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DISPLAY PANEL AND DISPLAY DEVICE

Abstract

Provided are a display panel and a display device. The display panel includes a first display region, a second display region and a first function region. The second display region includes a first signal line extending in the second direction and including a first segment and a second segment that are separated by the first function region. The first display region includes a first display sub-region. The first display sub-region includes a third signal line extending in the second direction and electrically connected to the first segment and the second segment. In the same pixel circuit of the first display sub-region, the second signal line and the third signal line are located on the same side of a fourth signal line.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This is a continuation of U.S. patent application Ser. No. 18/091,745, filed on Dec. 30, 2022, which claims priority to Chinese Patent Application No. 202210773013.7 filed Jun. 30, 2022, the disclosure of which are incorporated herein by reference in their entireties.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of display technologies and, in particular, to a display panel and a display device.

BACKGROUND

[0003] In an existing display device, due to the need to integrate a front camera, a fingerprint recognition element and an infrared sensing element, holes are dug in the display panel to form a function region. External light can enter a photosensitive assembly located under the display panel through the function region on the display panel.

[0004] Since signal lines around the function region need to be correspondingly connected around the function region, a wider bezel needs to be disposed around the function region to provide sufficient winding space, affecting the screen-to-body ratio of the display panel and not satisfying the market demand for narrow bezel.

SUMMARY

[0005] The present disclosure provides a display panel and a display device to reduce the bezel area around the function region and increase the screen-to-body ratio.

[0006] According to an aspect of the present disclosure, a display panel is provided.

[0007] The display panel includes a first display region, a second display region and a first function region. The first display region is adjacent to the first function region in a first direction, and the second display region is adjacent to the first function region in a second direction, where the first direction intersects the second direction. The second display region includes a first signal line extending in the second direction, the first signal line is configured to supply a first type of signal to a pixel circuit of the second display region, and the first signal line includes a first segment and a second segment that are separated by the first function region. The first display region includes a first display sub-region. The first display sub-region includes a second signal line and a third signal line that extend in the second direction, the second signal line is configured to supply the first type of signal to a pixel circuit of the first display sub-region, and the third signal line is electrically connected to the first segment and the second segment. The display panel further includes a fourth signal line extending in the second direction and configured to transmit a second type of signal. In a same pixel circuit of the first display sub-region, the second signal line and the third signal line are located on a same side of the fourth signal line.

[0008] According to another aspect of the present disclosure, a display device is provided and includes the display panel described in the first aspect.

[0009] It is to be understood that the contents described in this part are not intended to identify key or important features of the embodiments of the present disclosure and are not intended to limit the

scope of the present disclosure. Other features of the present disclosure will become readily understood through the description hereinafter.

Description

BRIEF DESCRIPTION OF DRAWINGS

[0010] To illustrate solutions in embodiments of the present disclosure more clearly, the drawings used in description of the embodiments will be briefly described below. Apparently, the drawings described below illustrate part of embodiments of the present disclosure, and those of ordinary skill in the art may obtain other drawings based on the drawings described below on the premise that no creative work is done.

[0011] FIG. 1 is a diagram illustrating the structure of a display panel according to embodiments of the present disclosure.

[0012] FIG. 2 is an enlarged view of the structure of part A of FIG. 1.

[0013] FIG. 3 is a diagram illustrating the structure of another display panel according to embodiments of the present disclosure.

[0014] FIG. 4 is an enlarged view of the structure of part B of FIG. 3.

[0015] FIG. 5 is a partial view of the structure of a display panel according to embodiments of the present disclosure.

[0016] FIG. 6 is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0017] FIG. 7 is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0018] FIG. 8 is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0019] FIG. 9 is a diagram illustrating the layout structure of a pixel circuit group according to embodiments of the present disclosure.

[0020] FIG. 10 is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0021] FIG. 11 is a partial section view of the structure of a display panel according to embodiments of the present disclosure.

[0022] FIG. 12 is a partial section view of the structure of another display panel according to embodiments of the present disclosure.

[0023] FIG. 13 is a diagram illustrating the structure of a pixel circuit according to embodiments of the present disclosure.

[0024] FIG. 14 is a partial section view of the structure of another display panel according to embodiments of the present disclosure.

[0025] FIG. 15 is a partial section view of the structure of another display panel according to embodiments of the present disclosure.

[0026] FIG. 16 is a partial section view of the structure of another display panel according to embodiments of the present disclosure.

[0027] FIG. 17 is a partial section view of the structure of another display panel according to embodiments of the present disclosure.

[0028] FIG. 18 is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0029] FIG. 19 is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0030] FIG. 20 is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0031] FIG. **21** is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0032] FIG. **22** is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0033] FIG. **23** is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0034] FIG. **24** is a partial section view of the structure of another display panel according to embodiments of the present disclosure.

[0035] FIG. **25** is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0036] FIG. **26** is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0037] FIG. **27** is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0038] FIG. **28** is a partial view of the structure of another display panel according to embodiments of the present disclosure.

[0039] FIG. **29** is a partial section view of the structure of another display panel according to embodiments of the present disclosure.

[0040] FIG. **30** is a diagram illustrating the structure of a display device according to embodiments of the present disclosure.

DETAILED DESCRIPTION

[0041] The solutions in embodiments of the present disclosure will be described clearly and completely in conjunction with the drawings in the embodiments of the present disclosure from which the solutions will be better understood by those skilled in the art. Apparently, the embodiments described below are part, not all, of the embodiments of the present disclosure. Based on the embodiments described herein, all other embodiments obtained by those skilled in the art are within the scope of the present disclosure on the premise that no creative work is done.

[0042] It is to be noted that the terms “first”, “second” and the like in the description, claims and drawings of the present disclosure are used for distinguishing between similar objects and are not necessarily used for describing a particular order or sequence. It is to be understood that the data used in this way is interchangeable where appropriate so that the embodiments of the present disclosure described herein may also be implemented in a sequence not illustrated or described herein. In addition, terms “comprising”, “including” and any other variations thereof are intended to encompass a non-exclusive inclusion. For example, a process, method, system, product or device that includes a series of steps or units not only includes the expressly listed steps or units, but may also include other steps or units that are not expressly listed or are inherent to such process, method, product or device.

[0043] FIG. **1** is a diagram illustrating the structure of a display panel according to embodiments of the present disclosure. FIG. **2** is an enlarged view of the structure of part A of FIG. **1**. As shown in FIG. **1** and FIG. **2**, the display panel according to this embodiment of the present disclosure includes a first display region **10**, a second display region **11** and a first function region **12**. The first display region **10** is adjacent to the first function region **12** in the first direction X. The second display region **11** is adjacent to the first function region **12** in the second direction Y. The first direction X intersects the second direction Y. The second display region **11** includes a first signal line **13** extending in the second direction Y, the first signal line is configured to supply the first type of signal to a pixel circuit **14** of the second display region **11**, and the first signal line includes a first segment **131** and a second segment **132** that are separated by the first function region **12**. The first display region **10** includes a first display sub-region **101** including a second signal line **15** and a third signal line **16** that extend in the second direction Y. The second signal line **15** is configured to supply the first type of signal to a pixel circuit **14** of the first display sub-region **101**. The third

signal line **16** is electrically connected to the first segment **131** and the second segment **132**. The display panel further includes a fourth signal line **17** extending in the second direction Y and configured to transmit the second type of signal. In the same pixel circuit **14** of the first display sub-region **101**, the second signal line **15** and the third signal **16** are located on the same side of the fourth signal line **17**.

[0044] Specifically, as shown in FIG. 1 and FIG. 2, the first function region **12** is configured to place a photosensitive element. The photosensitive element may be, but is not limited to, a camera, a light sensor, a distance sensor, a depth sensor, an iris recognition sensor, or an infrared sensor.

[0045] Optionally, the first function region **12** may be a non-display region. That is, the first function region **12** does not emit light to reduce the effect on the use performance of the photosensitive element.

[0046] In addition, the first function region **12** may be a rectangular region, a circular region, or an elliptical region. The position of the first function region **12** may be disposed on any side of the display panel. Those skilled in the art may configure the shape and the position of the first function region **12** according to actual needs. This is not limited in this embodiment of the present disclosure.

[0047] With continued reference to FIG. 1 and FIG. 2, the first display region **10** and the second display region **11** are disposed around the first function region **12**. The first display region **10** and the second display region **11** include multiple pixel circuits **14** and multiple light-emitting elements (not shown) that are arranged in an array. The multiple pixel circuits **14** are in one-to-one correspondence with the multiple light-emitting elements. A pixel circuit **14** is configured to drive a corresponding light-emitting element to emit light so that the display function can be fulfilled.

[0048] The first display region **10** and the second display region **11** are provided with signal lines electrically connected to the multiple pixel circuits **14**. The signal lines may include a data signal line, a scan signal line, a light emission control signal line, a reference voltage signal line and a power signal line so that the multiple pixel circuits **14** can be provided with various types of signals required for driving the multiple light-emitting elements to emit light.

[0049] Specifically, as shown in FIG. 1 and FIG. 2, a part of the first display region **10** is divided as the first display sub-region **101**, the first display sub-region **101** is provided with the second signal line **15** extending in the second direction Y, and the second signal line is configured to supply the first type of signal to the pixel circuit **14** of the first display sub-region **101**. Since the first display region **10** is adjacent to the first function region **12** in the first direction X (a direction intersecting the second direction Y), the second signal lines **15** are not separated by the first function region **12** and are continuous wires.

[0050] In the second display region **11**, the first signal line **13** extending in the second direction Y is provided for supplying the first type of signal to the pixel circuit **14** of the second display region **11**. Since the second display region **11** is adjacent to the first function region **12** in the second direction Y, the first signal line **13** is separated into the first segment **131** and the second segment **132** by the first function region **12**.

[0051] In this embodiment, to supply the first type of signal to the pixel circuit **14** electrically connected to the same first signal line **13**, the first display sub-region **101** is provided with the third signal line **16** extending in the second direction Y, by which the first segment **131** and the second segment **132** that are separated in the same first signal line **13** are connected. The first segment **131** and the second segment **132** that are separated by the first function region **12** in the first signal line **13** are connected by the third signal line **16** disposed in the first display sub-region **101**, and the first signal line **13** does not need to be wound from the bezel position of the first function region **12** so that the number of signal lines in the bezel position of the first function region **12** can be reduced, the bezel area of the first function region **12** can thereby be reduced, and the screen-to-body ratio of the display panel can thereby be increased.

[0052] The first signal line **13** and the second signal line **15** may be each any one of a data signal

line, a scan signal line, a light emission control signal line, a reference voltage signal line, or a power signal line. That is, the first type of signal may be any one of a data signal, a scan signal, a light emission control signal, a reference voltage signal, or a power signal. This is not limited in this embodiment of the present disclosure.

[0053] With continued reference to FIG. 1 and FIG. 2, the display panel further includes a fourth signal line **17** extending in the second direction Y and configured to transmit the second type of signal. The second type of signal may also be any one of a data signal, a scan signal, a light emission control signal, a reference voltage signal or a power signal but different from the first type of signal.

[0054] In the same pixel circuit **14** of the first display sub-region **101**, the second signal line **15** and the third signal line **16** are located on the same side of the fourth signal line **17**. That is, among the second signal line **15**, the third signal line **16** and the fourth signal line **17** that correspond to the same pixel circuit **14**, the second signal line **15** and the third signal line **16** are collectively placed on the same side of the fourth signal line **17** so that the distance between the second signal line **15** and the third signal line **16** can be closer. With this configuration, parasitic capacitances between other metal films or other signal nodes in the pixel circuit **14** and the second signal line **15** and the third signal line **16** can be at a similar level so that the loss difference between the first type of signals transmitted on the second signal line **15** and on the third signal line **16** can be reduced, thereby helping improve the display uniformity.

[0055] Optionally, the first type of signal and the second type of signal are each an alternating current signal.

[0056] The second signal line **15** corresponding to the pixel circuit **14** means the second signal line **15** connected to the pixel circuit **14**. The fourth signal line **17** corresponding to the pixel circuit **14** means the fourth signal line **17** connected to the pixel circuit **14**. The third signal line **16** corresponding to the pixel circuit **14** means the third signal line **16** overlapping the pixel circuit **14** or closest to the pixel circuit **14**.

[0057] It is to be noted that FIG. 1 and FIG. 2 show an example in which the first display region **10** includes only one first display sub-region **101** located on only one side of the second display region **101**. This is not limited thereto.

[0058] In addition, to illustrate various signal lines more clearly, the fourth signal line **17** is bolded in some drawings of the present disclosure. That is, in some drawings, the fourth signal line **17** is denoted as a thicker line segment, and the remaining thinner segment is used for transmitting the first type of signal, which does not limit the protection scope of the present disclosure.

[0059] FIG. 3 is a diagram illustrating the structure of another display panel according to embodiments of the present disclosure. FIG. 4 is an enlarged view of the structure of part B of FIG. 3. As shown in FIG. 3 and FIG. 4, optionally, the first display region **10** includes two first display sub-regions **101** located on two sides of the second display region **11** respectively so that the connection distance between the third signal line **16** and the first signal line **13** can be reduced, thereby reducing the transmission loss of the first type of signal.

[0060] In other embodiments, the first display region **10** may further include more first display sub-regions **101**. The number and the positions of the first display sub-regions **101** may be disposed according to actual needs and are not limited in this embodiment of the present disclosure.

[0061] In conclusion, in the display panel according to this embodiment of the present disclosure, the first display region **10** is provided with the first display sub-region **101**, and the first display sub-region **101** is added with the third signal line **16** by which the first segment **131** and the second segment **132** that are separated by the first function region **12** in the first signal line **13** in the second display region **11** are connected so that the first type of signal can be supplied to the pixel circuit **14** electrically connected to the same first signal line **13**. Meanwhile, the first segment **131** and the second segment **132** are connected by the third signal line **16** disposed in the first display sub-region **101**. Compared with the related art in which the first signal line **13** is wound from the

bezel position of the first function region **12**, this arrangement has the following effects: The number of signal lines in the bezel position of the first function region **12** can be reduced, the bezel area of the first function region **12** can thereby be reduced, and the screen-to-body ratio of the display panel can thereby be increased.

[0062] Further, with the configuration in which the second signal line **15** and the third signal line **16** are located on the same side of the fourth signal line **17** in the same pixel circuit **14** of the first display sub-region **101**, the second signal line **15** and the third signal line **16** can be collectively placed so that parasitic capacitances between other metal films or other signal nodes in the pixel circuit **14** and the second signal line **15** and the third signal line **16** can be at a similar level, and the loss difference between the data signals transmitted on the second signal line **15** and on the third signal line **16** can be reduced, thereby helping improve the display uniformity.

[0063] With continued reference to FIG. **1** and FIG. **2**, optionally, the fourth signal line **17** is a first power signal line **18**, and the second type of signal is a first power signal.

[0064] Specifically, the first power signal line **18** is configured to supply the first power signal to the pixel circuit **14**. The first power signal is a direct current signal instead of an alternating current (AC) signal, so the first power signal line **18** can supply a constant voltage to the pixel circuit **14**. The first power signal line **18** may be, for example, a PVDD signal line or a PVEE signal line. This is not limited in this embodiment of the present disclosure.

[0065] In this embodiment, the second signal line **15** and the third signal line **16** are located on the same side of the first power signal line **18** in the same pixel circuit **14** of the first display sub-region **101**. That is, among the second signal line **15**, the third signal line **16** and the first power signal line **18** that correspond to the same pixel circuit **14**, the second signal line **15** and the third signal line **16** are collectively placed on the same side of the first power signal line **18** so that the distance between the second signal line **15** and the third signal line **16** can be closer. With this configuration, parasitic capacitances between other metal films or other signal nodes in the pixel circuit **14** and the second signal line **15** and the third signal line **16** can be at a similar level so that the loss difference between the data signals transmitted on the second signal line **15** and on the third signal line **16** can be reduced, thereby helping improve the display uniformity.

[0066] With continued reference to FIG. **1** and FIG. **2**, optionally, the second signal line **15**, the third signal line **16** and the fourth signal line **17** overlap the pixel circuit **14** of the first display sub-region **101** in the thickness direction of the display panel.

[0067] Specifically, as shown in FIG. **1** and FIG. **2**, the vertical projections of the second signal line **15**, the third signal line **16** and the fourth signal line **17** on the plane on which the display panel is located overlap the vertical projection of the pixel circuit **14** on the plane on which the display panel is located so that the second signal line **15**, the third signal line **16** and the fourth signal line **17** do not need to occupy additional space, thereby improving the pixel density of the display panel and the display effect.

[0068] It is to be noted that the pixel circuit **14** includes multiple transistors, multiple transistors of the same pixel circuit **14** are generally disposed collectively, and the multiple transistors may be regarded as an integral transistor combination structure. In this present disclosure, that the vertical projections of signal lines on the plane on which the display panel is located overlap the vertical projection of the pixel circuit **14** on the plane on which the display panel is located means that the vertical projections of the signal lines on the plane on which the display panel is located overlap the vertical projection of a transistor combination structure of the pixel circuit **14** on the plane on which the display panel is located. That is, the vertical projections of the signal lines on the plane on which the display panel is located overlap the vertical projection of at least one transistor of the pixel circuit **14** on the plane on which the display panel is located, which is not repeated hereafter.

[0069] The multiple transistors may include, but are not limited to, a first light emission control transistor, a data signal write transistor, a drive transistor, a compensation transistor, a first reset transistor, a second light emission control transistor and a light emission reset transistor.

[0070] In addition, as shown in FIG. 1 and FIG. 2, the third signal line **16** overlaps the pixel circuit **14** of the first display sub-region **101** in the thickness direction of the display panel, but the third signal line **16** is not electrically connected to the pixel circuit **14** of the first display sub-region **101**. That is, the third signal line **16** and the pixel circuit **14** overlapping the third signal line **16** are insulated from each other so that the mutual interference between the third signal line **16** and the pixel circuit **14** of the first display sub-region **101** can be reduced.

[0071] FIG. 5 is a partial view of the structure of a display panel according to embodiments of the present disclosure. As shown in FIG. 5, optionally, the second signal line **15** and the third signal line **16** may also be located in the first display sub-region **101**. With this configuration, parasitic capacitances can be prevented from being formed between the first signal line **13** and the second signal line **15** and each metal film in the pixel circuit **14** so that the effect of the first signal line **13** and the second signal line **15** on the performances of the pixel circuit **14** can be reduced.

[0072] Similarly, in other embodiments, the fourth signal line **17** may also be located between two adjacent pixel circuits **14** in the first display sub-region **101** to prevent parasitic capacitances from being formed between the first signal line **13** and the second signal line **15** and each metal film in the pixel circuits **14** and reduce the effect of the first signal line **13** and the second signal line **15** on the performances of the pixel circuits **14**. This is not limited in this embodiment of the present disclosure.

[0073] As described in the preceding, in the present disclosure, a signal line located between the two adjacent pixel circuits **14** means that the signal line is located between transistor combination structures of the two adjacent pixel circuits **14**. That is, the vertical projection of the signal line on the plane on which the display panel is located does not overlap the vertical projections of the transistors of the two adjacent pixel circuits **14** on the plane on which the display panel is located. This is not repeated here.

[0074] With continued reference to FIGS. 1 to 5, optionally, in the same pixel circuit **14**, the third signal line **16** is located on one side of the second signal line **15** facing the fourth signal line **17**, or the third signal line **16** is located on one side of the second signal line **15** facing away from the fourth signal line **17**.

[0075] Exemplarily, as shown in FIGS. 1 to 5, among the second signal line **15**, the third signal line **16** and the fourth signal line **17** that correspond to the same pixel circuit **14**, the third signal line **16** may be located on one side of the second signal line **15** facing away from the fourth signal line **17** so that the connection distance between the second signal line **15** and the pixel circuit **14** can be reduced, thereby helping reduce the transmission loss of the first type of signal.

[0076] FIG. 6 is a partial view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIG. 6, exemplarily, among the second signal line **15**, the third signal line **16** and the fourth signal line **17** that correspond to the same pixel circuit **14**, the third signal line **16** may also be located on one side of the second signal line **15** facing the fourth signal line **17** so that the flexibility in the design of the third signal line **16** can be improved, thereby matching the third signal line **16** and the pixel circuit **14**. For example, when there is a larger distance between the second signal line **15** and the fourth signal line **17** in the pixel circuit **14**, the third signal line **16** may be disposed between the second signal line **15** and the fourth signal line **17** so that the pixel density of the display panel can be improved.

[0077] FIG. 7 is a partial view of the structure of another display panel according to embodiments of the present disclosure. FIG. 8 is a partial view of the structure of another display panel according to embodiments of the present disclosure. FIG. 9 is a diagram illustrating the layout structure of a pixel circuit group according to embodiments of the present disclosure. As shown in FIGS. 7 to 9, optionally, the display panel according to this embodiment of the present disclosure includes a pixel circuit group **19**. The pixel circuit group **19** includes a first pixel circuit **20** and a second pixel circuit **21**. The first pixel circuit **20** and the second pixel circuit **21** are adjacent to each other in the first direction and are arranged in a mirror-image.

[0078] Specifically, as shown in FIGS. 7 to 9, pixel circuits **14** are divided into multiple pixel circuit groups **19**, and a pixel circuit group **19** includes two adjacent pixel circuits **14** that are a first pixel circuit **20** and a second pixel circuit **21**. With the configuration in which the first pixel circuit **20** and the second pixel circuit **21** are in a mirror-image arrangement, when the first pixel circuit **20** and the second pixel circuit **21** are connected to part of signal lines, the first pixel circuit **20** and the second pixel circuit **21** can share the same one connection through hole so that the number of punching holes can be reduced, thereby helping improve the transmittance of the display panel. In this manner, when the display panel is provided with such a photosensitive element as an under-screen fingerprint recognition module, the use performance of the photosensitive element can be improved.

[0079] Exemplarily, as shown in FIG. 9, connection through holes C1, C2, C3 and C4 are the connection through holes respectively between the pixel circuit **14** and the corresponding signal lines. If the first pixel circuit **20** and the second pixel circuit **21** are not in a mirror-image arrangement, the first pixel circuit **20** needs to be provided with a group of connection through holes C1, C2, C3 and C4, and the second pixel circuit **21** also needs to be provided with a group of connection through holes C1, C2, C3 and C4. That is, one pixel circuit group **19** needs to be provided with two groups of connection through holes C1, C2, C3 and C4. In this embodiment, with the configuration in which the first pixel circuit **20** and the second pixel circuit **21** are in a mirror-image arrangement, the first pixel circuit **20** and the second pixel circuit **21** can share the same one group of connection through holes C1, C2, C3 and C4 so that the configuration of one group of connection through holes C1, C2, C3 and C4 can be saved. One pixel circuit group **19** can satisfy the potential requirement of the first pixel circuit **20** and the second pixel circuit **21** by being provided with only one group of connection through holes C1, C2, C3 and C4 so that the transmittance of the display panel can be improved.

[0080] It is to be noted that the first pixel circuit **20** and the second pixel circuit shown in FIG. 9 share the connection through hole C1 and C2, and the connection through holes C3 and C4 marked in the second pixel circuit **21** are shared by the second pixel circuit **21** shown in FIG. 9 and a first pixel circuit **20** (not shown) adjacent to the right side of the second pixel circuit **21** shown in FIG. 9. It is to be understood that when two adjacent pixel circuits **14** are in a mirror-image arrangement, the number of connection through holes can be reduced at the junction of the two adjacent pixel circuits **14** by sharing the connection through holes so that the transmittance of the display panel can be improved.

[0081] It is to be noted that as shown in FIG. 9, the second signal line **15** and the third signal line **16** are located on the same side of the fourth signal line **17** in the same pixel circuit **14** of the first display sub-region **101**, that is, among the second signal line **15**, the third signal line **16** and the fourth signal line **17** that correspond to the same pixel circuit **14**, the second signal line **15** and the third signal line **16** are collectively placed on the same side of the fourth signal line **17** so that the distance between the second signal line **15** and the third signal line **16** can be closer. With this configuration, parasitic capacitances between the second signal line **15** and the third signal line **16** and metal films or signal nodes in the pixel circuit **14** can be at a similar level so that the loss difference between the first type of signals transmitted on the second signal line **15** and on the third signal line **16** can be reduced, thereby helping improve the display uniformity.

[0082] It is to be noted that, to illustrate the positional relationship of the second signal line **15** and the third signal line **16** clearly, the outline of the second signal line **15** and the outline of the third signal line **16** are thickened in FIG. 9, which does not limit the protection scope of the present disclosure.

[0083] With continued reference to FIGS. 7 to 9, optionally, in the same pixel circuit group **19** of the first display sub-region **101**, in the first direction X, the second signal line **15** is located between two third signal lines **16**, or the third signal line **16** is located between two second signal lines **15**.

[0084] Specifically, as shown in FIG. 7 and FIG. 8, that the third signal line **16** is located between

two second signal lines **15** is used as an example. Two third signal line **16** may be collectively placed, compared with the configuration in which the second signal line **15** and the third signal line **16** are alternately disposed in the first direction X, so that the mutual interference between the second signal line **15** and the third signal line **16** can be reduced. In this manner, the first type of signal transmitted on the second signal line **15** and on the third signal line **16** can be more accurate and more stable so that the driving performance of the pixel circuit **14** can be improved.

[0085] FIG. **10** is a partial view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIG. **9** and FIG. **10**, optionally, the second signal line **15** is located between two third signal lines **16** in the same pixel circuit group **19** of the first display sub-region **101** so that two second signal lines **15** can be collectively placed. Compared with the configuration in which the second signal line **15** and the third signal line **16** are alternatively disposed in the first direction X, this configuration can reduce the mutual interference between the second signal line **15** and the third signal line **16**. In this manner, the first type of signal transmitted on the second signal line **15** and on the third signal line **16** can be more accurate and more stable so that the driving performance of the pixel circuit **14** can be improved.

[0086] It is to be noted that the pixel circuit group shown in FIG. **9** is located in the first display sub-region **101**.

[0087] FIG. **11** is a partial section view of the structure of a display panel according to embodiments of the present disclosure. As shown in FIG. **9** and FIG. **11**, optionally, the second signal line **15** and the third signal line **16** are located in the same film.

[0088] As shown in FIG. **9** and FIG. **11**, optionally, with the configuration in which the second signal line **15** and the third signal line **16** are disposed in the same film, in the thickness direction of the display panel, the second signal line **15** and the third signal line **16** can have the basically same vertical distances from other metal films in the pixel circuit **14** so that parasitic capacitances between other metal films in the pixel circuit **14** and the second signal line **15** and the third signal line **16** can be at a similar level, and the loss difference between the data signals transmitted on the second signal line **15** and on the third signal line **16** can be reduced, thereby improving the display uniformity.

[0089] Meanwhile, with this configuration in which the second signal line **15** and the third signal line **16** are disposed in the same film, the configuration of a metal layer can be saved by not disposing an additional metal layer for the third signal line **16** so that the production cost and the thickness of the display panel can be reduced. Moreover, the third signal line **16** may use the same material as the second signal line **15** so that the third signal line **16** and the second signal line **15** can be prepared in the same process, thereby shortening the preparation time.

[0090] It is to be noted that the specific film positions of the second signal line **15** and the third signal line **16** may be disposed according to actual needs.

[0091] Exemplarily, as shown in FIG. **11**, the pixel circuit **14** includes a first thin-film transistor **22**. The first thin-film transistor **22** includes a first active layer **24**, a first gate layer **25** and a first source-drain electrode layer **26** that are stacked on one side of a base substrate **23**. The second signal line **15** and the third signal line **16** may be disposed on one side of the first source-drain electrode layer **26** facing away from the base substrate **23**. The second signal line **15** and the third signal line **16** may be formed using a Ti/Al/Ti metal stack. Al has a smaller resistance so that the resistances of the second signal line **15** and the third signal line **16** can be reduced, and the line loss of the first type of signal on the second signal line **15** and the third signal line **16** can be reduced, thereby reducing the voltage drops of the first type of signal on the second signal line **15** and on the third signal line **16** and helping improve the display uniformity.

[0092] It is to be noted that the specific film positions of the second signal line **15** and the third signal line **16** are not limited to the preceding embodiment, and the second signal line **15** and the third signal line **16** may also be disposed in the same layer as any metal film, such as the first gate layer **25** and the first source-drain electrode layer **26**, in other embodiments. This is not limited in

this embodiment of the present disclosure.

[0093] Exemplarily, as shown in FIG. 11, the pixel circuit 14 further includes a storage capacitor 40. The storage capacitor 40 includes a first plate 401 and a second plate 402. The first plate 401 is located on one side of the second plate 402 facing away from the base substrate 23. The second signal line 15 and the third signal line 16 may also be disposed in the same layer as the first plate 401 or the second plate 402.

[0094] In addition, as shown in FIG. 11, one side of the first active layer 24 facing the base substrate 23 is provided with a light-shielding metal layer 41, and in the thickness direction of the display panel, the light-shielding metal layer 41 overlaps the first active layer 24. The light-shielding metal layer 41 is configured to shield the channel formed by the first active layer 24 to prevent light from shining on the first active layer 24 so that the first active layer 24 can be prevented from affecting the off-state current of the first thin-film transistor 22 due to exposure to light, thereby preventing light from adversely affecting the first thin-film transistor 22. Optionally, the second signal line 15 and the third signal line 16 may also be disposed in the same layer as the light-shielding metal layer 41, but are not limited to the preceding embodiment.

[0095] With continued reference to FIG. 9 and FIG. 11, optionally, in the first direction X, the distance between the second signal line 15 and the third signal line 16 is d_1 , where $d_1 \geq 2.5 \mu\text{m}$.

[0096] As shown in FIG. 11, with the configuration in which the distance d_1 between the second signal line 15 and the third signal line 16 is greater than or equal to $2.5 \mu\text{m}$, the mutual interference between the second signal line 15 and the third signal line 16 caused by a too close distance between the second signal line 15 and the third signal line 16 can be prevented so that the first type of signal transmitted on the second signal line 15 and on the third signal line 16 can be more accurate and more stable, thereby improving the driving performance of the pixel circuit 14.

[0097] It is to be noted that the specific value of the distance d_1 between the second signal line 15 and the third signal line 16 may be disposed according to actual needs and is not limited in this embodiment of the present disclosure. It is to be understood that the larger the distance d_1 between the second signal line 15 and the third signal line 16, the smaller the mutual interference between the second signal line 15 and the third signal line 16, but the smaller the distance d_1 between the second signal line 15 and the third signal line 16, the more advantageous it is to compress the size of the pixel circuit 14 so that the pixel density of the display panel can be improved.

[0098] FIG. 12 is a partial section view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIG. 12, optionally, the second signal line 15 and the third signal line 16 are located in different films and, in the thickness direction of the display panel, at least partially overlap.

[0099] Specifically, as shown in FIG. 12, with the configuration in which the second signal line 15 and the third signal line 16 are located in different layers, compared with the configuration in which the second signal line 15 and the third signal line 16 are located in the same layer, the second signal line 15 and the third signal line 16 can at least partially overlap in the thickness direction of the display panel so that the overall projection area of the second signal line 15 and the third signal line 16 on the plane on which the display panel is located can be reduced, thereby helping improve the transmittance of the display panel.

[0100] Exemplarily, as shown in FIG. 12, the second signal line 15 may be disposed on one side of the first source-drain electrode layer 26 facing away from the base substrate 23. The second signal line 15 may be formed using a Ti/Al/Ti metal stack, and since Al has a smaller resistance, the resistance of the second signal line 15 can be reduced so that the line loss of the first type of signal on the second signal line 15 can be reduced, thereby reducing the voltage drop of the first type of signal on the second signal line 15 and helping improve the display uniformity.

[0101] Meanwhile, the third signal line 16 may be disposed in the same layer as the first source-drain electrode layer 26. The metal film in which the first source-drain electrode layer 26 is located is generally formed using a Ti/Al/Ti metal stack, and the third signal line 16 disposed in the film in

which the first source-drain electrode layer **26** is located can reduce the line loss of the first type of signal on the third signal line **16** so that the voltage drop of the first type of signal on the third signal line **16** can be reduced, and the display uniformity can be improved.

[0102] It is to be noted that the specific film positions of the second signal line **15** and the third signal line **16** are not limited to the preceding embodiment, and the second signal line **15** and the third signal line **16** may also be disposed in the same layer as any metal film, such as the first gate layer **25**, the first source-drain electrode layer **26**, the first plate **401**, the second plate **402** or the light-shielding metal layer **41**, in other embodiments. This is not limited in this embodiment of the present disclosure.

[0103] Optionally, the first type of signal is a data signal.

[0104] The first signal line **13** and the second signal line **15** may be each a data signal line. The first type of signal transmitted on the first signal line **13** and on the second signal line **15** is a data signal.

[0105] FIG. **13** is a diagram illustrating the structure of a pixel circuit according to embodiments of the present disclosure. As shown in FIG. **9** and FIG. **13**, exemplarily, the pixel circuit **14** includes a data signal write transistor **27**, a drive transistor **28** and a compensation transistor **29**. The drive transistor **28** is connected in series between the first power signal line **18** and a light-emitting element **30**. The first electrode D3 of the drive transistor **28** is electrically connected to the first electrode S2 of the data signal write transistor **27**, the second electrode S3 of the drive transistor **28** is electrically connected to the first electrode D4 of the compensation transistor **29**, and the second electrode S4 of the compensation transistor **29** is electrically connected to the gate G3 of the drive transistor **28**. In the pixel circuit **14** of the first display sub-region **101**, the second electrode D2 of the data signal write transistor **27** is electrically connected to the second signal line **15**. In the pixel circuit **14** of the second display region **11**, the second electrode D2 of the data signal write transistor **27** is electrically connected to the first signal line **13**.

[0106] The light-emitting element **30** is configured to emit light in the light emission stage so that the light emission function of the display panel or the display function of the display panel can be fulfilled.

[0107] The drive transistor **28** may be turned on according to the potential of the gate of the drive transistor **28**, and the drive current formed by turning on the drive transistor **28** is configured to drive the light-emitting element **30** to emit light.

[0108] The driving process of the pixel circuit **14** may include the following.

[0109] In the data signal voltage write stage, the data signal write transistor **27**, the compensation transistor **29** and the drive transistor **29** are turned on, so in the pixel circuit **14** of the first display sub-region **101**, a data signal voltage on the second signal line **15** is applied to a first node N1 (that is, the gate G3 of the drive transistor **28**) through the data signal write transistor **27**, the drive transistor **28** and the compensation transistor **29**; in the pixel circuit **14** of the second display region **11**, a data signal voltage on the first signal line **13** is applied to the first node N1 (that is, the gate G3 of the drive transistor **28**) through the data signal write transistor **27**, the drive transistor **28** and the compensation transistor **29**.

[0110] In the light emission stage, a first power signal on the first power signal line **18** is transmitted to the light-emitting element **30** through the drive transistor **28** so that the drive current generated by the drive transistor **28** can be supplied to the light-emitting element **30** to drive the light-emitting element **30** to emit light.

[0111] In this embodiment, with the configuration in which the first signal line **13** and the second signal line **15** transmit the data signal, the first segment **131** and the second segment **132** that are separated by the first function region **12** in the first signal line **13** in the second display region **11** are connected by the third signal line **16** added in the first display sub-region **101** so that the data signal can be supplied to the pixel circuit **14** electrically connected to the same first signal line **13**. The first signal line **13** does not need to be wound from the bezel position of the first function region **12** so that the number of data signal lines in the bezel position of the first function region **12**

can be reduced, thereby reducing the bezel area of the first function region **12** and increasing the screen-to-body of the display panel.

[0112] Further, as shown in FIG. **9**, that the fourth signal line **17** is the first power signal line **18** is used as an example. The second signal line **15**, the third signal line **16** and the first power signal line **18** have the same extending direction. In the same pixel circuit **14** of the first display sub-region **101**, with the configuration in which the second signal line **15** and the third signal line **16** are located on the same side of the first power signal line **18**, the second signal line **15** and the third signal line **16** can be collectively placed so that parasitic capacitances between other metal films or other signal nodes in the pixel circuit **14** and the second signal line **15** and the third signal line **16** can be at a similar level, and the loss difference between the data signals transmitted on the second signal line **15** and on the third signal line **16** can be reduced, thereby helping improve the display uniformity.

[0113] It is to be noted that the first type of signal transmitted by the second signal line **15** and the third signal line **16** is not limited to the preceding embodiment and may also be a scan signal or a light emission control signal in other embodiments. This is not limited in this embodiment of the present disclosure.

[0114] Exemplarily, the first signal line **13** and the second signal line **15** may be each a data signal line, and the first type of signal transmitted on the first signal line **13** and on the second signal line **15** is a scan signal. With the configuration in which the first signal line **13** and the second signal line **15** transmit the scan signal, the first segment **131** and the second segment **132** that are separated by the first function region **12** in the first signal line **13** in the second display region **11** are connected by the third signal line **16** added in the first display sub-region **101** so that the scan signal can be supplied to the pixel circuit **14** electrically connected to the same first signal line **13**. The first signal line **13** does not need to be wound from the bezel position of the first function region **12** so that the number of scan signal lines in the bezel position of the first function region **12** can be reduced, thereby reducing the bezel area of the first function region **12** and improving the screen-to-body of the display panel.

[0115] When the first type of signal transmitted on the first signal line **13** and on the second signal line **15** is a scan signal, the second signal line **15** and the third signal **16** can be disposed in different layers and can at least partially overlap in the thickness direction of the display panel so that the overall projection area of the second signal line **15** and the third signal line **16** on the plane on which the display panel is located can be reduced, thereby helping improve the transmittance of the display panel. Meanwhile, when the first type of signal transmitted on the first signal line **13** and on the second signal line **15** is a scan signal, the preceding configuration can also help reduce the signal coupling between the second signal line **15** and the third signal line **16** and improve the driving performance of the pixel circuit **14**.

[0116] With continued reference to FIGS. **1** to **10**, optionally, the display panel according to this embodiment of the present disclosure further includes a first connection line **31** extending in the first direction X, and the first connection line **31** is configured to connect the first signal line **13** in the second display region **11** to the third signal line **16** in the first display sub-region **101**.

[0117] As shown in FIGS. **1** to **10**, with the configuration of the first connection line **31** extending in the first direction X, the first segment **131** and the second segment **132** of the third signal line **16** can be led to the first display sub-region **101** so that the first segment **131** and the second segment **132** can be connected to the third signal line **16**.

[0118] With continued reference to FIGS. **2**, **4**, **6**, **7**, **9** and **10**, optionally, the first connection line **31** overlaps the pixel circuit **14** in the thickness direction of the display panel.

[0119] As shown in FIGS. **2**, **4**, **6**, **7**, **9** and **10**, the vertical projection of the first connection line **31** on the plane on which the display panel is located overlaps the vertical projection of the pixel circuit **14** on the plane on which the display panel is located so that the first connection line **31** does not need to occupy additional space, thereby helping improve the pixel density of the display panel.

[0120] With continued reference to FIG. 5 and FIG. 8, optionally, the first connection line **31** may also be located between two adjacent pixel circuits **14** so that a parasitic capacitor can be prevented from being formed between the first connection line **31** and each metal film in the pixel circuits **14**, thereby reducing the effect of the first connection line **31** on the performances of the pixel circuits **14**.

[0121] It is to be noted that the first connection line **31** located in the display region (specifically, in the first display sub-region **101** and the second display region) can reduce the number of connection lines disposed in the bezel of the first function region **12**, and even connection lines cannot be disposed in the bezel of the first function region **12** so that the bezel area of the first function region **12** can be reduced, and the screen-to-body of the array substrate can be increased.

[0122] FIG. 14 is a partial section view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIG. 9 and FIG. 14, optionally, the first connection line **31** and the third signal line **16** are located in different films.

[0123] Specifically, as shown in FIG. 9 and FIG. 14, the first connection line **31** and the third signal line **16** are located in different films, and the first connection line **31** and the third signal line **16** connected to the first connection line **31** are connected by punching.

[0124] As shown in FIGS. 1 to 10, the first connection line **31** extends in the first direction X, and the first signal line **13**, the second signal line **15**, the third signal line **16** and the fourth signal line **17** extend in the second direction Y. Therefore, the first connection line **31** overlaps part of wires in the first signal line **13**, the second signal line **15**, the third signal line **16** and the fourth signal line **17**. In this embodiment, with the configuration in which the first connection line **31** and the third signal line **16** are located in different layers, when the first connection line **31** needs to be connected to the third signal line **16**, the connection is performed by punching; when the first connection line **31** does not need to be connected to the third signal line **16**, punching does not need to be performed. In this manner, the preparation process is simple and easy to implement.

Moreover, when the third signal line **16** is disposed in the same layer as any of the first signal line **13**, the second signal line **15** or the fourth signal line **17**, since the first connection line **31** and the third signal line **16** are located in different films, it is not required to configure the first connection line **31** to use a jump wire to avoid the signal lines in the same layer as the third signal line **16** so that the structure can be simpler, and the reliability of the display panel can be improved.

[0125] Exemplarily, as shown in FIG. 9 and FIG. 14, the third signal line **16** may be disposed on one side of the first source-drain electrode layer **26** facing away from the base substrate **23**. The third signal line **16** may be formed using a Ti/Al/Ti metal stack, and since Al has a smaller resistance, the resistance of the third signal line **16** can be reduced so that the line loss of the first type of signal on the third signal line **16** can be reduced, thereby reducing the voltage drop of the first type of signal on the third signal line **16** and helping improve the display uniformity.

[0126] Meanwhile, the first connection line **31** may be disposed in the same layer as the first source-drain electrode layer **26**. The metal film in which the first source-drain electrode layer **26** is located is generally formed using a Ti/Al/Ti metal stack, and the third signal line **31** disposed in the film in which the first source-drain electrode layer **26** is located can reduce the line loss of the first type of signal on the first connection line **31** so that the voltage drop of the first type of signal on the first connection line **31** can be reduced, and the display uniformity can be improved.

[0127] Further, as shown in FIG. 9 and FIG. 14, the first connection line **31** and the third signal line **16** are located in adjacent metal films, and in the thickness direction of the display panel, the distance between the first connection line **31** and the third signal line **16** may be closer so that the punching connection can be facilitated.

[0128] It is to be noted that the specific film positions of the first connection line **31** and the third signal line **16** are not limited to the preceding embodiment, and the first connection line **31** and the third signal line **16** may also be disposed in the same layer as any metal film, such as the first gate layer **25**, the first source-drain electrode layer **26**, the first plate **401**, the second plate **402** or the

light-shielding metal layer **41**, in other embodiments. This is not limited in this embodiment of the present disclosure.

[0129] FIG. **15** is a partial section view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIG. **9** and FIG. **15**, optionally, the display panel further includes a reference voltage signal line **32** extending in the first direction X, and the reference voltage signal line **32** is configured to supply a reference voltage signal to the pixel circuit **14**, and the first connection line **31** and the reference voltage signal line **32** are insulated from each other and, in the thickness direction of the display panel, at least partially overlap.

[0130] Specifically, as shown in FIG. **9** and FIG. **15**, the first connection line **31** and the reference voltage signal line **31** have the same extending direction and are insulated from each other to prevent the mutual interference between signals on the first connection line **31** and on the reference voltage signal line **32**.

[0131] As shown in FIG. **9** and FIG. **15**, the vertical projection of the first connection line **31** on the plane on which the display panel is located at least partially overlaps the vertical projection of the reference voltage signal line **32** on the plane on which the display panel is located so that the overall projection area of the first connection line **31** and the reference voltage signal line **32** on the plane on which the display panel is located can be reduced, thereby improving the transmittance of the display panel. In this manner, when the display panel is provided with such a photosensitive element as an under-screen fingerprint recognition module, the use performance of the photosensitive element can be improved.

[0132] Meanwhile, since a reference voltage signal transmitted by the reference voltage signal line **32** is a direct current signal, that is, the voltage on the reference voltage signal line **32** is a constant voltage, and the first connection line **31** and the reference voltage signal line **32** at least partially overlap in the thickness direction of the display panel, the mutual interference between the first connection line **31** and the reference voltage signal line **32** can be reduced.

[0133] Moreover, since the voltage on the reference voltage signal line **32** is a constant voltage, with the configuration in which the first connection line **31** and the reference voltage signal line **32** at least partially overlap, the reference voltage signal line **32** can also shield the first connection line **31** so that the effect between other metal films or other signal nodes in the pixel circuit **14** and the first connection line **31** can be reduced.

[0134] FIG. **16** is a partial section view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIG. **16**, optionally, the first connection line **31** and the reference voltage signal line **32** are located in the same film.

[0135] As shown in FIG. **16**, with the configuration in which the first connection line **31** and the reference voltage signal line **32** are located in the same film, the configuration of a metal layer can be saved by not disposing an additional metal layer for the first connection line **31** so that the production cost and the thickness of the display panel can be reduced. Moreover, the first connection line **31** may use the same material as the reference voltage signal line **32** so that the first connection line **31** and the reference voltage signal line **32** can be prepared in the same process, thereby shortening the preparation time.

[0136] With continued reference to FIGS. **9**, **13** and **15**, optionally, the display panel according to this embodiment of the present disclosure further includes the first power signal line **18** configured to transmit the first power signal. The reference voltage signal line **32** includes a first reference voltage signal line **321**. The pixel circuit **14** includes the drive transistor **28** and a first reset transistor **33**. The drive transistor **28** is connected in series between the first power signal line **18** and the light-emitting element **30**. The gate G3 of the drive transistor **28** is electrically connected to the first electrode S5 of the first reset transistor **33**, and the second electrode D5 of the first reset transistor **33** is electrically connected to the first reference voltage signal line **321**. The first connection line **31** and the first reference voltage signal line **321** are located in different films and, in the thickness direction of the display panel, at least partially overlap.

[0137] The drive transistor **28** may be turned on according to the potential of the gate of the drive transistor **28**, and the drive current formed by turning on the drive transistor **28** is configured to drive the light-emitting element **30** to emit light.

[0138] The driving process of the pixel circuit **14** may further include the following.

[0139] In the initialization stage, the first reset transistor **33** is turned on, so a first reference voltage on the first reference voltage signal line **321** is applied to the first node N1 through the first reset transistor **33**, that is, the potential of the first node N1 is the first reference voltage. At this time, the potential of the gate G3 of the drive transistor **28** is also the first reference voltage so that the first node N1 (the gate G3 of the drive transistor **28**) can be reset.

[0140] As shown in FIG. **9** and FIG. **15**, the vertical projection of the first connection line **31** on the plane on which the display panel is located and the vertical projection of the first reference voltage signal line **321** on the plane on which the display panel is located at least partially overlap so that the overall projection area of the first connection line **31** and the first reference voltage signal line **321** on the plane on which the display panel is located can be reduced, thereby improving the transmittance of the display panel. In this manner, when the display panel is provided with such a photosensitive element as an under-screen fingerprint recognition module, the use performance of the photosensitive element can be improved.

[0141] Meanwhile, since the first reference voltage signal transmitted by the first reference voltage signal line **321** is a direct current signal, that is, the voltage on the first reference voltage signal line **321** is a constant voltage, and the first connection line **31** and the first reference voltage signal line **321** at least partially overlap in the thickness direction of the display panel, the mutual interference between the first connection line **31** and the first reference voltage signal line **321** can be reduced.

[0142] Moreover, since the voltage on the first reference voltage signal line **321** is a constant voltage, with the configuration in which the first connection line **31** and the first reference voltage signal line **321** at least partially overlap, the first reference voltage signal line **321** can also shield the first connection line **31** so that the effect between other metal films or other signal nodes in the pixel circuit **14** and the first connection line **31** can be reduced.

[0143] FIG. **17** is a partial section view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIGS. **9**, **13** and **17**, optionally, the display panel further includes the first power signal line **18** configured to transmit the first power signal. The reference voltage signal line **32** includes a second reference voltage signal line **322**, and the pixel circuit **14** includes the drive transistor **28** and a light emission reset transistor **34**. The drive transistor **28** is connected in series between the first power signal line **18** and the light-emitting element **30**. The anode of the light-emitting element **30** is electrically connected to the first electrode S7 of the light emission reset transistor **34**, and the second electrode D7 of the light emission reset transistor **34** is electrically connected to the second reference voltage signal line **322**.

[0144] As shown in FIG. **17**, the first connection line **31** and the second reference voltage signal line **322** are located in different films and, in the thickness direction of the display panel, at least partially overlap.

[0145] The drive transistor **28** may be turned on according to the potential of the gate of the drive transistor **28**, and the drive current formed by turning on the drive transistor **28** is configured to drive the light-emitting element **30** to emit light.

[0146] The driving process of the pixel circuit **14** may further include the following.

[0147] In the data signal voltage write stage, the light emission reset transistor **34** is turned on, so the light emission reset transistor **34** writes a second reference voltage on the second reference voltage signal line **322** into the anode of the light-emitting element **30** so that the anode of the light-emitting element **30** can be reset, the effect of the voltage of the anode of the light-emitting element **30** of the previous frame on the voltage of the anode of the light-emitting element **30** of the subsequent frame can be reduced, and the display uniformity can be improved.

[0148] As shown in FIG. **17**, the vertical projection of the first connection line **31** on the plane on

which the display panel is located and the vertical projection of the second reference voltage signal line **322** on the plane on which the display panel is located at least partially overlap so that the overall projection area of the first connection line **31** and the second reference voltage signal line **322** on the plane on which the display panel is located can be reduced, thereby helping improve the transmittance of the display panel. In this manner, when the display panel is provided with such a photosensitive element as an under-screen fingerprint recognition module, the use performance of the photosensitive element can be improved.

[0149] Meanwhile, since the second reference voltage signal transmitted by the second reference voltage signal line **322** is a direct current signal, that is, the voltage on the second reference voltage signal line **322** is a constant voltage, and the first connection line **31** and the second reference voltage signal line **322** at least partially overlap in the thickness direction of the display panel, the mutual interference between the first connection line **31** and the second reference voltage signal line **322** can be reduced.

[0150] Moreover, since the voltage on the second reference voltage signal line **322** is a constant voltage, with the configuration in which the first connection line **31** and the second reference voltage signal line **322** at least partially overlap, the second reference voltage signal line **322** can also shield the first connection line **31** so that the effect between other metal films or other signal nodes in the pixel circuit **14** and the first connection line **31** can be reduced.

[0151] As shown in FIG. **9**, optionally, the first reference voltage signal line **321** and the second reference voltage signal line **322** are located in different films.

[0152] Exemplarily, as shown in FIG. **9** and FIG. **15**, the first reference voltage signal line **321** may be disposed in the same layer as the first plate **401** so that the configuration of a metal layer can be saved, thereby reducing the production cost and the thickness of the display panel. Moreover, the first reference voltage signal line **321** may use the same material as the first plate **401** so that the first reference voltage signal line **321** and the first plate **401** can be prepared in the same process, thereby shortening the preparation time.

[0153] Further, as shown in FIG. **9** and FIG. **17**, the second reference voltage signal line **322** may be disposed in the same layer as the first source-drain electrode layer **26** so that the configuration of a metal layer can be saved, thereby reducing the production cost and the thickness of the display panel. Moreover, the second reference voltage signal line **322** may use the same material as the first source-drain electrode layer **26** so that the second reference voltage signal line **322** and the first source-drain electrode layer **26** can be prepared in the same process, thereby shortening the preparation time.

[0154] Further, when the first connection line **31** and the first reference voltage signal line **321** are disposed in different layers and, in the thickness direction of the display panel, at least partially overlap, the first connection line **31** and the second reference voltage signal line **322** may be disposed in the same layer so that the configuration of a metal layer can be saved, thereby reducing the production cost and the thickness of the display panel. Moreover, the first connection line **31** may use the same material as the second reference voltage signal line **322** so that the first connection line **31** and the second reference voltage signal line **322** can be prepared in the same process, thereby shortening the preparation time.

[0155] Further, when the first connection line **31** and the second reference voltage signal line **322** are disposed in different layers and, in the thickness direction of the display panel, at least partially overlap, the first connection line **31** and the first reference voltage signal line **321** may be disposed in the same layer so that the configuration of a metal layer can be saved, thereby reducing the production cost and the thickness of the display panel. Moreover, the first connection line **31** may use the same material as the first reference voltage signal line **321** so that the first connection line **31** and the first reference voltage signal line **321** can be prepared in the same process, thereby shortening the preparation time.

[0156] It is to be noted that the specific film positions of the first reference voltage signal line **321**

and the second reference voltage signal line **322** are not limited to the preceding embodiment, and the first reference voltage signal line **321** and the second reference voltage signal line **322** may also be disposed in the same layer as any metal film, such as the first gate layer **25**, the first source-drain electrode layer **26**, the first plate **401**, the second plate **402** or the light-shielding metal layer **41**, in other embodiments. This is not limited in this embodiment of the present disclosure.

[0157] With continued reference to FIG. **9**, optionally, the display panel further includes the first power signal line **18** configured to transmit the first power signal. The pixel circuit **14** includes the data signal write transistor **27**, the drive transistor **28** and the compensation transistor **29**. The drive transistor **28** is connected in series between the first power signal line **18** and the light-emitting element **30**. The first electrode D3 of the drive transistor **28** is electrically connected to the first electrode S2 of the data signal write transistor **27**, the second electrode S3 of the drive transistor **28** is electrically connected to the first electrode D4 of the compensation transistor **29**, and the second electrode S4 of the compensation transistor **29** is electrically connected to the gate G3 of the drive transistor **28**. In the pixel circuit **14** of the first display sub-region **101**, the second electrode D2 of the data signal write transistor **27** is electrically connected to the second signal line **15** through a first via **35**. In the second direction Y, the distance between the first connection line **13** and the first via **35** is d_2 , where $d_2 > 0$.

[0158] The light-emitting element **30** is configured to emit light in the light emission stage so that the light emission function of the display panel or the display function of the display panel can be fulfilled.

[0159] The drive transistor **28** may be turned on according to the potential of the gate of the drive transistor **28**, and the drive current formed by turning on the drive transistor **28** is configured to drive the light-emitting element **30** to emit light.

[0160] The driving process of the pixel circuit **14** may include the following.

[0161] In the data signal voltage write stage, the data signal write transistor **27**, the compensation transistor **29** and the drive transistor **28** are turned on, so in the pixel circuit **14** of the first display sub-region **101**, the data signal voltage on the second signal line **15** is applied to the first node N1 (that is, the gate G3 of the drive transistor **28**) through the data signal write transistor **27**, the drive transistor **28** and the compensation transistor **29**; in the pixel circuit **14** of the second display region **11**, the data signal voltage on the first signal line **13** is applied to the first node N1 (that is, the gate G3 of the drive transistor **28**) through the data signal write transistor **27**, the drive transistor **28** and the compensation transistor **29**.

[0162] In the light emission stage, the first power signal on the first power signal line **18** is transmitted to the light-emitting element **30** through the drive transistor **28** so that the drive current generated by the drive transistor **28** can be supplied to the light-emitting element **30** to drive the light-emitting element **30** to emit light.

[0163] Exemplarily, the second electrode D2 of the data signal write transistor **27** is located in the first source-drain electrode layer **26**, the second signal line **15** may be disposed on one side of the first source-drain electrode layer **26** facing away from the base substrate **23**, and the data signal write transistor **27** is electrically connected to the second signal line **15** through the first via **35** so that the first type of signal on the second signal line **15** can be transmitted to the data signal write transistor **27** through the first via **35**.

[0164] As shown in FIG. **9**, the distance d_2 between the first connection line **13** and the first via **35** in the second direction Y is greater than 0, that is, there is a gap between the first connection line **13** and the first via **35** so that a short circuit between the first connection line **13** and the second signal line **15** can be prevented, thereby ensuring the reliability of the pixel circuit **14**.

[0165] It is to be noted that the specific value of the distance d_2 between the first connection line **13** and the first via **35** may be disposed according to actual needs and is not limited in this embodiment of the present disclosure. It is to be understood that the larger the distance d_2 between the first connection line **13** and the first via **35**, the smaller the mutual interference between the first

connection line **13** and the first via **35**, but the smaller the distance $d2$ between the first connection line **13** and the first via **35**, the more advantageous it is to compress the size of the pixel circuit **14** so that the pixel density of the display panel can be improved.

[0166] It is to be noted that, as shown in FIG. **9**, the size of the first via **35** is generally larger due to the limitation of the preparation process to ensure the reliability of the connection between the data signal write transistor **27** and the second signal line **15**. To ensure that the distance $d2$ between the first connection line **13** and the first via **35** is greater than 0, the first connection line **13** may be disposed as a polyline to avoid the first via **35**, which may be disposed by those skilled in the art according to actual needs and is not limited in this embodiment of the present disclosure.

[0167] As shown in FIGS. **1** to **10**, optionally, the first display region **10** further includes a second display sub-region **102**. The second display sub-region **102** includes a fifth signal line **36** extending in the second direction Y and configured to supply the first type of signal to a pixel circuit **14** of the second display sub-region **102**.

[0168] FIG. **18** is a partial view of the structure of another display panel according to embodiments of the present disclosure. FIG. **19** is a partial view of the structure of another display panel according to embodiments of the present disclosure. FIG. **20** is a partial view of the structure of another display panel according to embodiments of the present disclosure. FIG. **21** is a partial view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIGS. **18** to **21**, the display panel according to this embodiment of the present disclosure further includes a virtual signal line **37** extending in the second direction Y and including a first virtual signal line **371** located in the second display sub-region **102**, and in the same pixel circuit **14** of the second display sub-region **102**, the fifth signal line **36** and the first virtual signal line **371** are located on the same side of the fourth signal line **17**. The virtual signal line **37** further includes a second virtual signal line **372** located in the first display sub-region **101**, and the second virtual signal line **372** and the third signal line **16** are arranged in the second direction Y and are insulated from each other. The virtual signal line further includes a third virtual signal line **373** located in the second display region **11**, and in the same pixel circuit **14** of the second display region **11**, the first signal line **13** and the third virtual signal line **373** are located on the same side of the fourth signal line **17**.

[0169] Specifically, as shown in FIGS. **1** to **8**, since the first display sub-region **101** is added with the third signal line **16** extending in the second direction Y, the wiring density in the second direction Y in the first display sub-region **101** is greater than the wiring densities in the second direction Y in other display regions, and the reflected light is different due to different wiring densities in the second direction Y of different regions of the display region, affecting the overall visual effect of the display panel.

[0170] With continued reference to FIGS. **18** to **21**, in this embodiment, the second display sub-region **102** is provided with the first virtual signal line **371** extending in the second direction Y, and in the same pixel circuit **14** of the second display sub-region **102**, the fifth signal line **36** and the first virtual signal line **371** are located on the same side of the fourth signal line **17**. The first virtual signal line **371** is configured to compensate for the wiring density in the second direction Y of the second display sub-region **102** so that the wiring density in the second direction Y of the second display sub-region **102** and the wiring density in the second direction Y of the first display-region **101** can tend to be consistent, thereby improving the problem of different reflections and ensuring the overall visual effect of the display panel.

[0171] The positional relationship between the first virtual signal line **371** and the corresponding pixel circuit **14** may be disposed with reference to the positional relationship between the third signal line **16** and the corresponding pixel circuit **14** so that the wires of the second display sub-region **102** and the first display sub-region **101** can be uniformly distributed in the second direction Y, thereby further improving the problem of different reflections of the second display sub-region **102** and the first display sub-region **101**.

[0172] Further, with continued reference to FIGS. **18** to **21**, the first display sub-region **101** is provided with the second virtual signal line **372** extending in the second direction Y, and the second virtual signal line **372** and the third signal line **16** are arranged in the second direction Y and are insulated from each other so that the second virtual signal line **372** can be prevented from affecting the signal transmission of the third signal line **16**. The second virtual signal line **372** is configured to compensate for the wiring density in the second direction Y of the region not provided with the third signal line **16** in the first display sub-region **101** so that the wiring density in the second direction Y of the region not provided with the third signal line **16** in the first display sub-region **101** and the wiring density in the second direction Y of the region provided with the third signal line **16** in the first display sub-region **101** can tend to be consistent, thereby improving the problem of different reflections.

[0173] The positional relationship between the second virtual signal line **372** and the corresponding pixel circuit **14** may be disposed with reference to the positional relationship between the third signal line **16** and the corresponding pixel circuit **14**. For example, the second virtual signal line **372** and the third signal line **16** are located on the same straight line so that the wires of the region not provided with the third signal line **16** in the first display sub-region **101** and the region provided with the third signal line **16** in the first display sub-region **101** can be uniformly distributed in the second direction Y, thereby further improving the problem of different reflections of the first display sub-region **101**. Meanwhile, the second virtual signal line **372** and the third signal line **16** are disconnected from each other to ensure the insulation between the second virtual signal line **372** and the third signal line **16**.

[0174] Further, with continued reference to FIGS. **18** to **21**, the second display region **11** is provided with the third virtual signal line **373** extending in the second direction Y, and in the same pixel circuit **14** of the second display region **11**, the first signal line **13** and the third virtual signal line **373** are located on the same side of the fourth signal line **17**. The third virtual signal line **373** is configured to compensate for the wiring density in the second direction Y of the second display region **11** so that the wiring density in the second direction Y of the second display region **11** and the wiring density in the second direction Y of the first display-region **101** can tend to be consistent, thereby improving the problem of different reflections.

[0175] The positional relationship between the third virtual signal line **373** and the corresponding pixel circuit **14** may be disposed with reference to the positional relationship between the third signal line **16** and the corresponding pixel circuit **14** so that the wires of the second display region **11** and the first display sub-region **101** can be uniformly distributed in the second direction Y, thereby further improving the problem of different reflections of the second display region **11** and the first display sub-region **101**.

[0176] It is to be noted that the positional relationship between the virtual signal line **37** and the corresponding pixel circuit **14** may be disposed with reference to the positional relationship between the third signal line **16** and the corresponding pixel circuit **14**. For example, as shown in FIG. **18** and FIG. **19**, when the third signal line **16** and the pixel circuit **14** overlap, the virtual signal line **37** and the pixel circuit **14** also overlap. For example, as shown in FIG. **20** and FIG. **21**, when the third signal line **16** is located between two adjacent pixel circuits **14**, the virtual signal line **37** is also located between the two adjacent pixel circuits **14** so that the wiring density in the second direction Y of the overall display region can tend to be consistent, thereby improving the problem of different reflections.

[0177] Optionally, the third type of signal is applied to the virtual signal line **37** and is a fixed voltage signal.

[0178] A fixed voltage signal is applied to the virtual signal line **37** so that the voltage on the virtual signal line **37** can be a constant voltage. This configuration can reduce the effect of the virtual signal line **37** on the pixel circuit **14**.

[0179] Meanwhile, since the voltage on the virtual signal line **37** is a constant voltage, the virtual

signal line **37** can shield the signal lines and the signal nodes that overlap the virtual signal line **37** so that the mutual interference between the signal lines and the signal nodes in the pixel circuit **14** can be reduced, and the driving performance of the pixel circuit **14** can be improved.

[0180] With continued reference to FIGS. **18** to **21**, optionally, the display panel according to this embodiment of the present disclosure further includes the first power signal line **18** configured to transmit the first power signal, and the fixed voltage signal is the same as the first power signal.

[0181] Specifically, as shown in FIGS. **18** to **21**, the virtual signal line **37** may be electrically connected to the first power signal line **18**, and since the first power signal is a direct current signal instead of an alternating current (AC) signal, the first power signal line **18** can supply a constant fixed voltage to the virtual signal line **37**. On one hand, the effect of the virtual signal line **37** on the pixel circuit **14** can be reduced. On the other hand, the voltage on the virtual signal line **37** is a constant voltage so that the virtual signal line **37** can shield the signal lines and the signal nodes that overlap the virtual signal **37**, thereby helping reduce the mutual interference between the signal lines and the signal nodes in the pixel circuit **14** and improving the driving performance of the pixel circuit **14**.

[0182] In addition, after the first power signal line **18** is electrically connected to the virtual signal line **37**, the wiring area of the first power signal line **18** can be enlarged so that the resistance of the first power signal line **18** can be reduced, thereby reducing the drop (IR drop) of the first power signal on the first power signal line **18** and helping improve the display uniformity.

[0183] As shown in FIG. **13**, optionally, the display panel according to this embodiment of the present disclosure further includes the first power signal line **18** and a second power signal line **38**. The first power signal line **18** is configured to transmit the first power signal. The second power signal line **38** is configured to transmit a second power signal. The voltage of the second power signal is less than the voltage of the first power signal. The fixed voltage signal is the same as the second power signal.

[0184] Specifically, as shown in FIG. **13**, the drive transistor **28** and the light-emitting element **30** are connected in series between the first power signal line **18** and the second power signal line **38**. In the light emission stage, a current path is formed from the first power signal line **18**, the drive transistor **28** and the light-emitting element **30** to the second power signal line **38** so that the drive current generated by the drive transistor **28** can be transmitted to the light-emitting element **30** to drive the light-emitting element **30** to emit light.

[0185] The first power signal line **18** is configured to supply the first power signal to the pixel circuit **14**, the second power signal line **38** is configured to supply the second power signal to the pixel circuit **14**, and the first power signal and the second power signal are each a direct current signal instead of an alternating current (AC) signal, so the first power signal line **18** and the second power signal line **38** can each supply a fixed voltage to the pixel circuit **14**. The voltage of the second power signal is less than the voltage of the first power signal. The first power signal line **18** may be, for example, a PVDD signal line, and the second power signal line **38** may be, for example, a PVEE signal line. This is not limited in this embodiment of the present disclosure.

[0186] Further, the virtual signal line **37** may be electrically connected to the second power signal line **38**, and since the second power signal is a direct current signal instead of an alternating current (AC) signal, the second power signal line **18** can supply a constant fixed voltage to the virtual signal line **37**. On one hand, the effect of the virtual signal line **37** on the pixel circuit **14** can be reduced. On the other hand, the voltage on the virtual signal line **37** is a constant voltage so that the virtual signal line **37** can shield the signal lines and the signal nodes that overlap the virtual signal **37**, thereby helping reduce the mutual interference between the signal lines and the signal nodes in the pixel circuit **14** and improving the driving performance of the pixel circuit **14**.

[0187] In addition, after the second power signal line **38** is electrically connected to the virtual signal line **37**, the wiring area of the second power signal line **38** can be enlarged so that the resistance of the second power signal line **38** can be reduced, thereby reducing the drop (IR drop)

of the second power signal on the second power signal line **38** and helping improve the display uniformity.

[0188] It is to be noted that the second power signal line **38** may be disposed in the non-display region surrounding the display region, and the virtual signal line **37** may extend into the non-display region to be connected to the second power signal line **38**, which is not limited thereto, and the second power signal line **38** may also be located in the display region in other embodiments. The specific manner of the second power signal line **38** may be disposed according to actual needs and is not limited in this embodiment of the present disclosure.

[0189] With continued reference to FIGS. **18** to **21**, optionally, in the same pixel circuit **14** of the first display sub-region **101**, in the first direction X, the distance between the second signal line **15** and the third signal line **16** is $d1$, and in the same pixel circuit **14** of the second display sub-region **102**, in the first direction X, the distance between the fifth signal line **36** and the first virtual signal line **37** is $d3$, where $d1 \geq d3$.

[0190] Specifically, as shown in FIGS. **18** to **21**, the distance $d1$ between the second signal line **15** and the third signal line **16** may be equal to the distance $d3$ between the fifth signal line **36** and the first virtual signal line **37** so that the wires of the first display sub-region **101** and the second display sub-region **102** can be uniformly distributed in the second direction Y, thereby improving the problem of different reflections of the first display sub-region **101** and the second display sub-region **102**.

[0191] In addition, since the third signal line **16** is configured to transmit the first type of signal, and the first virtual signal line **37** does not need to transmit a signal having a change in the voltage, in another embodiment, the distance $d1$ between the second signal line **15** and the third signal line **16** may be greater than the distance $d3$ between the fifth signal line **36** and the first virtual signal line **37** so that the distance between the second signal line **15** and the third signal line **16** can be larger, the signal interference between the second signal line **15** and the third signal line **16** can be reduced, and the first type of signal transmitted on the second signal line **15** and on the third signal line **16** can be more accurate and more stable, thereby helping improve the driving performance of the pixel circuit **14**.

[0192] Optionally, the line width of the third signal line is $W1$, and the line width of the virtual signal line is $W2$, where $W1 \leq W2$.

[0193] Specifically, the line width $W1$ of the third signal line may be equal to the line width $W2$ of the virtual signal line so that the wires of the first display sub-region **101** and the second display sub-region **102** can be uniformly distributed in the second direction Y, thereby improving the problem of different reflections of the first display sub-region **101** and the second display sub-region **102**.

[0194] In addition, since the third signal line **16** is configured to transmit the first type of signal, and the first virtual signal line **37** does not need to transmit a signal having a change in the voltage, in another embodiment, the line width $W1$ of the third signal line is less than the line width $W2$ of the virtual signal line so that the third signal line **16** can be thinner, the projection area of the third signal line **16** on the plane on which the display panel is located can be smaller, and the overlapping area between the third signal line **16** and other signal lines in the pixel circuit **14** can be reduced, thereby reducing parasitic capacitances between the third signal line **16** and the other signal lines in the pixel circuit **14** and the signal interference between the third signal line **16** and the other signal lines in the pixel circuit **14**. In this manner, the first type of signal transmitted on third signal line **16** can be more accurate and more stable so that the driving performance of the pixel circuit **14** can be improved. Meanwhile, reducing the parasitic capacitances between the third signal line **16** and the other signal lines in the pixel circuit **14** can also help reduce the loss of the first type of signal on the third signal line **16** so that the consumption of the display panel can be reduced.

[0195] FIG. **22** is a partial view of the structure of another display panel according to embodiments

of the present disclosure. FIG. 23 is a partial view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIG. 22 and FIG. 23, optionally, the display panel according to this embodiment of the present disclosure further includes a second connection line 39 extending in the first direction X, and the second connection line 39 is configured to connect the first virtual signal line 371 to the second virtual signal line 372 and/or configured to connect the second virtual signal line 372 to the third virtual signal line 373.

[0196] Specifically, as shown in FIG. 22 and FIG. 23, with the configuration of the second connection line 39 extending in the first direction X, the first virtual signal line 371 of the second display sub-region 102 is electrically connected to the second virtual signal line 372 of the first display sub-region 101 through the second connection line 39 so that the fixed voltage on the first virtual signal line 371 of the second display sub-region 102 and the fixed voltage on the second virtual signal line 372 of the first display sub-region 101 can be consistent, and the effect of the first virtual signal line 371 on the corresponding pixel circuit 14 and the effect of the second virtual signal line 372 on the corresponding pixel circuit 14 can tend to be consistent, thereby helping improve the display uniformity of the first display sub-region 101 and the second display sub-region 102.

[0197] In addition, when a power signal (for example, the first power signal or the second power signal) is applied to the first virtual signal line 371 and the second virtual signal line 372, the first virtual signal line 371 is connected to the second virtual signal line 372 through the second connection line 39 so that the wiring area for transmitting the power signal can be enlarged, thereby reducing the transmission loss of the power signal and helping improve the display uniformity.

[0198] Further, as shown in FIG. 22 and FIG. 23, with the configuration of the second connection line 39 extending in the first direction X, the second virtual signal line 372 of the first display sub-region 101 is electrically connected to the third virtual signal line 373 of the second display region 11 through the second connection line 39 so that the fixed voltage on the second virtual signal line 372 of the first display sub-region 101 and the fixed voltage on the third virtual signal line 373 of the second display region 11 can be consistent, and the effect of the second virtual signal line 372 on the corresponding pixel circuit 14 and the effect of the third virtual signal line 373 on the corresponding pixel circuit 14 can tend to be consistent, thereby helping improve the display uniformity of the first display sub-region 101 and the second display region 11.

[0199] In addition, when a power signal (for example, the first power signal or the second power signal) is applied to the second virtual signal line 372 and the third virtual signal line 373, the second virtual signal line 372 is connected to the third virtual signal line 373 through the second connection line 39 so that the wiring area for transmitting the power signal can be enlarged, thereby reducing the transmission loss of the power signal and helping improve the display uniformity.

[0200] FIG. 24 is a partial section view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIG. 24, optionally, the first virtual signal line 371, the second virtual signal line 372 and the third virtual signal line 373 are located in the same film, and the second connection line 39 and the virtual signal line 37 are located in different films.

[0201] Specifically, as shown in FIG. 24, the first virtual signal line 371 of the second display sub-region 102, the second virtual signal line 372 of the first display sub-region 101 and the third virtual signal line 373 of the second display region 11 are disposed in the same layer, and in the thickness direction of the display panel, the first virtual signal line 371, the second virtual signal line 372 and the third virtual signal line 373 have the basically same vertical distances from other metal films in the pixel circuit 14 so that parasitic capacitances between other metal films in the pixel circuit 14 and the first virtual signal line 371, the second virtual signal line 372 and the third virtual signal line 373 can be at a similar level, and the effect of the first virtual signal line 371 on the corresponding pixel circuit 14, the effect of the second virtual signal line 372 on the corresponding pixel circuit 14, and the effect of the third virtual signal line 373 on the corresponding pixel circuit 14 can tend to be consistent, thereby helping improve the display

uniformity of the display panel.

[0202] Meanwhile, with the configuration in which the first virtual signal line **371**, the second virtual signal line **372** and the third virtual signal line **373** are disposed in the same film, the configuration of metal layers can be saved by not disposing a separate metal layer for each kind of virtual signal line so that the production cost and the thickness of the display panel can be reduced. Moreover, the first virtual signal line **371**, the second virtual signal line **372** and the third virtual signal line **373** may use the same material so that the first virtual signal line **371**, the second virtual signal line **372** and the third virtual signal line **373** can be prepared in the same process, thereby shortening the preparation time.

[0203] Further, as shown in FIG. **24**, the second connection line **39** and the virtual signal line **37** are located in different films.

[0204] Specifically, as shown in FIG. **24**, the second connection line **39** and the virtual signal line **37** are located in different films, and the second connection line **39** and the virtual signal line **37** connected to the second connection line **31** are connected by punching.

[0205] It is to be understood that the second connection line **39** extends in the first direction X, and the virtual signal line **37** extends in the second direction Y, so the second connection line **39** overlaps part of the virtual signal line **37**. In this embodiment, with the configuration in which the second connection line **39** and the virtual signal line **37** are disposed in different layers, when the second connection line **39** needs to be connected to the virtual signal line **37**, the connection is performed by punching; when the second connection line **39** does not need to be connected to the virtual signal line **37**, punching does not need to be performed. Moreover, it is not required to configure the second connection line **39** to use a jump wire to avoid the virtual signal line **37** so that the structure can be simpler and easy to implement.

[0206] Exemplarily, as shown in FIG. **24**, the virtual signal line **37** may be disposed on one side of the first source-drain electrode layer **26** facing away from the base substrate **23**. The virtual signal line **37** may be formed using a Ti/Al/Ti metal stack, and since Al has a smaller resistance, the resistance of the virtual signal line **37** can be reduced, and the line loss of the fixed voltage signal on the virtual signal line **37** can be reduced so that the voltage drop of the fixed voltage signal on the virtual signal line **37** can be reduced, and the display uniformity can be improved.

[0207] Meanwhile, the second connection line **39** may be disposed in the same layer as the first source-drain electrode layer **26**. The metal film in which the first source-drain electrode layer **26** is located is generally formed using a Ti/Al/Ti metal stack, and the second connection line **39** disposed in the film in which the first source-drain electrode layer **26** is located can reduce the line loss of the fixed voltage signal on the second connection line **39** so that the voltage drop of the fixed voltage signal on the second connection line **39** can be reduced, and the display uniformity can be improved.

[0208] Further, as shown in FIG. **24**, the second connection line **39** and the virtual signal line **37** are located in adjacent metal films, and in the thickness direction of the display panel, the distance between the second connection line **39** and the virtual signal line **37** can be closer so that the punching connection can be facilitated.

[0209] It is to be noted that the specific film positions of the second connection line **39** and the virtual signal line **37** are not limited to the preceding embodiment, and the second connection line **39** and the virtual signal line **37** may also be disposed in the same film as any metal film, such as the first gate layer **25**, the first source-drain electrode layer **26**, the first plate **401**, the second plate **402** or the light-shielding metal layer **41**, in other embodiments. This is not limited in this embodiment of the present disclosure.

[0210] It is to be noted that, to reduce the length of drawings, FIG. **24** only shows the related structures of the first virtual signal line **371**, the second virtual signal line **372** and the third signal line **373**, which does not represent the actual structure of the display panel and does not limit the protection scope of the present disclosure.

[0211] FIG. 25 is a partial view of the structure of another display panel according to embodiments of the present disclosure. FIG. 26 is a partial view of the structure of another display panel according to embodiments of the present disclosure. FIG. 27 is a partial view of the structure of another display panel according to embodiments of the present disclosure. FIG. 28 is a partial view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIGS. 25 to 28, optionally, the display panel according to this embodiment of the present disclosure further includes the first connection line 31 extending in the first direction X and configured to connect the first signal line 13 in the second display region 11 to the third signal line 16 in the first display sub-region 101 and further includes a virtual connection line 42 extending in the first direction X. The virtual connection line 42 and the first connection line 31 are arranged in the first direction X and are insulated from each other.

[0212] Specifically, as shown in FIGS. 25 to 28, with the configuration of the first connection line 31 extending in the first direction X, the first segment 131 and the second segment 132 of the third signal line 16 can be led to the first display sub-region 101 so that the first segment 131 and the second segment 132 can be connected to the third signal line 16.

[0213] As shown in FIG. 25 and FIG. 26, optionally, the first connection line 31 overlaps the pixel circuit 14 in the thickness direction of the display panel, that is, the vertical projection of the first connection line 31 on the plane on which the display panel is located overlaps the vertical projection of the pixel circuit 14 on the plane on which the display panel is located, so that the first connection line 31 does not need to occupy additional space, thereby helping improve the pixel density of the display panel.

[0214] As shown in FIG. 27 and FIG. 28, optionally, the first connection line 31 may also be located between two adjacent pixel circuits 14 so that a parasitic capacitor can be prevented from being formed between the first connection line 31 and each metal film in the pixel circuits 14, thereby reducing the effect of the first connection line 31 on the performances of the pixel circuits 14.

[0215] It is to be noted that the first connection line 31 located in the display region (specifically, in the first display sub-region 101 and the second display region 11) can reduce the number of connection lines disposed in the bezel of the light-transmissive region, and even connection lines are not disposed in the bezel of the light-transmissive region so that the bezel area of the light-transmissive region can be reduced, and the screen-to-body of the array substrate can be improved.

[0216] As shown in FIGS. 1 to 8, since the display region is added with the first connection line 31 extending in the first direction X, the wiring density in the first direction X of the region in which the first connection line 31 is located is greater than the wiring densities in the first direction X of other display regions, and the problem of different reflections occurs due to different wiring densities in the first direction X of different regions of the display region in the first direction X.

[0217] With continued reference to FIGS. 25 to 28, in this embodiment, the display panel is provided with the virtual connection line 42 extending in the first direction X, the virtual connection line 42 and the first connection line 31 are arranged in the first direction X and are insulated from each other to prevent the virtual connection line 42 from affecting the signal transmission of the first connection line 31. The virtual connection line 42 is configured to compensate for the wiring density in the first direction X of the region not provided with the first connection line 31 so that the wiring density in the first direction X of the region not provided with the first connection line 31 and the wiring density in the first direction X of the region in which the first connection line 31 is located can tend to be consistent, thereby improving the problem of different reflections.

[0218] The positional relationship between the virtual connection line 42 and the corresponding pixel circuit 14 may be disposed with reference to the positional relationship between the first connection line 31 and the corresponding pixel circuit 14. For example, the virtual connection line 42 and the first connection line 31 are located on the same straight line and are disconnected from

each other to ensure the insulation between the virtual connection line **42** and the first connection line **31** so that the wires of the region not provided with the first connection line **31** and the region in which the first connection line **31** is located can be uniformly distributed in the first direction X, thereby further improving the problem of different reflections.

[0219] In other embodiments, for example, as shown in FIG. **25** and FIG. **26**, when the first connection line **31** overlaps the pixel circuit **14**, the virtual connection line **42** also overlaps the pixel circuit **14**. For example, as shown in FIG. **27** and FIG. **28**, when the first connection line **31** is located between two adjacent pixel circuits **14**, the virtual connection line **42** is also located between the two adjacent pixel circuits **14** so that the wiring density in the first direction X of the overall display region can tend to be consistent, thereby improving the problem of different reflections.

[0220] With continued reference to FIG. **9** and FIG. **13**, optionally, the display panel according to this embodiment of the present disclosure further includes a first scan line **43**, a second scan line **44**, a third signal line **45**, a light emission control signal line **46**, the first power signal line **18**, the second power signal line **38**, the first reference voltage signal line **321** and the second reference voltage signal line **322**, the first power signal line **18** is configured to transmit the first power signal, the second power signal line **38** is configured to transmit the second power signal, and the voltage of the second power signal is less than the voltage of the first power signal. The pixel circuit **14** includes a first light emission control transistor **47**, the data signal write transistor **27**, the drive transistor **28**, the compensation transistor **29**, the first reset transistor **33**, a second light emission control transistor **48**, the light emission reset transistor **34**, the storage capacitor **40** and the light-emitting element **30**. The gate G5 of the first reset transistor **33** is electrically connected to the first scan line **43**, the first electrode S5 of the first reset transistor **33** and the second electrode S4 of the compensation transistor **29**, the gate G3 of the drive transistor **28** and the second plate **402** of the storage capacitor **40** are electrically connected to each other at the first node N1, and the second electrode D5 of the first reset transistor **33** is electrically connected to the first reference voltage signal line **321**. The first electrode D4 of the compensation transistor **29** is electrically connected to the second electrode S3 of the drive transistor **28** and the first electrode D6 of the second light emission control transistor **48**, and the gate G4 of the compensation transistor **29** is electrically connected to the second scan line **44**. The gate G1 of the first light emission control transistor **47** and the gate G6 of the second light emission control transistor **48** are both electrically connected to the light emission control signal line **46**, the first electrode D1 of the first light emission control transistor **47** is electrically connected to the first power signal line **18**, and the second electrode S1 of the first light emission control transistor **47** is electrically connected to the first electrode D3 of the drive transistor **28** and the first electrode S2 of the data signal write transistor **27**. The second electrode S6 of the second light emission control transistor **48** is electrically connected to the anode of the light-emitting element **30** and the first electrode S7 of the light emission reset transistor **34**. The second electrode D7 of the light emission reset transistor **34** is electrically connected to the second reference voltage signal line **322**, and the gate G7 of the light emission reset transistor **34** is electrically connected to the third scan line **45**. The gate G2 of the data signal write transistor **27** is electrically connected to the third scan line **45**. The first plate **401** of the storage capacitor **40** is electrically connected to the first power signal line **18**. The cathode of the light-emitting element **30** is electrically connected to the second power signal line **38**. In the pixel circuit **14** of the first display sub-region **101**, the second electrode D2 of the data signal write transistor **27** is electrically connected to the second signal line **15**. In the pixel circuit of the second display region **11**, the second electrode D2 of the data signal write transistor **27** is electrically connected to the first signal line **13**.

[0221] Specifically, the driving process of the pixel circuit **14** shown in FIG. **9** and FIG. **13** is the following.

[0222] In the initialization stage, a first scan signal on the first scan line **43** turns on the first reset

transistor **33**, so the first reference voltage on the first reference voltage signal line **321** is applied to one terminal of the storage capacitor **40** through the first reset transistor **33**, that is, the potential of the first node **N1** is the first reference voltage so that the first node **N1** can be reset. At this time, the potential of the gate **G3** of the drive transistor **28** is also the first reference voltage.

[0223] In the data signal voltage write stage, a third scan signal on the third scan line **45** turns on the data signal write transistor **27** and the compensation transistor **29**, and, at this time, the potential of the gate **G3** of the drive transistor **28** is the first reference voltage, and the drive transistor **28** is also turned on, so the data signal voltage on the data signal line is applied to the first node **N1** through the data signal write transistor **27**, the drive transistor **28** and the compensation transistor **29** so that the data signal voltage can be written into the storage capacitor **40**.

[0224] Meanwhile, in the data signal voltage write stage, a third scan signal on the third scan line **45** turns on the light emission reset transistor **34**, so the light emission reset transistor **34** writes the second reference voltage on the second reference voltage signal line **322** into the anode of the light-emitting element **30** so that the anode of the light-emitting element **30** can be reset, the effect of the voltage of the anode of the light-emitting element **30** of the previous frame on the voltage of the anode of the light-emitting element **30** of the subsequent frame can be reduced, and the display uniformity can be improved.

[0225] In the light emission stage, a light emission control signal on the light emission control signal line **46** turns on the first light emission control transistor **47** and the second light emission control transistor **48** so that the drive transistor **28** can drive the light-emitting element **30** to emit light, and the light emission function of the display panel and the display function of the display panel can be fulfilled.

[0226] FIG. **29** is a partial section view of the structure of another display panel according to embodiments of the present disclosure. As shown in FIGS. **9**, **13** and **29**, optionally, the compensation transistor **29** and the first reset transistor **33** are each an oxide-semiconductor transistor **49**.

[0227] The drive transistor **28** controls the magnitude of the drive current according to the voltage of the gate of the drive transistor **28**, and the magnitude of the drive current is configured to adjust the light emission brightness of the light-emitting element **30** so that the grayscale can be controlled. The compensation transistor **29** and the first reset transistor **33** are both electrically connected to the gate of the drive transistor **28** so that the performances of the compensation transistor **29** and the first reset transistor **33** can directly affect the potential of the gate of the drive transistor **28**, thereby affecting the light emission brightness of the light-emitting element **30**.

[0228] In this embodiment, the first reset transistor **33** may be disposed as an oxide-semiconductor transistor **49**, for example, an n-type indium gallium zinc oxide (IGZO) transistor. When the first scan signal on the first scan line **43** is a high-level signal, the source-drain electrode of the n-type oxide-semiconductor transistor **49** is turned on so that the first reset transistor **33** can be turned on. Since the IGZO transistor has a low mobility and a small leakage current, the first reset transistor **33** uses the oxide-semiconductor transistor **49** so that the charge of the gate of the drive transistor **28** can be prevented from leaking away through the first reset transistor **33** during low-frequency driving, and the leakage current problem during low-frequency driving can be effectively solved, thereby making the pixel circuit **14** suitable for implementation of low-frequency driving and helping reduce the consumption of the display panel.

[0229] Further, the compensation transistor **29** may also use the oxide-semiconductor transistor **49**, for example, an n-type indium gallium zinc oxide (IGZO) transistor. When the second scan signal on the second scan line **44** is a high-level signal, the source-drain electrode of the n-type oxide-semiconductor transistor **49** is turned on so that the compensation transistor **29** can be turned on. Since the IGZO transistor has a low mobility and a small leakage current, the compensation transistor **29** uses the oxide-semiconductor transistor **49** so that the charge of the gate of the drive transistor **28** can be prevented from leaking away through the compensation transistor **29** during

low-frequency driving, and the effect of a leakage current on the stability of the potential of the gate of the drive transistor **28** can be effectively reduced, thereby helping improve the stability of the pixel circuit **14** during low-frequency driving.

[0230] Optionally, the first light emission control transistor **47**, the data signal write transistor **27**, the drive transistor **28**, the second light emission control transistor **48** and the light emission reset transistor **34** may be each a p-type low-temperature polysilicon (LTPS) thin-film transistor (p-type transistor). The LTPS transistor has the advantages of a small size and good stability.

[0231] With continued reference to FIGS. **9**, **13** and **29**, optionally, the compensation transistor **29** and the first reset transistor **33** are each a double-gate transistor.

[0232] Since the double-gate transistor has a small leakage current, the compensation transistor **29** and the first reset transistor **33** use the double-gate transistor so that the charge of the gate of the drive transistor **28** can be prevented from leaking away through the compensation transistor **29** and the first reset transistor **33** during low-frequency driving, and the leakage current problem during low-frequency driving can be effectively solved, thereby making the pixel circuit **14** suitable for implementation of low-frequency driving and helping reduce the consumption of the display panel

[0233] Meanwhile, when the compensation transistor **29** and the first reset transistor **33** are each an oxide-semiconductor transistor **49**, due to the generally larger size of the oxide-semiconductor transistor **49**, the compensation transistor **29** and the first reset transistor **33** are each disposed as a double-gate transistor so that the size of the compensation transistor **29** and the first reset transistor **33** can be reduced.

[0234] With continued reference to FIG. **29**, exemplarily, the pixel circuit **14** may simultaneously include the first thin-film transistor **22** and the oxide-semiconductor transistor **49**. The first thin-film transistor **22** is an LTPS transistor and includes the first active layer **24**, the first gate layer **25** and the first source-drain electrode layer **26** that are stacked on one side of the base substrate **23**, where the first gate layer **25** may be located on the first active layer **24**. That is, the LTPS transistor is generally a top-gate structure. The oxide-semiconductor transistor **49** includes a second gate layer **50**, a second active layer **51**, a third gate layer **52** and a second source-drain electrode layer **53** that are stacked on one side of the base substrate **23**, where the third gate layer **52** is located on the second active layer **51**, and the second gate layer **50** is located under the second active layer **51**. That is, the oxide-semiconductor transistor **49** is generally a top-bottom double-gate structure, where the third gate layer **52** is the top gate, and the second gate layer **50** is the bottom gate.

[0235] The second gate layer **50** may be located in the same film as the first plate **401**, and the second source-drain electrode layer **53** may be located in the same film as the first source-drain electrode layer **26** so that the configuration of metal layers can be saved, and the production cost and the thickness of the display panel can be reduced. This is not limited thereto.

[0236] With continued reference to FIG. **9**, optionally, the first power signal line **18** covers the compensation transistor **29** and the first reset transistor **33** in the thickness direction of the display panel.

[0237] The first power signal line **18** is configured to supply the first power signal to the pixel circuit **14**, and the first power signal is a direct current signal instead of an alternating current (AC) signal, so the voltage on the first power signal line **18** is a constant voltage. As shown in FIG. **9**, in this embodiment, the first power signal line **18** covers the compensation transistor **29** and the first reset transistor **33** so that the first power signal line **18** can shield the compensation transistor **29** and the first reset transistor **33** and reduce the effect of the signal lines on the compensation transistor **29** and the first reset transistor **33** in the pixel circuit **14**, thereby stabilizing the potential of the gate of the drive transistor **28**, helping improve the control precision of the drive current by the pixel circuit **14**, and further improving the display effect.

[0238] With continued reference to FIG. **9** and FIG. **13**, optionally, the first power signal line **18** covers the first node N1 in the thickness direction of the display panel.

[0239] Specifically, as shown in FIG. **13**, the potential of the first node N1 is the potential of the

gate of the drive transistor **28**, so the first power signal line **18** covers the first node **N1** so that the first power signal line **18** can shield the first node **N1** and reduce the effect of the signal lines on the potential of the first node **N1** in the pixel circuit **14**, thereby stabilizing the potential of the gate of the drive transistor **28**, helping improve the control precision of the drive current by the pixel circuit **14** and further improving the display effect.

[0240] With continued reference to FIG. **9**, optionally, the line width of the first power signal line **18** is greater than the line width of the second signal line **15** and the line width of the third signal line **16**. With the configuration in which the line width of the second signal line **15** and the line width of the third signal line **16** are smaller, the second signal line **15** and the third signal line **16** can be thinner, and the vertical projection of the second signal line **15** on the plane on which the display panel is located and the vertical projection of the third signal line **16** on the plane on which the display panel is located can be smaller so that the overlapping areas between the second signal line **15** and the third signal line **16** and other signal lines in the pixel circuit **14** can be reduced, thereby reducing parasitic capacitances between the second signal line **15** and the third signal line **16** and the other signal lines in the pixel circuit **14** and reducing the signal interference between the second signal line **15** and the third signal line **16** and the other signal lines in the pixel circuit **14**. In this manner, the first type of signal transmitted on the second signal line **15** and on the third signal line **16** can be more accurate and more stable so that the driving performance of the pixel circuit **14** can be improved. Meanwhile, reducing the parasitic capacitances between the second signal line **15** and the third signal line **16** and the other signal lines in the pixel circuit **14** can also help reduce the loss of the first type of signal on the second signal line **15** and on the third signal line **16** so that the consumption of the display panel can be reduced.

[0241] Meanwhile, the line width of the first power signal line **18** is larger, that is, the first power signal line **18** is wider, so that the resistance on the first power signal line **18** can be reduced, thereby reducing the line loss of the first power signal on the first power signal line **18** and helping improve the display uniformity.

[0242] With continued reference to FIGS. **11**, **12**, **14** to **17**, **24** and **29**, optionally, the base substrate **23** may be disposed as a three-layer structure including a first substrate **231**, a first inorganic layer **232** and a first substrate **233** that are sequentially disposed. With the configuration in which the first inorganic layer **232** can prevent moisture and oxygen from entering the pixel circuit **14**, the driving performance of the pixel circuit **14** can be ensured.

[0243] With continued reference to FIGS. **11**, **12**, **14** to **17**, **24** and **29**, optionally, a buffer layer **54** is disposed between the light-shielding metal layer **41** and the first active layer **24** and can play roles of shockproof, buffering and isolation.

[0244] With continued reference to FIGS. **11**, **12**, **14** to **17**, **24** and **29**, optionally, one side of the buffer layer **54** facing away from the base substrate **23** is provided with a gate insulating layer **55**, a capacitor insulating layer **56**, an interlayer insulating layer **57**, a planarization layer **58** and a passivation layer **59** that are sequentially disposed. The gate insulating layer **55** is located between the first active layer **24** and the first gate layer **25**. The capacitor insulating layer **56** is located between the first plate **401** and the second plate **402**. The interlayer insulating layer **57** is located between the first plate **401** and the first source-drain electrode layer **26**. The planarization layer **58** is located between the first source-drain electrode layer **26** and the second signal line **15**. The passivation layer **59** is located on one side of the second signal line **15** facing away from the base substrate **23**.

[0245] The gate insulating layer **55**, the capacitor insulating layer **56** and the interlayer insulating layer **57** may be each an inorganic film, and the planarization layer **58** and the passivation layer **59** may be each an organic film.

[0246] Further, the interlayer insulating layer **57** may include an insulating layer or multiple insulating layers. For example, as shown in FIG. **29**, the interlayer insulating layer **57** may further include a first interlayer insulating layer **571**, a second interlayer insulating layer **572** and a third

interlayer insulating layer **573** that are stacked, where the first interlayer insulating layer **571** is located between the second gate layer **50** and the second active layer **51**, the second interlayer insulating layer **572** is located between the second active layer **51** and the third gate layer **52**, and the third interlayer insulating layer **573** is located between the third gate layer **52** and the second source-drain electrode layer **53**. This is not limited thereto.

[0247] It is to be noted that the specific structure of the pixel circuit **14** is not limited to the preceding structure and may be disposed by those skilled in the art according to actual needs.

[0248] Based on the same inventive concept, embodiments of the present disclosure further provide a display device. FIG. **30** is a diagram illustrating the structure of a display device according to embodiments of the present disclosure. As shown in FIG. **30**, the display device **70** includes the display panel **71** according to any embodiment of the present disclosure. Therefore, the display device **70** according to this embodiment of the present disclosure has the technical effects of the technical solution in any preceding embodiment, and structures which are same as or correspond to the preceding embodiments and the explanation of the terms will not be repeated here.

[0249] As shown in FIG. **30**, the display panel **71** includes the first function region **12**, the display device **70** includes an optical electronic element (not shown) disposed in the first function region **12**, and the optical electronic element may include one or more of a photographing module, a light sensor or an ultrasonic distance sensor, which may be disposed by those skilled in the art according to actual needs.

[0250] The display device **70** according to this embodiment of the present disclosure may be the phone shown in FIG. **30** or may be any electronic product having a display function, including, but not limited to the following categories: a television, a laptop, a desktop display, a tablet computer, a digital camera, a smart bracelet, smart glasses, a vehicle-mounted display, a medical device, an industrial control device, or a touch interactive terminal. No special limitations are made thereto in this embodiment of the present disclosure.

[0251] The preceding embodiments are not intended to limit the protection scope of the present disclosure. It is to be understood by those skilled in the art that various modifications, combinations, sub-combinations and substitutions may be made according to design requirements and other factors. Any modifications, equivalent substitutions, improvements and the like made within the spirit and principle of the present disclosure shall fall within the protection scope of the present disclosure.

Claims

1. A display panel, comprising: a first display region, a second display region and a first function region, wherein the first display region is adjacent to the first function region in a first direction, the second display region is adjacent to the first function region in a second direction, and the first direction intersects the second direction; wherein the second display region comprises a first signal line extending in the second direction, the first signal line is configured to supply a first type of signal to a pixel circuit of the second display region, and the first signal line comprises a first segment and a second segment that are separated by the first function region; wherein the first display region comprises a first display sub-region; wherein the first display sub-region comprises a second signal line and a third signal line that extend in the second direction, the second signal line is configured to supply the first type of signal to a pixel circuit of the first display sub-region, and the third signal line is electrically connected to the first segment and the second segment; wherein the display panel further comprises a fourth signal line extending in the second direction and configured to transmit a second type of signal; and wherein the second signal line, the third signal line and the fourth signal line overlap a same pixel circuit of the first display sub-region in a thickness direction of the display panel.

2. The display panel according to claim 1, comprising at least one of: the fourth signal line is a first

power signal line, the second type of signal is a first power signal, or the first type of signal is a data signal.

3. The display panel according to claim 1, wherein in a same pixel circuit of the first display sub-region, the second signal line and the third signal line are located on a same side of the fourth signal line.

4. The display panel according to claim 1, further comprising a pixel circuit group, wherein the pixel circuit group comprises a first pixel circuit and a second pixel circuit disposed adjacent to each other in the first direction and arranged in a mirror-image; and in a same pixel circuit group of the first display sub-region, in the first direction, the second signal line is located between two third signal lines, or the third signal line is located between two second signal lines.

5. The display panel according to claim 1, wherein the second signal line and the third signal line are located in a same film.

6. The display panel according to claim 1, wherein in the first direction, a distance between the second signal line and the third signal line is d_1 , and $d_1 \geq 2.5 \mu\text{m}$.

7. The display panel according to claim 1, further comprising a first connection line extending in the first direction, wherein the first connection line is configured to connect the first signal line to the third signal line.

8. The display panel according to claim 7, comprising at least one of: the first connection line and the third signal line are located in different films, or the first connection line and the reference voltage signal line are located in a same film.

9. The display panel according to claim 7, further comprising a reference voltage signal line extending in the first direction, wherein the reference voltage signal line is configured to supply a reference voltage signal to the pixel circuit; and the first connection line and the reference voltage signal line are insulated from each other, and in the thickness direction of the display panel, the first connection line and the reference voltage signal line at least partially overlap.

10. The display panel according to claim 9, further comprising a first power signal line, wherein the first power signal line is configured to transmit a first power signal; wherein the reference voltage signal line comprises a first reference voltage signal line and a second reference voltage signal line; wherein the pixel circuit further comprises a drive transistor, a first reset transistor and a light emission reset transistor; wherein the drive transistor is connected in series between the first power signal line and a light-emitting element; wherein a gate of the drive transistor is electrically connected to a first electrode of the first reset transistor, and a second electrode of the first reset transistor is electrically connected to the first reference voltage signal line; wherein an anode of the light-emitting element is electrically connected to a first electrode of the light emission reset transistor, and a second electrode of the light emission reset transistor is electrically connected to the second reference voltage signal line; and wherein the first connection line and at least one of the first reference voltage signal line or the second reference voltage signal line are located in different films, and in the thickness direction of the display panel, the first connection line and at least one of the first reference voltage signal line or the second reference voltage signal line at least partially overlap.

11. The display panel according to claim 7, further comprising a first power signal line, wherein the first power signal line is configured to transmit a first power signal; wherein the pixel circuit further comprises a data signal write transistor, a drive transistor, and a compensation transistor; wherein the drive transistor is connected in series between the first power signal line and a light-emitting element; wherein a first electrode of the drive transistor is electrically connected to a first electrode of the data signal write transistor, a second electrode of the drive transistor is electrically connected to a first electrode of the compensation transistor, and a second electrode of the compensation transistor is electrically connected to a gate of the drive transistor; wherein in the pixel circuit of the first display sub-region, a second electrode of the data signal write transistor is electrically connected to the second signal line through a first via; and wherein in the second

direction, a distance between the first connection line and the first via is d_2 , wherein $d_2 > 0$.

12. The display panel according to claim 1, wherein the first display region further comprises a second display sub-region; wherein the second display sub-region comprises a fifth signal line extending in the second direction and configured to supply the first type of signal to a pixel circuit of the second display sub-region; wherein the display panel further comprises a virtual signal line extending in the second direction; wherein the virtual signal line comprises a first virtual signal line located in the second display sub-region, and in a same pixel circuit of the second display sub-region, the fifth signal line and the first virtual signal line are located on a same side of the fourth signal line; and wherein the virtual signal line further comprises a second virtual signal line located in the first display sub-region, the second virtual signal line and the third signal line are arranged in the second direction and are insulated from each other.

13. The display panel according to claim 12, wherein the virtual signal line further comprises a third virtual signal line located in the second display region, and in a same pixel circuit of the second display region, the first signal line and the third virtual signal line are located on a same side of the fourth signal line.

14. The display panel according to claim 12, wherein a third type of signal is applied to the virtual signal line, and the third type of signal is a fixed voltage signal.

15. The display panel according to claim 12, wherein in the same pixel circuit of the first display sub-region, in the first direction, a distance between the second signal line and the third signal line is d_1 ; and in the same pixel circuit of the second display sub-region, in the first direction, a distance between the fifth signal line and the first virtual signal line is d_3 ; wherein $d_1 \geq d_3$.

16. The display panel according to claim 12, wherein a line width of the third signal line is W_1 , and a line width of the virtual signal line is W_2 , wherein $W_1 \leq W_2$.

17. The display panel according to claim 12, further comprising a second connection line extending in the first direction, wherein the second connection line is configured to connect the first virtual signal line to the second virtual signal line, and/or configured to connect the second virtual signal line to the third virtual signal line.

18. The display panel according to claim 17, wherein the first virtual signal line, the second virtual signal line and the third virtual signal line are located in a same film; and the second connection line and the virtual signal line are located in different films.

19. The display panel according to claim 12, further comprising a first connection line extending in the first direction, wherein the first connection line is configured to connect the first signal line of the second display region to the third signal line of the first display sub-region; wherein the display panel further comprises a virtual connection line extending in the first direction, the virtual connection line and the first connection line are arranged in the first direction and are insulated from each other.

20. A display device, comprising a display panel, wherein the display panel comprises: a first display region, a second display region and a first function region, wherein the first display region is adjacent to the first function region in a first direction, the second display region is adjacent to the first function region in a second direction, and the first direction intersects the second direction; wherein the second display region comprises a first signal line extending in the second direction, the first signal line is configured to supply a first type of signal to a pixel circuit of the second display region, and the first signal line comprises a first segment and a second segment that are separated by the first function region; wherein the first display region comprises a first display sub-region; wherein the first display sub-region comprises a second signal line and a third signal line that extend in the second direction, the second signal line is configured to supply the first type of signal to a pixel circuit of the first display sub-region, and the third signal line is electrically connected to the first segment and the second segment; wherein the display panel further comprises a fourth signal line extending in the second direction and configured to transmit a second type of

signal; and wherein the second signal line, the third signal line and the fourth signal line overlap a same pixel circuit of the first display sub-region in a thickness direction of the display panel.
