

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE

SEOUL SEMICONDUCTOR CO., LTD., a )  
Korean corporation, and SEOUL VIOSYS CO., )  
LTD., a Korean corporation, )  
 )  
Plaintiffs, )  
 )  
v. ) C.A. No. \_\_\_\_\_  
 )  
TECHNICAL CONSUMER PRODUCTS, ) **JURY TRIAL DEMANDED**  
INC. dba TCP LIGHTING, )  
 )  
Defendant. )

**COMPLAINT FOR PATENT INFRINGEMENT**

Plaintiffs Seoul Semiconductor Co., Ltd. (“Seoul Semiconductor”) and Seoul Viosys Co., Ltd. (“Seoul Viosys”), (collectively the “Seoul Plaintiffs” or “Plaintiffs”) for their Complaint against Defendant Technical Consumer Products, Inc. dba TCP Lighting (“TCP” or “Defendant”) allege as follows:

**NATURE OF THE ACTION**

1. The Seoul Plaintiffs bring this patent infringement action to protect their valuable patented technology relating to light emitting diodes (“LEDs”) and LED lighting. An LED is a semiconductor device that converts electrical energy into light. LEDs have many advantages over conventional light sources, including lower energy consumption, longer lifetime, and smaller size.
2. Seoul Semiconductor was founded in 1992 with approximately 30 employees in a small space of a commercial building in Bongchen-dong, Seoul, Korea. From those initial 30 employees, Seoul Semiconductor has grown into one of the largest manufacturers of LEDs in the world. Its subsidiary, Seoul Viosys, is also a leading company in the LED industry.

3. The Seoul Plaintiffs' success is in large part due to their significant investment in innovation and their respect for intellectual property. Seoul Semiconductor has invested in research and development ("R&D") for decades. Seoul Semiconductor invests over 10% of sales revenue into R&D and owns one of the largest LED patent portfolios in the world, which includes more than 10,000 patents worldwide.

### **THE PARTIES**

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

5. Plaintiff Seoul Viosys is a company organized and existing under the laws of the Republic of Korea, with its principal place of business at 65-16, Sandan-ro 163 beon-gil, Danwon-gu, Ansan-city, Gyeonggi-do, Korea 425-851. Seoul Viosys is a subsidiary of Seoul Semiconductor.

6. TCP is a Delaware corporation with a principal place of business at 325 Campus Dr. Aurora, Ohio, 44202. TCP's registered agent, The Corporation Trust Company, is located at 1209 Orange St., Wilmington, Delaware 19801.

### **JURISDICTION AND VENUE**

7. This Court has jurisdiction over the subject matter of this action under 28 U.S.C. §§ 1331 and 1338(a) because, at the very least, this action arises under the patent laws of the United States, including 35 U.S.C. § 271 et seq.

8. This Court has personal jurisdiction over TCP. TCP is amenable to service of summons for this action. Furthermore, personal jurisdiction over TCP in this action comports with

due process. TCP has sought the protection of and benefit from the laws of the State of Delaware by incorporating and organizing in Delaware.

9. Venue is proper in this Court pursuant to 28 U.S.C. § 1400(b). On information and belief, TCP is incorporated in the State of Delaware and, therefore, is a resident of this District.

### **PATENTS-IN-SUIT**

10. Seoul Semiconductor is the lawful owner of all right, title, and interest in United States Patent No. 11,721,675 entitled “White Light Source System” (“the ’675 patent”), including the right to sue and to recover for infringement thereof. The ’675 patent was duly and legally issued on August 8, 2023, by the United States Patent and Trademark Office to Yamakawa *et al.* A copy of the ’675 patent is attached hereto as Exhibit A.

11. Seoul Semiconductor is the lawful owner of all right, title, and interest in United States Patent No. 11,632,836 entitled “Light Emitting Apparatus Including Light-Emitting Diode” (“the ’836 patent”), including the right to sue and to recover for infringement thereof. The ’836 patent was duly and legally issued on April 18, 2023, by the United States Patent and Trademark Office to Lee. A copy of the ’836 patent is attached hereto as Exhibit B.

12. Seoul Semiconductor is the lawful owner of all right, title, and interest in United States Patent No. 10,510,933 entitled “Light Emitting Diode Package and Manufacturing Method Thereof” (“the ’933 patent”), including the right to sue and to recover for infringement thereof. The ’933 patent was duly and legally issued on December 17, 2019, by the United States Patent and Trademark Office to Oh *et al.* A copy of the ’933 patent is attached hereto as Exhibit C.

13. Seoul Semiconductor is the lawful owner of all right, title, and interest in United States Patent No. 8,659,050 entitled “Slim LED package” (“the ’050 patent”), including the right to sue and to recover for infringement thereof. The ’050 patent was duly and legally issued on

February 25, 2014, by the United States Patent and Trademark Office to Seo *et al.* A copy of the '050 patent is attached hereto as Exhibit D.

14. Seoul Semiconductor is the lawful owner of all right, title, and interest in United States Patent No. 10,134,967 entitled “Light Emitting Device” (“the '967 patent”), including the right to sue and to recover for infringement thereof. The '967 patent was duly and legally issued on November 20, 2018, by the United States Patent and Trademark Office to Seo *et al.* An *inter partes* review certificate for the '967 Patent issued on April 5, 2022, which substituted the originally-issued claims of the '967 Patent with 16 amended claims. A copy of the '967 patent, as amended by the April 5, 2022 *inter partes* review certificate, is attached hereto as Exhibit E.

15. Seoul Semiconductor is the lawful owner of all right, title, and interest in United States Patent No. 9,147,821 entitled “Light Emitting Device” (“the '821 patent”), including the right to sue and to recover for infringement thereof. The '821 patent was duly and legally issued on September 29, 2015, by the United States Patent and Trademark Office to Seo *et al.* A copy of the '821 patent is attached hereto as Exhibit F.

16. Seoul Viosys is the lawful owner of all right, title, and interest in United States Patent No. 7,982,207 entitled “Light Emitting Diode” (“the '207 patent”), including the right to sue and to recover for infringement thereof. The '207 patent was duly and legally issued on July 19, 2011, by the United States Patent and Trademark Office to Kim *et al.* A copy of the '207 patent is attached hereto as Exhibit G.

17. Seoul Viosys is the lawful owner of all right, title, and interest in United States Patent No. 9,929,314 entitled “Light Emitting Diode Chip Having Electrode Pad” (“the '314 patent”), including the right to sue and to recover for infringement thereof. The '314 patent was

duly and legally issued on March 27, 2018, by the United States Patent and Trademark Office to Kim *et al.* A copy of the '314 patent is attached hereto as Exhibit H.

18. Seoul Semiconductor is the lawful owner of all right, title, and interest in United States Patent No. 8,604,496 entitled "Optical Semiconductor Device" ("the '496 patent"), including the right to sue and to recover for infringement thereof. The '496 patent was duly and legally issued on December 10, 2013, by the United States Patent and Trademark Office to Shioda *et al.* A copy of the '496 patent is attached hereto as Exhibit I.

19. Seoul Viosys is the lawful owner of all right, title, and interest in United States Patent No. 9,799,800 entitled "Light Emitting Device and Method of Fabricating the Same" ("the '800 patent"), including the right to sue and to recover for infringement thereof. The '800 patent was duly and legally issued on October 24, 2017, by the United States Patent and Trademark Office to Jang *et al.* A copy of the '800 patent is attached hereto as Exhibit J.

#### **TCP'S KNOWLEDGE OF THE PATENTS AND ITS INFRINGEMENT**

20. On July 11, 2023, the Seoul Plaintiffs sent a letter to Walmart, Inc. ("Walmart") explaining that a number of Great Value branded products were infringing Seoul Plaintiffs' patents. The Seoul Plaintiffs' letter specifically listed the Great Value #GVP38DLMOTION and Great Value #GVVCOA6027ND products and warned that they were infringing the '821 patent, the '967 patent, the '314 patent, the '207 patent, the '496 patent, and the '800 patent. The Seoul Plaintiffs attached photos of the UPC codes for each of the products to their letter.

21. The Seoul Plaintiffs did not receive any response to their July 11, 2023 letter. On August 23, 2023, the Seoul Plaintiffs sent a further letter to Walmart following up on their July 2023 letter. The Seoul Plaintiffs requested that sales of infringing products cease. The Seoul Plaintiffs did not receive any response to their August 2023 letter either.

22. On January 18, 2024, the Seoul Plaintiffs sent a further letter to Walmart, describing the prior correspondence and UPC codes that they had sent about Great Value products. The Seoul Plaintiffs again expressed their concerns about patent infringement and provided Walmart with 24 pages of detailed claim charts showing x-ray imaging and detailed microscopic imaging with examples of patent infringement by GVP38DLMOTION of the ‘821 patent and ‘314 patent and GVVCOA6027ND of the ‘821 patent. The Seoul Plaintiffs requested that good faith measures be taken to address their patent infringement concerns.

23. On January 26, 2024, Walmart emailed the Seoul Plaintiffs and stated that it does not design or manufacture LED light bulbs and had therefore “forward[ed] your claims to the suppliers of the accused products,” including TCP.

24. On February 20, 2024, Seoul Plaintiffs’ counsel sent a letter to TCP’s counsel at the law firm of Norton Rose Fulbright, which also represents Walmart, stating that the Seoul Plaintiffs had learned that TCP is a supplier of GreatValue products to Walmart and that those products infringe the Seoul Plaintiffs’ patents. The letter specifically identified Great Value GVP38DLMOTION and GVVCOA6027ND products. In the letter, the Seoul Plaintiffs stated that “[i]t is our understanding that Walmart provided TCP a copy of Seoul’s letters and that TCP has been aware of Seoul’s infringement concerns since at least July 2023.” TCP’s counsel did not dispute the statements in this letter, including TCP’s awareness of the letters since July 2023, nor did TCP’s counsel challenge that TCP’s products were infringing the Seoul Plaintiffs’ patents.

25. On February 21, 2024, the Seoul Plaintiffs sent Walmart a letter asking it to confirm the identity of Walmart’s suppliers for the accused products identified as infringing the Seoul Plaintiffs’ patents.

26. On February 23, 2024, Walmart responded by confirming that TCP is one of the suppliers for the Great Value products.

27. After receiving this confirmation, on February 23, 2024, Seoul Plaintiffs' counsel sent TCP's counsel a letter pointing out that, despite Walmart's desire that TCP work with the Seoul Plaintiffs to resolve the patent infringement concerns, TCP had not made any attempt to resolve this or respond to the Seoul Plaintiffs' infringement concerns over the course of seven months. The Seoul Plaintiffs provided numbers for TCP products identified by Walmart. The Seoul Plaintiffs also provided the 24 pages of claim charts and the Seoul Plaintiffs' July 11, 2023 letter to TCP's counsel. The Seoul Plaintiffs warned that TCP knowingly selling products to Walmart that infringe Seoul Plaintiffs' patents and ignoring the requests to stop infringement was a very serious matter and could constitute willful infringement. Seoul Plaintiffs' counsel stated that the Seoul Plaintiffs were prepared to bring a patent infringement action against TCP if their concerns were not resolved.

28. On February 26, 2024, TCP's counsel confirmed to Seoul Plaintiffs' counsel that "we have received communications from both of your firms alleging that our Clients [TCP] are infringing a number of patents that are purportedly owned by Seoul Semiconductor." TCP's counsel claims to represent both Walmart and TCP. Despite claiming that he would get back to Seoul Plaintiffs' counsel to try to resolve the infringement concerns, the Seoul Plaintiffs have never received any substantive response from TCP regarding the letters or patent infringement by TCP products.

29. On April 18, 2024, the Seoul Plaintiffs sent TCP's counsel another letter stating that it had been attempting to resolve these patent infringement concerns for Great Value products since July 2024. The letter noted that the Seoul Plaintiffs had provided notice of specific products

and specific patents that were infringing, as well as detailed claim charts. The Seoul Plaintiffs requested that TCP confirm that it would not sell products that infringe the Seoul Plaintiffs' patents. The Seoul Plaintiffs have never received any substantive response from TCP to this letter or any other notice of patent infringement.

**COUNT 1**

**INFRINGEMENT OF U.S. PATENT NO. 11,721,675**

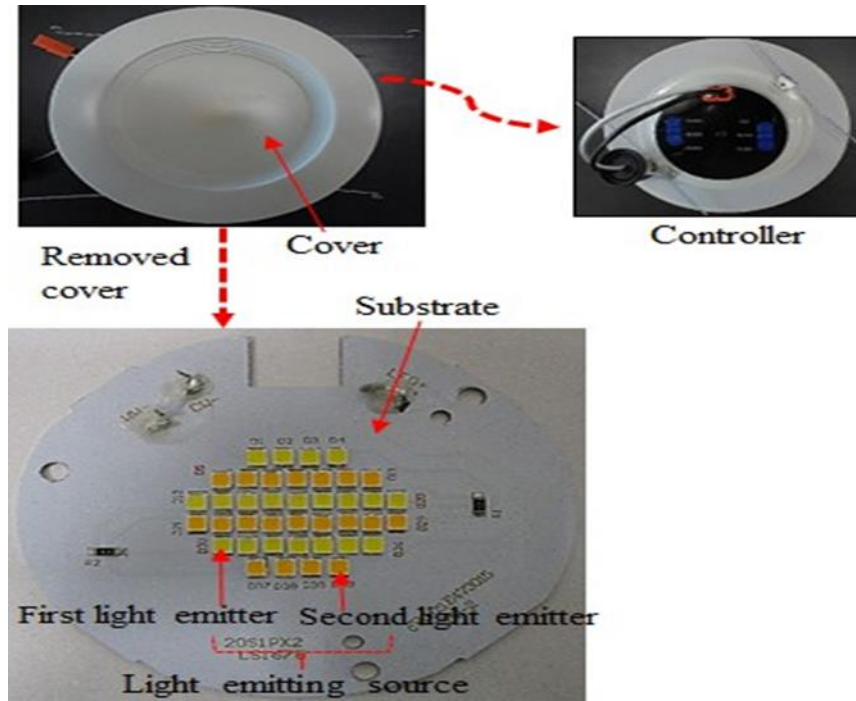
**EXEMPLARY CLAIM 18**

30. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

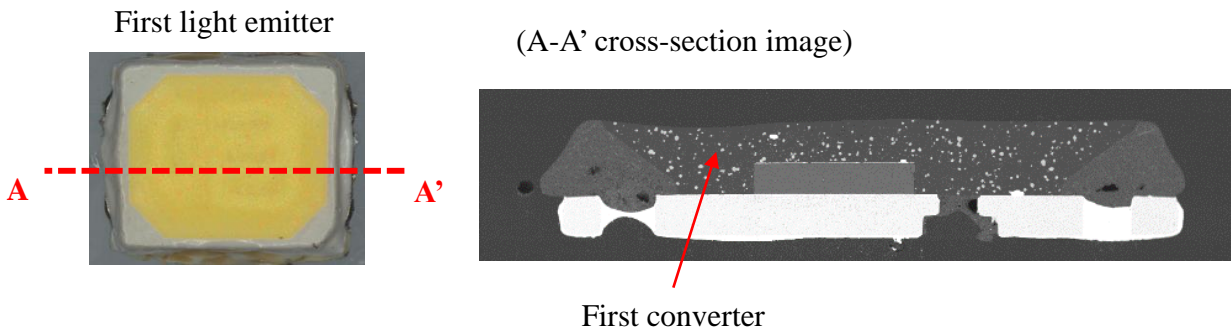
31. TCP has infringed and continues to infringe one or more claims of the '675 patent, including but not limited to exemplary claim 18, in violation of 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell and/or selling the TCP #L120R56DCCT2 within the United States.

32. The annotated images below, taken with a camera, show an LED package incorporated into the TCP #L120R56DCCT2. Specifically, the annotated images below show that the TCP #L120R56DCCT2 includes a substrate (bottom image); a light emitting source disposed on the substrate (bottom image) which includes a first light emitter configured to emit a first light having a first color temperature and a second light emitter configured to emit a second light having a second color temperature; and a cover disposed on the light emitting source and covering the substrate. The top left image shows the cover covering the substrate shown on the bottom image. The images below further show a controller (top right image) configured to electrically control the light emitting source.

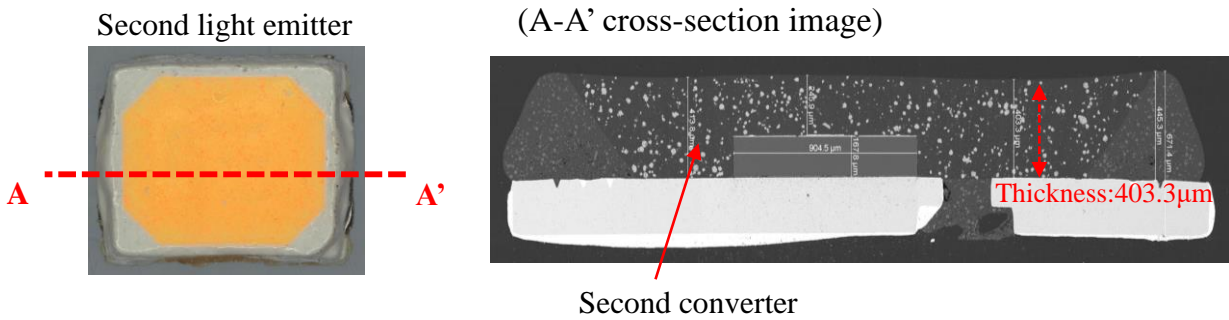




33. The annotated images below of the LED package incorporated into the TCP #L120R56DCCT2 show that the first light emitter (left image) of the TCP #L120R56DCCT2 has a first converter (right image, taken with a scanning electron microscope and illustrating cross-sectional view of first light emitter) that includes phosphors and a resin. Each phosphor of the first converter has different half-value widths and at least one of such phosphors has a particle size in a range of 5  $\mu\text{m}$  to 50  $\mu\text{m}$ .



34. The annotated images below of the LED package incorporated into the TCP #L120R56DCCT2 show that the second light emitter (left image) of the TCP #L120R56DCCT2 has a second converter (right image, taken with a scanning electron microscope and illustrating cross-sectional view of second light emitter) having a thickness in a range of 100 um to 1000 um (the measured thickness is 403.3 um) and which includes phosphors and a resin. Each phosphor of the second converter has different peak wavelengths, with the distance between peak wavelengths of at least two phosphors of the second converter being 150 nm or less.



35. TCP'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.

36. TCP's infringement has occurred with knowledge of the '675 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

## **COUNT 2**

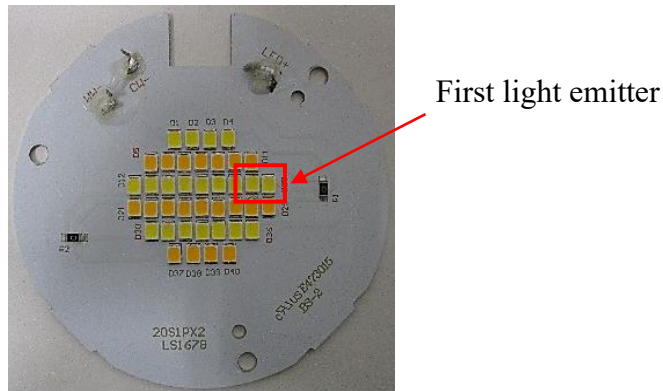
### **INFRINGEMENT OF U.S. PATENT NO. 11,632,836**

#### **EXEMPLARY CLAIM 1**

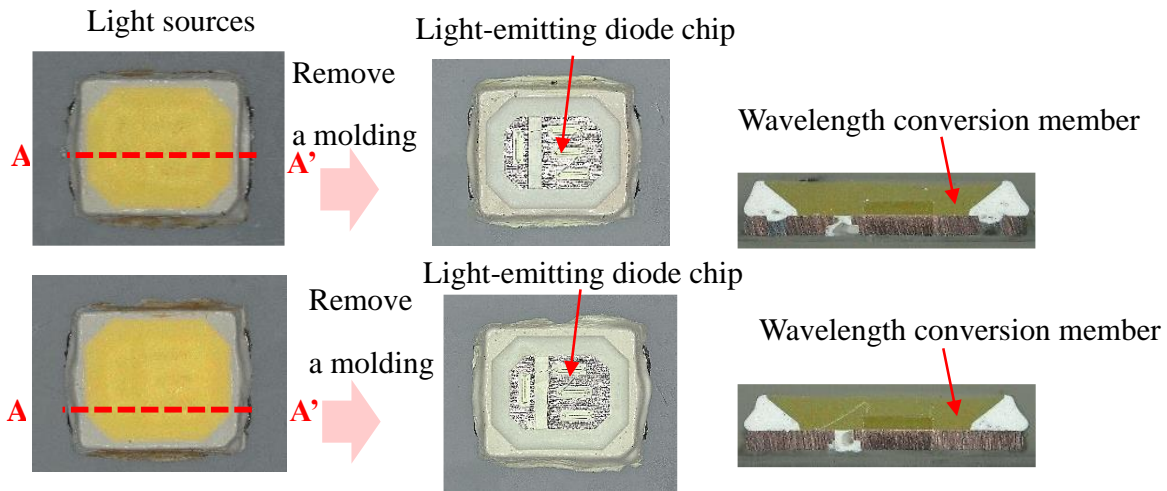
38. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

39. TCP has infringed and continues to infringe one or more claims of the '836 patent, including but not limited to exemplary claim 1, in violation of 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell and/or selling the TCP #L120R56DCCT2 within the United States.

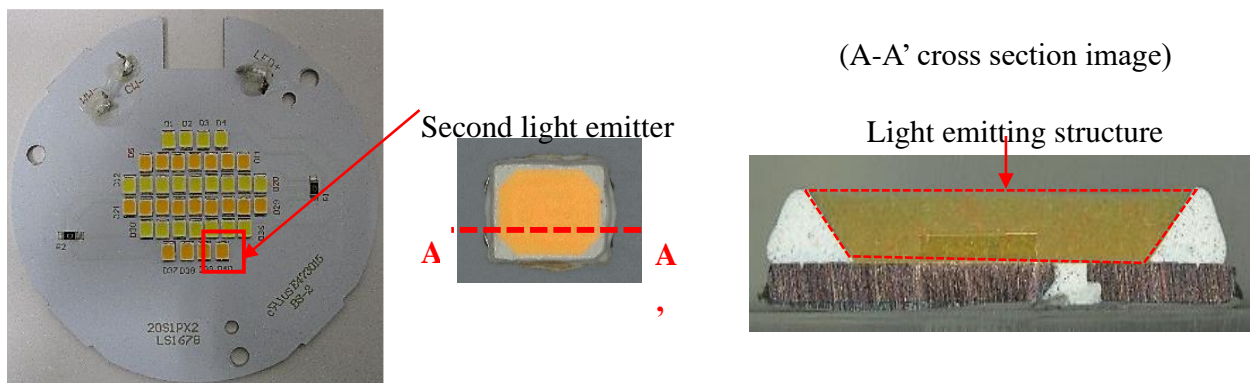
40. The annotated image below, taken with a camera, shows an LED package incorporated into the TCP #L120R56DCCT2. Specifically, the annotated image below shows that the TCP #L120R56DCCT2 includes a first light emitter that includes a plurality of light sources. Each light source is configured to emit light with a different color temperature.



41. The annotated images below of the LED package incorporated into the TCP #L120R56DCCT2 show that each of the light sources (left images) includes a light-emitting diode chip (center images show that removing molding from light source reveals the chips) and a wavelength conversion member (right images taken with a scanning electron microscope show cross sectional view of light sources) configured to convert a wavelength range of light emitted from the light-emitting diode chip.

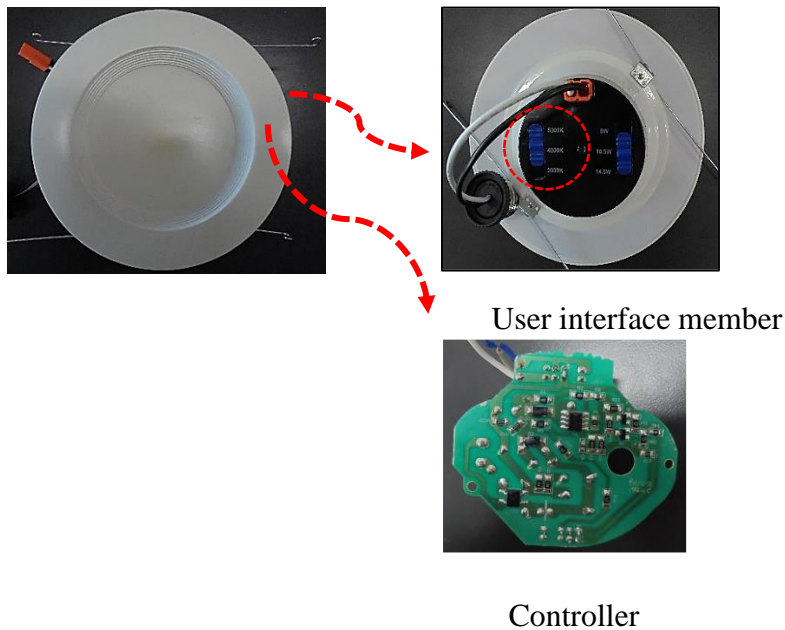


42. The annotated images below of the LED package incorporated into the TCP #L120R56DCCT2 show that the TCP #L120R56DCCT2 includes a second light emitter (left image) that includes at least one light emitting structure (right image taken with scanning electron microscope shows cross sectional view of second light emitter). The at least one light emitting structure is configured to emit light having a longer peak wavelength than that emitted from the first light emitter.



43. The annotated images below of the lighting device incorporated into the TCP #L120R56DCCT2 show that the TCP #L120R56DCCT2 includes a controller and a user interface

member connected to the controller and configured to receive input of a user. The controller is configured (1) to adjust characteristics of light emitted from the first and second light emitters, and (2) to disable the second light emitter in response to receiving an input for prohibiting emission of the light emitting structure through the user interface member.



44. TCP'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.

45. TCP's infringement has occurred with knowledge of the '836 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

**COUNT 3**

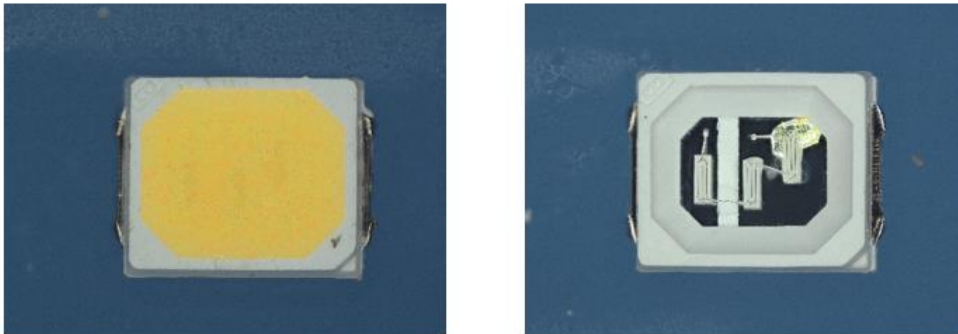
**INFRINGEMENT OF U.S. PATENT NO. 10,510,933**

**EXEMPLARY CLAIM 15**

47. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

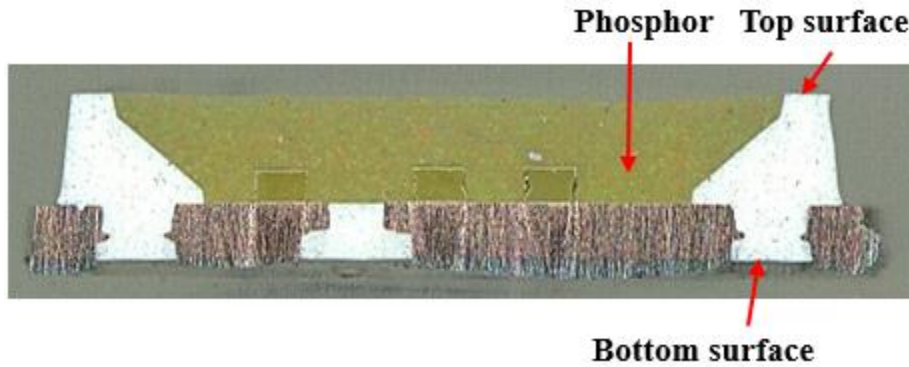
48. TCP has infringed and continues to infringe one or more claims of the '933 patent, including but not limited to exemplary claim 15, in violation of 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell and/or selling the Great Value #GVP38DLMOTION within the United States.

49. The Great Value #GVP38DLMOTION includes a plurality of LED packages, each of which includes a light emitting diode. The image of an LED package from the Great Value #GVP38DLMOTION reproduced below left. The image below right shows an LED chip within package. The chip emits blue light with a Full Width at Half Maximum of less than 40 nm, extending from approximately 440 nm to approximately 460 nm.

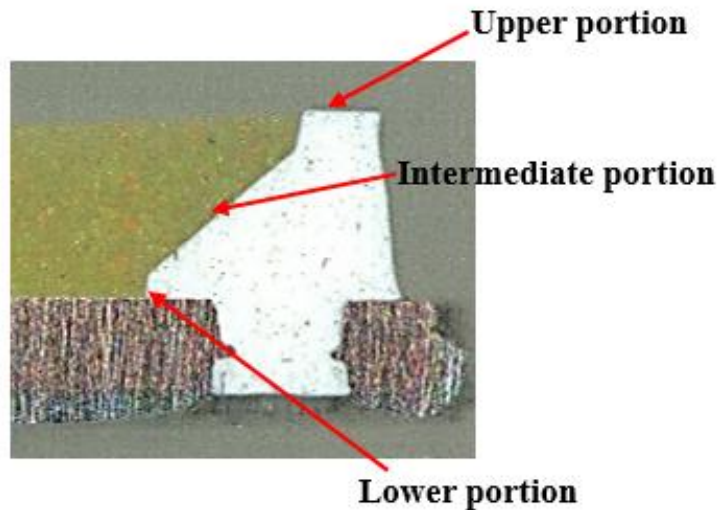


50. The image above left is an optical microscope image of the top surface of the package, where the white material comprises a housing. The image below is an optical microscope image created after cross-sectioning the package. The housing material appears white in the optical

image. The image shows that the package includes a housing having both a top surface and a bottom surface. A layer of phosphor particles can also be seen.



51. The cropped image below focuses on the cross-sectional shape of the top surface of the housing, showing an upper portion, an intermediate portion, and a lower portion.



52. Also shown in the image above is an encapsulating molding part formed over and around the light-emitting diode chip. The molding part is a silicon based encapsulant, which contains two different phosphors, one a phosphor that has an output wavelength in the green with a peak near 560 nm, and a phosphor that has an output wavelength in the red with a peak near 630 nm. The Full Width at Half Maximum of the nitride based phosphor is narrower than that of the

Lutetium-based phosphor. The Full Width at Half Maximum of the Lutetium-based phosphor is wider than that of the LED chip.

53. The output from the blue chip combined with light down converted by the first and second phosphors is perceived as white light.

54. TCP'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.

55. TCP's infringement has occurred with knowledge of the '933 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

#### **COUNT 4**

#### **INFRINGEMENT OF U.S. PATENT NO. 8,659,050**

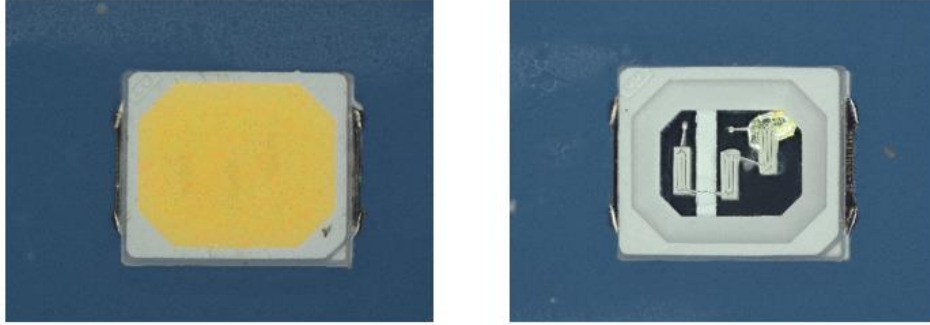
#### **EXEMPLARY CLAIM 1**

57. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

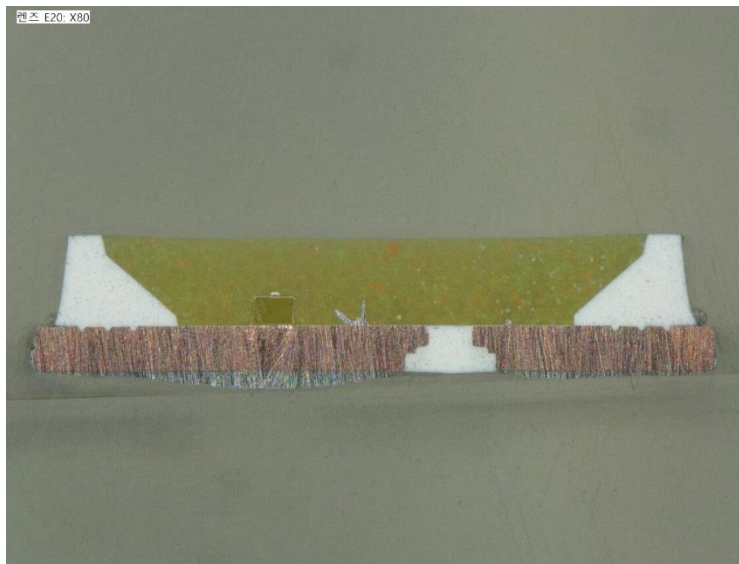
58. TCP has infringed and continues to infringe one or more claims of the '050 patent, including but not limited to exemplary claim 1, in violation of 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell and/or selling the Great Value #GVP38DLMOTION within the United States.

59. The Great Value #GVP38DLMOTION includes a plurality of LED packages. Optical microscope images of an LED package from the Great Value #GVP38DLMOTION are reproduced below before and after removal of an encapsulant.





60. The image below left is an optical microscope image of a cross-section through an LED package from the Great Value #GVP38DLMOTION.



61. The above cross-sectional image also shows first (right) and second (left) lead frames that are spaced apart from each other. The cross-sectional also shows that at least part of the surfaces of the first and second lead frames are covered by a yellow resin, In addition, the rectangular outline of an LED chip is shown disposed on upper surface of the first lead frame in both images above. An electrical connection between the LED and the second (left) lead frame is visible in the image above right.

62. The above cross-sectional also shows that both lead frames include a groove formed thereon, the resin is formed in the groove; and the groove comprises a plurality of sub-grooves, each sub-groove having a triangular cross-section.

63. TCP'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.

64. TCP's infringement has occurred with knowledge of the '050 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

### **COUNT 5**

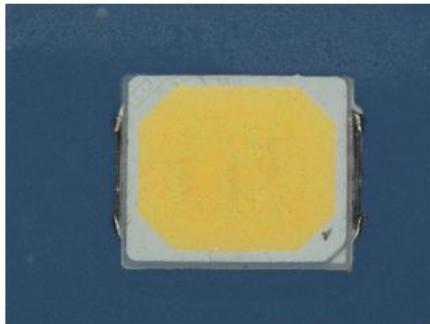
#### **INFRINGEMENT OF U.S. PATENT NO. 10,134,967**

**(as Amended by *Inter Partes* Review Certificate)**

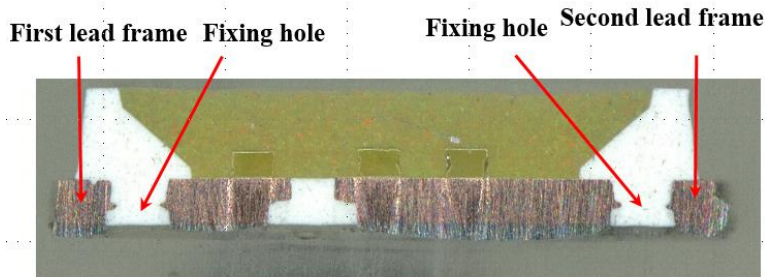
#### **EXEMPLARY CLAIM 17**

66. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

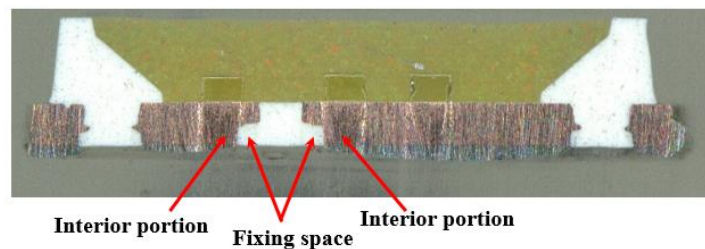
67. The TCP includes a plurality of LED packages. Optical microscope images of an LED package from the Great Value #GVP38DLMOTION are reproduced below before and after removal of an encapsulant. An LED chips are disposed on the top surface of the lead frames in the optical image.



68. The image below is an optical microscope image of a cross-section through the LED package with annotations added to indicate two lead frames, two fixing holes in the lead frames, the sidewalls of the lead frames, and undercuts in both lead frames.

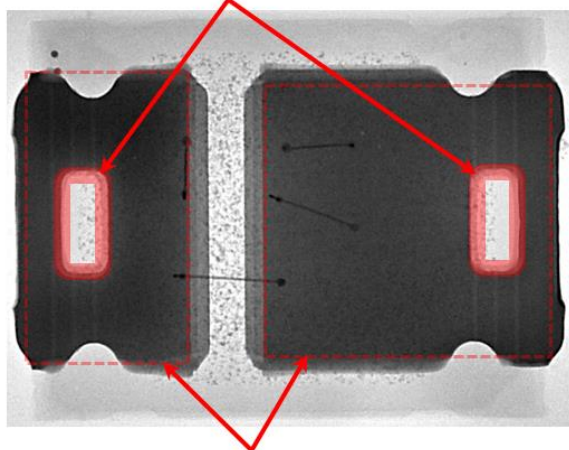


69. Further annotations are provided in the image below specifying the locations of the fixing spaces, which are recessed inward into the interior portions of the lead frames.



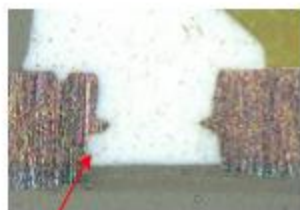
70. The image below is an x-ray vertically through the package, which shows the undercut sidewalls as relatively lighter regions around sides of the lead frames, and which are distinguishable from the interior portions of the lead frames which appear relatively darker due to the thicker metal in the interior portions. The x-ray image also again shows the locations of the fixing holes in each of the thicker interior portions of the lead frames.

**Undercut sidewall of fixing hole**



**Interior portion**

71. The pair of images below are cropped and enlarged to show the cross-sectional shape of the above identified fixing holes, which include undercut sidewalls. Those undercut sidewalls are further characterized by the above x-ray, which shows the undercuts as indicated by the relatively lighter (thinner) circumferential regions within the holes surrounded by the relatively darker (thicker) interior regions of the lead frames. Restated, the undercut sidewalls are indicated to be rotationally symmetric about the center of each hole, such that the undercuts within the holes envelop the inner bounds of each hole.

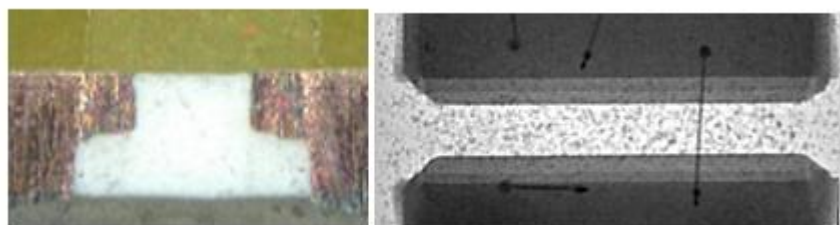


**Undercut sidewall**



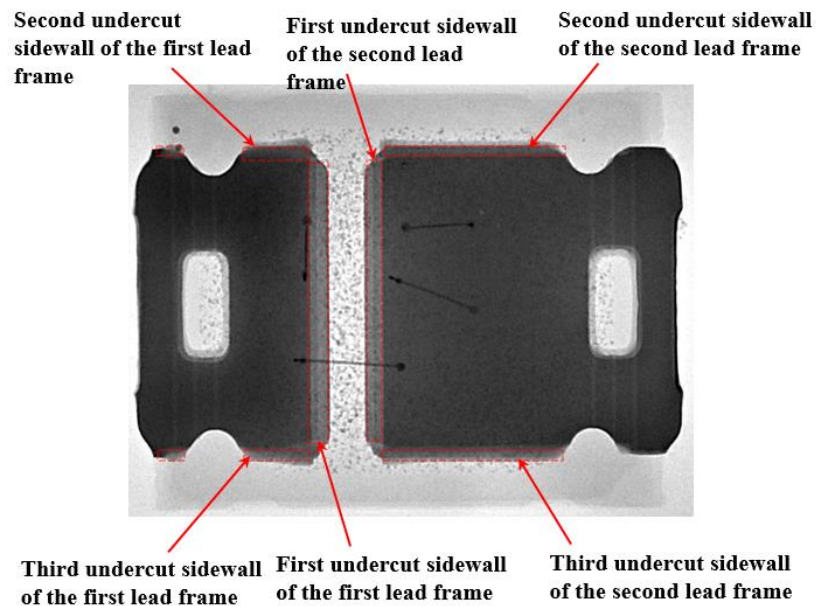
**Undercut sidewall**

72. The images below are cropped and enlarged images focused on the space between the two lead frames. The left image shows that the top surfaces of both lead frames are substantially



flat. The left and right images together provide information about the crosssectional shape of the space between the two lead frames. In particular, as shown, the two lead frames face each other. The x-ray on the right is rotated to show that the cross-section, when viewed in the horizontal direction, includes the light colored undercut in the first sidewall that face the light colored undercut in the second sidewall.

73. As shown in the x-ray image below, in addition to the pair of sidewalls that face each other as described in the preceding paragraph, the pair of lead frames also have two pairs of undercut sidewalls that are parallel to each other in the vertical direction. Those undercut sidewalls are also perpendicular to those discussed in the preceding paragraph.



74. TCP'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.

75. TCP's infringement has occurred with knowledge of the '967 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

**COUNT 6**

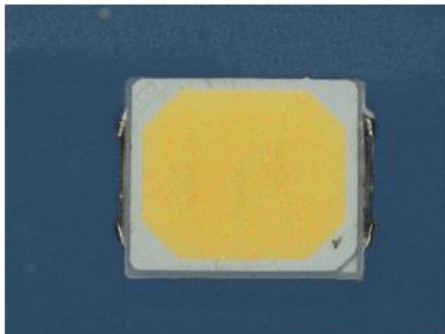
**INFRINGEMENT OF U.S. PATENT NO. 9,147,821**

**EXEMPLARY CLAIM 1**

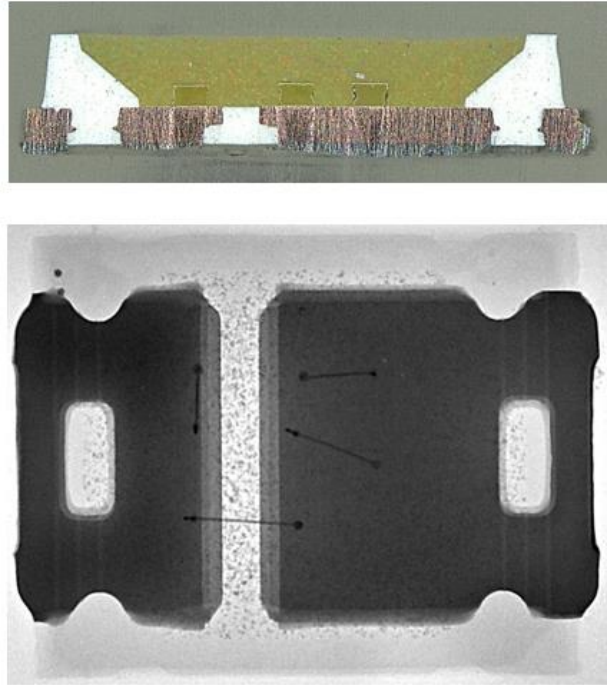
77. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

78. TCP has infringed and continues to infringe one or more claims of the '821 patent, including but not limited to exemplary claim 1, in violation of 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell and/or selling the Great Value #GVP38DLMOTION within the United States.

79. The Great Value #GVP38DLMOTION includes a plurality of LED packages. Optical microscope images of an LED package from the Great Value #GVP38DLMOTION are reproduced below before and after removal of an encapsulant.



80. The top image below is an optical microscope image of a cross-section through an LED package Great Value #GVP38DLMOTION. The bottom image below is an x-ray through the package.



81. As the above images show, the LED package contains two lead frames spaced apart from each other. The optical microscope image show that each lead frames has an upper portion and a lower portion. Two LED chips are disposed on the upper portion of the right lead frame in the optical image.

82. The cross-section image above depicts the cross-sectional shape of the sidewalls of both lead frames at the sides that face each other in the horizontal direction. In addition, the upper portion of the left and right lead frames extend further into the space between the lead frames than the lower portion of the left and right lead frames. That the upper portions extend further into the space than the lower portions indicates the upper and lower portions have different planar shapes from each other. This same feature is also depicted in the x-ray image above. In particular, both leads are shown with relatively dark central portions and relatively light outer portions. The

differences in brightness correlate to the thickness of the metal at those locations. The relatively light outer portions have different planar shapes than the relatively dark central portions.

83. As discussed above, since the upper portions extends further into the space than the lower portions, the sidewalls of both lead frames comprise an inset sidewall partially defining an outer fixing space. And also a planar area of the outer fixing space disposed between the second portions is smaller than a planar area of the outer fixing space disposed between the first portions the sidewalls of both lead frames comprise an inset sidewall partially defining an outer fixing space. And also a planar area of the outer fixing space disposed between the second portions is smaller than a planar area of the outer fixing space disposed between the first portions.

84. TCP'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.

85. TCP's infringement has occurred with knowledge of the '821 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

### **COUNT 7**

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

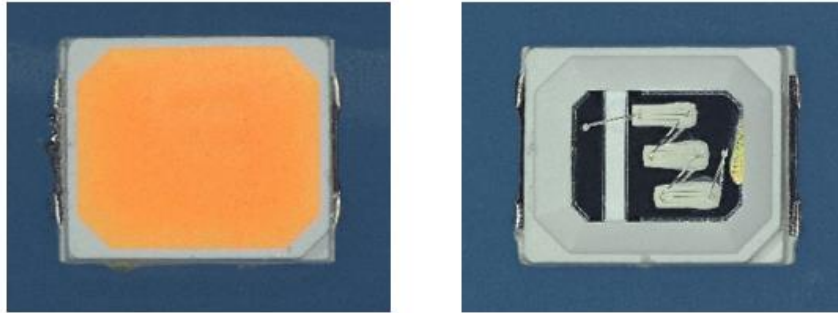
##### **EXEMPLARY CLAIM 7**

87. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

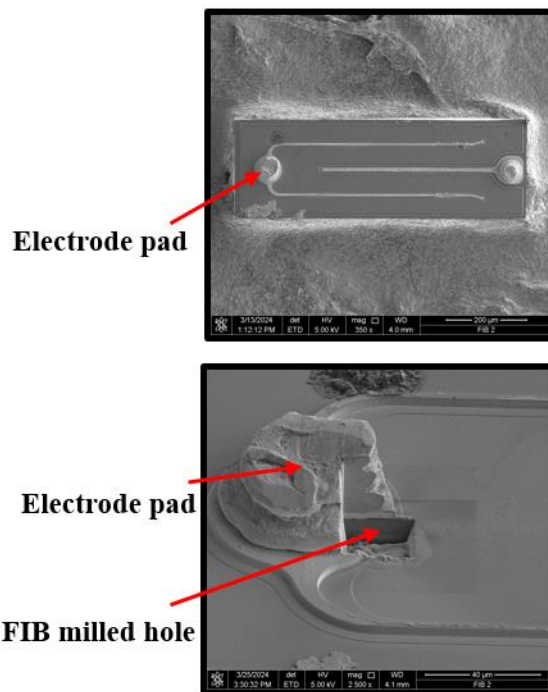
88. TCP has infringed and continues to infringe one or more claims of the '207 patent, including but not limited to exemplary claim 7, in violation of 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell and/or selling the within the United States.



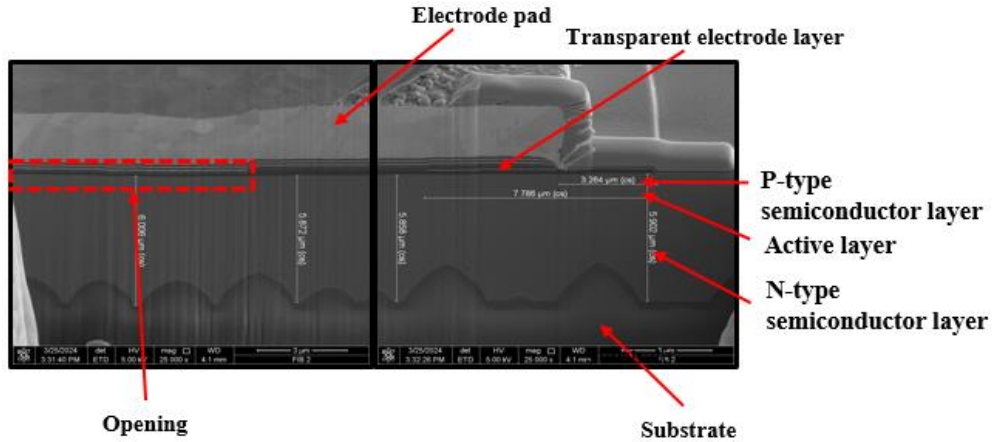
89. The Great Value #GVVCQA6027ND includes a plurality of LED packages, each of which includes a light emitting diode. The image of an LED package from the Great Value #GVVCQA6027ND is reproduced below left. The image below right shows the LED chip within the package.



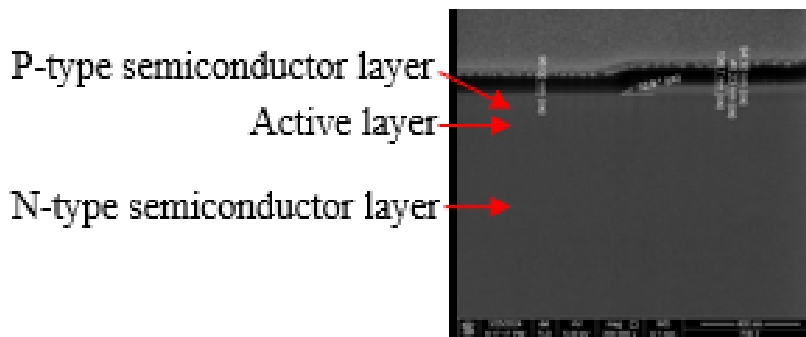
90. Below are two SEM images of the LED chip. The top image shows the top image of the LED chip, with an electrode pad labeled. The second image shows the area surrounding the electrode pad. The dark space near the electrode pad in the bottom image indicates a hole created using a FIB.



91. The below composite image shows the cross-section of the hole. Focusing in on the central part of the image, the cross-section shows from bottom to top (in relevant part) a substrate a p-type semiconductor layer, and a transparent electrode (ITO) layer.

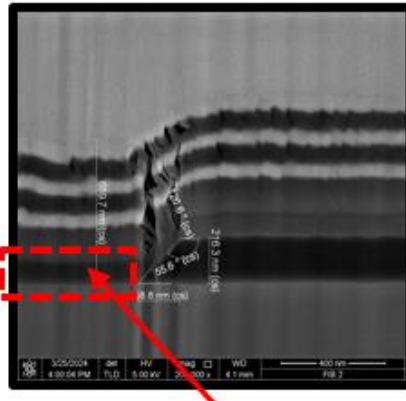


92. The FIB hole shown in the above image was created through the mesa of the chip. The image below is a SEM image of the layer structure comprising the mesa. As shown, the mesa includes a p-type layer, an active layer, and an n-type layer.



93. The image below is an enlarged SEM of the above-described FIB-milled hole. As the labels show, the layer structure includes a p-type layer that contacts an overlying aluminum layer within the opening and that contacts the transparent electrode layer outside of the opening. The region of contact between the aluminum and p-type semiconductor layer (*i.e.*, the opening), comprises a current blocking portion. The aluminum layer comprises a part of the electrode-pad

and extends into the opening as shown. The aluminum layer also contacts the upper surface of the ITO transparent electrode layer outside of the opening.



**Aluminum electrode pad**

94. TCP'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.

95. TCP's infringement has occurred with knowledge of the '207 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

### **COUNT 8**

#### **INFRINGEMENT OF U.S. PATENT NO. 9,929,314**

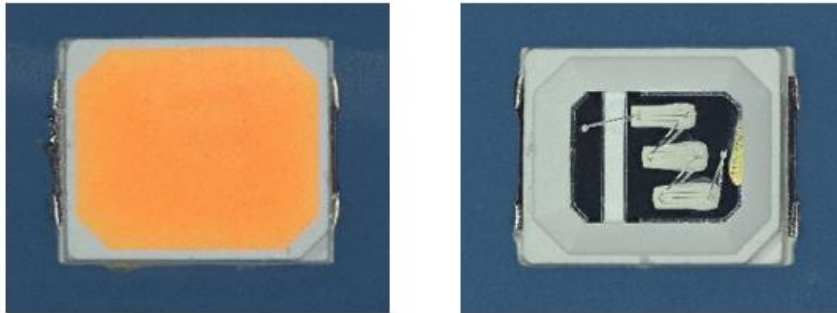
##### **EXEMPLARY CLAIM 1**

97. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

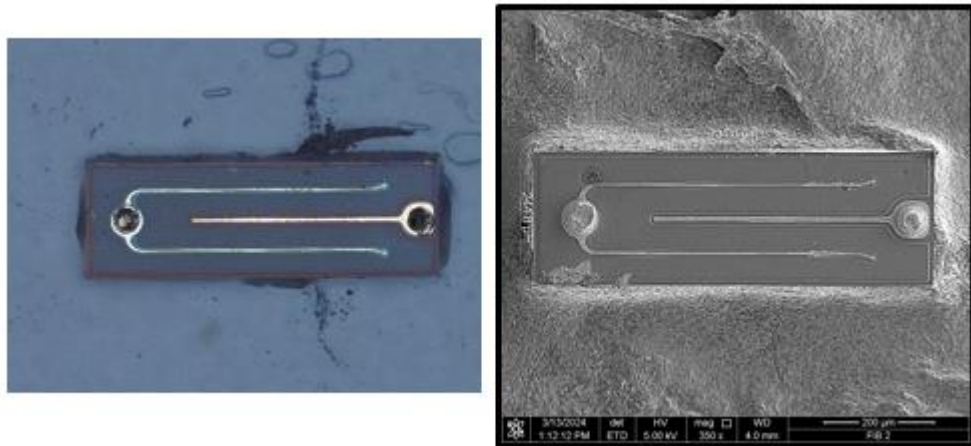
98. TCP has infringed and continues to infringe one or more claims of the '314 patent, including but not limited to exemplary claim 1, in violation of 35 U.S.C. § 271(a), at least by

without authority making, using, offering to sell and/or selling the Great Value #GVVCQA6027ND within the United States.

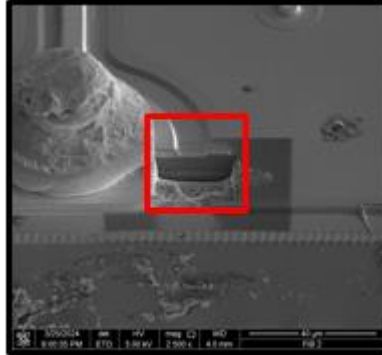
99. The Great Value #GVVCQA6027ND includes a plurality of LED packages, each of which includes light emitting diode devices. Optical microscope images of an LED package from the Great Value #GVVCQA6027ND are reproduced below before and after removal of an encapsulant. As shown in the image below right, the LED package includes three light emitting diode devices.



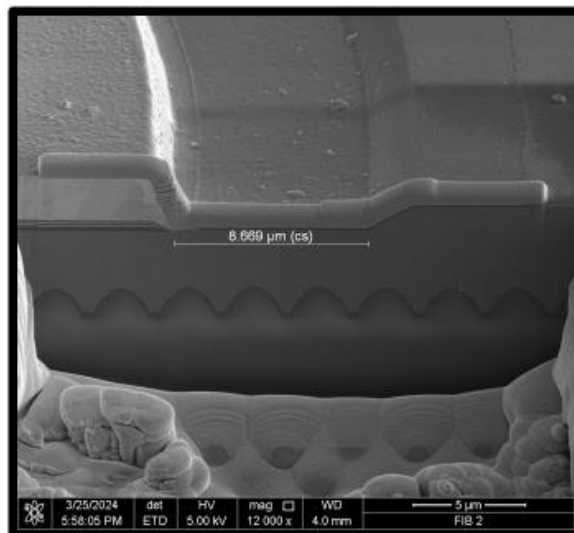
100. Optical and SEM images of an LED device from the Great Value #GVVCQA6027ND are reproduced below.



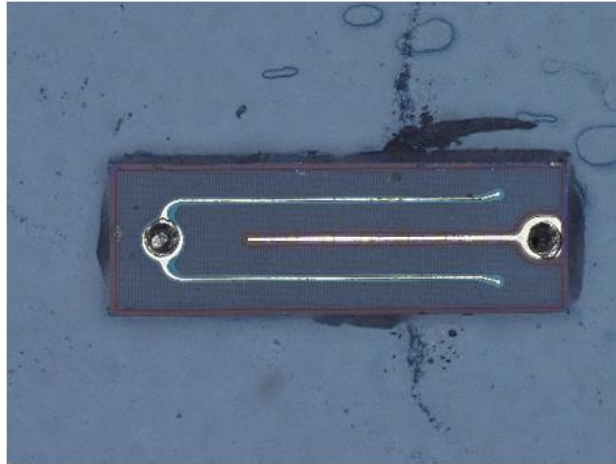
101. Below is SEM image of the device after a hole was milled using a FIB. The hole was milled adjacent to a p-type contact on the upper surface of the device.



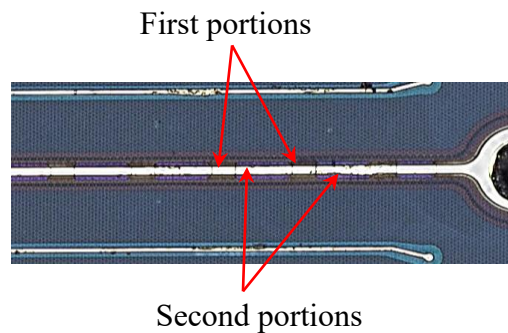
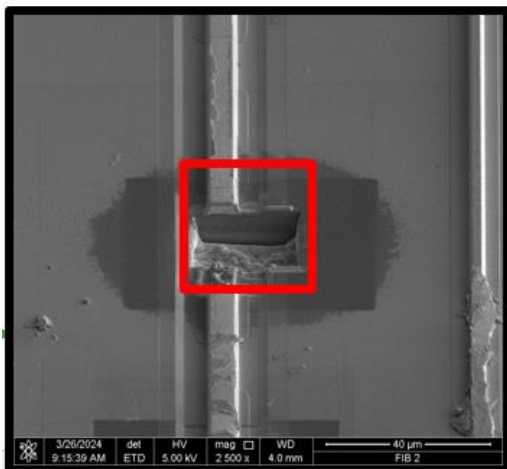
102. Below is a image of the inner surface of the milled hole showing the layer structure of the device, which includes from bottom to top: a patterned substrate and a light emitting structure disposed over the substrate. The light emitting structure includes from bottom to top, a first (n-type) semiconductor layer, an active layer, and a second (p-type) semiconductor layer.



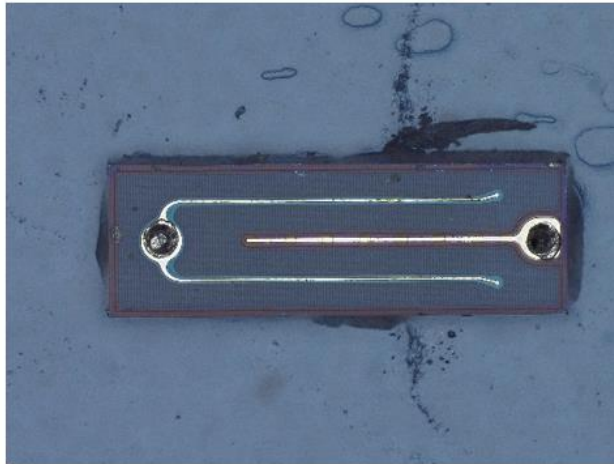
103. Returning to the optical microscope image from above (reproduced again below for convenience), the first electrode pad, which is disposed over the first (n-type) semiconductor layer is shown on the bottom right. A first extension is shown extending from the first electrode pad.



104. The image below shows a hole milled into the first extension using a FIB. The hole is milled through the middle of a set of ovals visible in the image below. The ovals indicate regions within which the first extension includes second portions that are not in contact with the underlying first (n-type) semiconductor layers. The areas outside of ovals indicate first portions that are in contact with the first (n-type) semiconductor layers. Those regions can also be seen in the optical microscope image below. As the images also show, the first portions and one of the second portions are alternately disposed along the first extension.



105. Returning again to the optical microscope image from above (reproduced again below for convenience), the second electrode pad, which is disposed over a transparent electrode layer and a second (p-type) semiconductor layer is shown near the top left. A second extension comprising two portions is shown extending from second first electrode pad.



106. TCP'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.

107. TCP's infringement has occurred with knowledge of the '314 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

**COUNT 9**

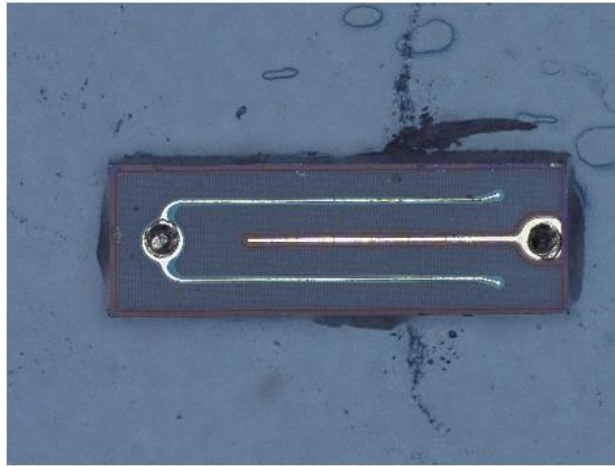
**INFRINGEMENT OF U.S. PATENT NO. 8,604,496**

**EXEMPLARY CLAIM 1**

109. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

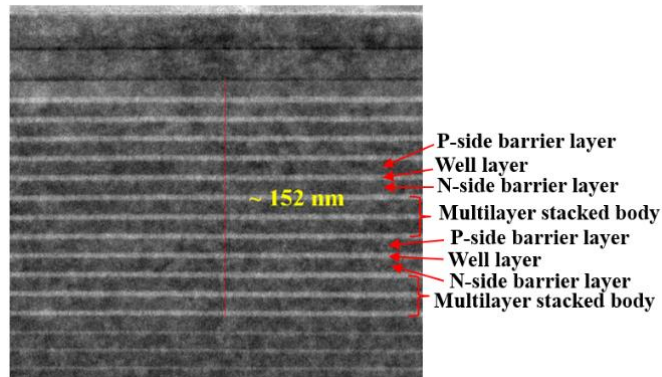
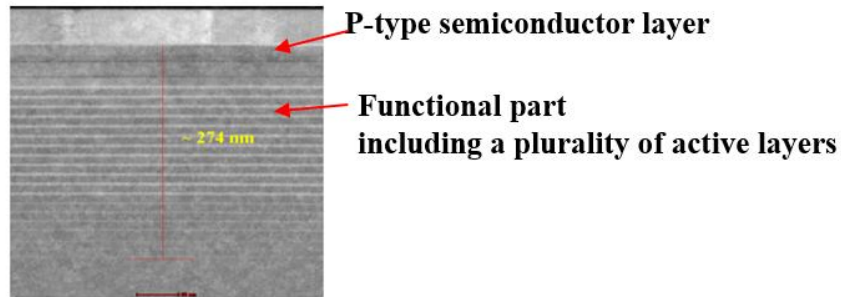
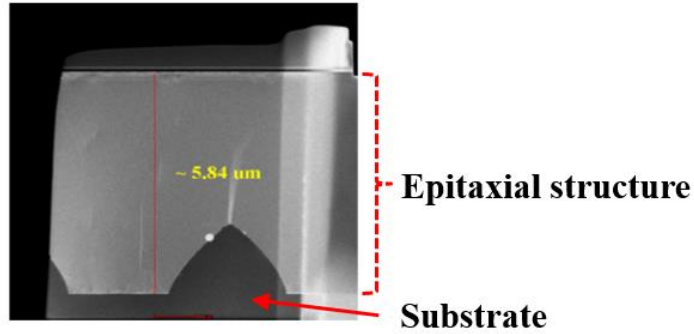
110. TCP has infringed and continues to infringe one or more claims of the '496 patent, including but not limited to exemplary claim 1, in violation of 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell and/or selling the within the United States.

111. The Great Value #GVVCQA6027ND includes a plurality of LED chips. An optical image of an LED chip from the Great Value #GVVCQA6027ND is reproduced below.



112. Three TEM images of the light emitting element are reproduced below. The top image shows the full epitaxial structure above a patterned sapphire substrate. The middle image enlarges the region above and below a functional part that includes a plurality of active layers. The bottom image enlarges the functional part, showing that the active layers can be viewed as multilayer stack bodies that include thick film layers alternately stack with thin film layers. Above the pair of multilayer stack bodies shown, the image indicates a pair of thicker films include one thick film layer closer to the n-type (lower) side functioning as an n-side barrier, and one thick film layer closer to the p-type (upper) side functioning as a p-side barrier. And between the each of the two pairs of thick films is a well layer.





113. TCP'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.

114. TCP's infringement has occurred with knowledge of the '496 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

**COUNT 10**

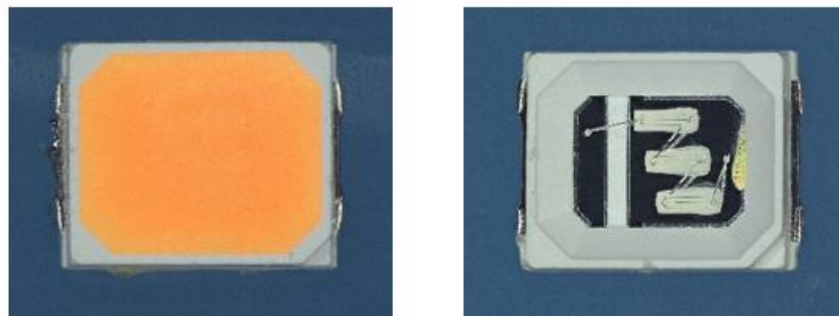
**INFRINGEMENT OF U.S. PATENT NO. 9,799,800**

**EXEMPLARY CLAIM 1**

116. Plaintiffs hereby adopt and re-allege the allegations set forth in paragraphs 1 through 29 above as though fully set forth herein.

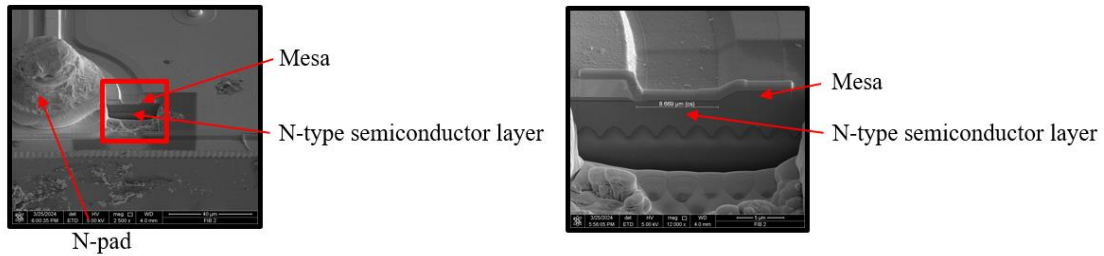
117. TCP has infringed and continues to infringe one or more claims of the '800 patent, including but not limited to exemplary claim 1, in violation of 35 U.S.C. § 271(a), at least by without authority making, using, offering to sell and/or selling the Great Value #GVVCQA6027ND within the United States.

118. The Great Value #GVVCQA6027ND includes a plurality of LED packages, each of which comprises a light emitting diode. Optical microscope images of the LED package from the Great Value #GVVCQA6027ND are reproduced below before and after removal of an encapsulant. As shown in the image below right, the LED package includes a light emitting diode (LED) chip.

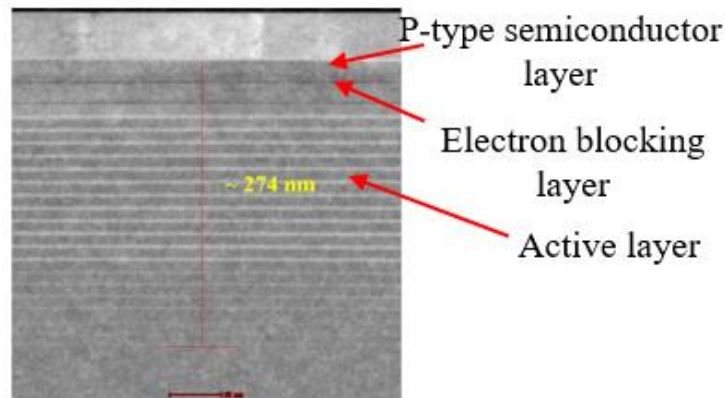


119. Below are two SEM images of an LED chip from the Great Value #GVVCQA6027ND. The image was created after the creation of a hole in the LED using FIB. The structure shown on the left side of the first image is an n-pad, which sits on top of an n-type semiconductor layer. The image below also shows the mesa, which extends above the n-type layer

and extends around the portion of the n-type contact shown. The second image is an SEM of the inner surface of the FIB milled hole, again showing the n-type semiconductor layer and the mesa.

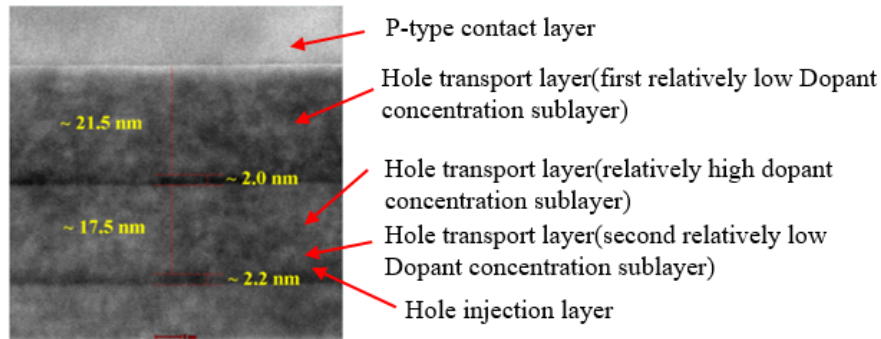


120. The image below is a TEM created in the region where the mesa covers the n-type semiconductor layer. The mesa includes a p-type semiconductor layer and an active layer and an electron blocking layer therebetween.



121. The image below is a TEM created in the region of the p-type semiconductor layer. The p-type semiconductor layer of the LED chip comprises a number of layers. From top to bottom, the layers include a p-type contact layer, a hole transport layer, and a hole injection layer. The p-type contact layer is distinguishable by a relatively high level of magnesium doping near the surface of the LED chip. Next, a hole transport layer has varying levels of the magnesium doping, a first layer with relatively low magnesium doping, an intermediate layer with relatively high magnesium doping, and second layer with relatively low magnesium doping. The level of

magnesium within the first sublayer layer of the hole transport layer correlates with darker grey. Upon information and belief, the magnesium concentration increases at both ends of the first sublayer increases and decreases toward the middle.



122. TCP'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.

123. TCP's infringement has occurred with knowledge of the '800 patent and knowledge that its acts constitute infringement. TCP's continuing conduct, therefore, is willful.

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

### **PRAYER FOR RELIEF**

WHEREFORE, the Plaintiffs request that the Court enter judgment in their favor and against Defendant Technical Consumer Product, Inc., as follows:

A. A judgment that Defendant infringes the '675, '836, '933, '050, '967, '821, '207, '314, '496, and '800 patents;

B. A preliminary and permanent injunction restraining and enjoining Defendant, its officers, partners, agents, servants, employees, parents, subsidiaries, divisions, affiliate corporations, joint ventures, other related business entities and all other persons acting in concert,

participation, or in privity with them, and their successors and assigns, from infringing the '675, '836, '933, '050, '967, '821, '207, '314, '496, and '800 patents;

C. An award of damages to Plaintiffs Seoul Semiconductor and Seoul Viosys arising from Defendant's past and continuing infringement up until the date Defendant is finally and permanently enjoined from further infringement, including compensatory damages;

D. A determination that Defendant's infringement of one or more of the '675, '836, '933, '050, '967, '821, '207, '314, '496, and '800 patents was willful, and a trebling of damages pursuant to 35 U.S.C. § 284;

E. A determination that this is an exceptional case and awarding the Seoul Plaintiffs' attorneys' fees pursuant to 35 U.S.C. § 285;

F. An order awarding the Seoul Plaintiffs the costs and expenses that they have incurred in prosecuting this action;

G. An order awarding the Seoul Plaintiffs pre- and post-judgment interest on their damages; and

H. Such other and further relief in law or in equity as this Court deems just and proper.

**JURY DEMAND**

Plaintiffs Seoul Semiconductor and Seoul Viosys respectfully request a jury trial on all issues so triable.

MORRIS, NICHOLS, ARSHT & TUNNELL LLP

*/s/ Jeremy A. Tigan*

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May 13, 2024