IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

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| 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. 8,648,446 ("the '446 patent"); 6,417,032 ("the '032 patent"); 7,355,235 ("the '235 patent"); and 7,501,227 ("the '227 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 '446 patent, issued on February 11, 2014, is entitled "Method for protecting a gate structure during contact formation." Hong-Dyi Chang, Pei-Chao Su, Kong-Beng Thei, Hun-Jan Tao, and Harry Hak-Lay Chuang are the named inventors. TSMC is the original and current owner by assignment of the '446 patent. A true and correct copy of the '446 patent is attached hereto as Exhibit A.

23. The '032 patent, issued on July 9, 2002, is entitled "Method of forming cross strapped Vss layout for full CMOS SRAM cell." Jhon-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 B.

24. The '235 patent, issued on April 8, 2008, is entitled "Semiconductor device and method for high-k gate dielectrics." Chih-Hao Wang, Ching-Wei Tsai, and Shang-Chih Chen are the named inventors. TSMC is the original and current owner by assignment of the '235 patent. A true and correct copy of the '235 patent is attached hereto as Exhibit C.

25. The '227 patent, issued on March 10, 2009, is entitled "System and method for photolithography in semiconductor manufacturing." Kuei Shun Chen, Chin-Hsiang Lin, and David Ding-Chung Lu are the named inventors. TSMC is the original and current owner by assignment of the '227 patent. A true and correct copy of the '227 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. 8,648,446**

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 '446 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 '446 Accused Products") in violation of 35 U.S.C. § 271(a). The '446 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 ’446 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.

32. On information and belief, GlobalFoundries also actively, knowingly, and intentionally induces infringement of one or more claims of the ’446 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, ’446 Accused Products or products containing the infringing semiconductor components of the ’446 Accused Products.

33. On information and belief, GlobalFoundries further contributes to the infringement of one or more claims of the ’446 patent under 35 U.S.C. § 271(c) by offering to sell, selling, and/or importing into the United States a component of the ’446 Accused Products, or a material or apparatus for use in practicing a process claimed in the ’446 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 ’446 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 ’446 patent and identified at least some of GlobalFoundries’ and others’ activities that infringe the ’446 patent. Thus, based on this disclosure, GlobalFoundries had knowledge of the ’446 patent and that its activities infringe the ’446 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 ’446 Accused Products are infringing the ’446 patent at least because GlobalFoundries has known that it is infringing the ’446 patent.

35. The ’446 Accused Products meet all the limitations of at least claim 1 of the ’446 patent. Specifically, claim 1 of the ’446 patent recites: a semiconductor device comprising: a substrate; a gate structure disposed over the substrate, wherein the gate structure includes a source region and a drain region disposed in the substrate, and wherein the gate structure interposes the source region and the drain region; a first etch stop layer disposed over the gate structure; a second etch stop layer disposed over the source region and the drain region; a dielectric layer disposed over substrate, wherein the dielectric layer is disposed over the first etch stop layer and the second etch stop layer; and a gate contact, a source contact, and a drain contact, wherein the gate contact extends through the dielectric layer and the first etch stop layer to the gate structure, and the source contact and the drain contact extend through the dielectric layer and the second etch stop layer respectively to the source region and the drain region.

36. The ’446 Accused Products are semiconductor devices. 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 ’446 Accused Products contain integrated circuits fabricated using, for example, GlobalFoundries’ 14 or 12 nanometer processes.

37. The ’446 Accused Products have a substrate. For example, the ’446 Accused Products include a silicon substrate with integrated circuits thereon.

38. The ’446 Accused Products have a gate structure disposed over the substrate, wherein the gate structure includes a source region and a drain region disposed in the substrate, and wherein the gate structure interposes the source region and the drain region. For example, the ’446 Accused Products contain PMOS logic transistors and NMOS logic transistors, each containing a gate structure, a source region, and a drain region disposed in the substrate. The gate structure interposes the source region and the drain region.

39. The ’446 Accused Products have a first etch stop layer disposed over the gate structure. For example, a silicon nitride etch stop layer is disposed over the gate structure.

40. The ’446 Accused Products have a second etch stop layer disposed over the source region and the drain region. For example, a second silicon nitride etch stop layer is disposed over the source region and the drain region.

41. The ’446 Accused Products have a dielectric layer disposed over substrate, wherein the dielectric layer is disposed over the first etch stop layer and the second etch stop layer. For example, a silicon oxide (SiO) layer is disposed over both etch stop layers and a silicon carbonitride (SiCN) layer is disposed over the silicon oxide layer.

42. The ’446 Accused Products have a gate contact, a source contact, and a drain contact, wherein the gate contact extends through the dielectric layer and the first etch stop layer to the gate structure. For example, each PMOS logic transistor and each NMOS logic transistor includes a gate contact extending through the dielectric layer and the first etch stop layer to the gate electrode portion of the gate structure.

43. The ’446 Accused Products have a source contact and drain contact that extend through the dielectric layer and the second etch stop layer respectively to the source region and the drain region. For example, each PMOS logic transistor and each NMOS logic transistor includes a source contact that extends through the dielectric layer to the source region and a drain contact that extends through the second etch stop layer to the drain region.

44. This description is based on publicly available information and a reasonable investigation of the structure and operation of the ’446 Accused Products. TSMC reserves the right to modify this description, including, for example, on the basis of information about the ’446 Accused Products that it obtains during discovery.

45. 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.

46. 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 '446 patent by GlobalFoundries.

**COUNT II: INFRINGEMENT OF U.S. PATENT NO. 6,417,032**

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

48. 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.

49. 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.

50. 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.

51. 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.

52. On information and belief, GlobalFoundries infringes one or more claims of the '032 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 '032 patent. For example, on information and belief, GlobalFoundries uses, offers to sell, sells, and/or imports into the United States the '032 Accused Products that were fabricated using a process claimed in the '032 patent

and those produces were not materially changed by subsequent processes or a trivial and nonessential component of another product.

53. 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 method of forming an SRAM device with an array of cells having low resistance conductors for the reference potential (Vss) circuits connected to transistors in the SRAM device comprising: forming an SRAM device with two pull-up transistors, two pull-down transistors and two pass gate transistors, including thin film gate electrode conductors and inter-connection lines, each of the transistors having a drain region and a source region with source regions of the two pull-up transistors connected to a power supply voltage (Vcc), forming a plurality of dielectric layers containing metal conductor lines over the transistors, the gate conductors and the interconnection lines, forming a conductive reference potential node electrically connected to the source region of each of the pull-down transistors, said metal conductor lines including a first Vss strap/conductor line oriented in a first direction in a first one of the dielectric layers and a second Vss strap/conductor line oriented in a second direction in a second one of the dielectric layers, and forming a VIA/contact between the conductive reference potential node and the first and second Vss strap/conductor lines.

54. The ’032 Accused Products are SRAM devices that include an array of cells having low resistance conductors for the reference potential (Vss) circuits connected to transistors in the SRAM device. 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. Each of these arrays of cells have low resistance conductors for the reference potential (Vss) circuits connected to the transistors in the SRAM device.

55. The ’032 Accused Products are formed with an SRAM device with two pull-up transistors, two pull-down transistors and two pass gate transistors, including thin film gate electrode conductors and inter-connection lines, each of the transistors having a drain region and a source region with source regions of the two pull-up transistors connected to a power supply voltage (Vcc). 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 two pass-gate transistors. The SRAM cells also include thin film gate electrode conductors and inter-connection lines, and each of the transistors has a drain region and a source region where the source regions of the two PMOS pull-up transistors are connected to a power supply voltage (Vcc), as is typical with SRAM cells.

56. The ’032 Accused Products are formed with a plurality of dielectric layers containing metal conductor lines over the transistors, the gate conductors and the interconnection lines. For example, the SRAM cells within each of the ’032 Accused Products include various dielectric layers in the inter-level dielectrics (ILDs), pre-metal dielectrics (PMDs), and metallization layers. At least some of these layers contain metal conductor lines over the transistors, the gate conductors, and the interconnection lines.

57. The ’032 Accused Products are formed with a conductive reference potential node electrically connected to the source region of each of the pull-down transistors, said metal conductor lines including a first Vss strap/conductor line oriented in a first direction in a first one of the dielectric layers and a second Vss strap/conductor line oriented in a second direction in a second one of the dielectric layers. For example, each of the ’032 Accused Products includes an SRAM array with distribution lands connected to power bus Vss lines running horizontally

(alternating with the word lines) and oriented in a first direction in one of the dielectric layers and oriented in a second direction in another one of the dielectric layers.

58. The ’032 Accused Products are formed with a VIA/contact between the conductive reference potential node and the first and second Vss strap/conductor lines. Each of the ’032 Accused Products contain, for example, copper filled vias and tungsten filled TiN lined contacts between the conductive reference potential node and the first and second Vss strap/conductor lines.

59. 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.

60. 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

61. 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 III: INFRINGEMENT OF U.S. PATENT NO. 7,355,235**

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

63. 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 ’235 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 '235 Accused Products") in violation of 35 U.S.C. § 271(a). The '235 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 '235 Accused Products include at least the Rockchip RK 3188 (28 nm), AMD RX480 (14nm), and AMD Ryzen 7 2700 (12nm) devices fabricated using, for example, GlobalFoundries' 28, 14, and 12 nanometer processes.

64. On information and belief, GlobalFoundries also actively, knowingly, and intentionally induces infringement of one or more claims of the '235 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, '235 Accused Products or products containing the infringing semiconductor components of the '235 Accused Products.

65. On information and belief, GlobalFoundries further contributes to the infringement of one or more claims of the '235 patent under 35 U.S.C. § 271(c) by offering to sell, selling, and/or importing into the United States a component of the '235 Accused Products, or a material or apparatus for use in practicing a process claimed in the '235 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 '235 patent, and is not a staple article or commodity of commerce suitable for substantial noninfringing use.

66. By at least September 30, 2019, TSMC disclosed, at least by filing this Complaint, the existence of the '235 patent and identified at least some of GlobalFoundries' and others' activities that infringe the '235 patent. Thus, based on this disclosure, GlobalFoundries had knowledge of the '235 patent and that its activities infringe the '235 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 '235 Accused Products are infringing the '235 patent at least because GlobalFoundries has known that it is infringing the '235 patent.

67. The '235 Accused Products meet all the limitations of at least claim 1 of the '235 patent. Specifically, claim 1 of the '235 patent recites: a semiconductor device, comprising: a substrate; a nitrogen-containing, substantially metal-free layer over the substrate; a high-k dielectric material having nitrogen over the nitrogen-containing layer, wherein the nitrogen percentage in the high-k dielectric material is lower than that in the nitrogen-containing layer; and a gate electrode material over the high-k dielectric material.

68. The '235 Accused Products are semiconductor devices. For example, the Rockchip RK3188 (28 nm) 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 '235 Accused Products contain integrated circuits fabricated using, for example, GlobalFoundries' 28, 14, or 12 nanometer process.

69. The '235 Accused Products have a substrate. For example, the '235 Accused Products include, for example, a silicon (Si) or silicon germanium (SiGe) substrate with integrated circuits thereon.

70. The '235 Accused Products have a nitrogen-containing, substantially metal-free layer over the substrate. For example, the '235 Accused Products contain PMOS and NMOS with a nitrogen-containing layer, such as silicon oxynitride (SiON), which is substantially metal-free, over the silicon (Si) or silicon germanium (SiGe) substrate.

71. The ’235 Accused Products have a high-k dielectric material having nitrogen over the nitrogen-containing layer, wherein the nitrogen percentage in the high-k dielectric material is lower than that in the nitrogen-containing layer. For example, the PMOS and NMOS high-k dielectric layer contains nitrogen, among others, and on information and belief, these PMOS and NMOS high-k dielectric layer contains nitrogen at a lower nitrogen percentage than the PMOS and NMOS nitrogen-containing layer, such as silicon oxynitride (SiON).

72. The ’235 Accused Products have a gate electrode material over the high-k dielectric material. For example, a gate electrode is disposed over the PMOS and NMOS high-k dielectric layer containing nitrogen.

73. This description is based on publicly available information and a reasonable investigation of the structure and operation of the ’235 Accused Products. TSMC reserves the right to modify this description, including, for example, on the basis of information about the ’235 Accused Products that it obtains during discovery.

74. 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.

75. 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 ’235 patent by GlobalFoundries.

**COUNT IV: INFRINGEMENT OF U.S. PATENT NO. 7,501,227**

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

77. 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 ’227 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 '227 Accused Products") in violation of 35 U.S.C. § 271(a). The '227 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 '227 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 processes.

78. On information and belief, GlobalFoundries also actively, knowingly, and intentionally induces infringement of one or more claims of the '227 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, '227 Accused Products or products containing the infringing semiconductor components of the '227 Accused Products.

79. On information and belief, GlobalFoundries further contributes to the infringement of one or more claims of the '227 patent under 35 U.S.C. § 271(c) by offering to sell, selling, and/or importing into the United States a component of the '227 Accused Products, or a material or apparatus for use in practicing a process claimed in the '227 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 '227 patent, and is not a staple article or commodity of commerce suitable for substantial noninfringing use.

80. By at least September 30, 2019, TSMC disclosed, at least by filing this Complaint, the existence of the '227 patent and identified at least some of GlobalFoundries' and

others' activities that infringe the '227 patent. Thus, based on this disclosure, GlobalFoundries had knowledge of the '227 patent and that its activities infringe the '227 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 '227 Accused Products are infringing the '227 patent at least because GlobalFoundries has known that it is infringing the '227 patent.

81. On information and belief, GlobalFoundries infringes one or more claims of the '227 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 '227 patent. For example, on information and belief, GlobalFoundries uses, offers to sell, sells, and/or imports into the United States the '227 Accused Products that were fabricated using a process claimed in the '227 patent and those produces were not materially changed by subsequent processes or a trivial and nonessential component of another product.

82. The '227 Accused Products meet all the limitations of at least claim 1 of the '227 patent. Specifically, claim 1 of the '227 patent recites: a method for producing a pattern on a substrate layer, the method comprising: providing a pattern including a main feature and a dummy feature; providing at least one first exposure onto the layer by a higher-precision lithography mechanism, wherein the first exposure produces the pattern on the layer; and providing at least one second exposure onto the layer by a lower-precision lithography mechanism, wherein the second exposure removes the dummy feature from the pattern, thereby producing the main feature on the layer.

83. The '227 Accused Products are semiconductor devices having integrated circuits where a pattern is produced on a substrate layer. For example, the AMD A8-3800 Llano (32nm)

is a 64-bit 4-core microprocessor. The Rockchip RK3188 (28nm) is a 4-core mobile 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 '227 Accused Products contain integrated circuits fabricated using, for example, GlobalFoundries' 32, 28, 14, or 12 nanometer processes. These integrated circuits contain a silicon substrate layer with patterns thereon.

84. The '227 Accused Products have a pattern including a main feature and a dummy feature. For example, in the GlobalFoundries' 32, 28, 14, and 12 nanometer processes, the '227 Accused Products utilize a two-pattern process where the fins are deposited in the first step, then unwanted fins are removed, forming an STI trench. This is a process referred to as "fin-first, cut-last."

85. On information and belief, the '227 Accused Products provide at least one first exposure onto the layer by a higher-precision lithography mechanism, wherein the first exposure produces the pattern on the layer. For example, the '227 Accused Products contain "right-way" and "wrong-way" directional printing, which is used to describe the resolution capability of the individual printing levels. On information and belief, this directional printing is part of the GlobalFoundries' 32, 28, 14, and 12 nanometer processes.

86. On information and belief, the '227 Accused Products provide at least one second exposure onto the layer by a lower-precision lithography mechanism, wherein the second exposure removes the dummy feature from the pattern. For example, a "fin-first, cut-last" is used to form the fins. Fins are separated with STI 1 trenches filled with oxide. The unwanted fins are removed using a cut mask, and etching deeper, to form STI 2, which is ~100-110 nm deeper than STI 1.

87. On information and belief, the ’227 Accused Products thereby produce a main feature on the layer. Using GlobalFoundries’ 32, 28, 14, or 12 nanometer processes and the “fin-first, cut-last” process described above, a main feature is left on the substrate layer.

88. This description is based on publicly available information and a reasonable investigation of the structure and operation of the ’227 Accused Products. TSMC reserves the right to modify this description, including, for example, on the basis of information about the ’227 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 ’227 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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