

**IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE**

NVIDIA CORPORATION, a Delaware corporation,

Plaintiff,

v.

SAMSUNG ELECTRONICS CO., LTD., a South Korea corporation; SAMSUNG ELECTRONICS AMERICA, INC., a New York corporation; SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, a limited liability Delaware corporation; SAMSUNG SEMICONDUCTOR, INC., a California corporation; and QUALCOMM INC., a Delaware corporation,

Defendants.

C.A. No.

**JURY TRIAL DEMANDED**

**COMPLAINT FOR PATENT INFRINGEMENT**

Plaintiff NVIDIA Corporation (“NVIDIA”) brings this action for patent infringement against Defendants Qualcomm, Inc. (“Qualcomm”) and Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., Samsung Telecommunications America, LLC, and Samsung Semiconductor, Inc. (collectively “Samsung”) and alleges as follows:

**PRELIMINARY STATEMENT**

1. This is an action to protect graphics technologies that are vital to success in modern computing.
2. Plaintiff NVIDIA Corporation (“NVIDIA”), the company that invented the graphics processing unit (“GPU”), is the largest company in the world dedicated to visual computing. Led by the world’s best visual computing engineers and supported by more than \$9 billion in research and development, NVIDIA has pioneered and revolutionized visual computing. NVIDIA’s inventions enable the rich visual computing experience that end customers demand when they purchase the more than one billion smartphones and tablet

computers sold every year. These same inventions power life-saving medical devices, defense systems used to protect the security of the United States, and many of the world's largest and fastest supercomputers. With about 7,000 patents and applications, NVIDIA has amassed the industry's largest body of innovation in modern computer graphics. NVIDIA is committed to maintaining its leadership role in visual computing technologies, investing over \$1.3 billion annually in research and development.

3. These innovations have redefined how our world connects and communicates. The GPU has become at least equal in importance to its older sibling, the CPU, in powering billions of "smart" mobile devices, such as smartphones and tablets. These mobile computers feature rich graphics and are powered by the GPU technologies invented by NVIDIA. Nearly every time someone operates a mobile device – whether using a graphical user interface, swiping to change a display screen, playing a computer game, editing photos, browsing the internet or watching videos – NVIDIA's inventions are used. The flexibility and quality of the user experience in modern computing, and the ability of consumers to enjoy the same level of visual computing on mobile devices as their desktop computers, is all attributable to NVIDIA's patented technologies.

4. In stark contrast, Samsung and Qualcomm are not visual computing companies. Defendants are mobile device and semiconductor companies. Qualcomm supplies more than half of the processors used in smartphones around the world and Samsung leads the global market in sales of smartphones. But while Samsung and Qualcomm are each multi-billion dollar goliaths in their respective industries, neither company has ever led the world in visual computing. Instead, they have built their profitability in mobile devices and their global market shares through the use of rich graphics that use NVIDIA's innovations and patented technologies.

5. For these reasons, NVIDIA brings this action against Defendants Samsung and Qualcomm for patent infringement pursuant to the patents laws of the United States, 35 U.S.C., Sec. 1 *et seq.* This civil action arises from Defendants' manufacture, use, sale or offers for sale

within the United States or importation into the United States of products such as smart phones and tablet computers that infringe patents owned by NVIDIA.

### **NVIDIA AND ITS HISTORY OF TECHNOLOGY LEADERSHIP**

6. NVIDIA is a pioneer in graphics technologies and the quintessential American success story. In 1993, co-founders Jen-Hsun Huang, Curtis Priem and Chris Malachowsky began NVIDIA in Silicon Valley with a dream to transform the visual computing experience. They sought to develop the innovative technologies that would improve user experience every time someone turned on their computer. This dream became a reality. Today, NVIDIA is a global company with nearly 9,000 employees. NVIDIA has shipped over 1 Billion GPUs since 1999.

7. In 1998, the team incorporated NVIDIA as a Delaware corporation and currently has its headquarters at 2701 San Tomas Expressway, Santa Clara, California 95050.

8. NVIDIA was the first company to put *all* functions necessary to graphics processing onto a single chip. This first product was released to the public in 1999 as the “GeForce 256.” The GeForce 256 achieved the difficult task of a single-chip processor integrating the entire 3D graphics pipeline (transformation, lighting, setup and rendering), allowing 3D graphics to be performed wholly on a graphics card with four times the processing power of a high-end CPU. NVIDIA obtained many patents related to these ground-breaking inventions and subsequent improvements, two of which are asserted in this case.

9. First, on March 6, 2001, the United States Patent Office duly, regularly, and legally issued to NVIDIA United States Patent No. 6,198,488 (“the ’488 Patent”), entitled *Transform, Lighting and Rasterization System Embodied on a Single Semiconductor Platform*, naming John Erik Lindholm, Simon Moy, Kevin Dawallu, Mingjian Yang, John Montrym, David B. Kirk, Paolo E. Sabella, Matthew N. Papakipos, Douglas A. Voorhies and Nicholas J. Foskett as inventors. A true, correct, and certified copy of the ’488 patent is attached hereto as Exhibit 1 and incorporated herein by reference.

10. Second, on January 31, 2006, the United States Patent Office duly, regularly, and legally issued to NVIDIA United States Patent No. 6,992,667 (“the ’667 Patent”), entitled *Single Semiconductor Graphics Platform System and Method with Skinning, Swizzling and Masking Capabilities*, naming John Erik Lindholm, Simon Moy, Kevin Dawallu, Mingjian Yang, John Montrym, David B. Kirk, Paolo E. Sabella, Matthew N. Papakipos, Douglas A. Voorhies and Nicholas J. Foskett as inventors. A true, correct, and certified copy of the ’667 Patent is attached hereto as Exhibit 2 and incorporated herein by reference.

11. The ’488 Patent generally discloses a graphics pipeline system on a single semiconductor platform used for processing graphics and multithreaded parallel processing of graphics data. The ’488 Patent is related to early, significant improvements of the first GPU, such as NVIDIA’s invention of incorporating a multithreaded unit with parallel processing capabilities into the graphics pipeline on the single-chip GPU. This invention allowed GPUs for the first time to perform different graphics operations in parallel. The related ’667 Patent disclosed a graphics pipeline system on a single semiconductor platform that was capable of additional graphics operations such as skinning, swizzling and masking.

12. The invention of integrating the entire graphics pipeline onto a single chip – together with multithreaded parallel processing capabilities – were critical steps in the development of the powerful mobile chips we have today. Central to the powerful processing power of today’s GPUs is their ability to process huge batches of data and program instructions in multithreaded processing units that can execute thousands of graphics and other computations in parallel. These GPUs enable consumers to run the same types of applications and graphics on their smartphones that they enjoy on their personal computers.

13. One of the next major advancements in the development of the GPU was making it programmable. Just a short time later, based on continued investment in innovative research and development, NVIDIA introduced the first fully programmable GPU, the GeForce 3, to the consumer market. The GeForce 3 debuted in 2001 and enabled programmers to execute custom visual effects and create sophisticated graphics using high-level shading languages. A related

processor, the NV2A, was used in Microsoft's original Xbox, which set a new standard for video game console features and performance. As a result of NVIDIA's technologies, for the first time non-experts were able to program GPUs to create sophisticated graphics, customize visual effects, control shapes and manipulate virtually all aspects of a scene, including lighting and surfaces.

14. Once again, NVIDIA was awarded numerous patents by the U.S. Patent and Trademark Office for inventions related to these unique and ground-breaking technologies. Four of the patents related to this technology are asserted here. On April 24, 2007, the United States Patent Office duly, regularly, and legally issued United States Patent No. 7,209,140 ("the '140 Patent"), entitled *System, Method and Article of Manufacture for a Programmable Vertex Processing Model with Instruction Set*, naming John Erik Lindholm, David B. Kirk, Henry P. Moreton and Simon Moy as the inventors. A true, correct, and certified copy of the '140 Patent is attached hereto as Exhibit 3 and incorporated herein by reference. The '140 patent protects basic systems and methods for programmable processing in a computer graphics pipeline. Using this invention, graphics operations in a hardware graphics accelerator are made programmable by allowing a user to utilize instructions from a predetermined instruction set.

15. On February 10, 2004, the United States Patent Office duly, regularly, and legally issued United States Patent No. 6,690,372 ("the '372 Patent"), entitled *System, Method and Article of Manufacturer for Shadow Mapping*, naming Walter E. Donovan and Liang Peng as the inventors. A true, correct, and certified copy of the '372 Patent is attached hereto as Exhibit 4 and incorporated herein by reference. The '372 patent discloses particular methods and systems for performing programmable shading calculations in a graphics pipeline that are now used by nearly all fragment shader programs executed on modern GPUs. Two other patents, U.S. Patent Nos. 7,038,685 and 7,015,913, protect additional inventions related to multithreaded programmable GPUs and are described further herein.

16. NVIDIA next focused on making graphics technology faster and more efficient. It made the graphics experience *even better*. Graphics rendering pipelines had fixed-function

shader units that could only perform one type of processing, such as vertex processing or pixel processing. This was very inefficient, as the processing units were under-utilized and often sat idle, resulting in diminished user experience. Multithreaded processing units in the pipeline could also be slowed-down when certain graphics data was not yet ready to be processed by the next program thread scheduled for execution.

17. To solve these challenges, NVIDIA invented powerful ways to harness the capabilities of the GPU and to efficiently process data, work at full capacity, and move quickly between different types of tasks. With the dawn of NVIDIA's inventions, visual computing was forever transformed. New "unified shaders" created and patented by NVIDIA added flexibility and enhanced performance, enabling the GPU to dynamically balance its workload at increased speeds, keeping all of its processing units efficiently utilized at all times. NVIDIA also invented ways to optimize multithreaded processing in the GPU, such as the ability to process program threads in any sequence to avoid bottlenecks in the pipeline.

18. In 2006, NVIDIA brought its new unified shaders to market when it introduced the GeForce 8800, the world's first GPU with a fully unified architecture that also supported Microsoft's DirectX 10 programming interface. The largest and fastest commercial GPU at the time, the GeForce 8800 did more than redefine the PC gaming experience – it was the first GPU that could also be used for general high performance computing.

19. The U.S. Patent and Trademark Office awarded NVIDIA numerous patents on these inventions, which are foundational to the efficient and fast operation of today's GPUs. On May 2, 2006, the United States Patent Office duly, regularly, and legally issued United States Patent No. 7,038,685 ("the '685 Patent"), entitled *Programmable Graphics Processor for Multithreaded Execution of Programs*, naming John Erik Lindholm as the inventor. A true, correct, and certified copy of the '685 Patent is attached hereto as Exhibit 5 and incorporated herein by reference. The '685 Patent protects the basic invention of multi-threaded execution of program instructions for processing different types of samples, such as pixel and vertex data, in a unified shader architecture that can dynamically balance its workloads.

20. On March 21, 2006, the United States Patent Office duly, regularly, and legally issued United States Patent No. 7,015,913 (“the ’913 Patent”), entitled *Method and Apparatus for Multithreaded Processing of Data in a Programmable Graphics Processor*, naming John Erik Lindholm, Rul M. Bastos and Harold Robert Feldman Zatz as the inventors. A true, correct, and certified copy of the ’913 Patent is attached hereto as Exhibit 6 and incorporated herein by reference. The ’913 Patent relates to scheduling multi-threaded processing of different types of samples of graphics data, such as vertex and pixel samples, in an order independent of the order in which they are received.

21. NVIDIA acquired additional graphics technologies when it purchased the intellectual property assets of a business rival, 3dfx Interactive, in late 2000. One of those assets was United States Patent No. 6,697,063 (“the ’063 Patent”), entitled *Rendering Pipeline*, which was duly, regularly and legally issued by the United States Patent Office on February 24, 2004, and named Ming Benjamin Zhu as the inventor. A true, correct, and certified copy of the ’063 Patent is attached hereto as Exhibit 7. At the time of his invention, Mr. Zhu was employed at another company called Gigapixel, which was subsequently acquired by 3dfx. Gigapixel was known for having pioneered technology for tile-based deferred 3D graphics rendering. The ’063 Patent was directed to this technology, which combined on-chip tiling with early visibility testing in the graphics pipeline. All of Samsung’s mobile products use GPUs that implement this patented invention.

22. NVIDIA’s technologies are used for many purposes. For example, the same Kepler architecture that powers the fastest supercomputer in the world at the U.S. Oak Ridge National Laboratory can also be found in NVIDIA’s mobile processors used to power smart phones, tablet computers, gaming devices and automotive accessories. Without NVIDIA’s technologies, videos and animation-heavy operations – including many of today’s user interfaces – would stutter instead of operating smoothly on the screen. GPUs enable consumers to use and enjoy mobile devices they purchase with the increasingly larger screens, higher resolutions, and multimedia tasks such as image recognition, flash video, and video processing capabilities that

end users demand. Because of the NVIDIA's technologies, images are processed more quickly, moving objects don't appear pixelated, and special effects can be added to videos and photos – all while conserving valuable battery resources.

23. NVIDIA continues to lead the world in new advances in graphics processing today. NVIDIA's graphics technologies are now at the heart of every mobile device and NVIDIA remains the largest company in the world dedicated to visual computing. NVIDIA's most recent mobile processor, the Tegra K1, features the first 192-core GPU and is based on the same Kepler architecture that drives the fastest supercomputer in the United States. The Tegra K1 "super chip" is the market's most advanced mobile processor and it is redefining mobile computing by, for the first time in history, bringing to mobile devices the same level of visual computing as desktop computing. For example, the Tegra K1 is the first mobile chip to support CUDA GPU computing and DirectX 11, and the new 64-bit Tegra K1 is the world's first 64-bit ARM processor for Android, allowing future mobile devices to offer PC-class performance for standard applications.

24. All of this innovation requires extraordinary investment. NVIDIA has invested billions of dollars in its innovations that have revolutionized the visual computing industry. Approximately 3,700 people in the U.S. (about 85% of NVIDIA's U.S. workforce) are dedicated to research and development related to product lines that practice the Asserted Patents. NVIDIA's innovation has also resulted in the aforementioned extensive intellectual property portfolio of approximately 7,000 patents and patent applications around the world, representing the industry's largest body of work in the field of computer graphics.

### **SAMSUNG and QUALCOMM**

25. Qualcomm and Samsung are not GPU pioneers nor are they innovators in graphics technology. Qualcomm dominates the global market for smartphone applications processors, with a market share exceeding 50%, and is also a leader in tablet application processors. Samsung leads the global market in sales of smartphones, selling about twice as many as its nearest competitor, and is also a global leader in the sales of tablet computers, nearly

tripling its market share over the past two years. Samsung smartphones, tablet computers, and other products are powered by mobile processors supplied by Qualcomm, which use GPUs commercially known as “Adreno.” The market success of Qualcomm and Samsung in these areas is built on the back of NVIDIA’s pioneering graphics technology, and Qualcomm and Samsung continue to release new products using NVIDIA’s technology.

26. Qualcomm and Samsung readily understand the current and growing importance of visual computing and the graphics technology upon which it is built. In 2008, nearly a decade after NVIDIA released the first GPU, Qualcomm entered the market for mobile chipsets with graphics processing capabilities not through its own research and development, but by acquiring 3D graphics technologies from Advanced Micro Devices. Qualcomm renamed the graphics cores it acquired “Adreno” and subsequently released its first mobile processor with an Adreno GPU in the last quarter of 2008 (the “Adreno 200”). Qualcomm has since released its Adreno 300 and 400 series of GPUs, which are incorporated in later generations of its Snapdragon mobile processors.

27. Qualcomm understands the importance of the GPU to today’s mobile devices. Qualcomm’s marketing information on its accused Snapdragon processors states,

Games, animations, UIs and apps have become an important part of mobile experiences, and that’s why the all-in-one design of Snapdragon processors come with the Adreno™ graphics processing unit (GPU) built in. The GPU significantly accelerates the rendering of complex geometries to meet a level of graphics performance required by today’s most complex and realistic mobile games, user interfaces, web browsers and other advanced graphics applications ....

28. Instead of developing its own graphics processing technology, Samsung purchases and uses Qualcomm’s infringing processors and GPUs, as well as other processors and GPUs that infringe the claims of the Asserted Patents. Yet Samsung refuses to enter into licenses that would appropriately compensate NVIDIA for its use of the essential graphics technologies protected by the NVIDIA patent portfolio. Since August 2012, NVIDIA has attempted to reach an appropriate license with Samsung, which would enable Samsung to properly use NVIDIA’s IP within its products. But Samsung has negotiated based on delay and

by pointing the infringement finger at its chipset suppliers, such as Qualcomm, or third parties that supply GPU technologies used by Samsung in its own processors. Samsung of course chooses its suppliers; designs, assembles and ships its mobile devices; but continues to refuse to accept responsibility for its use of NVIDIA's technology, while it continues to reap enormous profits from the sale of Samsung-branded products shipped into the United States and elsewhere.

29. Upon information and belief, Defendant Samsung Electronics Co. Ltd. is a foreign corporation organized and existing under the laws of South Korea with its principal place of business located in Seoul, South Korea. On information and belief, Samsung Electronics Co., Ltd., designs, develops, manufactures and sells consumer electronics, such as mobile phones and tablet computers, that infringe one or more claims of the Asserted Patents owned by NVIDIA. Upon information and belief, Samsung Electronics, Co. Ltd. conducts a substantial amount of business in this state both directly through, for example, online sales and advertisements made directly to consumers, and indirectly through, for example, the sales of its products by subsidiaries, distributors and resellers. Upon information and belief, Samsung Electronics Co., Ltd., is the parent corporation of co-defendants Samsung Electronics America, Inc., Samsung Telecommunications America, LLC and Samsung Semiconductor, Inc., each of which are also responsible for the sale, marketing and support of certain infringing consumer electronics within the United States, including the state of Delaware.

30. Upon information and belief, Defendant Samsung Electronics America, Inc., is a corporation organized and existing under the laws of the state of New York with its principal place of business in Ridgefield Park, New Jersey and is a wholly-owned subsidiary of Defendant Samsung Electronics Co., Ltd. Upon information and belief, Samsung Electronics America, Inc. is the managing entity that oversees the North America operations of co-defendants Samsung Defendants Samsung Telecommunications America, LLC and Samsung Semiconductor, Inc. Upon information and belief, Samsung Electronics America, Inc. conducts substantial business in this state, including through the sale and importation of infringing consumer electronics into the United States and into the state of Delaware.

31. Upon information and belief, Defendant Samsung Telecommunications America LLC is a subsidiary of Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. and is a limited liability corporation organized and existing under the laws of the state of Delaware with its principal place of business in Richardson, Texas. Upon information and belief, Defendant Samsung Telecommunications America, LLC conducts substantial business in this state, including through the sale and importation of infringing consumer electronics into the United States and into the state of Delaware, and employs full-time sales and marketing personnel in Delaware. These infringing products include personal and business communications products such as mobile phones and tablet computers.

32. Upon information and belief, Defendant Samsung Semiconductor, Inc. is a subsidiary of Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. Samsung Semiconductor, Inc. is a corporation organized and existing under the laws of California with its principal place of business in San Jose, California. Upon information and belief, Samsung Semiconductor, Inc. conducts substantial business in this state and is involved in the development, manufacture, import and/or sale of certain infringing processors and consumer electronics in the United States, including the state of Delaware.

33. Defendant Qualcomm, Inc. is a corporation organized and existing under the laws of Delaware with its principal place of business in San Diego, California. Qualcomm itself and through its subsidiaries designs, develops, manufactures and/or sells mobile processors which infringe the Asserted Patents and which are used in Samsung products that infringe the Asserted Patents. Both the Qualcomm and Samsung infringing products are developed, manufactured, imported, used and/or sold in the United States including the state of Delaware.

34. Qualcomm and Samsung have had knowledge of some or all of the Asserted Patents since before this Complaint was filed. Samsung knew of at least the '488, '667, and '063 Patents since at least August 7, 2012, and at least the '685 and '913 patents since at least January 15, 2014, through discussions with NVIDIA. Upon information and belief, Qualcomm knew of the same patents at least through discussions with Samsung. In the alternative, to the extent that

Samsung or Qualcomm lacked actual knowledge of one or more of the Asserted Patents, they were willfully blind to the existence of the patents and the infringement of the patents. At a minimum, Qualcomm and Samsung will have knowledge of all the Asserted Patents, their infringement of the Asserted Patents, and infringement of the Asserted Patents by the Accused Products, upon service of this Complaint by NVIDIA upon Qualcomm and Samsung concurrently with this filing.

### **THE ACCUSED PRODUCTS AT ISSUE**

35. The technology at issue involves graphics processing. The Accused Products include graphics technologies in their processors that render images for a display screen. The Accused Products utilize various patented technologies covered by the Asserted Patents, such as graphics processing on a single semiconductor platform, multithreaded graphics processing, unified shader architectures, programmable graphics processing, and early visibility testing in the graphics pipeline. Processors using these graphics processing technologies include Qualcomm's Snapdragon processors and Samsung's Exynos processors. Samsung products using those processors, such as mobile phones and tablet computers, infringe the Asserted Patents.

36. Samsung designs, develops, manufactures, sells, offers for sale, uses, and imports into the United States products that infringe the Asserted Patents. Examples of the Accused Products include, but are not limited to, Samsung products that incorporate Samsung and Qualcomm processors. Examples of such Samsung products include, but are not limited to, mobile phones (including the Galaxy Note 4, Galaxy Note Edge, Galaxy S5, Galaxy Note 3, and Galaxy S4) and tablet computers (including the Galaxy Tab S and Galaxy Note Pro).

37. Qualcomm designs, develops, manufactures, has manufactured, uses, and sells to Samsung processors referred to commercially as Snapdragon that are used in the Accused Products. The Qualcomm processors at issue include, but are not limited to, the Snapdragon S4 (using the Adreno 225), Snapdragon 400 (using the Adreno 305), Snapdragon 600 (using the Adreno 320), Snapdragon 800 and 801 (using the Adreno 330), and Snapdragon 805 (using the Adreno 420).

38. Each of the Accused Products meets each and every limitation of at least one claim of each of the Asserted Patents. The products identified herein are merely illustrative of the types and classes of infringing products that Samsung and Qualcomm manufacture, sell, offer for sale, use and/or import into the United States, in violation of the patent laws of the United States.

### **JURISDICTION AND VENUE**

39. This is a civil action for patent infringement pursuant to 35 U.S.C. § 1, *et. seq.* arising from Defendants' manufacture, use, sale or offers for sale within the United States or importation into the United States of consumer products such as mobile phones and tablet computers which products contain certain processors and chipsets with graphics processing capabilities which infringe one or more claims of United States patents owned by NVIDIA. These patents are United States Patent Nos. 6,198,488 ("the '488 Patent"), 6,992,667 ("the '667 Patent"), 7,038,685 ("the '685 Patent"), 7,015,913 ("the '913 Patent"), 6,697,063 ("the '063 Patent"), 7,209,140 ("the '140 Patent") and 6,690,372 ("the '372 Patent") (collectively the "Asserted Patents"). Examples of the Accused Products include Qualcomm's Snapdragon processors and Samsung mobile phones and tablet computers that use either Qualcomm's Snapdragon processors or Samsung's own Exynos processors.

40. The Court has subject matter jurisdiction over this action pursuant to, *inter alia*, 28 U.S.C. §§ 1331 and 1338(a).

41. Venue is proper in this district pursuant to 28 U.S.C. § 1391(b) because, *inter alia*, a substantial part of the events and omissions giving rise to the claims occurred here and the Defendants reside in this district and are subject to personal jurisdiction in this district. Each Defendant conducts substantial business activities in the state, including acts of patent infringement that have injured NVIDIA, and therefore the Defendants have purposefully availed themselves of the laws of the state of Delaware. In addition, Defendant Samsung Telecommunications America, LLC is incorporated in this state.

**FIRST CLAIM FOR RELIEF**

**(Infringement of U.S. Patent Number 6,198,488)**

42. Each of the above paragraphs is herein incorporated by reference.

43. The '488 Patent generally discloses a graphics pipeline system on a single semiconductor platform that is used for graphics processing and multithreaded parallel processing of graphics data on the single semiconductor platform.

44. NVIDIA is the assignee and owner of all right, title and interest in and to the '488 Patent, which is valid, enforceable, and is currently in full force and effect. Mssrs. Lindholm, *et al.* assigned to NVIDIA all right, title and interest in and to the '488 Patent.

45. NVIDIA asserts that at least claims 1, 19 and 20 are infringed by the Accused Products.

46. Defendants have infringed and continue to infringe the '488 patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products which include, but are not limited to, mobile phones (including the Galaxy Note 4, Galaxy Note Edge, Galaxy S5, Galaxy Note 3, and Galaxy S4) and tablet computers (including the Galaxy Tab S and Galaxy Note Pro).

47. Defendants also indirectly infringe the '488 Patent by inducing and/or contributing to infringement of the claims of the patent. For example, Defendants induce infringement and/or contributorily infringe when third parties, such as customers and consumers, and/or Defendants' employees, directly infringe the patent by using accused consumer products such as mobile phones and tablet computers and the processors incorporated into those products.

48. Defendants contribute to the infringement of the '488 Patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products. Upon information and belief, Defendants know the Accused Products, and/or hardware and software components of the Accused Products that constitute material parts of the claimed inventions, are especially made or adapted for use in infringing the claims of the

'488 Patent and are not staple articles or commodities of commerce suitable for substantial non-infringing use.

49. Defendants actively induce others to infringe the '488 Patent by encouraging and facilitating others to perform actions known by Defendants to infringe, including but not limited to the use of the Accused Products. Defendants know or should know that their actions will induce infringement and intend to induce infringement. For example, on information and belief, Defendants encourage, train, instruct, and provide support and technical assistance to their direct and indirect customers, potential customers and end users to make infringing use of the Accused Products, such as by publishing and providing technical materials and promotional literature describing and instructing in the infringing use of the Accused Products. Simply turning on and using the Accused Products, for their intended purposes or otherwise, practices method claims of the patent, as does the execution of applications stored in the Accused Products.

50. Defendants' infringement is causing damage and irreparable injury to NVIDIA and NVIDIA will continue to suffer damage and irreparable injury unless and until such infringement is enjoined by this Court.

51. On information and belief, the Defendants have been aware of the existence of the '488 Patent since at least August 2012, and continue to willfully, wantonly and deliberately engage in acts of infringement, as that term is defined in 35 U.S.C. § 271, without regard to the '488 Patent.

52. Upon information and belief, Samsung has gained profits through its infringement of the '488 Patent.

53. NVIDIA is entitled to injunctive relief and damages in accordance with 35 U.S.C. Sections 271, 281, 283 and 284.

#### **SECOND CLAIM FOR RELIEF**

#### **(Infringement of U.S. Patent Number 6,992,667)**

54. Each of the above paragraphs is herein incorporated by reference.

55. The '667 Patent generally discloses a graphics pipeline system on a single semiconductor platform that is used for graphics processing, with the additional capabilities to perform skinning, swizzling, and masking.

56. NVIDIA is the assignee and owner of all right, title and interest in and to the '667 Patent, which is valid, enforceable, and is currently in full force and effect. Msrs. Lindholm, *et al.* assigned to NVIDIA all right, title and interest in and to the '667 Patent.

57. NVIDIA asserts that at least claims 1-29 are infringed by Accused Products.

58. Defendants have infringed and continue to infringe the '667 patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products which include, but are not limited to, mobile phones (including the Galaxy Note 4, Galaxy Note Edge, Galaxy S5, Galaxy Note 3, and Galaxy S4) and tablet computers (including the Galaxy Tab S and Galaxy Note Pro).

59. Defendants also indirectly infringe the '667 Patent by inducing and/or contributing to infringement of the claims of the patent. For example, Defendants induce infringement and/or contributorily infringe when third parties, such as customers and consumers, and/or Defendants' employees, directly infringe the patent by using accused consumer products such as mobile phones and tablet computers and the processors incorporated into those products.

60. Defendants contribute to the infringement of the '667 Patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products. Upon information and belief, Defendants know the Accused Products, and/or hardware and software components of the Accused Products that constitute material parts of the claimed inventions, are especially made or adapted for use in infringing the claims of the '667 Patent and are not staple articles or commodities of commerce suitable for substantial non-infringing use.

61. Defendants actively induce others to infringe the '667 Patent by encouraging and facilitating others to perform actions known by Defendants to infringe, including but not limited to the use of the Accused Products. Defendants know or should know that their actions will

induce infringement and intend to induce infringement. For example, on information and belief, Defendants encourage, train, instruct, and provide support and technical assistance to their direct and indirect customers, potential customers and end users to make infringing use of the Accused Products, such as by publishing and providing technical materials and promotional literature describing and instructing in the infringing use of the Accused Products. Simply turning on and using the Accused Products, for their intended purposes or otherwise, practices method claims of the patent, as does the execution of applications stored in the Accused Products.

62. Defendants' infringement is causing damage and irreparable injury to NVIDIA and NVIDIA will continue to suffer damage and irreparable injury unless and until such infringement is enjoined by this Court.

63. On information and belief, the Defendants have been aware of the existence of the '667 Patent since at least August 2012, and continue to willfully, wantonly and deliberately engage in acts of infringement, as that term is defined in 35 U.S.C. § 271, without regard to the '667 Patent.

64. Upon information and belief, Samsung has gained profits through its infringement of the '667 Patent.

65. NVIDIA is entitled to injunctive relief and damages in accordance with 35 U.S.C. Sections 271, 281, 283 and 284.

### **THIRD CLAIM FOR RELIEF**

#### **(Infringement of U.S. Patent Number 7,038,685)**

66. Each of the above paragraphs is herein incorporated by reference.

67. The '685 Patent generally relates to multi-threaded execution of program instructions for processing different types of samples, such as pixel and vertex data, in a unified shader architecture.

68. NVIDIA is the assignee and owner of all right, title and interest in and to the '685 Patent, which is valid, enforceable, and is currently in full force and effect. Mr. Lindholm assigned to NVIDIA all right, title and interest in and to the '685 Patent.

69. NVIDIA asserts that at least claims 1-5, 7-19, 21-23, 25-30, 34-36, 38, 41-43 are infringed by Accused Products.

70. Defendants have infringed and continue to infringe the '685 patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products which include, but are not limited to, mobile phones (including the Galaxy Note 4, Galaxy Note Edge, Galaxy S5, Galaxy Note 3, and Galaxy S4) and tablet computers (including the Galaxy Tab S and Galaxy Note Pro).

71. Defendants also indirectly infringe the '685 Patent by inducing and/or contributing to infringement of the claims of the patent. For example, Defendants induce infringement and/or contributorily infringe when third parties, such as customers and consumers, and/or Defendants' employees, directly infringe the patent by using accused consumer products such as mobile phones and tablet computers and the processors incorporated into those products.

72. Defendants contribute to the infringement of the '685 Patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products. Upon information and belief, Defendants know the Accused Products, and/or hardware and software components of the Accused Products that constitute material parts of the claimed inventions, are especially made or adapted for use in infringing the claims of the '685 Patent and are not staple articles or commodities of commerce suitable for substantial non-infringing use.

73. Defendants actively induce others to infringe the '685 Patent by encouraging and facilitating others to perform actions known by Defendants to infringe, including but not limited to the use of the Accused Products. Defendants know or should know that their actions will induce infringement and intend to induce infringement. For example, on information and belief, Defendants encourage, train, instruct, and provide support and technical assistance to their direct and indirect customers, potential customers and end users to make infringing use of the Accused Products, such as by publishing and providing technical materials and promotional literature describing and instructing in the infringing use of the Accused Products. Simply turning on and

using the Accused Products, for their intended purposes or otherwise, practices method claims of the patent, as does the execution of applications stored in the Accused Products.

74. Defendants' infringement is causing damage and irreparable injury to NVIDIA and NVIDIA will continue to suffer damage and irreparable injury unless and until such infringement is enjoined by this Court.

75. On information and belief, the Defendants have been aware of the existence of the '685 Patent since at least January 2014, and continue to willfully, wantonly and deliberately engage in acts of infringement, as that term is defined in 35 U.S.C. § 271, without regard to the '685 Patent.

76. Upon information and belief, Samsung has gained profits through its infringement of the '685 Patent.

77. NVIDIA is entitled to injunctive relief and damages in accordance with 35 U.S.C. Sections 271, 281, 283 and 284.

#### **FOURTH CLAIM FOR RELIEF**

##### **(Infringement of U.S. Patent Number 7,015,913)**

78. Each of the above paragraphs is herein incorporated by reference.

79. The '913 Patent generally relates to scheduling multi-threaded processing of samples of graphics data, such as vertex and pixel samples, in an order independent of the order in which they are received.

80. NVIDIA is the assignee and owner of all right, title and interest in and to the '913 Patent, which is valid, enforceable, and is currently in full force and effect. Messrs. Lindholm, Bastos and Zatz assigned to NVIDIA all right, title and interest in and to the '913 Patent.

81. NVIDIA asserts that at least claims 5-8, 10, 12-20 and 24-27 are infringed by Accused Products.

82. Defendants have infringed and continue to infringe the '913 patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products which include, but are not limited to, mobile phones

(including the Galaxy Note 4, Galaxy Note Edge, Galaxy S5, Galaxy Note 3, and Galaxy S4) and tablet computers (including the Galaxy Tab S and Galaxy Note Pro).

83. Defendants also indirectly infringe the '913 Patent by inducing and/or contributing to infringement of the claims of the patent. For example, Defendants induce infringement and/or contributorily infringe when third parties, such as customers and consumers, and/or Defendants' employees, directly infringe the patent by using accused consumer products such as mobile phones and tablet computers and the processors incorporated into those products.

84. Defendants contribute to the infringement of the '913 Patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products. Upon information and belief, Defendants know the Accused Products, and/or hardware and software components of the Accused Products that constitute material parts of the claimed inventions, are especially made or adapted for use in infringing the claims of the '913 Patent and are not staple articles or commodities of commerce suitable for substantial non-infringing use.

85. Defendants actively induce others to infringe the '913 Patent by encouraging and facilitating others to perform actions known by Defendants to infringe, including but not limited to the use of the Accused Products. Defendants know or should know that their actions will induce infringement and intend to induce infringement. For example, on information and belief, Defendants encourage, train, instruct, and provide support and technical assistance to their direct and indirect customers, potential customers and end users to make infringing use of the Accused Products, such as by publishing and providing technical materials and promotional literature describing and instructing in the infringing use of the Accused Products. Simply turning on and using the Accused Products, for their intended purposes or otherwise, practices method claims of the patent, as does the execution of applications stored in the Accused Products.

86. Defendants' infringement is causing damage and irreparable injury to NVIDIA and NVIDIA will continue to suffer damage and irreparable injury unless and until such infringement is enjoined by this Court.

87. On information and belief, the Defendants have been aware of the existence of the '913 Patent since at least January 2014, and continue to willfully, wantonly and deliberately engage in acts of infringement, as that term is defined in 35 U.S.C. § 271, without regard to the '913 Patent.

88. Upon information and belief, Samsung has gained profits through its infringement of the '913 Patent.

89. NVIDIA is entitled to injunctive relief and damages in accordance with 35 U.S.C. Sections 271, 281, 283 and 284.

#### **FIFTH CLAIM FOR RELIEF**

##### **(Infringement of U.S. Patent Number 6,697,063)**

90. Each of the above paragraphs is herein incorporated by reference.

91. The '063 Patent discloses a pipeline system that renders computer graphics primitives for use in computer display systems. The '063 Patent describes an integrated circuit that includes a graphics rendering pipeline that also can include a screen space tiler, a memory interface, a scan/z engine, a rasterizer, and a shader.

92. NVIDIA is the assignee and owner of all right, title and interest in and to the '063 Patent, which is valid, enforceable, and currently in full force and effect. Mr. Zhu originally assigned to GigaPixel Corporation all right, title and interest in and to the '063 Patent. Thereafter, 3DFX Interactive, Inc. and GigaPixel Corporation assigned to NVIDIA U.S. Investment Company all right, title and interest in and to the '063 Patent. NVIDIA U.S. Investment Company assigned all right, title and interest in and to the '063 Patent to NVIDIA.

93. NVIDIA asserts that at least claims 7, 8, 11-13, 16-21, 23, 24, 28 and 29 are infringed by Accused Products.

94. Defendants have infringed and continue to infringe the '063 patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products which include, but are not limited to, mobile phones

(including the Galaxy Note 4, Galaxy Note Edge, Galaxy S5, Galaxy Note 3, and Galaxy S4) and tablet computers (including the Galaxy Tab S and Galaxy Note Pro).

95. Defendants also indirectly infringe the '063 Patent by inducing and/or contributing to infringement of the claims of the patent. For example, Defendants induce infringement and/or contributorily infringe when third parties, such as customers and consumers, and/or Defendants' employees, directly infringe the patent by using accused consumer products such as mobile phones and tablet computers and the processors incorporated into those products.

96. Defendants contribute to the infringement of the '063 Patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products. Upon information and belief, Defendants know the Accused Products, and/or hardware and software components of the Accused Products that constitute material parts of the claimed inventions, are especially made or adapted for use in infringing the claims of the '063 Patent and are not staple articles or commodities of commerce suitable for substantial non-infringing use.

97. Defendants actively induce others to infringe the '063 Patent by encouraging and facilitating others to perform actions known by Defendants to infringe, including but not limited to the use of the Accused Products. Defendants know or should know that their actions will induce infringement and intend to induce infringement. For example, on information and belief, Defendants encourage, train, instruct, and provide support and technical assistance to their direct and indirect customers, potential customers and end users to make infringing use of the Accused Products, such as by publishing and providing technical materials and promotional literature describing and instructing in the infringing use of the Accused Products. Simply turning on and using the Accused Products, for their intended purposes or otherwise, practices method claims of the patent, as does the execution of applications stored in the Accused Products.

98. Defendants' infringement is causing damage and irreparable injury to NVIDIA and NVIDIA will continue to suffer damage and irreparable injury unless and until such infringement is enjoined by this Court.

99. On information and belief, the Defendants have been aware of the existence of the '063 Patent since at least August 2012, and continue to willfully, wantonly and deliberately engage in acts of infringement, as that term is defined in 35 U.S.C. § 271, without regard to the '063 Patent.

100. Upon information and belief, Samsung has gained profits through its infringement of the '063 Patent.

101. NVIDIA is entitled to injunctive relief and damages in accordance with 35 U.S.C. Sections 271, 281, 283 and 284.

### **SIXTH CLAIM FOR RELIEF**

#### **(Infringement of U.S. Patent Number 7,209,140)**

102. Each of the above paragraphs is herein incorporated by reference.

103. The '140 Patent discloses a method and system for performing programmable graphics calculations in a hardware graphics accelerator.

104. NVIDIA is the assignee and owner of all right, title and interest in and to the '140 Patent, which is valid, enforceable, and is currently in full force and effect. Messrs. Lindholm, Kirk, Moreton and Moy assigned to NVIDIA all right, title and interest in and to the '140 Patent.

105. NVIDIA asserts that at least claims 1-7, 8-10, 12 and 14 are infringed by Accused Products.

106. Defendants have infringed and continue to infringe the '140 patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products which include, but are not limited to, mobile phones (including the Galaxy Note 4, Galaxy Note Edge, Galaxy S5, Galaxy Note 3, and Galaxy S4) and tablet computers (including the Galaxy Tab S and Galaxy Note Pro).

107. Defendants also indirectly infringe the '140 Patent by inducing and/or contributing to infringement of the claims of the patent. For example, Defendants induce infringement and/or contributorily infringe when third parties, such as customers and consumers,

and/or Defendants' employees, directly infringe the patent by using accused consumer products such as mobile phones and tablet computers and the processors incorporated into those products.

108. Defendants contribute to the infringement of the '140 Patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products. Upon information and belief, Defendants know the Accused Products, and/or hardware and software components of the Accused Products that constitute material parts of the claimed inventions, are especially made or adapted for use in infringing the claims of the '140 Patent and are not staple articles or commodities of commerce suitable for substantial non-infringing use.

109. Defendants actively induce others to infringe the '140 Patent by encouraging and facilitating others to perform actions known by Defendants to infringe, including but not limited to the use of the Accused Products. Defendants know or should know that their actions will induce infringement and intend to induce infringement. For example, on information and belief, Defendants encourage, train, instruct, and provide support and technical assistance to their direct and indirect customers, potential customers and end users to make infringing use of the Accused Products, such as by publishing and providing technical materials and promotional literature describing and instructing in the infringing use of the Accused Products. Simply turning on and using the Accused Products, for their intended purposes or otherwise, practices method claims of the patent, as does the execution of applications stored in the Accused Products.

110. Defendants' infringement is causing damage and irreparable injury to NVIDIA and NVIDIA will continue to suffer damage and irreparable injury unless and until such infringement is enjoined by this Court.

111. Upon information and belief, Samsung has gained profits through its infringement of the '140 Patent.

112. NVIDIA is entitled to injunctive relief and damages in accordance with 35 U.S.C. Sections 271, 281, 283 and 284.

**SEVENTH CLAIM FOR RELIEF**

**(Infringement of U.S. Patent Number 6,690,372)**

113. Each of the above paragraphs is herein incorporated by reference.

114. The '372 Patent discloses a method and system for performing programmable shading calculations in a graphics pipeline.

115. NVIDIA is the assignee and owner of all right, title and interest in and to the '372 Patent, which is valid, enforceable, and is currently in full force and effect. Messrs. Donovan and Peng assigned to NVIDIA all right, title and interest in and to the '372 Patent.

116. NVIDIA asserts that at least claims 1-6, 9-16 and 19-25 are infringed by Accused Products.

117. Defendants have infringed and continue to infringe the '140 patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products which include, but are not limited to, mobile phones (including the Galaxy Note 4, Galaxy Note Edge, Galaxy S5, Galaxy Note 3, and Galaxy S4) and tablet computers (including the Galaxy Tab S and Galaxy Note Pro).

118. Defendants also indirectly infringe the '372 Patent by inducing and/or contributing to infringement of the claims of the patent. For example, Defendants induce infringement and/or contributorily infringe when third parties, such as customers and consumers, and/or Defendants' employees, directly infringe the patent by using accused consumer products such as mobile phones and tablet computers and the processors incorporated into those products.

119. Defendants contribute to the infringement of the '372 Patent by manufacturing, using, selling and/or offering for sale in the United States and/or importing into the United States the Accused Products. Upon information and belief, Defendants know the Accused Products, and/or hardware and software components of the Accused Products that constitute material parts of the claimed inventions, are especially made or adapted for use in infringing the claims of the '372 Patent and are not staple articles or commodities of commerce suitable for substantial non-infringing use.

120. Defendants actively induce others to infringe the '372 Patent by encouraging and facilitating others to perform actions known by Defendants to infringe, including but not limited to the use of the Accused Products. Defendants know or should know that their actions will induce infringement and intend to induce infringement. For example, on information and belief, Defendants encourage, train, instruct, and provide support and technical assistance to their direct and indirect customers, potential customers and end users to make infringing use of the Accused Products, such as by publishing and providing technical materials and promotional literature describing and instructing in the infringing use of the Accused Products. Simply turning on and using the Accused Products, for their intended purposes or otherwise, practices method claims of the patent, as does the execution of applications stored in the Accused Products.

121. Defendants' infringement is causing damage and irreparable injury to NVIDIA and NVIDIA will continue to suffer damage and irreparable injury unless and until such infringement is enjoined by this Court.

122. Upon information and belief, Samsung has gained profits through its infringement of the '372 Patent.

123. NVIDIA is entitled to injunctive relief and damages in accordance with 35 U.S.C. Sections 271, 281, 283 and 284.

### **PRAYER FOR RELIEF**

WHEREFORE, NVIDIA prays for judgment as follows:

1. That Defendants infringe each of the Asserted Patents;
2. That in accordance with 35 U.S.C. Section 283, Defendants and their affiliates, employees, agents, officers, directors, attorneys, successors, and assigns and all those acting on behalf of or in concert with any of them be permanently enjoined from infringement, inducement of infringement, and contributory infringement of each of the Asserted Patents;
3. For an award of damages sufficient to compensate NVIDIA for Defendants' infringement of the Asserted Patents;

4. For an award of prejudgment and post-judgment interest;
5. For a finding that Defendants' infringement of at least the '488, '667, '063, '685 and '913 patents has been willful;
6. For an award of increased damages in an amount not less than three times the damages assessed, in accordance with 35 U.S.C. Section 284;
7. For a declaration that this case is "exceptional" under 35 U.S.C. Section 285, and an award to NVIDIA of its reasonable attorneys' fees, expenses and costs incurred in this action;
8. For an accounting; and
9. For such other relief as the Court deems just and proper.

**JURY TRIAL DEMAND**

NVIDIA demands a trial by jury as to all issues so triable.

ASHBY & GEDDES

*/s/ John G. Day*

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