IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

SAMSUNG DISPLAY CO., LTD. Plaintiff, v. BOE TECHNOLOGY CO., LTD. and MIANYANG BOE OPTOELECTRONICS TECHNOLOGY CO., LTD. Defendants.	Civil Action No. _____ JURY TRIAL DEMANDED

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Samsung Display Co., Ltd. ("Samsung Display" or "Plaintiff"), by and through the undersigned attorneys, complains and alleges the following against Defendants BOE Technology Co., Ltd., and Mianyang BOE Optoelectronics Technology Co., Ltd. (together, "BOE" or "Defendants").

NATURE OF THE ACTION

1. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. §§ 1, *et seq*.

2. Samsung Display has filed this lawsuit to respond to Defendants' unlawful infringement of Samsung Display's patented inventions and to obtain damages and other relief.

THE PARTIES

3. Plaintiff Samsung Display is a corporation organized and existing under the laws of the Republic of Korea, with its principal place of business at 1, Samsung-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 17113, Republic of Korea. Samsung Display is a market leader in the research, development, and manufacture of organic light emitting diode ("OLED") displays.

4. Upon information and belief, BOE Technology Co., Ltd. ("BOE Beijing") is a corporation organized and existing under the laws of China with its principal place of business located at No. 12 Xihuanzhong, RD, BDA, Beijing, 100176, P.R. China.

5. Upon information and belief, Mianyang BOE Optoelectronics Technology Co., Ltd. ("Mianyang BOE") is a corporation organized and existing under the laws of China with a principal place of business located at No. 198 Kefa Road, Hi-Tech Zone, Mianyang, P.R. China. Upon information and belief, Defendant BOE Beijing owns a controlling stake in Mianyang BOE.

6. Upon information and belief, Defendants make and sell OLED displays that infringe one or more claims of U.S. Patent No. 7,414,599 ("the '599 Patent"), U.S. Patent No. 9,330,593 ("the '593 Patent"), U.S. Patent No. 9,818,803 ("the '803 Patent"), U.S. Patent No. 10,854,683 ("the '683 Patent"), and U.S. Patent No. 11,594,578 ("the '578 Patent") (collectively, the "Asserted Patents"). Such OLED displays are hereinafter referred to as the "Accused Products."

JURISDICTION AND VENUE

7. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a) because this is a civil action arising under the Patent Act.

8. This Court has personal jurisdiction over Defendants. Defendant BOE Beijing has established minimum contacts with the United States as a whole and with Texas such that subjecting BOE Beijing to personal jurisdiction in this Court will not offend traditional notions of fair play and substantial justice. BOE Beijing has purposely availed itself of the laws and protections of the United States and the State of Texas by knowingly supplying and/or contracting to supply OLED displays for incorporation into products (such as smartphones) to be sold, offered for sale, imported, and used in the United States, the State of Texas, and in this District. BOE Beijing has targeted the United States by conducting regular business therein, and has placed and continues to place its products into

the stream of commerce through an established distribution channel with the expectation and/or knowledge that they will be purchased by consumers in the United States, the State of Texas, and this District. Samsung Display's claims for patent infringement arise directly from and/or relate to this activity. For example, an Apple iPhone 12 that, on information and belief, contains an infringing OLED display supplied by Defendants was purchased in Texas, and is discussed further below. BOE Beijing has also purposely availed itself of the laws and protections of the United States, the State of Texas, and this District by filing counterclaims in this District. *See* Docket No. 27, *Element Capital Commercial Company PTE. LTD v. BOE Technology Group Co., Ltd. et al*, Case No. 2-22-cv-00118 (E.D. Tex. Dec. 1, 2022).

9. Defendant Mianyang BOE has established minimum contacts with the United States as a whole and with Texas such that subjecting Mianyang BOE to personal jurisdiction in this Court will not offend traditional notions of fair play and substantial justice. Mianyang BOE has purposely availed itself of the laws and protections of the United States and the State of Texas by knowingly supplying and/or contracting to supply OLED displays for incorporation into products to be sold, offered for sale, imported, and used in the United States, in the State of Texas, and in this District. Mianyang BOE has targeted the United States by conducting regular business therein, and has placed and continues to place its products into the stream of commerce through an established distribution channel with the expectation and/or knowledge that they will be purchased by consumers in the United States, the State of Texas, and this District. For instance, Mianyang BOE has admitted that it supplies OLED displays that are imported into the United States. *See* Ex. 6 (Mianyang BOE's Motion to Intervene as a Respondent (Public Version), *In the Matter of Certain Active Matrix Organic Light-Emitting Diode Display Panels and Modules for Mobile Devices, and Components Thereof*, ITC Inv. No. 337-TA-1351, at 3, 6 (Feb. 22, 2023)). Further, an Apple iPhone 12 that, on

information and belief, contains an infringing OLED display supplied by Defendants was purchased in Texas, and is discussed further below. Samsung Display's claims for patent infringement arise directly from and/or relate to this activity.

10. Venue is proper in this District under 28 U.S.C. §§ 1391(a)-(d) and 1400(b). BOE Beijing and Mianyang BOE are foreign corporations that do not reside in the United States, and may be sued in any judicial district pursuant to 28 U.S.C. § 1391(c)(3).

11. Defendants are jointly and severally liable for infringing one or more claims of the Asserted Patents. Defendants' liability stems from the same transactions or occurrences regarding the use, sale, and/or offer for sale in the United States and/or the importation into the United States of the Accused Products. Consequently, this action involves questions of law and fact common to all Defendants.

THE ASSERTED PATENTS

12. U.S. Patent No. 7,414,599 ("the '599 Patent") is entitled "Organic Light Emitting Device Pixel Circuit and Driving Method Thereof." The '599 Patent generally relates to a novel pixel circuit for realizing high gradation in an organic light emitting device (OLED), thereby improving the device's image quality. A true and correct copy of the '599 Patent is attached as Exhibit 1.

13. Samsung Display is the sole owner by assignment of all right, title, and interest in the '599 Patent.

14. U.S. Patent No. 9,330,593 ("the '593 Patent") is entitled "Stage Circuit and Organic Light Emitting Display Using the Same." The '593 Patent discloses novel staging circuits for applying scanning signals to an OLED display. A true and correct copy of the '593 Patent is attached as Exhibit 2.

15. Samsung Display is the sole owner of all right, title, and interest in the '593 Patent.

16. U.S. Patent No. 9,818,803 ("the '803 Patent") is entitled "Pixel Arrangement Structure for Organic Light Emitting Display Device." The '803 Patent discloses novel pixel arrangement structures for an OLED display where the pixels are arranged according to novel patterns and layouts in which the pixels are formed in specified locations, formed to have differing surface areas, separated from each other by defined lengths, and/or formed to have particular shapes. A true and correct copy of the '803 Patent is attached as Exhibit 3.

17. Samsung Display is the sole owner by assignment of all right, title, and interest in the '803 Patent.

18. U.S. Patent No. 10,854,683 ("the '683 Patent") is a continuation of the '803 Patent and is entitled "Pixel Arrangement Structure for Organic Light Emitting Display Device." The '683 Patent discloses novel pixel arrangement structures for an OLED display where the pixels are arranged according to novel patterns and layouts in which the pixels are formed in specified locations, formed to have differing surface areas, separated from each other by defined lengths, and/or formed to have particular shapes. A true and correct copy of the '683 Patent is attached as Exhibit 4.

19. Samsung Display is the sole owner by assignment of all right, title, and interest in the '683 Patent.

20. U.S. Patent No. 11,594,578 ("the '578 Patent") is a continuation of the '683 Patent and is entitled "Pixel Arrangement Structure for Organic Light Emitting Display Device." The '578 Patent discloses novel pixel arrangement structures for an OLED display where the pixels are arranged according to novel patterns and layouts in which the pixels are formed in specified locations, formed to have differing surface areas, separated from each other by defined lengths,

and/or formed to have particular shapes. A true and correct copy of the ’578 Patent is attached as Exhibit 5.

21. Samsung Display is the sole owner by assignment of all right, title, and interest in the ’578 Patent.

22. On May 2, 2022, Samsung Display sent a letter to Defendant BOE Beijing notifying it that OLED displays being made and offered for sale by BOE were infringing Samsung Display’s patents including the ’599 Patent, the ’593 Patent, the ’803 Patent, and the ’683 Patent. Upon information and belief, Defendants have therefore had knowledge of the ’599 Patent, the ’593 Patent, the ’803 Patent, and the ’683 Patent, and of their infringement of those patents, at least since receiving the May 2, 2022 letter.

23. On December 28, 2022, Samsung Display filed a complaint with the U.S. International Trade Commission (“ITC”) alleging infringement of the ’599 Patent, the ’593 Patent, the ’803 Patent, and the ’683 Patent by numerous companies importing and/or selling active matrix OLED display panels and modules used as replacement displays for mobile devices. In response to this complaint, the ITC instituted Investigation No, 337-TA-1351, captioned *In re Certain Active Matrix Organic Light-Emitting Diode Display Panels and Modules for Mobile Devices, and Components Thereof*. On February 28, 2023, Mianyang BOE moved to intervene as a respondent in that Investigation, admitting that it manufactures and sells AMOLED replacement screens that are imported into the United States and arguing that the relief sought put its products at risk of being excluded from the U.S. Mianyang BOE’s motion was granted, making Mianyang BOE a respondent in that Investigation. On March 10, 2023, Samsung Display moved for leave to amend its ITC complaint to include claims for infringement of the recently issued ’578 Patent. That motion was

granted on March 28, 2023. On information and belief, Defendants have therefore had knowledge of the ’578 Patent and of their infringement of that patent since at least March 10, 2023.

THE ACCUSED PRODUCTS

24. The Accused Products are OLED displays used, made, sold, offered for sale, or imported by Defendants, including OLED displays incorporated into smartphones, tablets, and other mobile devices.

25. Upon information and belief, the Accused Products are manufactured and assembled by or for Defendants at facilities in China, including by BOE Mianyang. *See* About Us, boe.com/en/about/index (last accessed June 23, 2023) (“BOE owns a number of manufacturing sites in Beijing, Hefei, Chengdu, Chongqing, Fuzhou, Mianyang, Wuhan, Kunming, Suzhou, Ordos, and Gu’an, etc.”).

26. Upon information and belief, Defendants, directly or indirectly through affiliates, subsidiaries, agents or other representatives sell and/or offer for sale Accused Products in the United States, and/or import Accused Products into the United States, including in connection with supplying and selling Accused Products to U.S. businesses for product repair and as replacement parts and in connection with supplying and selling Accused Products to OEM customers for testing, evaluation, qualification, and incorporation into products, such as smartphones and tablets, that are used, sold, and/or offered for sale in the United States and/or imported into the United States.

27. Defendant BOE Beijing is identified by Apple on its Supplier List. *See* 2020 Apple Supplier List, Apple Inc. (last accessed June 23, 2023), apple.com/supplier-responsibility/pdf/Apple-Supplier-List.pdf. Market reports indicate that BOE supplies OLED display panels to Apple including for iPhone 12 and 13 models sold in the United States. *See*, *e.g.*, The iPhone OLED Supply

Chain in 2022 (last accessed June 23, 2023), omdia.tech.informa.com/blogs/2022/the-iphone-oled-supply-chain-in-2022 (June 23, 2022).

28. Upon information and belief, BOE Beijing has also imported Accused Products into the United States, and used them in the United States, to promote them at industry and trade shows. For example, upon information and belief, BOE imported OLED devices into the United States for exhibition at The Society for Information Display's ("SID") DisplayWeek in 2018, 2019, and again in 2022.

COUNT I – INFRINGEMENT OF U.S. PATENT NO. 7,414,599

29. Samsung Display hereby incorporates the allegations of Paragraphs 1 through 28 as fully set forth herein.

30. Upon information and belief, Defendants have infringed and continue to directly infringe the '599 Patent by making, using, selling, offering for sale in, and/or importing into the United States OLED displays, such as OLED displays incorporated into the iPhone 12 product.

31. Independent claim 1 of the '599 Patent recites:

1. A pixel circuit in an organic light emitting device, comprising:

> a first transistor for delivering a data signal voltage in response to a current scan line signal;
>
> a second transistor for generating a driving current depending on the data signal voltage delivered through the first transistor;
>
> a third transistor for detecting and self-compensating threshold voltage deviation in the second transistor;
>
> a fifth transistor for providing a power supply voltage for the second transistor in response to a current light-emitting signal;
>
> a sixth transistor which is coupled in series between the second transistor and an electroluminescent element and for providing the driving current for the electroluminescent element through the second transistor in response to the current light-emitting signal; and

a capacitor for storing the data signal voltage delivered to the second transistor,

wherein the electroluminescent element emits light corresponding to the driving current generated through the second transistor.

32. Upon information and belief, Apple iPhone 12 products that incorporate an OLED display supplied by Defendants, meet each of the limitations of claim 1.

33. The images below (Figs. 1–3) are of an Apple iPhone 12 sold in Texas that, on information and belief, contains an OLED display supplied by Defendants.

Figure 1

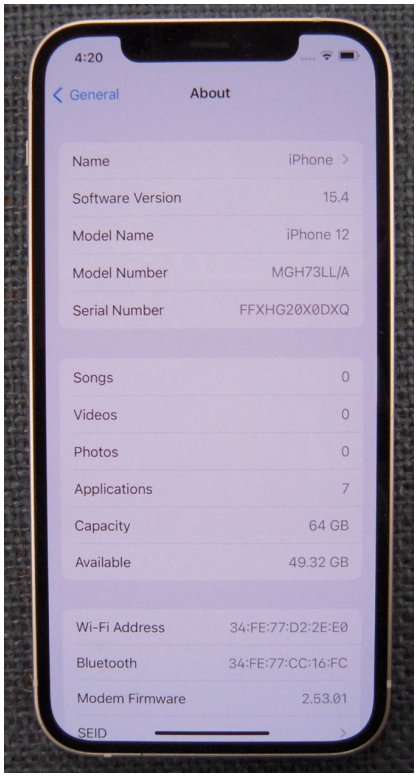


Figure 2

Figure 3

34. The BOE OLED display panel comprises a substrate that supports the OLED pixel elements that are visible through the glass panel as well as the circuitry that controls the operation of the OLED pixels. The BOE OLED display panel is mounted within the iPhone 12 chassis and

is located behind a glass panel, and in the image below (Fig. 4), the display panel substrate can be seen.

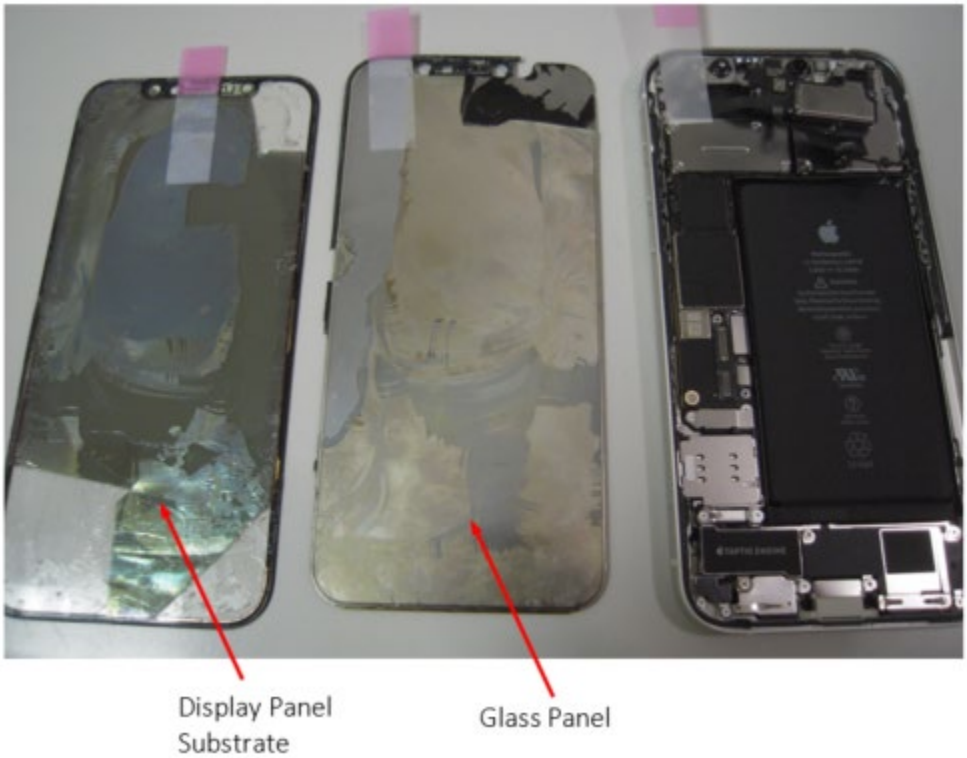


Figure 4

35. The BOE OLED display comprises "a pixel circuit in an organic light emitting device." The annotated image below (Fig. 5) (backside image of the BOE OLED display panel) shows a pixel circuit of the BOE OLED display panel, including transistors T1–T7, a storage capacitor Cst.

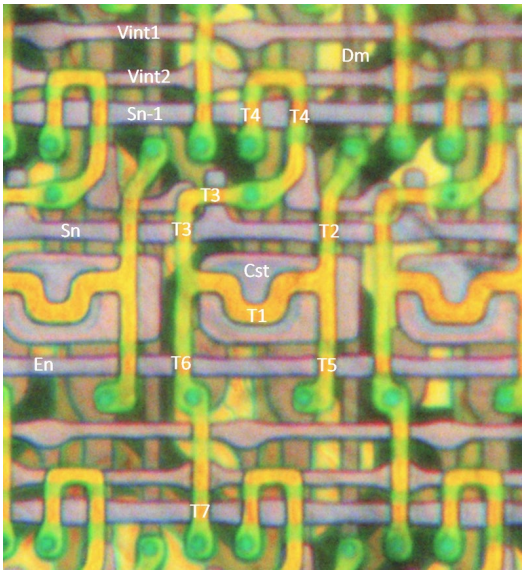


Figure 5

36. The pixel circuit of the BOE OLED display panel comprises "a first transistor for delivering a data signal voltage in response to a current scan line signal." As shown in the annotated backside image below (Fig. 6), the first transistor (T2) is coupled to the data signal line (Dm) for delivering a data signal voltage. The gate of T2 is coupled to a scan line Sn that provides a current scan line signal. In response to the current scan line signal, T2 delivers a data signal voltage.

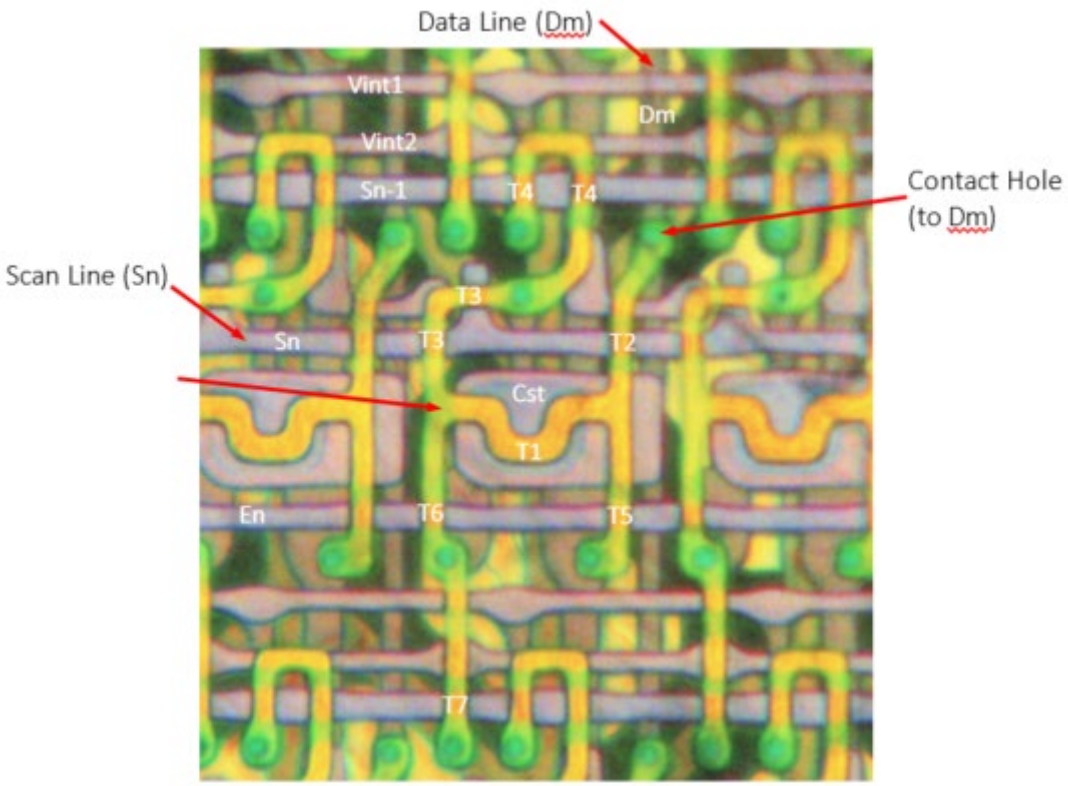


Figure 6

37. For example, as is further reflected in the exemplary annotated images below (Fig. 7 (backside image) and Fig. 8 (front side image)), in response to the current scan line signal (blue line) applied to Sn, T2 delivers the data signal voltage provided by Dm (red line). The annotated images below depict an exemplary voltage path from Dm through T2 to the gate of transistor T1.

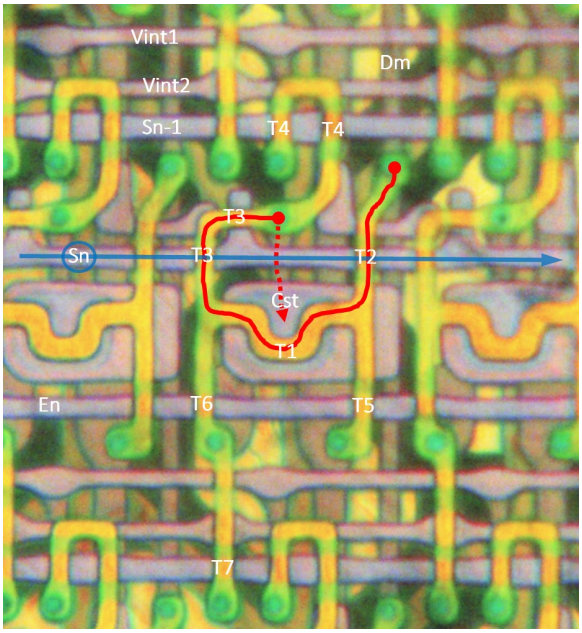


Figure 7

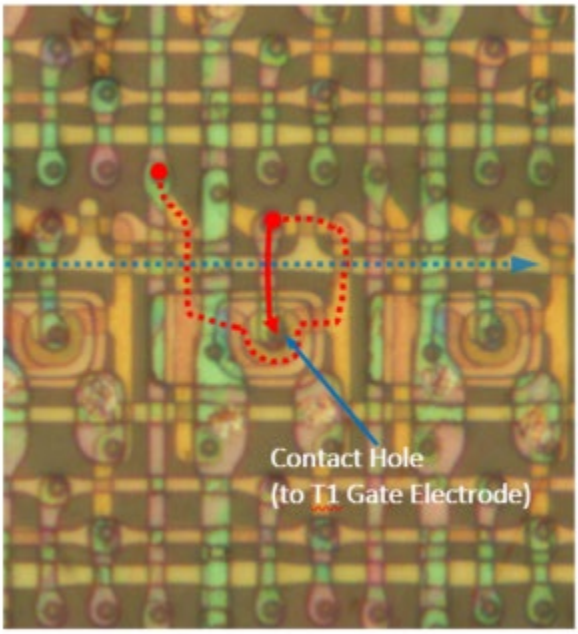


Figure 8

38. The pixel circuit of the BOE OLED display panel has a "second transistor for generating a driving current depending on the data signal voltage delivered through the first transistor." As shown in the annotated backside image below (Fig. 9), the second transistor (e.g., T1)

is coupled to a power supply voltage (e.g., ELVDD). As described above, the first transistor (e.g., T2) delivers a data signal voltage in response to a current scan line signal on scan line Sn. The data signal voltage is stored on the storage capacitor Cst. T1 generates a driving current provided from ELVDD that is determined by the voltage stored on the storage capacitor Cst.

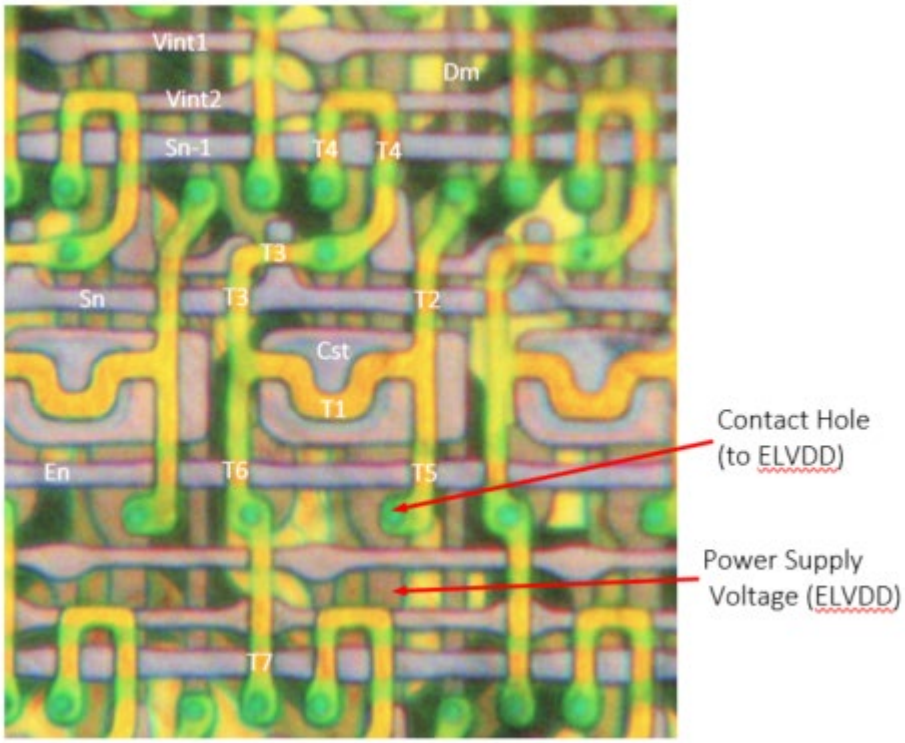


Figure 9

39. For example, as is further reflected in the exemplary annotated backside image below (Fig. 11), when transistors T5 and T6 are turned on by emission line En, a driving current flows from ELVDD through T1 to the OLED. The amount of current that flows through T1 to the OLED depends on the voltage that was stored on the storage capacitor Cst, which is based on the data signal voltage delivered previously through T2, as shown in Figure 10 below.

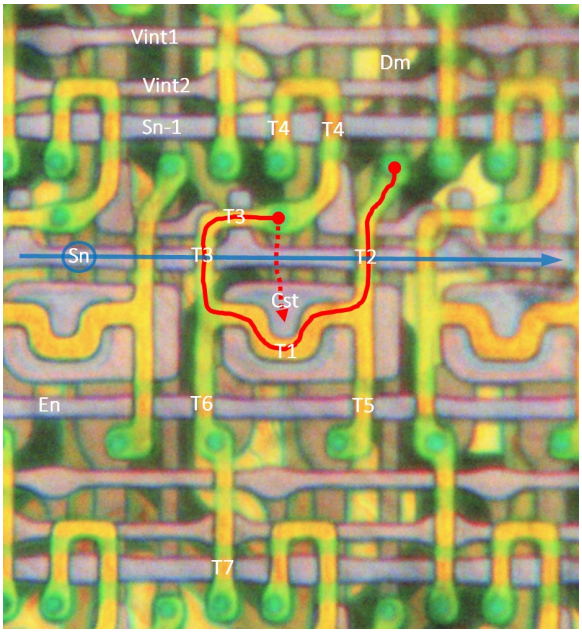


Figure 10

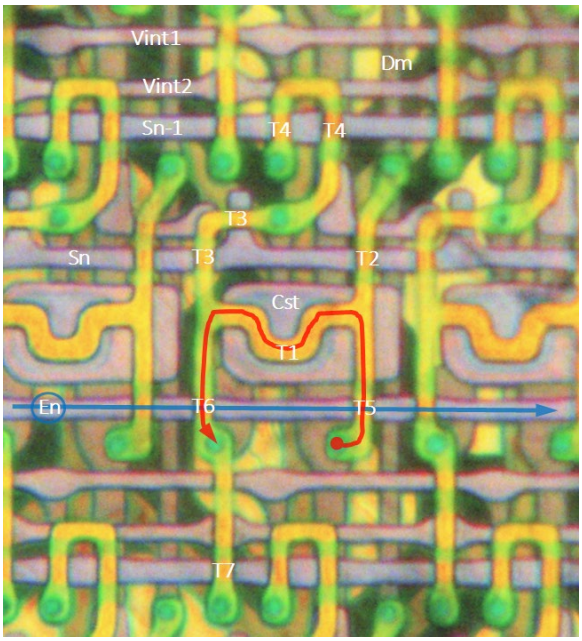


Figure 11

40. The pixel circuit of the BOE OLED display panel has a "third transistor for detecting and self-compensating threshold voltage deviation in the second transistor." As shown in the annotated backside image below (Fig. 12), the pixel circuit of the BOE OLED display has a third

transistor (e.g., T3) coupled between a drain and a gate of the second transistor (e.g., T1) for detecting and self-compensating threshold voltage deviation in T1.

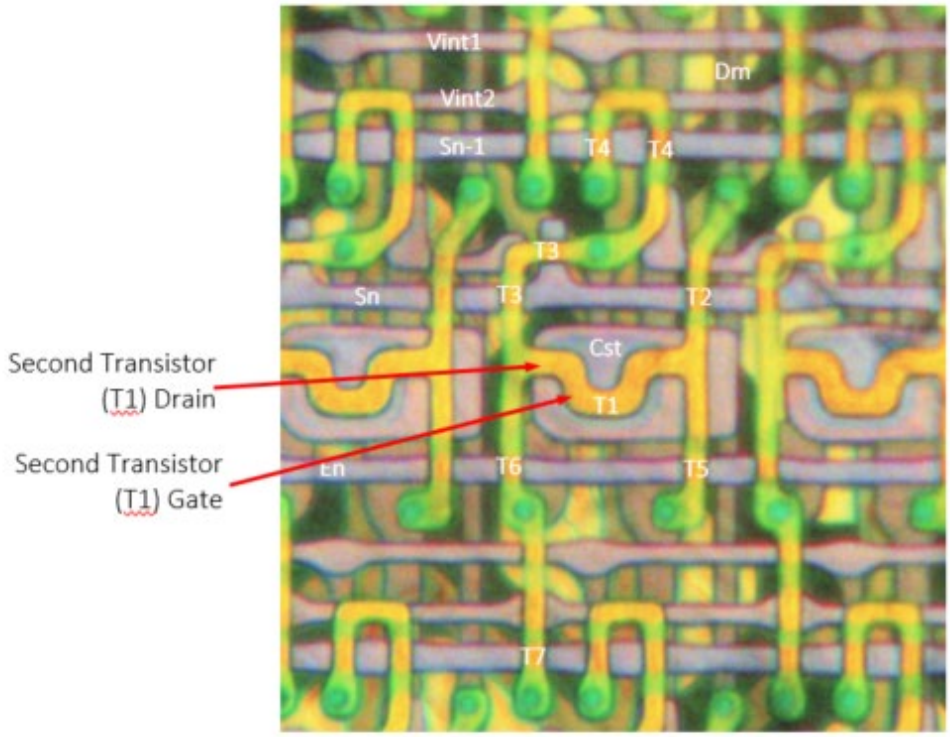


Figure 12

41. For example, as shown in Figures 13 and 14 below, when the scan line signal is applied to Sn, T3 receives the data signal voltage provided by Dm through T2 and applies it to the gate of T1. This allows for the detection and self-compensation of the threshold voltage deviation in T1.

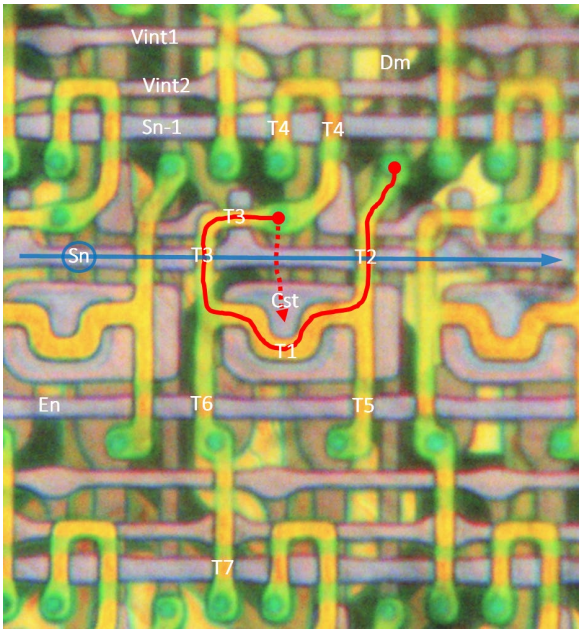


Figure 13

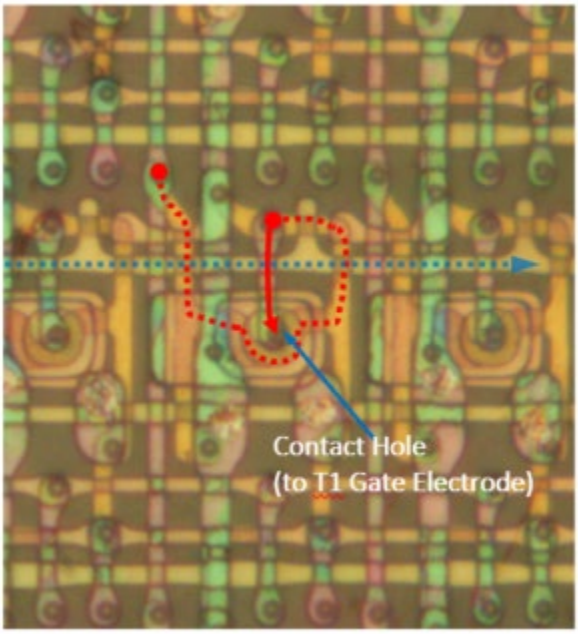


Figure 14

42. The pixel circuit of the BOE OLED display panel has a "fifth transistor for providing a power supply voltage for the second transistor in response to a current light-emitting signal." As shown in the annotated backside image below (Fig. 15), the fifth transistor (e.g., T5) is coupled to a

power supply voltage (e.g., ELVDD) and the second transistor (e.g., T1). The emission line (En) applies a current light-emitting signal to the gate of T5. In response to the current light-emitting signal, T5 provides a power supply voltage from ELVDD for T1.

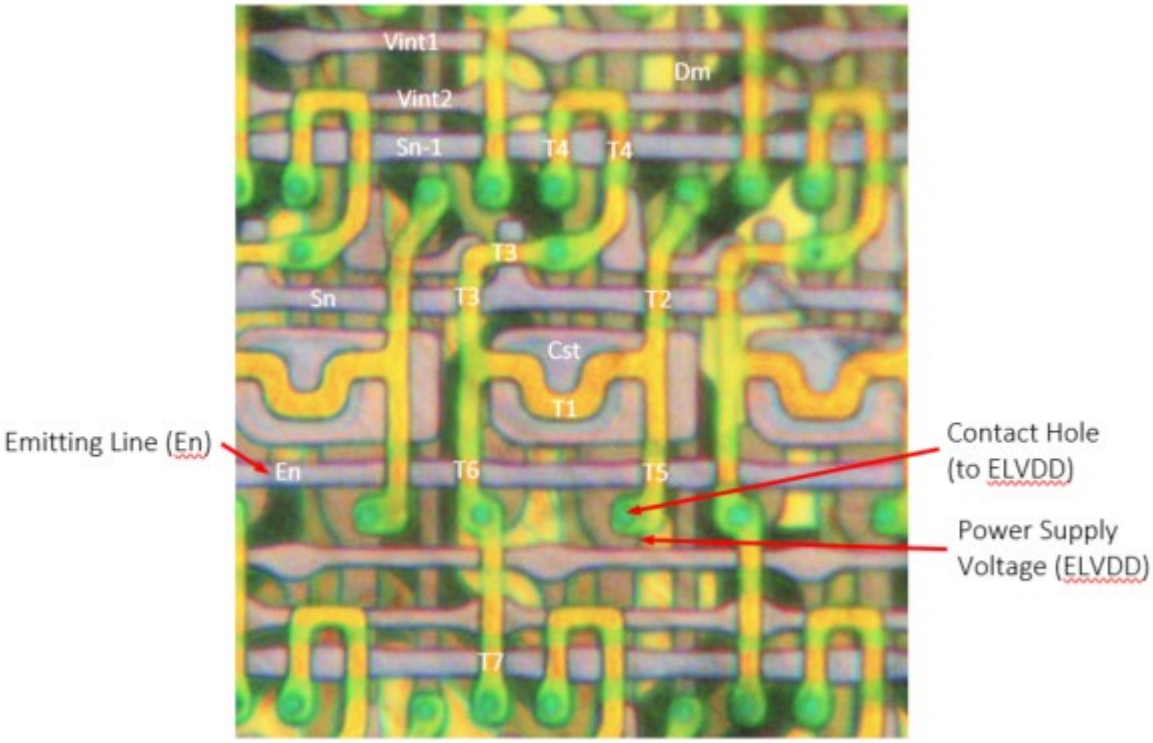


Figure 15

43. As shown in Figure 16 below, when the fifth transistor (T5) is turned on in response to a current light-emitting signal provided on the emission line (En), a power supply voltage (ELVDD) is provided to the second transistor (T1).

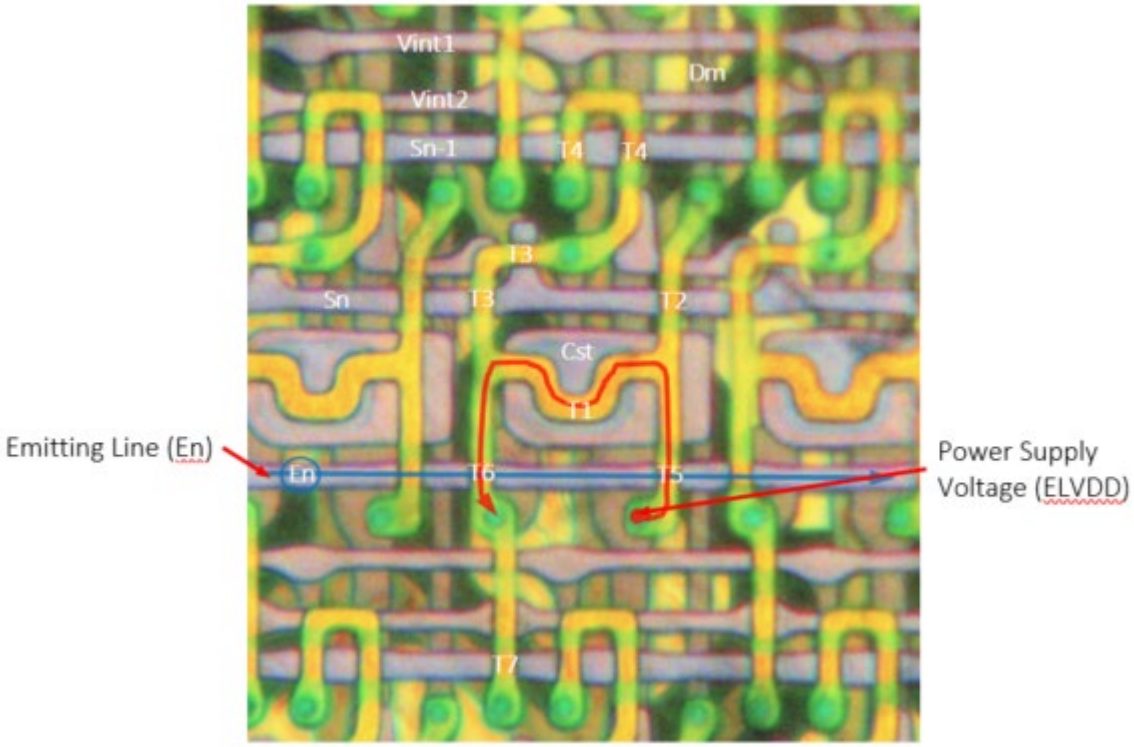


Figure 16

44. The pixel circuit of the BOE OLED display panel has a "sixth transistor that is coupled in series between the second transistor and an electroluminescent element and for providing the driving current for the electroluminescent element through the second transistor in response to the current light-emitting signal." As shown in the annotated backside image below (Fig. 17), the sixth transistor (e.g., T6) is coupled to the second transistor (e.g., T1) and to an electroluminescent element (OLED) through a contact hole. As further shown in Figure 17, T6 is in series between T1 and the OLED. The emission line (En) applies a current light-emitting signal to T6. In response to the current light-emitting signal, T6 provides the driving current for the OLED through T1.

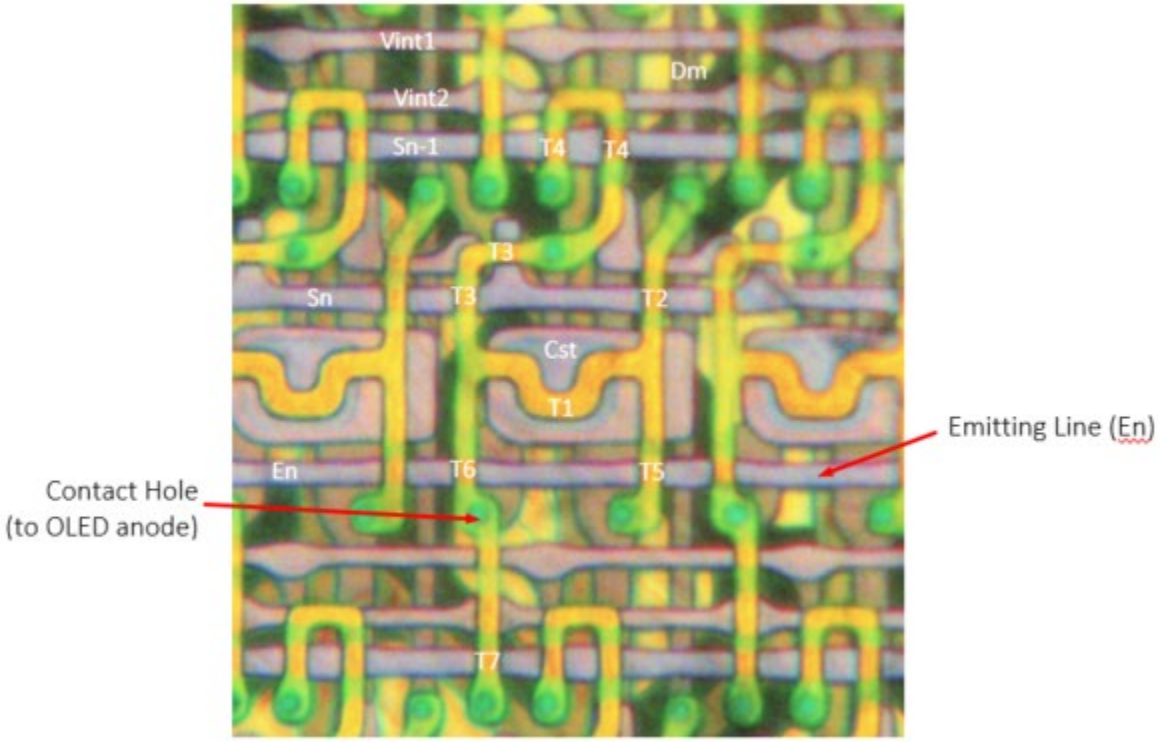


Figure 17

45. As shown in Figure 18 below, the sixth transistor (T6) is coupled in series between the second transistor (T1) and an electroluminescent element (OLED pixel element). As further shown in Figure 18, when the sixth transistor (T6) is turned on in response to a current light-emitting signal provided on the emission line (En), the driving current flows through T1 to the OLED through T6.

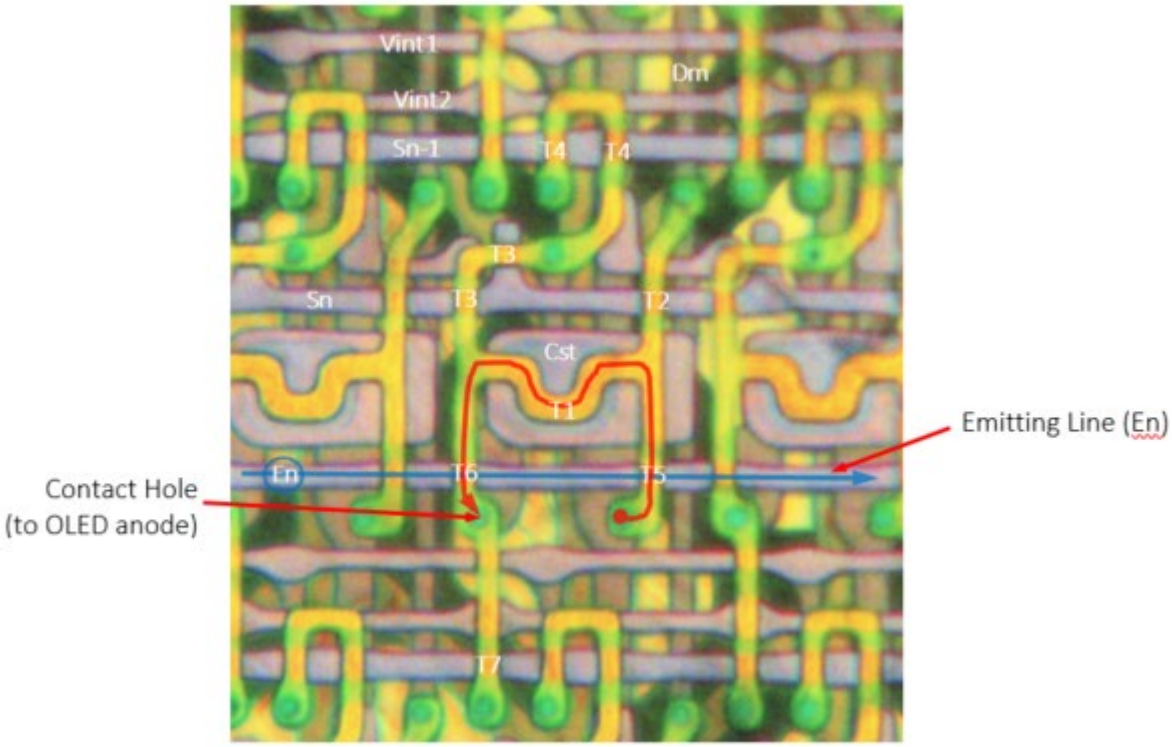


Figure 18

46. The pixel circuit of the BOE OLED display panel has a "capacitor for storing the data signal voltage delivered to the second transistor." As shown in the annotated backside image below (Fig. 19), the storage capacitor Cst has an upper plate (red dashed lines) and a lower plate (blue dashed lines). Cst stores the data signal voltage delivered to the second transistor (e.g., T1).

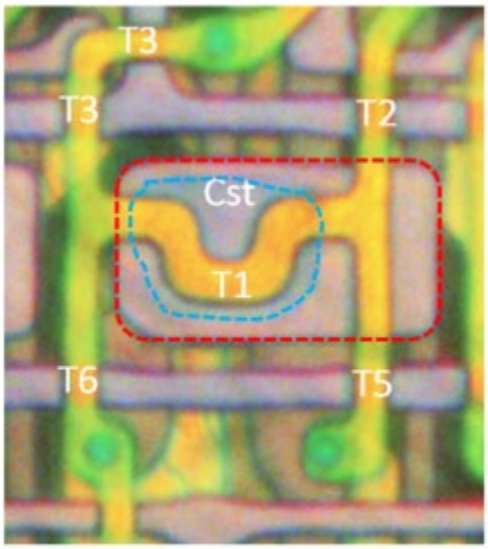


Figure 19

47. For example, as shown in Figures 20 and 21 below, the data signal voltage delivered to T1 in response to the current scan line signal on Sn is also provided to Cst.

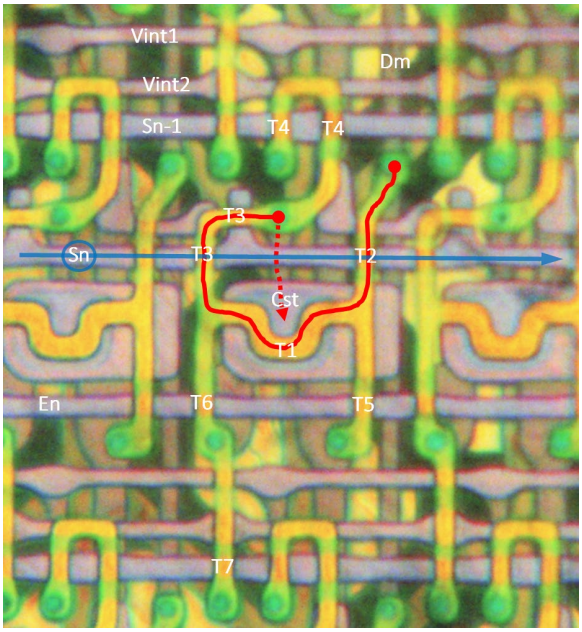


Figure 20

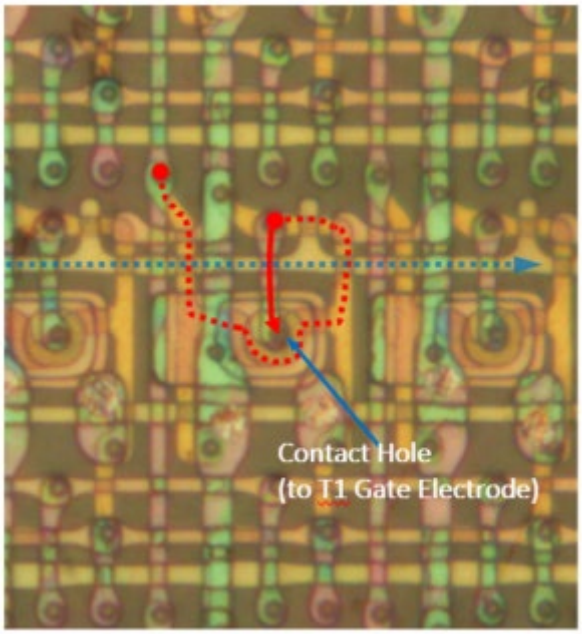


Figure 21

48. In the pixel circuit of the BOE OLED display panel, "the electroluminescent element emits light corresponding to the driving current generated through the second transistor." As reflected in the annotated image below (Fig. 22) (backside image of the BOE OLED display panel), the driving current flows from a power supply voltage (ELVDD) through the fifth transistor (T5), through the second transistor (T1), and through the sixth transistor (T6) transistor to the electroluminescent element (OLED) to emit light. The light emitted by the OLED corresponds to the driving current generated through the second transistor (T1).

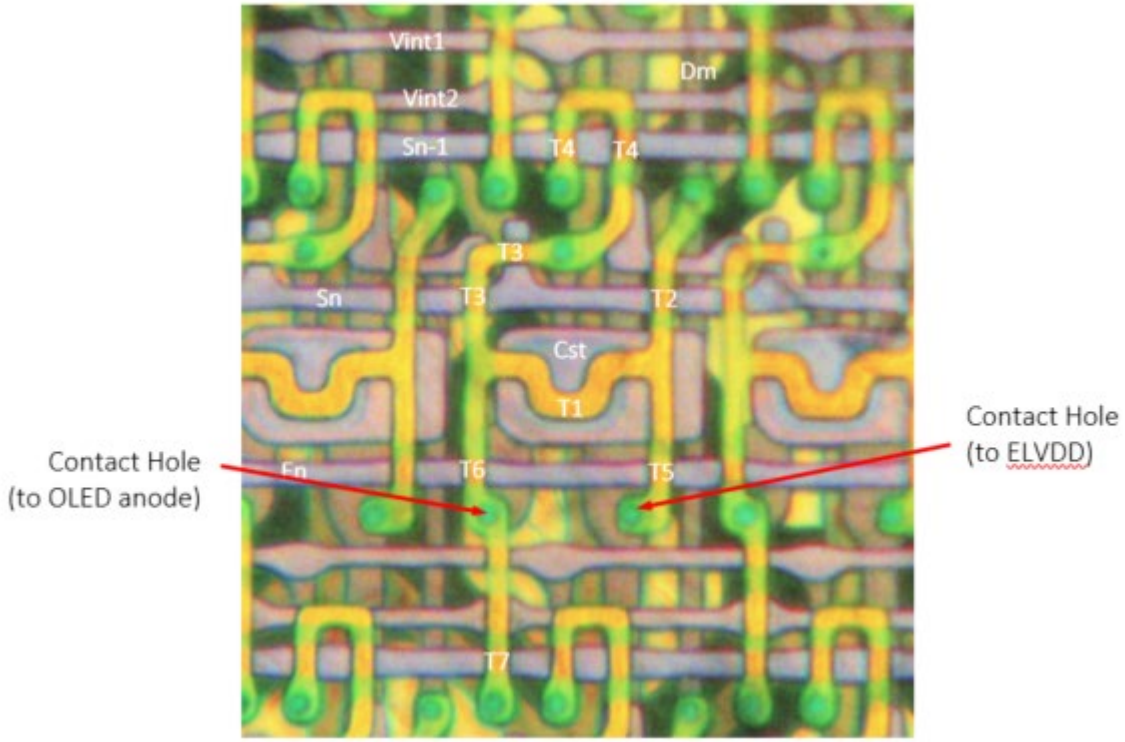


Figure 22

49. For example, as is further reflected in the exemplary annotated backside image below (Fig. 23), when T5 and T6 are turned on by a current light-emitting signal on En (blue line), current (red line) is allowed to flow from ELVDD through T1 to the OLED. The voltage stored by Cst is applied to the gate of T1, which determines the amount of driving current that flows through T1 to the OLED. The driving current flowing through T1 to the OLED determines the amount of light emitted by the OLED.

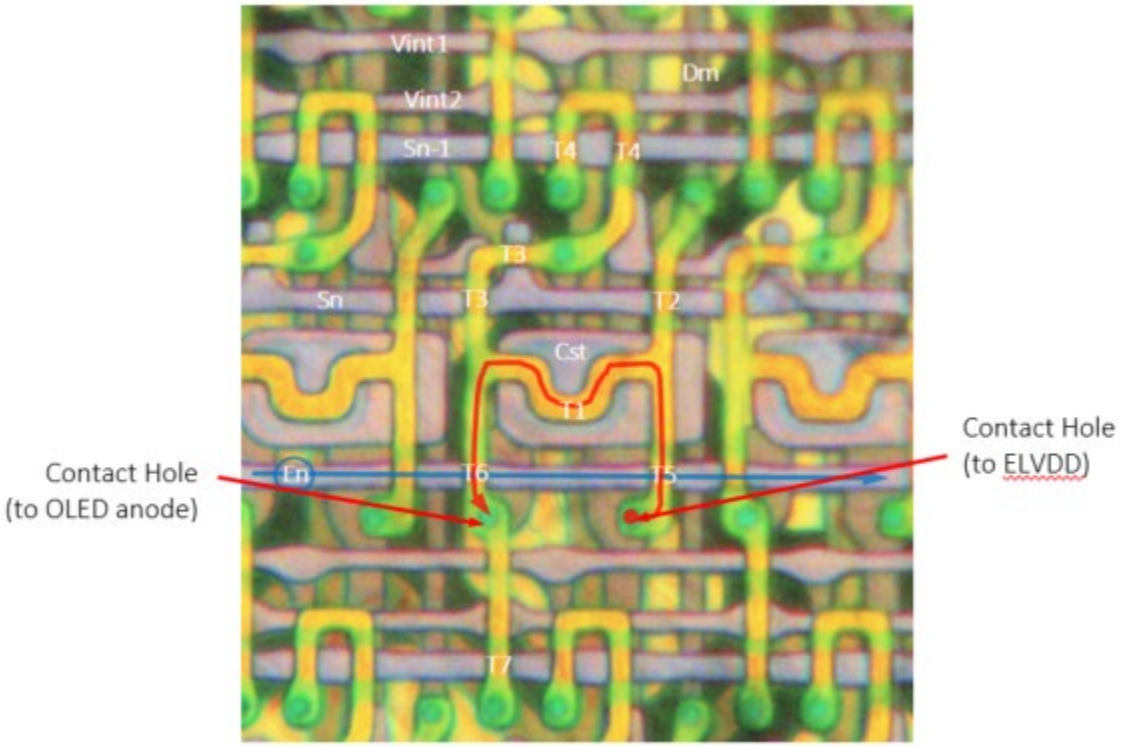


Figure 23

50. Upon information and belief, and as shown above in the example of a BOE display used in the iPhone 12, the Accused Products meet every limitation of at least claim 1 of the ’599 Patent.

51. By making, using, selling, offering for sale in, and/or importing into the United States the Accused Products, including the OLED displays used in iPhone 12 products, Defendants directly infringe at least claim 1 of the ’599 Patent.

52. Upon information and belief, Defendants have induced infringement of the ’599 Patent under 35 U.S.C. § 271(b) by knowingly and intentionally inducing others to directly infringe the ’599 Patent. Despite having notice of the ’599 Patent, Defendants have actively encouraged others to infringe the patent. For example, upon information and belief, Defendants have knowingly and intentionally induced third-party manufacturers, shippers, distributors, and/or retailers to directly

infringe (literally and/or under the doctrine of equivalents) the ’599 Patent by importing into the United States, using, and/or selling and offering to sell in the United States products containing infringing BOE OLED displays. Defendants’ OLED displays are specially designed to contain features that infringe the ’599 Patent and the Accused Products have no substantial uses other than ones that infringe the ’599 Patent. Upon information and belief, Defendants take active steps, directly and/or through contractual relationships with others, with the specific intent to cause such persons to import, use, sell, and/or or offer to sell products containing BOE OLED displays that infringe at least claim 1 of the ’599 Patent. Upon information and belief, such steps by Defendants include, among other things, making or selling the Accused Products, including BOE OLED displays for iPhone 12 products, for importation into or sale in the United States, knowing that such importation or sale would occur. Defendants have engaged in these activities with knowledge of the ’599 Patent and knowledge that the induced acts constitute infringement. Defendants’ inducement of infringement of the ’599 Patent is ongoing.

53. Upon information and belief, Defendants have also contributorily infringed the ’599 Patent under 35 U.S.C. § 271(c) through their supply of the BOE OLED displays to customers that incorporate those OLED displays into other products, including the iPhone 12. The BOE OLED displays have no substantial non-infringing uses and are especially designed and made for use in devices that infringe the ’599 Patent. Defendants have engaged in these activities despite having notice of the ’599 Patent, and the OLED displays that Defendants have sold and/or provided to customers embody a material part of the claimed invention of at least claim 1 of the ’599 Patent. Defendants’ contributory infringement of the ’599 Patent is ongoing.

54. Defendants’ infringement has been, and continues to be, willful. For example, Defendants have been on notice of the ’599 Patent and their infringement of the ’599 Patent since at

least their receipt of Samsung Display's May 2, 2022 notice letter, and yet have continued their infringing activities.

55. Samsung Display has suffered, and will continue to suffer, irreparable harm as a result of Defendants' infringement of the '599 Patent for which there is no adequate remedy at law, unless Defendants' infringement is enjoined by this Court. Accordingly, Samsung Display seeks a permanent injunction enjoining Defendants from making, using, selling (including for importation), offering to sell (including for importation), and/or importing the Accused Products, and/or otherwise infringing, or inducing or contributing to the infringement of, the '599 Patent.

COUNT II – INFRINGEMENT OF U.S. PATENT NO. 9,330,593

56. Samsung Display hereby incorporates the allegations of Paragraphs 1 through 55 as fully set forth herein.

57. Upon information and belief, Defendants have infringed and continue to directly infringe the '593 Patent by making, using, selling, offering for sale in, and/or importing into the United States OLED displays for incorporation into the Accused Products, such as OLED displays incorporated into the iPhone 12 product.

58. Independent claim 1 of the '593 Patent recites:

1. A stage circuit having a first input terminal, a second input terminal, a third input terminal, and an output terminal, the stage circuit comprising:

> an outputting unit having a first node and a second node, the outputting unit to supply a voltage of a first power supply to the output terminal according to a voltage applied to the first node and a signal of the third input terminal to the output terminal according to a voltage applied to the second node;
>
> a first driver to control the voltage of the second node in accordance with signals of the first input terminal, the second input terminal, and the third input terminal; and
>
> a second driver to control the voltage of the first node in accordance with the signal of the second input terminal and the voltage of the second node,

wherein the signal of the third input terminal directly controls an on/off operation of a transistor, the transistor included in the first driver.

59. Upon information and belief, Apple iPhone 12 products that incorporate an OLED display supplied by Defendants, meet each of the limitations of claim 1.

60. The images below (Figs. 24–26) are of an Apple iPhone 12 sold in Texas that, on information and belief, contains an OLED display supplied by Defendants.

Figure 24

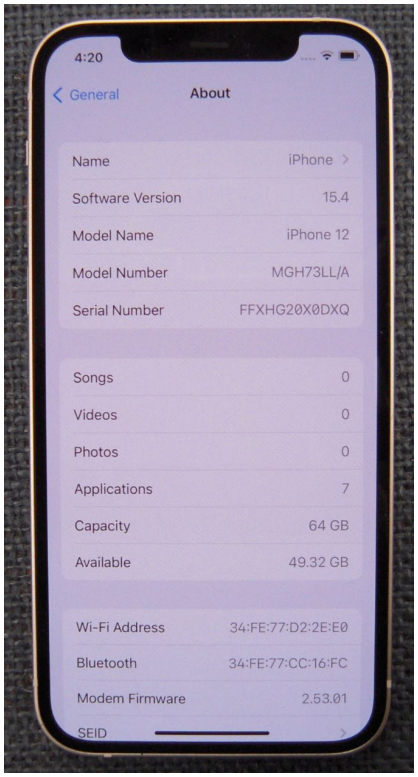


Figure 25

Figure 26

61. The BOE OLED display panel comprises a substrate that supports the OLED pixel elements that are visible through the glass panel as well as the circuitry that controls the operation of the OLED pixels. The BOE OLED display panel is mounted within the iPhone 12 chassis and

is located behind a glass panel, and in the image below (Fig. 27), the display panel substrate can be seen.

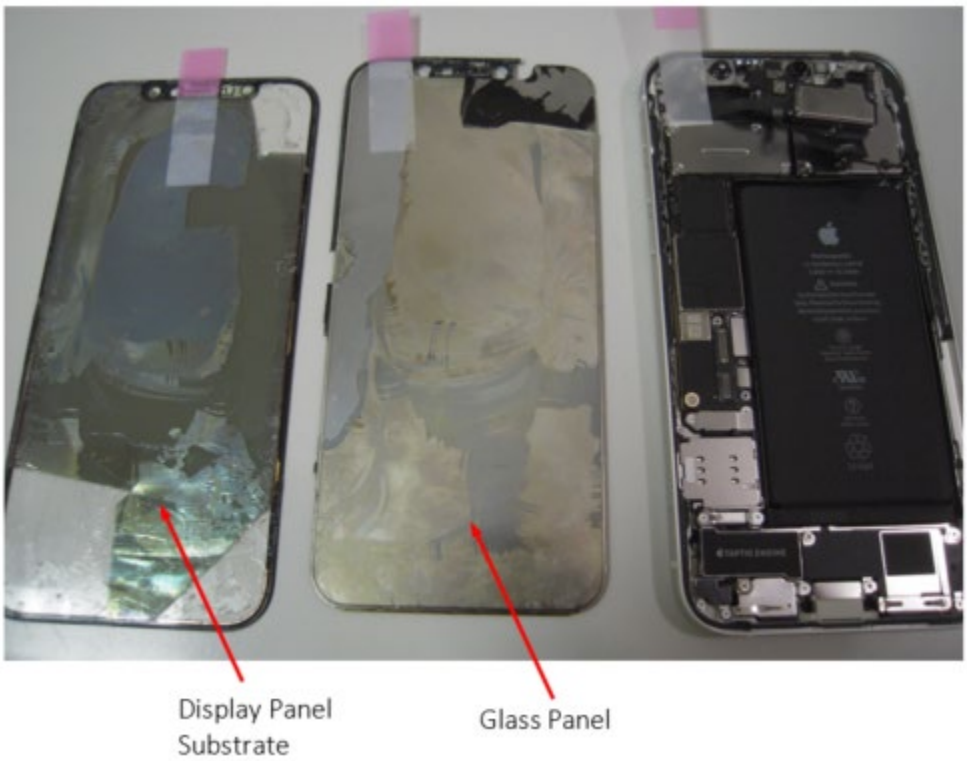


Figure 27

62. As shown in the annotated image below (Fig. 28), the BOE OLED display panel contains a scan driver with a plurality of stage circuits (blue dashed lines).

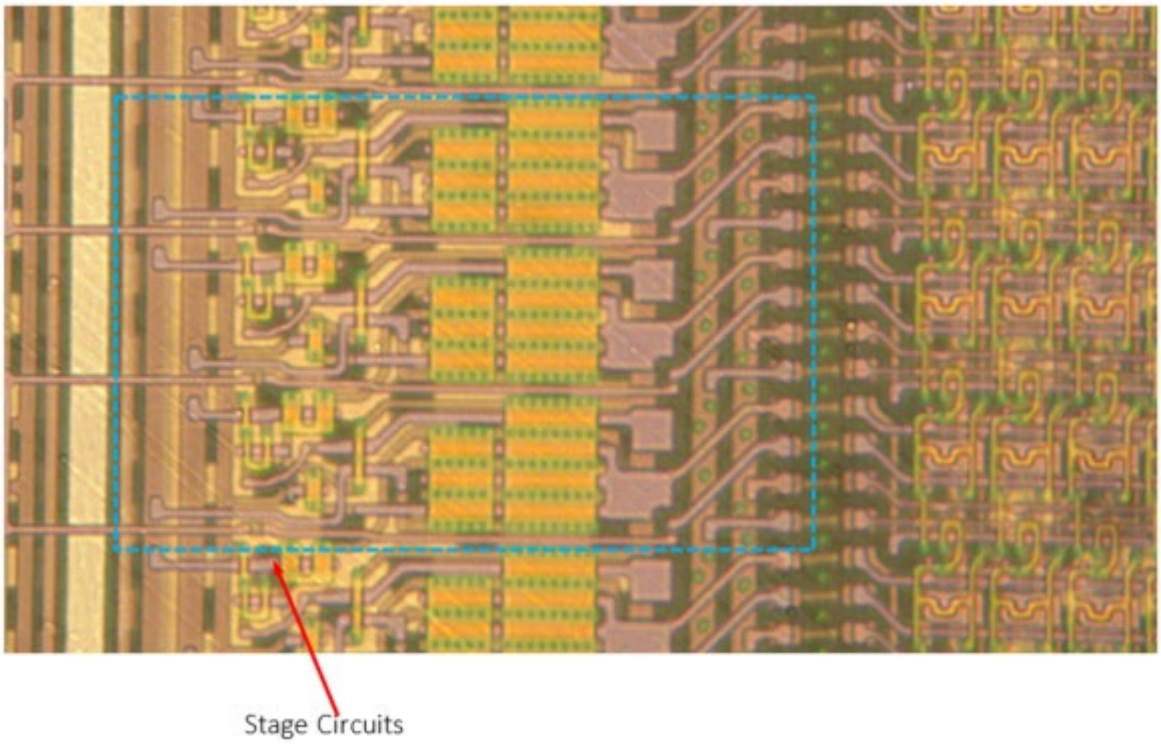


Figure 28

63. The BOE OLED display contains "a stage circuit having a first input terminal" (IN1), "a second input terminal" (IN2), "a third input terminal" (IN3), and "an output terminal" (OUT1), as annotated in the image below (Fig. 29).

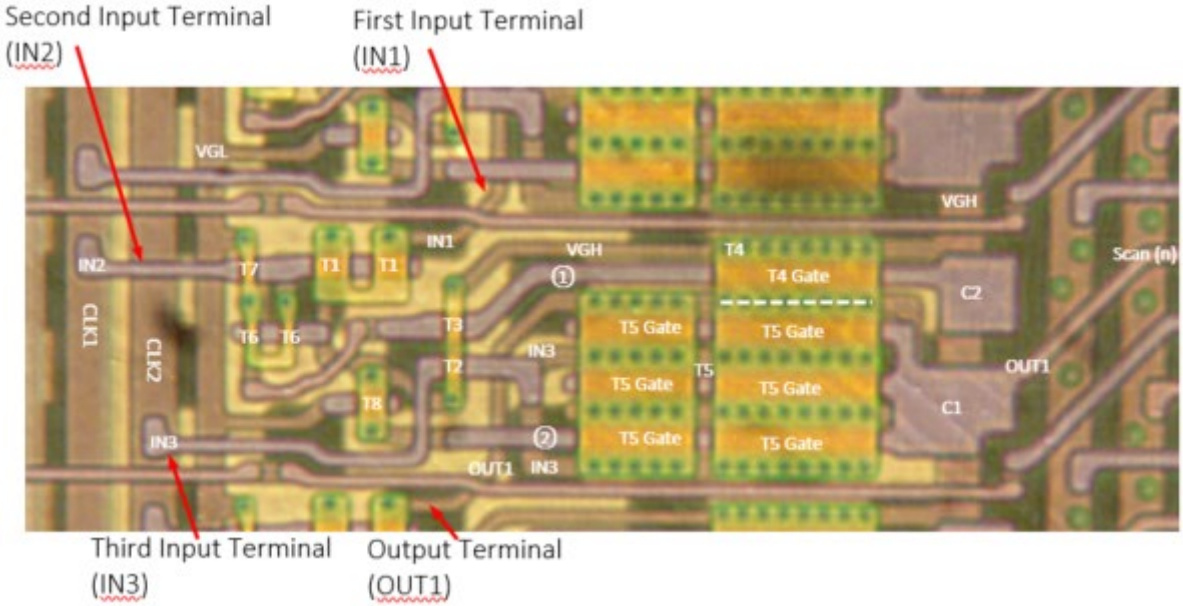


Figure 29

64. The stage circuit includes a stage circuit that has "an outputting unit having a first node and a second node, the outputting unit to supply a voltage of a first power supply to the output terminal according to a voltage applied to the first node and a signal of the third input terminal to the output terminal according to a voltage applied to the second node." As shown in the annotated image below (Fig. 30) the outputting unit comprises at least transistors T4 and T5 and capacitors C1 and C2. The outputting unit has a first node (e.g., between the gates of transistors T3 and T4) and a second node (e.g., between the gate of transistor T5 and the output of the first driver).

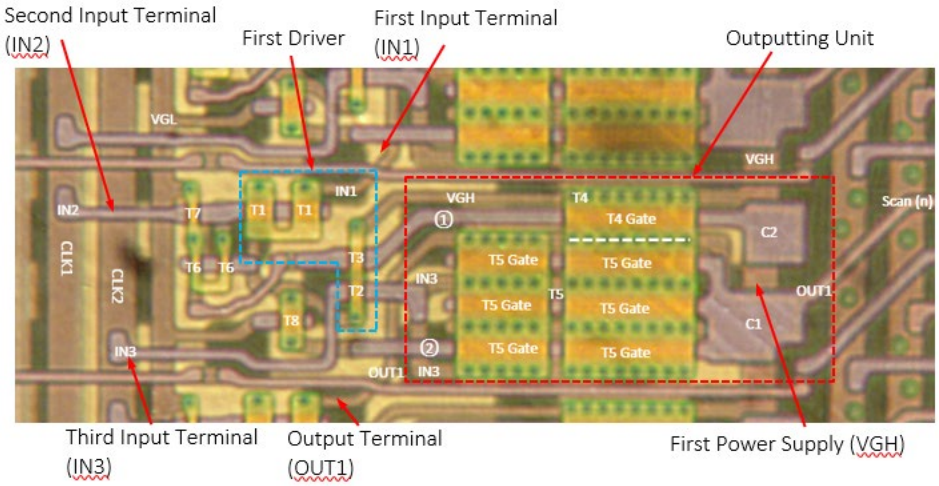


Figure 30

65. As shown in Figure 30, the outputting unit supplies the voltage of a first power supply (e.g., VGH) to the output terminal (e.g., OUT1), according to a voltage applied to the first node, and a signal of the third input terminal (e.g., IN3) to the output terminal (e.g., OUT1) according to a voltage applied to the second node. For example, as shown in Figure 30, transistors T4 and T5 supply a voltage to OUT1 depending upon the voltage between the gates of transistors T3 and T4 and the voltage between the gate of transistor T5 and the output of the first driver. VGH is coupled to an electrode of transistor T4, such that when a voltage is applied to the node between the gates of transistors T3 and T4, transistor T4 is turned on and VGH is supplied to OUT1. OUT1 is coupled to an electrode of transistor T5 such that when a voltage is applied to a node between the gate of transistor T5 and the output of the first driver, transistor T5 is turned on and IN3 is supplied to OUT1.

66. The BOE display contains a stage circuit that includes "a first driver to control the voltage of the second node in accordance with signals of the first input terminal, the second input terminal, and the third input terminal." As shown in the annotated image below (Fig. 31), the stage

circuit contains a first driver comprising at least transistors T1, T2, and T3. The first input terminal (e.g., IN1) is coupled to an electrode of transistor T1. The second input terminal (e.g., IN2) is coupled to the gate electrode of transistor T1. The third input terminal (e.g., IN3) is coupled to the gate electrode of transistor T2. The signals of the first input terminal (e.g., IN1), the second input terminal (e.g., IN2), and third input terminal (e.g., IN3) control the voltage of the second node (e.g., the voltage between the gate of transistor T5 and the output of the first driver) based on the respective voltages applied at the gate electrodes of transistors T1, T2, and T3.

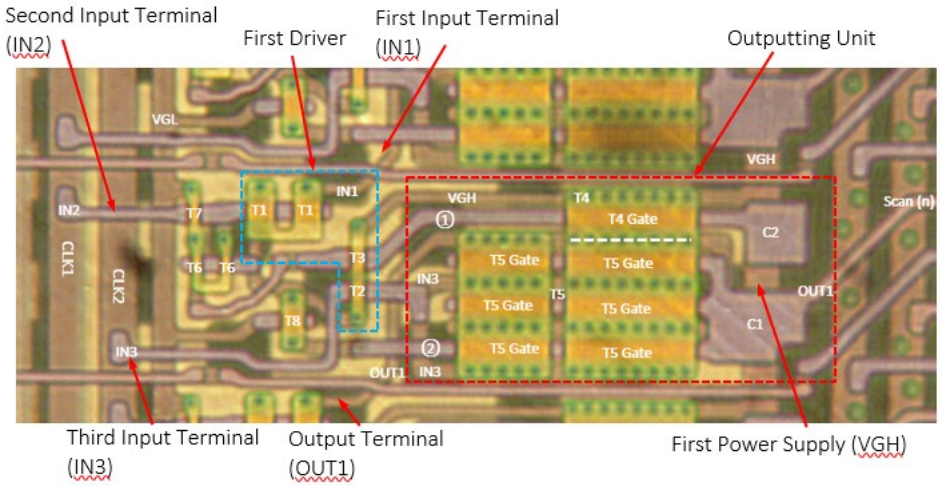


Figure 31

67. For example, as shown in Figure 31, IN1 is coupled to transistor T1, and the gate electrodes of transistor T1 are coupled to IN2. The transistors T2 and T3 are coupled in series to the drain of transistor T1, and IN3 is coupled to the gate electrode of transistor T2. The signals applied to IN1, IN2, and IN3 control the voltage between the output of the first driver and the gate of transistor T5.

68. The BOE display contains a stage circuit includes "a second driver to control the voltage of the first node in accordance with the signal of the second input terminal and the voltage of the second node." As shown in the annotated image below (Fig. 32), the stage circuit contains a

second driver comprising at least transistors T6 and T7. The signal of the second input terminal (e.g., IN2) is applied to the gate electrode of transistor T7, which controls the voltage of the first node (e.g., the voltage between the gates of transistors T3 and T4). The voltage of the second node (e.g., the voltage between the gate electrode of transistor T5 and the output of the first driver) is applied to the gate electrode of transistor T6, which controls the voltage of the first node (e.g., the voltage between the gate electrodes of transistors T3 and T4).

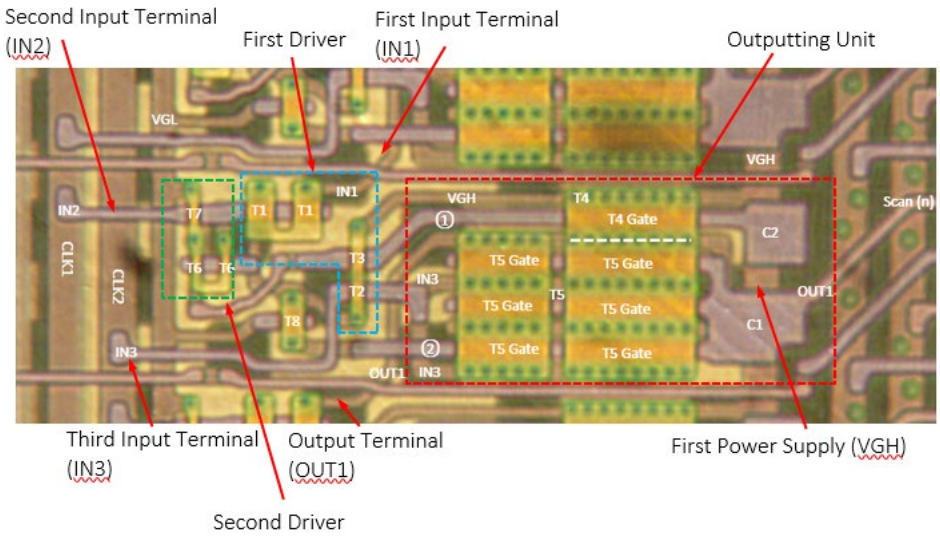


Figure 32

69. For example, as shown in Figure 32, IN2 is coupled to the gate of transistor T7, which is coupled between VGL and the node between the gates of transistors T3 and T4. The signal at IN2 controls whether VGL is applied between the gates of transistors T3 and T4. The transistor T6 is coupled between the gates of transistors T3 and T4 and IN2, and the voltage at the output of the first driver is coupled to the gate of transistor T6, thereby controlling when transistor T6 is on. When transistor T6 is on, it couples the node between the gates of transistors T3 and T4 to the signal present on IN2.

70. The BOE display contains a stage circuit in which "the signal of the third input terminal directly controls an on/off operation of a transistor, the transistor included in the first driver." As shown in the annotated image below (Fig. 33), the third input terminal (e.g., IN3) is coupled to the gate electrode of transistor T2 and the signal of the third input terminal directly controls the on/off operation of transistor T2. As described above, transistor T2 is included in the first driver.

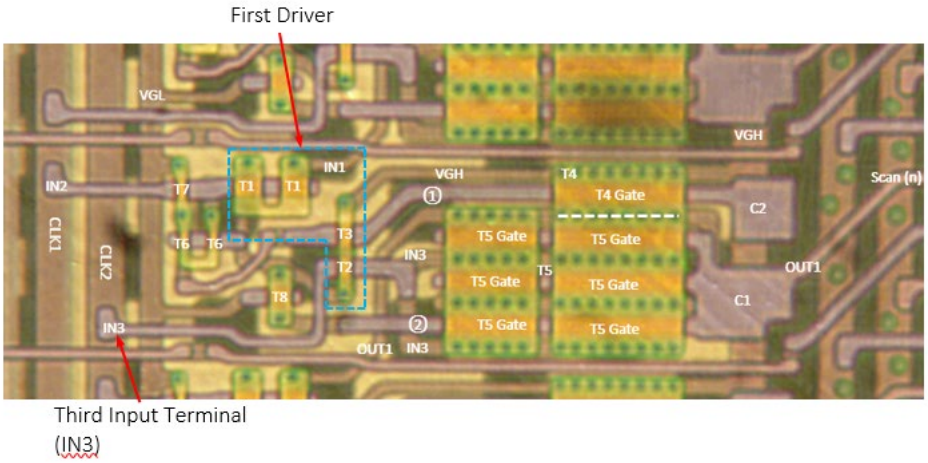


Figure 33

71. Upon information and belief, and as shown above in the example of a BOE display used in the iPhone 12, the Accused Products meet every limitation of at least claim 1 of the '593 Patent.

72. By making, using, selling, offering for sale in, and/or importing into the United States the Accused Products, including the OLED displays used in iPhone 12 products, Defendants directly infringe at least claim 1 of the '593 Patent.

73. Upon information and belief, Defendants have induced infringement of the '593 Patent under 35 U.S.C. § 271(b) by knowingly and intentionally inducing others to directly infringe the '593 Patent. Despite having notice of the '593 Patent, Defendants have actively encouraged

others to infringe the patent. For example, upon information and belief, Defendants have knowingly and intentionally induced third-party manufacturers, shippers, distributors, and/or retailers to directly infringe (literally and/or under the doctrine of equivalents) the ’593 Patent by importing into the United States, using, and/or selling and offering to sell in the United States products containing infringing BOE OLED displays. Defendants’ OLED displays are specially designed to contain features that infringe the ’593 Patent and the Accused Products have no substantial uses other than ones that infringe the ’593 Patent. Upon information and belief, Defendants take active steps, directly and/or through contractual relationships with others, with the specific intent to cause such persons to import, use, sell, and/or or offer to sell products containing BOE OLED displays that infringe at least claim 1 of the ’593 Patent. Upon information and belief, such steps by Defendants include, among other things, making or selling the Accused Products, including BOE OLED displays for iPhone 12 products, for importation into or sale in the United States, knowing that such importation or sale would occur. Defendants have engaged in these activities with knowledge of the ’593 Patent and knowledge that the induced acts constitute infringement. Defendants’ inducement of infringement of the ’593 Patent is ongoing.

74. Upon information and belief, Defendants have also contributorily infringed the ’593 Patent under 35 U.S.C. § 271(c) through their supply of the BOE OLED displays to customers that incorporate those OLED displays into other products, including the iPhone 12. The BOE OLED displays have no substantial non-infringing uses and are especially designed and made for use in devices that infringe the ’593 Patent. Defendants have engaged in these activities despite having notice of the ’593 Patent, and the OLED displays that Defendants have sold and/or provided to customers embody a material part of the claimed invention of at least claim 1 of the ’593 Patent. Defendants’ contributory infringement of the ’593 Patent is ongoing.

75. Defendants' infringement has been, and continues to be, willful. For example, Defendants have been on notice of the '593 Patent and their infringement of the '593 Patent since at least their receipt of Samsung Display's May 2, 2022 notice letter and yet have continued their infringing activities.

76. Samsung Display has suffered, and will continue to suffer, irreparable harm as a result of Defendants' infringement of the '593 Patent for which there is no adequate remedy at law, unless Defendants' infringement is enjoined by this Court. Accordingly, Samsung Display seeks a permanent injunction enjoining Defendants from making, using, selling (including for importation), offering to sell (including for importation), and/or importing the Accused Products, and/or otherwise infringing, or inducing or contributing to the infringement of, the '593 Patent.

COUNT III – INFRINGEMENT OF U.S. PATENT NO. 9,818,803

77. Samsung Display hereby incorporates the allegations of Paragraphs 1 through 76 as fully set forth herein.

78. Upon information and belief, Defendants have infringed and continue to directly infringe the '803 Patent by making, using, selling, offering for sale in, and/or importing into the United States OLED displays for incorporation into the Accused Products, such as OLED displays incorporated into the iPhone 12 product.

79. Independent claim 1 of the '803 Patent recites:

1. A pixel arrangement structure of an organic light emitting diode (OLED) display, comprising:

a plurality of pixels for displaying an image on the OLED display and comprising:

a first pixel having a center coinciding with a center of a virtual square;

a second pixel separated from the first pixel and having a center coinciding at a first vertex of the virtual square;

a second pixel separated from the first pixels and having a center at the first vertex;

another first pixel on a line defined by the center of the virtual square and the first vertex, the first pixel, the second pixel, and the other first pixel being consecutive pixels on the line from the plurality of pixels; and

a third pixel separated from the first pixels and the second pixel, and having a center at the second vertex neighboring the first vertex of the virtual square,

wherein the second pixel has a larger area than that of the third pixel, and;

wherein the first pixel is configured to emit green light.

80. Upon information and belief, Apple iPhone 12 products that incorporate an OLED display supplied by Defendants, meet each of the limitations of claim 1.

81. The images below (Figs. 34–36) are of an Apple iPhone 12 sold in Texas that, on information and belief, contains an OLED display supplied by Defendants.

Figure 34

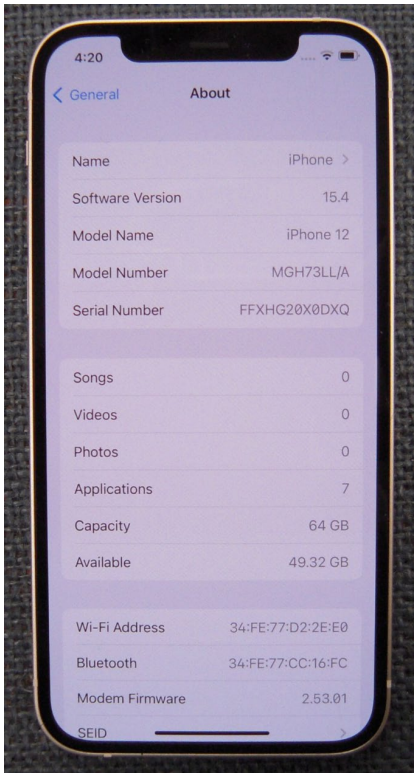


Figure 35

Figure 36

82. The BOE OLED display panel comprises a substrate that supports the OLED pixel elements that are visible through the glass panel as well as the circuitry that controls the operation of the OLED pixels. The BOE OLED display panel is mounted within the iPhone 12 chassis and

is located behind a glass panel, and in the image below (Fig. 37), the display panel substrate can be seen.

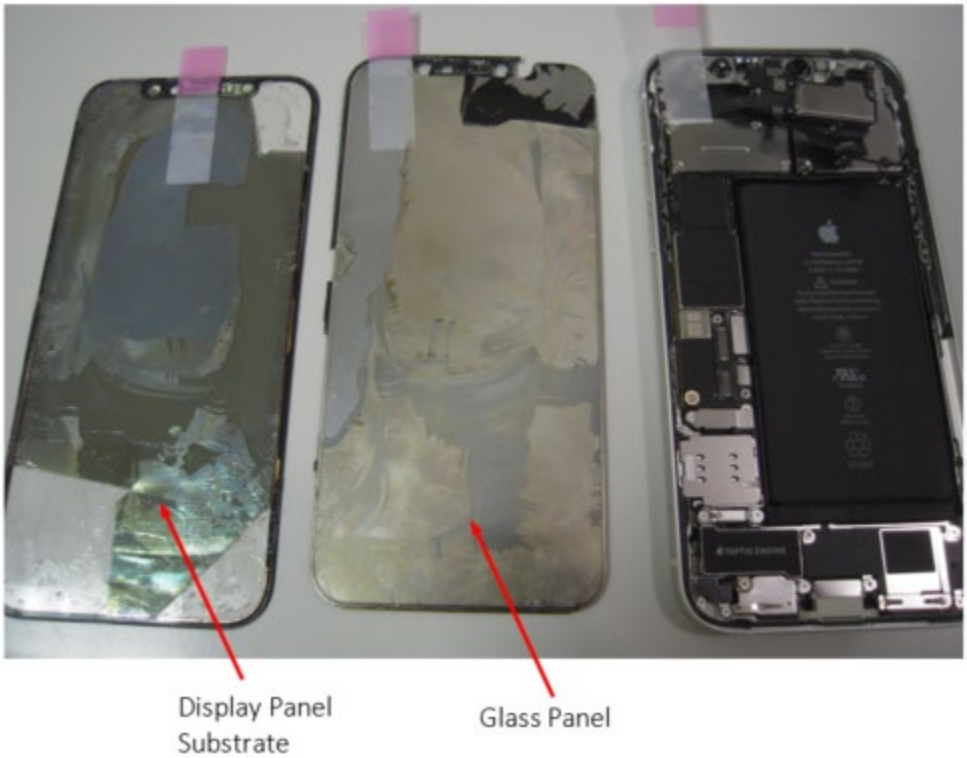


Figure 37

83. The BOE OLED display panel has a pixel arrangement structure. In the annotated image below (Fig. 38), a plurality of pixel elements are arranged:

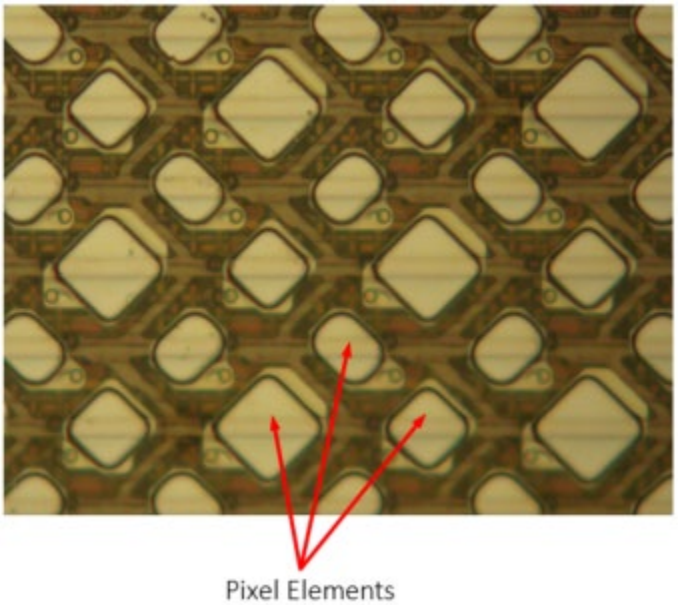


Figure 38

84. As shown in Figure 39, the "plurality of pixels" emit light "for displaying an image on the OLED display."

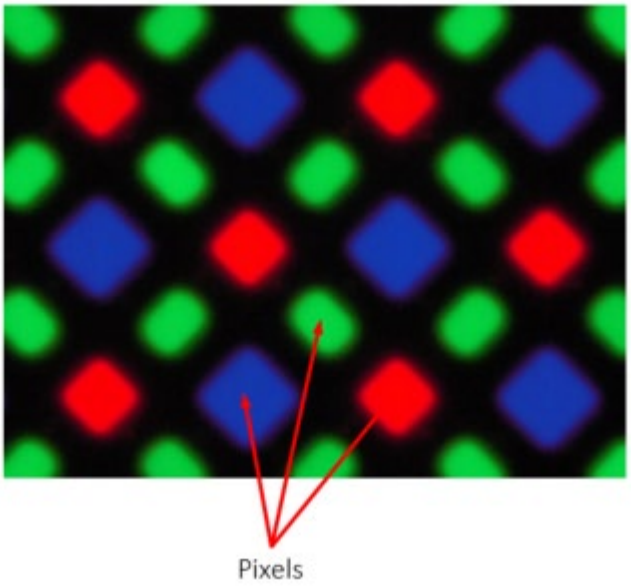


Figure 39

85. The BOE OLED display panel has "a first pixel having a center coinciding with a center of a virtual square." In the annotated image below (Fig. 40) (front-side image of the BOE OLED display panel substrate), the first pixel and the virtual square are identified.

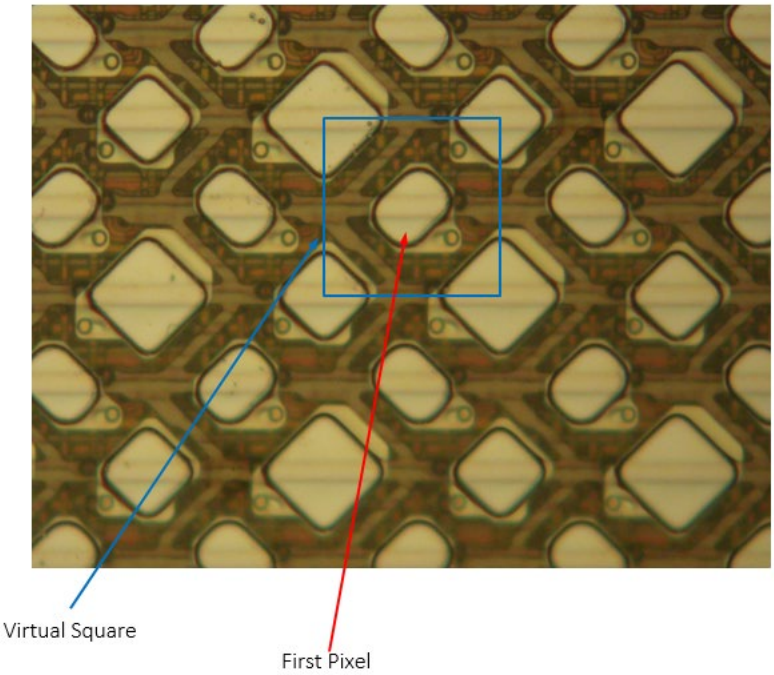


Figure 40

86. The BOE OLED display panel has "a second pixel separated from the first pixel and having a center at a first vertex of the virtual square." As shown in the annotated image below (Fig. 41), the OLED display panel has a second pixel (green arrow) that is separated from the first pixel (red arrow) and is centered at a first vertex of the virtual square (blue).

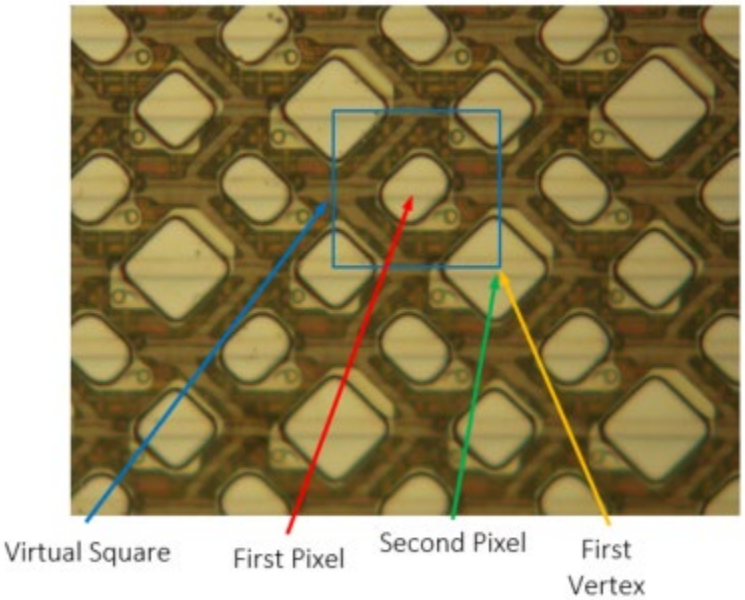


Figure 41

87. The BOE OLED display panel has "another first pixel on a line defined by the center of the virtual square and the first vertex, the first pixel, the second pixel, and the other first pixel being consecutive pixels on the line from among the plurality of pixels." As shown in the annotated image below (Fig. 42), the BOE OLED display panel has another first pixel (pink arrow) on a line (black) defined by the center of the virtual square (blue) and the first vertex, with the first pixel (red arrow), the second pixel (green arrow), and the other first pixel (pink arrow) being consecutive pixels on the line (black).

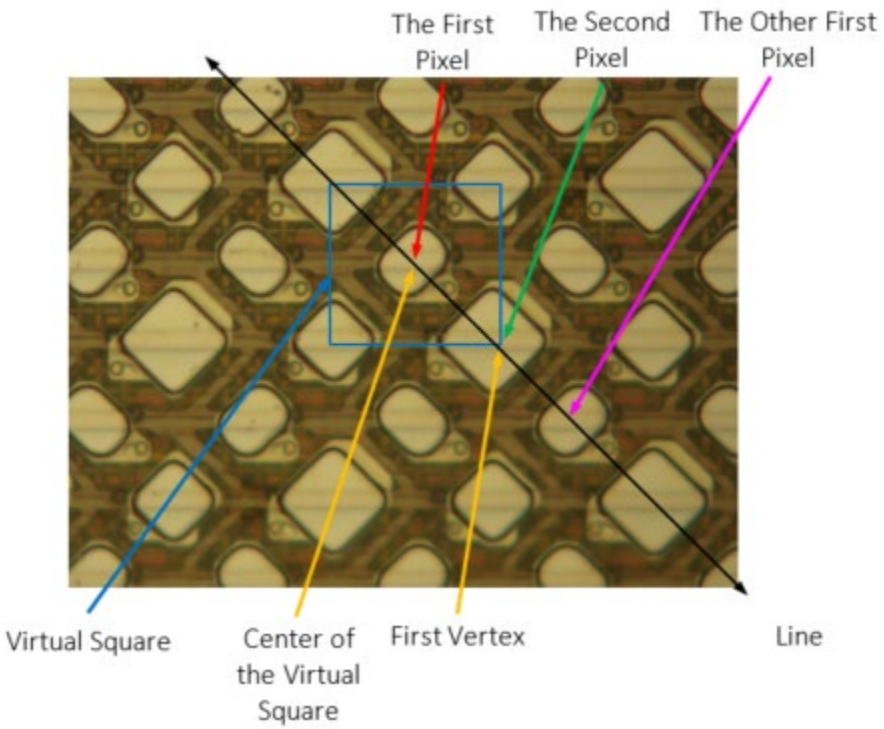


Figure 42

88. The BOE OLED display panel has "a third pixel separated from the first pixels and the second pixel, and having a center at a second vertex neighboring the first vertex of the virtual square." As shown in the annotated image below (Fig. 43), the BOE OLED display panel has a third pixel (yellow arrow) that is separated from the first pixel (red arrow) and the second pixel (green arrow) and is centered at a second vertex neighboring the first vertex of the virtual square (blue).

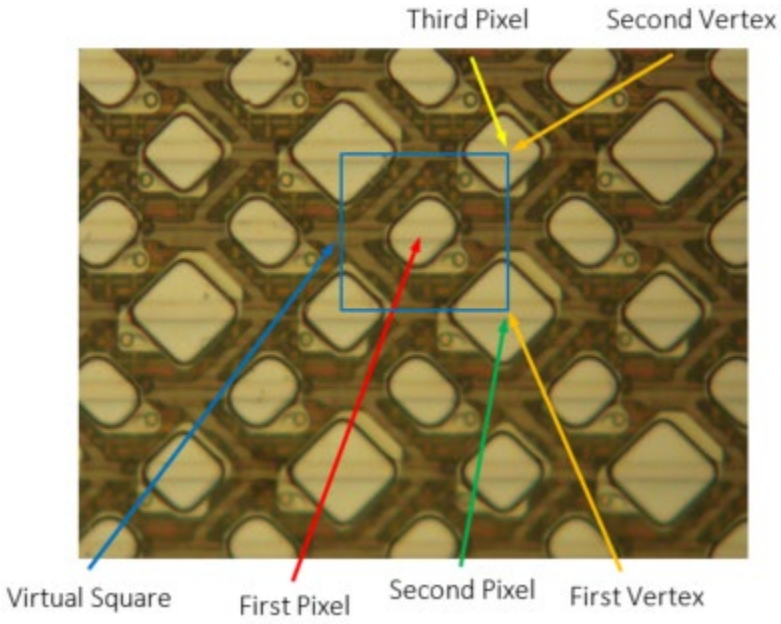


Figure 43

89. In the BOE OLED display panel, "the second pixel has a larger area than that of the third pixel." As shown in the annotated image below (Fig. 44), the second pixel's area (dotted green line) is larger than the area of the third pixel (dotted yellow line).

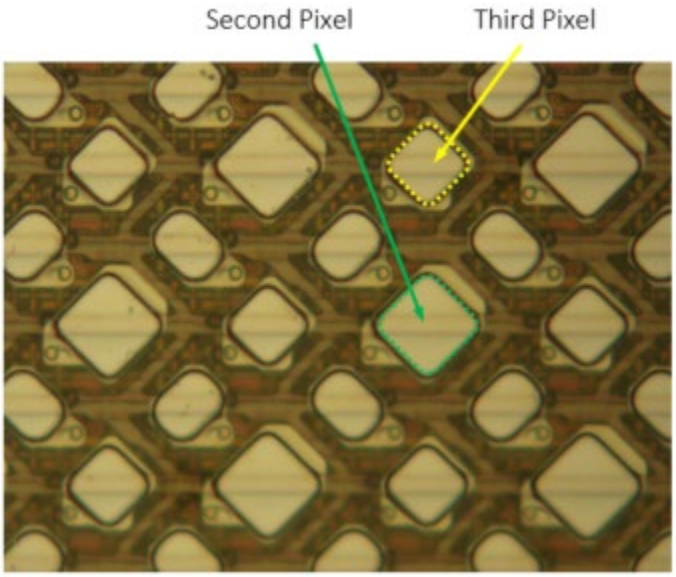


Figure 44

90. In the BOE OLED display panel, "the first pixel is configured to emit green light." As shown in the annotated image below (Fig. 45), the first pixel (red arrow) emits green light.

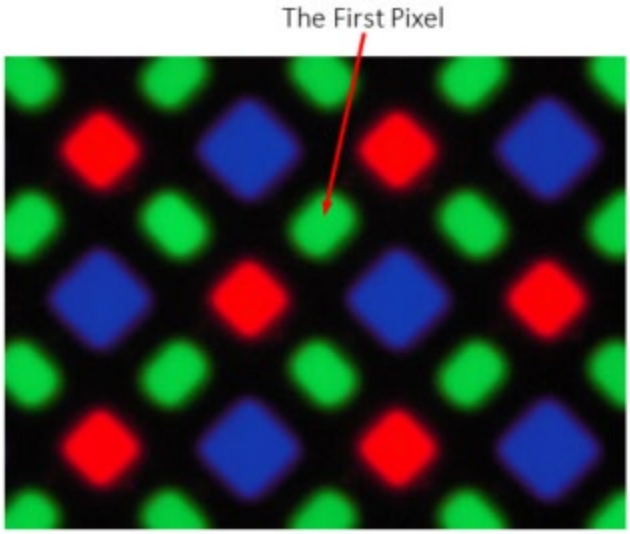


Figure 45

91. Upon information and belief, and as shown above in the example of a BOE display used in the iPhone 12, the Accused Products meet every limitation of at least claim 1 of the '803 Patent.

92. By making, using, selling, offering for sale in, and/or importing into the United States the Accused Products, including the BOE OLED displays used in iPhone 12 products, Defendants directly infringe at least claim 1 of the '803 Patent.

93. Upon information and belief, Defendants have induced infringement of the '803 Patent under 35 U.S.C. § 271(b) by knowingly and intentionally inducing others to directly infringe the '803 Patent. Despite having notice of the '803 Patent, Defendants have actively encouraged others to infringe the patent. For example, upon information and belief, Defendants have knowingly and intentionally induced third-party manufacturers, shippers, distributors, and/or retailers to directly infringe (literally and/or under the doctrine of equivalents) the '803 Patent by importing into the

United States, using, and/or selling and offering to sell in the United States products containing infringing BOE OLED displays. Defendants' OLED displays are specially designed to contain features that infringe the '803 Patent and the Accused Products have no substantial uses other than ones that infringe the '803 Patent. Upon information and belief, Defendants take active steps, directly and/or through contractual relationships with others, with the specific intent to cause such persons to import, use, sell, and/or or offer to sell products containing BOE OLED displays that infringe at least claim 1 of the '803 Patent. Upon information and belief, such steps by Defendants include, among other things, making or selling the Accused Products, including BOE OLED displays for iPhone 12 products, for importation into or sale in the United States, knowing that such importation or sale would occur. Defendants have engaged in these activities with knowledge of the '803 Patent and knowledge that the induced acts constitute infringement. Defendants' inducement of infringement of the '803 Patent is ongoing.

94. Upon information and belief, Defendants have also contributorily infringed the '803 Patent under 35 U.S.C. § 271(c) through their supply of the BOE OLED displays to customers that incorporate those OLED displays into other products, including the iPhone 12. The BOE OLED displays have no substantial non-infringing uses and are especially designed and made for use in devices that infringe the '803 Patent. Defendants have engaged in these activities despite having notice of the '803 Patent, and the OLED displays that Defendants have sold and/or provided to customers embody a material part of the claimed invention of at least claim 1 of the '803 Patent. Defendants' contributory infringement of the '803 Patent is ongoing.

95. Defendants' infringement has been, and continues to be, willful. For example, Defendants have been on notice of the '803 Patent and their infringement of the '803 Patent since at

least their receipt of Samsung Display's May 2, 2022 notice letter and yet have continued their infringing activities.

96. Samsung Display has suffered, and will continue to suffer, irreparable harm as a result of Defendants' infringement of the '803 Patent for which there is no adequate remedy at law, unless Defendants' infringement is enjoined by this Court. Accordingly, Samsung Display seeks a permanent injunction enjoining Defendants from making, using, selling (including for importation), offering to sell (including for importation), and/or importing the Accused Products, and/or otherwise infringing, or inducing or contributing to the infringement of, the '803 Patent.

COUNT IV – INFRINGEMENT OF U.S. PATENT NO. 10,854,683

97. Samsung Display hereby incorporates the allegations of Paragraphs 1 through 96 as fully set forth herein.

98. Upon information and belief, Defendants have infringed and continue to directly infringe the '683 Patent by making, using, selling, offering for sale in, and/or importing into the United States OLED displays for incorporation into the Accused Products, such as OLED displays incorporated into the iPhone 12 product.

99. Independent claim 1 of the '683 Patent recites:

1. A pixel arrangement structure of an organic light emitting diode (OLED) display, comprising:

a plurality of pixels for displaying an image on the OLED display and comprising:

a first pixel;

a pair of second pixels separated from the first pixel, the second pixels being located at opposite sides of the first pixel along a first line on which the first pixel, the second pixels, and another first pixel are consecutively arranged such that the first line passes through respective centers of the first pixel, the second pixels, and the other first pixel; and;

a pair of third pixels separated from the first pixel and the second pixels, the third pixels being located at opposite sides of the first pixel along a second line on which the first pixel, the third pixels, and an additional first pixel are consecutively arranged such that the second line passes through respective centers of the first pixel, the third pixels, and the additional first pixel, the second line crossing the first line at a location of the first pixel;

wherein a first distance between the second pixels is greater than a second distance between one of the second pixels and a neighboring one of the third pixels;

wherein the first pixels are configured to emit green light, which is a color that is different from light emitted by the second pixels and the third pixels;

wherein the first pixels are smaller than at least one of the second pixels or the third pixels, and;

wherein each of the second pixels has a larger area than each of the third pixels.

100. Upon information and belief, Apple iPhone 12 products that incorporate an OLED display supplied by Defendants meet each of the limitations of claim 1.

101. The images below (Figs. 46–48) are of an Apple iPhone 12 sold in Texas that, on information and belief, contains an OLED display supplied by Defendants.

Figure 46

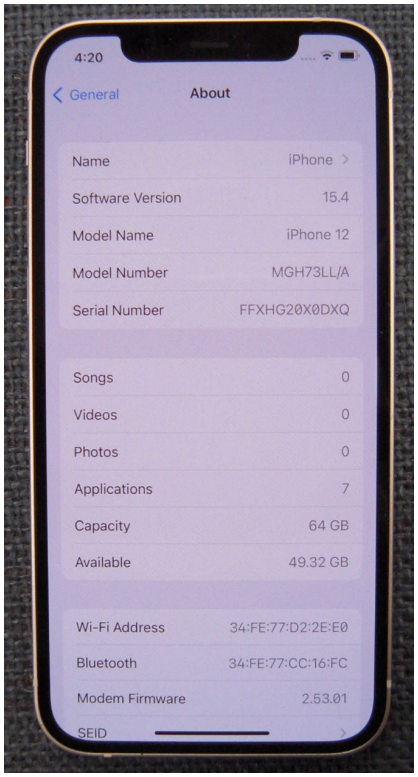


Figure 47

Figure 48

102. The BOE OLED display panel comprises a substrate that supports the OLED pixel elements that are visible through the glass panel as well as the circuitry that controls the operation of the OLED pixels. The BOE OLED display panel is mounted within the iPhone 12 chassis and

is located behind a glass panel, and in the image below (Fig. 49), the display panel substrate can be seen.

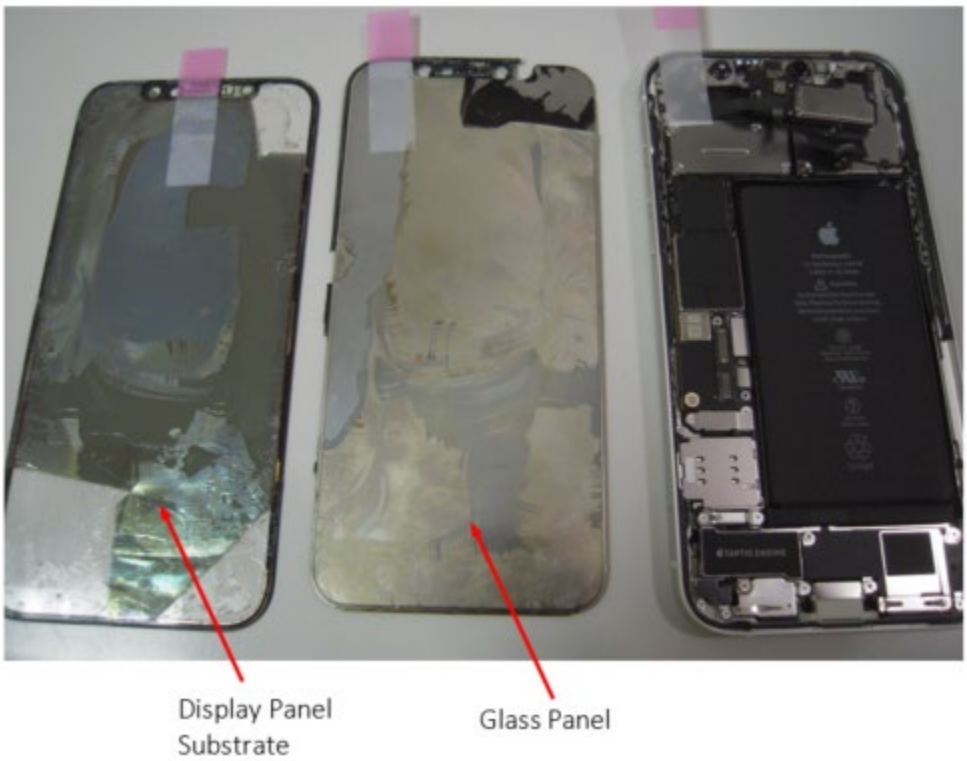


Figure 49

103. The BOE OLED display panel has "a pixel arrangement structure." In the annotated image below (Fig. 50), a plurality of pixel elements are arranged:

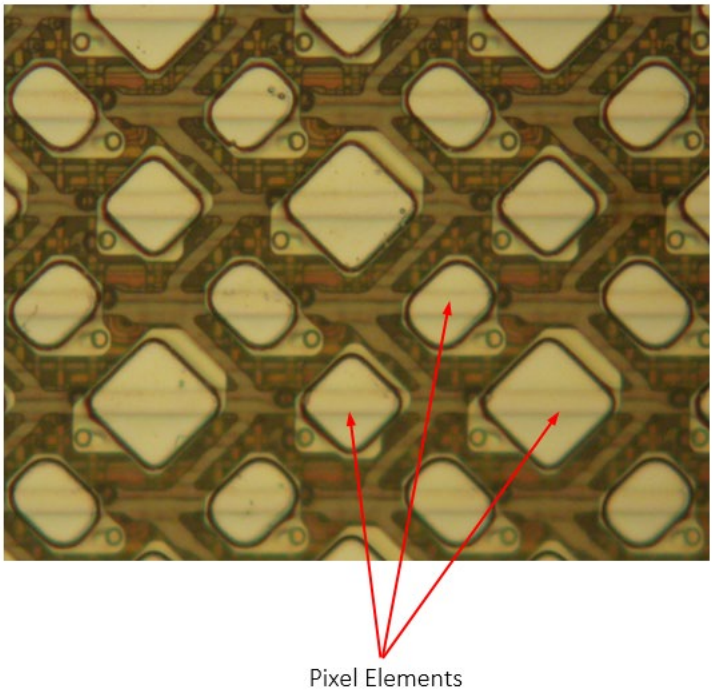


Figure 50

104. As shown in Figure 51, the plurality of pixels emit light for displaying an image on the BOE OLED display.

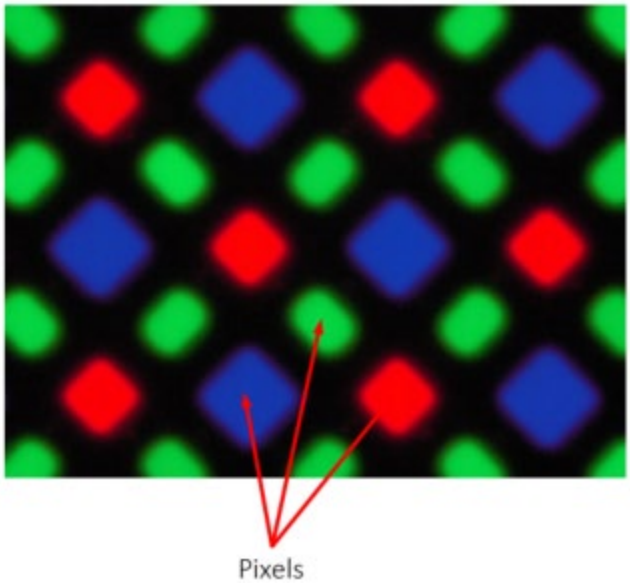


Figure 51

105. The BOE OLED display panel has "a first pixel." In the annotated image below (Fig. 52), the first pixel is identified.

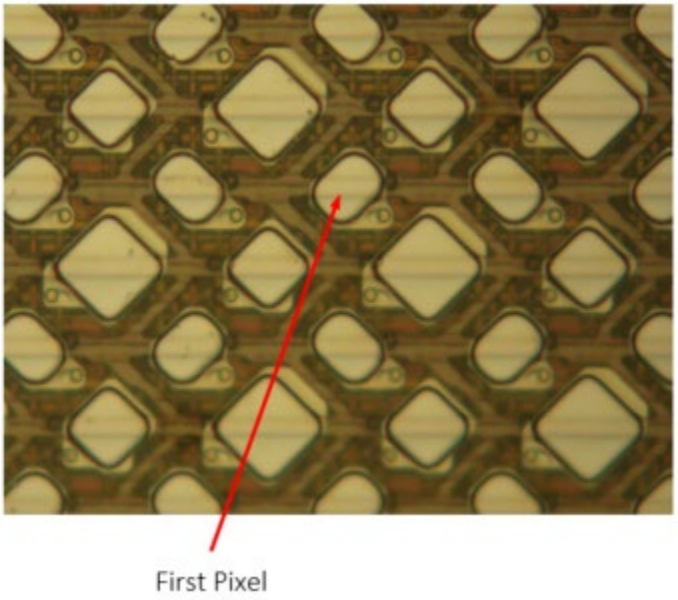


Figure 52

106. The BOE OLED display panel has "a pair of second pixels separated from the first pixel, the second pixels being located at opposite sides of the first pixel along a first line on which the first pixel, the second pixels, and another first pixel are consecutively arranged such that the first line passes through respective centers of the first pixel, the second pixels, and the other first pixel." As shown in the annotated image below (Fig. 53), the BOE OLED display panel has a pair of second pixels (green arrows) that are separated from and on opposite sides of the first pixel (red arrow) along a first line (black) passing through the centers of the first pixel (red arrow), the second pixels (green arrows), and another first pixel (pink arrow) consecutively arranged on the first line (black).

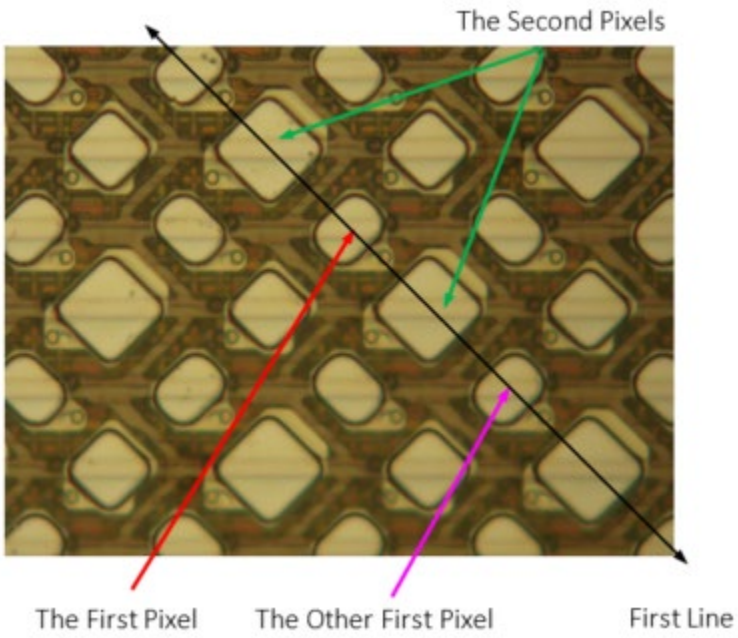


Figure 53

107. The BOE OLED display panel has "a pair of third pixels separated from the first pixel and the second pixels, the third pixels being located at opposite sides of the first pixel along a second line on which the first pixel, the third pixels, and an additional first pixel are consecutively arranged such that the second line passes through respective centers of the first pixel, the third pixels, and the additional first pixel." As shown in the annotated image below (Fig. 54), the BOE OLED display panel has a pair of third pixels (yellow arrows) that are separated from and on opposite sides of the first pixel (red arrow) along a second line (brown) passing through the centers of the first pixel (red arrow), the third pixels (yellow arrows), and an additional first pixel (pink arrow) consecutively arranged on the second line (brown).

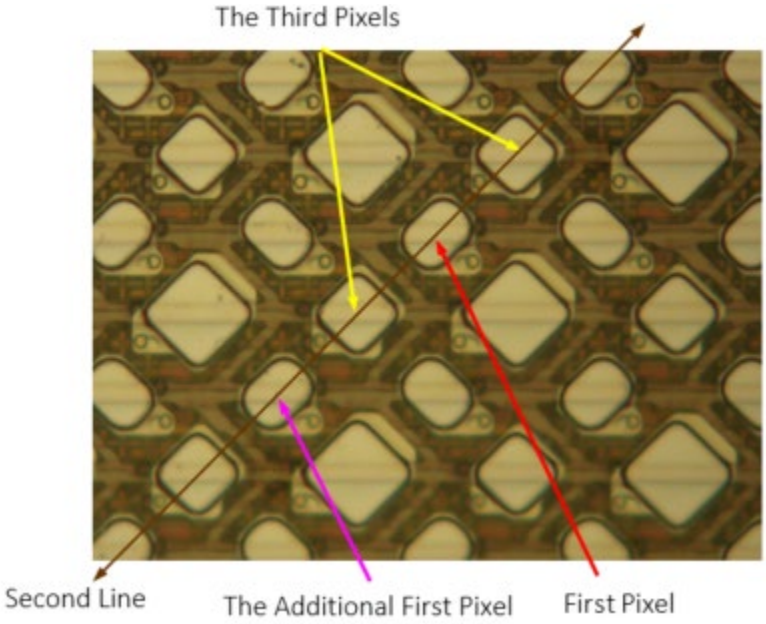


Figure 54

108. In the BOE OLED display panel, the second line is "crossing the first line at a location of the first pixel." As shown in the annotated image below (Fig. 55), the second line (brown) crosses the first line (black) at a location of the first pixel (red arrow).

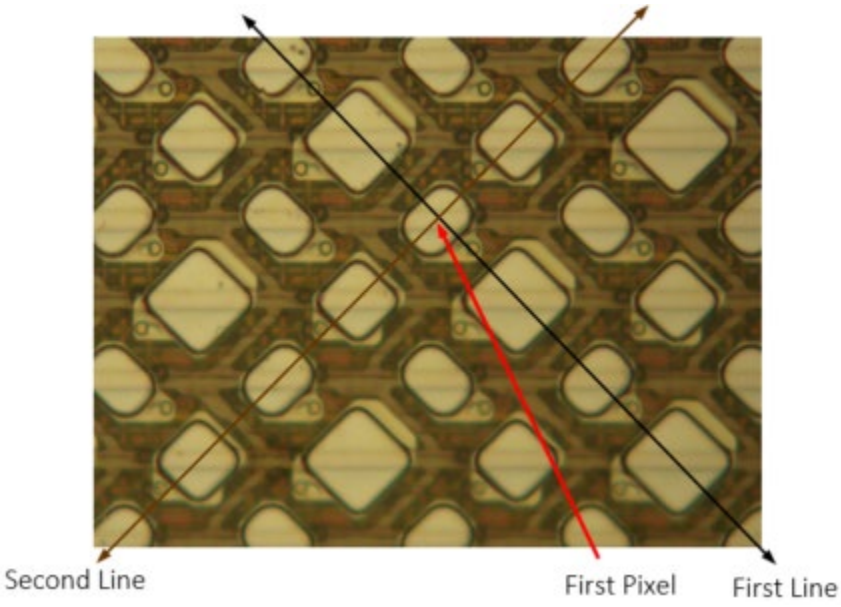


Figure 55

109. In the BOE OLED display panel, "a first distance between the second pixels is greater than a second distance between one of the second pixels and a neighboring one of the third pixels." As shown in the annotated image below (Fig. 56), a first distance (light green) between the second pixels (green arrows) of 78 micrometers is greater than a second distance (light blue) between one of the second pixels (green arrows) and a neighboring one of the third pixels (yellow arrows) of 55 micrometers.

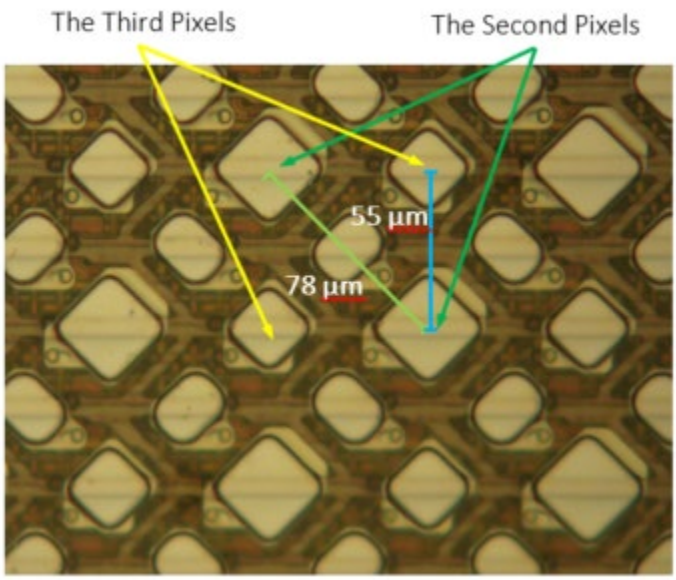


Figure 56

110. In the BOE OLED display panel, "the first pixels are configured to emit green light, which is a color that is different from light emitted by the second pixels and the third pixels." As shown in the annotated image below (Fig. 57), the first pixels (red arrows) emit green light, which is a color that is different from the blue light emitted by the second pixels (green arrows) and the red light emitted by the third pixels (yellow arrows).

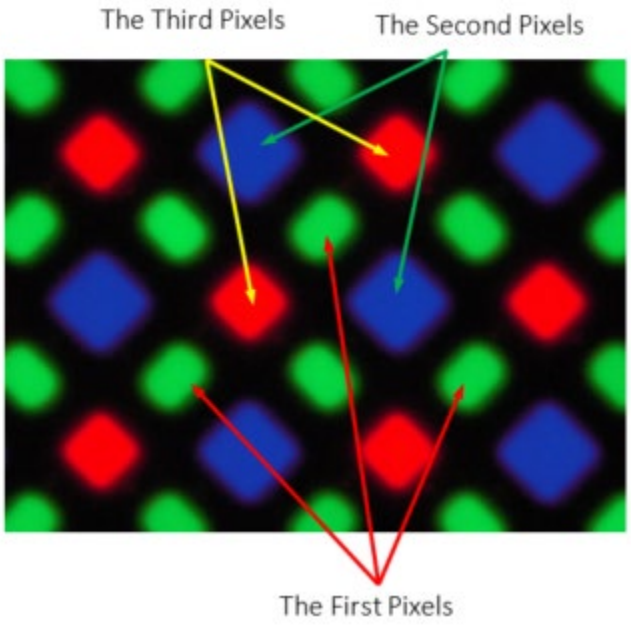


Figure 57

111. In the BOE OLED display panel, "the first pixels are smaller than at at least one of the second pixels or the third pixels." As shown in the annotated image below (Fig. 58), the first pixels (dotted red lines) are smaller than at least one of the second pixels (dotted green lines) or the third pixels (dotted yellow lines).

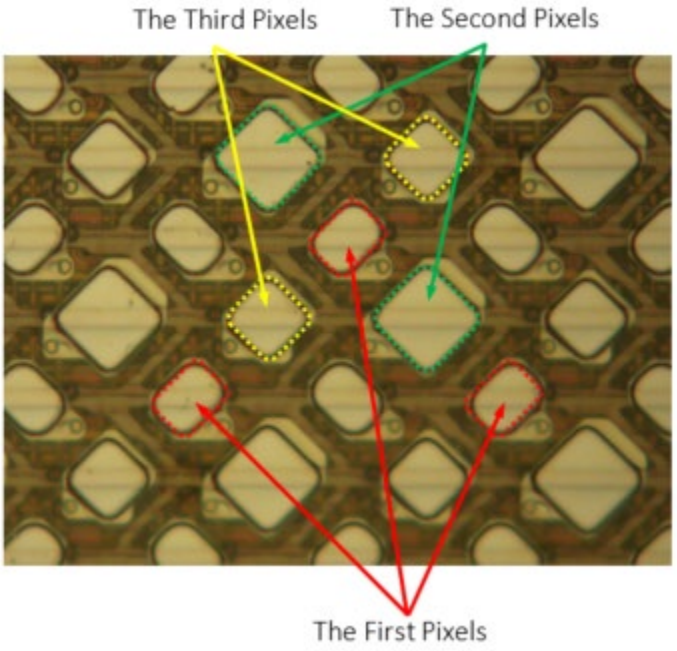


Figure 58

112. In the BOE OLED display panel, "each of the second pixels has a larger area than each of the third pixels." As shown in the annotated image below (Fig. 59), the area of each second pixel (dotted green lines) is larger than the area of each third pixel (dotted yellow lines).

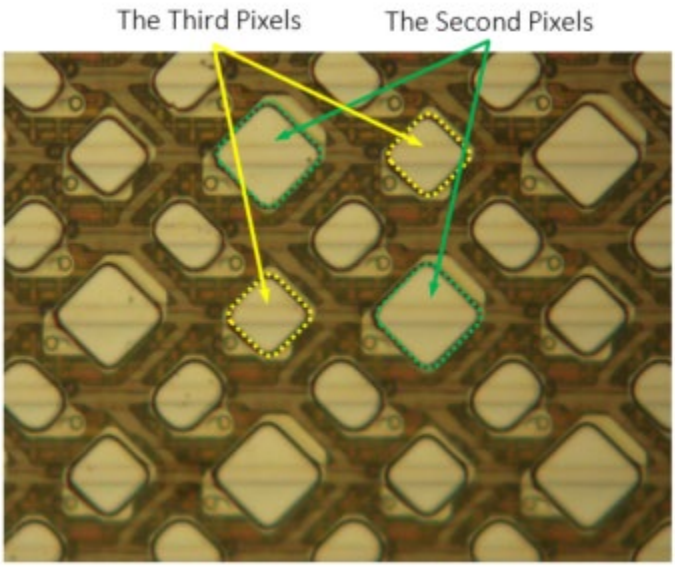


Figure 59

113. Upon information and belief, and as shown above in the example of the BOE displays used in the iPhone 12, the Accused Products meet every limitation of at least claim 1 of the '683 Patent.

114. By making, using, selling, offering for sale in, and/or importing into the United States the Accused Products, including the OLED displays used in iPhone 12 products, Defendants directly infringe at least claim 1 of the '683 Patent.

115. Upon information and belief, Defendants have induced infringement of the '683 Patent under 35 U.S.C. § 271(b) by knowingly and intentionally inducing others to directly infringe the '683 Patent. Despite having notice of the '683 Patent, Defendants have actively encouraged

others to infringe the patent. For example, upon information and belief, Defendants have knowingly and intentionally induced third-party manufacturers, shippers, distributors, and/or retailers to directly infringe (literally and/or under the doctrine of equivalents) the '683 Patent by importing into the United States, using, and/or selling and offering to sell in the United States products containing infringing BOE OLED displays. Defendants' OLED displays are specially designed to contain features that infringe the '683 Patent and the Accused Products have no substantial uses other than ones that infringe the '683 Patent. Upon information and belief, Defendants take active steps, directly and/or through contractual relationships with others, with the specific intent to cause such persons to import, use, sell, and/or or offer to sell products containing BOE OLED displays that infringe at least claim 1 of the '683 Patent. Upon information and belief, such steps by Defendants include, among other things, making or selling the Accused Products, including BOE OLED displays for iPhone 12 products, for importation into or sale in the United States, knowing that such importation or sale would occur. Defendants have engaged in these activities with knowledge of the '683 Patent and knowledge that the induced acts constitute infringement. Defendants' inducement of infringement of the '683 Patent is ongoing.

116. Upon information and belief, Defendants have also contributorily infringed the '683 Patent under 35 U.S.C. § 271(c) through their supply of the BOE OLED displays to customers that incorporate those OLED displays into other products, including the iPhone 12. The BOE OLED displays have no substantial non-infringing uses and are especially designed and made for use in devices that infringe the '683 Patent. Defendants have engaged in these activities despite having notice of the '683 Patent, and the OLED displays that Defendants have sold and/or provided to customers embody a material part of the claimed invention of at least claim 1 of the '683 Patent. Defendants' contributory infringement of the '683 Patent is ongoing.

117. Defendants' infringement has been, and continues to be, willful. For example, Defendants have been on notice of the '683 Patent and their infringement of the '683 Patent since at least their receipt of Samsung Display's May 2, 2022 notice letter and yet have continued their infringing activities.

118. Samsung Display has suffered, and will continue to suffer, irreparable harm as a result of Defendants' infringement of the '683 Patent for which there is no adequate remedy at law, unless Defendants' infringement is enjoined by this Court. Accordingly, Samsung Display seeks a permanent injunction enjoining Defendants from making, using, selling (including for importation), offering to sell (including for importation), and/or importing the Accused Products, and/or otherwise infringing, or inducing or contributing to the infringement of, the '683 Patent.

COUNT V – INFRINGEMENT OF U.S. PATENT NO. 11,594,578

119. Samsung Display hereby incorporates the allegations of Paragraphs 1 through 118 as fully set forth herein.

120. Upon information and belief, Defendants have infringed and continue to directly infringe the '578 Patent by making, using, selling, offering for sale in, and/or importing into the United States OLED displays for incorporation into the Accused Products, such as OLED displays incorporated into the iPhone 12 product.

121. Independent claim 1 of the '578 Patent recites:

1. A pixel arrangement structure of an organic light emitting diode (OLED) display, the pixel arrangement structure comprising a plurality of pixels comprising:

a plurality of first pixels;

a plurality of second pixels; and

a plurality of third pixels;

wherein the OLED display comprises a pixel defining layer defining areas of the first pixels, the second pixels, and the third pixels;

wherein the first pixels, the second pixels, and the third pixels are configured to emit different color lights;

wherein the first pixels are arranged in first sets extending along a first direction to form respective first lines;
wherein the second pixels and the third pixels are alternately arranged in second sets extending along the first direction to form respective second lines parallel to the first lines;

wherein one of the second lines passes through centers of the second pixels and the third pixels in a corresponding one of the second sets and passes between the first pixels in corresponding adjacent ones of the first sets;

wherein the first lines and the second lines are alternately arranged;

wherein the first pixels are also arranged in third sets extending along a second direction that is perpendicular to the first direction to form respective third lines;

wherein the second pixels and the third pixels are also alternately arranged in fourth sets extending along the second direction to form respective fourth lines that are parallel to the third lines;

wherein the third lines and the fourth lines are alternately arranged;

wherein the first pixels and either the second pixels or the third pixels are alternately arranged along a third direction, which crosses the first direction and the second direction;

wherein a region having a width in the second direction that is equal to a width of the first pixels in the second direction, extending parallel to the first direction, and completely overlapping a row of the first pixels extending in the first direction, is entirely offset in the second direction from at least one of the second pixels or the third pixels in at least one of rows of the second pixels and the third pixels adjacent to the row of the first pixels; and

wherein a shortest distance between two nearest ones of the first pixels in one of the first sets is greater than a shortest distance between one of the second pixels and one of the third pixels that are nearest each other in one of the second sets.

122. Upon information and belief, Apple iPhone 12 products that incorporate an OLED display supplied by Defendants meet each of the limitations of claim 1.

123. The images below (Figs. 60–62) are of an Apple iPhone 12 sold in Texas that, on information and belief, contains an OLED display supplied by Defendants.

Figure 60

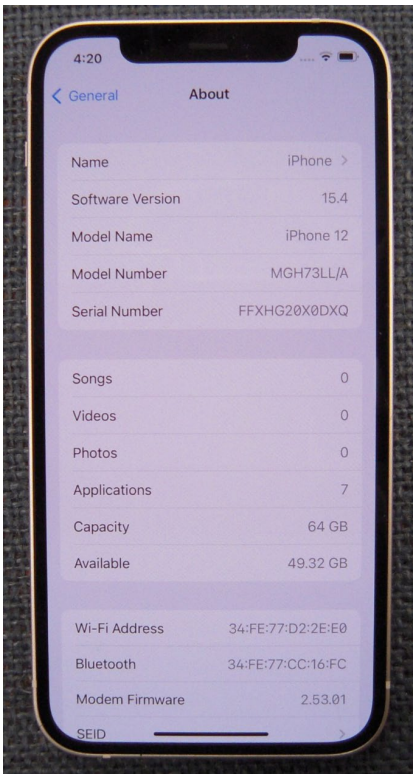


Figure 61

Figure 62

124. The BOE OLED display panel comprises a substrate that supports the OLED pixel elements that are visible through the glass panel as well as the circuitry that controls the operation of the OLED pixels. The BOE OLED display panel is mounted within the iPhone 12 chassis and is located behind a glass panel, and in the image below (Fig. 63), the display panel substrate can be seen.

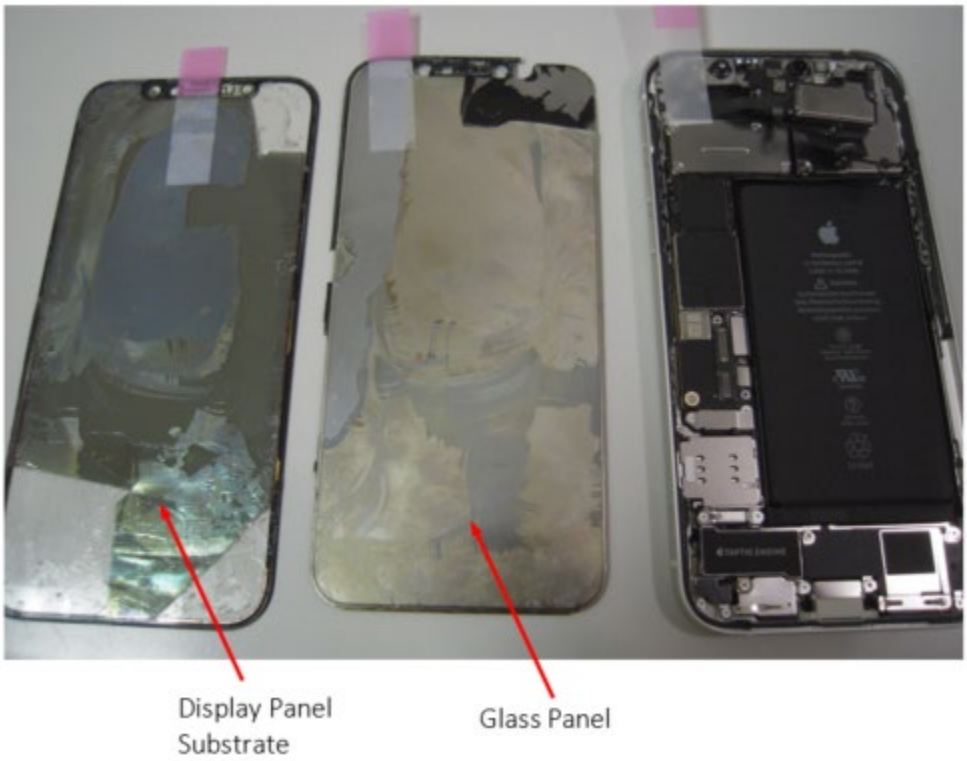


Figure 63

125. As shown in the image below (Fig. 64), the BOE OLED display contains a "pixel arrangement structure of an [OLED] display, the pixel arrangement structure comprising a plurality of pixels."

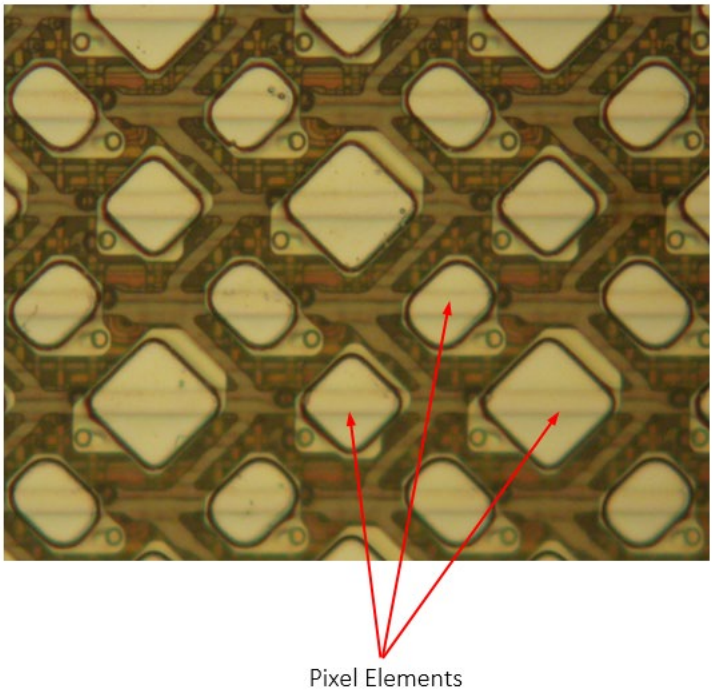


Figure 64

126. As shown in Figure 65 below, the BOE OLED display comprises a pixel arrangement structure comprising "a plurality of first pixels."

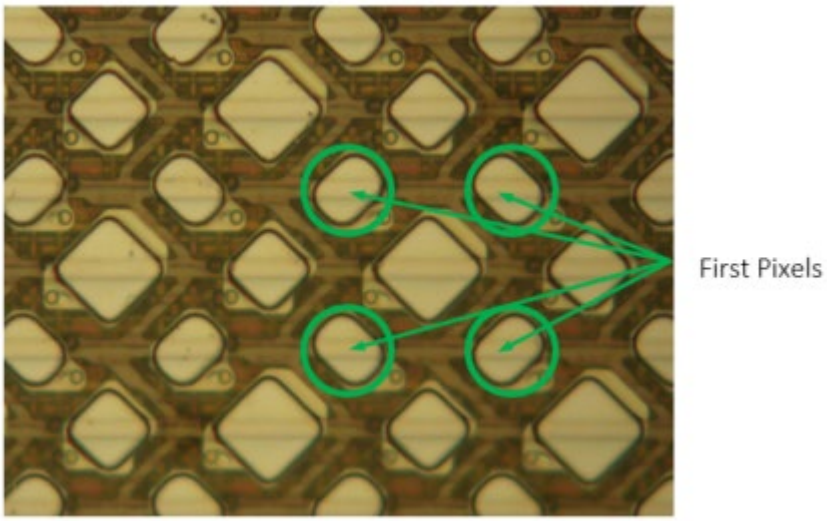
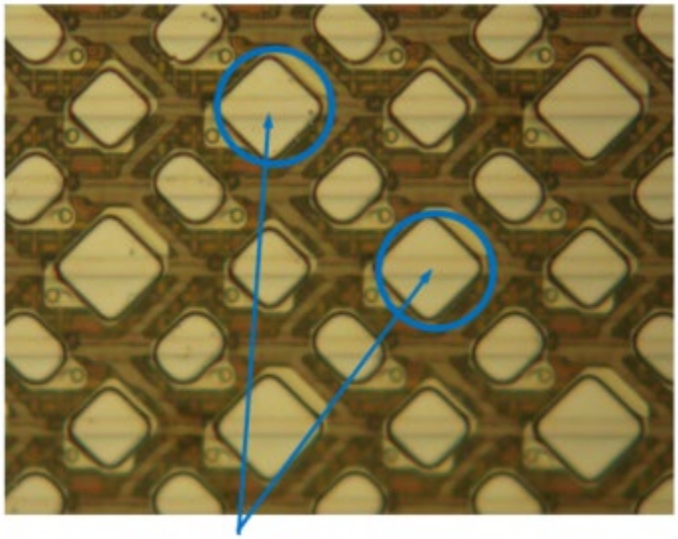


Figure 65

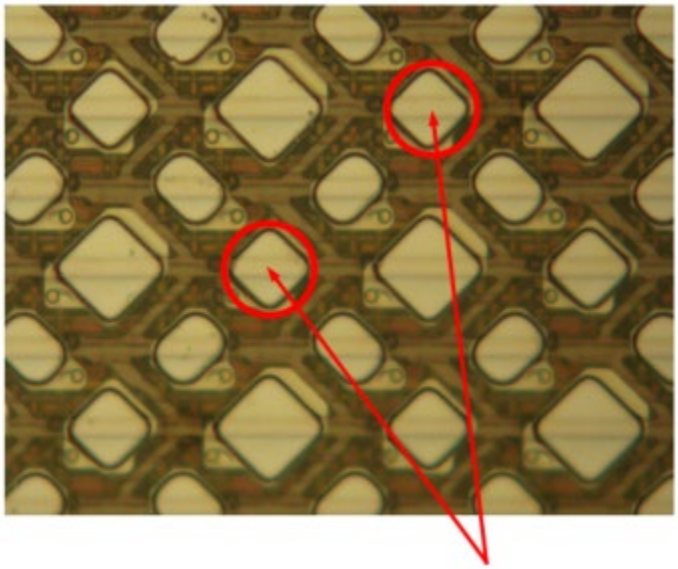
127. As shown in Figure 66 below, the BOE OLED display comprises a pixel arrangement structure comprising "a plurality of second pixels."



Second Pixels

Figure 66

128. As shown in Figure 67 below, the BOE OLED display comprises a pixel arrangement structure comprising "a plurality of third pixels."



Third Pixels

Figure 67

129. The BOE OLED display "comprises a pixel defining layer defining areas of the first pixels, the second pixels, and the third pixels." A pixel defining layer is formed to define the area of each pixel, as shown by the black boundaries surrounding each pixel in the image below (Fig. 68).

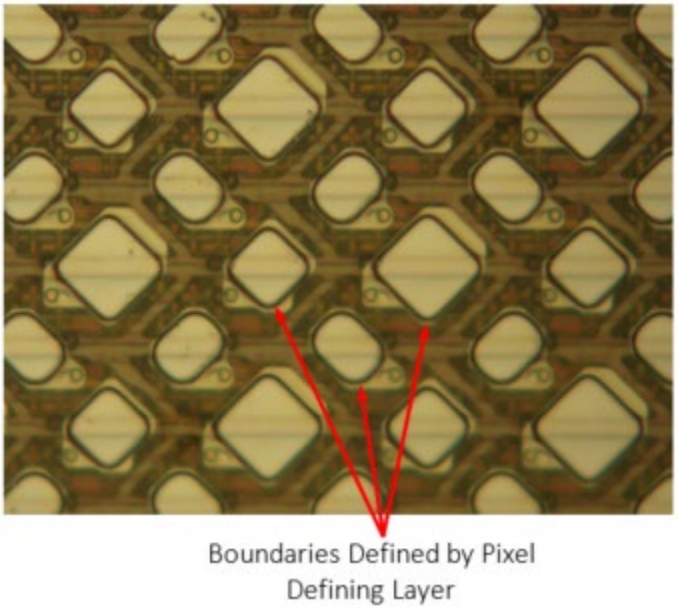


Figure 68

130. In the BOE OLED, "the first pixels, the second pixels, and the third pixels are configured to emit different color lights." As shown in the image below (Fig. 69), the first pixels (green arrows) are configured to emit green light, the second pixels (blue arrows) are configured to emit blue light, and the third pixels (red arrows) are configured to emit red light.

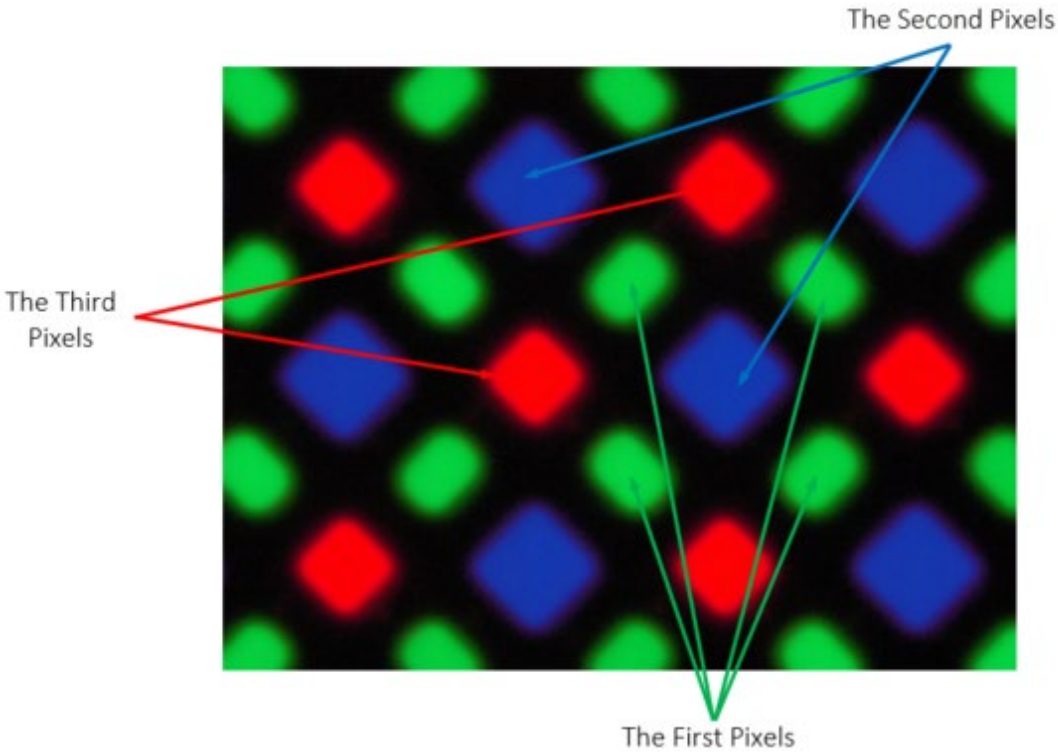


Figure 69

131. In the Mobile Defenders MDAP2715, "the first pixels are arranged in first sets extending along a first direction to form respective first lines." As shown in the image below (Fig. 70), the first pixels (green circles) are arranged in first sets extending along a first direction to form respective first lines (purple lines).

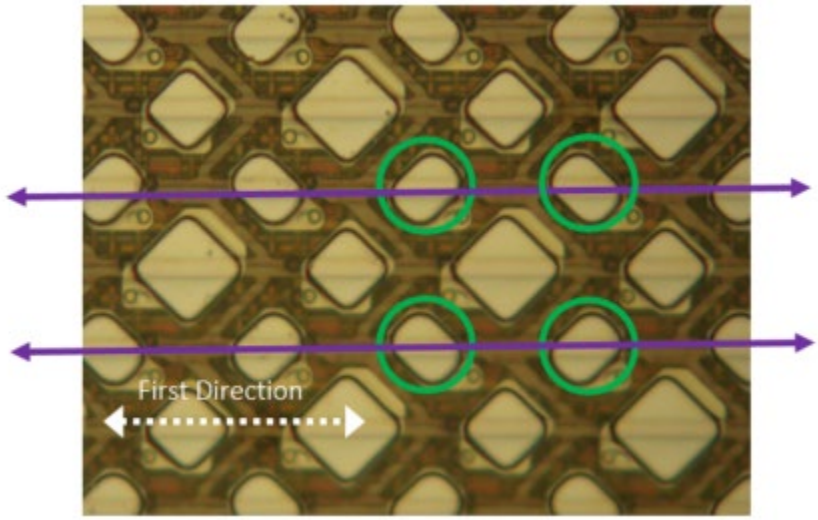


Figure 70

132. In the BOE OLED display, "the second pixels and the third pixels are alternately arranged in second sets extending along the first direction to form respective second lines parallel to the first lines." As shown in the image below (Fig. 71), the second pixels (blue circles) and the third pixels (red circles) are alternately arranged in second sets extending along the first direction to form respective second lines (orange lines) parallel to the first lines (purple lines).

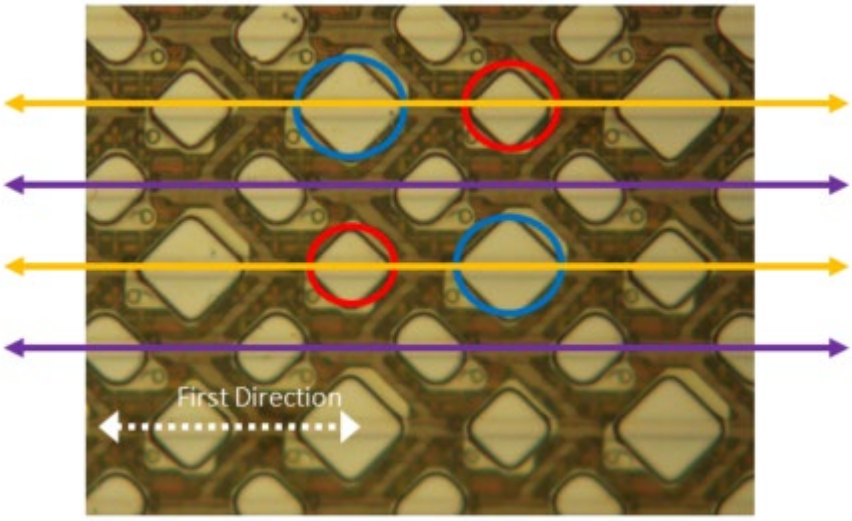


Figure 71

133. In the BOE OLED display, "one of the second lines passes through centers of the second pixels and the third pixels in a corresponding one of the second sets and passes between the first pixels in corresponding adjacent ones of the first sets." As shown in the image below (Fig. 72), one of the second lines (orange line) passes through centers of the second pixels and the third pixels in a corresponding one of the second sets (blue circle and red circle) and passes between the first pixels in corresponding adjacent ones of the first sets (green circles).

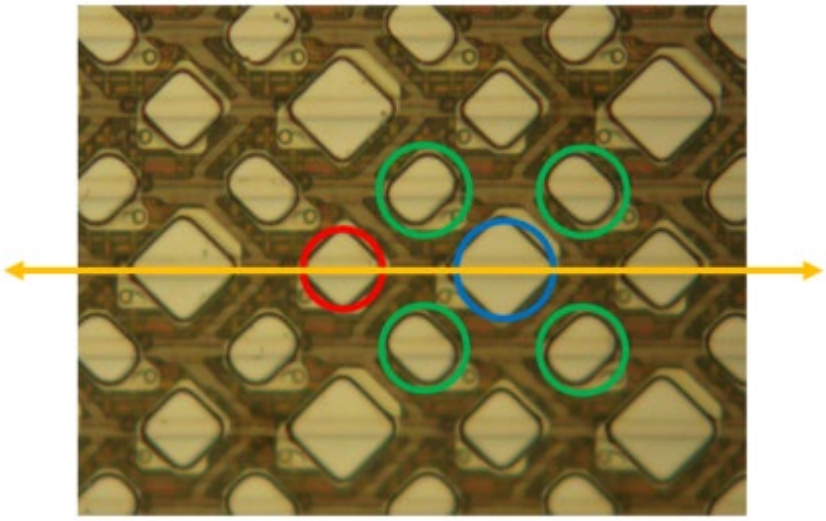


Figure 72

134. In the BOE OLED display panel, "the first lines and the second lines are alternately arranged." As shown in the image below (Fig. 73), the first lines (purple lines) and the second lines (orange lines) are alternately arranged.

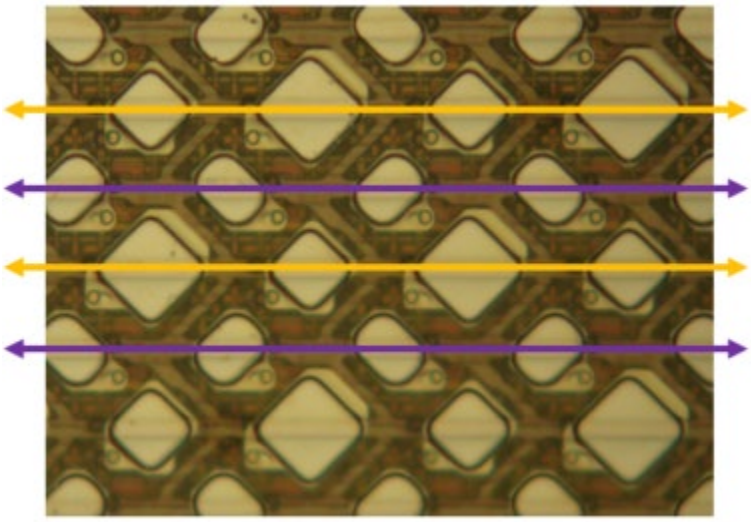


Figure 73

135. In the BOE OLED display panel, "the first pixels are also arranged in third sets extending along a second direction that is perpendicular to the first direction to form respective third lines." As shown in the image below (Fig. 74), the first pixels (green circles) are also arranged in third sets extending along a second direction that is perpendicular to the first direction to form respective third lines (pink lines).

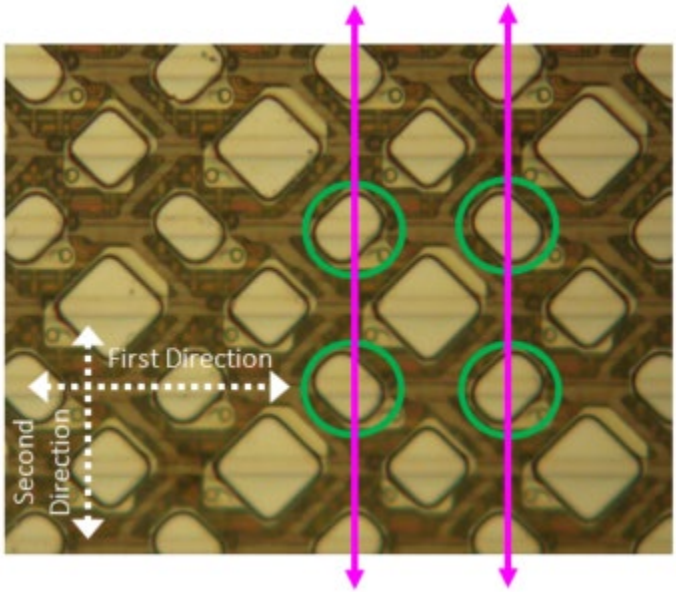


Figure 74

136. In the BOE OLED display panel, "the second pixels and the third pixels are also alternately arranged in fourth sets extending along the second direction to form respective fourth lines that are parallel to the third lines." As shown in the image below (Fig. 75), the second pixels (blue circles) and the third pixels (red circles) are also alternately arranged in fourth sets extending along the second direction to form respective fourth lines (yellow lines) that are parallel to the third lines (pink lines).

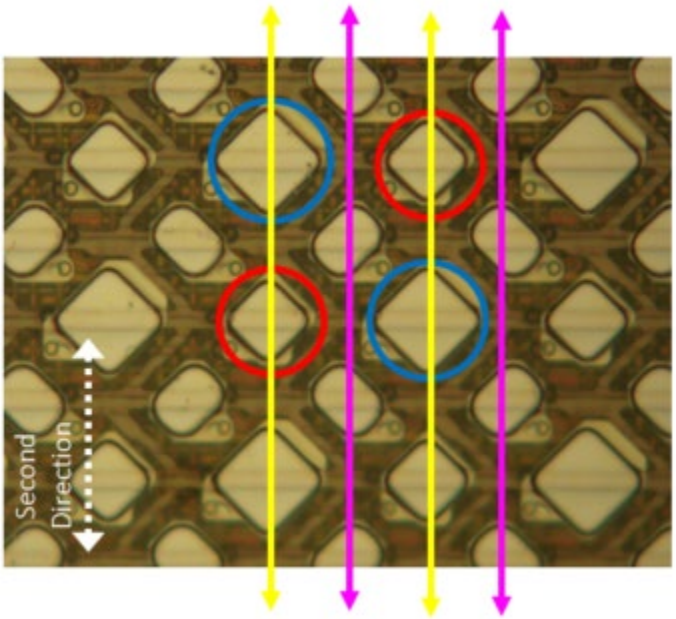


Figure 75

137. In the BOE OLED display panel, "the third lines and the fourth lines are alternately arranged." As shown in the image below (Fig. 76), the third lines (pink lines) and the fourth lines (yellow lines) are alternately arranged.

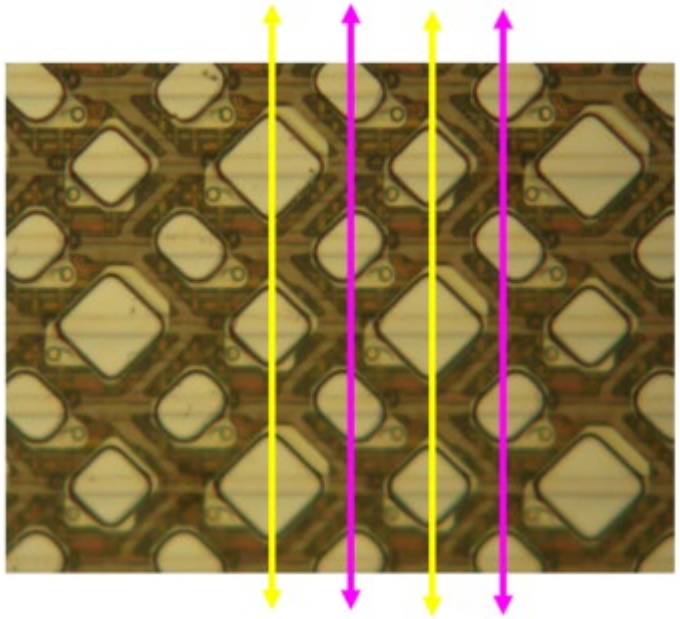


Figure 76

138. In the BOE OLED display panel, "the first pixels and either the second pixels or the third pixels are alternately arranged along a third direction, which crosses the first direction and the second direction." As shown in the image below (Fig. 77), the first pixels (green circles) and either the second pixels (blue circles) or the third pixels (red circles) are alternately arranged along a third direction, which crosses the first direction and the second direction.

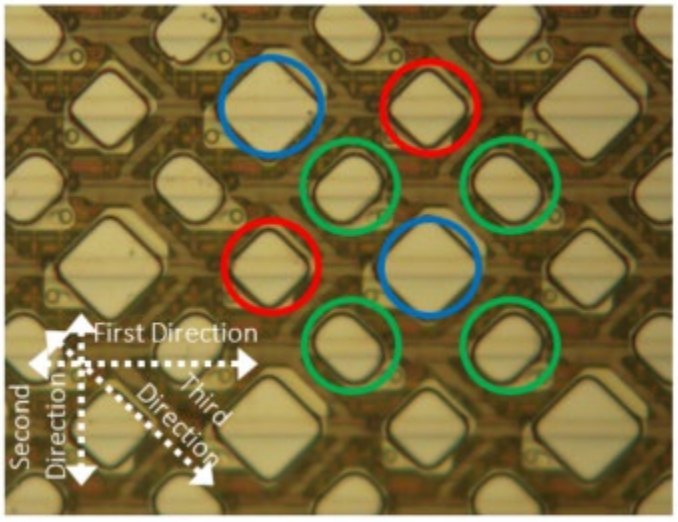


Figure 77

139. In the BOE OLED display panel, "a region having a width in the second direction that is equal to a width of the first pixels in the second direction, extending parallel to the first direction, and completely overlapping a row of the first pixels extending in the first direction, is entirely offset in the second direction from at least one of the second pixels or the third pixels in at least one of rows of the second pixels and the third pixels adjacent to the row of the first pixels." As shown in the image below (Fig. 78), a region (orange region) having a width in the second direction that is equal to a width of the first pixels in the second direction, extending parallel to the first direction, and completely overlapping a row of the first pixels extending in the first direction, is entirely offset in the second direction from at least one of the second pixels (blue circles) or the third pixels (red circles) in at least one of rows of the second pixels and the third pixels adjacent to the row of the first pixels.

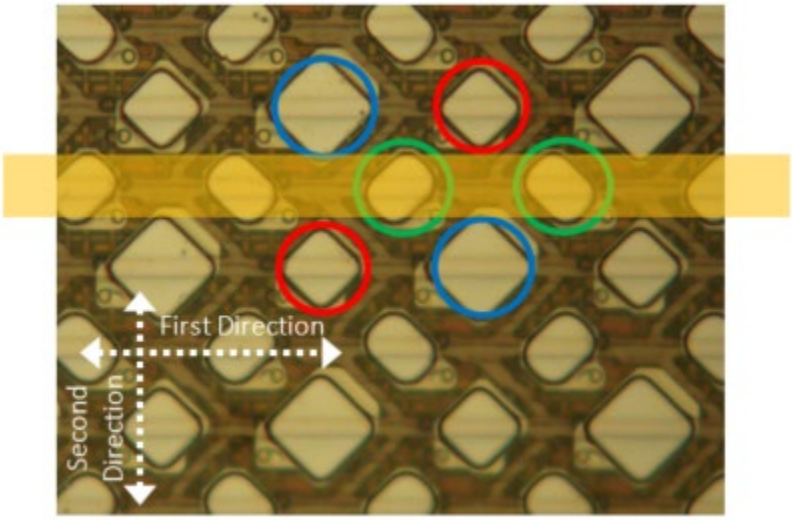


Figure 78

140. In the BOE OLED display panel, "a shortest distance between two nearest ones of the first pixels in one of the first sets is greater than a shortest distance between one of the second

pixels and one of the third pixels that are nearest each other in one of the second sets." As shown in the image below (Fig. 79), a shortest distance (light green) between two nearest ones of the first pixels in one of the first sets (green circles) of 32 micrometers is greater than a shortest distance (light blue) between one of the second pixels and one of the third pixels that are nearest each other in one of the second sets (blue circle and red circle) of 24 micrometers.

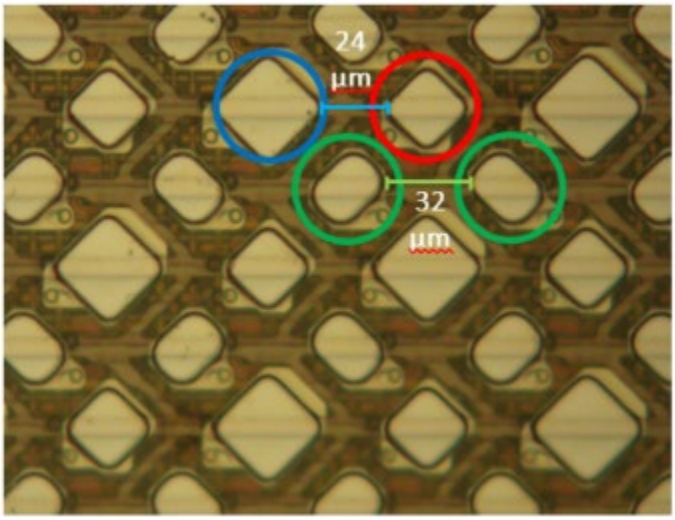


Figure 79

141. Upon information and belief, and as shown above in the example of the BOE displays used in the iPhone 12, the Accused Products meet every limitation of at least claim 1 of the '578 Patent.

142. By making, using, selling, offering for sale in, and/or importing into the United States the Accused Products, including the OLED displays used in iPhone 12 products, Defendants directly infringe at least claim 1 of the '578 Patent.

143. Upon information and belief, Defendants have induced infringement of the '578 Patent under 35 U.S.C. § 271(b) by knowingly and intentionally inducing others to directly infringe the '578 Patent. Despite having notice of the '578 Patent, Defendants have actively encouraged

others to infringe the patent. For example, upon information and belief, Defendants have knowingly and intentionally induced third-party manufacturers, shippers, distributors, and/or retailers to directly infringe (literally and/or under the doctrine of equivalents) the ’578 Patent by importing into the United States, using, and/or selling and offering to sell in the United States products containing infringing BOE OLED displays. Defendants’ OLED displays are specially designed to contain features that infringe the ’578 Patent and the Accused Products have no substantial uses other than ones that infringe the ’578 Patent. Upon information and belief, Defendants take active steps, directly and/or through contractual relationships with others, with the specific intent to cause such persons to import, use, sell, and/or or offer to sell products containing BOE OLED displays that infringe at least claim 1 of the ’578 Patent. Upon information and belief, such steps by Defendants include, among other things, making or selling the Accused Products, including BOE OLED displays for iPhone 12 products, for importation into or sale in the United States, knowing that such importation or sale would occur. Defendants have engaged in these activities with knowledge of the ’578 Patent and knowledge that the induced acts constitute infringement. Defendants’ inducement of infringement of the ’578 Patent is ongoing.

144. Upon information and belief, Defendants have also contributorily infringed the ’578 Patent under 35 U.S.C. § 271(c) through their supply of the BOE OLED displays to customers that incorporate those OLED displays into other products, including the iPhone 12. The BOE OLED displays have no substantial non-infringing uses and are especially designed and made for use in devices that infringe the ’578 Patent. Defendants have engaged in these activities despite having notice of the ’578 Patent, and the OLED displays that Defendants have sold and/or provided to customers embody a material part of the claimed invention of at least claim 1 of the ’578 Patent. Defendants’ contributory infringement of the ’578 Patent is ongoing.

145. Defendants' infringement has been, and continues to be, willful. For example, Defendants have been on notice of the '578 Patent and their infringement of the '578 Patent since at least March 10, 2023, when Samsung Display moved for leave to amend its ITC complaint to include claims for infringement of the recently issued '578 Patent, and yet have continued their infringing activities.

146. Samsung Display has suffered, and will continue to suffer, irreparable harm as a result of Defendants' infringement of the '578 Patent for which there is no adequate remedy at law, unless Defendants' infringement is enjoined by this Court. Accordingly, Samsung Display seeks a permanent injunction enjoining Defendants from making, using, selling (including for importation), offering to sell (including for importation), and/or importing the Accused Products, and/or otherwise infringing, or inducing or contributing to the infringement of, the '578 Patent.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff Samsung Display prays for relief as follows:

A. A judgment that each of the Defendants has willfully infringed, directly or indirectly, each of the Asserted Patents;

B. Compensatory damages in an amount commensurate with Defendants' infringement of the Asserted Patents, including without limitation lost profits and no less than a reasonable royalty;

C. Entry of a permanent injunction enjoining Defendants from making, using, selling (including for importation), offering to sell (including for importation), and/or importing the Accused Products, and/or otherwise infringing, or inducing or contributing to the infringement of, any of the Asserted Patents;

D. Pre-judgment interest on all damages awarded to Plaintiff;

E. Post-judgment interest on all sums awarded to Plaintiff from the date of the judgment;

F. An award of treble damages pursuant to 35 U.S.C. § 284;

G. An award of reasonable attorneys' fees pursuant to 35 U.S.C. § 285; and

H. Any and all other relief that the Court deems just and equitable.

JURY DEMAND

147. Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, Plaintiff hereby demands a jury trial on all issues raised by this complaint.

Dated: June 26, 2023

Respectfully submitted,

/s/ G. Blake Thompson

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