

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

TAIWAN SEMICONDUCTOR)	
MANUFACTURING COMPANY)	
LIMITED,)	
)	
Plaintiff,)	
)	
v.)	C.A. No. _____
)	
GLOBALFOUNDRIES U.S. INC.,)	JURY TRIAL DEMANDED
)	
Defendant.)	

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Taiwan Semiconductor Manufacturing Company Limited (“TSMC” or “Plaintiff”) brings this action for patent infringement against Defendant GlobalFoundries U.S. Inc. (“GlobalFoundries” or “Defendant”) as follows:

NATURE OF THE ACTION

1. This is a civil action for patent infringement under the patent laws of the United States, 35 U.S.C. § 1, *et seq.*
2. Defendant has infringed and continue to infringe, has contributed to and continues to contribute to the infringement of, and has induced and continues to induce the infringement of one or more claims of U.S. Patent Nos. 7,233,032 (“the ’032 patent”); 8,187,948 (“the ’948 patent”), 7,056,821 (“the ’821 patent”); and 7,235,864 (“the ’864 patent”) (collectively, the “Asserted Patents”) at least by making, using, selling, offering for sale, and importing into the United States semiconductor devices and integrated circuits that infringe one or more claims of each of the Asserted Patents.

3. TSMC is the legal owner by assignment of the Asserted Patents, which were duly and legally issued by the United States Patent and Trademark Office (“USPTO”). TSMC seeks monetary damages and injunctive relief to address ongoing infringement of its valuable patent portfolio.

THE PARTIES

4. Taiwan Semiconductor Manufacturing Co., Ltd. is a Taiwanese company and is located at No. 8, Li Hsin Road VI, Hsinchu Science Park, Hsinchu 300-78, Taiwan, R.O.C.

5. GlobalFoundries is a Delaware corporation with its principal place of business at 2600 Great America Way, Santa Clara, California 95054.

6. GlobalFoundries, either itself and/or through the activities of its subsidiaries, makes, uses, sells, offers for sale, and/or imports throughout the United States, including within this District, products, such as semiconductor devices and integrated circuits, that infringe the Asserted Patents. GlobalFoundries’ customers incorporate these products into downstream products that are made, used, sold, offered for sale, and/or imported throughout the United States, including within this District. These downstream products may include, but are not limited to, semiconductor devices, integrated circuits, computer processors, network controllers, graphics cards, smartphones, tablets, laptop computers, televisions, and various other consumer electronics devices that include infringing semiconductor devices and integrated circuits.

JURISDICTION AND VENUE

7. This is a civil action for patent infringement arising under the patent laws of the United States, 35 U.S.C. §§ 1 *et seq.*

8. This Court has subject matter jurisdiction over the matters asserted herein under 28 U.S.C. §§ 1331 and 1338(a).

9. GlobalFoundries is subject to this Court's personal jurisdiction. GlobalFoundries is incorporated in this District and has infringed TSMC's patents in this District by, among other things, engaging in infringing conduct within and directed at or from this District. For example, GlobalFoundries has purposefully and voluntarily placed one or more of its infringing products, as described below, into the stream of commerce with the expectation that these infringing products will be used in this District. These infringing products have been and continue to be used in this District.

10. On information and belief, GlobalFoundries has regularly and systematically transacted business in this District, directly or through subsidiaries or intermediaries, and/or committed acts of patent infringement in this District as alleged more particularly below. GlobalFoundries has also placed integrated circuits (and products containing those integrated circuits) into the stream of commerce by shipping infringing products into this District, shipping infringing products knowing that those products would be shipped into this District, and/or shipping infringing products knowing that these infringing products would be incorporated into other infringing products that would be shipped into this District.

11. The Court therefore has both general and specific personal jurisdiction over GlobalFoundries.

12. Venue is proper in this District pursuant to 28 U.S.C. § 1400(b) at least because, as discussed above, GlobalFoundries is incorporated in this District and hence resides in this District.

FACTUAL BACKGROUND

13. TSMC is a world-class semiconductor foundry with over 48,000 employees worldwide. TSMC pioneered the pure-play foundry business model in 1987 when it was founded and has been the world's largest dedicated semiconductor foundry ever since. TSMC's

groundbreaking foundry model immediately revolutionized the semiconductor and electronics industries and was the first foundry model that enabled fast and efficient manufacturing of made-to-specification silicon semiconductor wafers. For years, TSMC has been recognized as the world's most advanced and most successful provider of semiconductor fabrication and foundry services for customers who design their own circuit layouts, but who either lack their own semiconductor manufacturing expertise and facilities or simply wish to use TSMC's leading-edge fabrication services and technology to manufacture wafers.

14. Each year, TSMC spends billions of dollars on research and development to improve its semiconductor technology and maintain the most advanced semiconductor manufacturing capability in the world. Today, TSMC is the world's largest semiconductor foundry, manufacturing more than 10,000 different products using more than 250 distinct process technologies for over 480 different customers.

15. TSMC serves its customers with annual capacity of more than 12 million 12-inch equivalent wafers (more than any other foundry). It was also the first foundry in the world to provide production capability for the most advanced manufacturing technologies, including 7-nanometer processes, and will be the first foundry to offer commercial production of the world's most advanced 5-nanometer manufacturing technology in 2020. TSMC's pioneering history and dedication to research and development has helped solidify its position as the most innovative and advanced foundry in the world today.

16. TSMC's history of innovation and dedication to innovation has resulted in a world-class patent portfolio, with thousands of patents awarded in the United States and worldwide every year, and a total of almost 37,000 patents issued to date. Due to its dedication

to innovation and its investment in research and development, TSMC has been one of the top ten U.S. patent holders based on the number of new patent grants for three years running.

17. GlobalFoundries is a foundry owned by a sovereign wealth fund, Mubadala Investment Company. It was created by the divestiture of the manufacturing arm of Advanced Micro Devices (AMD). GlobalFoundries has a history of lackluster performance and outmoded technology. Industry analysts have noted that both the Samsung and TSMC foundries are far ahead of GlobalFoundries in key technology advances and that the technology gap is widening every year. For example, one analyst noted that Samsung and TSMC are both ahead of GlobalFoundries in leading-edge nodes and packaging technologies such as TSMC's CoWoS, a 2.5D chip stack, and InFO, a wafer-level fan-out technique. TSMC's advantage in 7-nanometer manufacturing capability and these critical technologies helped TSMC capture lucrative, high-volume opportunities with all leading smartphone vendors and many mobile and high performance computing providers.

18. On information and belief, in August 2018, unable to keep pace with emerging technology trends and not willing to invest the \$2-4 billion required to support a new technology process, GlobalFoundries announced it would be halting all development of its 7 nanometer technology (which GlobalFoundries' new CEO, Tom Caulfield, termed "bleeding edge") in favor of scaling out its 14 and 12 nanometer platforms. This strategic blunder left GlobalFoundries without a viable 10 nanometer or 7 nanometer platform and resulted in the major advanced chip suppliers flocking to TSMC for this mission-critical technology. Even though 7 nanometer manufacturing capability was by all accounts a lucrative investment, GlobalFoundries found itself at least six months behind TSMC in development, so it abandoned all efforts to innovate and support this emerging technology. In fact, on information and belief,

AMD, which spun off its manufacturing arm to create GlobalFoundries, still purchased 7 nanometer solutions from TSMC because GlobalFoundries did not have any applicable 7 nanometer solutions.

19. Starting in late 2018, GlobalFoundries started to sell off portions of its business and decrease manufacturing capacity. In December 2018, GlobalFoundries announced the sale of a major fabrication facility in Singapore to Vanguard International Semiconductor for \$236 million. Four months later, in April 2019, GlobalFoundries sold a key fabrication plant in New York to ON Semiconductor for \$430 million. Less than one month later, in May 2019, GlobalFoundries sold off its ASIC business and Avera Semiconductor, the chip-design team that GlobalFoundries acquired back in 2015 when it purchased IBM's microelectronics division, for \$650 million to Marvell Semiconductor.

20. On information and belief, in August 2019, faced with intense pressure to extract as much income as possible from the business, GlobalFoundries, without notice and unprovoked, launched a massive patent infringement campaign against TSMC and its customers in an attempt to monetize GlobalFoundries' stagnant and outdated patent portfolio. In doing so, GlobalFoundries decided to abandon work on technological advancement and instead shifted focus to wielding the legal process for profit by filing 19 district court lawsuits against TSMC and its customers.

21. Since its inception, GlobalFoundries has failed to adequately invest in developing emerging technologies. It instead decided to use dozens—if not hundreds—of innovative and patented technologies of TSMC without payment or permission. As set forth below, the infringing GlobalFoundries products incorporate or use many technologies that were developed

by TSMC and protected by patents owned by TSMC. TSMC respectfully seeks relief from this Court for GlobalFoundries' extensive infringement.

THE ASSERTED PATENTS

22. The '032 patent, issued on June 19, 2007, is entitled "SRAM device having high aspect ratio cell boundary." John Jhy Liaw is the named inventor. TSMC is the original and current owner by assignment of the '032 patent. A true and correct copy of the '032 patent is attached hereto as Exhibit A.

23. The '948 patent, issued on May 29, 2012, is entitled "Hybrid gap-fill approach for STI formation." Neng-Kuo Chen, Chih-Hsiang Chang, Kuo-Hwa Tzeng, and Cheng-Yuan Tsai are the named inventors. TSMC is the original and current owner by assignment of the '948 patent. A true and correct copy of the '948 patent is attached hereto as Exhibit B.

24. The '821 patent, issued on June 6, 2006, is entitled "Method for manufacturing dual damascene structure with a trench formed first." Chin-Tien Yang, Juan-Jann Jou, Yu-Hua Lee, and Chia-Hung Lai are the named inventors. TSMC is the original and current owner by assignment of the '821 patent. A true and correct copy of the '821 patent is attached hereto as Exhibit C.

25. The '864 patent, issued on June 26, 2007, is entitled "Integrated circuit devices, edge seals therefor." Tze-Liang Lee is the named inventor. TSMC is the original and current owner by assignment of the '864 patent. A true and correct copy of the '864 patent is attached hereto as Exhibit D.

ACTS GIVING RISE TO THIS ACTION

26. The allegations provided below are exemplary and without prejudice to TSMC's infringement contentions. In providing these allegations, TSMC does not convey or imply any particular claim constructions or the precise scope of the claims. TSMC's claim construction contentions regarding the meaning and scope of the claim terms will be provided under the Court's scheduling order and local rules.

27. The infringing products include, but are not limited to, all GlobalFoundries semiconductor devices, integrated circuits, and products manufactured at 32 nanometer technology nodes and smaller including, but not limited to, semiconductor devices manufactured using GlobalFoundries' 32/28 nanometer High-k Metal Gate (HGMK) processes (including GlobalFoundries' 28 nanometer High Performance Plus (28HPP) and 28 nanometer Super Low Power (28SLP) processes), GlobalFoundries' 22 nanometer technology (including GlobalFoundries' 22 nanometer Fully-Depleted Silicon-On-Insulator (FD-SOI) technology and 22FDX platform), GlobalFoundries' 16 nanometer technology (including GlobalFoundries' 16 nanometer Fin Field Effect Transistor ("FinFET") process), GlobalFoundries' 14 nanometer technology (including GlobalFoundries' 14 nanometer FinFET and 14LPP processes), and GlobalFoundries' 12 nanometer technology (including GlobalFoundries' 12 nanometer FinFET and 12LP process and 12FDX platform), and all chipsets, systems-on-a-chip ("SoCs"), processors, controllers, products, and devices containing or utilizing the foregoing technologies, processes, or platforms ("Accused Products"). Some non-exhaustive examples of the Accused Products include the AMD A8-3800 Llano (32nm), Rockchip RK3188 (28nm), Rockchip RK1808 (22nm), AMD RX480 (14nm), and AMD Ryzen 7 2700 (12nm) devices, as well as any other semiconductor device, integrated circuit, chipset, SoC, processor, controller, product, or device manufactured using an infringing GlobalFoundries' technology.

28. As detailed in more detail below, each element of at least one claim of each of the Asserted Patents is literally present in the Accused Products, or is literally practiced by the process through which each of the Accused Products is made. To the extent that any element is not literally present or practiced, each such element is present or practiced under the doctrine of equivalents.

29. In short, GlobalFoundries has made extensive use of TSMC's patented technologies, including the technology described and claimed in the Asserted Patents. TSMC has no choice but to defend its proprietary and patented technology. TSMC thus requests that this Court award it damages sufficient to compensate for GlobalFoundries' infringement of the Asserted Patents, find this case exceptional and award TSMC its attorneys' fees and costs, and grant an injunction against GlobalFoundries to prevent ongoing infringement of the Asserted Patents.

COUNT I: INFRINGEMENT OF U.S. PATENT NO. 7,233,032

30. TSMC incorporates by reference and realleges all the foregoing paragraphs of this Complaint as if fully set forth herein.

31. On information and belief, GlobalFoundries has directly infringed, continues to infringe, and/or has induced or contributed to the infringement of at least claim 1 of the '032 patent by making, using, selling, offering for sale, and/or importing into the United States, without authority or license, integrated circuits manufactured by GlobalFoundries using, for example, GlobalFoundries' 32, 28, 14, and 12 nanometer technology and products containing these integrated circuits (collectively, "the '032 Accused Products") in violation of 35 U.S.C. § 271(a). The '032 Accused Products are non-limiting examples that were identified based on publicly available information, and TSMC reserves the right to identify additional infringing activities, products and services, including, for example, on the basis of information obtained

during discovery. The '032 Accused Products include at least the AMD A8-3800 Llano (32nm), Rockchip RK3188 (28nm), AMD RX480 (14nm), and AMD Ryzen 7 2700 (12nm) devices fabricated using, for example, GlobalFoundries' 32, 28, 14, or 12 nanometer process.

32. On information and belief, GlobalFoundries also actively, knowingly, and intentionally induces infringement of one or more claims of the '032 patent under 35 U.S.C. § 271(b) by actively encouraging others to import into the United States, and/or make, use, sell, and/or offer to sell in the United States, '032 Accused Products or products containing the infringing semiconductor components of the '032 Accused Products.

33. On information and belief, GlobalFoundries further contributes to the infringement of one or more claims of the '032 patent under 35 U.S.C. § 271(c) by offering to sell, selling, and/or importing into the United States a component of the '032 Accused Products, or a material or apparatus for use in practicing a process claimed in the '032 patent, that constitutes a material part of the inventions, knowing the same to be especially made or especially adapted for use in an infringement of the '032 patent, and is not a staple article or commodity of commerce suitable for substantial noninfringing use.

34. By at least September 30, 2019, TSMC disclosed, at least by filing this Complaint, the existence of the '032 patent and identified at least some of GlobalFoundries' and others' activities that infringe the '032 patent. Thus, based on this disclosure, GlobalFoundries had knowledge of the '032 patent and that its activities infringe the '032 patent since at least September 30, 2019. Based on TSMC's disclosures, GlobalFoundries has also known or should have known since at least September 30, 2019 that its customers, distributors, suppliers, and other purchasers of the '032 Accused Products are infringing the '032 patent at least because GlobalFoundries has known that it is infringing the '032 patent.

35. The '032 Accused Products meet all the limitations of at least claim 1 of the '032 patent. Specifically, claim 1 of the '032 patent recites: a static random access memory (SRAM) device, comprising: a substrate having an n-doped region interposing first and second p-doped regions; and an SRAM unit cell including: a first pass-gate transistor and a first pull-down transistor located at least partially over the first p-doped region; first and second pull-up transistors located at least partially over the n-doped region; a second pass-gate transistor, a second pull-down transistor, and first and second read port transistors, all located at least partially over the second p-doped region; a first transistor active region implanted in the first p-doped region and extending between source/drain contacts of the first pass-gate transistor and the first pull-down transistor; and a second transistor active region implanted in the second p-doped region and extending between source/drain contacts of the second pass-gate transistor and the second pull-down transistor.

36. The '032 Accused Products are all static random access memory (SRAM) devices. For example, each of the '032 Accused Products includes one or more SRAM caches with, for example, a six-transistor (6T) or eight-transistor (8T) SRAM array.

37. The '032 Accused Products have a substrate having an n-doped region interposing first and second p-doped regions. For example, each of the '032 Accused Products includes SRAM cells within the SRAM arrays with at least two PMOS pull-up transistors, at least two NMOS pull-down transistors, and at least NMOS two pass-gate transistors. The pass-gate and pull-down transistors are NMOS, so they are made in, for example, p-doped regions with implanted n-doped source/drains. The pull-up transistors are PMOS, so they will be made in, for example, n-doped regions with implanted p-doped source/drains.

38. The '032 Accused Products have an SRAM unit cell including: a first pass-gate transistor and a first pull-down transistor located at least partially over the first p-doped region; first and second pull-up transistors located at least partially over the n-doped region; a second pass-gate transistor, a second pull-down transistor, and first and second read port transistors, all located at least partially over the second p-doped region. For example, as explained above, the pass-gate and pull-down transistors are NMOS, so they are made in, for example, p-doped regions with implanted n-doped source/drains. The read port transistors are also NMOS, so they are made in, for example, p-doped regions with implanted n-doped source/drains. The pull-up transistors are PMOS, so they will be made in n-doped regions with implanted p-doped source/drains.

39. The '032 Accused Products have a first transistor active region implanted in the first p-doped region and extending between source/drain contacts of the first pass-gate transistor and the first pull-down transistor and a second transistor active region implanted in the second p-doped region and extending between source/drain contacts of the second pass-gate transistor and the second pull-down transistor. For example, as discussed above, the pass-gate and pull-down transistors are NMOS, so they are made in p-doped regions with implanted n-doped source/drains. The read port transistors are also NMOS, so they are made in, for example, p-doped regions with implanted n-doped source/drains. The pull-up transistors are PMOS, so they will be made in, for example, n-doped regions with implanted p-doped source/drains. For FinFET products, the fins of the first pass-gate transistor connect to the fins of the first pull-down transistor, and the fins of the second pass-gate transistor connect to the fins of the second pull-down transistor.

40. This description is based on publicly available information and a reasonable investigation of the structure and operation of the '032 Accused Products. TSMC reserves the right to modify this description, including, for example, on the basis of information about the '032 Accused Products that it obtains during discovery.

41. GlobalFoundries' infringement has damaged and continues to damage TSMC in an amount yet to be determined, of at least a reasonable royalty and/or the lost profits that TSMC would have made but for GlobalFoundries' acts of infringement

42. This is an exceptional case. TSMC is entitled to attorneys' fees and costs under 35 U.S.C. § 285 as a result of the infringement of the '032 patent by GlobalFoundries.

COUNT II: INFRINGEMENT OF U.S. PATENT NO. 8,187,948

43. TSMC incorporates by reference and realleges all the foregoing paragraphs of this Complaint as if fully set forth herein.

44. On information and belief, GlobalFoundries has directly infringed, continues to infringe, and/or has induced or contributed to the infringement of at least claim 1 of the '948 patent by making, using, selling, offering for sale, and/or importing into the United States, without authority or license, integrated circuits manufactured by GlobalFoundries using, for example, GlobalFoundries' 14 and 12 nanometer technology and products containing these integrated circuits (collectively, "the '948 Accused Products") in violation of 35 U.S.C. § 271(a). The '948 Accused Products are non-limiting examples that were identified based on publicly available information, and TSMC reserves the right to identify additional infringing activities, products and services, including, for example, on the basis of information obtained during discovery. The '948 Accused Products include at least the AMD RX480 (14nm) and AMD Ryzen 7 2700 (12nm) devices fabricated using, for example, GlobalFoundries' 14 or 12 nanometer process.

45. On information and belief, GlobalFoundries also actively, knowingly, and intentionally induces infringement of one or more claims of the '948 patent under 35 U.S.C. § 271(b) by actively encouraging others to import into the United States, and/or make, use, sell, and/or offer to sell in the United States, '948 Accused Products or products containing the infringing semiconductor components of the '948 Accused Products.

46. On information and belief, GlobalFoundries further contributes to the infringement of one or more claims of the '948 patent under 35 U.S.C. § 271(c) by offering to sell, selling, and/or importing into the United States a component of the '948 Accused Products, or a material or apparatus for use in practicing a process claimed in the '948 patent, that constitutes a material part of the inventions, knowing the same to be especially made or especially adapted for use in an infringement of the '948 patent, and is not a staple article or commodity of commerce suitable for substantial noninfringing use.

47. By at least September 30, 2019, TSMC disclosed, at least by filing this Complaint, the existence of the '948 patent and identified at least some of GlobalFoundries' and others' activities that infringe the '948 patent. Thus, based on this disclosure, GlobalFoundries had knowledge of the '948 patent and that its activities infringe the '948 patent since at least September 30, 2019. Based on TSMC's disclosures, GlobalFoundries has also known or should have known since at least September 30, 2019 that its customers, distributors, suppliers, and other purchasers of the '948 Accused Products are infringing the '948 patent at least because GlobalFoundries has known that it is infringing the '948 patent.

48. On information and belief, GlobalFoundries infringes one or more claims of the '948 patent under 35 U.S.C. § 271(g) by using, offering to sell, selling, and/or importing into the United States a product made by a process claimed in the '948 patent. For example, on

information and belief, GlobalFoundries uses, offers to sell, sells, and/or imports into the United States the '948 Accused Products that were fabricated using a process claimed in the '948 patent and those products were not materially changed by subsequent processes or a trivial and nonessential component of another product.

49. The '948 Accused Products meet all the limitations of at least claim 1 of the '948 patent. Specifically, claim 1 of the '948 patent recites: a method of forming an integrated circuit structure, the method comprising: providing a semiconductor substrate comprising a top surface; forming an opening extending from the top surface into the semiconductor substrate; performing a conformal deposition method to fill a dielectric material into the opening; performing a first treatment on the dielectric material, wherein the first treatment comprises an implantation to the dielectric material; and after the first treatment, performing a steam anneal on the dielectric material.

50. The '948 Accused Products are semiconductor devices with integrated circuits. For example, the AMD RX480 (14nm) is a graphics card featuring the Polaris GPU. The AMD Ryzen 7 2700 (12nm) is a 64-bit 8-core desktop processor. Each of the '948 Accused Products contain integrated circuits fabricated using, for example, GlobalFoundries' 14 or 12 nanometer processes.

51. The '948 Accused Products have a semiconductor substrate comprising a top surface. For example, the '948 Accused Products include a silicon substrate with integrated circuits thereon.

52. The '948 Accused Products have an opening extending from the top surface of the semiconductor substrate into the semiconductor substrate. For example, the '948 Accused

Products contain STI formations that form an opening at the top surface into the silicon substrate.

53. The '948 Accused Products performs a conformal deposition method to fill a dielectric material into the opening. For example, in the '948 Accused Products, dielectric material, such as silicon dioxide (SiO₂), is used to fill the opening in the STI formation using a conformal deposition method.

54. The '948 Accused Products performs a first treatment on the dielectric material, wherein the first treatment comprises an implantation to the dielectric material. For example, in the '948 Accused Products, the dielectric material, such as silicon dioxide (SiO₂), is implanted with, for example, Trisilylamine (TSA), NH_x, and ozone (O₃).

55. The '948 Accused Products perform a steam anneal on the dielectric material after the first treatment. For example, on information and belief, in the '948 Accused Products, after the silicon dioxide (SiO₂) dielectric material is implanted with, for example, Trisilylamine (TSA), NH_x, and ozone (O₃), a steam anneal is performed on the dielectric material.

56. This description is based on publicly available information and a reasonable investigation of the structure and operation of the '948 Accused Products. TSMC reserves the right to modify this description, including, for example, on the basis of information about the '948 Accused Products that it obtains during discovery.

57. GlobalFoundries' infringement has damaged and continues to damage TSMC in an amount yet to be determined, of at least a reasonable royalty and/or the lost profits that TSMC would have made but for GlobalFoundries' acts of infringement.

58. This is an exceptional case. TSMC is entitled to attorneys' fees and costs under 35 U.S.C. § 285 as a result of the infringement of the '948 patent by GlobalFoundries.

COUNT III: INFRINGEMENT OF U.S. PATENT NO. 7,056,821

59. TSMC incorporates by reference and realleges all the foregoing paragraphs of this Complaint as if fully set forth herein.

60. On information and belief, GlobalFoundries has directly infringed, continues to infringe, and/or has induced or contributed to the infringement of at least claim 1 of the '821 patent by making, using, selling, offering for sale, and/or importing into the United States, without authority or license, integrated circuits manufactured by GlobalFoundries using, for example, GlobalFoundries' 28, 14, and 12 nanometer technology and products containing these integrated circuits (collectively, "the '821 Accused Products") in violation of 35 U.S.C. § 271(a). The '821 Accused Products are non-limiting examples that were identified based on publicly available information, and TSMC reserves the right to identify additional infringing activities, products and services, including, for example, on the basis of information obtained during discovery. The '821 Accused Products include at least the Rockchip RK3188 (28nm), AMD RX480 (14nm), AMD Ryzen 7 2700 (12nm) devices fabricated using, for example, GlobalFoundries' 28, 14, and 12 nanometer process.

61. On information and belief, GlobalFoundries also actively, knowingly, and intentionally induces infringement of one or more claims of the '821 patent under 35 U.S.C. § 271(b) by actively encouraging others to import into the United States, and/or make, use, sell, and/or offer to sell in the United States, '821 Accused Products or products containing the infringing semiconductor components of the '821 Accused Products.

62. On information and belief, GlobalFoundries further contributes to the infringement of one or more claims of the '821 patent under 35 U.S.C. § 271(c) by offering to sell, selling, and/or importing into the United States a component of the '821 Accused Products, or a material or apparatus for use in practicing a process claimed in the '821 patent, that

constitutes a material part of the inventions, knowing the same to be especially made or especially adapted for use in an infringement of the '821 patent, and is not a staple article or commodity of commerce suitable for substantial noninfringing use.

63. By at least September 30, 2019, TSMC disclosed, at least by filing this Complaint, the existence of the '821 patent and identified at least some of GlobalFoundries' and others' activities that infringe the '821 patent. Thus, based on this disclosure, GlobalFoundries had knowledge of the '821 patent and that its activities infringe the '821 patent since at least September 30, 2019. Based on TSMC's disclosures, GlobalFoundries has also known or should have known since at least September 30, 2019 that its customers, distributors, suppliers, and other purchasers of the '821 Accused Products are infringing the '821 patent at least because GlobalFoundries has known that it is infringing the '821 patent.

64. On information and belief, GlobalFoundries infringes one or more claims of the '821 patent under 35 U.S.C. § 271(g) by using, offering to sell, selling, and/or importing into the United States a product made by a process claimed in the '821 patent. For example, on information and belief, GlobalFoundries uses, offers to sell, sells, and/or imports into the United States the '821 Accused Products that were fabricated using a process claimed in the '821 patent and those products were not materially changed by subsequent processes or a trivial and nonessential component of another product.

65. The '821 Accused Products meet all the limitations of at least claim 1 of the '821 patent. Specifically, claim 1 of the '821 patent recites: a method for manufacturing dual damascene structure with a trench formed first, comprising the steps of: providing a substrate having a plurality of semiconductor devices; forming a first metal layer on the substrate; forming a first etching stop layer on the first metal layer; forming a dielectric layer on the first etching

stop layer; forming a second etching stop layer on the dielectric layer; forming a first patterned photoresist layer on the second etching stop layer; forming a trench by etching through the second etching stop layer and stopping in the dielectric layer at a predetermined depth; filling with a sacrificial layer into the trench; planarizing the sacrificial layer; forming a second patterned photoresist layer on the sacrificial layer; forming a via by etching the sacrificial layer and the dielectric layer; removing the sacrificial layer and the second patterned photoresist layer; etching the first etching stop layer to expose the first metal layer; filling with a second metal layer; and planarizing the second metal layer.

66. On information and belief, the '821 Accused Products are made using a method for manufacturing dual damascene structure with a trench formed first, comprising a series of steps described herein.

67. The relevant dual damascene structure in the '821 Accused Products is made using the first step of providing a substrate having a plurality of semiconductor devices. For example, the Rockchip RK3188 (28nm) is a low power processor for mobile devices. The AMD RX480 (14nm) is a graphics card featuring the Polaris GPU. The AMD Ryzen 7 2700 (12nm) is a 64-bit 8-core desktop processor. Each of the '821 Accused Products contain a substrate having a plurality of semiconductor devices fabricated using, for example, GlobalFoundries' 28, 14, or 12 nanometer process.

68. The relevant dual damascene structure in the '821 Accused Products is made using the second step of forming a first metal layer on the substrate. For example, the '821 Accused Products have metal contacts formed on the substrate.

69. The relevant dual damascene structure in the '821 Accused Products is made using the third, fourth, and fifth steps of: forming a first etching stop layer on the first metal

layer; forming a dielectric layer on the first etching stop layer; and forming a second etching stop layer on the dielectric layer. For example, in the '821 Accused Products a first etching stop layer is adjacent to the layer containing the metal contacts. In addition, there is a dielectric layer adjacent to the first etching stop layer, with a second etching stop layer also adjacent to the dielectric layer.

70. On information and belief, the relevant dual damascene structure in the '821 Accused Products is made using the additional steps of: forming a first patterned photoresist layer on the second etching stop layer; forming a trench by etching through the second etching stop layer and stopping in the dielectric layer at a predetermined depth; filling with a sacrificial layer into the trench; planarizing the sacrificial layer; forming a second patterned photoresist layer on the sacrificial layer; forming a via by etching the sacrificial layer and the dielectric layer; removing the sacrificial layer and the second patterned photoresist layer; and etching the first etching stop layer to expose the first metal layer.

71. The relevant dual damascene structure in the '821 Accused Products is made by the additional steps of filling the trench with a second metal layer and planarizing the second metal layer. For example, the '821 Accused Products have metal interconnects attached to the contacts in other layers. The interconnects have a planar surface.

72. This description is based on publicly available information and a reasonable investigation of the structure and operation of the '821 Accused Products. TSMC reserves the right to modify this description, including, for example, on the basis of information about the '821 Accused Products that it obtains during discovery.

73. GlobalFoundries' infringement has damaged and continues to damage TSMC in an amount yet to be determined, of at least a reasonable royalty and/or the lost profits that TSMC would have made but for GlobalFoundries' acts of infringement.

74. This is an exceptional case. TSMC is entitled to attorneys' fees and costs under 35 U.S.C. § 285 as a result of the infringement of the '821 patent by GlobalFoundries.

COUNT IV: INFRINGEMENT OF U.S. PATENT NO. 7,235,864

75. TSMC incorporates by reference and realleges all the foregoing paragraphs of this Complaint as if fully set forth herein.

76. On information and belief, GlobalFoundries has directly infringed, continues to infringe, and/or has induced or contributed to the infringement of at least claim 1 of the '864 patent by making, using, selling, offering for sale, and/or importing into the United States, without authority or license, integrated circuits manufactured by GlobalFoundries using, for example, GlobalFoundries' 32, 28, 14, and 12 nanometer technology and products containing these integrated circuits (collectively, "the '864 Accused Products") in violation of 35 U.S.C. § 271(a). The '864 Accused Products are non-limiting examples that were identified based on publicly available information, and TSMC reserves the right to identify additional infringing activities, products and services, including, for example, on the basis of information obtained during discovery. The '864 Accused Products include at least the AMD A8-3800 Llano (32nm), Rockchip RK3188 (28nm), AMD RX480 (14nm), and AMD Ryzen 7 2700 (12nm) devices fabricated using, for example, GlobalFoundries' 32, 28, 14, or 12 nanometer process.

77. On information and belief, GlobalFoundries also actively, knowingly, and intentionally induces infringement of one or more claims of the '864 patent under 35 U.S.C. § 271(b) by actively encouraging others to import into the United States, and/or make, use, sell,

and/or offer to sell in the United States, '864 Accused Products or products containing the infringing semiconductor components of the '864 Accused Products.

78. On information and belief, GlobalFoundries further contributes to the infringement of one or more claims of the '864 patent under 35 U.S.C. § 271(c) by offering to sell, selling, and/or importing into the United States a component of the '864 Accused Products, or a material or apparatus for use in practicing a process claimed in the '864 patent, that constitutes a material part of the inventions, knowing the same to be especially made or especially adapted for use in an infringement of the '864 patent, and is not a staple article or commodity of commerce suitable for substantial noninfringing use.

79. By at least September 30, 2019, TSMC disclosed, at least by filing this Complaint, the existence of the '864 patent and identified at least some of GlobalFoundries' and others' activities that infringe the '864 patent. Thus, based on this disclosure, GlobalFoundries had knowledge of the '864 patent and that its activities infringe the '864 patent since at least September 30, 2019. Based on TSMC's disclosures, GlobalFoundries has also known or should have known since at least September 30, 2019 that its customers, distributors, suppliers, and other purchasers of the '864 Accused Products are infringing the '864 patent at least because GlobalFoundries has known that it is infringing the '864 patent.

80. The '864 Accused Products meet all the limitations of at least claim 1 of the '864 patent. Specifically, claim 1 of the '864 patent recites: an edge seal for a chip with integrated circuits, comprising: a first metal line along a periphery of the chip; a first inter-metal dielectric layer on the first metal line; a second metal line overlying the first inter-metal dielectric layer and extending along the periphery of the chip; a plurality of first metal plugs in the first inter-metal dielectric layer connecting the first metal line and the second metal line; and at least one first

metal wall in the first inter-metal dielectric layer laterally adjacent to a periphery of the first metal line, in which the first metal wall connects the first metal line and the second metal line.

81. The '864 Accused Products are chips with integrated circuits. For example, the AMD A8-3800 Llano (32 nm) is an accelerated processing unit (APU) designed to act as a central processing unit and graphics processing unit on a single die. The Rockchip RK3188 (28nm) is a mobile device processor. The AMD RX480 (14nm) is a graphics card featuring the Polaris GPU. The AMD Ryzen 7 2700 (12nm) is a 64-bit 8-core desktop processor. Each of the '864 Accused Products contain integrated circuits fabricated using, for example, GlobalFoundries' 32, 28, 14, or 12 process.

82. The '864 Accused Products have an edge seal for a chip with integrated circuits. For example, the '864 Accused Products include a die seal surrounding electronic integrated circuits printed on a microchip die.

83. The '864 Accused Products have a first metal line along a periphery of the chip. For example, the die seal of the '864 Accused Products is disposed less than 200 micrometers from the edge of the microchip die perimeter on all sides of the microchip and includes metal structures such as a first copper line.

84. The '864 Accused Products have a first inter-metal dielectric layer on the first metal line. For example, a layer of material composed of fluorinated silicon dioxide, silicon monoxide, or silicon carbonitride is disposed above the first copper line and beneath a subsequent copper line.

85. The '864 Accused Products have a second metal line overlying the first inter-metal dielectric layer and extending along the periphery of the chip. For example, a second, subsequent copper line is disposed atop the layer of fluorinated silicon dioxide, silicon

monoxide, or silicon carbonitride. The second, subsequent copper line runs the length of the seal which extends along the periphery of the microchip die perimeter.

86. The '864 Accused Products have a plurality of first metal plugs in the first inter-metal dielectric layer connecting the first metal line and the second metal line. For example, the '864 Accused Products includes copper filled via plugs produced through a via process. The copper via plugs extend from the second copper line, through the layer of fluorinated silicon dioxide, silicon monoxide, or silicon carbonitride, and contact that first copper line.

87. The '864 Accused Products have at least one first metal wall in the first inter-metal dielectric layer laterally adjacent to a periphery of the first metal line, in which the first metal wall connects the first metal line and the second metal line. For example, adjacent both ends of the first and second copper lines, copper sidewall extends therebetween in proximity to the edges of each copper line. The walls extend over the length of the die seal surrounding electronic integrated circuits printed on the microchip die and runs parallel to the edges of the first and second copper lines.

88. This description is based on publicly available information and a reasonable investigation of the structure and operation of the '864 Accused Products. TSMC reserves the right to modify this description, including, for example, on the basis of information about the '864 Accused Products that it obtains during discovery.

89. GlobalFoundries' infringement has damaged and continues to damage TSMC in an amount yet to be determined, of at least a reasonable royalty and/or the lost profits that TSMC would have made but for GlobalFoundries' acts of infringement.

90. This is an exceptional case. TSMC is entitled to attorneys' fees and costs under 35 U.S.C. § 285 as a result of the infringement of the '864 patent by GlobalFoundries.

PRAYER FOR RELIEF

WHEREFORE, TSMC respectfully requests:

1. That Judgment be entered that GlobalFoundries has infringed one or more of the Asserted Patents, directly and indirectly, by way of inducement or contributory infringement, literally or under the doctrine of equivalents;
2. That, in accordance with 35 U.S.C. § 283, GlobalFoundries and all 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 Asserted Patents and (2) making, using, selling, offering for sale and/or importing the Accused Products;
3. An award of damages sufficient to compensate TSMC for GlobalFoundries' infringement under 35 U.S.C. § 284;
4. That the case be found exceptional under 35 U.S.C. § 285 and that TSMC be awarded its attorneys' fees;
5. Costs and expenses in this action;
6. An award of prejudgment and post-judgment interest; and
7. Such other and further relief as the Court may deem just and proper.

DEMAND FOR JURY TRIAL

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, TSMC respectfully demands a trial by jury on all issues raised by the Complaint.

Respectfully submitted,

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