11800H)[13] in this District, including at 10401 Research Blvd, Austin, TX 78759.[14]

24. This Court has personal jurisdiction over Defendants in accordance with the Texas Long Arm Statute, Tex. Civ. Prac. & Rem. Code § 17.042, because, among other things, Defendants have contracted with Texas residents to sell Accused Products in Texas (including Defendants' agreements for Intel to sell Intel Accused Products to Dell), committed other acts of infringement in Texas, and recruited Texas residents for employment.

25. This Court has general personal jurisdiction over Defendants because Dell's principal place of business is in this District and Intel claims to be at "home"[15] in this District.

26. This Court has specific personal jurisdiction over Defendants because they have committed acts within this District giving rise to this action (including acts of infringement) and have established minimum contacts with this forum such that the exercise of jurisdiction over Defendants would not offend traditional notions of fair play and substantial justice.

27. Venue is proper in this Court pursuant to 28 U.S.C. §§ 1391 and 1400(b) because

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[11] https://www.bestbuy.com/site/dell-g15-15-6-fhd-gaming-laptop-intel-core-i7-16gb-memory-nvidia-geforce-rtx-3050-512gb-solid-state-drive-black-dark-shadow-grey/6470463.p?skuId=6470463

[12] https://www.intel.com/content/www/us/en/newsroom/news/advancing-chipmaking-4000-steps.html#gs.k3n0p9; https://www.intel.com/content/www/us/en/products/docs/devices-systems/laptops/laptop-innovation-program/a-shared-vision-for-the-future-of-computing.html

[13] https://www.costco.com/dell-xps-17-laptop---11th-gen-intel-core-i7-11800h---geforce-rtx-3050---windows-11.product.100808060.html

[14] https://www.dell.com/en-us/shop/dell/cp/reseller_store_locator

[15] https://www.intel.com/content/www/us/en/corporate-responsibility/intel-in-texas.html

Defendants reside in this District.

28. Venue is proper in this Court pursuant to 28 U.S.C. §§ 1391 and 1400(b) because Defendants have regular and established places of business in this district and have committed acts of infringement in this district.

29. Joinder of Defendants is proper under 35 U.S.C. § 299, because Greenthread's right to relief arises from the same transactions or occurrences regarding the same Accused Products (such as Intel's sale of Intel Accused Products to Dell) and questions of fact common to all Defendants will arise in this action.

THE GREENTHREAD PATENTS

30. On April 16, 2013, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 8,421,195 ("the '195 Patent"), entitled "Semiconductor Devices with Graded Dopant Regions," listing Dr. Mohan Rao as the inventor, from a patent application filed January 12, 2007. The '195 Patent claims priority from U.S. Patent Application No. 10/934,915,[16] filed on September 3, 2004. A true and correct copy of the '195 Patent is attached hereto as Exhibit 1 and incorporated herein by reference.

31. On November 17, 2015, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 9,190,502 ("the '502 Patent"), entitled "Semiconductor Devices with Graded Dopant Regions," listing Dr. Mohan Rao as the inventor, from a patent application filed October 16, 2014. The '502 Patent claims priority from U.S. Patent Application No. 10/934,915,[17] filed on September 3, 2004. A true and correct copy of the '502 Patent is attached hereto as Exhibit 2 and incorporated herein by reference.

[16] Pub. No. US 2006/0049464.
[17] Pub. No. US 2006/0049464.

32. On December 17, 2019, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 10,510,842 ("the '842 Patent"), entitled "Semiconductor Devices with Graded Dopant Regions," listing Dr. Mohan Rao as the inventor, from a patent application filed on May 9, 2017. The '842 Patent claims priority from U.S. Patent Application No. 10/934,915,[18] filed on September 3, 2004. A true and correct copy of the '842 Patent is attached hereto as Exhibit 3 and incorporated herein by reference.

33. On August 4, 2020, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 10,734,481 ("the '481 Patent"), entitled "Semiconductor Devices with Graded Dopant Regions," listing Dr. Mohan Rao as the inventor, from a patent application filed on December 17, 2019. The '481 Patent claims priority from U.S. Patent Application No. 10/934,915,[19] filed on September 3, 2004. A true and correct copy of the '481Patent is attached hereto as Exhibit 4 and incorporated herein by reference.

34. On September 14, 2021, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 11,121,222 ("the '222 Patent"), entitled "Semiconductor Devices with Graded Dopant Regions," listing Dr. Mohan Rao as the inventor, from a patent application filed on July 27, 2020. The '222 Patent claims priority from U.S. Patent Application No. 10/934,915,[20] filed on September 3, 2004. A true and correct copy of the '222 Patent is attached hereto as Exhibit 5 and incorporated herein by reference.

35. On April 26, 2022, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 11,316,014 ("the '014 Patent"), entitled "Semiconductor Devices with Graded Dopant Regions," listing Dr. Mohan Rao as the inventor, from a patent application filed on July 9,

[18] Pub. No. US 2006/0049464.
[19] Pub. No. US 2006/0049464.
[20] Pub. No. US 2006/0049464.

2021. The '014 Patent claims priority from U.S. Patent Application No. 10/934,915,[21] filed on September 3, 2004. A true and correct copy of the '014 Patent is attached hereto as Exhibit 6 and incorporated herein by reference.

36. The '195, '502, '842, '481, '222, and '014 Patents are collectively referred to as the "Greenthread Patents."

37. Greenthread exclusively owns all rights, title, and interest in the Greenthread Patents necessary to bring this action, including the right to recover past and future damages. Certain of the Greenthread Patents were previously owned by Dr. G.R. Mohan Rao ("Dr. Rao"). On April 27, 2015, Dr. Rao assigned to Greenthread the then-issued Greenthread Patents and all related "continuations, continuations-in-part and extensions of said Applications and Patents and any pending applications or issued patents that directly claim or are amended to claim priority to any of the Applications or Patents." Dr. Rao's assignment was recorded with the U.S. Patent and Trademark Office on May 13, 2015, and again on July 22, 2021, and is attached hereto as Exhibit 7. Greenthread has therefore owned all rights to the Greenthread Patents necessary to bring this action throughout the period of Dell's and Intel's infringement and still owns those rights to the Greenthread Patents.

38. Dell and Intel are not currently licensed to practice the Greenthread Patents.

39. The Greenthread Patents are valid and enforceable.

FACTUAL BACKGROUND

40. Dr. G.R. Mohan Rao ("Dr. Rao"), the sole inventor of the Greenthread Patents, has been an innovator in the semiconductor industry since the 1960s. He is a named inventor on more than 100 Patents worldwide and authored numerous technical publications over the last 50 years.

[21] Pub. No. US 2006/0049464.

41. In September 1968, Dr. Rao received a Ph.D. in physics with a specialization in electronics from Andhra University in Waltair, India. He then traveled to the United States to attend a graduate program in physics at the University of Cincinnati.

42. After learning of an opportunity to work with Professor William Carr of Southern Methodist University ("SMU"), Dr. Rao transferred to SMU where he earned a Ph.D in Electrical Engineering. While there, he worked in the SMU laboratory with Jack Kilby of Texas Instruments (a pioneering electrical engineer who would later receive a Nobel Prize for his work), on metal-oxide-silicon transistors ("MOS devices"), which are used for switching and amplifying electronic signals in electronic devices. MOS devices form the basis of modern electronics and are the most widely used semiconductor devices in the world. The U.S. Patent and Trademark Office has called this device a "groundbreaking invention that transformed life and culture around the world."[22] Dr. Rao built these devices from scratch while a graduate student at SMU.

43. Through his mentor, Jack Kilby, Dr. Rao interviewed with—and was ultimately hired by—Texas Instruments to continue his work on MOS devices in 1972. Dr. Rao worked at Texas Instruments for the next twenty-two years, rising from an engineer to a Senior Fellow. At that time, Texas Instruments had only 12 Senior Fellows out of approximately 20,000 engineers. Eventually, Dr. Rao moved into a management position at Texas Instruments, ultimately becoming a Senior Vice President in 1985.

44. At Texas Instruments, Dr. Rao received his first patent while working in a process and product engineering capacity to solve a production problem with Texas Instruments' 4-kilobit RAM product. That patent was merely the beginning of Dr. Rao's long inventive career. Indeed,

[22] https://www.uspto.gov/about-us/news-updates/remarks-director-iancu-2019-international-intellectual-property-conference

from the late 1970s through the mid-1980s, Dr. Rao worked on or managed projects relating to Texas Instruments' 64kb RAM, 256Kb RAM, 1Mb RAM, 4 Mb RAM, EEPROM, SRAM, and microcontrollers. For that work, Dr. Rao received numerous additional U.S. Patents.

45. The USPTO was not the only organization to recognize Dr. Rao's achievements. Some of Dr. Rao's work at Texas Instruments was so remarkable that it has been credited in multiple exhibits in the National Museum of American History at the Smithsonian Institution.[23] For example, the Smithsonian has displayed Texas Instruments' experimental 1-megabit CMOS DRAM, produced in April 1985 under Dr. Rao's leadership, and credited Dr. Rao for the achievement.[24]

46. In 1994, Dr. Rao left Texas Instruments for Cirrus Logic. During his two-year

[23] http://smithsonianchips.si.edu/texas/wafer.htm
[24] http://smithsonianchips.si.edu/texas/t_360.htm

tenure at Cirrus Logic, he received more U.S. Patents relating to his work on integrated graphics controllers and memory.

47. In 1996, Dr. Rao started a company called Silicon Aquarius. Through a relationship between Silicon Aquarius and Matsushita, Dr. Rao led a design team in working on a 256Mb DRAM chip. After Silicon Aquarius ceased operations, Dr. Rao did consulting work for a number of different consulting companies and devoted much of his free time to thinking about various challenges and problems with which the semiconductor industry had struggled for years.

48. In 2003, Dr. Rao and Philip John founded Greenthread to continue Dr. Rao's pioneering work. A focal point of Dr. Rao's research was poor refresh time and the related problem of how to deal with and control the movement of both wanted and unwanted carriers in semiconductor devices, including memory and logic devices. Dr. Rao realized that graded dopants could be used to create a "drift layer" and other structures to facilitate the movement—in an upward or downward direction, as appropriate—of carriers from the semiconductor surfaces down into the substrate and vice versa. It was Dr. Rao's work on this problem that culminated in the Greenthread Patents.

INTEL'S INFRINGEMENT

49. Intel has directly infringed, and continues to infringe, one or more claims of each of the Greenthread Patents through making, using, offering to sell, selling within the United States, and/or importing into the United States semiconductor products that practice the claimed inventions, including Intel Accused CPUs and Intel Accused Flash Memory Products ("Intel Accused Products").

A. Intel Accused CPUs

50. The Intel Accused CPUs include all CPUs designed or manufactured (in whole or

in part) by Intel, including Intel's 12th generation of semiconductors labeled as "Alder Lake," Intel's 11th generation of semiconductors labeled as "Tiger Lake," and Intel's 10th generation of semiconductors labeled as "Comet Lake." An exemplary list of Intel Accused CPUs is identified in Exhibit 8.

51. As shown in Exhibit 9 the Intel Core i7 11800H CPU meets each and every element of at least one claim of the Greenthread Patents.

52. Upon information and belief, Intel fabricates CPUs using similar designs according to a limited number of processes, many or all of which utilize substantially similar process steps, including process steps for creating regions with graded dopant concentrations. Upon information and belief, the Intel Accused CPUs are in relevant part substantially similar to the exemplary Intel Core i7 11800H, in particular with regard to the manner in which the exemplary Intel Core i7 11800H includes and utilizes regions with graded dopant concentrations. Exhibit 9 is thus illustrative of the manner in which each of the Intel Accused CPUs infringes.

53. Greenthread reserves the right to amend its list of Intel Accused Products, including based on information learned in discovery.

B. Intel Accused Flash Memory Products

54. Intel Accused Flash Memory Products include all flash memory products designed or manufactured (in whole or in part) by Intel. Flash memory products include solid state drives ("SSDs"), microSD/SD cards, and thumb drives.

55. As shown in Exhibit 10 the Micron 16 nm node NAND flash memory meets each and every element of at least one claim of the Greenthread Patents.

56. The exemplary Micron 16 nm node NAND flash memory analyzed in Exhibit 10 bears Intel Die markings and was manufactured by Intel.

Figure 1.1.2: Die markings (optical), 16 nm MLC NAND flash memory of IMFT

57. Upon information and belief, Intel designs and/or fabricates flash memory products using similar designs according to a limited number of processes, many or all of which utilize substantially similar process steps, including process steps for creating regions with graded dopant concentrations.

58. Upon information and belief, the Intel Accused Flash Memory Products are in relevant part substantially similar to the exemplary Micron 16 nm node NAND flash memory analyzed in Exhibit 10, in particular with regard to the manner in which the exemplary flash memory product includes and utilizes regions with graded dopant concentrations. Exhibit 10 is thus illustrative of the manner in which each of the Intel Accused Flash Memory Products.

59. Greenthread reserves the right to amend its list of Intel Accused Products, including based on information learned in discovery.

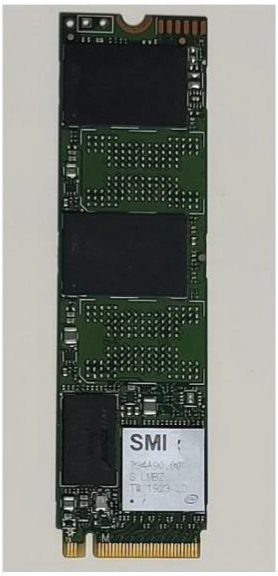
DELL'S INFRINGEMENT

60. Greenthread incorporates by reference the preceding paragraphs as though fully set forth herein. Greenthread further incorporates by reference Exhibit 8-12, which further detail Dell's infringement for each category of Accused Products identified below. As described below Dell infringes the Greenthread Patents by making, using, offering to sell, selling within the United States, and/or importing into the United States the Dell Accused Products, which include at least Dell-Intel Accused Products (defined below), the Dell-Micron Accused Products (defined below), the Dell-WD Accused Products (defined below), and the Dell-Sony Accused Products (defined below).

A. Dell-Intel Accused Products

61. In concert with Intel, through the "Intel Partner Alliance," Dell incorporates many Intel Accused CPUs and Intel Accused Flash Memory Products ("Intel Accused Products") into Dell Products and/or many Dell Products comprise Intel Accused Products. Dell Products incorporating or comprising Intel Accused Products are the "Dell-Intel Accused Products," regardless of how such products are branded.

62. For example, the Intel Core i7 11800H analyzed in Exhibit 9 was obtained from a Dell Alienware M15 R6 laptop purchased in the United States. That same laptop included flash memory manufactured by Intel, as shown below. The laptop is therefore a Dell-Intel Accused Product both because it incorporates an Accused Intel CPU and because it incorporates an Intel Accused Flash Memory Product. By way of further example, Dell incorporates the Intel Core i7 11800H into other Dell Products, including Inspiron, New Inspiron, XPS, New XPS, G15, and Alienware laptops. Such Dell Products are Dell-Intel Accused Products. An exemplary list of Dell-Intel Accused Products is identified in Exhibit 8.



63. Dell has directly infringed, and continues to infringe, one or more claims of each of the Greenthread Patents through making, using, offering to sell, selling within, and/or importing into the United States Dell-Intel Accused Products, including the exemplary Dell Alienware M15 R6 laptop. Greenthread reserves the right to amend its list of Dell-Intel Accused Products, including based on information learned in discovery.

B. Dell-Micron Accused Products

64. Dell-Micron Accused Products include all Dell Products containing or comprising flash memory designed or manufactured (in whole or in part) by Micron Technology, Inc., Micron Semiconductor Products, Inc., Micron Technology Texas, LLC and/or their affiliates ("Micron") regardless of how such products are branded. Flash memory products include SSDs, microSD/SD cards, and thumb drives.

65. As shown in Exhibit 10, the exemplary Micron 16 nm node NAND flash memory meets each and every element of at least one claim of the Greenthread Patents.

66. Upon information and belief, Micron fabricates and designs flash memory using similar designs according to a limited number of processes, many or all of which utilize

substantially similar process steps, including process steps for creating regions with graded dopant concentrations. Upon information and belief, the Micron flash memory products are in relevant part substantially similar to the exemplary Micron 16 nm node NAND flash memory shown in Exhibit 10, particularly with regard to the manner in which the exemplary Micron 16 nm node flash memory includes and utilizes regions with graded dopant concentrations. Exhibit 10 is thus illustrative of the manner in which Dell-Micron Accused Products meet the claim limitations of the Greenthread Patents.

67. Upon information and belief, Dell has infringed, and continues to infringe, one or more claims of each of the Greenthread patents through making, using, offering to sell, selling within the United States, and/or importing into the United States Dell-Micron Accused Products.

68. For example, Dell's website states that numerous Dell PCs incorporate Micron SSDs:[25]

Note: A computer restart usually recovers the computer, there has been no data loss reported.

Dell computers that use Micron SSDs:

- Precision Fixed Workstations
- Precision Mobile Workstations
- Latitude
- OptiPlex
- XPS Desktops
- XPS Notebooks
- Vostro Desktops
- Vostro Notebooks
- Inspiron Desktops
- Inspiron Notebooks
- Alienware Desktops
- Alienware Notebooks

69. The Dell-Micron Accused Products include Precision Fixed Workstations, Precision Mobile Workstations, Latitude, Optiplex, XPS Desktops, XPS Notebooks, Vostro

[25] https://www.dell.com/support/kbdoc/en-nz/000126687/micron-2200s-pcie-nvme-ssds-exhibit-intermittent-bsod-and-drive-detection-errors

Desktops, Inspiron Desktops, Inspiron Netbooks, Alienware Desktops, and Alienware Notebooks.

C. Dell-WD Accused Products

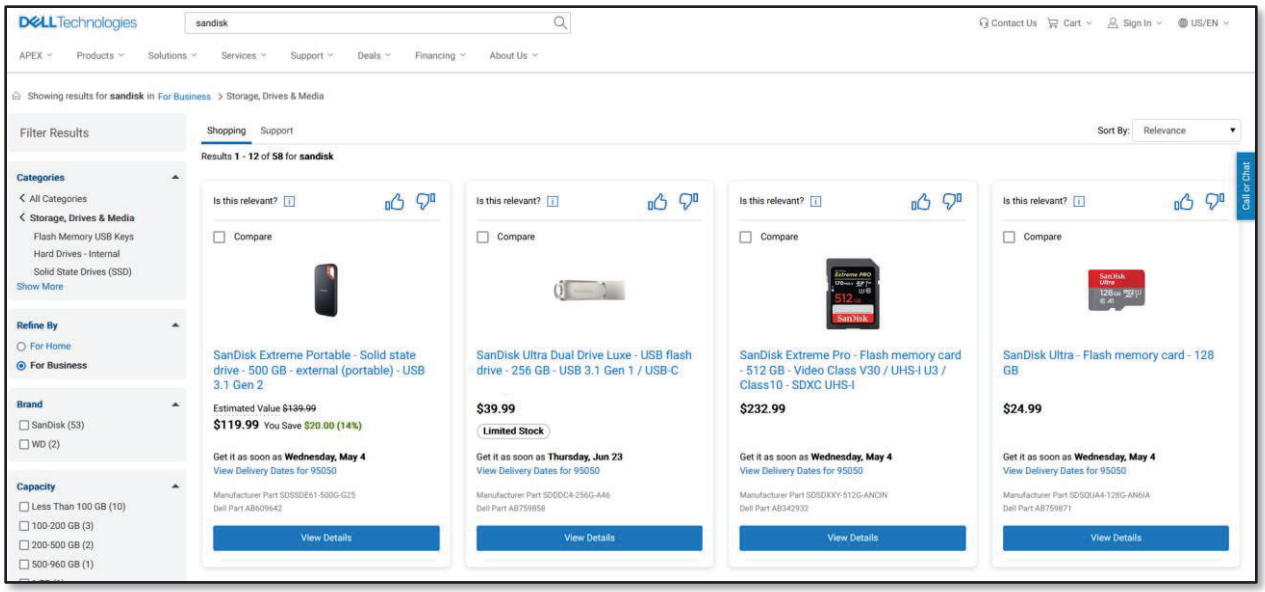
70. Dell-WD Accused Products include all Dell Products containing or comprising flash memory designed or manufactured (in whole or in part) by Western Digital Corporation, Western Digital Technologies, Inc., HGST, Inc., SanDisk LLC, SanDisk Holdings LLC, SanDisk Technologies LLC and/or their affiliates ("Western Digital" or "WD") regardless of how such products are branded. Flash memory products include SSDs, microSD/SD cards, and thumb drives.

71. As shown in Exhibit 11, the SanDisk 15 nm 16 GB NAND flash memory meets each and every element of at least one claim of the Greenthread Patents.

72. Upon information and belief, WD fabricates and designs flash memory using similar designs according to a limited number of processes, many or all of which utilize substantially similar process steps, including process steps for creating regions with graded dopant concentrations. Upon information and belief, WD flash memory products are in relevant part substantially similar to the exemplary SanDisk 15 nm 16 GB NAND flash memory shown in Exhibit 11, in particular with regard to the manner in which the exemplary SanDisk 15 nm 16 GB NAND flash memory includes and utilizes regions with graded dopant concentrations. Exhibit 11 is thus illustrative of the manner in which Dell-WD Accused Products meet the claim limitations of the Greenthread Patents.

73. Upon information and belief, Dell has infringed, and continues to infringe, one or more claims of each of the Greenthread patents through making, using, offering to sell, selling within the United States, and/or importing into the United States Dell-WD Accused Products.

74. For example, Dell's website advertises dozens of Dell-WD Accused Products.



75. An exemplary list of Dell-WD Accused Products is identified in Exhibit 8. Greenthread reserves the right to amend its list of Dell-WD Accused Products, including based on information learned in discovery.

D. Dell-Sony Accused Products

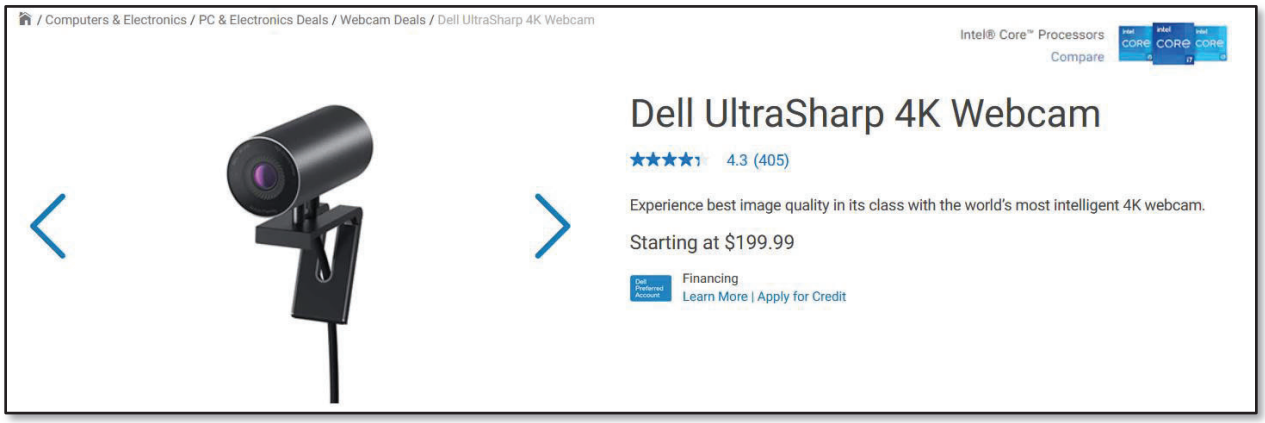
76. Dell-Sony Accused Products include all Dell Products containing or comprising image sensors designed or manufactured (in whole or in part) by Sony Corporation, Sony Semiconductor Solutions, Sony Global Manufacturing & Operations, Sony Electronics Inc., Sony Corporation of America or their affiliates ("Sony") regardless of how such products are branded.

77. As shown in Exhibit 12, an exemplary Sony image sensor meets each and every element of at least one claim of certain of the Greenthread Patents.

78. Upon information and belief, Sony fabricates and designs image sensors using similar designs according to a limited number of processes, many or all of which utilize substantially similar process steps, including process steps for creating regions with graded dopant concentrations. Upon information and belief, Sony image sensors are in relevant part substantially similar to the exemplary image sensor shown in Exhibit 12, in particular with regard to the manner

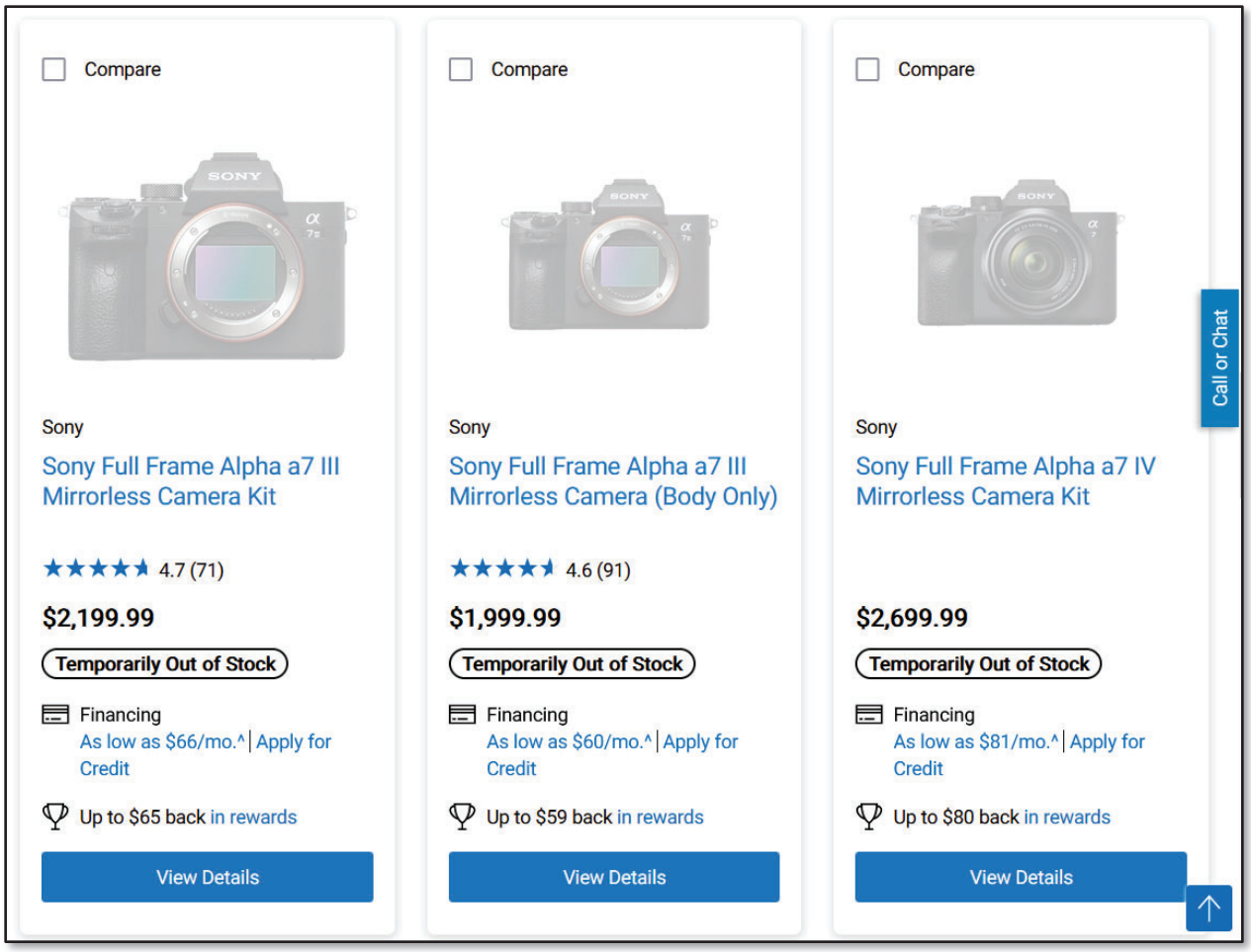
in which the exemplary image sensor includes and utilizes regions with graded dopant concentrations. Exhibit 12 is thus illustrative of the manner in which Dell-Sony Accused Products meet the claim limitations of the Greenthread Patents.

79. Upon information and belief, Dell has infringed, and continues to infringe, one or more claims of certain Greenthread patents through making, using, offering to sell, selling within the United States, and/or importing into the United States Dell-Sony Accused Products. For example, Dell advertises its "Dell UltraSharp Webcam" as having "a large 4K Sony STARVIS™ CMOS sensor."[26]



80. Dell also advertises for sale other products containing Sony image sensors.

[26] https://deals.dell.com/en-us/productdetail/e48b



81. Upon information and belief, Dell also incorporates further Sony image sensors into other Dell Products, such as webcams, that Dell integrates into Dell laptops, desktops, and other computing devices. Greenthread reserves the right to amend its list of Dell-Sony Accused Products, including based on information learned in discovery.

COUNT I: INFRINGEMENT OF U.S. PATENT NO. 8,421,195

82. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint and exhibits attached hereto as if fully set forth herein.

83. The following allegations are based on publicly available information and a reasonable investigation of the structure and operation of the Accused Products. Greenthread

reserves the right to modify this description, including, for example, on the basis of information about the Accused Products that it obtains during discovery.

84. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

85. As alleged above and in Exhibits 8-11, the products analyzed in Exhibits 9-11 meet each and every one of the claim limitations of at least one claim of the '195 patent.

86. As alleged above, the products analyzed in Exhibits 9-11 are exemplary of the Intel Accused CPUs, Intel Accused Flash Memory Products, Dell-Intel Accused Products, Dell-Micron Accused Products, and Dell-WD Accused Products.

87. As alleged above, Intel has and continues to infringe at least one claim of the '195 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Intel Accused Products.

88. As alleged above, Dell has and continues to infringe at least one claim of the '195 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Dell Accused Products.

89. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

COUNT II: INFRINGEMENT OF U.S. PATENT NO. 9,190,502

90. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint and exhibits attached hereto as if fully set forth herein.

91. The following allegations are based on publicly available information and a reasonable investigation of the structure and operation of the Accused Products. Greenthread

reserves the right to modify this description, including, for example, on the basis of information about the Accused Products that it obtains during discovery.

92. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

93. As alleged above and in Exhibits 8-11, the products analyzed in Exhibits 9-11 meet each and every one of the claim limitations of at least one claim of the '502 patent.

94. As alleged above, the products analyzed in Exhibits 9-11 are exemplary of the Intel Accused CPUs, Intel Accused Flash Memory Products, Dell-Intel Accused Products, Dell-Micron Accused Products, and Dell-WD Accused Products.

95. As alleged above, Intel has and continues to infringe at least one claim of the '502 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Intel Accused Products.

96. As alleged above, Dell has and continues to infringe at least one claim of the '502 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Dell Accused Products.

97. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty

COUNT III: INFRINGEMENT OF U.S. PATENT NO. 10,510,842

98. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint and exhibits attached hereto as if fully set forth herein.

99. The following allegations are based on publicly available information and a reasonable investigation of the structure and operation of the Accused Products. Greenthread

reserves the right to modify this description, including, for example, on the basis of information about the Accused Products that it obtains during discovery.

100. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

101. As alleged above and in Exhibits 8-12, the products analyzed in Exhibits 9-12 meet each and every one of the claim limitations of at least one claim of the '842 patent.

102. As alleged above, the products analyzed in Exhibits 9-12 are exemplary of the Intel Accused CPUs, Intel Accused Flash Memory Products, Dell-Intel Accused Products, Dell-Micron Accused Products, Dell-WD Accused Products, and Dell-Sony Accused Products.

103. As alleged above, Intel has and continues to infringe at least one claim of the '842 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Intel Accused Products.

104. As alleged above, Dell has and continues to infringe at least one claim of the '842 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Dell Accused Products.

105. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

COUNT IV: INFRINGEMENT OF U.S. PATENT NO. 10,734,481

106. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint and exhibits attached hereto as if fully set forth herein.

107. The following allegations are based on publicly available information and a reasonable investigation of the structure and operation of the Accused Products. Greenthread

reserves the right to modify this description, including, for example, on the basis of information about the Accused Products that it obtains during discovery.

108. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

109. As alleged above and in Exhibits 8-12, the products analyzed in Exhibits 9-12 meet each and every one of the claim limitations of at least one claim of the '841 patent.

110. As alleged above, the products analyzed in Exhibits 9-12 are exemplary of the Intel Accused CPUs, Intel Accused Flash Memory Products, Dell-Intel Accused Products, Dell-Micron Accused Products, Dell-WD Accused Products, and Dell-Sony Accused Products.

111. As alleged above, Intel has and continues to infringe at least one claim of the '841 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Intel Accused Products.

112. As alleged above, Dell has and continues to infringe at least one claim of the '841 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Dell Accused Products.

113. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

COUNT V: INFRINGEMENT OF U.S. PATENT NO. 11,121,222

114. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint and exhibits attached hereto as if fully set forth herein.

115. The following allegations are based on publicly available information and a reasonable investigation of the structure and operation of the Accused Products. Greenthread

reserves the right to modify this description, including, for example, on the basis of information about the Accused Products that it obtains during discovery.

116. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

117. As alleged above and in Exhibits 8-12, the products analyzed in Exhibits 9-12 meet each and every one of the claim limitations of at least one claim of the '222 patent.

118. As alleged above, the products analyzed in Exhibits 9-12 are exemplary of the Intel Accused CPUs, Intel Accused Flash Memory Products, Dell-Intel Accused Products, Dell-Micron Accused Products, Dell-WD Accused Products, and Dell-Sony Accused Products.

119. As alleged above, Intel has and continues to infringe at least one claim of the '222 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Intel Accused Products.

120. As alleged above, Dell has and continues to infringe at least one claim of the '222 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Dell Accused Products.

121. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

COUNT VI: INFRINGEMENT OF U.S. PATENT NO. 11,316,014

122. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint and exhibits attached hereto as if fully set forth herein.

123. The following allegations are based on publicly available information and a reasonable investigation of the structure and operation of the Accused Products. Greenthread

reserves the right to modify this description, including, for example, on the basis of information about the Accused Products that it obtains during discovery.

124. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

125. As alleged above and in Exhibits 8-12, the products analyzed in Exhibits 9-12 meet each and every one of the claim limitations of at least one claim of the '014 patent.

126. As alleged above, the products analyzed in Exhibits 9-12 are exemplary of the Intel Accused CPUs, Intel Accused Flash Memory Products, Dell-Intel Accused Products, Dell-Micron Accused Products, Dell-WD Accused Products, and Dell-Sony Accused Products.

127. As alleged above, Intel has and continues to infringe at least one claim of the '014 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Intel Accused Products.

128. As alleged above, Dell has and continues to infringe at least one claim of the '014 patent by making, using, offering to sell, selling within the United States, and/or importing into the United States Dell Accused Products.

129. Defendants' infringement has damaged and continues to damage Greenthread in an amount yet to be determined, of at least a reasonable royalty.

DAMAGES

130. As a result of Defendants' acts of infringement, Greenthread has suffered and continues to suffer actual and consequential damages. However, Greenthread does not yet know the full extent of the infringement and the amount of damages cannot be ascertained except through discovery and special accounting. To the fullest extent permitted by law, Greenthread seeks recovery of damages at least for reasonable royalties, unjust enrichment, and benefits received by

Defendants as a result of using the patented technology. Greenthread further seeks any other damages to which Greenthread is entitled under law or in equity.

DEMAND FOR JURY TRIAL

131. Greenthread hereby demands a jury trial for all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, Greenthread respectfully requests that this Court enter judgment in its favor as follows:

A. That Judgment be entered that Defendants have infringed one or more claims of the Greenthread Patents, literally and under the doctrine of equivalents;

B. That, in accordance with 35 U.S.C. § 283, Defendants and all its affiliates, employees, agents, officers, directors, attorneys, successors, and assigns and all those acting on behalf of or in active concert or participation with any of them, be preliminarily and permanently enjoined from (1) infringing the Greenthread Patents and (2) making, using, selling, and offering for sale, or importing into the United States, the Accused Products;

C. An award of damages sufficient to compensate Greenthread for Defendants' infringement under 35 U.S.C. § 284;

D. That the case be found exceptional under 35 U.S.C. § 285 and that Greenthread be awarded its reasonable attorneys' fees;

E. Costs and expenses in this action;

F. An award of prejudgment and post-judgment interest; and

Such other and further relief as the Court may deem just and proper.

Dated: April 29, 2022.

MCKOOL SMITH, P.C.

/s/ *Alan L. Whitehurst*
Alan L. Whitehurst
D.C. Bar No. 484873
awhitehurst@mckoolsmith.com
Nicholas J. Matich
D.C. Bar No. 1024907 (*admission pending*)
nmatich@mckoolsmith.com
Arvind Jairam
D.C. Bar No. 1017133 (*admission pending)*
ajairam@mckoolsmith.com
MCKOOL SMITH, P.C.
1999 K Street NW
Washington, DC 20006
Telephone: 202-370-8300
Telecopier: 202-370-8344

John B. Campbell
Texas Bar No. 24036314
jcampbell@mckoolsmith.com
MCKOOL SMITH, P.C.
303 Colorado Street, Suite 2100
Austin, Texas 78701
Telephone: 512-692-8700
Telecopier: 512-692-8744

Kaitlyn M. Dawson
Texas Bar No. 24101683 (*admission pending*)
kdawson@mckoolsmith.com
600 Travis Street, Suite 7000
Houston, Texas 77002
Telephone: 713-485-7300
Telecopier: 713-485-7344

ATTORNEYS FOR PLAINTIFF GREENTHREAD, LLC

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the above and foregoing document has been served on all counsel of record via the Court's ECF system on April 29, 2022.

/s/ Alan L. Whitehurst
Alan L. Whitehurst