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** **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Greenthread, LLC ("Greenthread" or "Plaintiff") files this Complaint against Intel Corporation ("Intel"), and Dell Inc. and Dell Technologies Inc. (collectively, "Dell," or "Dell Defendants," and together with Intel, "Defendants"), 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 five 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 "'4481 Patent"), and 11,121,222 (the "'222 Patent") (collectively "the Greenthread Patents"), copies of which are attached hereto as Exhibits A-G, 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" and "delltechnologies.com."

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

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 Dell 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, TX 78664.[7]

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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
[7] https://www.delltechnologies.com/en-us/contactus.htm

17. Dell's online retail store at Dell.com sells, offers for sale, and advertises Dell 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]

18. 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.

19. Best Buy is an authorized Dell retailer[9] selling and offering for sale Accused Products[10] (including Dell Accused Products containing the exemplary Intel Core i7 11800H),[11] in this District, including at 9607 Research Blvd. Suite 500, Austin, TX 78759.

20. Intel approves and authorizes sales of Dell products through Best Buy.[12]

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

22. 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

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[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
[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

infringement in Texas, and recruited Texas residents for employment.

23. 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.

24. 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.

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

26. 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.

27. 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

28. 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

[15] https://www.intel.com/content/www/us/en/corporate-responsibility/intel-in-texas.html
[16] Pub. No. US 2006/0049464.

September 3, 2004. A true and correct copy of the ’195 Patent is attached hereto as Exhibit A and incorporated herein by reference.

29. 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 B and incorporated herein by reference.

30. 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 C and incorporated herein by reference.

31. On August 4, 2020, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 10,734,481 (“the ’4481 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 ’4481 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 ’4481Patent is attached hereto as Exhibit D and incorporated herein by reference.

32. On September 14, 2021, the U.S. Patent and Trademark Office duly and legally

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

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 E and incorporated herein by reference.

33. The '195, '502, '842, '4481, and '222 Patents are collectively referred to as the "Greenthread Patents."

34. 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 is attached hereto as Exhibit F. 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.

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

36. The Greenthread Patents are valid and enforceable.

FACTUAL BACKGROUND

37. 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

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

than 100 Patents worldwide and authored numerous technical publications over the last 50 years.

38. 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.

39. 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."[21] Dr. Rao built these devices from scratch while a graduate student at SMU.

40. 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.

41. 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

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

RAM product. That patent was merely the beginning of Dr. Rao's long inventive career. Indeed, 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.

42. 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.[22] 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.[23]

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

43. In 1994, Dr. Rao left Texas Instruments for Cirrus Logic. During his two-year tenure at Cirrus Logic, he received more U.S. Patents relating to his work on integrated graphics controllers and memory.

44. 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.

45. 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

46. 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 ("Intel Accused Products"). One exemplary Intel Accused Product is the Intel Core i7 11800H. As described below, a scanning electron microscope, spreading resistance profile, and secondary ion mass spectrometry analysis shows that the Intel Core i7 11800H meets each and

every element of at least one claim of the Greenthread Patents.

47. Upon information and belief, Intel fabricates the Intel Accused 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. Upon information and belief, the Intel Accused Products 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. Paragraphs in this complaint describing exemplary infringement by the Intel Core i7 11800H are thus illustrative of the manner in which each of the Intel Accused Products infringes.

48. The Intel Accused Products include 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 Products is identified in Exhibit G. Greenthread reserves the right to amend its list of Intel Accused Products, including based on information learned in discovery.

DELL'S INFRINGEMENT

49. Greenthread incorporates by reference the preceding paragraphs as though fully set forth herein.

50. The scanning electron microscope, spreading resistance profile, and secondary ion mass spectrometry analysis shown in below was performed on an Intel Core i7 11800H obtained from a Dell Alienware M15 R6 laptop purchased in the United States.

51. In concert with Intel, through the "Intel Partner Alliance," Dell incorporates many Intel Accused Products into Dell's products ("Dell Accused Products"). 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 Accused Products, including the exemplary Dell Alienware M15 R6 laptop that contains Intel Accused Products, including the exemplary Intel Core i7 11800H and other Intel Accused Products.

52. Dell Accused Products include at least all Dell Products that incorporate any Intel Accused Product as a component. For example, Dell incorporates Intel Core i7 11800H into Inspiron, New Inspiron, XPS, New XPS, G15, and Alienware laptops. An exemplary list of Dell Accused Products is identified in Exhibit G. Greenthread reserves the right to amend its list of Dell Accused Products, including based on information learned in discovery.

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

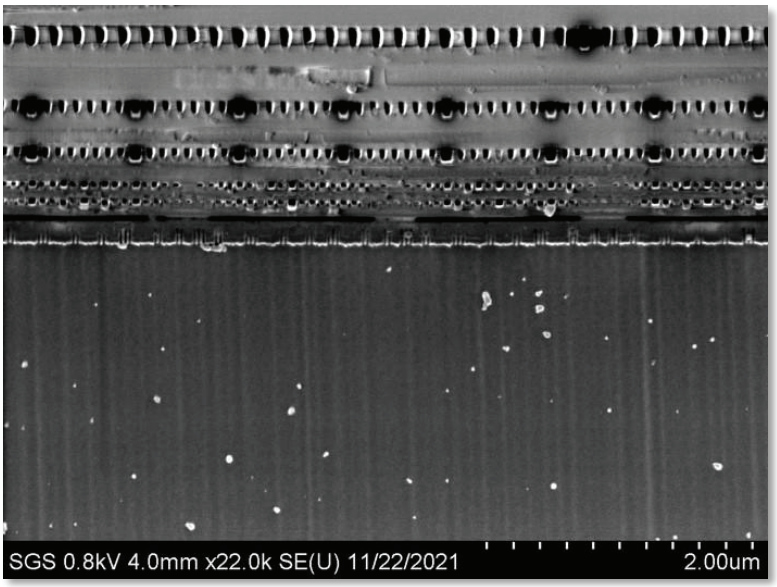
53. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint as if fully set forth herein.

54. The exemplary Intel Core i7 11800H infringes one or more claims of the ’195 Patent, including for example, claim 1 of the ’195 Patent. Greenthread’s allegations of infringement are not limited to claim 1 and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

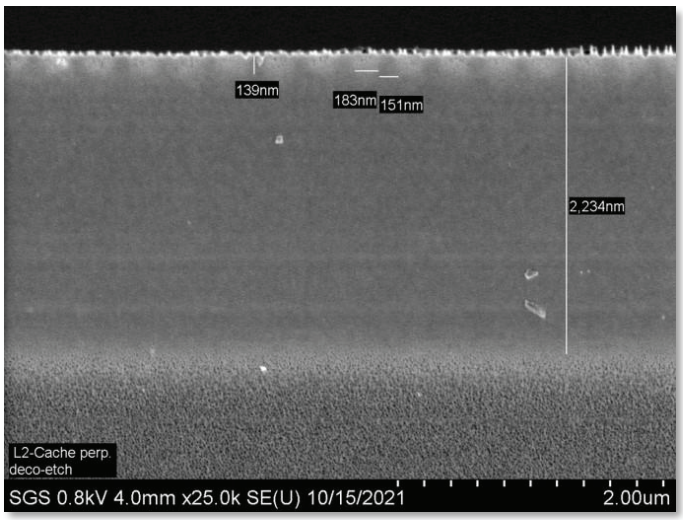
55. Greenthread’s allegations are not limited to the exemplary Intel Core i7 11800H. As previously alleged, the Intel Core i7 11800H is exemplary of numerous Intel Accused Products which are incorporated into numerous Dell Accused Products. On information and belief, each of the Intel Accused Products infringes in a substantially similar manner to the Intel Core i7 11800H and each of the Dell Accused Products infringes by incorporating one or more of the Intel Accused Products.

56. To the extent that the preamble is a limitation, the Intel Core i7 11800H is a CMOS semiconductor device.

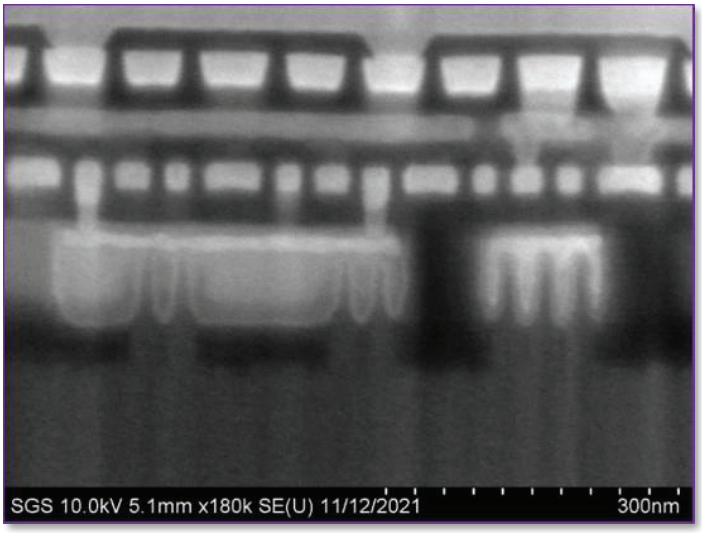
57. The Intel Core i7 11800H has a surface layer.



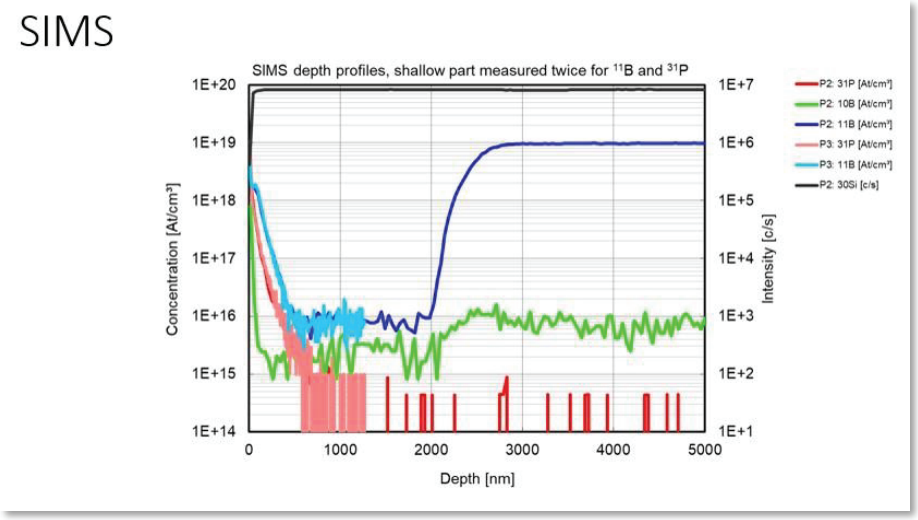
58. The Intel Core i7 11800H has a substrate.

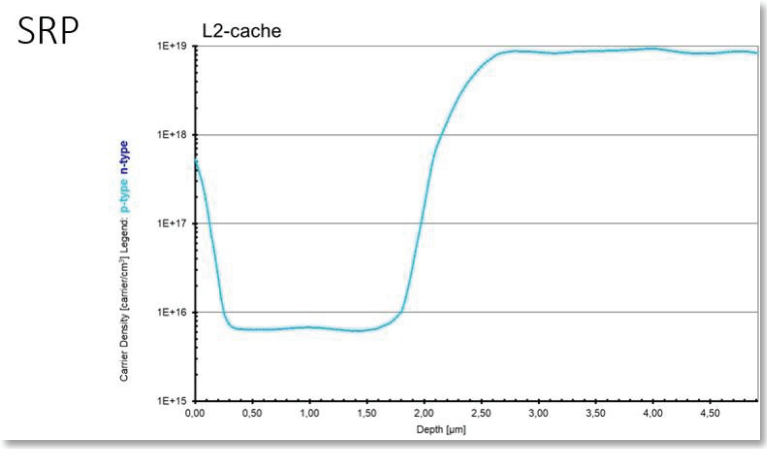


59. The Intel Core i7 11800H has an active region including a source and a drain, disposed on one surface of said surface layer.

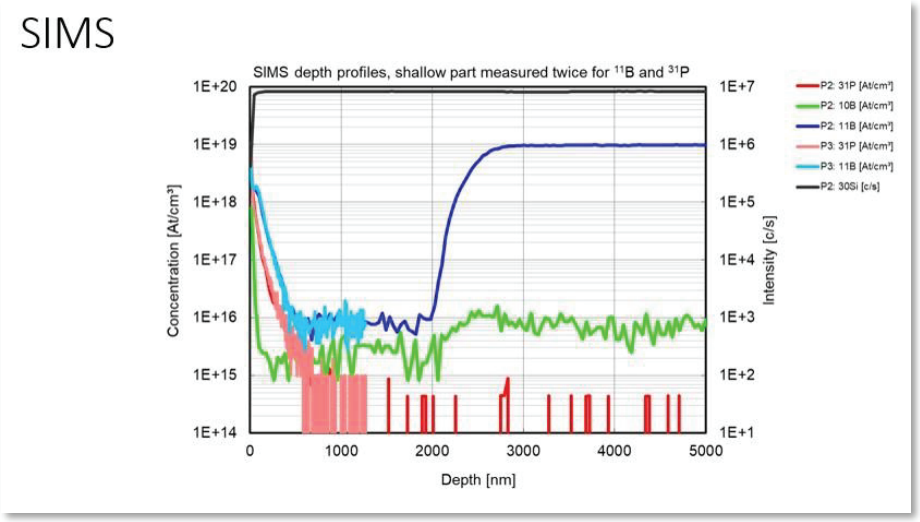


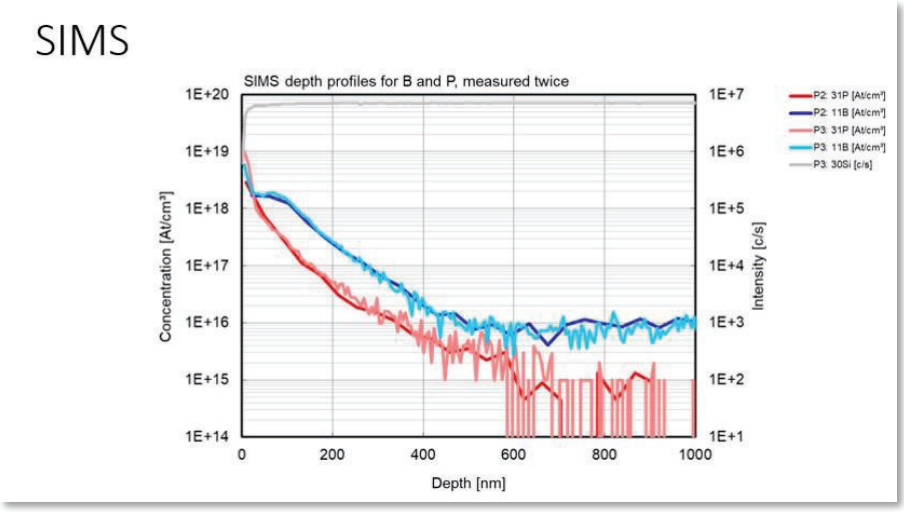
60. The Intel Core i7 11800H has a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants extending between said surface layer and said substrate, said drift layer further having a first static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate.

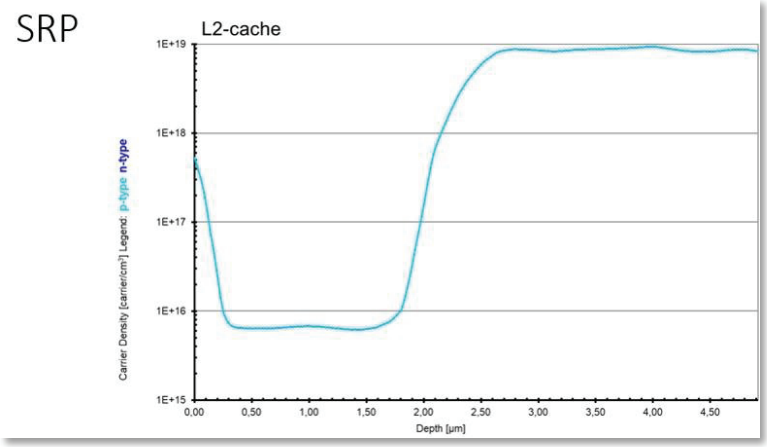




61. The Intel Core i7 11800H has at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate.







62. The foregoing 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.

63. 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

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

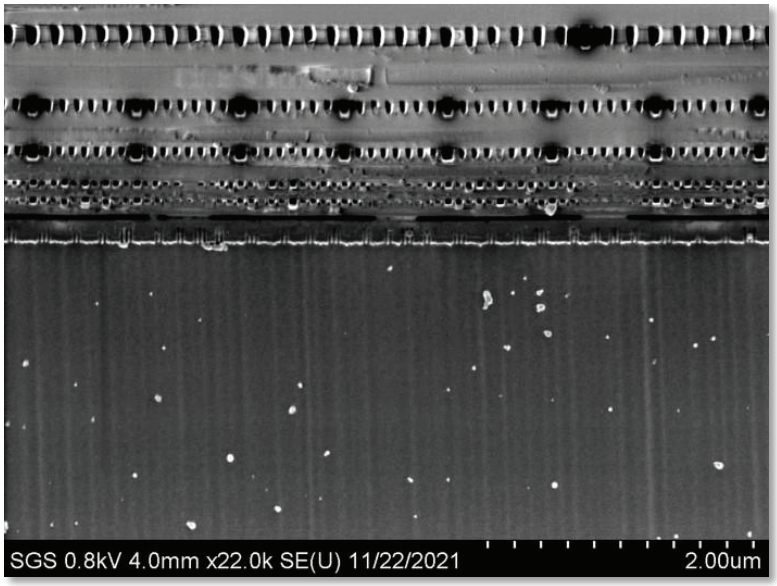
65. The exemplary Intel Core i7 11800H infringes one or more claims of the '502

Patent, including for example, claim 7 of the ’502 Patent. Greenthread’s allegations of infringement are not limited to claim 7 and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

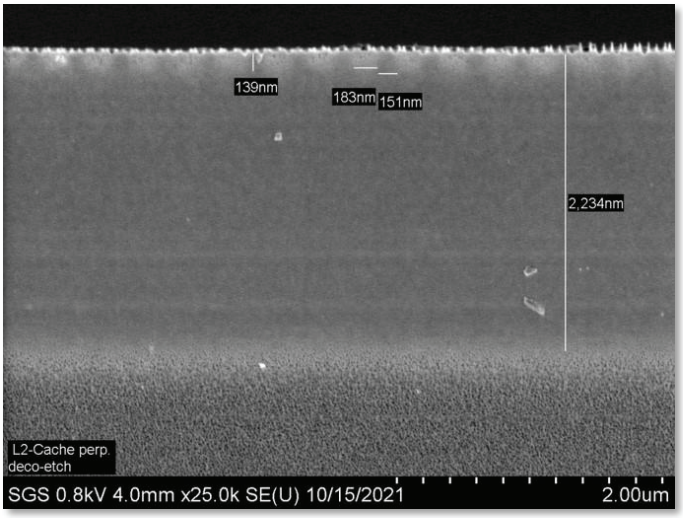
66. Greenthread’s allegations are not limited to the exemplary Intel Core i7 11800H. As previously alleged, the Intel Core i7 11800H is exemplary of numerous Intel Accused Products which are incorporated into numerous Dell Accused Products. On information and belief, each of the Intel Accused Products infringes in a substantially similar manner to the Intel Core i7 11800H and each of the Dell Accused Products infringes by incorporating one or more of the Intel Accused Products.

67. To the extent that the preamble is a limitation, the Intel Core i7 11800H is a semiconductor device.

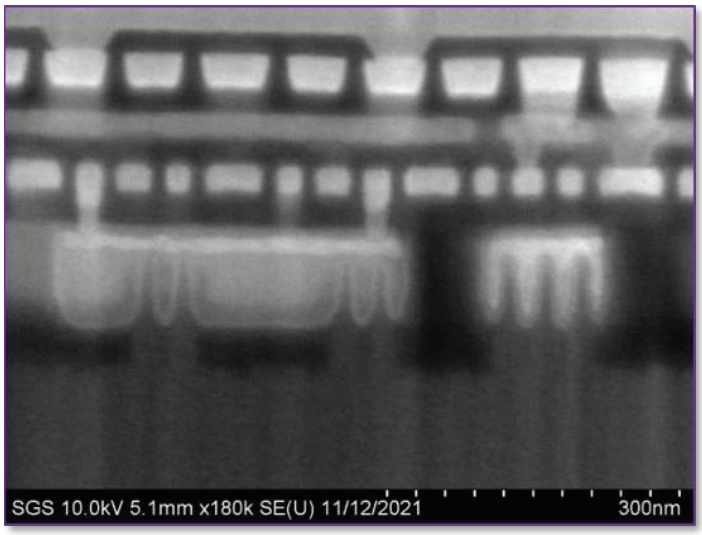
68. The Intel Core i7 11800H has a surface layer.



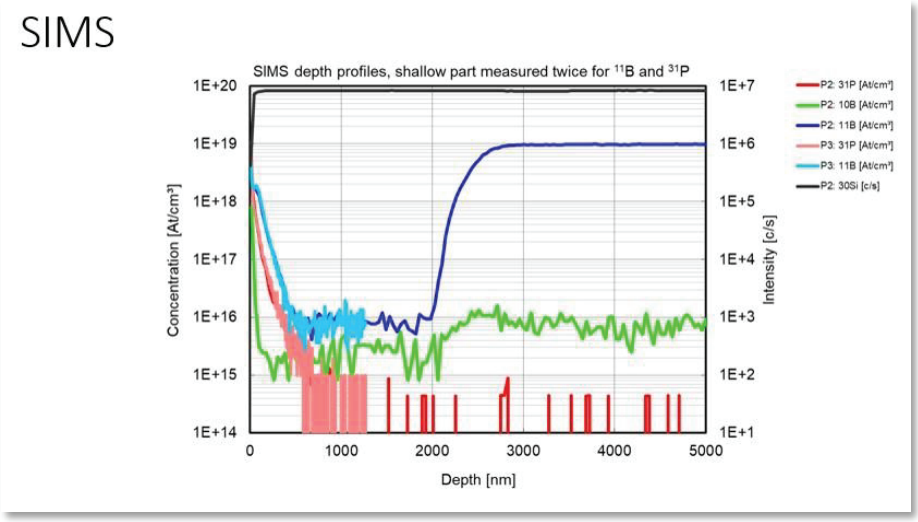
69. The Intel Core i7 11800H has a substrate.

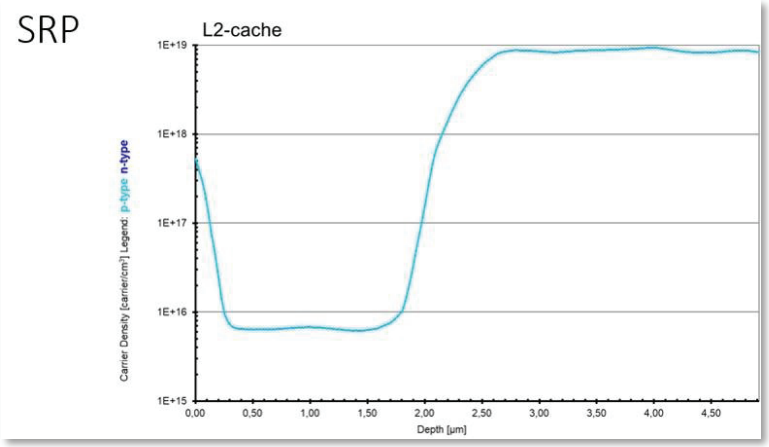


70. The Intel Core i7 11800H has an active region including a source and a drain, disposed on one surface of said surface layer.

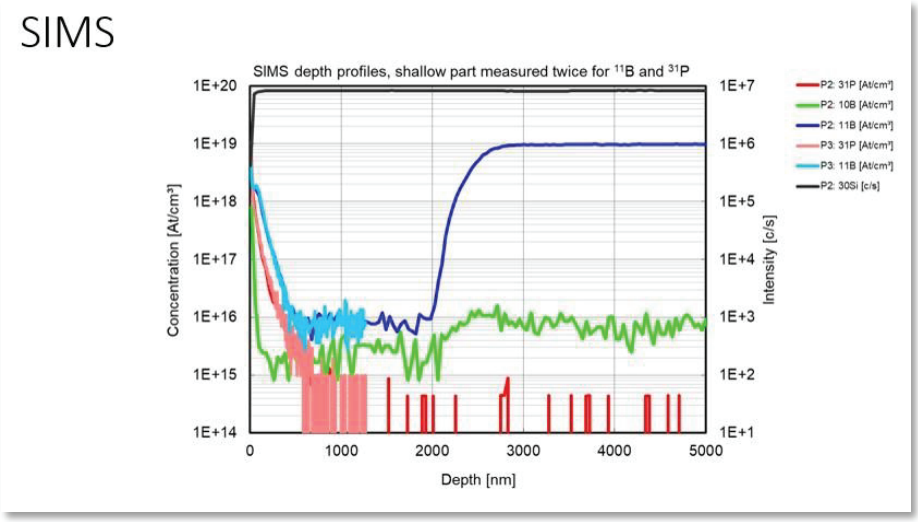


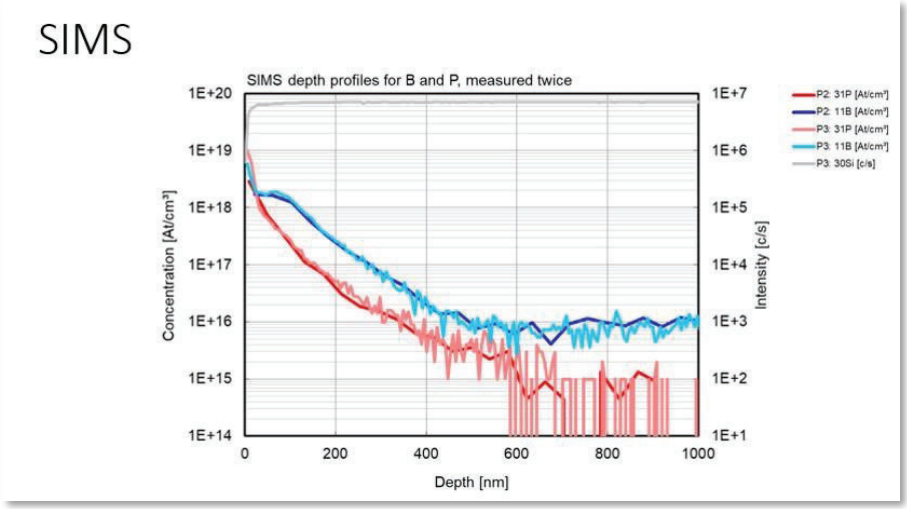
71. The Intel Core i7 11800H has a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants generating a first static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate.

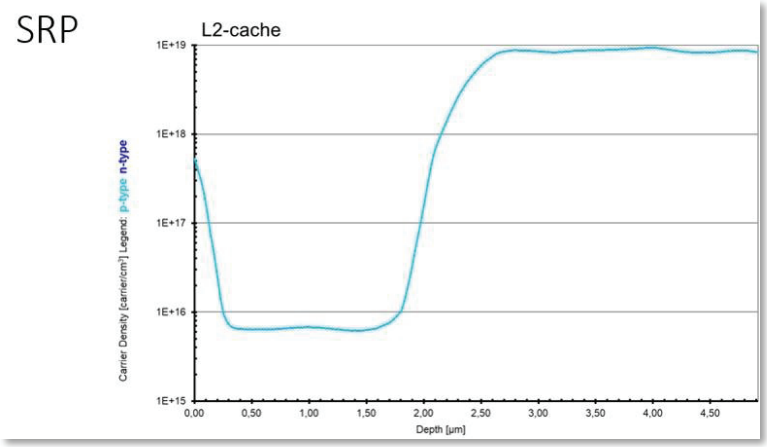




72. The Intel Core i7 11800H has at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants generating a second static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate.







73. The foregoing 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.

74. 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

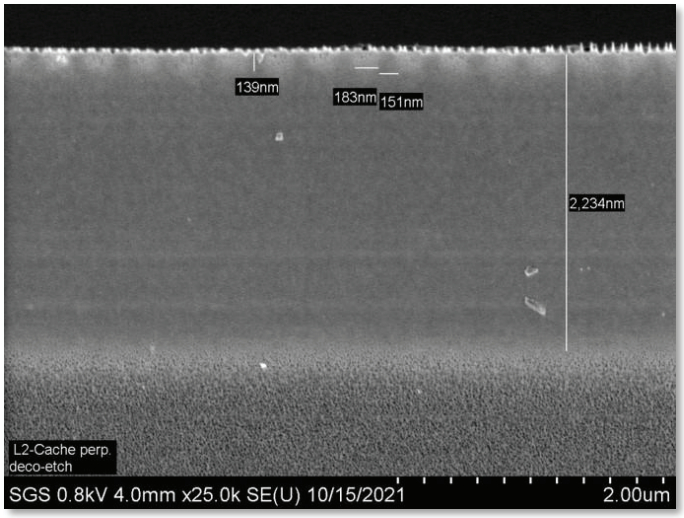
75. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint as if fully set forth herein.

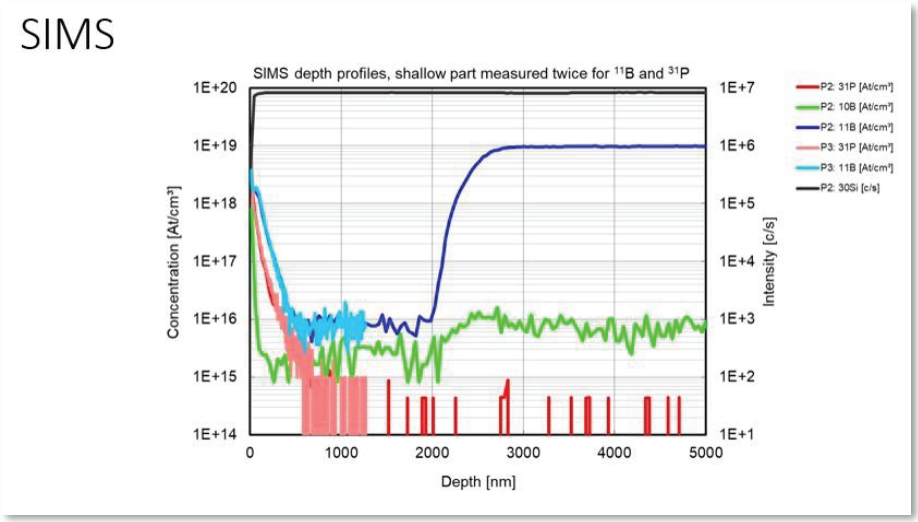
76. The exemplary Intel Core i7 11800H infringes one or more claims of the '842 Patent, including for example, claim 1 of the '842 Patent. Greenthread's allegations of infringement are not limited to claim 1 and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

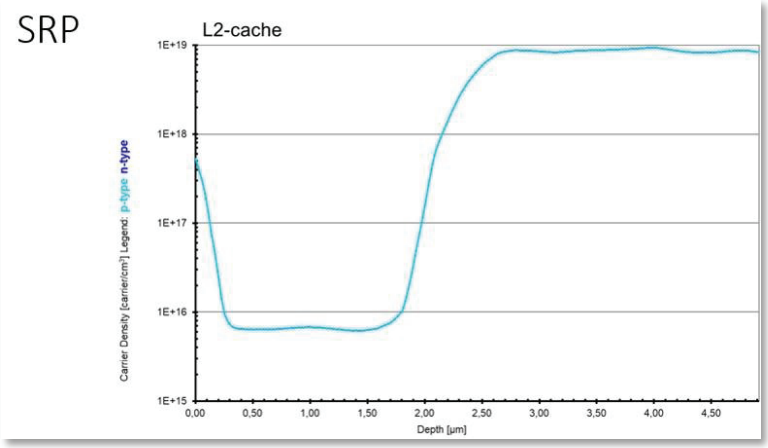
77. Greenthread's allegations are not limited to the exemplary Intel Core i7 11800H. As previously alleged, the Intel Core i7 11800H is exemplary of numerous Intel Accused Products which are incorporated into numerous Dell Accused Products. On information and belief, each of the Intel Accused Products infringes in a substantially similar manner to the Intel Core i7 11800H and each of the Dell Accused Products infringes by incorporating one or more of the Intel Accused Products.

78. To the extent that the preamble is a limitation, the Intel Core i7 11800H is a semiconductor device.

79. The Intel Core i7 11800H has a substrate of a first doping type at a first doping level having first and second surfaces.

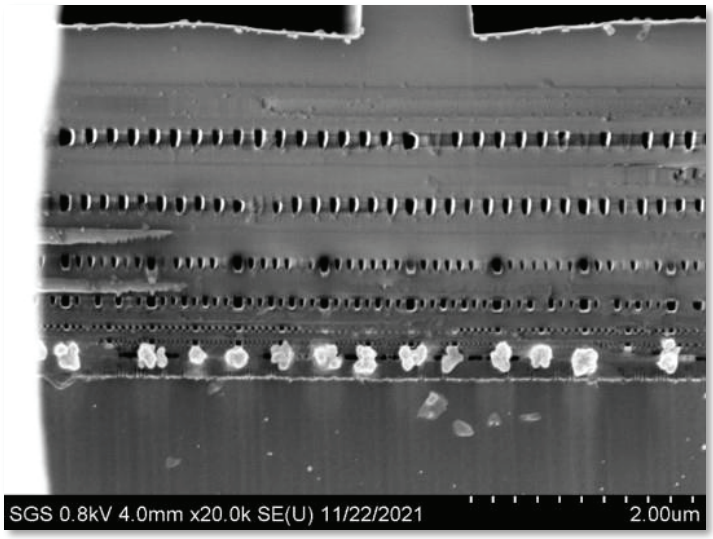


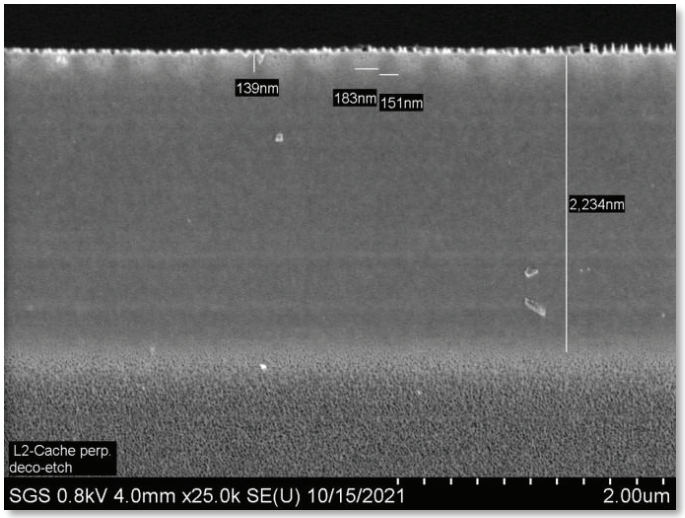


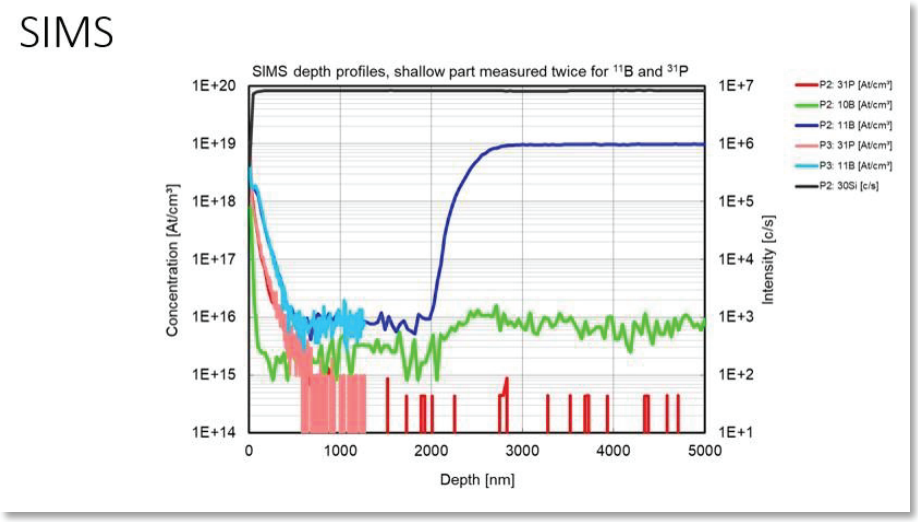


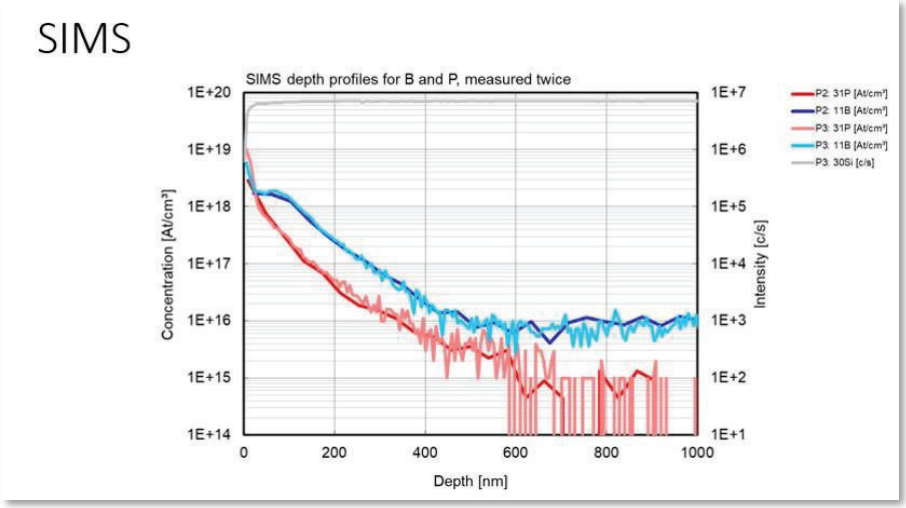
80. The Intel Core i7 11800H has a first active region disposed adjacent the first surface of the substrate with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed. See images below.

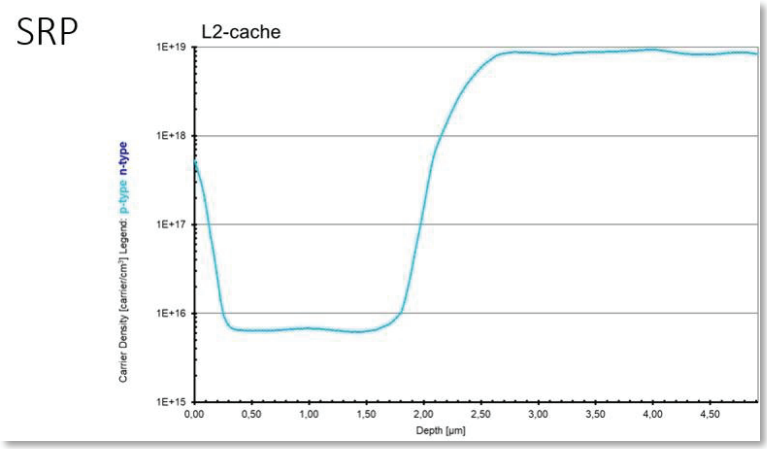
81. The Intel Core i7 11800H has a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed.





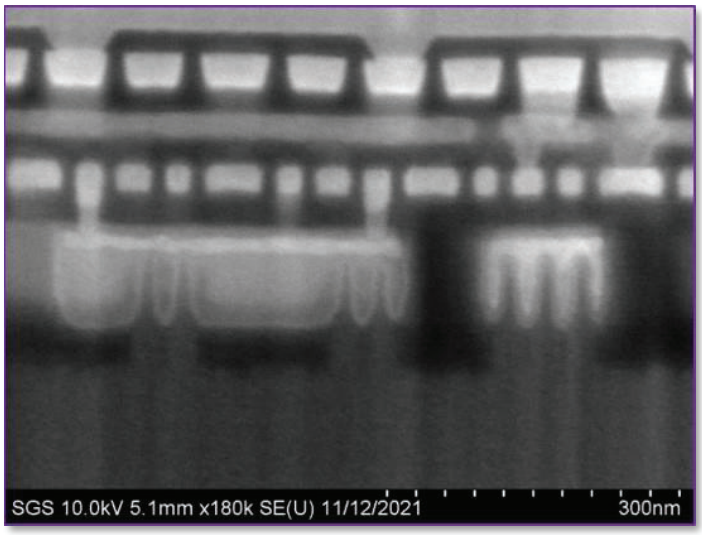




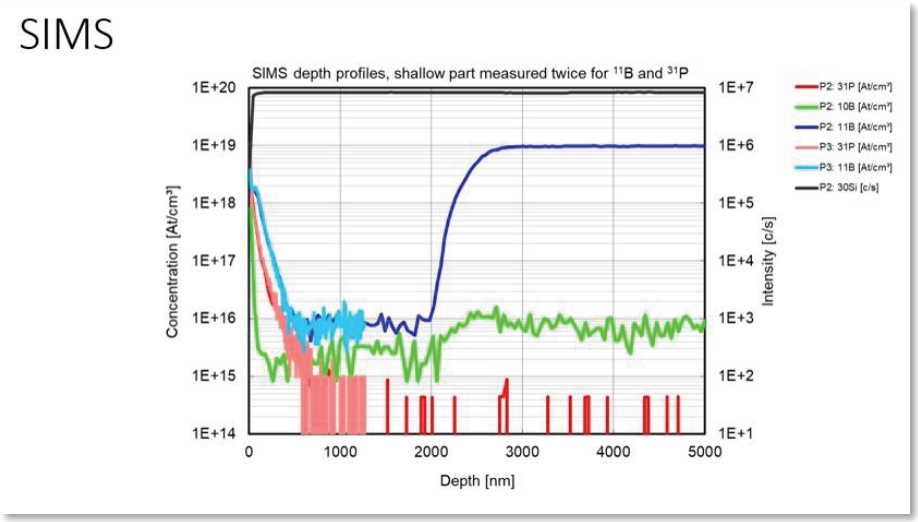


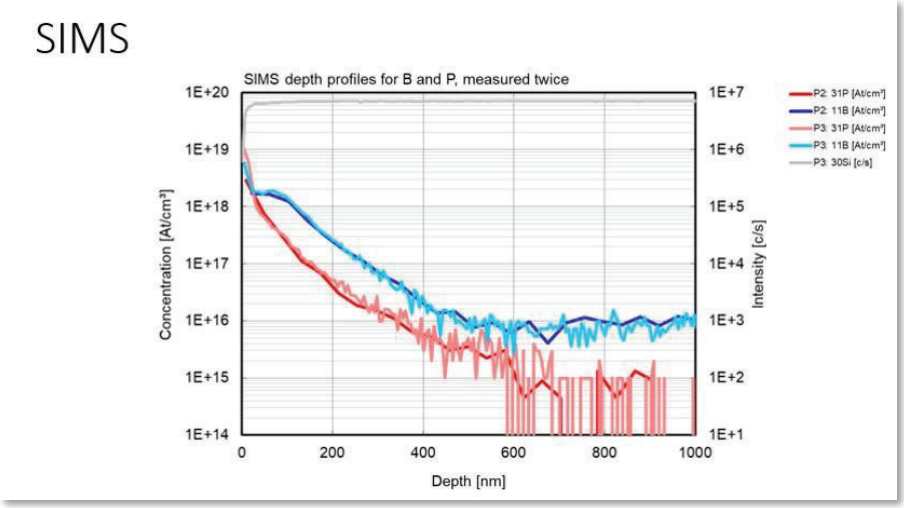
82. The Intel Core i7 11800H has transistors formed in at least one of the first active

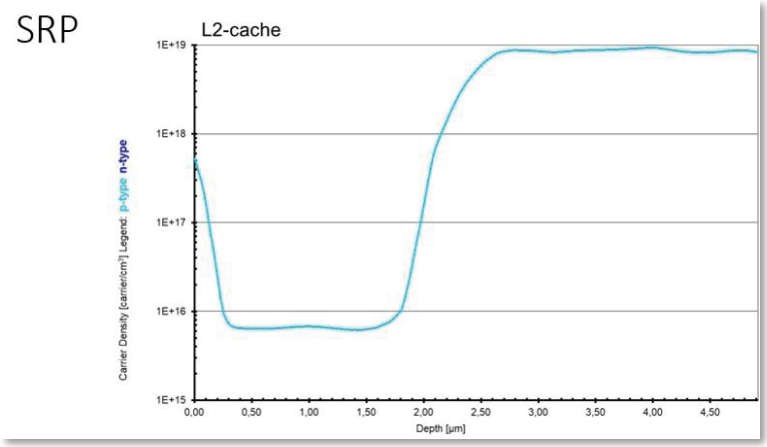
region or second active region.



83. The Intel Core i7 11800H has at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate.







84. The foregoing 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.

85. 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

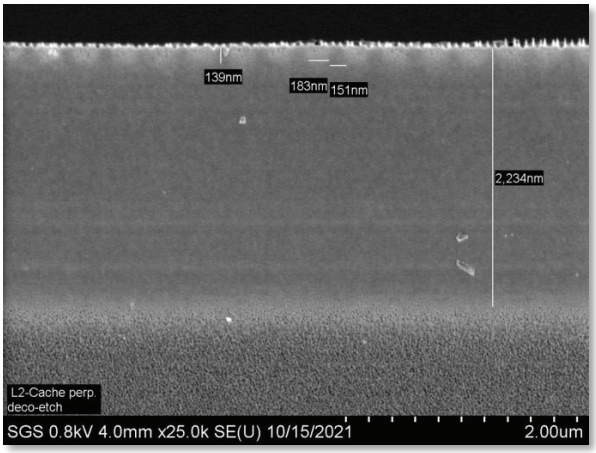
86. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint as if fully set forth herein.

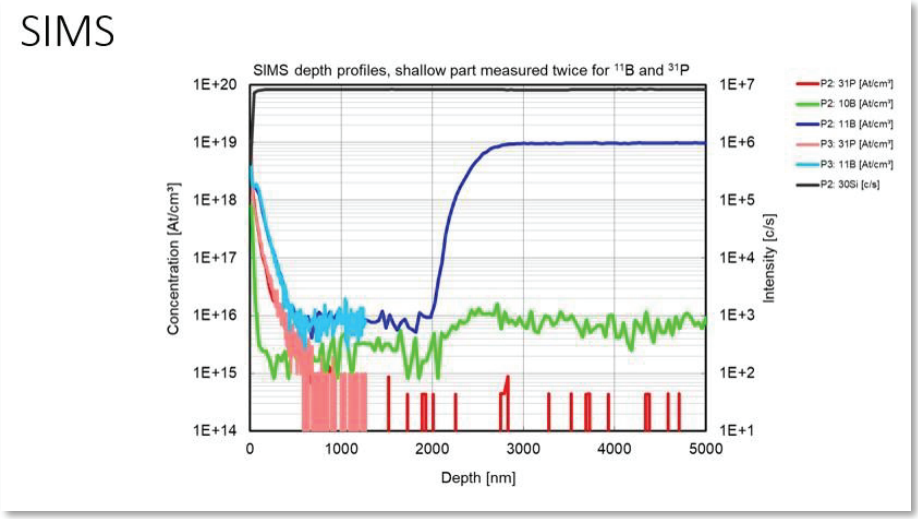
87. The exemplary Intel Core i7 11800H infringes one or more claims of the 4'841 Patent, including for example, claim 1 of the 4'841 Patent. Greenthread's allegations of infringement are not limited to claim 1 and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

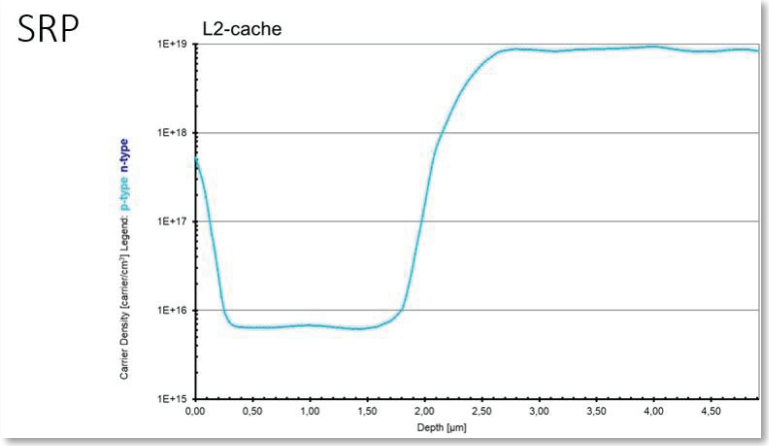
88. Greenthread's allegations are not limited to the exemplary Intel Core i7 11800H. As previously alleged, the Intel Core i7 11800H is exemplary of numerous Intel Accused Products which are incorporated into numerous Dell Accused Products. On information and belief, each of the Intel Accused Products infringes in a substantially similar manner to the Intel Core i7 11800H and each of the Dell Accused Products infringes by incorporating one or more of the Intel Accused Products.

89. To the extent that the preamble is a limitation, the Intel Core i7 11800H is a semiconductor device.

90. The Intel Core i7 11800H has a substrate of a first doping type at a first doping level having first and second surfaces.

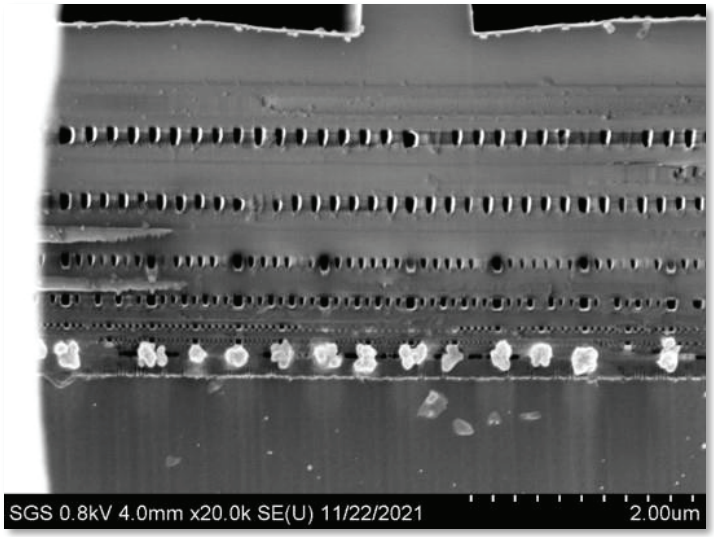


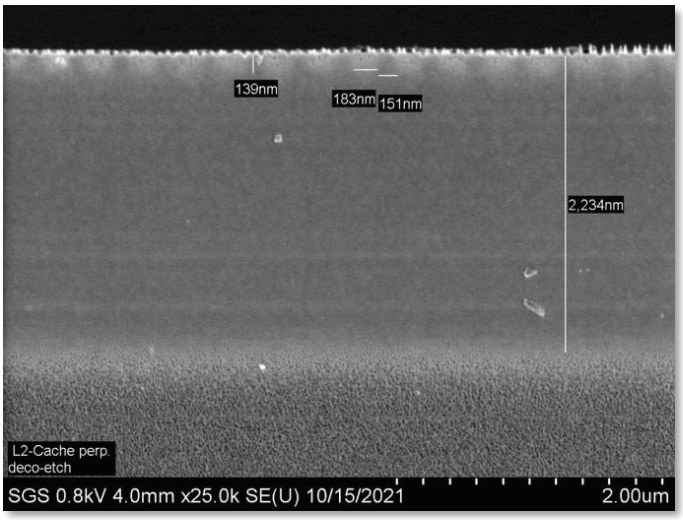




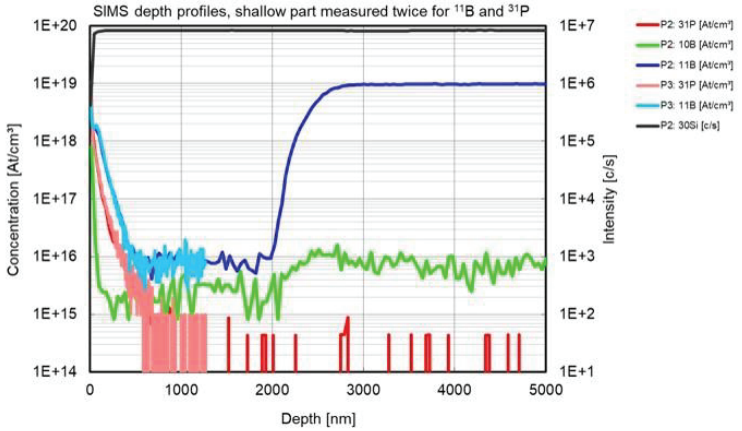
91. The Intel Core i7 11800H has a first active region disposed adjacent the first surface of the substrate with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed. See images below.

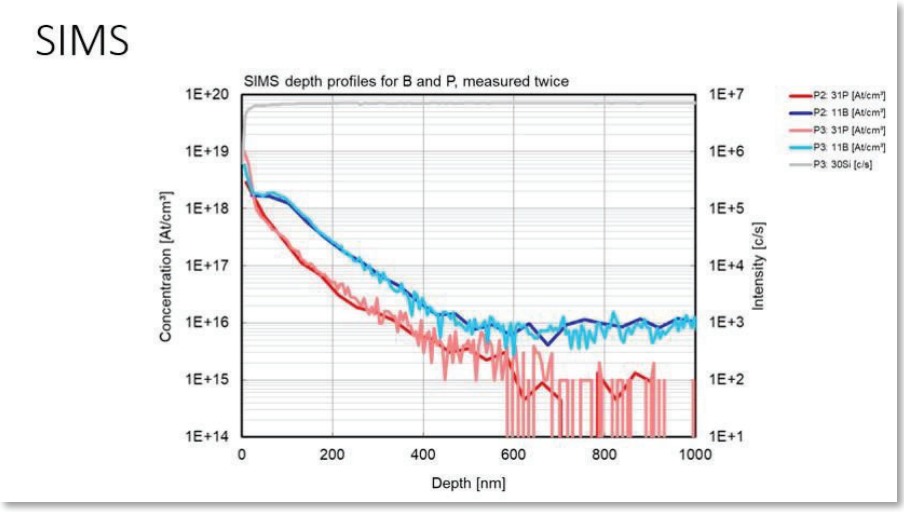
92. The Intel Core i7 11800H has a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed.

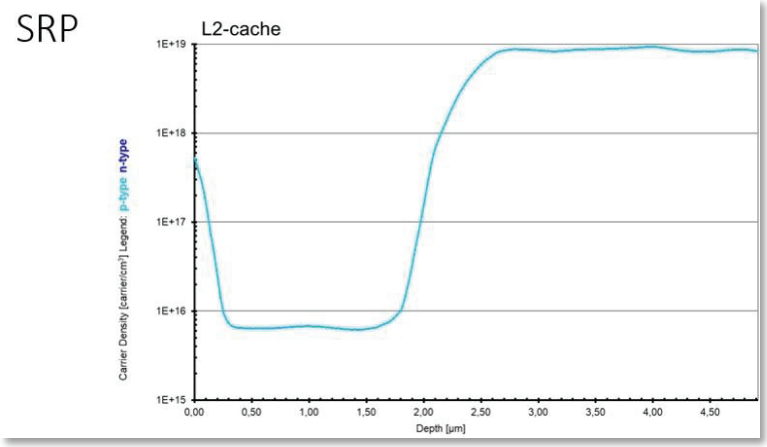

SGS 0.8kV 4.0mm x20.0k SE(U) 11/22/2021
2.00um


139nm
183nm
151nm
2,234nm
L2-Cache perp.
deco-etch
SGS 0.8kV 4.0mm x25.0k SE(U) 10/15/2021
2.00um

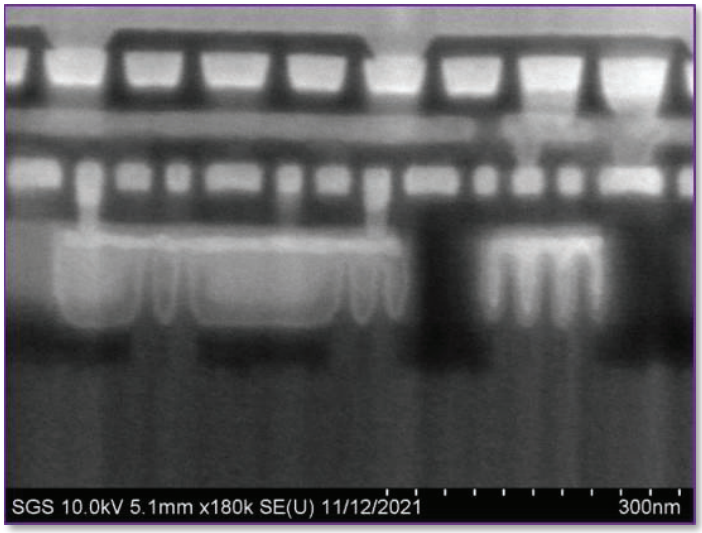
SIMS


SIMS depth profiles, shallow part measured twice for 11B and 31P
Concentration [At/cm³]
Intensity [c/s]
Depth [nm]
1E+20
1E+19
1E+18
1E+17
1E+16
1E+15
1E+14
1E+7
1E+6
1E+5
1E+4
1E+3
1E+2
1E+1
0
1000
2000
3000
4000
5000
P2: 31P [At/cm³]
P2: 10B [At/cm³]
P2: 11B [At/cm³]
P3: 31P [At/cm³]
P3: 11B [At/cm³]
P2: 30Si [c/s]



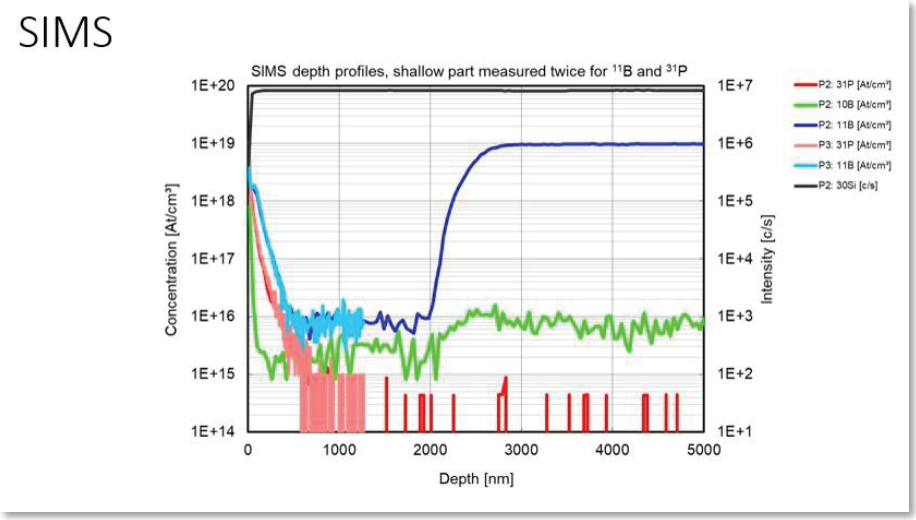


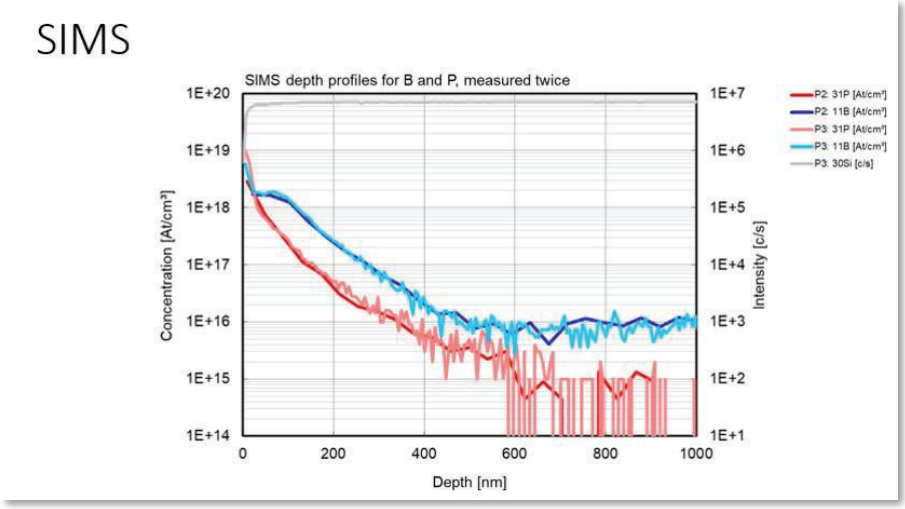
93. The Intel Core i7 11800H has transistors formed in at least one of the first active region or second active region.

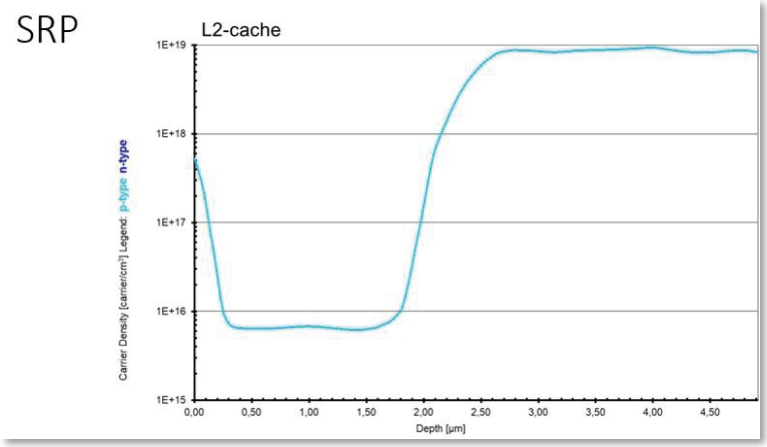


94. The Intel Core i7 11800H has at least a portion of at least one of the first and second

active regions having at least one graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate.

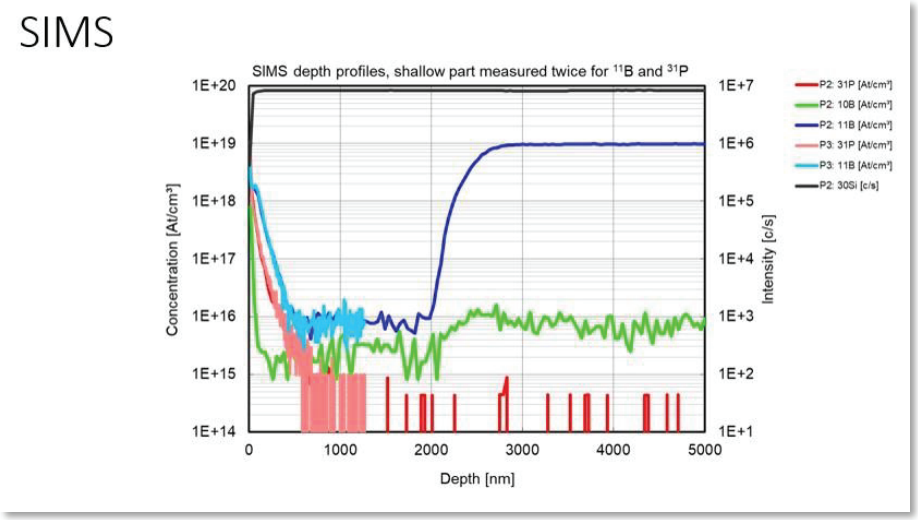


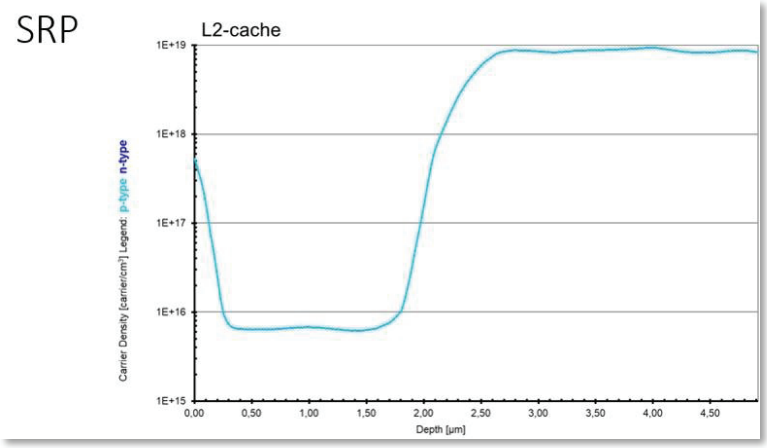




95. The Intel Core i7 11800H has at least one well region adjacent to the first or second

active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the first surface to the second surface of the substrate.





96. The foregoing 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.

97. 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

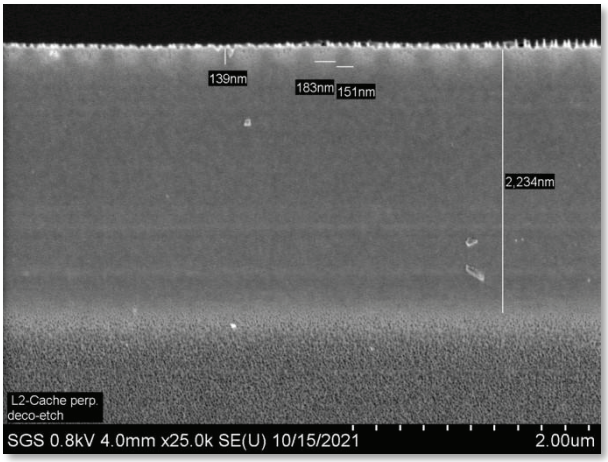
98. Greenthread incorporates by reference and re-alleges all of the foregoing paragraphs of this Complaint as if fully set forth herein.

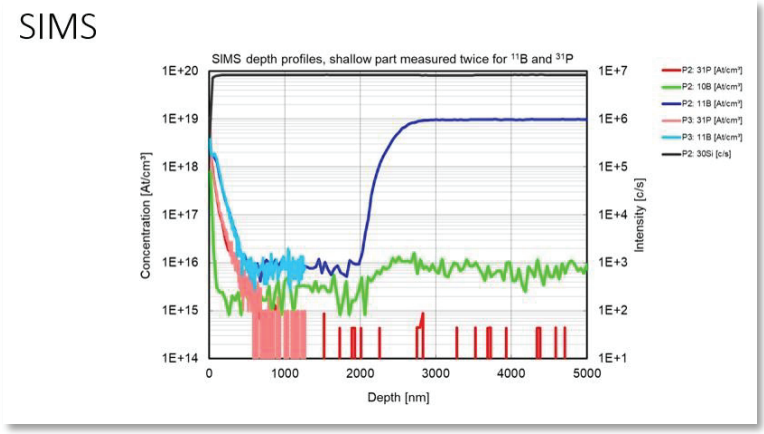
99. The exemplary Intel Core i7 11800H infringes one or more claims of the ’222 Patent, including for example, claim 1 of the ’222 Patent. Greenthread’s allegations of infringement are not limited to claim 1 and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

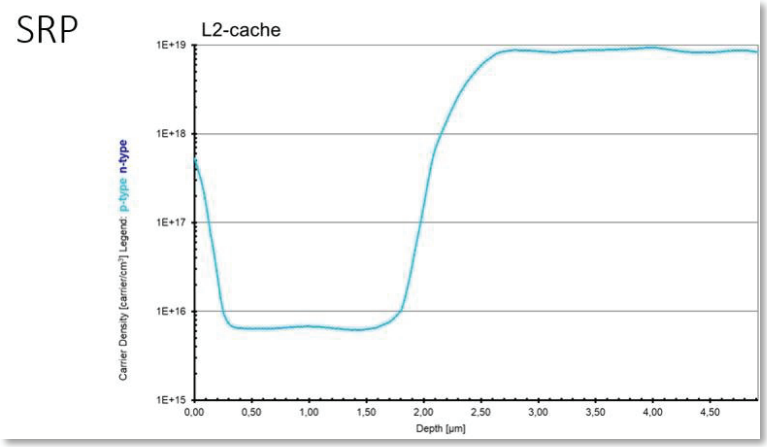
100. Greenthread’s allegations are not limited to the exemplary Intel Core i7 11800H. As previously alleged, the Intel Core i7 11800H is exemplary of numerous Intel Accused Products which are incorporated into numerous Dell Accused Products. On information and belief, each of the Intel Accused Products infringes in a substantially similar manner to the Intel Core i7 11800H and each of the Dell Accused Products infringes by incorporating one or more of the Intel Accused Products.

101. To the extent that the preamble is a limitation, the Intel Core i7 11800H is a VLSI semiconductor devices.

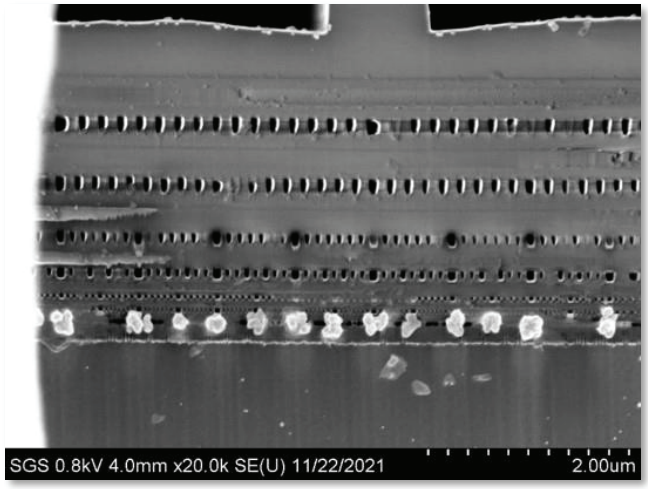
102. The Intel Core i7 11800H contains a substrate of a first doping type at a first doping level having a surface.

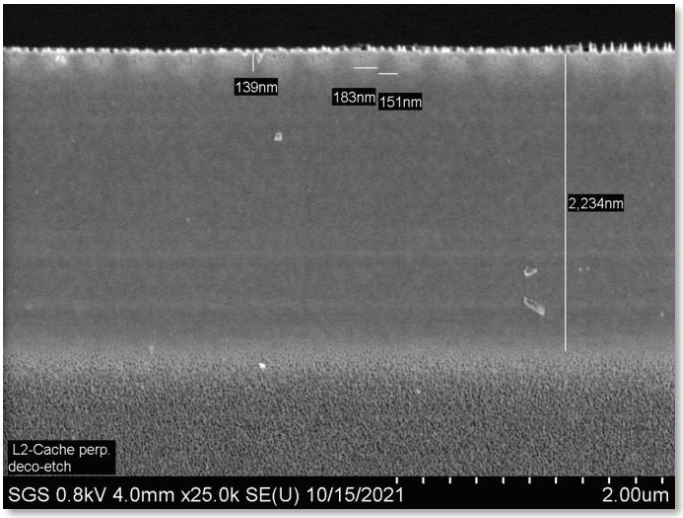




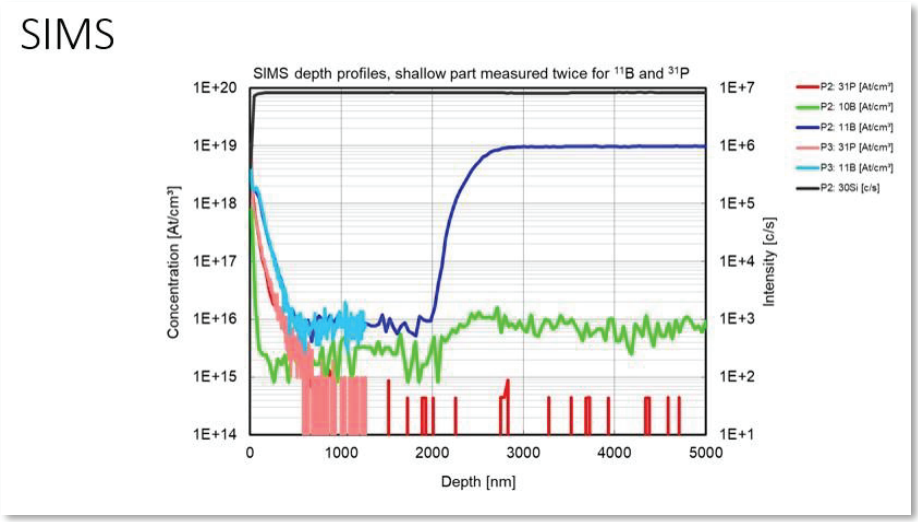


103. The Intel Core i7 11800H contains a first active region disposed adjacent the surface with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed.

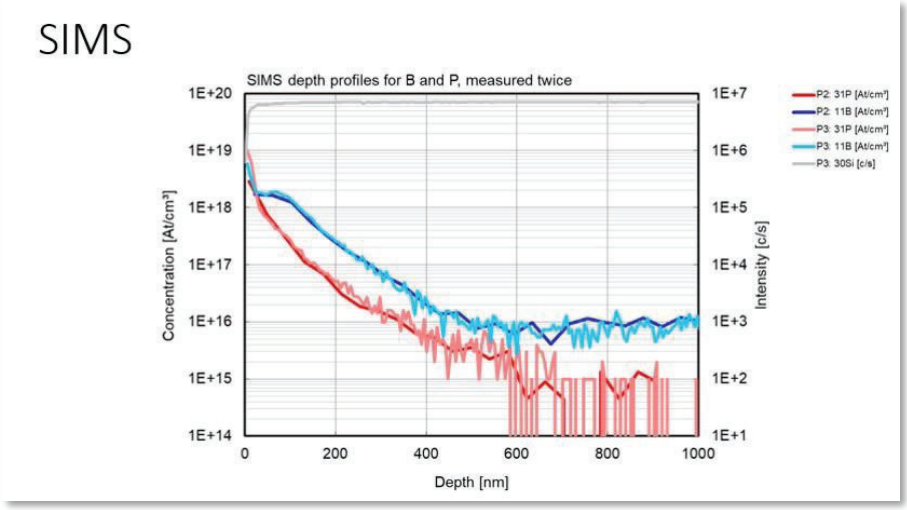


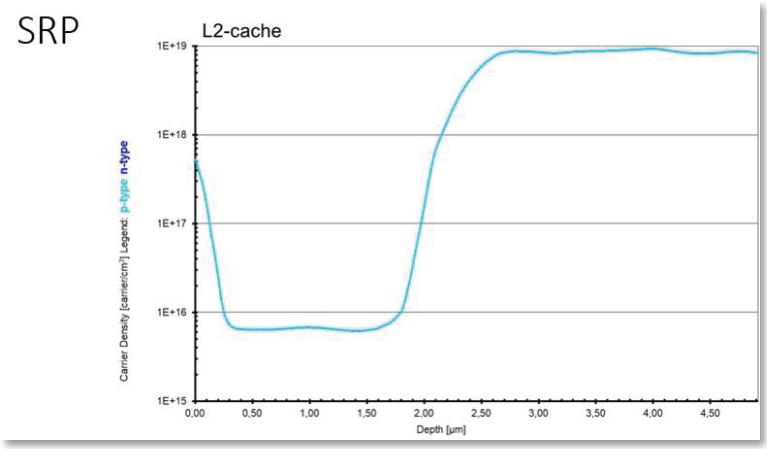

139nm
183nm
151nm
2,234nm
L2-Cache perp.
deco-etch
SGS 0.8kV 4.0mm x25.0k SE(U) 10/15/2021
2.00um

SIMS

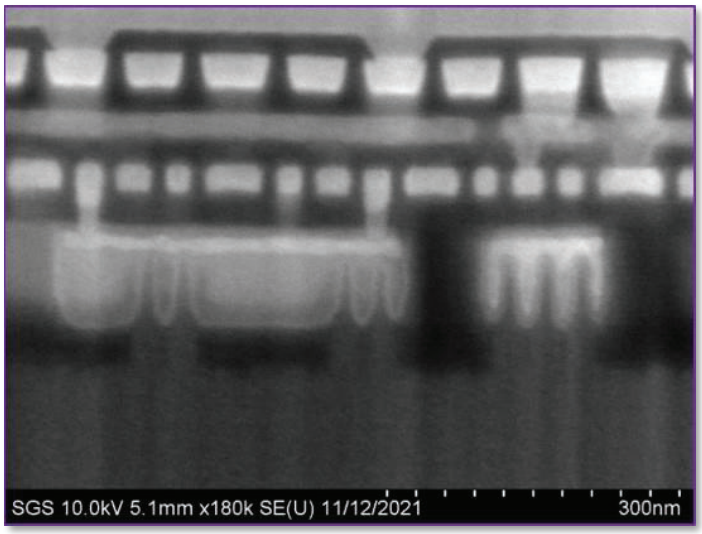

SIMS depth profiles, shallow part measured twice for 11B and 31P
Concentration [At/cm³]
Intensity [c/s]
Depth [nm]
P2: 31P [At/cm²]
P2: 10B [At/cm²]
P2: 11B [At/cm²]
P3: 31P [At/cm²]
P3: 11B [At/cm²]
P2: 30Si [c/s]

SIMS

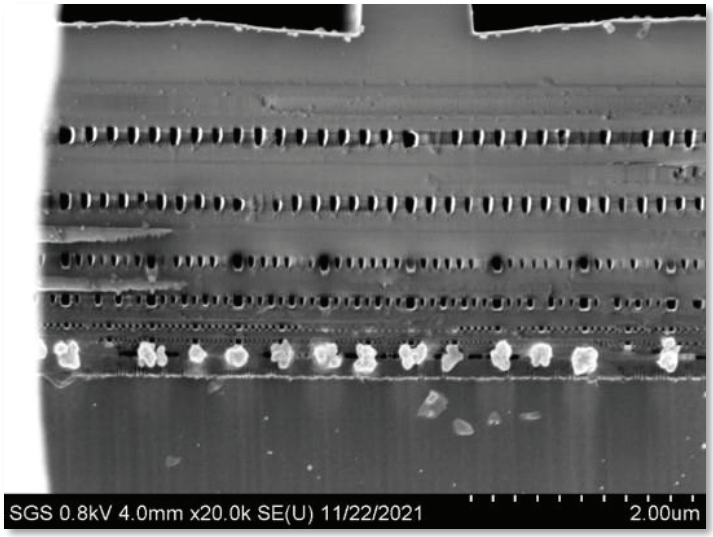

SIMS depth profiles for B and P, measured twice
Concentration [At/cm³]
Intensity [c/s]
Depth [nm]
P2: 31P [At/cm²]
P2: 11B [At/cm²]
P3: 31P [At/cm²]
P3: 11B [At/cm²]
P3: 30Si [c/s]

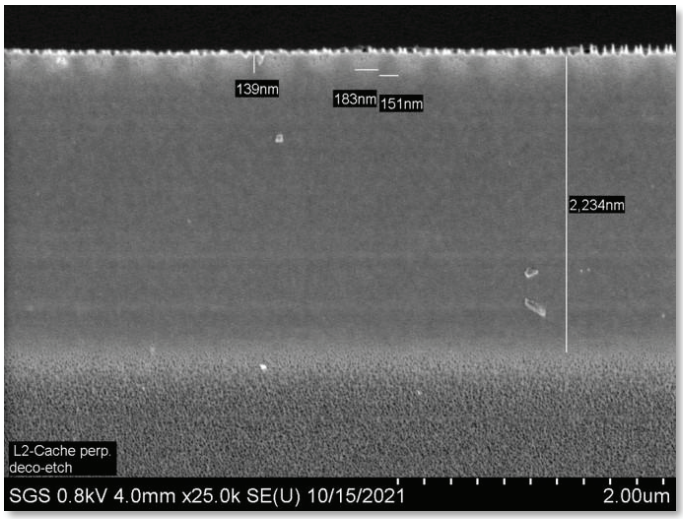


104. The Intel Core i7 11800H contains a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed.

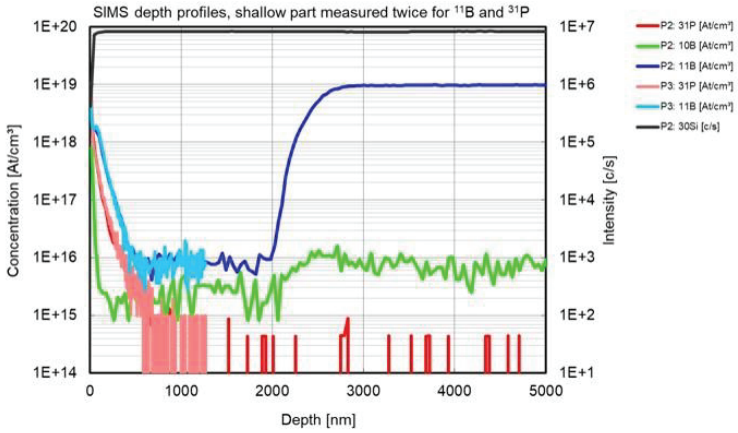


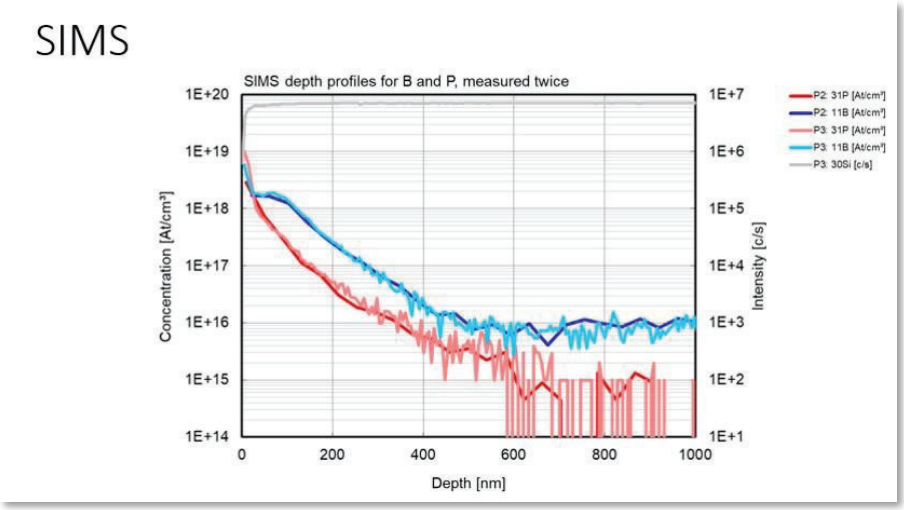
105. The Intel Core i7 11800H contains at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first and second active regions toward an area of the substrate where there are no active regions.

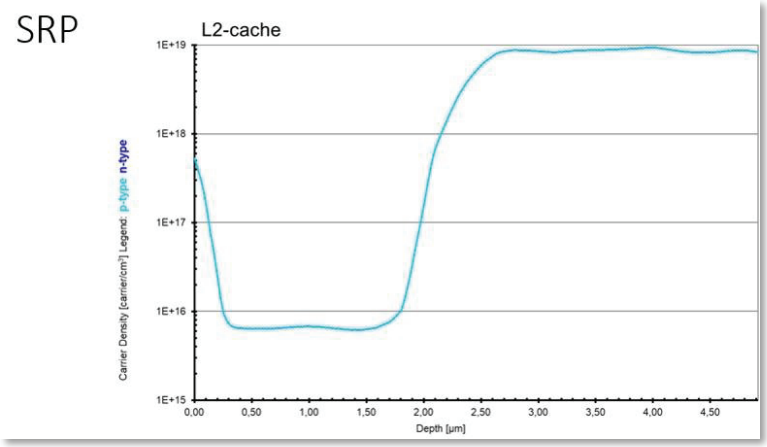

SGS 0.8kV 4.0mm x20.0k SE(U) 11/22/2021
2.00um


139nm
183nm
151nm
2,234nm
L2-Cache perp.
deco-etch
SGS 0.8kV 4.0mm x25.0k SE(U) 10/15/2021
2.00um

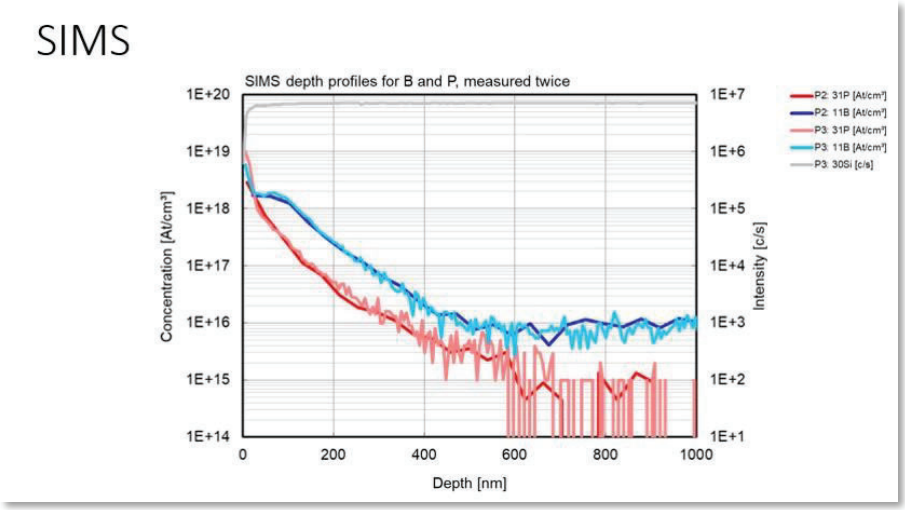
SIMS

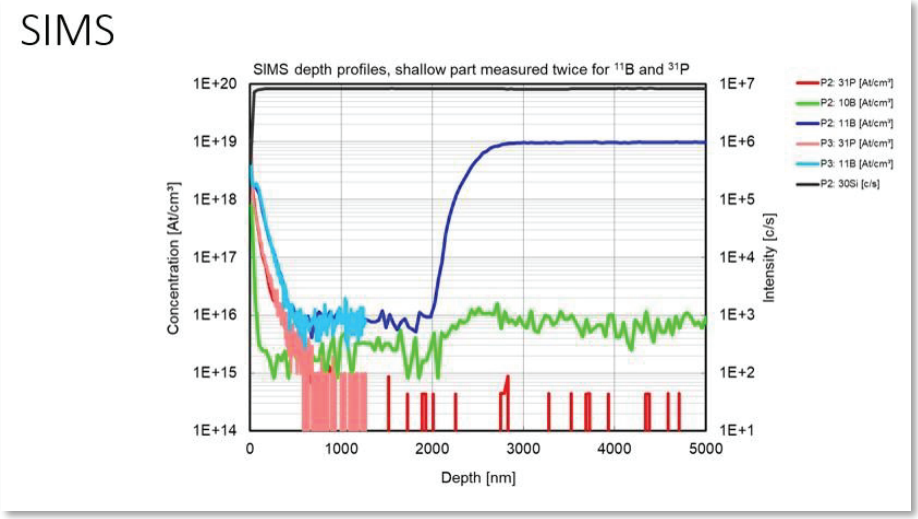

SIMS depth profiles, shallow part measured twice for 11B and 31P
Concentration [At/cm³]
Intensity [c/s]
Depth [nm]
1E+20
1E+19
1E+18
1E+17
1E+16
1E+15
1E+14
1E+7
1E+6
1E+5
1E+4
1E+3
1E+2
1E+1
0
1000
2000
3000
4000
5000
P2: 31P [At/cm³]
P2: 10B [At/cm³]
P2: 11B [At/cm³]
P3: 31P [At/cm³]
P3: 11B [At/cm³]
P2: 30Si [c/s]

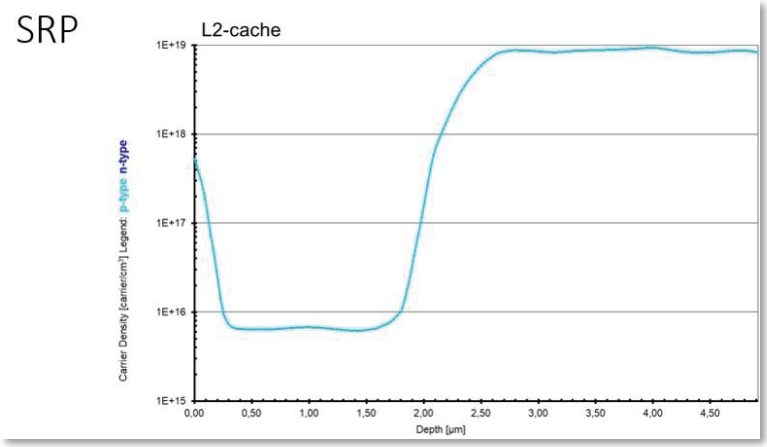




106. The Intel Core i7 11800H contains at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the surface towards the area of the substrate where there are no active regions, wherein at least some of the transistors form digital logic of the VLSI semiconductor device.







107. The foregoing 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.

DAMAGES

109. 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

110. 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: January 27, 2022.

MCKOOL SMITH, P.C.

/s/ *Alan L. Whitehurst*

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