

**IN THE UNITED STATES DISTRICT COURT FOR
THE SOUTHERN DISTRICT OF NEW YORK**

SEOUL VIOSYS CO., LTD.,

Plaintiff,

v.

P3 INTERNATIONAL CORPORATION,

Defendant.

Case No. 1:16-cv-06276-AJN

JURY TRIAL DEMANDED

AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Seoul Viosys Co., Ltd. (“SVC” or “Plaintiff”) hereby sues P3 International Corporation (“P3” or “Defendant”), and alleges as follows:

THE PARTIES

1. Seoul Viosys Co., Ltd. is a company organized and existing under the laws of the Republic of Korea, and having its principal place of business at 65-16, Sandan-ro163beon-gil, Danwon-gu Ansan-si, Gyeonggi-do, Korea.

2. SVC innovates light emitting diode technology. SVC designs, manufactures and sells LEDs of varying wavelengths (e.g., visible light, near ultra-violet, and UV) for numerous applications and products, including televisions, monitors, lighting, curing, printing, counterfeit detection, disinfection, sensors, and analytical and medical instrument applications. The technologies designed, manufactured, and sold by SVC include its violeds UV LED technology, which can be used for disinfection, deodorization, phototherapy, and curing. Another SVC use for the violeds UV LED technology is as a UV light source in the MOSclean home mosquito trap, an image of which is reproduced below.



3. On information and belief, P3 International Corporation is a company organized and existing under the laws of New York, and having its principal place of business at 132 Nassau St., Suite 1103 New York, NY 10038-2400. Based on a review of the records at the New York Department of State, Division of Corporations Entity Information database, P3 has no registered agent for service of process. A true and correct copy of the information as obtained from the New York Department of State, Division of Corporations Entity Information database is attached as Exhibit A.

4. P3's authorized representative, as identified by the New York Department of State, Division of Corporations Entity Information database, is Chief Executive Officer Damian Krause of 132 Nassau St., Suite 1103, New York, NY 10038.

5. On information and belief, P3 is in the business of importing into the United States, marketing, offering for sale, selling and distributing electronic devices having Light Emitting Diodes (LEDs), including the P7880 LED Bug Trap ("P7880") and the P7885 LED Bug Trapper II ("P7885"). True and correct copies of printouts from P3's website, which show that it

offers the P7880 and P7885 devices for sale in the United States, are attached as Exhibit B and Exhibit C respectively. Images of the P7885 and P7880 are reproduced below to the left and right, respectively.



JURISDICTION AND VENUE

6. This is a civil action for patent infringement arising under the Patent Laws of the United States of America, 35 U.S.C. §1 et. seq. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331, 1338(a).

7. This Court has personal jurisdiction over P3 because, among other things, P3 is a New York corporation, has its principal place of business in New York, and conducts business in the Southern District of New York.

8. Venue is proper in this judicial district pursuant to 28 U.S.C. §§1391 (b) and (c), and 1400(b).

THE PATENTS IN SUIT

9. On July 19, 2011 United States Patent No. 7,982,207 (“the ’207 Patent”), entitled, “Light emitting diode”, was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the ’207 Patent is attached to this Complaint as Exhibit D.

10. SVC is the owner and assignee of the ’207 Patent, and holds the right to sue and recover damages for infringement thereof, including past damages.

11. On May 31, 2011 United States Patent No. 7,951,626 (“the ’626 Patent”), entitled, “Light emitting device and method of manufacturing the same”, was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the ’626 Patent is attached to this Complaint as Exhibit E.

12. SVC is the owner and assignee of the ’626 Patent, and holds the right to sue and recover damages for infringement thereof, including past damages.

13. On December 1, 2015 United States Patent No. 9,203,006 (“the ’006 Patent”), entitled, “Light emitting device”, was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the ’006 Patent is attached to this Complaint as Exhibit F.

14. SVC is the exclusive licensee of the ’006 Patent, and holds the right to sue and recover damages for infringement thereof, including past damages.

15. On April 8, 2014 United States Patent No. 8,692,282 (“the ’282 Patent”), entitled, “Light emitting diode package and light emitting module comprising the same”, was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the ’282 Patent is attached to this Complaint as Exhibit G.

16. SVC is the exclusive licensee of the '282 Patent, and holds the right to sue and recover damages for infringement thereof, including past damages.

17. On May 1, 2012 United States Patent No. 8,168,988 ("the '988 Patent"), entitled, "Light emitting element with a plurality of cells bonded, method of manufacturing the same, and light emitting device using the same", was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '988 Patent is attached to this Complaint as Exhibit H.

18. SVC is the owner and assignee of the '988 Patent, and holds the right to sue and recover damages for infringement thereof, including past damages.

19. On February 12, 2012 United States Patent No. 8,664,693 ("the '693 Patent"), entitled, "Light emitting diode having algan buffer layer and method of fabricating the same", was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '693 Patent is attached to this Complaint as Exhibit I.

20. SVC is the owner and assignee of the '693 Patent, and holds the right to sue and recover damages for infringement thereof, including past damages.

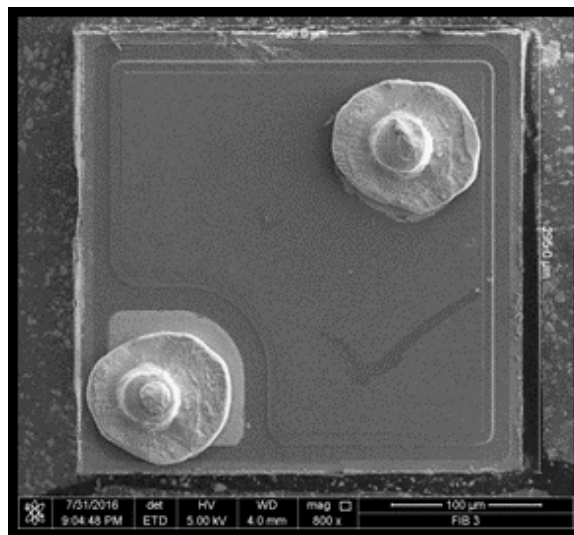
21. On February 3, 2016 United States Patent No. 9,269,867 ("the '867 Patent"), entitled, "Light emitting device and method of fabricating the same", was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '867 Patent is attached to this Complaint as Exhibit J.

22. SVC is the owner and assignee of the '867 Patent, and holds the right to sue and recover damages for infringement thereof, including past damages.

**INFRINGEMENT OF U.S. PATENT NO. 7,982,207
EXAMPLE CLAIMS 1, 6, AND 7**

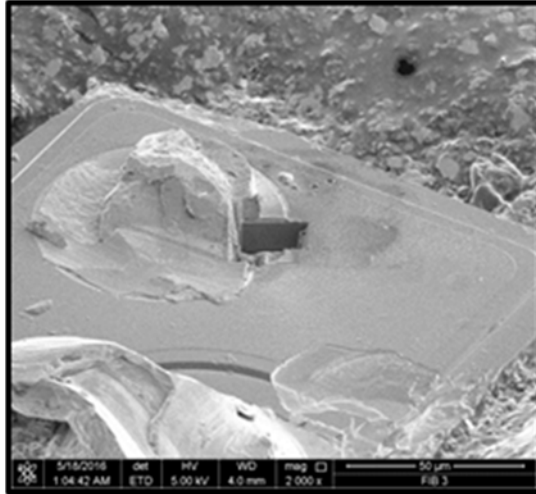
23. The P7880 LED Bug Trap and the P7885 LED Bug Trapper II are depicted in paragraph 5 above and in Exhibit B and Exhibit C to this Complaint.

24. As indicated in Exhibit C to the Complaint, the P7885 device includes “a built-in UV LED light.” Below is a scanning electron microscope image of the top surface of a square UV LED from an example P7885.

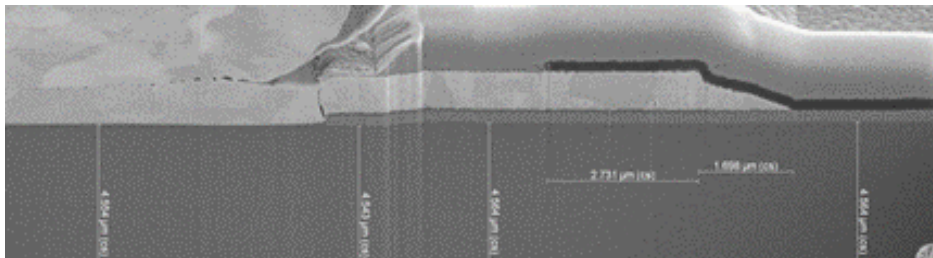


25. The P pad of the rectangular UV LED is shown as a circular structure toward the upper right corner of the image. The P pad is formed over a p-type semiconductor layer.

26. Below is another scanning electron microscope image, which was created after milling a small hole through the edge of the P pad and the surrounding material.



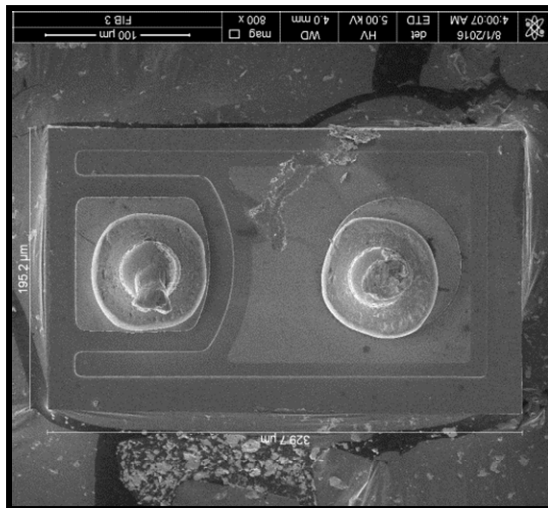
27. Further scanning electron microscope images of the milled hole are provided together below to indicate the various layers both under the P pad and outside of the P pad. In particular, the area to the left of the below composite image indicates the structures closer to the center of the P pad, the area in the center indicates the structures near the edge of the P pad, and the area at the far right indicates the structures beyond the edge of the P pad.



28. With respect to the central region discussed in the preceding paragraph, there is shown, from bottom to top, a p-type semiconductor comprised of magnesium doped GaN, a transparent electrode comprised of Indium Tin Oxide (ITO), a chromium layer, a platinum layer, and finally the gold P pad. With respect to the left region discussed in the preceding paragraph, there is shown, from bottom to top, a p-type semiconductor comprised of magnesium doped GaN, a chromium layer, a platinum layer, and finally the gold P pad. The left region, therefore, indicates an opening in the ITO layer, where instead of contacting the ITO, the chromium and

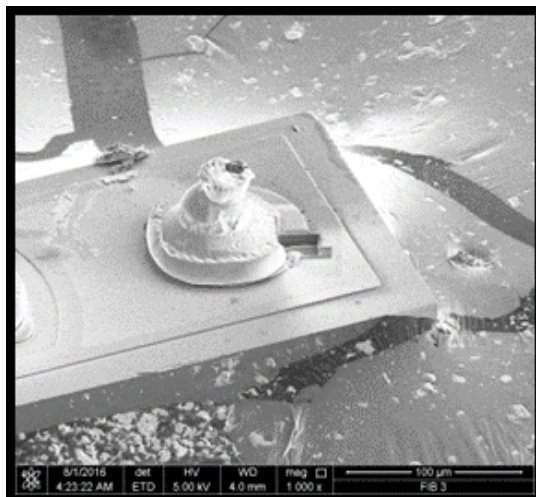
platinum layers contact the underlying p-type semiconductor layer. The chromium and platinum layers, where they contact the p-type semiconductor layer, comprise a current blocking portion.

29. As indicated in Exhibit B to the Complaint, the P7880 device includes “6 LED’s [that] produce UV light that attracts insects.” Below is a scanning electron microscope image of the top surface of a rectangular UV LED from an example P7880.

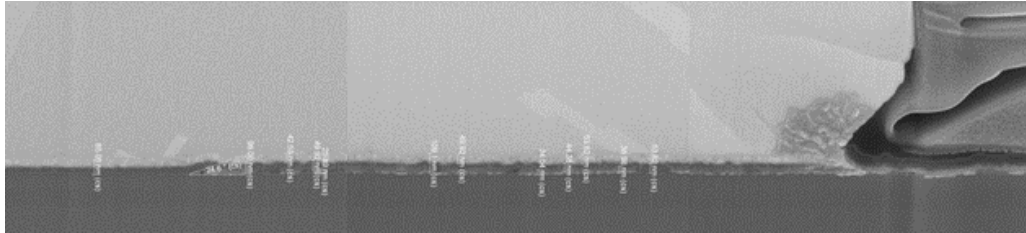


30. The P pad of the rectangular UV LED is shown as a circular structure toward the right side of the image. The P pad is formed over a p-type semiconductor layer.

31. Below is another scanning electron microscope image, which was created after milling a small hole through the edge of the P pad and the surrounding material.



32. Further scanning electron microscope images of the milled hole are provided together below to indicate the various layers both under the P pad and outside of the P pad. In particular, the area to the left of the below composite image indicates the structures closer to the center of the P pad, the area in the center indicates the structures near the edge of the P pad, and the area at the far right indicates the structures beyond the edge of the P pad.

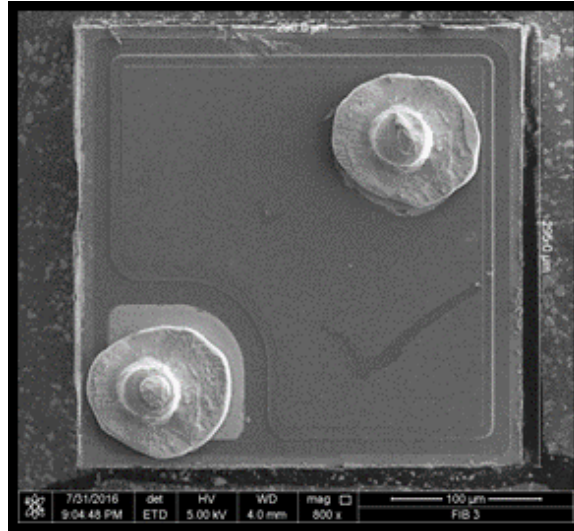


33. With respect the central region discussed in the preceding paragraph, there is shown from bottom to top a p-type semiconductor comprised of magnesium doped GaN, a transparent electrode comprised of a thin layer of nickel-gold, a chromium layer, a platinum layer, and finally the gold P pad. With respect to the left region discussed in the preceding paragraph, there is shown, from bottom to top, a p-type semiconductor comprised of magnesium doped GaN, a chromium layer, a platinum layer, and finally the gold P pad. The left region, therefore, indicates an opening in the nickel-gold layer, where instead of contacting the nickel-gold, the chromium and platinum layers contact the underlying p-type semiconductor layer. The chromium and platinum layers, where they contact the p-type semiconductor layer, comprise a current blocking portion.

**INFRINGEMENT OF U.S. PATENT NO. 7,951,626
EXAMPLE CLAIMS 9 AND 13**

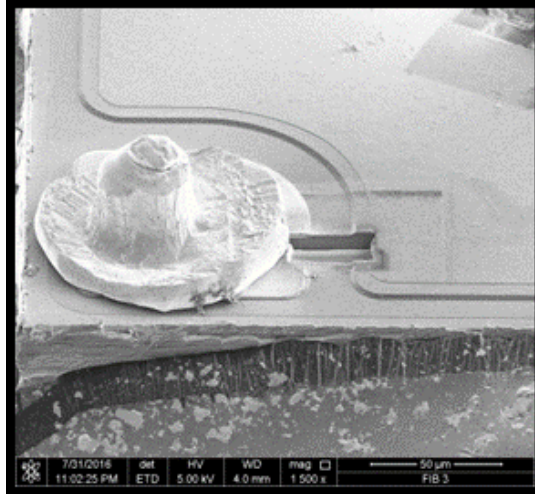
34. The P7880 LED Bug Trap and the P7885 LED Bug Trapper II are depicted in paragraph 5 above and in Exhibit B and Exhibit C to this Complaint.

35. As indicated in Exhibit C to the Complaint, the P7885 device includes “a built-in UV LED light.” Below is a scanning electron microscope image of the top surface of a square UV LED from an example P7885.

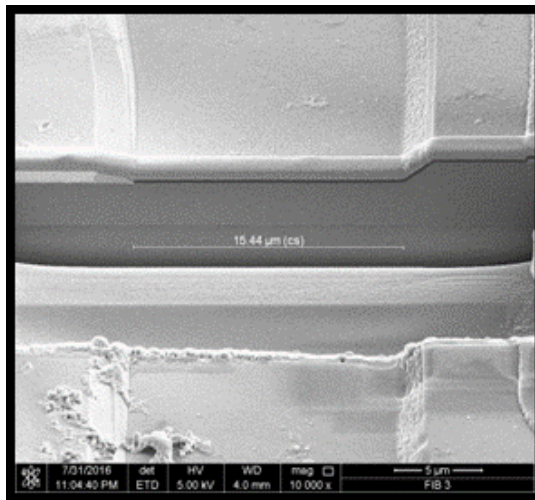


36. The N pad of the rectangular UV LED is shown as a circular structure toward the bottom left corner of the image. The N pad is formed over an N-type semiconductor layer. In addition, the P pad of the rectangular UV LED is shown as a circular structure toward the top right corner of the image. The P pad is formed over a P-type semiconductor layer.

37. As shown in another scanning electron microscope image, which was created after milling a small hole near the N pad, the N pad is formed near a mesa above the surface on which the N pad is formed.

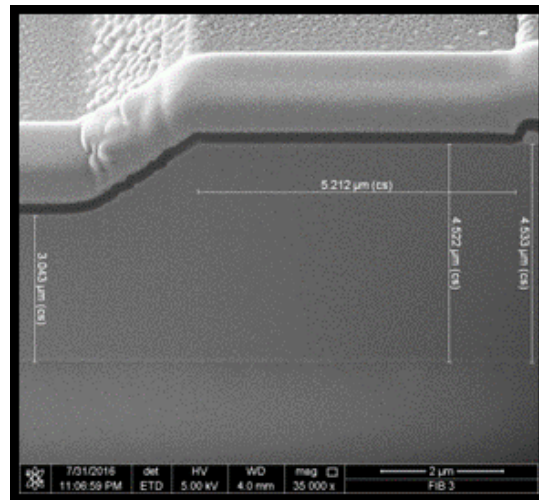


38. A larger image of the milled hole in the mesa shows that the edge of the mesa is sloped away from the N pad. The angle of the slope is approximately 40 degrees. The area of the LED comprising the mesa comprises in relevant part a substrate upon which an N-type semiconductor layer was formed, an active layer on the N-type layer, and a P-type semiconductor layer on the active layer.

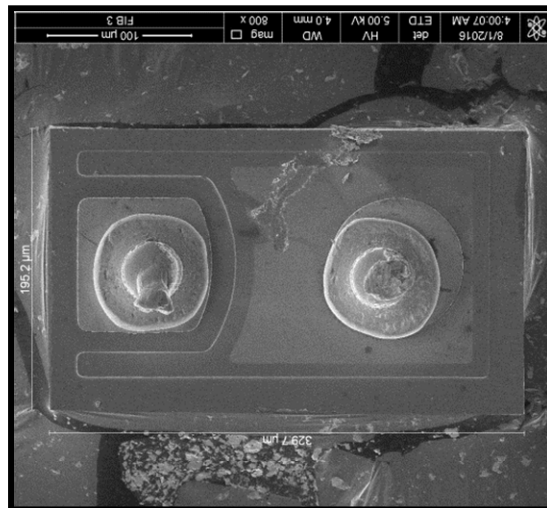


39. A further enlarged view of the sloped edge of the mesa is provided below. In view of the shape and slope of the mesa edge, which is below 50 degrees, and upon information and belief regarding the processes used to manufacture UV LEDs, it is likely that the mesa edge

shape was created by hard-baking a photoresist followed by etching of the top surface of the UV LED.

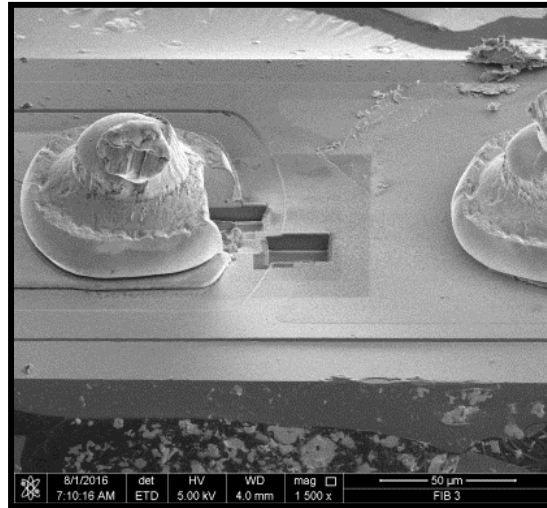


40. As indicated in Exhibit B to the Complaint, the P7880 device includes “6 LED’s [that] produce UV light that attracts insects.” Below is a scanning electron microscope image of the top surface of a rectangular UV LED from an example P7880.

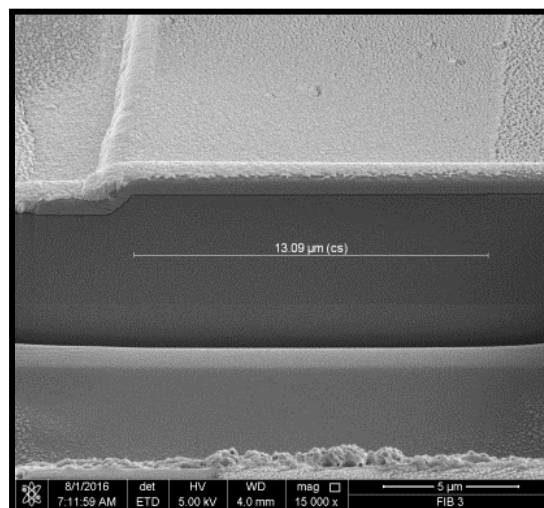


41. The N pad of the rectangular UV LED is shown as a circular structure toward the left side of the image. The N pad is formed over an n-type semiconductor layer. In addition, the P pad of the rectangular UV LED is shown as a circular structure toward the right side of the image. The P pad is formed over a P-type semiconductor layer.

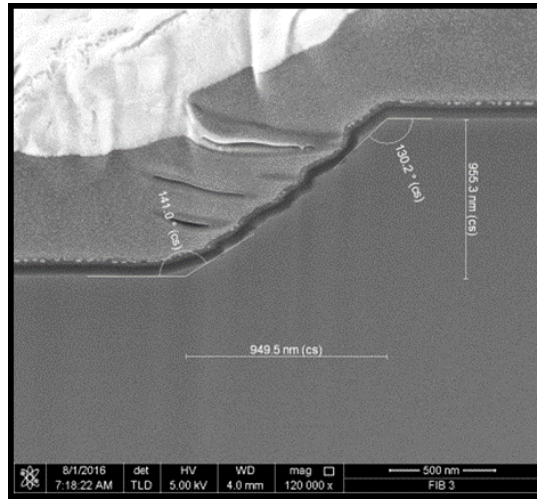
42. As shown in another scanning electron microscope image, which was created after milling a small hole near the N pad, the N pad is formed near a mesa above the surface on which the N pad is formed.



43. A larger image of the milled hole in the mesa shows that the edge of the mesa is sloped away from the N pad. The angle of the slope is approximately 40 degrees. The area of the LED comprising the mesa comprises in relevant part a substrate upon which an N-type semiconductor layer was formed, an active layer on the N-type layer, and a P-type semiconductor layer on the active layer.



44. A further enlarged view of the sloped edge of the mesa is provided below. In view of the shape and slope of the mesa edge, which is below 50 degrees, and upon information and belief regarding the processes used to manufacture UV LEDs, it is likely that the mesa edge shape was created by hard-baking a photoresist followed by etching of the top surface of the UV LED.



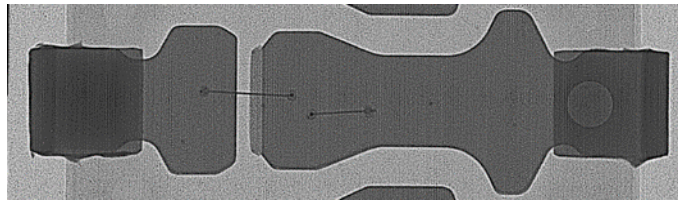
**INFRINGEMENT OF U.S. PATENT NO. 9,203,006
EXAMPLE CLAIMS 1, 6, 8, 10, 15 AND 19**

45. The P7885 LED Bug Trapper II is depicted in paragraph 5 above and in Exhibit C to this Complaint.

46. As indicated in Exhibit C to the Complaint, the P7885 device includes “a built-in UV LED light.” The image below depicts a package from the P7885, which comprises a light emitting device.



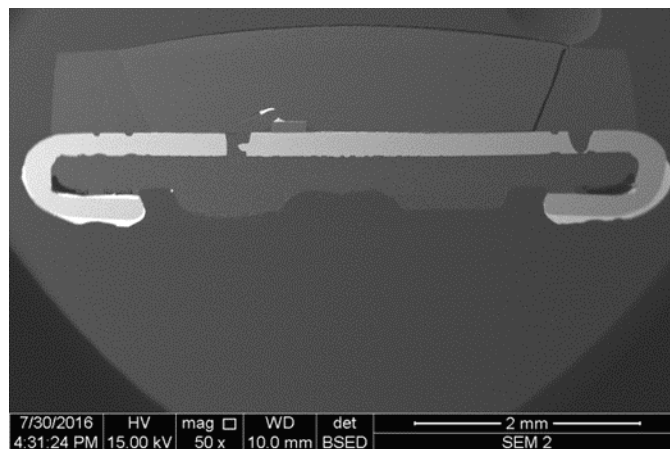
47. The x-ray image below focuses on two example lead frames from the package depicted above. The two lead frames are spaced apart from each other. In addition, each of the lead frames comprises a first portion and a second portion disposed on the first portion.



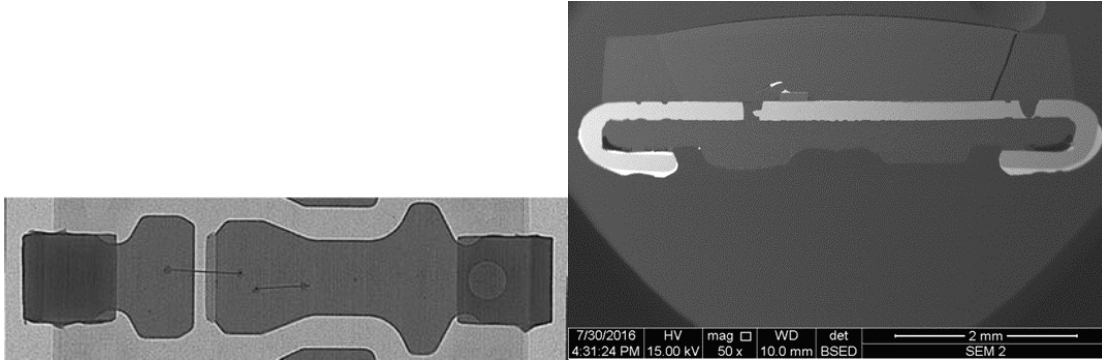
48. These first and second portions of the lead frames can be further visualized in the cross-sectional image below. Here, the semiconductor chip can be seen as a small rectangle on the top surface of the lead frame on the right. In addition, it can be seen that both lead frames are at least partially covered by a resin.



49. The cross-sectional x-ray image below illustrates that each of the leads can be considered as a top portion and a bottom portion having different planar shapes. The cross-sectional x-ray image also shows that the lead frame on the right as a fixing element with a space below the fixing element.



50. As shown in the x-ray images below, the lead frame on the right includes an additional fixing element toward the right side of each image.



51. The side surfaces of the fixing elements, which can be seen in cross section above, are stepped or inclined.

**INFRINGEMENT OF U.S. PATENT NO. 8,692,282
EXAMPLE CLAIMS 1-6**

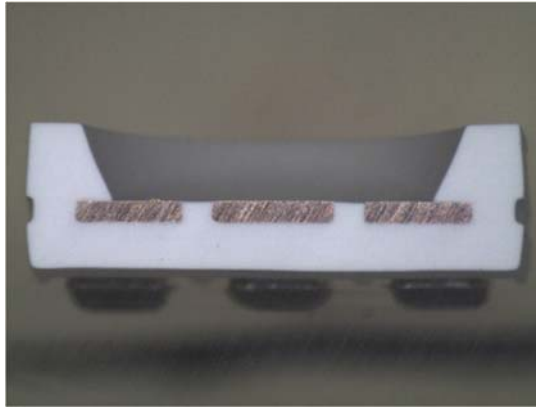
52. The P7885 LED Bug Trapper II is depicted in paragraph 5 above and in Exhibit C to this Complaint.

53. As indicated in Exhibit C to the Complaint, the P7885 device includes “a built-in UV LED light.”

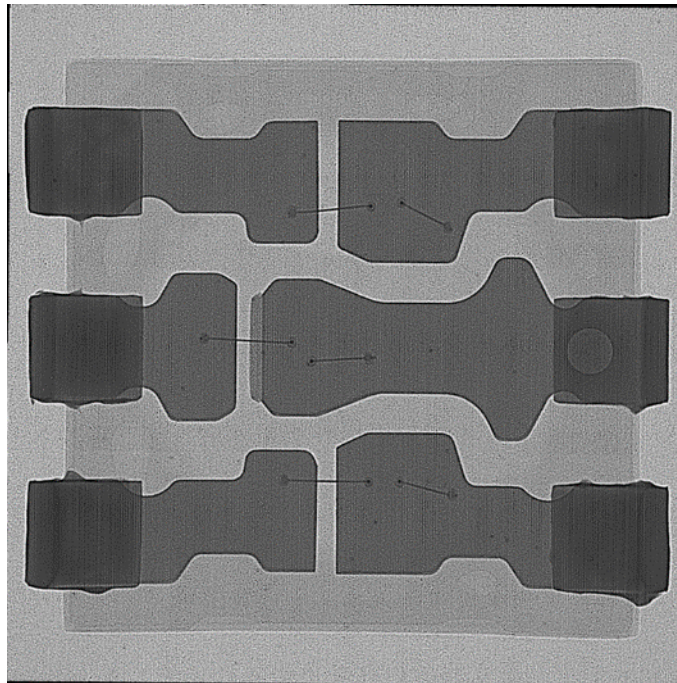
54. The built-in UV LED light is provided within a square package, an image of which is provided below. The package includes a lead frame and light emitting diode chips. Two groups of terminals are shown at opposing left and right sides of the package. A chip area is shown, for example, by the portion of the lead frame upon which the central UV LED is arranged.



55. As shown in the cross-sectional image of the package below, the body of the package supports the parts of the lead frame.



56. As can be seen in the below x-ray of the package, at least two terminals having different widths are shown in the group of terminals on the left and at least two terminals having different widths are shown in the group of terminals on the right.

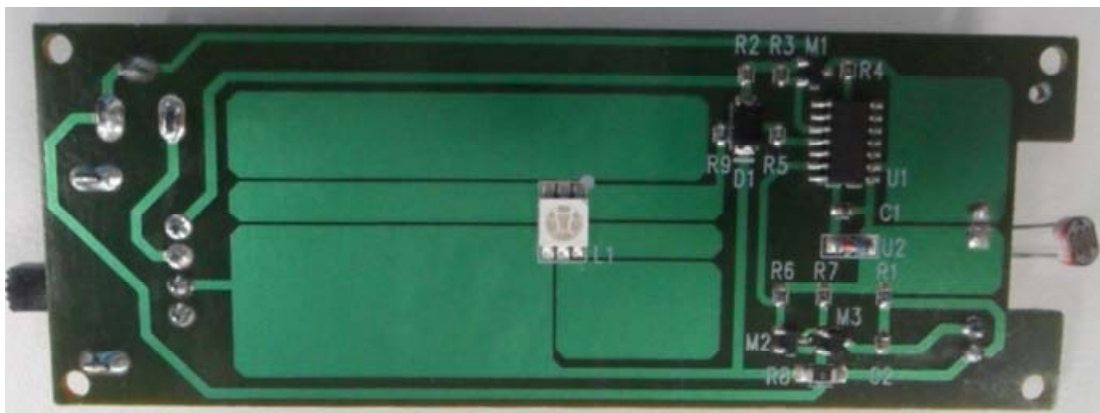


57. The connections between the terminals and the LED chips can be seen from the dark lines comprising wires in the x-ray image.

**INFRINGEMENT OF U.S. PATENT NO. 8,168,988
EXAMPLE CLAIMS 1-13**

58. The P7885 LED Bug Trapper II is depicted in paragraph 5 above and in Exhibit C to this Complaint.

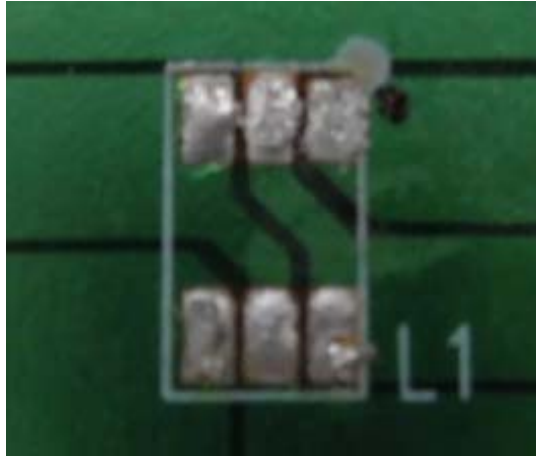
59. As indicated in Exhibit C to the Complaint, the P7885 device includes light emitting diodes. Three light emitting diodes (LEDs) are provided in the white package shown at the center of the image of a printed circuit board below.



60. An enlarged image of the package containing the 3 LEDs is provided below.



61. Reproduced below is an enlarged image of the portion of the printed circuit board from above after removal of the package. As shown by the green areas in the image below, the 3 LEDs are connected in series.



62. Below is shown a second printed circuit board from the P7885, which is connected to an electrical plug. This printed circuit board includes circuitry that controls the voltage waveform and current waveform that is applied to the LEDs.

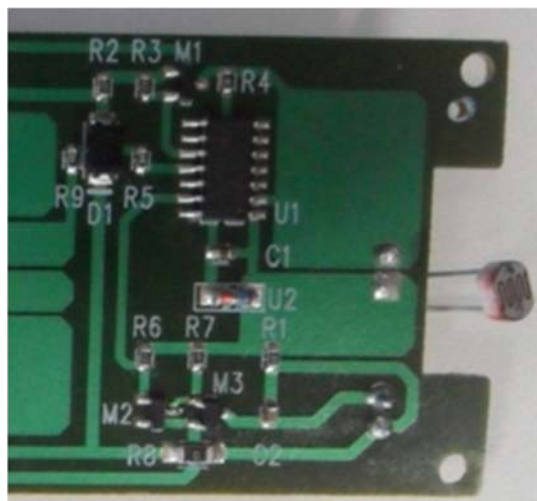


63. The image above also shows the power source unit of the P7885, which includes the electrical plug.

64. The below further enlarged image of the second printed circuit board includes a rectifying bridge connected to the power source. The rectifying bridge is a black rectangle at the center of the image. The rectifying bridge is marked with the identifier MB6M. Upon information and belief, such rectifying bridges contain four diodes.



65. Returning to the first printed circuit board, a portion of which is depicted in the image below, a resistor labeled R8 is connected in parallel with the 3 LEDs provided in the package depicted above.



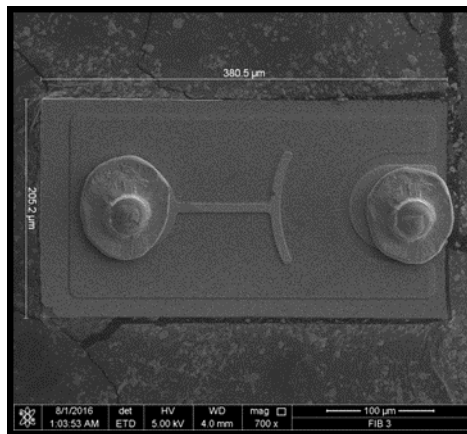
**INFRINGEMENT OF U.S. PATENT NO. 8,664,693
EXAMPLE CLAIMS 1, 2, 9 and 10**

66. The P7885 LED Bug Trapper II is depicted in paragraph 5 above and in Exhibit C to this Complaint.

67. As indicated in Exhibit C to the Complaint, the P7885 device includes light emitting diodes. Three light emitting diodes (LEDs) are provided in the white package shown below.



68. Below is provided an image of a blue LED from the P7885.



69. The blue LED has a sapphire substrate. Above the sapphire substrate is a buffer layer of $\text{Al}_x\text{Ga}_{1-x}\text{N}$. And above the buffer layer is a first conductive semiconductor layer of N-type $\text{Al}_z\text{In}_y\text{Ga}_{1-z-y}\text{N}$.

70. The buffer layer of $\text{Al}_x\text{Ga}_{1-x}\text{N}$ has two regions. The first region, which is positioned just above the substrate, is an $\text{Al}_x\text{Ga}_{1-x}\text{N}$ layer with a composition ratio of Al equal to 1. The second region, which is positioned above the first region, is an $\text{Al}_x\text{Ga}_{1-x}\text{N}$ layer with a composition ratio x of Al decreasing linearly with increasing distance from the substrate to the first conductive semiconductor layer. The second region has a thickness between 1 nm and 50 nm.

71. The degree of lattice mismatch between the sapphire substrate and the second region of the buffer layer is smaller than the degree of lattice mismatch between substrate and the conductive semiconductor layer.

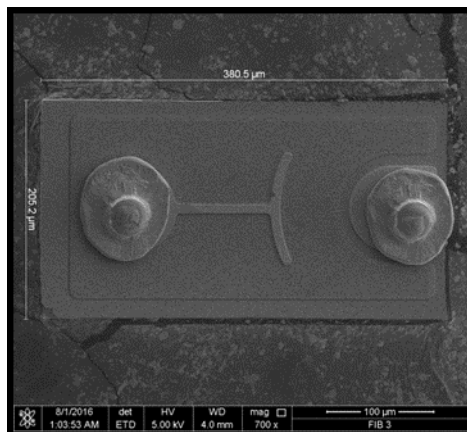
**INFRINGEMENT OF U.S. PATENT NO. 9,269,867
EXAMPLE CLAIMS 1-3 and 11-13**

72. The P7885 LED Bug Trapper II is depicted in paragraph 5 above and in Exhibit C to this Complaint.

73. As indicated in Exhibit C to the Complaint, the P7885 device includes light emitting diodes. Three light emitting diodes (LEDs) are provided in the white package shown below.



74. Below is provided an image of a blue LED from the P7885.



75. The blue LED has a sapphire substrate. Above the sapphire substrate is an N-type semiconductor layer. Above the N-type semiconductor layer is an active layer. And above the active layer is a P-type semiconductor layer.

76. A portion of the N-type semiconductor layer is exposed rather than being covered by the active layer and P-type semiconductor layer. Part of the exposed portion of the N-type semiconductor layer has an irregular convex-concave pattern of irregular heights and irregular depths. The exposed portion of the N-type semiconductor layer having the irregular convex-concave pattern extends around the edge. The exposed edge includes corner regions that are wider than the lateral regions between the corners.

77. An N pad is formed on a part of the exposed portion of the N-type semiconductor layer.

78. The irregular convex-concave pattern is located between the N pad and the P-type semiconductor layer.

79. The N-type semiconductor layer is comprised of GaN and includes three sublayers. One of the sublayers has a relatively lower level of dopant impurities and the other two sublayers.

80. The top-most sublayer of the N-type semiconductor layer is in ohmic contact with the N pad. The top-most layer of the N-type semiconductor layer also includes the convex-concave pattern.

81. The height of the convex-concave pattern is lower than the height of the N-type semiconductor layer under the convex-concave pattern.

COUNT I

INFRINGEMENT OF U.S. PATENT NO. 7,982,207

82. Paragraphs 1 through 81 are incorporated herein by reference.

83. SVC alleges on information and belief that P3 has directly infringed and continues to directly infringe, literally and/or under the doctrine of equivalents, at least claims 1, 6 and 7 of the '207 Patent by selling, offering for sale and/or importing products which include the claimed light emitting device, including but not limited to the P7885 LED Bug Trapper II and P7880 LED Bug Trap, and other similar products.

84. SVC has suffered, and continues to suffer damages as a result of P3's infringement of the '207 Patent, in an amount to be proved at trial.

COUNT II

INFRINGEMENT OF U.S. PATENT NO. 7,951,626

85. Paragraphs 1 through 84 are incorporated herein by reference.

86. SVC alleges on information and belief that P3 has directly infringed and continues to directly infringe, literally and/or under the doctrine of equivalents, at least claims 9 and 13 of the '626 Patent by selling, offering for sale and/or importing products which include the claimed light emitting device, including but not limited to the P7885 LED Bug Trapper II and P7880 LED Bug Trap, and other similar products.

87. SVC has suffered, and continues to suffer damages as a result of P3's infringement of the '626 Patent, in an amount to be proved at trial.

COUNT III

INFRINGEMENT OF U.S. PATENT NO. 9,203,006

88. Paragraphs 1 through 87 are incorporated herein by reference.

89. On information and belief, SVC alleges that P3 has directly infringed and continues to directly infringe, literally and/or under the doctrine of equivalents, at least claims 1, 6, 8, 10, 15, and 19 of the '006 Patent by selling, offering for sale and/or importing products which include the claimed light emitting device, including but not limited to the P7885 LED Bug Trapper II, and other similar products.

90. SVC has suffered, and continues to suffer damages as a result of P3's infringement of the '006 Patent, in an amount to be proved at trial.

COUNT IV

INFRINGEMENT OF U.S. PATENT NO. 8,692,282

91. Paragraphs 1 through 90 are incorporated herein by reference.

92. SVC alleges on information and belief that P3 has directly infringed and continues to directly infringe, literally and/or under the doctrine of equivalents, at least claims 1-6 of the '282 Patent by selling, offering for sale and/or importing products which include the claimed light emitting device, including but not limited to the P7885 LED Bug Trapper II, and other similar products.

93. SVC has suffered, and continues to suffer damages as a result of P3's infringement of the '282 Patent, in an amount to be proved at trial.

COUNT V

INFRINGEMENT OF U.S. PATENT NO. 8,168,988

94. Paragraphs 1 through 93 are incorporated herein by reference.

95. SVC alleges on information and belief that P3 has directly infringed and continues to directly infringe, literally and/or under the doctrine of equivalents, at least claims 1-13 of the '988 Patent by selling, offering for sale and/or importing products which include the

claimed light emitting device, including but not limited to the P7885 LED Bug Trapper II, and other similar products.

96. SVC has suffered, and continues to suffer damages as a result of P3's infringement of the '988 Patent, in an amount to be proved at trial.

COUNT VI

INFRINGEMENT OF U.S. PATENT NO. 8,667,693

97. Paragraphs 1 through 96 are incorporated herein by reference.

98. SVC alleges on information and belief that P3 has directly infringed and continues to directly infringe, literally and/or under the doctrine of equivalents, at least claims 1, 2, 9, and 10 of the '693 Patent by selling, offering for sale and/or importing products which include the claimed light emitting device, including but not limited to the P7885 LED Bug Trapper II, and other similar products.

99. SVC has suffered, and continues to suffer damages as a result of P3's infringement of the '693 Patent, in an amount to be proved at trial.

COUNT VII

INFRINGEMENT OF U.S. PATENT NO. 9,269,867

100. Paragraphs 1 through 99 are incorporated herein by reference.

101. SVC alleges on information and belief that P3 has directly infringed and continues to directly infringe, literally and/or under the doctrine of equivalents, at least claims 1-3 and 11-13 of the '867 Patent by selling, offering for sale and/or importing products which include the claimed light emitting device, including but not limited to the P7885 LED Bug Trapper II, and other similar products.

102. SVC has suffered, and continues to suffer damages as a result of P3's infringement of the '867 Patent, in an amount to be proved at trial.

PRAYER FOR
RELIEF

WHEREFORE, Seoul Viosys Co., Ltd. respectfully requests that this Court enter judgment against Defendant as follows:

- A. That Defendant has infringed United States Patent No. 7,982,207;
- B. That Defendant has infringed United States Patent No. 7,951,626;
- C. That Defendant has infringed United States Patent No. 9,203,006;
- D. That Defendant has infringed United States Patent No. 8,692,282;
- E. That Defendant has infringed United States Patent No. 8,168,988;
- F. That Defendant has infringed United States Patent No. 8,664,693;
- G. That Defendant has infringed United States Patent No. 9,269,867;
- H. That Plaintiff be awarded damages adequate to compensate it for Defendant's infringement, together with pre-judgment and post-judgment interest;
- I. That the Court permanently enjoin Defendant from marketing, offering for sale, selling and/or importing the P7880 LED Bug Trap and the P7885 LED Bug Trapper II and other similar products that infringe one or more of the asserted claims of the asserted patents; and
- J. An Order for all other relief as the Court or a jury may deem proper and just.

Respectfully submitted,

/s/ Michael B. Eisenberg

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