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(54) **OLED DISPLAY MODULE AND METHOD OF FORMING THE SAME**

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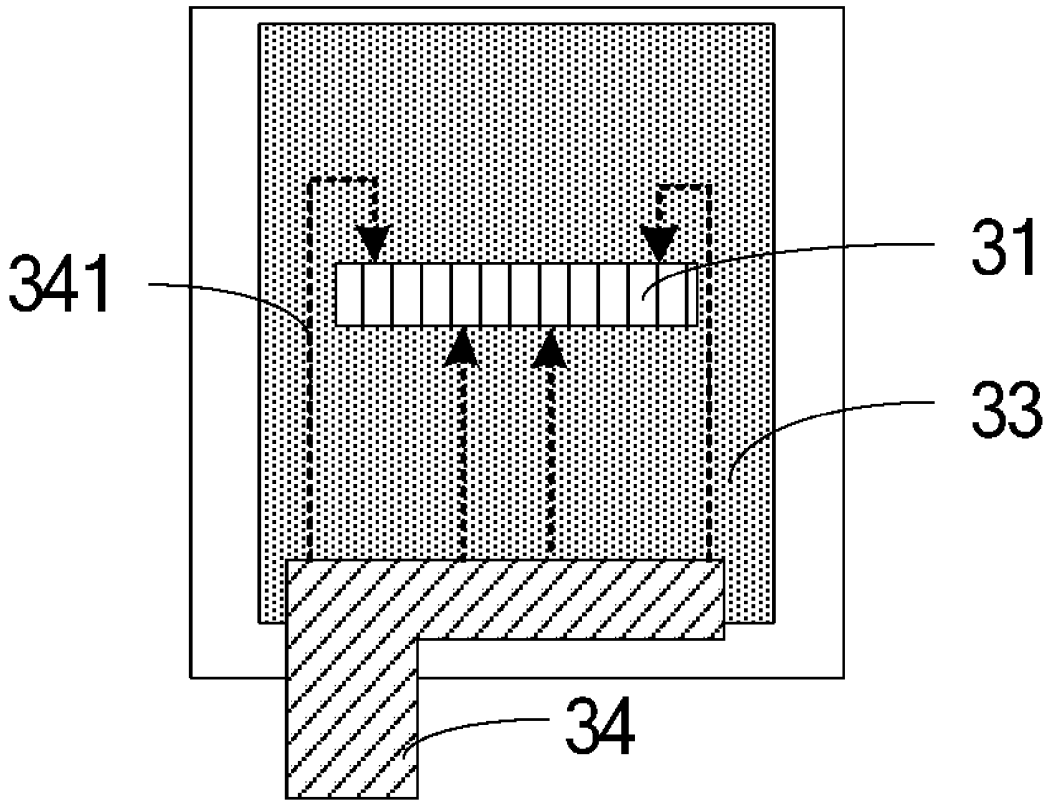
CPC ***H01L 27/3255*** (2013.01); *H01L 2227/323* (2013.01)

(57) **ABSTRACT**

An organic light-emitting diode (OLED) display module and a method of forming the OLED display module are proposed. The OLED display module includes an OLED display screen comprising a display signal input terminal and a driver chip. The driver chip is fixed on a back of the OLED display screen and includes a driving signal output terminal. A signal output by the driving signal output terminal is led out from two or more terminals of the driver chip and finally input to the display signal input terminal. The risk of the OLED display module is effectively reduced while the yield rate is improved.



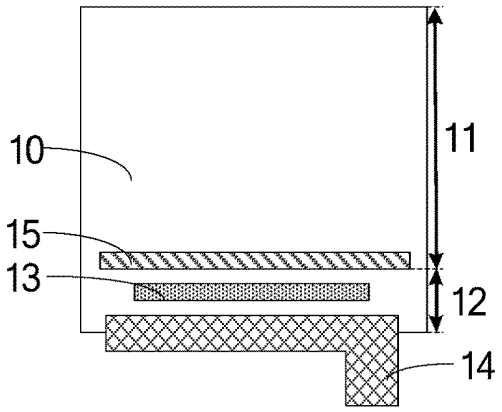


Fig. 1 (Related Art)

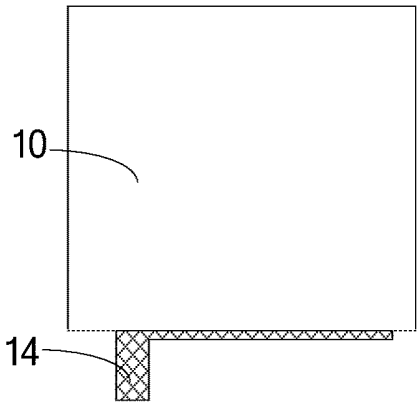


Fig. 2 (Related Art)

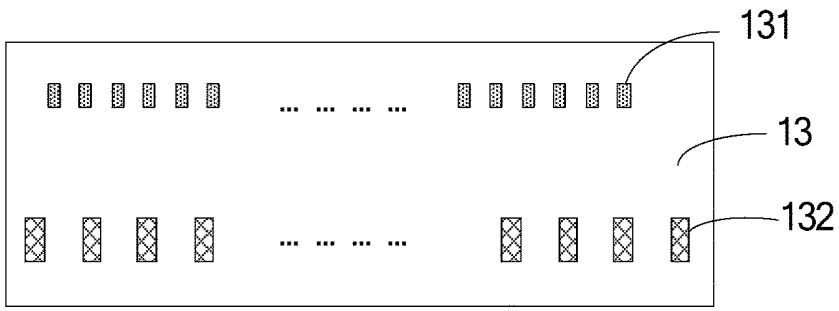


Fig. 3 (Related Art)

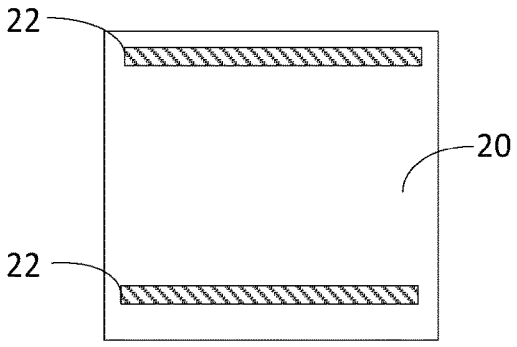


Fig. 4

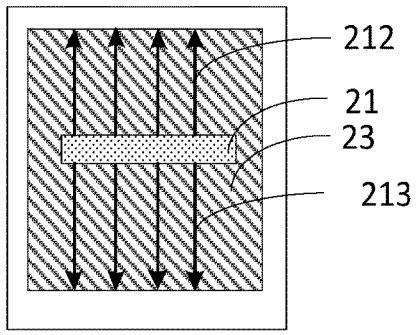


Fig. 5

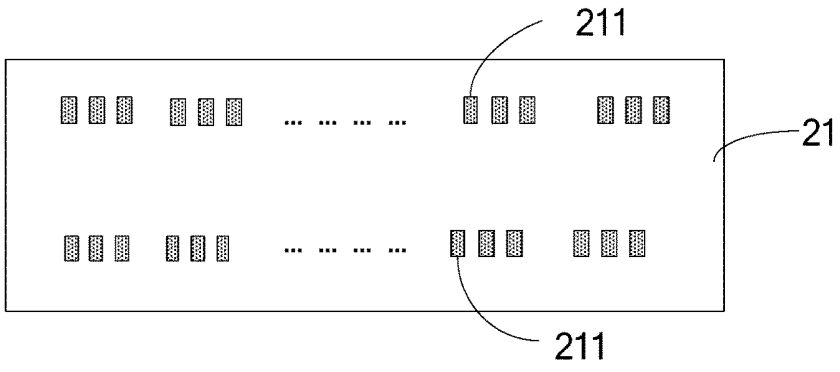


Fig. 6

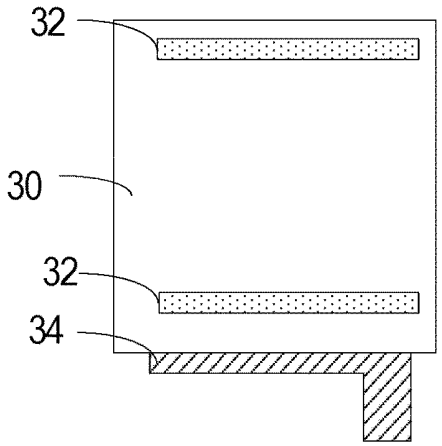


Fig. 7

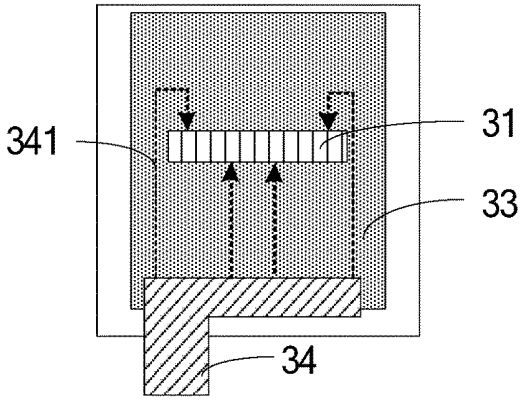


Fig. 8

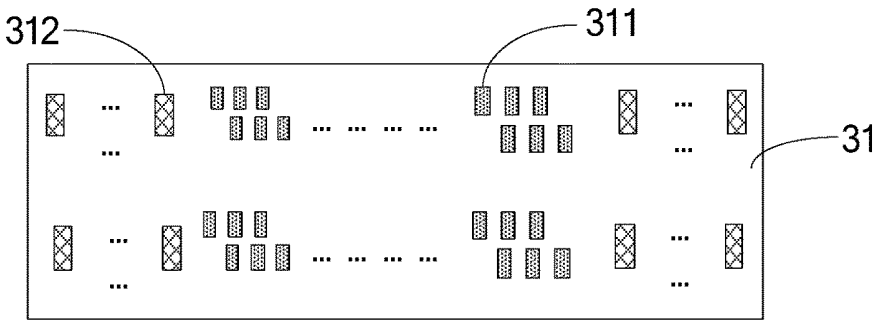


Fig. 9

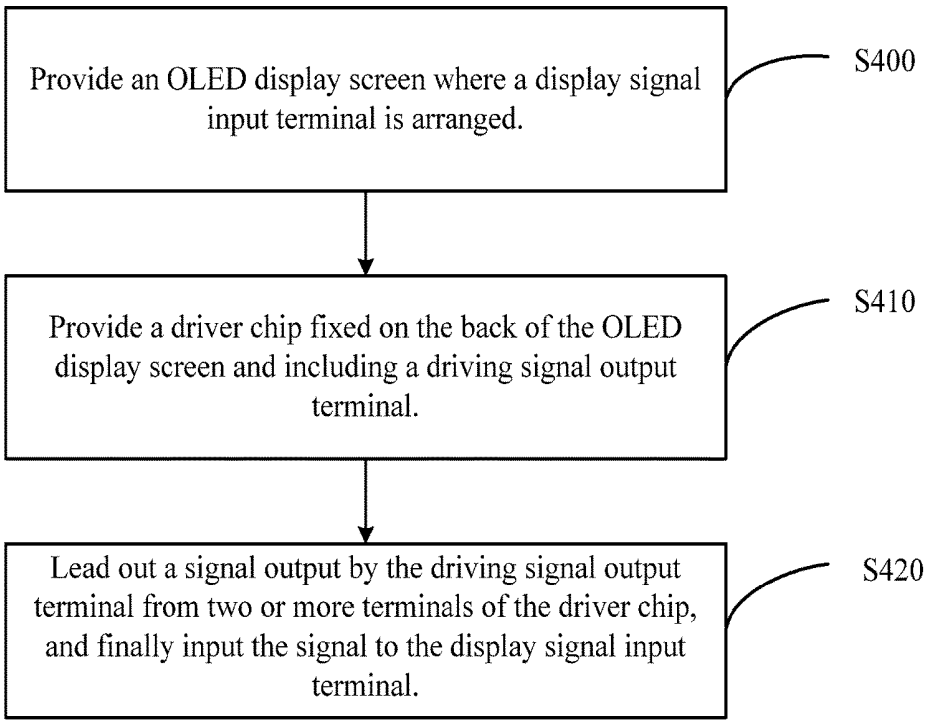

Provide an OLED display screen where a display signal input terminal is arranged.
S400
Provide a driver chip fixed on the back of the OLED display screen and including a driving signal output terminal.
S410
Lead out a signal output by the driving signal output terminal from two or more terminals of the driver chip, and finally input the signal to the display signal input terminal.
S420

Fig. 10

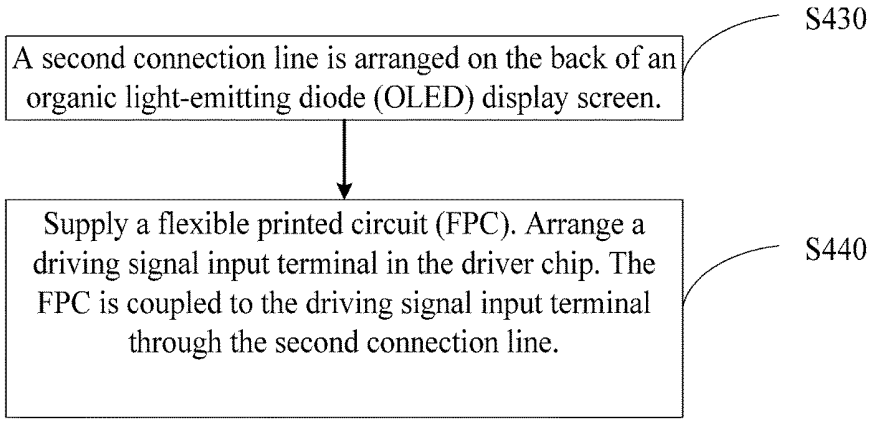

A second connection line is arranged on the back of an organic light-emitting diode (OLED) display screen.
S430
Supply a flexible printed circuit (FPC). Arrange a driving signal input terminal in the driver chip. The FPC is coupled to the driving signal input terminal through the second connection line.
S440

Fig. 11

OLED DISPLAY MODULE AND METHOD OF FORMING THE SAME

BACKGROUND

1. Field of the Disclosure

[0001] The present disclosure relates to the field of liquid crystal display, and more particularly, to an organic light-emitting diode (OLED) display module and a method of forming the OLED display module.

2. Description of Related Art

[0002] Electron devices are more widely applied with the development of the technology. In addition to a display screen, a conventional electrical device includes a driver chip and/or a flexible printed circuit (FPC).

[0003] FIG. **1** is a schematic diagram of a front view of a conventional display module. FIG. **2** is a schematic diagram of the back of the conventional display module. A large part of a lower border zone **12** remains on the lower area of the effective zone **11** because of the front of display screen **10**. A driver chip **13** and an FPC **14** are arranged on the lower border zone **12** to supply a display signal input terminal **15** with a driving signal. The driver chip **13** bonds with an indium tin oxide (ITO) pad arranged on the display screen through an input pad and an output pad inside the driver chip **13**.

[0004] Please refer to FIG. **3**. FIG. **3** shows a bonding surface of the driver chip **13** and the display screen **10**. A signal output pin **131** of the driver chip **13** is arranged at a first terminal of the driver chip **13**, and a signal input pin **132** of the driver chip **13** is arranged at a second terminal of the driver chip **13**. The first and second terminals of the driver chip **13** are opposite terminals in a longitudinal direction.

[0005] Because of the improvement of the resolution of the display screen, the driver chip includes more and more input pads and output pads. The display screen includes more and more pads and source lines on the surface as well. Once the area of the lower border zone **12** becomes great enough with a high resolution, the pads on the display screen and the display screen are reduced obviously with denser source lines. It becomes much harder to design a display module due to the reduced pads and the denser source lines. It's also bad for the reducing yield rate of the display module.

[0006] OLED is characterized by self-illumination, low driver voltage, high illumination efficiency, short response time, high clarity and contrast, flexible display, large-area full-color display, etc. Besides, no light guide plates (LGPs) are arranged in an OLED display screen for separation compared with a liquid crystal display screen of related art.

[0007] In light of the above-mentioned characteristics of the OLED, it is necessary to design a more user-friendly OLED display module.

SUMMARY

[0008] An object of the present disclosure is to propose an OLED display module and a method of forming the display module to reduce the risk of designing the OLED display module and to enhance the yield rate.

[0009] According to one aspect of the present disclosure, an organic light-emitting diode (OLED) display module includes an OLED display screen comprising a display signal input terminal, a driver chip and a flexible printed circuit (FPC). The driver chip is fixed on a back of the OLED display screen includes a driving signal output terminal and a driving signal input terminal. A signal output by the driving signal output terminal is led out from two or more terminals of the driver chip through a first connection line and finally input to the display signal input terminal. The FPC is coupled to the driving signal input terminal through a second connection line. The first connection line and the second connection line are arranged on the back of the OLED display screen. The first connection line is connected between the display signal input terminal and the driving signal output terminal through a connection pad.

[0010] According to another aspect of the present disclosure, an organic light-emitting diode (OLED) display module includes an OLED display screen comprising a display signal input terminal and a driver chip. The driver chip is fixed on a back of the OLED display screen and includes a driving signal output terminal. A signal output by the driving signal output terminal is led out from two or more terminals of the driver chip and finally input to the display signal input terminal.

[0011] According to still another aspect of the present disclosure, a method of forming an organic light-emitting diode (OLED) display module includes providing an OLED display screen where a display signal input terminal is arranged, providing a driver chip fixed on a back of the OLED display screen and comprising a driving signal output terminal, and leading out a signal output by the driving signal output terminal from two or more terminals of the driver chip and finally inputting the signal to the display signal input terminal.

[0012] The present disclosure brings advantages as follows. Routings on the OLED display screen are well distributed and the size of the pad is ensured. Besides, the risk of the OLED display module is effectively reduced while the yield rate is improved. It is because the driver chip is arranged on the back of the OLED display screen and a signal output by a driving signal output terminal is led out by two or more terminals of the driver chip.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. **1** is a schematic diagram of a front view of a conventional display module.

[0014] FIG. **2** is a schematic diagram of the back of the conventional display module.

[0015] FIG. **3** shows a bonding surface of the driver chip and the display screen.

[0016] FIG. **4** illustrates a front view of an organic light-emitting diode (OLED) display module according to a first embodiment of the present disclosure.

[0017] FIG. **5** illustrates a back view of the organic light-emitting diode (OLED) display module shown in FIG. **4**.

[0018] FIG. **6** illustrates a bonding surface of the driver chip and the display screen shown in FIG. **4**.

[0019] FIG. **7** illustrates a front view of an organic light-emitting diode (OLED) display module according to a second embodiment of the present disclosure.

[0020] FIG. **8** illustrates a back view of the organic light-emitting diode (OLED) display module shown in FIG. **7**.

[0021] FIG. **9** illustrates a bonding surface of the driver chip and the display screen shown in FIG. **7**.

[0022] FIG. **10** illustrates a method of forming an organic light-emitting diode (OLED) display module according to a third embodiment of the present disclosure.

[0023] FIG. **11** illustrates a method of forming an organic light-emitting diode (OLED) display module according to a fourth embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0024] The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0025] Please refer to FIG. **4** and FIG. **5** illustrating an organic light-emitting diode (OLED) display module according to a first embodiment of the present disclosure. The OLED display module includes an OLED display screen **20** and a driver chip **21**.

[0026] The OLED display screen **20** is characterized by self-illumination, low driver voltage, etc. A display signal is input to the OLED display screen **20** through a display signal input terminal **22** arranged on the front side of the OLED display screen **20** so that the OLED display screen **20** can show images normally.

[0027] The two display signal input terminals **22** are arranged on two opposite terminals of the OLED display screen **20** correspondingly in this embodiment. In another embodiment, display signal input terminals **22** are arranged on two adjacent terminals of the OLED display screen **20** correspondingly. Further, display signal input terminals **22** are arranged on other three or four terminals.

[0028] The driver chip **21** is fixed on the back of the OLED display screen **20**. Specifically, the driver chip **21** is immobilized on a conductive coating layer **23**. In at least one embodiment, the driver chip **21** is fastened on the center of the back of the OLED display screen **20**.

[0029] Please refer to FIG. **6** illustrating the driver chip **21**. The driver chip **21** includes a driving signal output terminal **211**. A signal output by the driving signal output terminal **211** is led out from two terminals of the driver chip **21** and finally input to the display signal input terminal **22**.

[0030] The two terminals of the driver chip **21** are two opposite terminals of the driver chip **21** in a longitudinal direction in this embodiment. In another embodiment, two terminals of the driver chip **21** are adjacent terminals of the driver chip **21** in a longitudinal direction. In another embodiment, a signal output by the driving signal output terminal **211** is led out from three or four terminals of the driver chip **21**, which is not limited by the present disclosure actually.

[0031] In this embodiment, a signal output by the driving signal output terminal **211** is led out from the two terminals of the driver chip **21** through a first connection line (not shown) and finally input to the display signal input terminal **22**. The first connection line is arranged on the back of the OLED display screen **20**. A connection pad is arranged on one terminal of the first connection line. This terminal is connected to the driving signal output terminal **211** correspondingly. The other terminal of the first connection line is connected to the display signal input terminal **22**.

[0032] One part of the first connection line extends to the driving signal output terminal **211** of the driver chip **21** from one terminal of the OLED display screen **20** including the display signal input terminal **22** in this embodiment. Besides, the other part of the first connection line extends to the other terminal of the driver chip **21** from the other terminal of the OLED display screen **20** including the display signal input terminal **22**. More specifically, as FIG. **5** illustrates, a solid line with an arrow **212** and a solid line with an arrow **213** indicate signal paths between the driver chip **21** and the display signal input terminal **22**. The solid line with an arrow **212** is a signal path related to one part of the first connection line. The solid line with an arrow **213** is a signal path related to the other part of the first connection line.

[0033] The first connection line is formed in the conductive coating layer **23** in this embodiment.

[0034] The driver chip is arranged on the back of the OLED display screen **30**, and a signal output by the driving signal output terminal are led out from two or more terminals of the driver chip in the above-mentioned embodiment. In this way, wires on the OLED display screen **30** are well distributed, and the size of the pad is ensured. Besides, the risk of designing the OLED display module is effectively reduced and the yield rate is obviously improved.

[0035] Please refer to FIG. **7** and FIG. **8** illustrating an organic light-emitting diode (OLED) display module according to another embodiment of the present disclosure. The OLED display module includes an OLED display screen **30**, a driver chip **31**, and a flexible printed circuit (FPC) **34**.

[0036] The OLED display screen **30** introduced by the present embodiment is identical or similar to the corresponding structure described by the above-mentioned embodiments so the aforesaid descriptions can be certainly referred to. The present disclosure will not go further on this topic.

[0037] The FPC **34** inputs a driving signal to the driver chip **31** in this embodiment. As FIG. **9** illustrates, the driver chip **31** includes driving signal output terminals **312** as well as driving signal output terminals **311**.

[0038] The driving signal output terminals **312** are distributed at two sides of the bottom of the driver chip **31**. The driving signal output terminals **311** are distributed between the driving signal input terminals **312** arranged at two sides of the bottom of the driver chip **31**. Definitely, the driving signal input terminals **312** may be arranged on one terminal of the driver chip **31**.

[0039] To increase an effective display area on the OLED display module, the FPC **34** is fixed on the back of the OLED display screen **30** and electrically connected to the driving signal input terminal **312** of the driver chip **31** through a second connection line (not shown). As FIG. **8** illustrates, a dotted line with an arrow **341** indicates a driving signal path of the second connection line between the FPC **34** and the driving signal input terminal **312**.

[0040] The second connection line is formed in a conductive coating layer **33** in the second embodiment. In another embodiment, a flexible printed circuit (FPC) **34** may be fixed on the front of an organic light-emitting diode (OLED) display screen **30**.

[0041] Please refer to FIG. **10** illustrating a method of forming an organic light-emitting diode (OLED) display module according to a third embodiment of the present disclosure. The method includes steps as follows.

[0042] Step S**400**: Provide an OLED display screen **30** where a display signal input terminal **32** is arranged.

[0043] The display signal input terminals **32** are settled at two opposite terminals of the OLED display screen **30** correspondingly in this embodiment. Display signal input terminals **32** may be settled at two adjacent terminals of an

organic light-emitting diode (OLED) display screen **30** in another embodiment. Further, display signal input terminals **32** are arranged on three or even four terminals of an organic light-emitting diode (OLED) display screen **30**.

[0044] Step S**410**: Provide a driver chip **31** fixed on the back of the OLED display screen **30** and including a driving signal output terminal **311**.

[0045] Specifically, the driver chip **31** is fastened on a conductive coating layer **33** arranged on the back of the OLED display screen **30**. In at least one embodiment, the driver chip **31** is fixed on the center of the back of the OLED display screen **30**.

[0046] Step S**420**: Lead out a signal output by the driving signal output terminal **311** from two or more terminals of the driver chip **31**, and finally input the signal to the display signal input terminal **32**.

[0047] A signal output by the driving signal output terminal **311** is led out from the two terminals of the driver chip **31** through a first connection line (not shown) and finally input to the display signal input terminal **32**. The two terminals of the driver chip **31** are two opposite terminals of the driver chip **31** in a longitudinal direction in this embodiment. In another embodiment, a signal output by a driving signal output terminal **311** is led out from two adjacent terminals of an organic light-emitting diode (OLED) display screen **30**. Further, a signal output by a driving signal output terminal **311** is led out from three or even four terminals of an organic light-emitting diode (OLED) display screen **30**.

[0048] A first connection line is arranged on the back of the OLED display screen **30**. A connection pad is arranged on one terminal of the first connection line. This terminal is connected to the driving signal output terminal **311** correspondingly. The other terminal of the first connection line is connected to the display signal input terminal **32**.

[0049] Specifically, one part of the first connection line extends to the driving signal output terminal **311** of the driver chip **31** from one terminal of the OLED display screen **30** including the display signal input terminal **32** in this embodiment. Besides, the other part of the first connection line extends to the other terminal of the driver chip **31** including the driving signal output terminal **311** from the other terminal of the OLED display screen **30**.

[0050] In at least one embodiment, the first connection line formed in a conductive coating layer **33**.

[0051] Please refer to FIG. **11**. A method further includes following steps in another embodiment.

[0052] Step S**430**: A second connection line is arranged on the back of an organic light-emitting diode (OLED) display screen.

[0053] The second connection line (not shown) is arranged on the back of the OLED display screen **30**. Specifically, the second connection line is placed in the conductive coating layer **33** on the back of the OLED display screen **30**.

[0054] Step S**440**: Supply a flexible printed circuit (FPC) **34**. Arrange a driving signal input terminal **312** in the driver chip **31**. The FPC **34** is coupled to the driving signal input terminal **312** through the second connection line.

[0055] In addition to a driving signal output terminals **311**, the driver chip **31** further includes the driving signal input terminals **312**. Specifically, the driving signal input terminals **312** are distributed at two sides of the bottom of the driver chip **31**. The driving signal output terminals **311** are distributed between the driving signal input terminals **312** arranged at the two sides of the bottom of the driver chip **31**.

[0056] The FPC **34** is electrically connected to the driving signal input terminal **312** through the second connection line to input a driving signal to the driver chip **31**. The FPC **34** is fastened on the back of the OLED display screen **30** to increase an effective display area on the OLED display module. In another embodiment, the FPC **34** may be fixed on the front of the OLED display screen **30**.

[0057] With respect to the OLED display module produced in all of the embodiments with the above-mentioned method, please refer to the aforesaid descriptions. The present disclosure will not go further on this topic.

[0058] The present disclosure is described in detail in accordance with the above contents with the specific preferred examples. However, this present disclosure is not limited to the specific examples. For the ordinary technical personnel of the technical field of the present disclosure, on the premise of keeping the conception of the present disclosure, the technical personnel can also make simple deductions or replacements, and all of which should be considered to belong to the protection scope of the present disclosure.

What is claimed is:

1. An organic light-emitting diode (OLED) display module, comprising:

an OLED display screen, comprising a display signal input terminal;

a driver chip, fixed on a back of the OLED display screen and comprising a driving signal output terminal and a driving signal input terminal; a signal output by the driving signal output terminal being led out from two or more terminals of the driver chip through a first connection line and finally input to the display signal input terminal; and

a flexible printed circuit (FPC), coupled to the driving signal input terminal through a second connection line,

wherein the first connection line and the second connection line are arranged on the back of the OLED display screen, the first connection line is connected between the display signal input terminal and the driving signal output terminal through a connection pad.

2. The OLED display module of claim **1**, wherein the two or more terminals of the driver chip are two opposite terminals of the driver chip in a longitudinal direction;

the display signal input terminals are settled at two opposite terminals of the OLED display screen correspondingly;

one part of the first connection line extends to the terminal of the driver chip from the terminal of the OLED display screen; the other part of the first connection line extends to the other terminal of the driver chip from the other terminal of the OLED display screen.

3. The OLED display module of claim **1**, wherein the first connection line is formed in a conductive coating layer.

4. The OLED display module of claim **1**, wherein the driving signal input terminals are distributed at two sides of a bottom of the driver chip; the driving signal output terminals are distributed between the driving signal input terminals arranged at the two sides of the bottom of the driver chip.

5. An organic light-emitting diode (OLED) display module, comprising:

an OLED display screen, comprising a display signal input terminal;

a driver chip, fixed on a back of the OLED display screen and comprising a driving signal output terminal; a

signal output by the driving signal output terminal being led out from two or more terminals of the driver chip and finally input to the display signal input terminal.

6. The OLED display module of claim **5**, wherein the signal output by the driving signal output terminal is led out from the two or more terminals of the driver chip through a first connection line and finally input to the display signal input terminal; the first connection line is arranged on the back of the OLED display screen; a connection pad is arranged on one terminal of the first connection line; the one terminal of the first connection line is connected to the driving signal output terminal; the other terminal of the first connection line is connected to the display signal input terminal.

7. The OLED display module of claim **6**, wherein the two or more terminals of the driver chip are two opposite terminals of the driver chip in a longitudinal direction;

the display signal input terminals are settled at two opposite terminals of the OLED display screen correspondingly;

one part of the first connection line extends to the terminal of the driver chip from the terminal of the OLED display screen; the other part of the first connection line extends to the other terminal of the driver chip from the other terminal of the OLED display screen.

8. The OLED display module of claim **6**, wherein the first connection line is formed in a conductive coating layer.

9. The OLED display module of claim **5**, wherein the OLED display module further comprises:

a second connection line, arranged on the back of the OLED display screen;

a flexible printed circuit (FPC);

a driving signal input terminal, arranged on the driver chip; the FPC being electrically connected to the driving signal input terminal of the driver chip through the second connection line.

10. The OLED display module of claim **9**, wherein the driving signal input terminals are distributed at two sides of a bottom of the driver chip; the driving signal output terminals are distributed between the driving signal input terminals arranged at the two sides of the bottom of the driver chip.

11. A method of forming an organic light-emitting diode (OLED) display module, comprising:

providing an OLED display screen where a display signal input terminal is arranged;

providing a driver chip fixed on a back of the OLED display screen and comprising a driving signal output terminal;

leading out a signal output by the driving signal output terminal from two or more terminals of the driver chip and finally inputting the signal to the display signal input terminal.

12. The method of claim **11**, wherein a step of leading out a signal output by the driving signal output terminal from two or more terminals of the driver chip and finally inputting the signal to the display signal input terminal, comprises:

leading out the signal output by the driving signal output terminal from the two or more terminals of the driver chip through a first connection line and finally inputting to the display signal input terminal; arranging the first connection line on the back of the OLED display screen; arranging a connection pad on one terminal of the first connection line; connecting the one terminal of the first connection line to the driving signal output terminal; connecting the other terminal of the first connection line to the display signal input terminal.

13. The method of claim **12**, wherein the step of leading out a signal output by the driving signal output terminal from two or more terminals of the driver chip and finally inputting the signal to the display signal input terminal, comprises:

setting the two or more terminals of the driver chip to be two opposite terminals of the driver chip in a longitudinal direction;

arranging the display signal input terminals at two opposite terminals of the OLED display screen correspondingly;

extending one part of the first connection line to the terminal of the driver chip from the terminal of the OLED display screen; extending the other part of the first connection line to the other terminal of the driver chip from the other terminal of the OLED display screen.

14. The method of claim **12**, wherein the step of leading out a signal output by the driving signal output terminal from two or more terminals of the driver chip and finally inputting the signal to the display signal input terminal, comprises:

forming the first connection line in a conductive coating layer.

15. The method of claim **11**, further comprising:

arranging a second connection line on the back of the OLED display screen;

supplying a flexible printed circuit (FPC); arranging a driving signal input terminal in the driver chip; electrically connecting the FPC to the driving signal input terminal through the second connection line.

16. The method of claim **15**, wherein the driving signal input terminals are distributed at two sides of a bottom of the driver chip; the driving signal output terminals are distributed between the driving signal input terminals arranged at the two sides of the bottom of the driver chip.

* * * * *

专利名称(译)	OLED显示模块及其形成方法		
公开(公告)号	US20180247989A1	公开(公告)日	2018-08-30
申请号	US15/552487	申请日	2017-04-20
[标]申请(专利权)人(译)	武汉华星光电技术有限公司		
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外部链接	Espacenet USPTO		

摘要(译)

提出了一种有机发光二极管（OLED）显示模块和形成OLED显示模块的方法。 OLED显示模块包括OLED显示屏，OLED显示屏包括显示信号输入端和驱动芯片。驱动芯片固定在OLED显示屏的背面，并包括驱动信号输出端。由驱动信号输出端子输出的信号从驱动器芯片的两个或更多个端子引出，并最终输入到显示信号输入端子。有效降低了OLED显示模块的风险，同时提高了产率。