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16 Attorneys for Plaintiffs SEOUL
17 SEMICONDUCTOR CO., LTD. and
18 SEOUL VIOSYS CO., LTD.

19 **UNITED STATES DISTRICT COURT**
20 **CENTRAL DISTRICT OF CALIFORNIA**

21 SEOUL SEMICONDUCTOR CO.,
22 LTD., a Korean corporation, SEOUL
23 VIOSYS CO., LTD., a Korean
24 corporation,

25 Plaintiffs,

26 v.

27 ARCHIPELAGO LIGHTING, INC., a
28 California corporation,

Defendant.

Case No. 5:17-cv-01890

**COMPLAINT FOR PATENT
INFRINGEMENT**

DEMAND FOR JURY TRIAL

1 Plaintiffs Seoul Semiconductor Co., Ltd. (“Seoul Semiconductor”) and Seoul
2 Viosys Co., Ltd. (“Seoul Viosys”), (collectively “Plaintiffs”) for their Complaint
3 against defendant Archipelago Lighting, Inc. (“Archipelago” or “Defendant”) allege
4 as follows:

5 **INTRODUCTION**

6 1. Plaintiffs bring this patent infringement action to protect their valuable
7 patented technology relating to light-emitting diode (LEDs) and LED lighting. An
8 LED is a semiconductor device that converts electrical energy into light. LEDs have
9 many advantages over conventional light sources, including lower energy
10 consumption, longer lifetime, and smaller size.

11 2. Seoul Semiconductor was founded in 1992 with around 30 employees in
12 a small space of a commercial building in Bongchen-dong, Seoul. From those 30
13 employees, Seoul Semiconductor grew into one of the largest manufacturers of LEDs
14 in the world. Seoul Viosys is also a leading company in the LED industry and an
15 affiliate company of Seoul Semiconductor.

16 3. Seoul Semiconductor’s success is in large part due to its significant
17 investment in innovation and respect for intellectual property. Seoul Semiconductor
18 has invested in research and development (“R&D”) for the last two decades. Seoul
19 Semiconductor invests over 10% of sales revenue into R&D and owns one of the
20 largest LED patent portfolios in the world, which includes more than 10,000 patents
21 worldwide.

22 **THE PARTIES**

23 4. Plaintiff Seoul Semiconductor is a company organized and existing
24 under the laws of the Republic of Korea, with its principal place of business at 1B-25,
25 727, Wonsi-dong, Danwon-gu, Ansan-city, Gyeonggi-do, Korea 425-851.

26 5. Plaintiff Seoul Viosys is a company organized and existing under the
27 laws of the Republic of Korea, with its principal place of business at 65-16, Sandan-
28 ro163beon-gil, Danwon-gu, Ansan-si, Gyeonggi-do, Korea 425-851.

1 6. On information and belief, defendant Archipelago is a company
2 organized and existing under the laws of the State of California with its principal
3 place of business at 4615 State Street, Montclair, California 91763.

4 7. On information and belief, Archipelago is in the business of importing
5 into the United States, marketing, offering for sale, selling and distributing lighting
6 products including light products based on light emitting diode (LED) technology.

7 8. Among Archipelago's products are its A19F6027-2 and
8 LTCA12C32524K1 bulbs. Images of the A19F6027-2 and LTCA12C32524K1 bulbs
9 are reproduced to the left and right respectively below.



18
19 **JURISDICTION AND VENUE**

20 9. This is an action for patent infringement, under the patent laws of the
21 United States, 35 U.S.C. § 271 *et seq.* This Court has subject matter jurisdiction
22 under 28 U.S.C. §§1331 and 1338(a).

23 10. This Court has personal jurisdiction over Archipelago, which according
24 to its corporate registration, is a California corporation with the address 4615 State
25 Street, Montclair, California. Upon information and belief, Archipelago resided in
26 and/or has an established place of business in this district, which encompasses
27 Montclair.
28

11. Venue is proper within this judicial district under 28 U.S.C. §§1391(b) and 1400(b). On information and belief, acts of patent infringement have been committed in this District, a substantial part of the property at issue in this action is situated in this district, and Archipelago is subject to personal jurisdiction in this District. In addition, venue is proper because Plaintiffs have suffered and are suffering harm in this District.

PATENTS-IN-SUIT

12. On April 18, 2017, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,627,435 (“the ’435 Patent”), entitled “Light Emitting Device,” to Lee *et al.* Seoul Viosys is the owner by assignment of the ’435 Patent. A true and correct copy of the ’435 Patent is attached hereto as Exhibit 1.

13. On July 28, 2015, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,093,627 (“the ’627 Patent”), entitled “Light Emitting Diode and Method of Fabricating the Same,” to Lee *et al.* Seoul Viosys is the owner by assignment of the ’627 Patent. A true and correct copy of the ’627 Patent is attached hereto as Exhibit 2.

14. On February 21, 2017, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,577,157 (“the ’157 Patent”), entitled “Light Emitting Diode Chip Having Distributed Bragg Reflector and Method of Fabricating the Same,” to Lee *et al.* Seoul Viosys is the owner by assignment of the ’157 Patent. A true and correct copy of the ’157 Patent is attached hereto as Exhibit 3.

15. On April 20, 2010, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 7,700,960 (“the ’960 Patent”), entitled “Light Emitting Diode With ITO Layer and Method for Fabricating the Same,” to Kim *et al.* Seoul Viosys is the owner by assignment of the ’960 Patent. A true and correct copy of the ’960 Patent is attached hereto as Exhibit 4.

16. On May 1, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,168,988 (“the ’988 Patent”), entitled “Light

1 Emitting Element With a Plurality of Cells Bonded, Method of Manufacturing the
2 Same, and Light Emitting Device Using the Same,” to Lee *et al.* Seoul Viosys is the
3 owner by assignment of the ’988 Patent. A true and correct copy of the ’988 Patent is
4 attached hereto as Exhibit 5.

5 17. On October 14, 2014, the United States Patent and Trademark Office
6 duly and legally issued U.S. Patent No. 8,860,331 (“the ’331 Patent”), entitled “Light
7 Emitting Device for AC Power Operating,” to Lee *et al.* Seoul Viosys is the owner by
8 assignment of the ’331 Patent. A true and correct copy of the ’331 Patent is attached
9 hereto as Exhibit 6.

10 18. On September 9, 2014, the United States Patent and Trademark Office
11 duly and legally issued U.S. Patent No. 8,829,552 (“the ’552 Patent”), entitled “Light
12 Emitting Device,” to Seo *et al.* Seoul Semiconductor is the owner by assignment of
13 the ’552 Patent. A true and correct copy of the ’552 Patent is attached hereto as
14 Exhibit 7.

15 19. On May 6, 2014, the United States Patent and Trademark Office duly
16 and legally issued U.S. Patent No. 8,716,946 (“the ’946 Patent”), entitled “Light
17 Emitting Device for AC Power Operation,” to Lee *et al.* Seoul Viosys is the owner by
18 assignment of the ’946 Patent. A true and correct copy of the ’946 Patent is attached
19 hereto as Exhibit 8.

20 20. On July 25, 2017, the United States Patent and Trademark Office duly
21 and legally issued U.S. Patent No. 9,716,210 (“the ’210 Patent”), entitled “Light
22 Emitting Diode and Method of Fabricating the Same,” to Kim *et al.* Seoul Viosys is
23 the owner by assignment of the ’210 Patent. A true and correct copy of the ’210
24 Patent is attached hereto as Exhibit 9.

25 21. On May 31, 2011, the United States Patent and Trademark Office duly
26 and legally issued U.S. Patent No. 7,951,626 (“the ’626 Patent”), entitled “Light
27 Emitting Device and Method of Manufacturing the Same,” to Lee *et al.* Seoul Viosys
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1 is the owner by assignment of the '626 Patent. A true and correct copy of the '626
2 Patent is attached hereto as Exhibit 10.

3 22. On September 20, 2016, the United States Patent and Trademark Office
4 duly and legally issued U.S. Patent No. 9,450,155 ("the '155 Patent"), entitled "Light
5 Emitting Device Having Wavelength Converting Layer," to Jung *et al.* Seoul
6 Semiconductor is the owner by assignment of the '155 Patent. A true and correct
7 copy of the '155 Patent is attached hereto as Exhibit 11.

8 23. On March 4, 2014, the United States Patent and Trademark Office duly
9 and legally issued U.S. Patent No. 8,664,638 ("the '638 Patent"), entitled "Light-
10 Emitting Diode Having an Interlayer With High Voltage Density and Method for
11 Manufacturing the Same," to Yoo *et al.* Seoul Viosys is the owner by assignment of
12 the '638 Patent. A true and correct copy of the '638 Patent is attached hereto as
13 Exhibit 12.

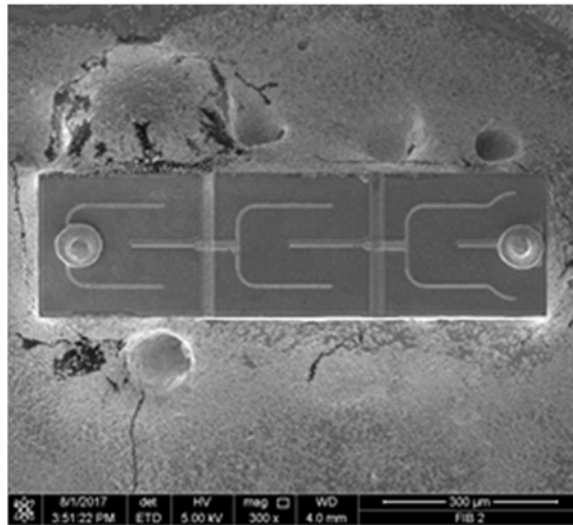
14 **COUNT I**

15 **INFRINGEMENT OF THE '435 PATENT**

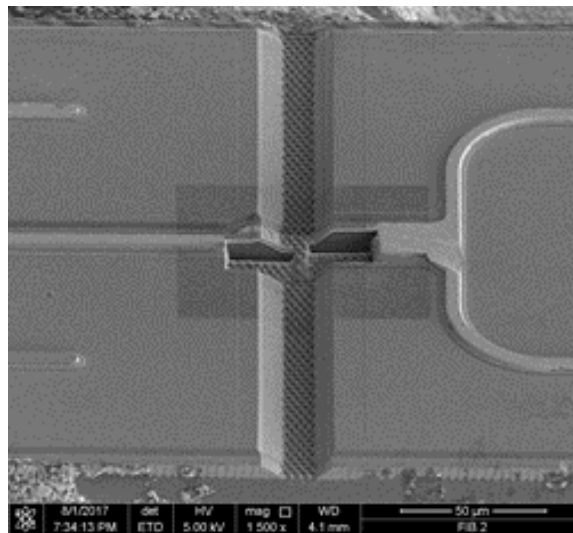
16 **EXAMPLE CLAIM 1**

17 24. Archipelago has infringed and continues to infringe one or more claims
18 of the '435 Patent, including but not limited to exemplary claim 1, pursuant to 35
19 U.S.C. § 271(a), at least by without authority making, using, offering to sell, and/or
20 selling the A19F6027-2 bulb within the United States or importing the A19F6027-2
21 bulb into the United States.

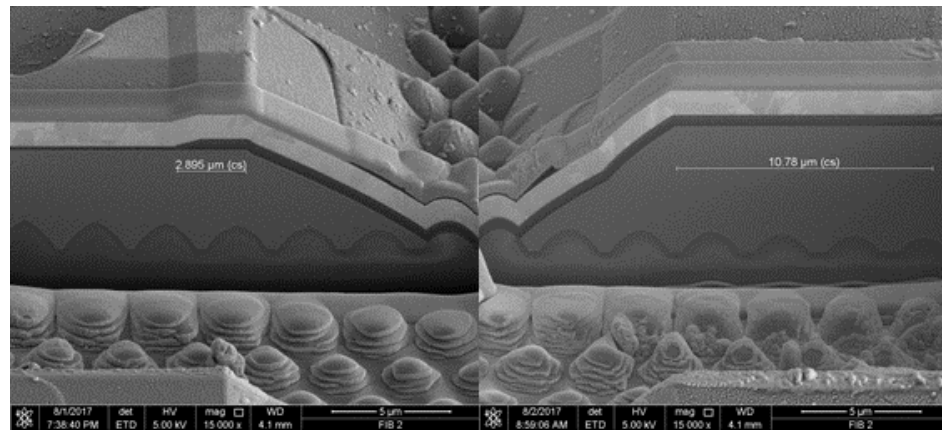
22 25. The A19F6027-2 bulb includes a plurality of LED packages, each of
23 which includes a light emitting diode chip that comprises light emitting cells. A
24 scanning electron microscope image of a chip from an A19F6027-2 bulb is
25 reproduced below.



26. Below is a scanning electron microscope image of a pair of holes milled into the LED chip using a focused ion beam.



27. Below is a composite image created from scanning electron microscope images of the milled holes.



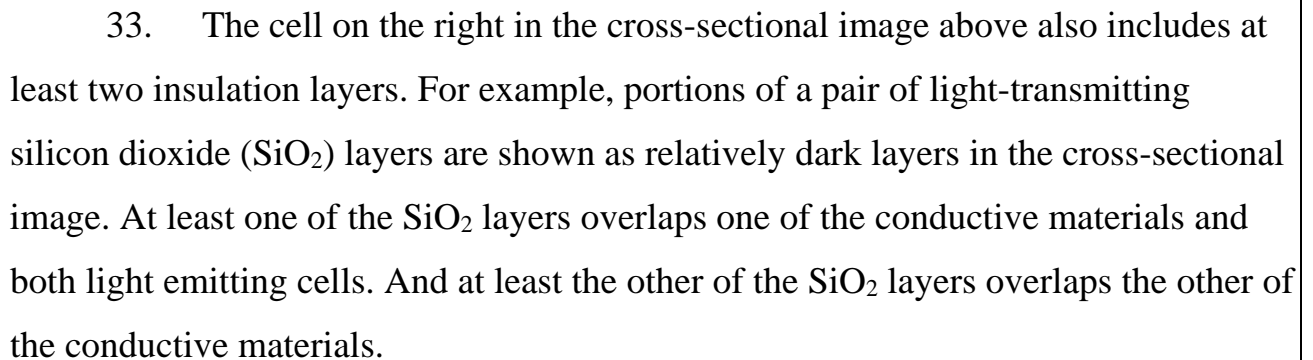
28. The bottom of the image reproduced above shows a substrate. Above the substrate are cross sectional views of portions of two light emitting cells.

29. Both of the light emitting cells include first and second semiconductor layers with an active layer disposed between them. The upper semiconductor layer comprises a p-type layer and the lower semiconductor layer comprises an n-type layer.

30. In addition, the light emitting cell on the right side of the image includes a continuous inclined surface having a slope between 20° and 80° from a horizontal plane of the substrate.

31. The light emitting cell on the right includes at least two conductive materials, including a metallic conductor and a transparent layer of indium tin oxide (ITO). At least one of those conductive materials is disposed on the upper p-type semiconductor layer of the cell on the right. And at least the other of those conductive materials electrically connects the light emitting cells.

32. Below is a composite image created from scanning electron microscope images of the milled hole in the light emitting cell on the right side of the image above. In this image, the ITO layer is shown as a relatively thin and bright line above the upper p-type semiconductor layer. The ITO layer extends horizontally from the right edge of the image. In this image, the metallic conductor is shown as including a

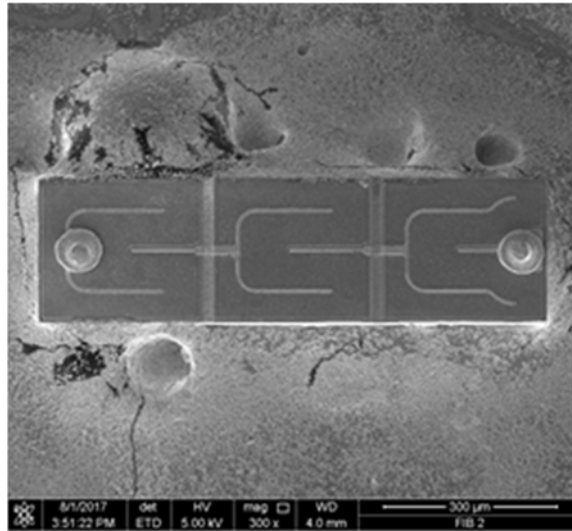


35. Plaintiffs are entitled to injunctive relief and damages in accordance with 35 U.S.C. §§ 271, 281, 283, and 284.

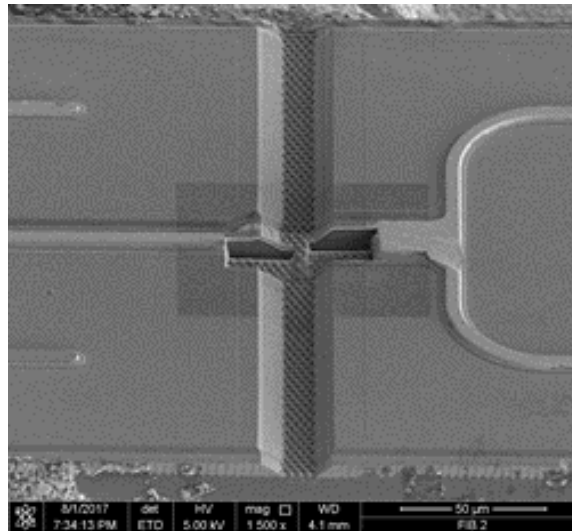
INFRINGEMENT OF THE '627 PATENT

36. Archipelago has infringed and continues to infringe one or more claims of the '627 Patent, including but not limited to exemplary claim 1, pursuant to 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell, and/or selling the A19F6027-2 bulb within the United States or importing the A19F6027-2 bulb into the United States.

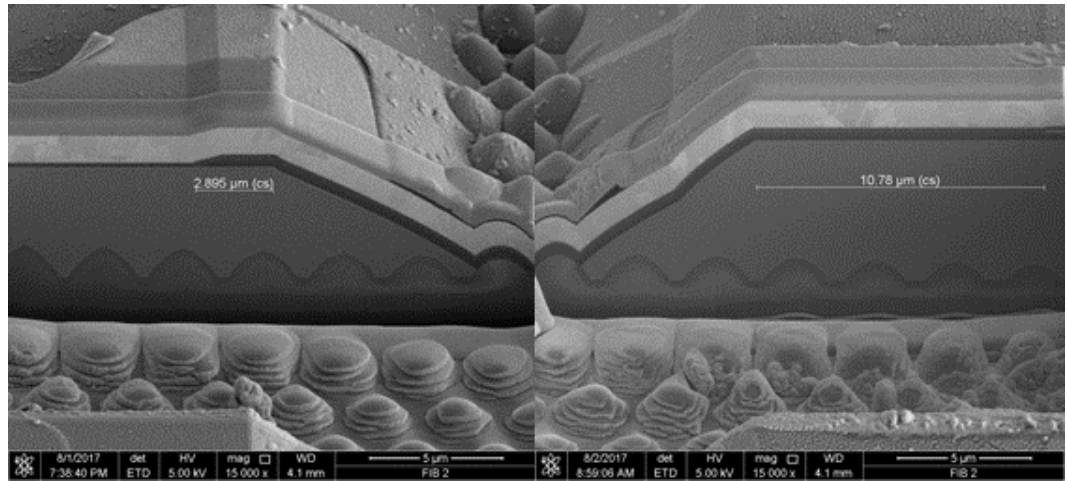
1 37. The A19F6027-2 bulb includes a plurality of LED packages, each of
2 which includes a light emitting diode chip that comprises light emitting cells. A
3 scanning electron microscope image of a chip from an A19F6027-2 bulb is
4 reproduced below.



14 38. Below is a scanning electron microscope image taken after a pair of
15 holes were milled into the LED chip using a focused ion beam.



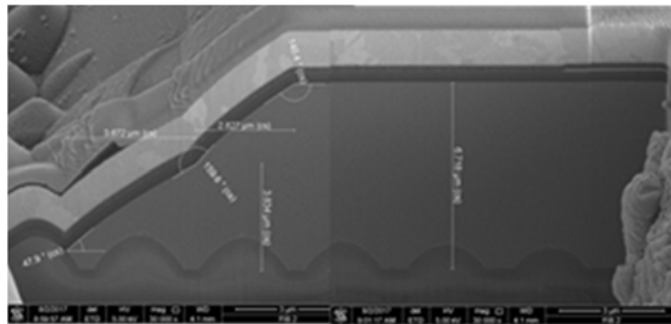
25 39. Below is a composite image created from scanning electron microscope
26 images of the milled holes.



40. The bottom of the image reproduced above shows a substrate. Above the substrate are cross sectional views of portions of two light emitting cells. The two light emitting cells are spaced apart from each other.

41. Disposed on the light emitting cell on the right side of the above image is an electrode comprised of ITO that provides an electrical connection to the underlying light emitting cell.

42. Below is a composite image created from scanning electron microscope images of the milled hole in the light emitting cell on the right side of the image above. In this image, the ITO layer is shown as a relatively thin and bright line extending horizontally from the right edge of the image.



43. Disposed under the ITO layer and extending horizontally toward the center of the image above is a SiO₂ current blocking layer. The current blocking layer is shown as a relatively thick and dark horizontal line in the images above.

44. Disposed over a portion of both light emitting cells depicted in the images above is a metallic interconnection, which electrically connects the two light emitting cells. The interconnection is shown in the images above as including a relatively thick and bright layer that extends from the left edge to the right edge of the images.

45. Disposed under the interconnection along the sloped side surface of the light emitting cell toward the right side of the image above is a SiO₂ insulation layer. The insulation layer is shown in the images above as a relatively dark line between the interconnection and the sloped side surface of the light emitting cell.

46. As can be seen in the images above, the insulation layer, which conforms to the sloped side surface of the light emitting cell, is connected to the insulation layer, which extends horizontally toward the right side of the image above.

47. Archipelago's infringement has caused and is continuing to cause damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court, as a remedy at law alone would be inadequate.

48. Plaintiffs are entitled to injunctive relief and damages in accordance with 35 U.S.C. §§ 271, 281, 283, and 284.

COUNT III

INFRINGEMENT OF THE '157 PATENT

EXAMPLE CLAIM 1

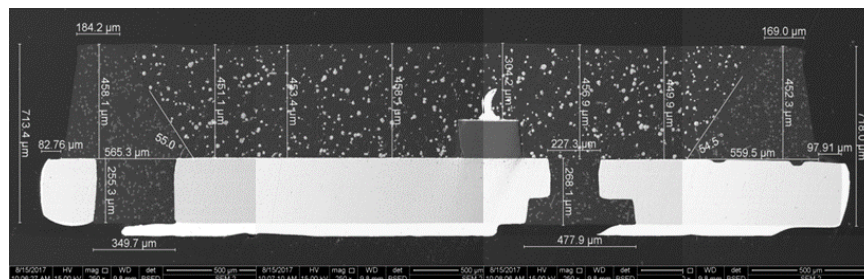
49. Archipelago has infringed and continues to infringe one or more claims of the '627 Patent, including but not limited to exemplary claim 1, pursuant to 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell, and/or selling the A19F6027-2 bulb within the United States or importing the A19F6027-2 bulb into the United States.

50. The A19F6027-2 bulb includes a plurality of LED packages, each of which includes a light emitting diode chip that comprises light emitting cells. An

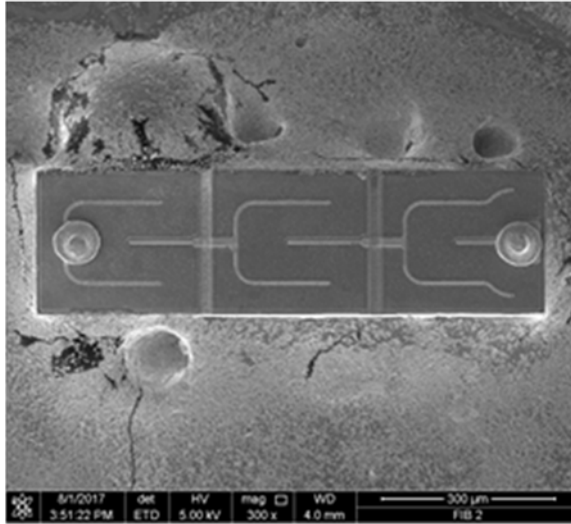
1 optical microscope image of a portion of the top of a package from an A19F6027-2
2 bulb is reproduced below.



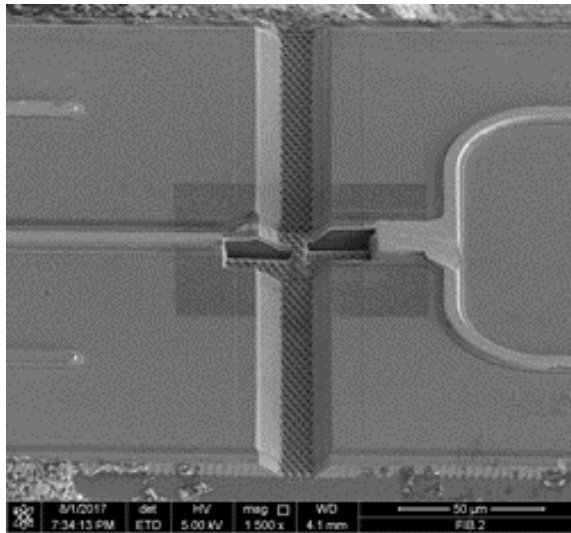
11 51. An scanning electron microscope image of a cross-section through the
12 package is reproduced below. The cross-sectional view shows the body, leads, and a
13 mounting surface upon which a light emitting diode chip is disposed. The light
14 emitting diode chip is shown covered by a member comprised of resin. The resin
15 member contains phosphor particles, which can be seen as relatively bright particles
16 within the darker resin.



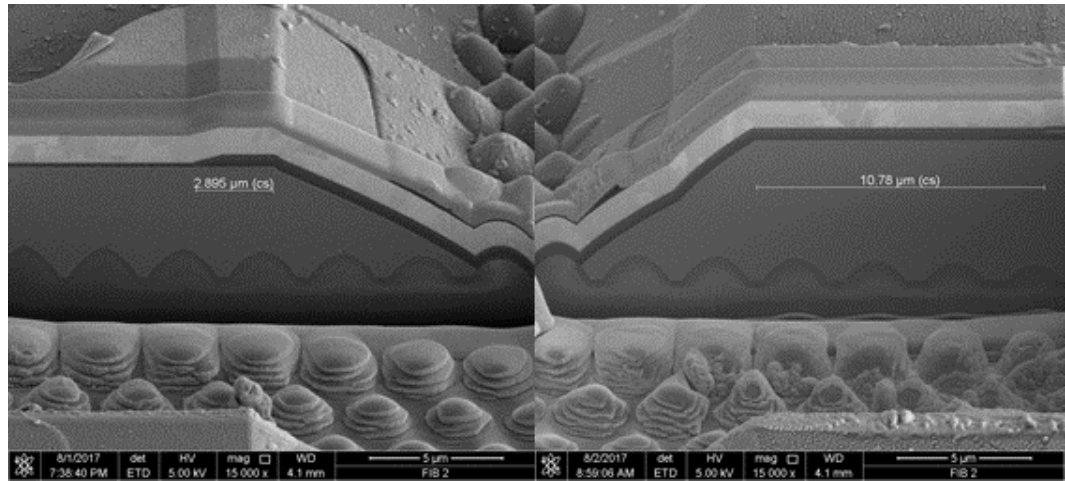
22 52. A scanning electron microscope image of a light emitting diode chip
23 from an A19F6027-2 bulb is reproduced below.



53. Below is a scanning electron microscope image taken after a pair of holes were milled into the LED chip using a focused ion beam.



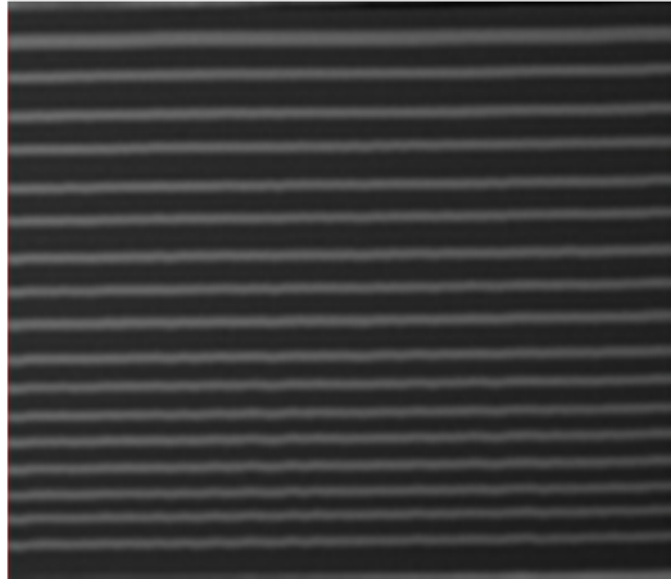
54. Below is a composite image created from scanning electron microscope images of the milled holes.



55. The composite image above shows portions of two light emitting cells above a substrate, one toward the left side of the image and one toward the right side of the image. The portion of the light emitting cell toward the right side of the image above includes an active layer disposed between an upper p-type semiconductor layer and a lower n-type semiconductor layer.

56. The image below shows a portion of the distributed Bragg reflector located on the bottom of the substrate on which the light emitting cells are located. As shown in the below image, the distributed Bragg reflector comprises two portions, an upper portion comprising relatively thick layers of SiO₂ and titanium dioxide (TiO₂) and a lower portion comprising relatively thin layers of SiO₂ and TiO₂. The relatively dark layers comprise SiO₂ and the relatively bright comprise TiO₂. The optical thickness of the layers comprising the upper portion are nearly 1.5 times the optical thickness of the layers comprising the lower portion.

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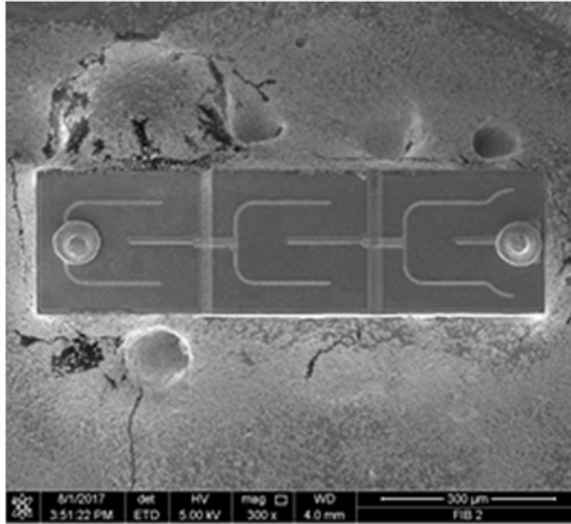
57. Archipelago's infringement has caused and is continuing to cause damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court, as a remedy at law alone would be inadequate.

58. Plaintiffs are entitled to injunctive relief and damages in accordance with 35 U.S.C. §§ 271, 281, 283, and 284.

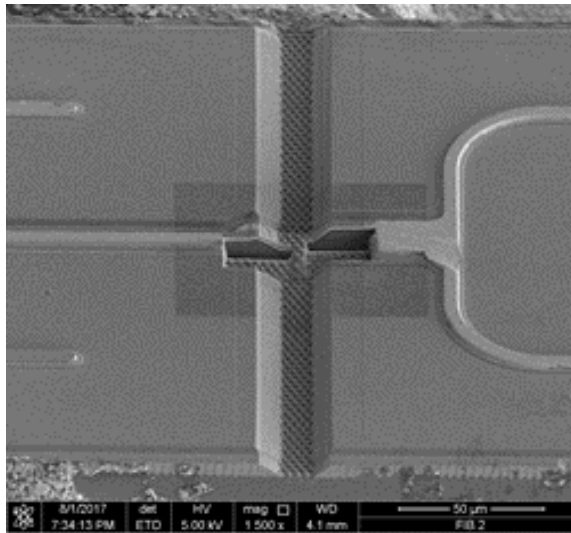
COUNT IV
INFRINGEMENT OF THE '960 PATENT
EXAMPLE CLAIM 1

59. Archipelago has infringed and continues to infringe one or more claims of the '960 Patent, including but not limited to exemplary claim 1, pursuant to 35 U.S.C. § 271(a) at least by without authority making, using, offering to sell, and/or selling the A19F6027-2 bulb within the United States or importing the A19F6027-2 bulb into the United States.

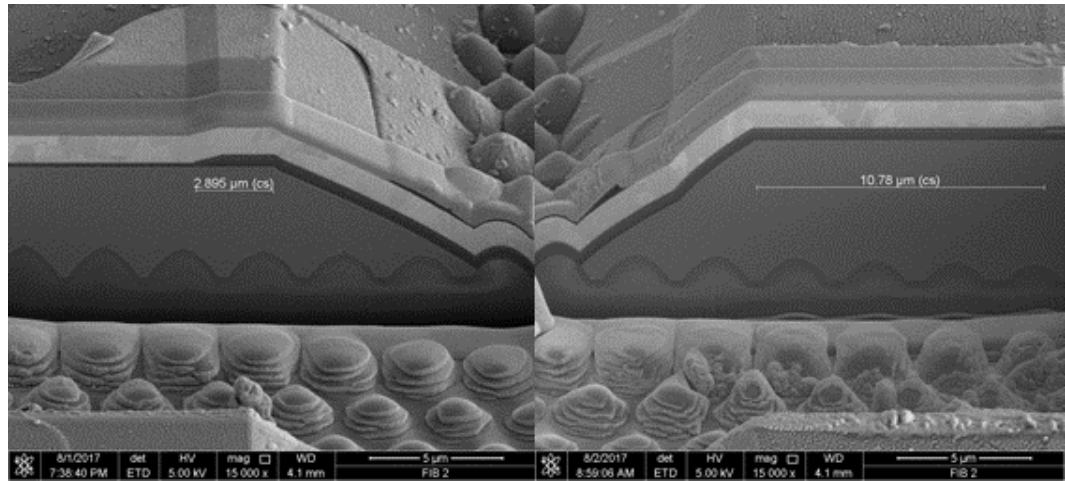
60. The A19F6027-2 bulb includes a plurality of LED packages, each of which includes a light emitting diode chip that comprises light emitting cells. A scanning electron microscope image of a chip from an A19F6027-2 bulb is reproduced below.



61. Below is a scanning electron microscope image taken after a pair of holes were milled into the LED chip using a focused ion beam.



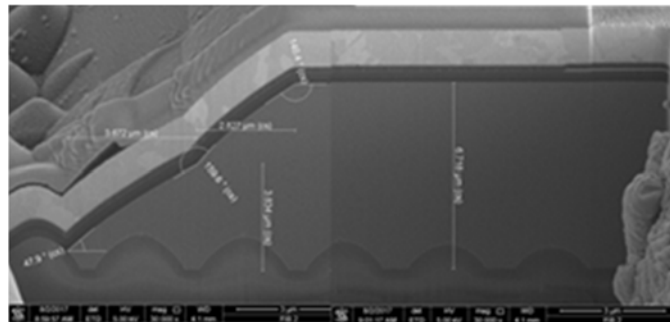
62. Below is a composite image created from scanning electron microscope images of the milled holes.



63. The composite image above shows portions of two example light emitting cells above a substrate, one toward the left side of the image and one toward the right side of the image. Both light emitting cells include at least two semiconductor layers and inclined surfaces.

64. A current diffusion layer, which is comprised of ITO, is arranged on the upper semiconductor layer of the light emitting cell on the right side of the above image.

65. Below is a composite image created from scanning electron microscope images of the milled hole in the light emitting cell on the right side of the image above. In this image and the image above, the ITO layer is shown as a relatively thin bright line extending horizontally from the right edge of the image. As the image shows, the ITO layer extends over only a portion of the upper surface of the light emitting cell, leaving an opening.



1 66. An insulation layer, which is comprised of SiO₂, is arranged under a
2 portion of the ITO current diffusion layer. This arrangement can be seen in the above
3 images, where the SiO₂ is a relatively thick and dark layer that extends from the right
4 edge of the images to the top surface of the light emitting cell on the left.

5 67. A conductive material, which is comprised of layers of metals, is
6 arranged on the insulation layer described in the preceding paragraph. The conductive
7 material couples the two light emitting cells. The conductive material is also coupled
8 to the upper p-type semiconductor layer in each cell through the ITO current
9 diffusion layer. The conductive material is shown in the images above as including a
10 relatively thick and bright layer that extends from the left to right edges of both
11 images above.

12 68. A second insulation layer, which is also comprised of SiO₂, is arranged
13 over a portion of the conductive material. The second insulation layer is shown as a
14 relatively thin and dark layer above the conductive material in the images above.

15 69. As shown in the composite image of the milled hole in the light emitting
16 cell the right of the above image, a portion of the conductive material toward the right
17 side of the image overlaps with the ITO current diffusion layer and a portion of the
18 conductive material extends toward the center beyond the ITO current diffusion
19 layer. The portion that extends beyond the ITO current diffusion layer is arranged in
20 the opening in that layer.

21 70. Archipelago's infringement has caused and is continuing to cause
22 damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage
23 and irreparable injury unless and until that infringement is enjoined by this Court, as
24 a remedy at law alone would be inadequate.

25 71. Plaintiffs are entitled to injunctive relief and damages in accordance
26 with 35 U.S.C. §§ 271, 281, 283, and 284.

COUNT V

INFRINGEMENT OF THE '988 PATENT

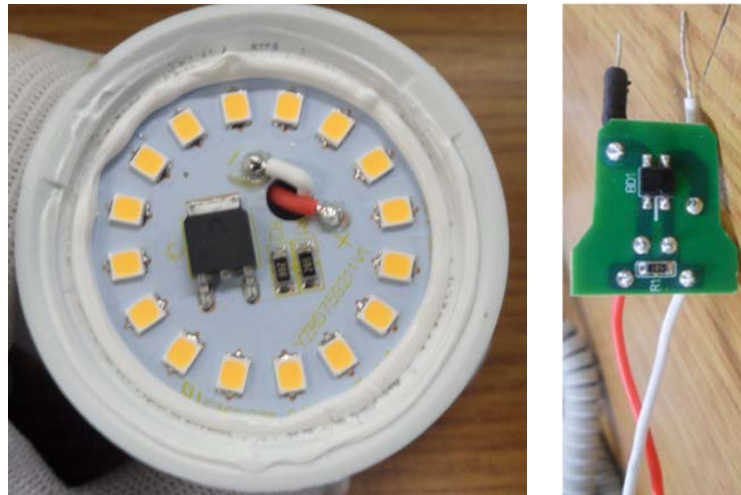
EXAMPLE CLAIM 1

72. Archipelago has infringed and continues to infringe one or more claims of the '960 Patent, including but not limited to exemplary claim 1, pursuant to 35 U.S.C. § 271(a) at least by without authority making, using, offering to sell, and/or selling the A19F6027-2 bulb within the United States or importing the A19F6027-2 bulb into the United States.

73. The A19F6027-2 bulb is a light emitting device that includes a power source formed, in part, by the E26 size standard screw-in base by which power is provided to the active portions of the bulb, which is depicted below.



74. The images below show two circuit boards from the A19F6027-2 bulb.



75. The circuit board in the left image above includes a light emitting element comprising a plurality of series connected light emitting cells.

76. Elements of a control unit configured to control a voltage waveform and a current waveform applied to the light emitting element are provided on the circuit boards shown above. Among the circuit elements are a resistor mounted on the circuit board shown in the right image above, which is connected in parallel with the light emitting cells.

77. The element labeled BD1 in the right image above is a rectifying bridge unit comprising four diodes, which comprises part of the light emitting element. The rectifying bridge unit is connected to the power source unit.

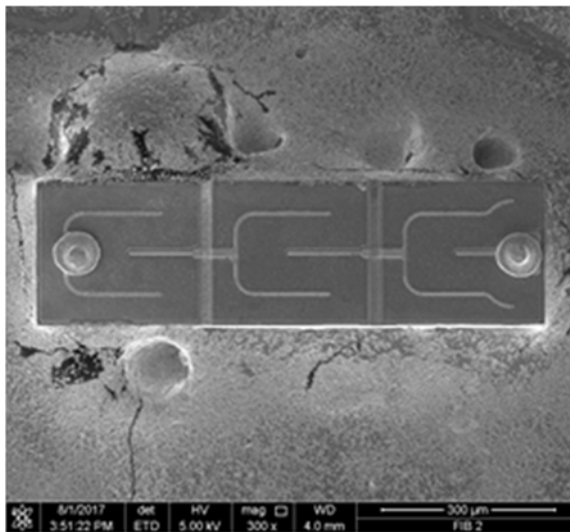
78. Archipelago's infringement has caused and is continuing to cause damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court, as a remedy at law alone would be inadequate.

79. Plaintiffs are entitled to injunctive relief and damages in accordance with 35 U.S.C. §§ 271, 281, 283, and 284.

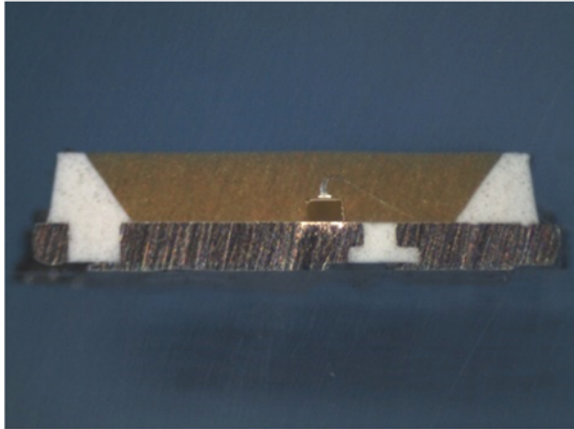
COUNT VI**INFRINGEMENT OF THE '331 PATENT****EXAMPLE CLAIM 11**

80. Archipelago has infringed and continues to infringe one or more claims of the '331 Patent, including but not limited to claim 11, pursuant to 35 U.S.C. § 271(a) at least by without authority making, using, offering to sell, and/or selling the A19F6027-2 bulb within the United States or importing the A19F6027-2 bulb into the United States.

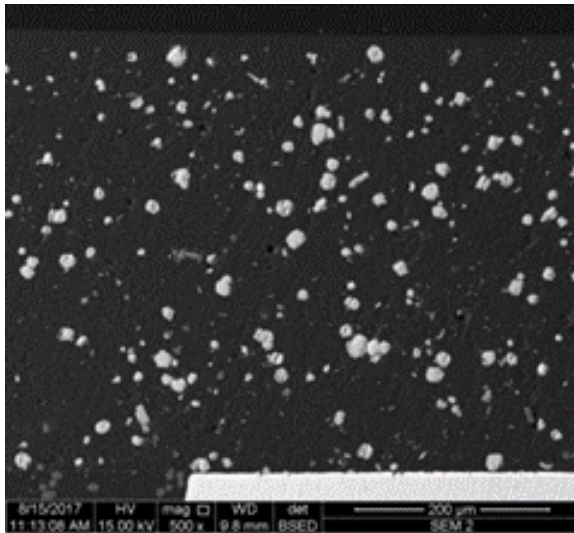
81. The A19F6027-2 bulb includes a plurality of LED packages, each of which includes an LED chip that comprises a plurality of light emitting cells connected in series. A scanning electron microscope image of an LED chip from an A19F6027-2 bulb is reproduced below.



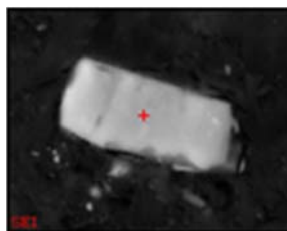
82. Below is an optical microscope image of a cross section through an example LED package from a A19F6027-2 bulb. The optical image shows a transparent member made of resin covering the LED chip.



83. Below is a scanning electron microscope image of a portion of the transparent member from a A19F6027-2 bulb. The image shows two different types of phosphors.

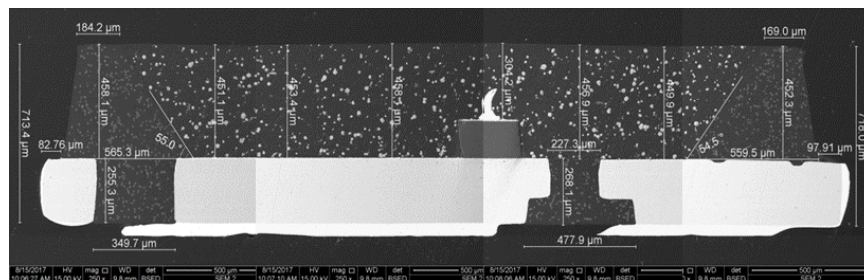


84. An example particle of a first phosphor, which generally have a relatively elongated shape and possess a relatively long decay time when excited by the LED chip, is depicted below.



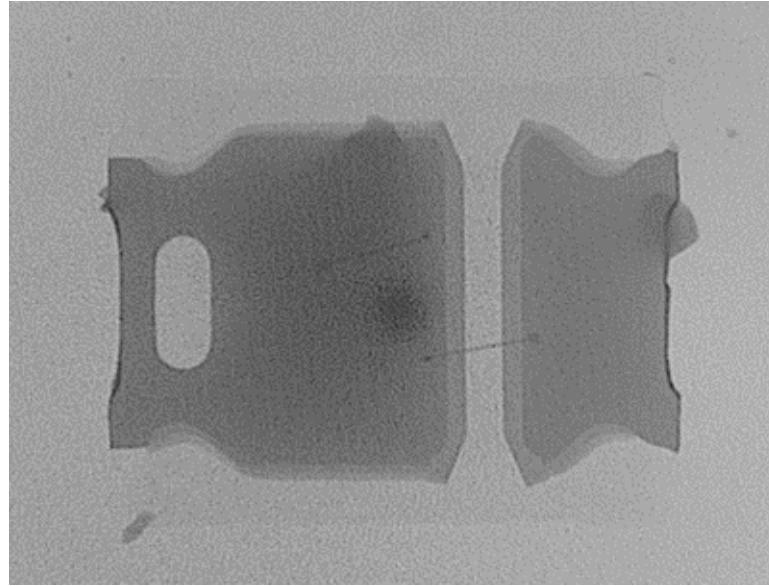


91. A scanning electron microscope image of a cross-section through the package is reproduced below.



92. The image above depicts the cross-section of a pair of spaced-apart lead frames, which indicates the upper and lower surfaces of each lead frame. Each of the lead frames also includes sidewalls that connect the upper and lower surfaces.

93. An x-ray image taken vertically through the pair of lead frames is reproduced below. The darkest area on the left lead frame in the image below indicates a light emitting diode chip, which can also be seen near the center in the cross-sectional image above. The x-ray image below also depicts for each lead frame a central relatively dark area that encompasses the majority of each lead frame. The x-ray image also depicts, for each lead frame, three relatively bright zones at the periphery. The relatively bright areas correspond to the locations with insets in the sidewalls, which can also be seen in the cross-sectional image above right as small areas under each lead frame that are filled with resin.



94. The three inset sidewalls described in the preceding paragraph at least partially define a fixing space for each of the lead frames that undercuts the upper surface. The fixing spaces are filled with resin as shown in the image above to support the two lead frames.

95. Archipelago's infringement has caused and is continuing to cause damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court, as a remedy at law alone would be inadequate.

96. Plaintiffs are entitled to injunctive relief and damages in accordance with 35 U.S.C. §§ 271, 281, 283, and 284.

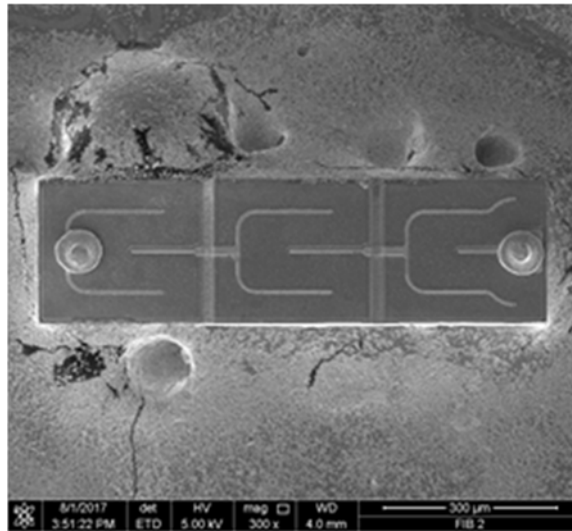
COUNT VIII

INFRINGEMENT OF THE '946 PATENT

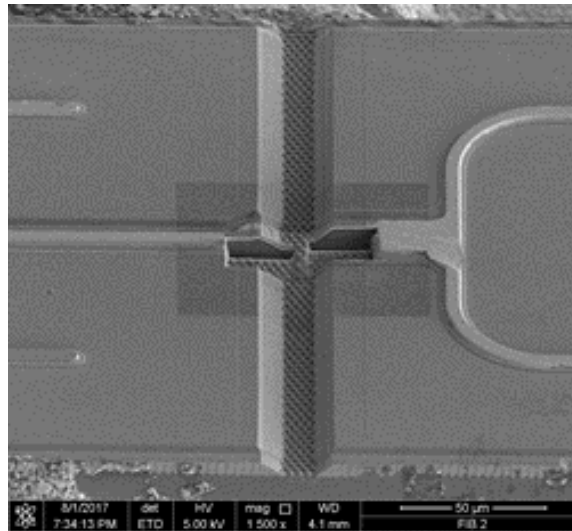
EXAMPLE CLAIM 1

97. Archipelago has infringed and continues to infringe one or more claims of the '552 Patent, including but not limited to exemplary claim 1, pursuant to 35 U.S.C. § 271(a) at least by without authority making, using, offering to sell, and/or selling the A19F6027-2 bulb within the United States or importing the A19F6027-2 bulb into the United States.

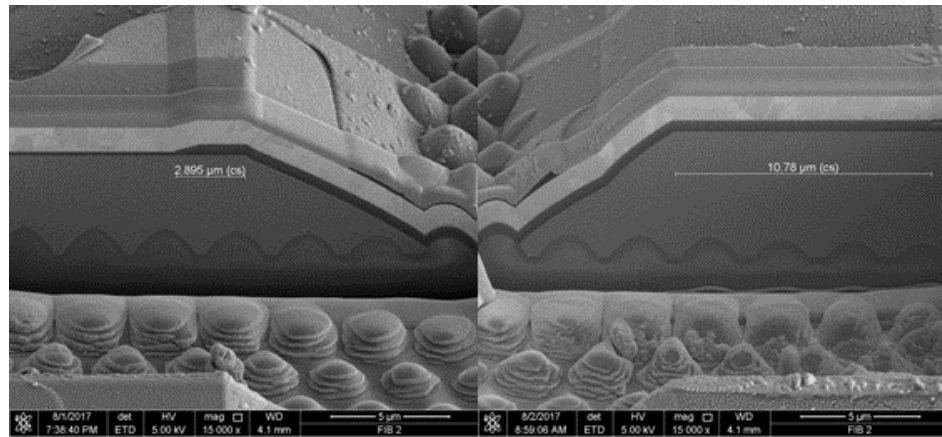
1 98. The A19F6027-2 bulb includes a plurality of LED packages, each of
2 which includes a light emitting diode chip that comprises a series connected array of
3 light emitting cells. The array is configured to receive an input voltage to cause the
4 cells to emit light. A scanning electron microscope image of a chip from an
5 A19F6027-2 bulb is reproduced below.



15
16 99. Below is a scanning electron microscope image of a pair of holes milled
17 into the LED chip using a focused ion beam.

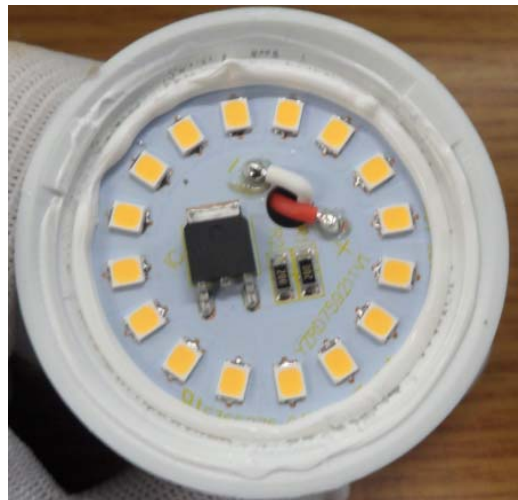


100. Below is a composite image created from scanning electron microscope images of the milled holes.



101. The bottom of the image reproduced above shows a substrate. Above the substrate are cross sectional views of portions of two of the light emitting cells, each of which includes an inclined side surface.

102. Three images are provided below. From left to right, those images are: the full A19F6027-2 bulb; a first circuit board contained within the bulb; and a second circuit board contained within the bulb.



103. Two different voltages are relevant to the operation of the A19F6027-2 bulb.

1 104. As indicated by the E26 base of the bulb as depicted in the image to the
2 left above, the A19F6027-2 bulb receives as input a wall voltage of 120V and 60Hz
3 alternating current electricity. The reference to 60Hz indicates the periodic cycles
4 over which the input voltage changes. During each cycle, the wall voltage includes a
5 peak of approximately 120 volts after which the voltage falls toward zero volts.

6 105. Although wall voltage is received as the input to the A19F6027-2 bulb,
7 the light emitting cells cannot be properly driven by the 120V/60Hz alternating
8 current. The 120V/60Hz alternating current has a cyclical peak of approximately 120
9 volts in the forward direction, passes through zero, and then reaches a peak of
10 approximately 120 volts in the reverse direction. The alternating current, therefore,
11 drops below the level necessary to drive the light emitting cells after the peak of 120
12 volts.

13 106. Instead of applying the input voltage to the light emitting cells, elements
14 on the circuit boards above center and right convert the input to DC-like power to
15 drive the light emitting cells. The DC-like power has a cyclical voltage that varies
16 between approximately 149 volts and 138 volts. The cyclical DC-like power causes
17 the light emitting cells to emit light having a periodically changing luminous intensity
18 that remains non-zero throughout the cycle of the input 120V/60Hz alternating
19 current.

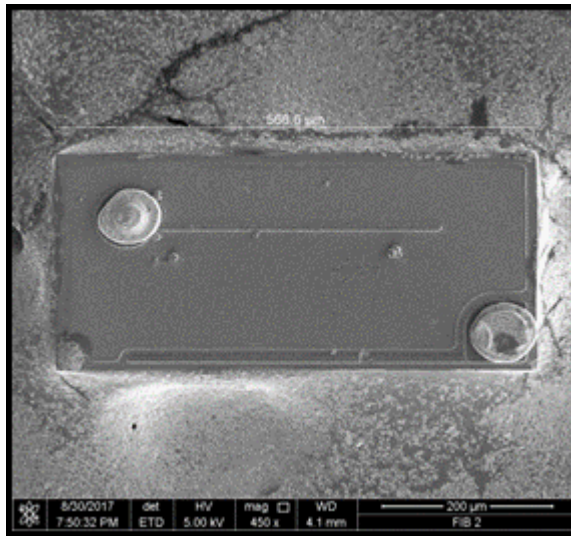
20 107. Archipelago's infringement has caused and is continuing to cause
21 damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage
22 and irreparable injury unless and until that infringement is enjoined by this Court, as
23 a remedy at law alone would be inadequate.

24 108. Plaintiffs are entitled to injunctive relief and damages in accordance
25 with 35 U.S.C. §§ 271, 281, 283, and 284.

COUNT IX**INFRINGEMENT OF THE '210 PATENT****EXAMPLE CLAIM 1**

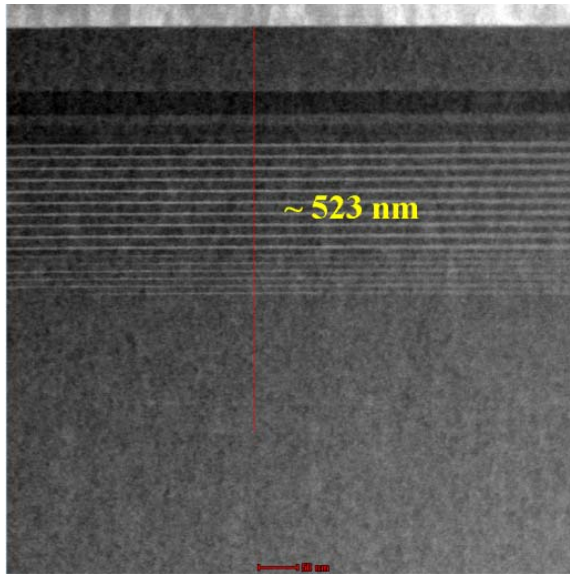
109. Archipelago has infringed and continues to infringe one or more claims of the '210 Patent, including but not limited to exemplary claim 1, pursuant to 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell, and/or selling the LTCA12C32524K1 bulb within the United States or importing the LTCA12C32524K1 bulb into the United States.

110. The LTCA12C32524K1 bulb includes a plurality of filaments, each of which includes a plurality light emitting diode chips. A scanning electron microscope image of a chip from an LTCA12C32524K1 bulb is reproduced below.



111. The above image depicts two pads. The upper left corner of the chip includes a p-pad, which is electrically connected to a p-type contact layer. The lower right corner of the chip includes a n-pad, which is electrically connected to an n-type contact layer.

112. A tunneling electron microscope image depicting the cross section of the epitaxial layers of the chip from the LTCA12C32524K1 bulb is reproduced below.



113. The chip from the LTCA12C32524K1 bulb includes a plurality of different semiconductor layers. Among the layers included are, from top to bottom, a p-type contact layer, an active region comprising a multi-quantum well, a superlattice layer including a plurality of layers, a spacer layer including a plurality of layers, and an n-type contact layer.

114. The multi-quantum well includes a plurality of quantum well layers and a plurality of barrier layers. The quantum well layers include a composition ratio of Indium.

115. The barrier layers, quantum well layers, and the superlattice each have a bandgap. The barrier layers possess a bandgap larger than the superlattice, and the quantum well layers possess a bandgap smaller than the superlattice.

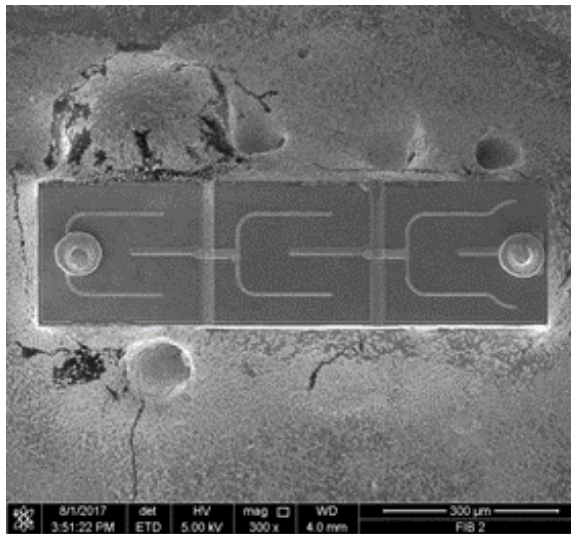
116. Archipelago's infringement has caused and is continuing to cause damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court, as a remedy at law alone would be inadequate.

117. Plaintiffs are entitled to injunctive relief and damages in accordance with 35 U.S.C. §§ 271, 281, 283, and 284.

COUNT X
INFRINGEMENT OF THE '626 PATENT
EXAMPLE CLAIM 9

118. On information and belief, Archipelago has infringed and continues to infringe at least exemplary claim 9 of the '626 Patent pursuant to 35 U.S.C. § 271(g) at least by without authority importing into the United States or offering to sell, selling, and/or using within the United States A19F6027-2 bulbs, which on information and belief are made by a process that infringes those claims and are not materially changed by subsequent processes and do not become a trivial and nonessential component of another product.

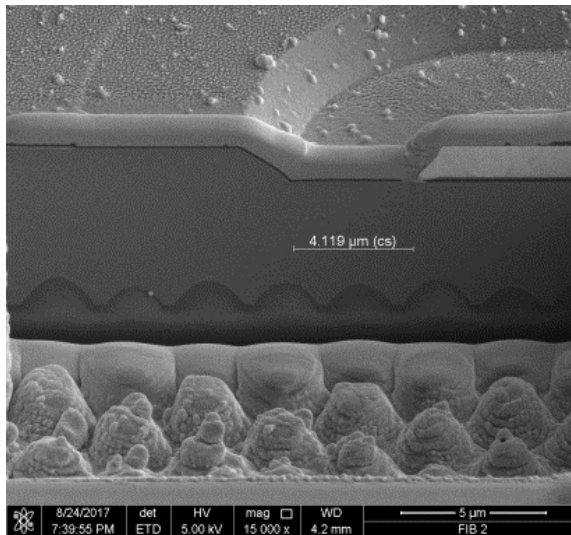
119. Below is a scanning electron microscope image of the top surface of an LED from the A19F6027-2 bulb.



120. The n-pad of the LED is shown as a circular structure toward the center of the right side of the image. The N-pad is formed over an n-type semiconductor layer. The p-pad of the LED is shown as a circular structure toward the center of the left side of the image. The P-pad is formed over a p-type semiconductor layer.

121. As shown in another scanning electron microscope image, which was created after milling a hole in the LED chip, a mesa having a sloped edge exists at the surface of the LED chip. The mesa, which appears at the left side of the image,

comprises a layer of P-type material toward the top, an active layer under the P-type layer, and a layer of N-type material under the active layer.



122. In view of the angular slope of the mesa edge, and upon information and belief regarding the process used to manufacture the LED chip, the mesa edge shape was created by forming an etching pattern on the surface, hard-baking the photoresist to create an inclined edge, and etching the photoresist and portions of the surface.

123. Archipelago's infringement has caused and is continuing to cause damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court, as a remedy at law alone would be inadequate.

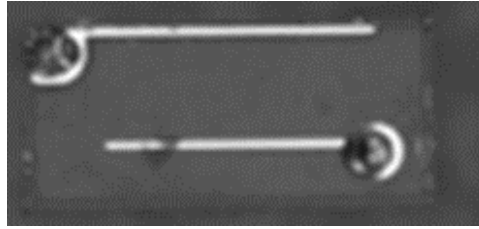
124. Plaintiffs are entitled to injunctive relief and damages in accordance with 35 U.S.C. §§ 271, 281, 283, and 284.

COUNT XI

INFRINGEMENT OF THE '155 PATENT

EXAMPLE CLAIM 1

125. Archipelago has infringed and continues to infringe one or more claims of the '155 Patent, including but not limited to exemplary claim 1, pursuant to 35 U.S.C. § 271(a) at least by without authority making, using, offering to sell, and/or



129. On the left edge of both filament images above is a terminal, which appears dark in the optical image and bright in the scanning electron microscope image. Although only one is shown in the cross-sectional images, another terminal also exists at the opposing end of the filament to supply power to the semiconductor stacked structures. The left-most semiconductor stacked structure is connected to the adjacent lead terminal by a first additional electrode, which is disposed only on a first electrode of that semiconductor stacked structure. A similar arrangement is provided at the other end of the filament (not shown), where the right-most semiconductor stacked structure is connected to the adjacent lead terminal by a second additional electrode, which is disposed only on a first electrode of that semiconductor stacked structure.

130. The two lead terminals discussed in the preceding paragraph comprise a mount that is electrically connected to the first and second additional electrodes.

131. Other than the left-most and right-most semiconductor stacked structures, each of the other semiconductor stacked structures is connected via its first and second electrodes to its neighbors via their second and first electrodes respectively. Those connections are shown for the three semiconductor stacked structures on the right in the cross-sectional images of the filament provided above as disposed under the upper surface of the wavelength converting layer.

132. Archipelago's infringement has caused and is continuing to cause damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court, as a remedy at law alone would be inadequate.

133. Plaintiffs are entitled to injunctive relief and damages in accordance with 35 U.S.C. §§ 271, 281, 283, and 284.

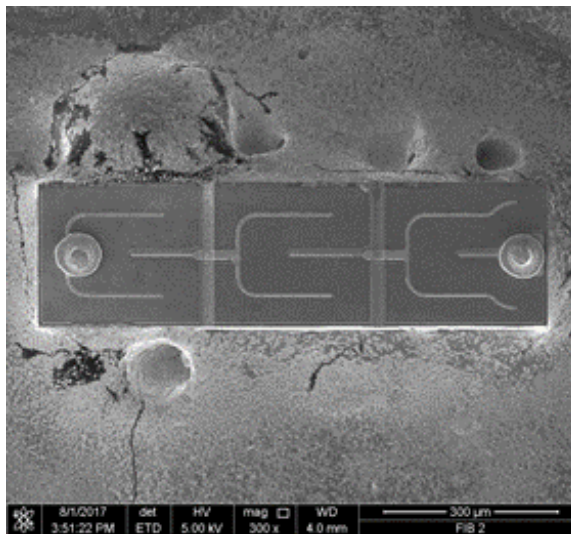
COUNT XII

INFRINGEMENT OF THE '638 PATENT

EXAMPLE CLAIM 1

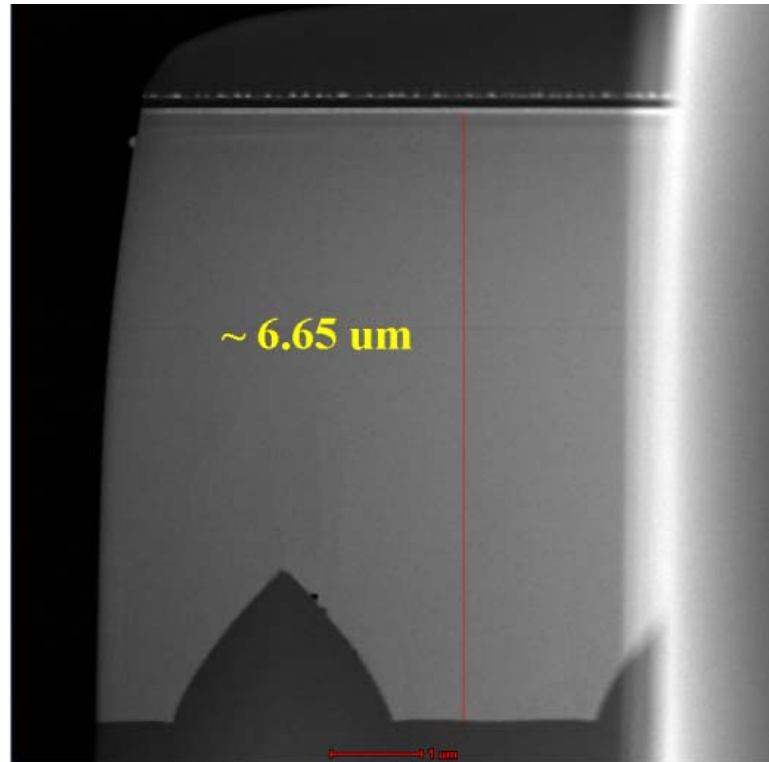
134. Archipelago has infringed and continues to infringe one or more claims of the '638 Patent, including but not limited to exemplary claim 1, pursuant to 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell, and/or selling the A19F6027-2 bulb within the United States or importing the A19F6027-2 bulb into the United States.

135. The A19F6027-2 bulb includes a plurality of LED packages, each of which includes a light emitting diode. A scanning electron microscope image of a chip from an A19F6027-2 bulb is reproduced below.



136. The above image depicts two pads. The left side of the chip includes a p-pad, which is electrically connected to a p-type contact layer. The right side of the chip includes a n-pad, which is electrically connected to an n-type contact layer.

137. A tunneling electron microscope image depicting the cross section of the epitaxial layers of the chip from the A19F6027-2 bulb is reproduced below.



138. The chip from the A19F6027-2 bulb includes a plurality of different semiconductor layers formed over a substrate. Among the layers included are, from bottom to top, a buffer layer, a gallium nitride-based first lower semiconductor layer, a gallium nitride-based first interlayer that comprises a single composition, a gallium nitride-based second interlayer, a gallium nitride-based n-type contact layer, and active layer, and a gallium nitride-based p-type contact layer. The first interlayer comprises the same composition as the n-type contact layer.

139. Upon information and belief, the second interlayer has a higher dislocation density than the first lower semiconductor layer and the second interlayer has a dislocation density different from that of the first interlayer. Upon information and belief, the first interlayer has a lower dislocation density than the buffer layer, and has higher dislocation density than the first lower semiconductor layer.

140. Archipelago's infringement has caused and is continuing to cause damage and irreparable injury to Plaintiffs. Plaintiffs will continue to suffer damage

1 and irreparable injury unless and until that infringement is enjoined by this Court, as
2 a remedy at law alone would be inadequate.

3 141. Plaintiffs are entitled to injunctive relief and damages in accordance
4 with 35 U.S.C. §§ 271, 281, 283, and 284.

5 **PRAYER FOR RELIEF**

6 WHEREFORE, Plaintiffs respectfully requests that this Court enter judgment
7 in its favor and against Archipelago as follows:

8 A. A declaration that Archipelago has infringed the '435 Patent, '627
9 Patent, '157 Patent, '960 Patent, '988 Patent, '331 Patent, '552 Patent, '946 Patent,
10 '210 Patent, '626 Patent, '155 Patent, and '638 Patent under 35 U.S.C. § 271, and a
11 final judgment incorporating the same;

12 B. A permanent injunction, enjoining Archipelago and its officers, agents,
13 servants, employees, representatives, successors, and assigns, and all others acting in
14 concert or participation with them from continued infringement under 35 U.S.C. §
15 271 of the '435 Patent, '627 Patent, '157 Patent, '960 Patent, '988 Patent, '331
16 Patent, '552 Patent, '946 Patent, '210 Patent, '626 Patent, '155 Patent, and '638
17 Patent;

18 C. An award of damages adequate to compensate Plaintiffs for
19 Archipelago's infringement the '435 Patent, '627 Patent, '157 Patent, '960 Patent,
20 '988 Patent, '331 Patent, '552 Patent, '946 Patent, '210 Patent, '626 Patent, '155
21 Patent, and '638 Patent, together with prejudgment and post-judgment interest and
22 costs pursuant to 35 U.S.C. § 284;

23 D. An accounting of all infringing sales and other infringing acts by
24 Archipelago, and an order compelling an accounting for infringing acts not presented
25 at trial and an award by the Court of additional damages for such acts; and

26 E. Any other relief to which Plaintiffs are entitled or that the Court seems
27 just and proper.
28

JURY DEMAND

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, Plaintiffs hereby demand trial by jury of all issues so triable.

DATED: September 15, 2017

Respectfully submitted,

HOLLAND & KNIGHT LLP

By /s/ Stacey H. Wang

Stacey H. Wang

Michael B. Eisenberg (*pro hac vice*
application concurrently filed)

Attorney for Plaintiffs SEOUL
SEMICONDUCTOR CO., LTD. and
SEOUL VIOSYS CO., LTD.