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19 Attorneys for Plaintiff
 20 BELL SEMICONDUCTOR, LLC

21 **IN THE UNITED STATES DISTRICT COURT**
 22 **FOR THE SOUTHERN DISTRICT OF CALIFORNIA**

23 BELL SEMICONDUCTOR, LLC

24 Plaintiff,

25 v.

26 QUALCOMM TECHNOLOGIES,
 27 INC.

28 Defendant.

Case No. '22CV1796 CAB WVG

**COMPLAINT FOR PATENT
 INFRINGEMENT**

1 Plaintiff Bell Semiconductor, LLC (“Bell Semic” or “Plaintiff”) brings this
2 Complaint against Defendant Qualcomm Technologies, Inc. (“Qualcomm”) for
3 infringement of U.S. Patent No. 7,396,760 (“the ’760 patent”). Plaintiff, on personal
4 knowledge of its own acts, and on information and belief as to all others based on
5 investigation, alleges as follows:

6 **SUMMARY OF THE ACTION**

7 1. This is a patent infringement suit relating to Qualcomm’s unauthorized
8 and unlicensed use of the ’760 patent. The circuit design methodologies claimed in the
9 ’760 patent are used by Qualcomm in the production of one or more of its
10 semiconductor chips, including its 5G RF transceiver chips such as the Snapdragon
11 865 and 665 (“Qualcomm Accused Products”).

12 2. Traditionally, the process flow for IC design is highly linear, with each
13 phase of the design process depending on the previous steps. Accordingly, when
14 revisions to portions of the physical design are made, as typically happens numerous
15 times during the design process, all the subsequent steps typically need to be redone in
16 their entirety for at least the layer, if not the entire device. This is because regardless
17 of the size or extent of the revision to the physical design, the changes must be merged
18 into a much larger integrated circuit design and then the remaining steps of the design
19 process flow re-run.

20 3. Semiconductor devices include different kinds of materials to function as
21 intended. For example, these devices typically include both metal (*i.e.*, conductor) and
22 insulator materials, which are deposited or otherwise processed sequentially in layers
23 to form the final device. These layers—and the interconnects and components formed
24 within them—have gotten much smaller over time, increasing the performance of
25 these devices dramatically. As a result, it has become even more important to keep the
26 layers planar as the device is being built because defects and warpage can cause
27 fabrication issues and malfunctioning of the device.

28 4. Manufacturers use a process called Chemical Mechanical

1 Planarization/Polishing (“CMP”) to smooth out the surface of the device to prepare
2 the device for further processing, such as deposition of another layer. This allows
3 subsequent layers to be built and connected more easily with fewer opportunities for
4 short circuits or other errors that render the device defective. CMP functions best
5 when there is a certain density and variance of the same material on the surface of the
6 chip. This is because different materials will be “polished” away at different rates,
7 leading to erosion or dishing on the surface.

8 5. To reduce this problem “dummy” material, also known as “dummy fill,”
9 is typically inserted into low-density regions of the device to increase the overall
10 uniformity of the structures on the surface of the layer and reduce the density
11 variability across the surface of the device. However, dummy fill can increase
12 capacitance if it is placed too close to signal wires, which slows the transmission
13 speed of signals and degrades the overall performance of the device.

14 6. Just as unwanted capacitance can result from the interaction of elements
15 within the layer of an integrated circuit, it can also result from interaction of elements
16 across adjacent layers. While certain elements (such as signal lines and power lines)
17 cannot be easily moved without affecting circuit performance, there is substantially
18 more flexibility regarding placement, positioning, and spacing of non-signal carrying
19 features such as dummy fill, even when certain quantities of dummy fill are needed
20 within layers and portions of layers to meet processing requirements.

21 7. Prior to development of the methodology described in the ’760 patent,
22 the placement of dummy fill in the open areas of the interconnect layer was performed
23 based primarily upon meeting density requirements. To the extent that timing and
24 capacitance effects were considered in dummy fill dimensions, orientation,
25 positioning, or otherwise in dummy fill placement, the conventional dummy fill tools
26 at the time only considered intralayer effects—i.e., interactions between dummy fill
27 features and other elements (such as signal nets) on that same layer. However, use of
28 dummy fill that overlapped on successive layers could and often did create a

1 substantial interlayer bulk capacitive effect that had a negative impact on circuit
2 timing and performance, and which was not considered by the conventional dummy
3 fill tools at the time even when they considered certain intralayer timing effects. *See*
4 Ex. A at 1:43–2:6, 4:11–16.

5 8. Recognizing these drawbacks, as well as the importance of having a flat or
6 planarized surface on the devices, the inventors of the '760 patent set out to develop a
7 design process that would also consider the interlayer bulk capacitance created by
8 overlapping dummy fill and consider those intralayer effects in arranging dummy fill in
9 the chip layout so as to minimize the unwanted bulk capacitance created by overlapping
10 dummy fill features.

11 9. The inventors of the '760 patent ultimately conceived of a method for
12 addressing the interlayer capacitive effects of dummy fill by treating each successive
13 set of layers as a pair and then rearranging the dummy fill in one or both layers so as to
14 minimize their overlap. This was particularly advantageous in “intelligent dummy fill
15 placement,” i.e., when timing impact is considered when placing dummy fill. *See* Ex.
16 A at 2:10–19.

17 10. The inventions disclosed in the '760 patent provide many advantages over
18 the prior art. In particular, rearranging the dummy fill features such that they do not
19 align vertically in successive layers can reduce unwanted bulk capacitance introduced
20 by dummy fill and thus minimize the interlayer capacitance. *See* Ex. A at 2:45–48, 2:47–
21 59, 3:30–33, 5:19–39. This removed unwanted bulk capacitance that would otherwise
22 slow down signals in the circuit and adversely affect timing in the IC, thus improving
23 its speed and performance. *See* Ex. A at 2:3–6. These significant advantages are
24 achieved through the use of the patented inventions and thus the '760 patent presents
25 significant commercial value for companies like Qualcomm.

26 11. Bell Semic brings this action to put a stop to Qualcomm’s unauthorized
27 and unlicensed use of the inventions claimed in the '760 patent.
28

THE PARTIES

1
2 12. Plaintiff Bell Semic is a limited liability company organized under the
3 laws of the State of Delaware with a place of business at One West Broad Street, Suite
4 901, Bethlehem, PA 18018.

5 13. Bell Semic stems from a long pedigree that began at Bell Labs. Bell Labs
6 sprung out of the Bell System as a research and development laboratory, and
7 eventually became known as one of America’s greatest technology incubators. Bell
8 Labs employees invented the transistor in 1947 in Murray Hill, New Jersey. It was
9 widely considered one of the most important technological breakthroughs of the time,
10 earning the inventors the Nobel Prize in Physics. Bell Labs made the first commercial
11 transistors at a plant in Allentown, Pennsylvania. For decades, Bell Labs licensed its
12 transistor patents to companies throughout the world, creating a technological boom
13 that led to the use of transistors in the semiconductor devices prevalent in most
14 electronic devices today.

15 14. Bell Semic, a successor to Bell Labs’ pioneering efforts, owns over 1,900
16 worldwide patents and applications, approximately 1,500 of which are active United
17 States patents. This patent portfolio of semiconductor-related inventions was developed
18 over many years by some of the world’s leading semiconductor companies, including
19 Bell Labs, Lucent Technologies, Agere Systems, and LSI Logic and LSI Corporation
20 (“LSI”). This portfolio reflects technology that underlies many important innovations
21 in the development of semiconductors and integrated circuits for high-tech products,
22 including smartphones, computers, wearables, digital signal processors, IoT devices,
23 automobiles, broadband carrier access, switches, network processors, and wireless
24 connectors.

25 15. The principals of Bell Semic all worked at Bell Labs’ Allentown facility,
26 and have continued the rich tradition of innovating, licensing, and helping the industry
27 at large since those early days at Bell Labs. For example, Bell Semic’s CTO was a LSI
28 Fellow and Broadcom Fellow. He is known throughout the world as an innovator with

1 more than 300 patents to his name, and he has a sterling reputation for helping
2 semiconductor fabs improve their efficiency. Bell Semic's CEO took a brief hiatus from
3 the semiconductor world to work with Nortel Networks in the telecom industry during
4 its bankruptcy. His efforts saved the pensions of tens of thousands of Nortel retirees and
5 employees. In addition, several Bell Semic executives previously served as engineers
6 at many of these companies and were personally involved in creating the ideas claimed
7 throughout Bell Semic's extensive patent portfolio.

8 16. On information and belief, Qualcomm maintains a campus located in San
9 Diego that consists of 36 buildings, 25,000 employees, and that spans hundreds of
10 acres of land. *See This Corporate Campus is Now a Mini Smart City*, Fast Company
11 (available at <https://www.fastcompany.com/90583927/this-corporate-campus-isnowa-minismartcity#:~:text=With%2036%20buildings%2C%2025%2C000%20employees%2C%20and%20hundreds%20of,technologies%20aimed%20at%20making%20space%20and%20cities%20smarter>) (last visited November 4, 2022).

15 17. On information and belief, Qualcomm develops, designs, and/or
16 manufactures products in the United States, including in this District, according to the
17 '760 patented processes/methodologies; and/or uses the '760 patented
18 processes/methodologies in the United States, including in this District, to make
19 products; and/or distributes, markets, sells, or offers to sell in the United States and/or
20 imports products into the United States, including in this District, that were
21 manufactured or otherwise produced using the patented process. Additionally,
22 Qualcomm introduces those products into the stream of commerce knowing that they
23 will be sold and/or used in this District and elsewhere in the United States.

24 **JURISDICTION AND VENUE**

25 18. This is an action for patent infringement arising under the Patent Laws of
26 the United States, Title 35 of the United States Code. Accordingly, this Court has
27 subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

28 19. This Court has personal jurisdiction over Qualcomm under the laws of

1 the State of California, due at least to its substantial business in California and in this
2 District. Qualcomm has purposefully and voluntarily availed itself of the privileges of
3 conducting business in the United States, in the State of California, and in this District
4 by continuously and systematically placing goods into the stream of commerce
5 through an established distribution channel with the expectation that they will be
6 purchased by consumers in this District. In the State of California and in this District,
7 Qualcomm, directly or through intermediaries: (i) performs at least a portion of the
8 infringements alleged herein; (ii) develops, designs, and/or manufactures products
9 according to the '760 patented process/methodology; (iii) distributes, markets, sells, or
10 offers to sell products formed according to the '760 patented process/methodology;
11 and/or (iv) imports products formed according to the '760 patented
12 process/methodology.

13 20. On information and belief, venue is proper in this Court pursuant to 28
14 U.S.C. §§ 1391 and 1400 because Qualcomm has committed, and continues to
15 commit, acts of infringement in this District and has a regular and established place of
16 business in this District. For example, Qualcomm maintains a regular and established
17 place of business at its corporate headquarters, which is located in the District at 5775
18 Morehouse Drive, San Diego, CA 92121. *See Office Locator*, Qualcomm (available at
19 <https://www.qualcomm.com/company/facilities/offices?country=USA®ion=CA>)
20 (last visited November 4, 2022).

21 21. In addition to the foregoing, Qualcomm has numerous other regular and
22 established physical places of business in the District. More specifically, 32 of
23 Qualcomm's 70 United States offices are located in this District. *See 70 Offices in*
24 *USA*, Qualcomm (available at
25 <https://www.qualcomm.com/company/facilities/offices?country=USA&page=3>) (last
26 visited on November 4, 2022).

27 22. Currently, Qualcomm is advertising 217 jobs in the San Diego-metro
28 area. These positions include those that relate to the '626 patented technologies, such

1 as positions for a Component Engineer and Design Verification Engineer. *See*
2 *Transform Your Future*, Qualcomm ([https://qualcomm.wd5.myworkdayjobs.com/en-](https://qualcomm.wd5.myworkdayjobs.com/en-US/External)
3 [US/External](https://qualcomm.wd5.myworkdayjobs.com/en-US/External)) (last visited November 4, 2022).

4 23. Venue is also convenient in this District. This is at least true because of
5 this District’s close ties to this case—including the technology, relevant witnesses,
6 and sources of proof noted above—and its ability to quickly and efficiently move this
7 case to resolution.

8 24. On information and belief, Bell Semic’s causes of action arise directly
9 from Qualcomm’s circuit design work and other activities in this District. Moreover,
10 on information and belief, Qualcomm has derived substantial revenues from its
11 infringing acts occurring within the State of California and within this District.

12 **U.S. PATENT NO. 7,396,760**

13 25. Bell Semic is the owner by assignment of the ’760 patent. The ’760
14 patent is titled “Method and System for Reducing Inter-Layer Capacitance in
15 Integrated Circuits.”

16 26. A true and correct copy of the ’760 patent is attached as Exhibit A.

17 27. The inventors of the ’760 patent are Kunal Taravade, Neal Callan, and Paul
18 Filseth.

19 28. The ’760 patent issued on July 8, 2008 from an application filed on
20 November 17, 2004.

21 29. The ’760 patent generally relates to “a method for reducing inter-layer
22 capacitance” in integrated circuits “through dummy fill methodology.” Ex. A at 1:8–
23 10.

24 30. The background section of the ’760 patent identifies the shortcomings of
25 the prior art. More specifically, the specification describes that the prior dummy fill
26 methodologies were disadvantageous because they typically focused on achieving
27 uniformity of feature density and failed to sufficiently address adverse effects of the
28 dummy fill on electric field and unwanted bulk capacitance. *See* Ex. A at 1:62–66. In

1 addition, these dummy fill methodologies only considered intralayer effects of dummy
2 fill, to the extent that they considered timing impact at all. *See* Ex. A at 1:66–2:3.
3 Thus, placement of dummy fill, even if advantageous on each individual layer, could
4 create problems when it overlapped with dummy fill features on successive layers,
5 introducing an additional bulk capacitance component that could be substantial. *See*
6 *id.* at 4:11–17, 4:25–28. These methodologies failed to consider interlayer effects such
7 as those caused by the overlap of dummy fill features in successive layers, which
8 could have a substantial negative impact on timing. *See id.* at 2:3–6.

9 31. In light of the drawbacks of the prior art, the inventors of the '760 patent
10 recognized a need for “intelligent dummy fill placement to reduce interlayer
11 capacitance caused by overlaps of dummy fill area on successive layers,” which
12 would also “treat[] each consecutive pair of layers together when the intelligent
13 dummy filling placement is performed.” Ex. A at 2:7–13. The inventions claimed in
14 the '760 patent address this need.

15 32. The '760 patent contains two independent claims and 19 total claims.
16 Claim 1 reads:

- 17 1. A method for placing dummy fill patterns in an integrated circuit
18 fabrication process, comprising:
 - 19 obtaining layout information of the integrated circuit, the integrated
20 circuit including a plurality of layers;
 - 21 obtaining a first dummy fill space for a first layer based on the layout
22 information;
 - 23 obtaining a second dummy fill space for a second layer, the second
24 layer being placed successively to the first layer
 - 25 ;
 - 26 determining an overlap between the first dummy fill space and the
27 second dummy fill space; and
 - 28 minimizing the overlap by re-arranging a plurality of first dummy
 fill features and a plurality of second dummy fill features,

1 wherein the first dummy fill space includes non-signal carrying lines
2 on the first layer and the second dummy fill space includes non-
3 signal carrying lines on the second layer.

4 33. This claim, as a whole, provides significant benefits and improvements to
5 the function of the semiconductor device, *e.g.*, minimizing interlayer bulk capacitance
6 and thus improving the timing characteristics and performance of the IC while
7 meeting interconnect density requirements during processing. *See, e.g.*, Ex. A at 1:37–
8 55, 5:19–39.

9 34. The claims of the '760 patent also recite inventive concepts that improve
10 the functioning of the fabrication process, particularly as to dummy filling. The claims
11 of the '760 patent disclose a new and novel solution to specific problems related to
12 improving semiconductor fabrication. As explained in detail above and in the '760
13 patent specification, the claimed inventions improve upon the prior art processes by
14 considering successive layers rather than each layer on its own, and then determining
15 the overlap between dummy fill features on successive layers before rearranging them
16 to minimize their overlap and thus reduce interlayer bulk capacitance. This has
17 advantages such as minimizing the parasitic capacitance of the interconnect layers,
18 especially the bulk capacitance contributed by the interlayer effects of overlapping
19 dummy fill features, while maintaining necessary interconnect density to meet
20 fabrication requirements.

21 **COUNT I – INFRINGEMENT OF U.S. PATENT NO. 7,396,760**

22 35. Bell Semic re-alleges and incorporates by reference the allegations of the
23 foregoing paragraphs as if fully set forth herein.

24 36. The '760 patent is valid and enforceable under the United States Patent
25 Laws.

26 37. Bell Semic owns, by assignment, all right, title, and interest in and to the
27 '760 patent, including the right to collect for past damages.

28 38. A copy of the '760 patent is attached at Exhibit A.

1 39. On information and belief, Qualcomm has and continues to directly
2 infringe pursuant to 35 U.S.C. § 271(a) one or more claims of the '760 patent by using
3 the patented methodology to design one or more semiconductor devices, including as
4 one example the Accused Products, in the United States.

5 40. On information and belief, Qualcomm employs a variety of design tools,
6 for example, Cadence, Synopsys, and/or Siemens tools, to rearrange dummy fill to
7 minimize its overlap in successive layers (the "Accused Processes") as recited in the
8 '760 patent claims. As one example, Qualcomm's Accused Processes allow
9 arrangement and rearrangement of dummy fill in a timing aware fashion, including with
10 the ability to stagger the dummy fill in successive layers so as to minimize the interlayer
11 bulk capacitance after determining their overlap as required by claim 1 of the '760
12 patent. Qualcomm does so by employing a design tool, such as at least one of a Cadence,
13 Synopsys, and/or Siemens tool, rearrange the dummy fill features in successive layers
14 of its Accused Products.

15 41. Qualcomm's Accused Processes also form the dummy fill features in a
16 grid within one or more of the successive layers, provide square-shaped dummy fill
17 features in one or more of the successive layers, determine the dummy fill space based
18 on a local pattern density in one or more of the successive layers, and minimize total
19 bulk capacitance and/or certain of its components. Qualcomm does so by employing a
20 design tool, such as at least one of the Cadence, Synopsys, and/or Siemens tools, to
21 implement dummy fill functionality in a timing-aware fashion and with consideration
22 of interlayer capacitive effects in creation and design of the Qualcomm Accused
23 Products.

24 42. An exemplary infringement analysis showing infringement of one or more
25 claims of the '760 patent is set forth in Exhibit B. The declaration of Dhaval
26 Brahmhatt, an expert in the field of semiconductor device design, is attached at Exhibit
27 C and further describes Qualcomm's infringement of the '760 patent.

28 43. Qualcomm's Accused Processes infringe and continue to infringe one or

1 more claims of the '760 patent during the pendency of the '760 patent.

2 44. On information and belief, Qualcomm has and continues to infringe
3 directly pursuant to 35 U.S.C. § 271, *et. seq.*, either literally or under the doctrine of
4 equivalents, by using the Accused Processes in violation of one or more claims of the
5 '760 patent. Qualcomm has and continues to infringe directly pursuant to 35 U.S.C. §
6 271, *et. seq.*, either literally or under the doctrine of equivalents, by making, selling, or
7 offering to sell in the United States, or importing into the United States products
8 manufactured or otherwise produced using the Accused Processes in violation of one
9 or more claims of the '760 patent.

10 45. Qualcomm's infringement of the '760 patent is exceptional and entitles
11 Bell Semic to attorneys' fees and costs incurred in prosecuting this action under 35
12 U.S.C. § 285.

13 46. Bell Semic has been damaged by Qualcomm's infringement of the '760
14 patent and will continue to be damaged unless Qualcomm is enjoined by this Court.
15 Bell Semic has suffered and continues to suffer irreparable injury for which there is no
16 adequate remedy at law. The balance of hardships favors Bell Semic, and public interest
17 is not disserved by an injunction.

18 47. Bell Semic is entitled to recover from Qualcomm all damages that Bell
19 Semic has sustained as a result of Qualcomm's infringement of the '760 patent,
20 including without limitation and/or not less than a reasonable royalty.

21 **PRAYER FOR RELIEF**

22 WHEREFORE, Bell Semic respectfully requests that this Court enter judgment
23 in its favor as follows and award Bell Semic the following relief:

- 24 (a) a judgment declaring that Qualcomm has infringed one or more claims of
25 the '760 patent in this litigation pursuant to 35 U.S.C. § 271, *et seq.*;
- 26 (b) an award of damages adequate to compensate Bell Semic for infringement
27 of the '760 patent by Qualcomm, in an amount to be proven at trial,
including supplemental post-verdict damages until such time as
Qualcomm ceases its infringing conduct;
- 28 (c) a permanent injunction, pursuant to 35 U.S.C. § 283, prohibiting
Qualcomm and its officers, directors, employees, agents, consultants,

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- contractors, suppliers, distributors, all affiliated entities, and all others acting in privity with Qualcomm, from committing further acts of infringement;
- (d) a judgment requiring Qualcomm to make an accounting of damages resulting from Qualcomm’s infringement of the ’760 patent;
- (e) the costs of this action, as well as attorneys’ fees as provided by 35 U.S.C. § 285;
- (f) pre-judgment and post-judgment interest at the maximum amount permitted by law;
- (g) all other relief, in law or equity, to which Bell Semic is entitled.

Dated: November 16, 2022 By: /s/ James J. Yukevich

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Attorneys for Plaintiff Bell Semiconductor, LLC

DEMAND FOR JURY TRIAL

Plaintiff hereby demands a jury trial for all issues so triable.

Dated: November 16, 2022

By: /s/ James J. Yukevich

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