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| First Names Inventor   | Chih-Pang Chang                                                   |               |   |
| Title                  | SEMICONDUCTOR STRUCTURE AND ORGANIC<br>ELECTROLUMINESCENCE DEVICE |               |   |
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| Application Number     | :                                                                 | Filing Date   | : |
| Art Unit               | :                                                                 | Examiner Name | : |

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Date: Aug. 4, 2011

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Date: Aug. 4, 2011

SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE  
DEVICE

5 CROSS-REFERENCE TO RELATED APPLICATION

This application claims the priority benefit of Taiwan application serial no. 100118144, filed on May 24, 2011. The entirety of the above-mentioned patent application is hereby incorporated by reference herein and made a part of this specification.

10

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The invention relates to a semiconductor structure. Particularly, the invention relates to a semiconductor structure adapted to a light emitting device.

15 Description of Related Art

[0002] A channel layer of a thin film transistor is made of oxide semiconductor (which is referred to as an oxide semiconductor thin film transistor), which can effectively improve carrier mobility of the device. Meanwhile, since the oxide semiconductor is transparent, conductive, amorphous and suitable for low temperature  
20 process, etc., the oxide semiconductor thin film transistor is adapted to be applied to display panels.

[0003] However, when the oxide semiconductor thin film transistor is applied to an active matrix liquid crystal display (AMLCD) or an active matrix organic light emitting display (AMOLED), ultraviolet (UV)-light irradiation is required during a packaging

process or a UV-bleach process. Therefore, since the channel layer of the oxide semiconductor thin film transistor is irradiated by UV-light, a device characteristic thereof is probably unstable, for example, a drain induced barrier lowering (DIBL) effect is probably occurred to cause a current leakage phenomenon of the device, which  
5 may influence a display quality.

#### SUMMARY OF THE INVENTION

[0004] The invention is directed to a semiconductor structure, which is capable of effectively preventing a device characteristic variation occurred when a device is  
10 irradiated by light.

[0005] The invention is directed to an organic electroluminescence device, which uses the semiconductor structure of the invention to provide good and stable device characteristics.

[0006] The invention provides a semiconductor structure, which disposed on a  
15 substrate. The semiconductor structure includes a gate electrode, a gate insulating layer, a channel layer, a source electrode, a drain electrode, a dielectric layer and a conductive light-shielding pattern layer. The gate electrode and the gate insulating layer are disposed on the substrate, and the gate insulating layer covers the gate electrode. The channel layer is disposed on the gate insulating layer and located above  
20 the gate electrode. The channel layer has a channel length  $L$  along a channel direction and has a first side and a second side opposite to the first side. The source electrode and the drain electrode are located at the two opposite sides of the channel layer, and are electrically connected to the first side and the second side of the channel layer, respectively. The dielectric layer covers the source electrode, the drain electrode and

the channel layer. The conductive light-shielding pattern layer is disposed on the dielectric layer, and is overlapped to a portion of the source electrode and a portion of the channel layer in a vertical projection, where the conductive light-shielding pattern layer and the channel layer have an overlapping length  $d1$ , and  $0.3 \leq d1/L \leq 0.85$ .

5 [0007] In an embodiment of the invention, a material of the channel layer includes oxide semiconductor.

[0008] In an embodiment of the invention, the oxide semiconductor includes indium gallium zinc oxide (IGZO).

[0009] In an embodiment of the invention, the conductive light-shielding pattern  
10 layer has a third side and a fourth side along the channel direction. The fourth side is overlapped to the channel layer, where the overlapping length is equal to a distance between the fourth side and the first side of the channel layer along the channel direction.

[0010] In an embodiment of the invention, the channel layer covers a portion of the  
15 source electrode and a portion of the drain electrode.

[0011] In an embodiment of the invention, the source electrode and the drain electrode respectively cover a portion of the channel layer.

[0012] In an embodiment of the invention, the semiconductor structure further includes an etching stop layer disposed on the channel layer, and the source electrode  
20 and the drain electrode respectively cover a portion of the etching stop layer.

[0013] In an embodiment of the invention, the drain electrode has a fifth side along the channel direction, where the fifth side is overlapped to the channel layer, and the fifth side and the second side are spaced by a distance  $t1$  along the channel direction, and  $0 < t1/L < 0.15$ .

[0014] The invention provides an organic electroluminescence device including the aforementioned semiconductor structure, an organic light emitting layer disposed on the conductive light-shielding pattern layer of the semiconductor structure, and an upper electrode disposed on the organic light emitting layer.

- 5 [0015] In order to make the aforementioned and other features and advantages of the invention comprehensible, several exemplary embodiments accompanied with figures are described in detail below.

#### BRIEF DESCRIPTION OF THE DRAWINGS

- 10 [0016] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

- [0017] FIG. 1A is a cross-sectional view of a semiconductor structure according to  
15 an embodiment of the invention.

[0018] FIG. 1B is a top view of the semiconductor structure of FIG. 1A.

[0019] FIG. 2 is a cross-sectional view of an organic electroluminescence device applying the semiconductor structure of FIG. 1A and FIG. 1B.

- [0020] FIG. 3A is a cross-sectional view of a semiconductor structure according to  
20 another embodiment of the invention.

[0021] FIG. 3B is a top view of the semiconductor structure of FIG. 3A.

[0022] FIG. 4A is a cross-sectional view of a semiconductor structure according to another embodiment of the invention.

[0023] FIG. 4B is a top view of the semiconductor structure of FIG. 4A.

[0024] FIG. 5A is a diagram illustrating relationship curves of actually measured overlapping lengths  $d_1$  relative to threshold voltages and carrier mobility of a thin film transistor according to an embodiment of the invention.

[0025] FIG. 5B is a diagram illustrating relationship curves of actually measured overlapping lengths  $d_1$  relative to sub-threshold swings and drain induced barrier lowering (DIBL) effects of a thin film transistor according to an embodiment of the invention.

#### DETAILED DESCRIPTION OF DISCLOSED EMBODIMENTS

[0026] In order to mitigate influence on a thin film transistor caused by light irradiation, for example, a drain induced barrier lowering (DIBL) effect and a current leakage phenomenon, a light mask is used to define a light-shielding layer covering the device, so as to shield the light from directly irradiating the channel layer. However, if the light-shielding layer covers a drain electrode of the device, an extra electric field is generated during operation of the device, which may cause shift and decrease of a threshold voltage of the device driven by a high source voltage, and may also cause the current leakage phenomenon.

[0027] Therefore, a covering area of the light-shielding layer is further adjusted to balance a light-shielding effect and device performance.

[0028] FIG. 1A is a cross-sectional view of a semiconductor structure according to an embodiment of the invention, and FIG. 1B is a top view of the semiconductor structure of FIG. 1A. For clarity's sake, only a part of the components of the semiconductor structure of FIG. 1A is illustrated in FIG. 1B. As shown in FIG. 1A and FIG. 1B, a gate electrode 110 of the semiconductor structure 100 is disposed on a

substrate 12. A gate insulating layer 120 is disposed on the substrate 12 and covers the gate electrode 110. A channel layer 130 is disposed on the gate insulating layer 120 and located above the gate electrode 110. In the present embodiment, a material of the channel layer 130 is, for example, an oxide semiconductor material, such as indium gallium zinc oxide (IGZO), indium gallium oxide (IGO), indium zinc oxide (IZO), etc.,  
5 which is preferably the IGZO semiconductor. The channel layer 130 has a channel length L along a channel direction D, and has a first side S1 and a second side S2 opposite to the first side S1.

[0029] A source electrode 140 and a drain electrode 150 of the semiconductor  
10 structure 100 are located at the two opposite sides of the channel layer 130, and the source electrode 140 and the drain electrode 150 are electrically connected to the first side S1 and the second side S2 of the channel layer 130. In the present embodiment, the channel layer 130 covers a portion of the source electrode 140 and a portion of the drain electrode 150. In other words, the first side S1 and the second side S2 of the  
15 channel layer 130 are respectively located on the source electrode 140 and the drain electrode 150. Moreover, a dielectric layer 160 covers the source electrode 140, the drain electrode 150 and the channel layer 130. The semiconductor structure of the present embodiment is an oxide semiconductor thin film transistor structure.

[0030] A conductive light-shielding pattern layer 172 is disposed on the dielectric  
20 layer 160. The conductive light-shielding pattern layer 172 is electrically floating, which is not electrically connected to other electrodes, and is overlapped to a portion of the source electrode 140 and a portion of the channel layer 130 in a vertical projection. The conductive light-shielding pattern layer 172 can be formed by a metal layer, or can be formed by a stacked layer of a metal layer and a transparent conductive layer.

Moreover, the conductive light-shielding pattern layer 172 and the channel layer 130 have an overlapping length  $d1$  along the channel direction  $D$ . In the present embodiment, the conductive light-shielding pattern layer 172 may have any shape that has a light-shielding effect. For example, the conductive light-shielding pattern layer 172 is a rectangle, and has a third side  $S3$  and a fourth side  $S4$  along the channel direction  $D$ , where the fourth side  $S4$  is overlapped to the channel layer 130 in the vertical projection. Here, the overlapping length  $d1$  is equal to a distance between the fourth side  $S4$  and the first side  $S1$  of the channel layer 130 along the channel direction  $D$ .

[0031] Considering both of the light-shielding effect, the device performance and the DIBL effect, the overlapping length  $d1$  of the present embodiment is  $0.3 \leq d1/L \leq 0.85$ , which is preferably  $0.4 \leq d1/L \leq 0.7$ . In detail, the conductive light-shielding pattern layer 172 is overlapped to a portion of the channel layer 130 in the vertical projection, and the overlapping length thereof is more than  $0.3L$ , which can mitigate the DIBL effect, and shield a certain amount of the light (for example, an ultraviolet (UV) light) in the light irradiation step to reduce the influence on the channel layer 130 caused by the light irradiation. On the other hand, the overlapping length between the conductive light-shielding pattern layer 172 and the channel layer 130 is limited under  $0.85L$ , so that the conductive light-shielding pattern layer 172 is not overlapped to the drain electrode 150 or even cover the drain electrode 150, so as to avoid generating the extra electric field during operation of the device, and prevent occurrence of the current leakage.

[0032] The semiconductor structure of the invention is adapted to be applied to an organic electroluminescence device. Referring to FIG. 2, FIG. 2 is a cross-sectional

view of an organic electroluminescence device 20 applying the semiconductor structure 100 of FIG. 1A and FIG. 1B. The organic electroluminescence device 20 includes the aforementioned semiconductor structure 100 disposed on the substrate 12 and an organic light emitting diode (OLED) 200. In an embodiment, the semiconductor structure 100 can serve as a switching transistor, which is electrically connected to the OLED 200 through other circuits (not shown), as that shown in FIG. 2. In another embodiment, the semiconductor structure 100 can also serve as a driving transistor, and the OLED 200 can be electrically connected to the drain electrode 150 of the semiconductor structure 100 through a contact window, and the above techniques are well known by those skilled in the art, so that details thereof are not repeated. When a lower electrode 174 of the OLED 200 is fabricated, a conductive light-shielding pattern layer 172 can be simultaneously fabricated. In the present embodiment, when a pattern of the conductive layer 170 is fabricated, besides the conductive light-shielding pattern layer 172 used for shielding a portion of the source electrode 140 and a portion of the channel layer 130 is formed, the lower electrode 174 can be simultaneously formed. In other words, the conductive light-shielding pattern layer 172 and the lower electrode 174 can be obtained by patterning a same material layer. An organic light emitting layer 210 is disposed on the lower electrode 174 of the conductive layer 170. An upper electrode 220 is disposed on the organic light emitting layer 210. The lower electrode 174 can be electrically connected to the drain electrode 150 directly or indirectly. In this way, a voltage can be applied through the upper electrode 220 and the lower electrode 174 to drive the organic light emitting layer 210 to emit light.

[0033] In an embodiment, the conductive layer 170 can be a metal layer or a stacked layer of the metal layer and a transparent conductive layer, and the conductive layer 170

is patterned to form the conductive light-shielding pattern layer 172 and the lower electrode 174, and then the organic light emitting layer 210 and the upper electrode 220 are fabricated, where the upper electrode 220 is a transparent conductive layer, and now the organic electroluminescence device 20 emitting light upwards is formed. In  
5 another embodiment, the conductive layer 170 can be a stacked layer of the metal layer and the transparent conductive layer. The conductive layer 170 is patterned to form the conductive light-shielding pattern layer 172 and the lower electrode 174, and the metal layer on the lower electrode 174 is removed to left the lower transparent conductive layer, and then the organic light emitting layer 210 and the upper electrode  
10 220 are fabricated, where the upper electrode 220 is an opaque conductive layer, and now the organic electroluminescence device 20 emitting light downwards is formed.

[0034] The thin film transistor structure of the aforementioned embodiment may have other variations according to actual application requirements.

[0035] FIG. 3A is a cross-sectional view of a semiconductor structure according to  
15 another embodiment of the invention, and FIG. 3B is a top view of the semiconductor structure of FIG. 3A. For clarity's sake, only a part of the components of the semiconductor structure of FIG. 3A is illustrated in FIG. 3B. As shown in FIG. 3A and FIG. 3B, the semiconductor structure 300 is similar to the semiconductor structure 100 of the aforementioned embodiment except that a relative position of a source  
20 electrode 340, a drain electrode 350 and a channel layer 330 is different. In detail, the source electrode 340 and the drain electrode 350 of the present embodiment respectively cover a portion of the channel layer 330, i.e. the a first side S1 and a second side S2 of the channel layer 330 are respectively located under the source electrode 340 and the drain electrode 350. A dielectric layer 360 covers the source electrode 340, the

drain electrode 350 and the channel layer 330. A conductive light-shielding pattern layer 370 is disposed on the dielectric layer 360. Similarly, the overlapping length  $d1$  of the conductive light-shielding pattern layer 370 and the channel layer 330 along the channel direction  $D$  is  $0.3 \leq d1/L \leq 0.85$ , which is preferably  $0.4 \leq d1/L \leq 0.7$ .

5 [0036] Moreover, since the source electrode 340 and the drain electrode 350 respectively cover a portion of the channel layer 330, the overlapping position of the drain electrode 350 and the channel layer 330 can be further limited to avoid that the conductive light-shielding pattern layer 370 covers the drain electrode 350. In the present embodiment, the drain electrode 350 has a fifth side  $S5$  along the channel  
10 direction  $D$ , and the fifth side  $S5$  is overlapped to the channel layer 330. In this way, a distance between the fifth side  $S5$  and the second side  $S2$  along the channel direction  $D$  is defined as an overlapping length  $t1$  of the drain electrode 350 and the channel layer 330. Compared to the overlapping length  $d1$  of the conductive light-shielding pattern layer 170 and the channel layer 130 of  $0.3 \leq d1/L \leq 0.85$  and preferably  $0.4 \leq d1/L \leq 0.7$ ,  
15 the overlapping length  $t1$  of the drain electrode 350 and the channel layer 330 is preferably  $0 < t1/L < 0.15$ . In this way, the conductive light-shielding pattern layer 370 is not over closed to the drain electrode 350 or even cover the drain electrode 350, so as to avoid generating the extra electric field during operation of the device, and prevent occurrence of the current leakage.

20 [0037] FIG. 4A is a cross-sectional view of a semiconductor structure according to another embodiment of the invention, and FIG. 4B is a top view of the semiconductor structure of FIG. 4A. For clarity's sake, only a part of the components of the semiconductor structure of FIG. 4A is illustrated in FIG. 4B. As shown in FIG. 4A and FIG. 4B, the semiconductor structure 400 is similar to the semiconductor structure

300 of the aforementioned embodiment except that the semiconductor structure 400 of the present embodiment further includes an etching stop layer 480 disposed on a channel layer 430, and a source electrode 440 and a drain electrode 450 respectively cover a portion of the etching stop layer 480. The other components and structural parameters such as the overlapping lengths  $d1$  and  $t1$ , etc. of the present embodiment are the same to that of the semiconductor structure 300, and details thereof are not repeated.

[0038] Moreover, the semiconductor structures 300 and 400 show in FIGs. 3A and 3B and FIGs. 4A and 4B can also be applied to the organic electroluminescence device 20 of FIG. 2 to achieve similar technical effects.

[0039] FIG. 5A is a diagram illustrating relationship curves of actually measured overlapping lengths  $d1$  relative to threshold voltages and carrier mobility of a thin film transistor according to an embodiment of the invention. FIG. 5B is a diagram illustrating relationship curves of actually measured overlapping lengths  $d1$  relative to sub-threshold swings and DIBL effects of a thin film transistor according to an embodiment of the invention. In the embodiments of FIG. 5A and FIG. 5B, a length of the channel layer of the thin film transistor is about  $23\text{ }\mu\text{m}$ , and the related curves of FIG. 5A and FIG. 5B represent variations of the aforementioned electrical characteristics of the thin film transistor due to variation of the overlapping length of the conductive light-shielding pattern layer and the channel layer from  $-6\text{ }\mu\text{m}$  to  $20\text{ }\mu\text{m}$ . According to FIG. 5A and FIG. 5B, it is known that the carrier mobility and the sub-threshold swing of the thin film transistor are maintained stable under different overlapping lengths. Moreover, the DIBL effect of the thin film transistor is effectively mitigated when the overlapping length is greater than  $4\text{ }\mu\text{m}$ , and meanwhile

the threshold voltage of the thin film transistor also trends to be stable. The overlapping length  $d1$  of the present embodiment is preferably not more than  $20\text{ }\mu\text{m}$  to avoid overlapping of the conductive light-shielding pattern layer and the drain electrode. When the overlapping length  $d1$  is within a range of  $7\text{-}20\text{ }\mu\text{m}$ , the DIBL effect is effectively mitigated, which is even better within a range of  $10\text{-}16\text{ }\mu\text{m}$ . A ratio between the overlapping length  $d1$  within the range of  $7\text{-}20\text{ }\mu\text{m}$  and the length ( $23\text{ }\mu\text{m}$ ) of the channel layer is approximately complied with the aforementioned  $0.3 \leq d1/L \leq 0.85$ , and preferably  $0.4 \leq d1/L \leq 0.7$ .

[0040] In summary, in the invention, in order to mitigate the influence on the thin film transistor caused by light irradiation, a metal light-shielding pattern layer is fabricated on the semiconductor structure to shield the light from directly irradiating the channel layer. Meanwhile, considering when the light-shielding layer covers the drain electrode of the device, the current leakage phenomenon is probably occurred, the overlapping length of the metal light-shielding pattern layer and the channel layer is further adjusted to balance the light-shielding effect and the device performance. Therefore, not only variation of the device characteristics caused by light irradiation can be effectively prevented, but good and stable device characteristics can also be provided.

[0041] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

## WHAT IS CLAIMED IS:

1. A semiconductor structure, disposed on a substrate, and comprising:
  - a gate electrode, disposed on the substrate;
  - a gate insulating layer, disposed on the substrate, and covering the gate
  - 5 electrode;
  - a channel layer, disposed on the gate insulating layer and located above the gate electrode, wherein the channel layer has a channel length  $L$  along a channel direction and has a first side and a second side opposite to the first side;
  - a source electrode and a drain electrode, located at the two opposite sides of
  - 10 the channel layer, and electrically connected to the first side and the second side of the channel layer, respectively;
  - a dielectric layer, covering the source electrode, the drain electrode and the channel layer; and
  - a conductive light-shielding pattern layer, disposed on the dielectric layer,
  - 15 and overlapped to a portion of the source electrode and a portion of the channel layer in a vertical projection, wherein the conductive light-shielding pattern layer and the channel layer have an overlapping length  $d_1$ , and  $0.3 \leq d_1/L \leq 0.85$ .
2. The semiconductor structure as claimed in claim 1, wherein a material of the channel layer comprises oxide semiconductor.
- 20 3. The semiconductor structure as claimed in claim 2, wherein the oxide semiconductor comprises indium gallium zinc oxide (IGZO).
4. The semiconductor structure as claimed in claim 1, wherein the conductive light-shielding pattern layer has a third side and a fourth side along the channel direction, the fourth side is overlapped to the channel layer in the vertical

projection, wherein the overlapping length  $d_1$  is equal to a distance between the fourth side and the first side of the channel layer along the channel direction.

5. The semiconductor structure as claimed in claim 1, wherein the channel layer covers a portion of the source electrode and a portion of the drain electrode.

5           6. The semiconductor structure as claimed in claim 1, wherein the source electrode and the drain electrode respectively cover a portion of the channel layer.

7. The semiconductor structure as claimed in claim 6, further comprising an etching stop layer disposed on the channel layer, wherein the source electrode and the drain electrode respectively cover a portion of the etching stop layer.

10           8. The semiconductor structure as claimed in claim 6, wherein the drain electrode has a fifth side along the channel direction, wherein the fifth side is overlapped to the channel layer, and the fifth side and the second side are spaced by a distance  $t_1$  along the channel direction, and  $0 < t_1/L < 0.15$ .

9. An organic electroluminescence device, disposed on a substrate, and  
15 comprising:

a gate electrode, disposed on the substrate;

a gate insulating layer, disposed on the substrate, and covering the gate electrode;

a channel layer, disposed on the gate insulating layer and located above the  
20 gate electrode, wherein the channel layer has a channel length  $L$  along a channel direction and has a first side and a second side opposite to the first side;

a source electrode and a drain electrode, located at the two opposite sides of the channel layer, and electrically connected to the first side and the second side of the channel layer, respectively;

a dielectric layer, covering the source electrode, the drain electrode and the channel layer;

a conductive light-shielding pattern layer, disposed on the dielectric layer, and overlapped to a portion of the source electrode and a portion of the channel layer in

5 a vertical projection, wherein the conductive light-shielding pattern layer and the channel layer have an overlapping length  $d1$ , and  $0.3 \leq d1/L \leq 0.85$ ;

a lower electrode, disposed on the dielectric layer and electrically connected to the drain electrode;

an organic light emitting layer, disposed on the lower electrode; and

10 an upper electrode, disposed on the organic light emitting layer.

10. The organic electroluminescence device as claimed in claim 9, wherein a material of the channel layer comprises oxide semiconductor.

11. The organic electroluminescence device as claimed in claim 10, wherein the oxide semiconductor comprises indium gallium zinc oxide (IGZO).

15 12. The organic electroluminescence device as claimed in claim 9, wherein the conductive light-shielding pattern layer has a third side and a fourth side along the channel direction, the fourth side is overlapped to the channel layer in the vertical projection, wherein the overlapping length  $d1$  is equal to a distance between the fourth side and the first side of the channel layer along the channel direction.

20 13. The organic electroluminescence device as claimed in claim 9, wherein the channel layer covers a portion of the source electrode and a portion of the drain electrode.

14. The organic electroluminescence device as claimed in claim 9, wherein the source electrode and the drain electrode respectively cover a portion of the channel

layer.

15. The organic electroluminescence device as claimed in claim 14, further comprising an etching stop layer disposed on the channel layer, wherein the source electrode and the drain electrode respectively cover a portion of the etching stop layer.

- 5           16. The organic electroluminescence device as claimed in claim 14, wherein the drain electrode has a fifth side along the channel direction, wherein the fifth side is overlapped to the channel layer, and the fifth side and the second side are spaced by a distance  $t_1$  along the channel direction, and  $0 < t_1/L < 0.15$ .

## ABSTRACT OF THE INVENTION

A semiconductor structure and an organic electroluminescence device applying the same are provided. A gate insulating layer covers a gate electrode disposed on a substrate. A channel layer has a channel length  $L$  along a channel direction and has a first side and a second side opposite to the first side. The channel layer is located on the gate insulating layer over the gate electrode. A source electrode and a drain electrode are located at and electrically connected to the first side and the second side of the channel layer, respectively. A conductive light-shielding pattern layer is disposed on a dielectric layer covering the source electrode, the drain electrode and the channel layer, and is overlapped to a portion of the source electrode and a portion of the channel layer in a vertical projection. The conductive light-shielding pattern layer and the channel layer have an overlapping length  $d_1$ , and  $0.3 \leq d_1/L \leq 0.85$ .

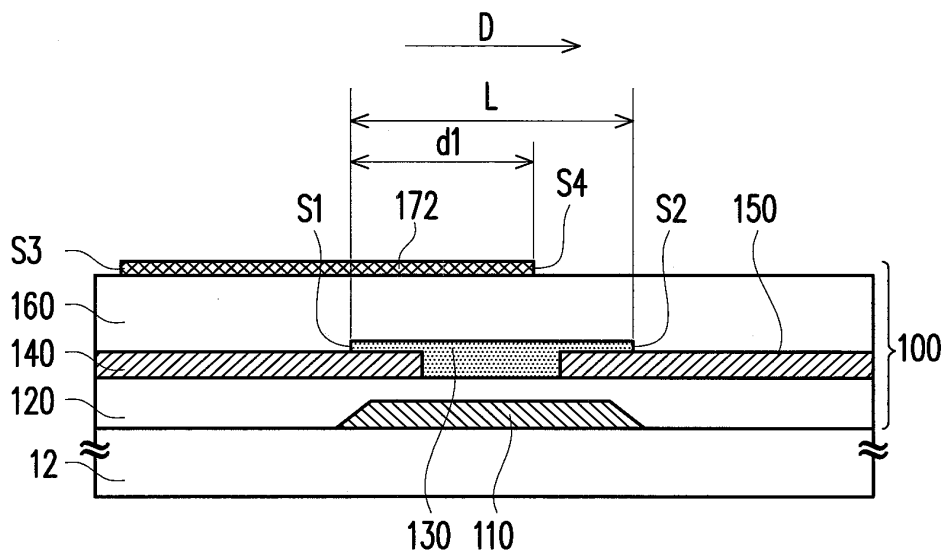


FIG. 1A

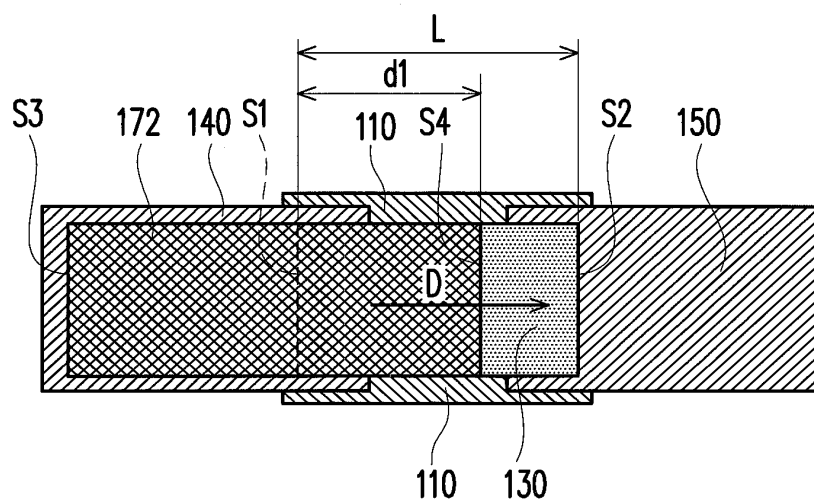


**FIG. 1B**

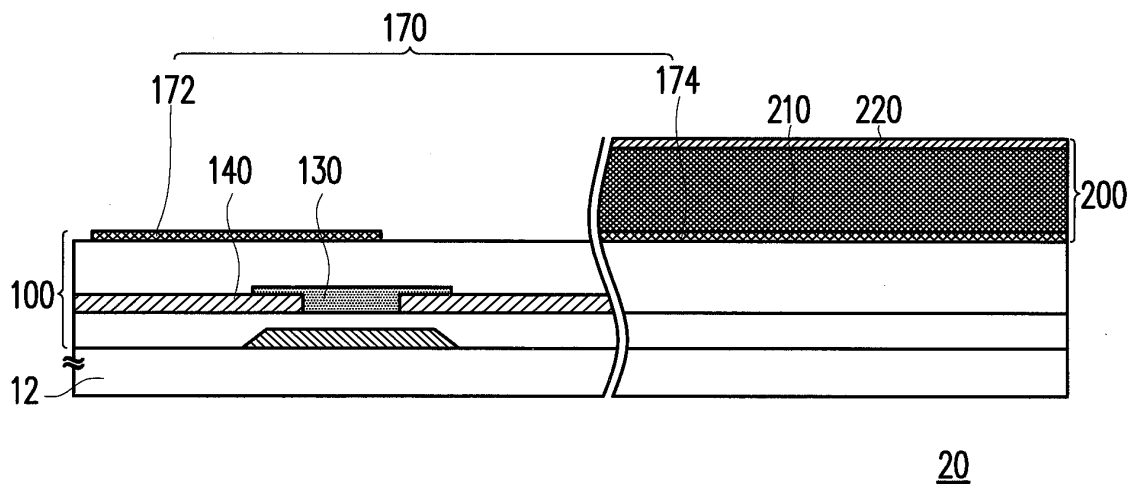


FIG. 2

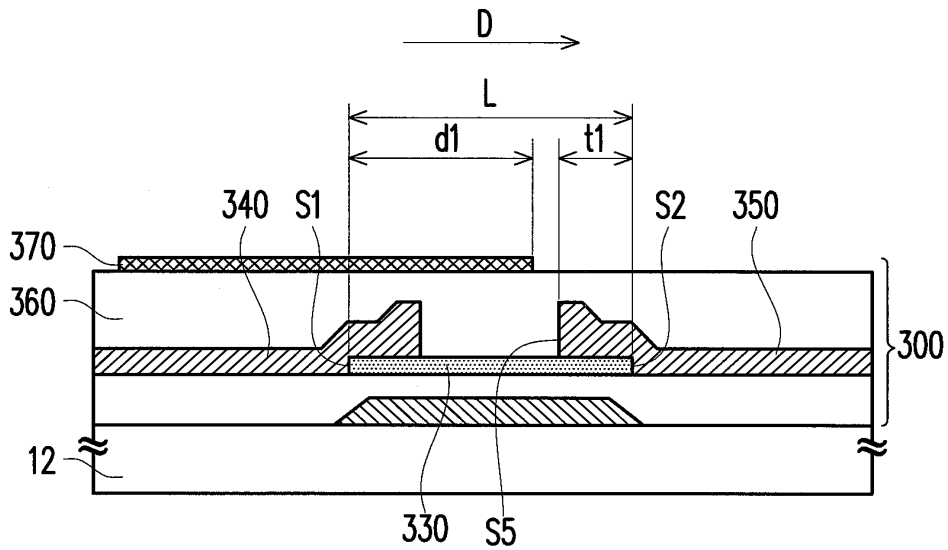


FIG. 3A

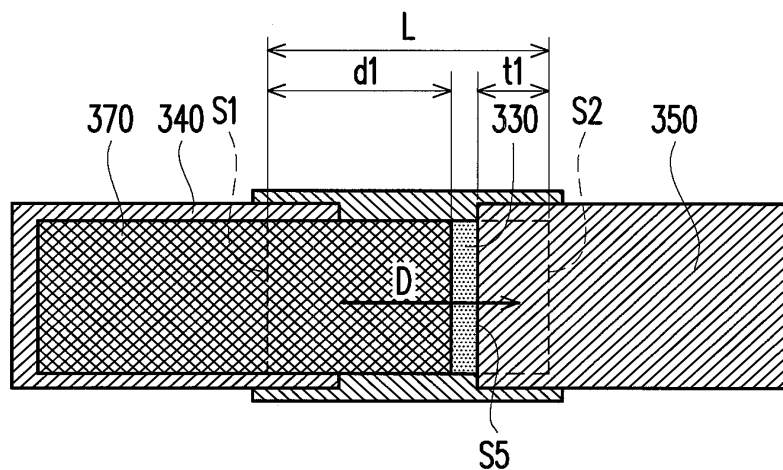


FIG. 3B

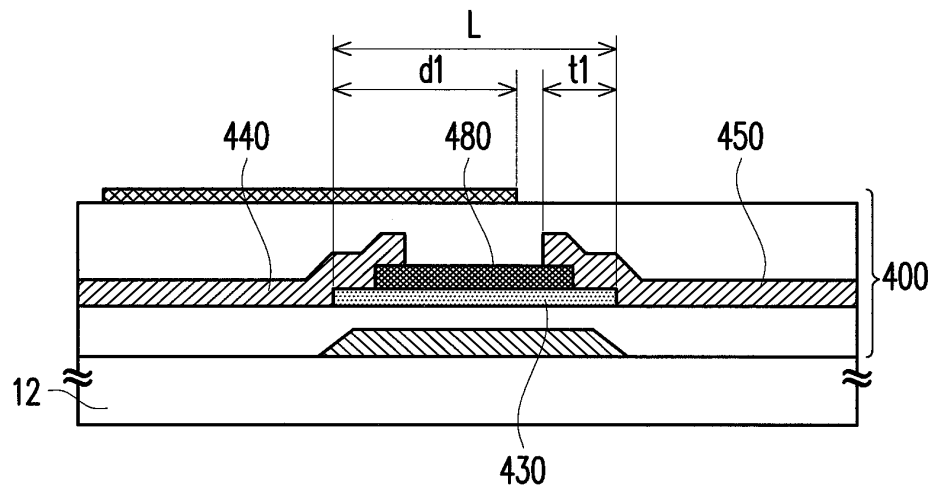


FIG. 4A

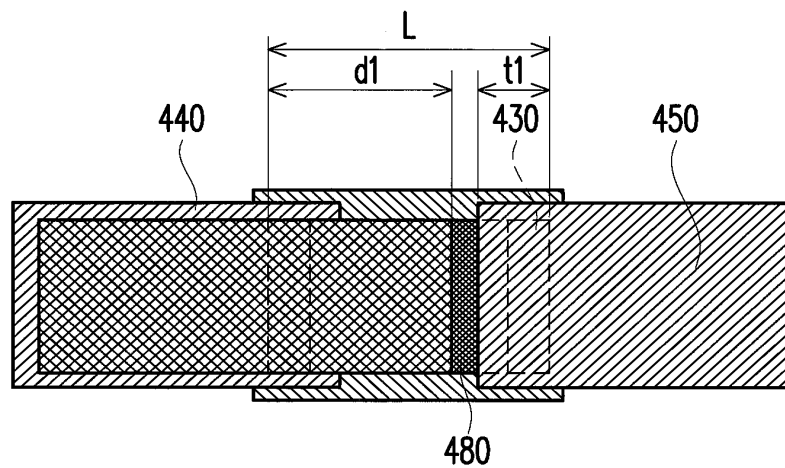


FIG. 4B

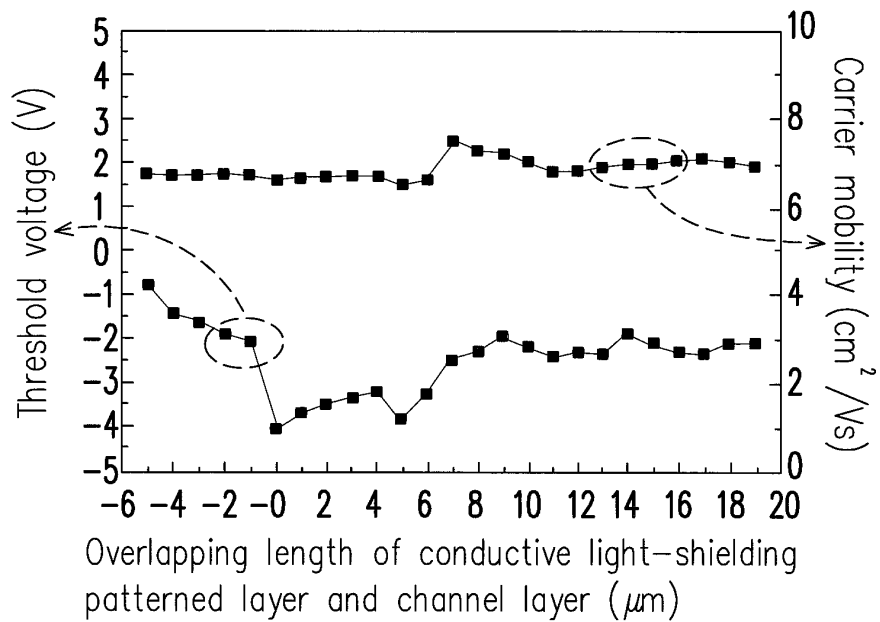


**FIG. 5A**

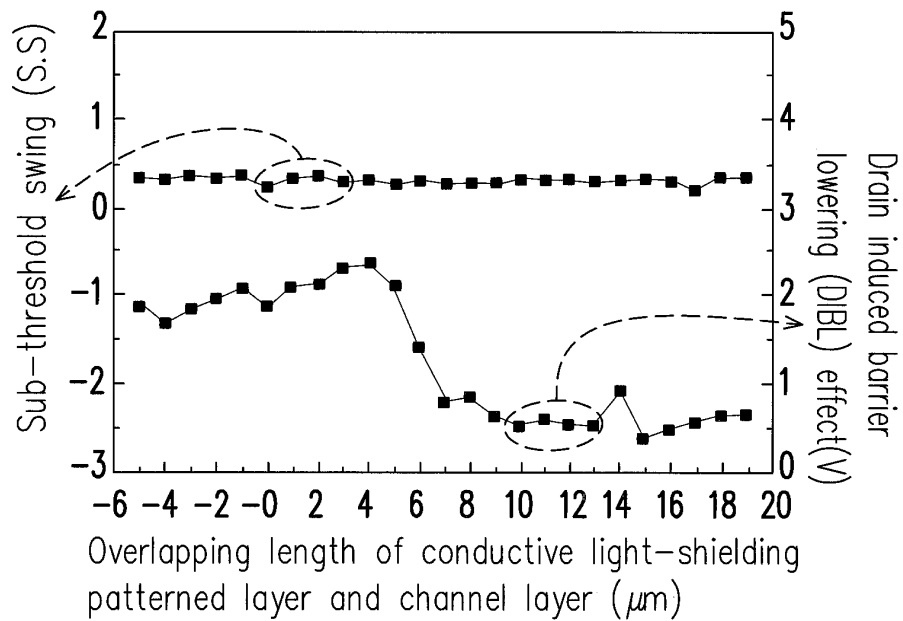


**FIG. 5B**

|                                                                                                     |                        |                 |  |
|-----------------------------------------------------------------------------------------------------|------------------------|-----------------|--|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |                 |  |
|                                                                                                     | Filing Date            |                 |  |
|                                                                                                     | First Named Inventor   | Chih-Pang Chang |  |
|                                                                                                     | Art Unit               |                 |  |
|                                                                                                     | Examiner Name          |                 |  |
|                                                                                                     | Attorney Docket Number | 37986-US-PA     |  |

| U.S.PATENTS                                                                                 |         |                    |                        |                  |                                                 | Remove                                                                 |
|---------------------------------------------------------------------------------------------|---------|--------------------|------------------------|------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Examiner Initial*                                                                           | Cite No | Patent Number      | Kind Code <sup>1</sup> | Issue Date       | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|                                                                                             | 1       | 5838399            |                        | 1998-11-17       | Someya et al.                                   |                                                                        |
| If you wish to add additional U.S. Patent citation information please click the Add button. |         |                    |                        |                  |                                                 | Add                                                                    |
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|                                                                                             | 2       | 20070290227        |                        | 2007-12-20       | Liang et al.                                    |                                                                        |
|                                                                                             | 3       | 20100295042        |                        | 2010-11-25       | Yano et al.                                     |                                                                        |
|                                                                                             | 4       | 20100244022        |                        | 2010-09-30       | Takahashi et al.                                |                                                                        |
|                                                                                             | 5       | 20080217618        |                        | 2008-09-11       | Deane                                           |                                                                        |

|                                                                                                     |                        |                 |  |
|-----------------------------------------------------------------------------------------------------|------------------------|-----------------|--|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |                 |  |
|                                                                                                     | Filing Date            |                 |  |
|                                                                                                     | First Named Inventor   | Chih-Pang Chang |  |
|                                                                                                     | Art Unit               |                 |  |
|                                                                                                     | Examiner Name          |                 |  |
|                                                                                                     | Attorney Docket Number | 37986-US-PA     |  |

|  |   |             |  |            |            |  |
|--|---|-------------|--|------------|------------|--|
|  | 6 | 20070296333 |  | 2007-12-27 | Kim et al. |  |
|--|---|-------------|--|------------|------------|--|

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| Examiner Initial*        | Cite No | Foreign Document Number <sup>3</sup> | Country Code <sup>2</sup> | Kind Code <sup>4</sup> | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T <sup>5</sup>           |
|                          | 1       |                                      |                           |                        |                  |                                                 |                                                                          | <input type="checkbox"/> |

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| Examiner Initials*              | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T <sup>5</sup>           |
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|--------------------|--|-----------------|--|
| Examiner Signature |  | Date Considered |  |

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

|                        |                 |
|------------------------|-----------------|
| Application Number     |                 |
| Filing Date            |                 |
| First Named Inventor   | Chih-Pang Chang |
| Art Unit               |                 |
| Examiner Name          |                 |
| Attorney Docket Number | 37986-US-PA     |

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

|            |               |                     |            |
|------------|---------------|---------------------|------------|
| Signature  | /Belinda Lee/ | Date (YYYY-MM-DD)   | 2011-08-08 |
| Name/Print | Belinda Lee   | Registration Number | 46863      |

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

| Electronic Patent Application Fee Transmittal |          |                                                                |        |                      |
|-----------------------------------------------|----------|----------------------------------------------------------------|--------|----------------------|
| Application Number:                           |          |                                                                |        |                      |
| Filing Date:                                  |          |                                                                |        |                      |
| Title of Invention:                           |          | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |        |                      |
| First Named Inventor/Applicant Name:          |          | Chih-Pang Chang                                                |        |                      |
| Filer:                                        |          | Belinda Lee                                                    |        |                      |
| Attorney Docket Number:                       |          | 37986-US-PA                                                    |        |                      |
| Filed as Large Entity                         |          |                                                                |        |                      |
| Utility under 35 USC 111(a) Filing Fees       |          |                                                                |        |                      |
| Description                                   | Fee Code | Quantity                                                       | Amount | Sub-Total in USD(\$) |
| Basic Filing:                                 |          |                                                                |        |                      |
| Utility application filing                    | 1011     | 1                                                              | 330    | 330                  |
| Utility Search Fee                            | 1111     | 1                                                              | 540    | 540                  |
| Utility Examination Fee                       | 1311     | 1                                                              | 220    | 220                  |
| Pages:                                        |          |                                                                |        |                      |
| Claims:                                       |          |                                                                |        |                      |
| Miscellaneous-Filing:                         |          |                                                                |        |                      |
| Petition:                                     |          |                                                                |        |                      |
| Patent-Appeals-and-Interference:              |          |                                                                |        |                      |

| Description                              | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|------------------------------------------|----------|----------|--------|----------------------|
| <b>Post-Allowance-and-Post-Issuance:</b> |          |          |        |                      |
| <b>Extension-of-Time:</b>                |          |          |        |                      |
| <b>Miscellaneous:</b>                    |          |          |        |                      |
| <b>Total in USD (\$)</b>                 |          |          |        | <b>1090</b>          |

| Electronic Acknowledgement Receipt          |                                                                |
|---------------------------------------------|----------------------------------------------------------------|
| <b>EFS ID:</b>                              | 10682357                                                       |
| <b>Application Number:</b>                  | 13208360                                                       |
| <b>International Application Number:</b>    |                                                                |
| <b>Confirmation Number:</b>                 | 7890                                                           |
| <b>Title of Invention:</b>                  | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |
| <b>First Named Inventor/Applicant Name:</b> | Chih-Pang Chang                                                |
| <b>Customer Number:</b>                     | 31561                                                          |
| <b>Filer:</b>                               | Belinda Lee                                                    |
| <b>Filer Authorized By:</b>                 |                                                                |
| <b>Attorney Docket Number:</b>              | 37986-US-PA                                                    |
| <b>Receipt Date:</b>                        | 12-AUG-2011                                                    |
| <b>Filing Date:</b>                         |                                                                |
| <b>Time Stamp:</b>                          | 06:17:19                                                       |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)                                    |

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| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
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|                              |                                                     |                    |                                                    |     |    |
|------------------------------|-----------------------------------------------------|--------------------|----------------------------------------------------|-----|----|
| 1                            | Application Data Sheet                              | 37986ADS_FORM.pdf  | 965034<br>ff23fb473425dfe02848f3d168d13ffaec7b202  | no  | 4  |
| Warnings:                    |                                                     |                    |                                                    |     |    |
| Information:                 |                                                     |                    |                                                    |     |    |
| 2                            |                                                     | 37986-decl-poa.pdf | 250567<br>a5d6fd23d4c56cd55e8b04be4f585d4950307180 | yes | 3  |
|                              | Multipart Description/PDF files in .zip description |                    |                                                    |     |    |
|                              | Document Description                                |                    | Start                                              | End |    |
|                              | Oath or Declaration filed                           |                    | 1                                                  | 2   |    |
|                              | Power of Attorney                                   |                    | 3                                                  | 3   |    |
| Warnings:                    |                                                     |                    |                                                    |     |    |
| Information:                 |                                                     |                    |                                                    |     |    |
| 3                            |                                                     | 37986USF.pdf       | 788588<br>87997ffac305179296a69734c109f7dfeb7b858f | yes | 22 |
|                              | Multipart Description/PDF files in .zip description |                    |                                                    |     |    |
|                              | Document Description                                |                    | Start                                              | End |    |
|                              | Specification                                       |                    | 1                                                  | 12  |    |
|                              | Claims                                              |                    | 13                                                 | 16  |    |
|                              | Abstract                                            |                    | 17                                                 | 17  |    |
|                              | Drawings-only black and white line drawings         |                    | 18                                                 | 22  |    |
| Warnings:                    |                                                     |                    |                                                    |     |    |
| Information:                 |                                                     |                    |                                                    |     |    |
| 4                            | Information Disclosure Statement (IDS) Form (SB08)  | 37986IDS_FORM.pdf  | 611983<br>53a3488dfc177ded06ecd4cdb2cd7bccbfa45a4  | no  | 4  |
| Warnings:                    |                                                     |                    |                                                    |     |    |
| Information:                 |                                                     |                    |                                                    |     |    |
| 5                            | Fee Worksheet (SB06)                                | fee-info.pdf       | 33040<br>3c5a229f61796d2255895e0aed19f6122b3ad54f  | no  | 2  |
| Warnings:                    |                                                     |                    |                                                    |     |    |
| Information:                 |                                                     |                    |                                                    |     |    |
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**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

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| <b>Application Data Sheet 37 CFR 1.76</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                | Attorney Docket Number | 37986-US-PA |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                | Application Number     |             |
| Title of Invention                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |                        |             |
| <p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p> |                                                                |                        |             |

**Secrecy Order 37 CFR 5.2**

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

**Applicant Information:**

|                                                                                                                                                                                 |                                |                                           |                    |                                                                |                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------|--------------------|----------------------------------------------------------------|-------------------------------------------------------------|
| <b>Applicant 1</b>                                                                                                                                                              |                                |                                           |                    |                                                                | <b>Remove</b>                                               |
| <b>Applicant Authority</b>                                                                                                                                                      |                                | <input checked="" type="radio"/> Inventor |                    | <input type="radio"/> Legal Representative under 35 U.S.C. 117 | <input type="radio"/> Party of Interest under 35 U.S.C. 118 |
| <b>Prefix</b>                                                                                                                                                                   | <b>Given Name</b>              | <b>Middle Name</b>                        | <b>Family Name</b> | <b>Suffix</b>                                                  |                                                             |
|                                                                                                                                                                                 | Chih-Pang                      |                                           | Chang              |                                                                |                                                             |
| <b>Residence Information (Select One)</b> <input type="radio"/> US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service |                                |                                           |                    |                                                                |                                                             |
| <b>City</b>                                                                                                                                                                     | Taipei City                    | <b>Country Of Residence<sup>i</sup></b>   | TW                 |                                                                |                                                             |
| <b>Citizenship under 37 CFR 1.41(b)<sup>i</sup></b>                                                                                                                             |                                | TW                                        |                    |                                                                |                                                             |
| <b>Mailing Address of Applicant:</b>                                                                                                                                            |                                |                                           |                    |                                                                |                                                             |
| <b>Address 1</b>                                                                                                                                                                | c/o No. 1, Li-Hsin Rd. II,     |                                           |                    |                                                                |                                                             |
| <b>Address 2</b>                                                                                                                                                                | Science-Based Industrial Park, |                                           |                    |                                                                |                                                             |
| <b>City</b>                                                                                                                                                                     | Hsinchu                        | <b>State/Province</b>                     |                    |                                                                |                                                             |
| <b>Postal Code</b>                                                                                                                                                              |                                | <b>Country<sup>i</sup></b>                | TW                 |                                                                |                                                             |
| <b>Applicant 2</b>                                                                                                                                                              |                                |                                           |                    |                                                                | <b>Remove</b>                                               |
| <b>Applicant Authority</b>                                                                                                                                                      |                                | <input checked="" type="radio"/> Inventor |                    | <input type="radio"/> Legal Representative under 35 U.S.C. 117 | <input type="radio"/> Party of Interest under 35 U.S.C. 118 |
| <b>Prefix</b>                                                                                                                                                                   | <b>Given Name</b>              | <b>Middle Name</b>                        | <b>Family Name</b> | <b>Suffix</b>                                                  |                                                             |
|                                                                                                                                                                                 | Hsing-Hung                     |                                           | Hsieh              |                                                                |                                                             |
| <b>Residence Information (Select One)</b> <input type="radio"/> US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service |                                |                                           |                    |                                                                |                                                             |
| <b>City</b>                                                                                                                                                                     | Changhua County                | <b>Country Of Residence<sup>i</sup></b>   | TW                 |                                                                |                                                             |
| <b>Citizenship under 37 CFR 1.41(b)<sup>i</sup></b>                                                                                                                             |                                | TW                                        |                    |                                                                |                                                             |
| <b>Mailing Address of Applicant:</b>                                                                                                                                            |                                |                                           |                    |                                                                |                                                             |
| <b>Address 1</b>                                                                                                                                                                | c/o No. 1, Li-Hsin Rd. II,     |                                           |                    |                                                                |                                                             |
| <b>Address 2</b>                                                                                                                                                                | Science-Based Industrial Park, |                                           |                    |                                                                |                                                             |
| <b>City</b>                                                                                                                                                                     | Hsinchu                        | <b>State/Province</b>                     |                    |                                                                |                                                             |
| <b>Postal Code</b>                                                                                                                                                              |                                | <b>Country<sup>i</sup></b>                | TW                 |                                                                |                                                             |
| All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the <b>Add</b> button.                                     |                                |                                           |                    |                                                                | <b>Add</b>                                                  |

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|-------------------------------------------|----------------------------------------------------------------|------------------------|-------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                                                | Attorney Docket Number | 37986-US-PA |
|                                           |                                                                | Application Number     |             |
| Title of Invention                        | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |                        |             |

|                                                                                                               |                          |                                          |                                             |
|---------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------|---------------------------------------------|
| <input type="checkbox"/> An Address is being provided for the correspondence information of this application. |                          |                                          |                                             |
| Customer Number                                                                                               | 31561                    |                                          |                                             |
| Email Address                                                                                                 | USA@JCIPGROUP.COM.TW     | <input type="button" value="Add Email"/> | <input type="button" value="Remove Email"/> |
| Email Address                                                                                                 | BELINDA@JCIPGROUP.COM.TW | <input type="button" value="Add Email"/> | <input type="button" value="Remove Email"/> |

**Application Information:**

|                                         |                                                                |                                           |                          |
|-----------------------------------------|----------------------------------------------------------------|-------------------------------------------|--------------------------|
| Title of the Invention                  | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |                                           |                          |
| Attorney Docket Number                  | 37986-US-PA                                                    | Small Entity Status Claimed               | <input type="checkbox"/> |
| Application Type                        | Nonprovisional                                                 |                                           |                          |
| Subject Matter                          | Utility                                                        |                                           |                          |
| Suggested Class (if any)                |                                                                | Sub Class (if any)                        |                          |
| Suggested Technology Center (if any)    |                                                                |                                           |                          |
| Total Number of Drawing Sheets (if any) | 5                                                              | Suggested Figure for Publication (if any) |                          |

**Publication Information:**

|                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Request Early Publication (Fee required at time of Request 37 CFR 1.219)                                                                                                                                                                                                                                                                                                                      |
| <input type="checkbox"/> <b>Request Not to Publish.</b> I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application <b>has not and will not</b> be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing. |

**Representative Information:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |                                              |                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------|---------------------------------------------------------|
| Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing. |                                                  |                                              |                                                         |
| Please Select One:                                                                                                                                                                                                                                                                                                                                                                                                                                              | <input checked="" type="radio"/> Customer Number | <input type="radio"/> US Patent Practitioner | <input type="radio"/> Limited Recognition (37 CFR 11.9) |
| Customer Number                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 31561                                            |                                              |                                                         |

**Domestic Benefit/National Stage Information:**

|                                                                                                                                                                                                                                                                                                                                                                                                        |                 |                                       |                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------|--------------------------|
| This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification. |                 |                                       |                          |
| Prior Application Status                                                                                                                                                                                                                                                                                                                                                                               |                 | <input type="button" value="Remove"/> |                          |
| Application Number                                                                                                                                                                                                                                                                                                                                                                                     | Continuity Type | Prior Application Number              | Filing Date (YYYY-MM-DD) |
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| <b>Application Data Sheet 37 CFR 1.76</b> |                                                                | Attorney Docket Number | 37986-US-PA |
|                                           |                                                                | Application Number     |             |
| Title of Invention                        | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |                        |             |

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## Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

| Application Number                                                                                     | Country <sup>i</sup> | Parent Filing Date (YYYY-MM-DD) | Priority Claimed                                              |
|--------------------------------------------------------------------------------------------------------|----------------------|---------------------------------|---------------------------------------------------------------|
| 100118144                                                                                              | TW                   | 2011-05-24                      | <input checked="" type="radio"/> Yes <input type="radio"/> No |
| Additional Foreign Priority Data may be generated within this form by selecting the <b>Add</b> button. |                      |                                 | Add                                                           |

## Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

### Assignee <sup>1</sup>

Remove

If the Assignee is an Organization check here. ☒

Organization Name Au Optronics Corporation

### Mailing Address Information:

|                                                                                                |                                |                |     |
|------------------------------------------------------------------------------------------------|--------------------------------|----------------|-----|
| Address 1                                                                                      | No. 1, Li-Hsin Rd. II,         |                |     |
| Address 2                                                                                      | Science-Based Industrial Park, |                |     |
| City                                                                                           | Hsinchu                        | State/Province |     |
| Country <sup>i</sup>                                                                           | TW                             | Postal Code    |     |
| Phone Number                                                                                   |                                | Fax Number     |     |
| Email Address                                                                                  |                                |                |     |
| Additional Assignee Data may be generated within this form by selecting the <b>Add</b> button. |                                |                | Add |

## Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

|            |               |           |                   |                     |       |
|------------|---------------|-----------|-------------------|---------------------|-------|
| Signature  | /Belinda Lee/ |           | Date (YYYY-MM-DD) | 2011-08-08          |       |
| First Name | Belinda       | Last Name | Lee               | Registration Number | 46863 |

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|                                           |                                                                |                        |             |
|-------------------------------------------|----------------------------------------------------------------|------------------------|-------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                                                | Attorney Docket Number | 37986-US-PA |
|                                           |                                                                | Application Number     |             |
| Title of Invention                        | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |                        |             |

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

### DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION

As the below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name and that I believe I am an original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a design or Utility patent is sought on the invention entitled

#### SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE

the specification of which

  X   is attached hereto.

       was filed on \_\_\_\_\_

as Application Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_.

I hereby state that I have reviewed and understand the contents of the above-identified application, including the specification, claims and figures if any, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) or 365(b) of any foreign application(s) for patent or 365(a) of any PCT international application which designated at least one country other than the United States of America, or inventor's certificate listed on the Application Data Sheet, and have also identified on the Application Data Sheet any foreign application for patent or inventor's certificate having a filing date before that of each application on which priority is claimed:

I hereby claim the benefit under Title 35 U.S. Code § 119(e) of any U.S. provisional applications listed on the Application Data Sheet.

I hereby claim the benefit under Title 35, United States Code § 120 of any United States application(s) or PCT international application(s) designating The United States of America listed on the Application Data Sheet, and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulation, § 1.56 which become available between the filing date of the prior application(s) and the national or PCT international filing date of this application.

**DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any design or utility patents issued thereon.

Signature: Chih-Pang Chang Date: Aug. 4, 2011  
Sole or First Joint Inventor: Chih-Pang Chang

Citizenship: Taiwan, R.O.C.

Residence : Taipei City, Taiwan

Post Office Address: c/o No. 1, Li-Hsin Rd. II, Science-Based Industrial Park, Hsinchu, Taiwan,  
R.O.C.

Signature: Hsing-Hung Hsieh Date: Aug. 4, 2011  
Second Joint Inventor (if any): Hsing-Hung Hsieh

Citizenship: Taiwan, R.O.C.

Residence : Changhua County, Taiwan

Post Office Address: c/o No. 1, Li-Hsin Rd. II, Science-Based Industrial Park, Hsinchu, Taiwan,  
R.O.C.

| <b>PATENT APPLICATION FEE DETERMINATION RECORD</b><br>Substitute for Form PTO-875                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                               |                                    |               |          |                    | Application or Docket Number<br>13/208,360 |              |                         |                    |                         |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------|----------|--------------------|--------------------------------------------|--------------|-------------------------|--------------------|-------------------------|--|
| <b>APPLICATION AS FILED - PART I</b>                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                               |                                    |               |          |                    |                                            |              |                         |                    |                         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                               | (Column 1)                         | (Column 2)    |          | SMALL ENTITY       |                                            | OR           | OTHER THAN SMALL ENTITY |                    |                         |  |
| FOR                                                                                                                                                                                                                                                                                                                                                                                                        | NUMBER FILED                                                                                                                                                                                                                  | NUMBER EXTRA                       |               | RATE(\$) | FEE(\$)            |                                            |              | RATE(\$)                | FEE(\$)            |                         |  |
| BASIC FEE<br><small>(37 CFR 1.16(a), (b), or (c))</small>                                                                                                                                                                                                                                                                                                                                                  | N/A                                                                                                                                                                                                                           | N/A                                |               | N/A      |                    |                                            |              | N/A                     | 330                |                         |  |
| SEARCH FEE<br><small>(37 CFR 1.16(k), (l), or (m))</small>                                                                                                                                                                                                                                                                                                                                                 | N/A                                                                                                                                                                                                                           | N/A                                |               | N/A      |                    |                                            |              | N/A                     | 540                |                         |  |
| EXAMINATION FEE<br><small>(37 CFR 1.16(o), (p), or (q))</small>                                                                                                                                                                                                                                                                                                                                            | N/A                                                                                                                                                                                                                           | N/A                                |               | N/A      |                    |                                            |              | N/A                     | 220                |                         |  |
| TOTAL CLAIMS<br><small>(37 CFR 1.16(j))</small>                                                                                                                                                                                                                                                                                                                                                            | 16                                                                                                                                                                                                                            | minus 20 =                         | *             |          |                    |                                            |              | x 52 =                  | 0.00               |                         |  |
| INDEPENDENT CLAIMS<br><small>(37 CFR 1.16(h))</small>                                                                                                                                                                                                                                                                                                                                                      | 2                                                                                                                                                                                                                             | minus 3 =                          | *             |          |                    |                                            |              | x 220 =                 | 0.00               |                         |  |
| APPLICATION SIZE FEE<br><small>(37 CFR 1.16(s))</small>                                                                                                                                                                                                                                                                                                                                                    | If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$270 (\$135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). |                                    |               |          |                    |                                            |              | 0.00                    |                    |                         |  |
| MULTIPLE DEPENDENT CLAIM PRESENT <small>(37 CFR 1.16(j))</small>                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                               |                                    |               |          |                    |                                            |              | 0.00                    |                    |                         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                               |                                    |               | TOTAL    |                    |                                            |              | TOTAL                   | 1090               |                         |  |
| * If the difference in column 1 is less than zero, enter "0" in column 2.                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                               |                                    |               |          |                    |                                            |              |                         |                    |                         |  |
| <b>APPLICATION AS AMENDED - PART II</b>                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                               |                                    |               |          |                    |                                            |              |                         |                    |                         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                               | (Column 1)                         | (Column 2)    |          | (Column 3)         |                                            | SMALL ENTITY |                         | OR                 | OTHER THAN SMALL ENTITY |  |
| AMENDMENT A                                                                                                                                                                                                                                                                                                                                                                                                | CLAIMS REMAINING AFTER AMENDMENT                                                                                                                                                                                              | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA |          | RATE(\$)           | ADDITIONAL FEE(\$)                         |              |                         | RATE(\$)           | ADDITIONAL FEE(\$)      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Total<br><small>(37 CFR 1.16(j))</small>                                                                                                                                                                                      | *                                  | Minus         | **       | =                  |                                            |              |                         |                    | =                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Independent<br><small>(37 CFR 1.16(h))</small>                                                                                                                                                                                | *                                  | Minus         | ***      | =                  |                                            |              |                         |                    | =                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Application Size Fee <small>(37 CFR 1.16(s))</small>                                                                                                                                                                          |                                    |               |          |                    |                                            |              |                         |                    |                         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>                                                                                                                                                |                                    |               |          |                    |                                            |              |                         |                    |                         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                               |                                    |               |          | TOTAL<br>ADD'L FEE |                                            |              |                         | TOTAL<br>ADD'L FEE |                         |  |
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3.<br>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".<br>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".<br>The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1. |                                                                                                                                                                                                                               |                                    |               |          |                    |                                            |              |                         |                    |                         |  |
| AMENDMENT B                                                                                                                                                                                                                                                                                                                                                                                                | CLAIMS REMAINING AFTER AMENDMENT                                                                                                                                                                                              | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA |          | RATE(\$)           | ADDITIONAL FEE(\$)                         |              |                         | RATE(\$)           | ADDITIONAL FEE(\$)      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Total<br><small>(37 CFR 1.16(j))</small>                                                                                                                                                                                      | *                                  | Minus         | **       | =                  |                                            |              |                         |                    | =                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Independent<br><small>(37 CFR 1.16(h))</small>                                                                                                                                                                                | *                                  | Minus         | ***      | =                  |                                            |              |                         |                    | =                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Application Size Fee <small>(37 CFR 1.16(s))</small>                                                                                                                                                                          |                                    |               |          |                    |                                            |              |                         |                    |                         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>                                                                                                                                                |                                    |               |          |                    |                                            |              |                         |                    |                         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                               |                                    |               |          | TOTAL<br>ADD'L FEE |                                            |              |                         | TOTAL<br>ADD'L FEE |                         |  |



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| APPLICATION<br>NUMBER | FILING or<br>371(c) DATE | GRP ART<br>UNIT | FIL FEE REC'D | ATTY. DOCKET NO. | TOT CLAIMS | IND CLAIMS |
|-----------------------|--------------------------|-----------------|---------------|------------------|------------|------------|
| 13/208,360            | 08/12/2011               | 2811            | 1090          | 37986-US-PA      | 16         | 2          |

CONFIRMATION NO. 7890

FILING RECEIPT



\*OC000000049455715\*

31561  
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN

Date Mailed: 08/26/2011

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

**Applicant(s)**

Chih-Pang Chang, Taipei City, TAIWAN;  
Hsing-Hung Hsieh, Changhua County, TAIWAN;

**Assignment For Published Patent Application**

AU OPTRONICS CORPORATION, Hsinchu, TAIWAN

**Power of Attorney:** The patent practitioners associated with Customer Number 31561

**Domestic Priority data as claimed by applicant**

**Foreign Applications** (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)  
TAIWAN 100118144 05/24/2011

**If Required, Foreign Filing License Granted:** 08/22/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/208,360**

**Projected Publication Date:** 11/29/2012

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE

**Preliminary Class**

257

**PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES**

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

**LICENSE FOR FOREIGN FILING UNDER****Title 35, United States Code, Section 184****Title 37, Code of Federal Regulations, 5.11 & 5.15****GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

**NOT GRANTED**

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www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 13/208,360         | 08/12/2011            | Chih-Pang Chang       | 37986-US-PA            |

**CONFIRMATION NO. 7890**

**POA ACCEPTANCE LETTER**

31561  
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN



Date Mailed: 08/26/2011

**NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 08/12/2011.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/jchery/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



中華民國經濟部智慧財產局

INTELLECTUAL PROPERTY OFFICE  
MINISTRY OF ECONOMIC AFFAIRS  
REPUBLIC OF CHINA

茲證明所附文件，係本局存檔中原申請案的副本，正確無訛，  
其申請資料如下：

This is to certify that annexed is a true copy from the records of this office of  
the application as originally filed which is identified hereunder：

申 請 日：西元 2011 年 05 月 24 日  
Application Date May 24, 2011

申 請 案 號：100118144  
Application No.

申 請 人：友達光電股份有限公司  
Applicant(s)

發明人 / 創作人：張志榜、謝信弘  
Inventor(s)

局 長  
Director General

王美花

西元 2011 年 06 月 10 日  
Jun. 10, 2011

# 發明專利說明書

(本說明書格式、順序，請勿任意更動，※記號部分請勿填寫)

※ 申請案號：

※ 申請日：

※IPC 分類：

## 一、發明名稱：

半導體結構以及有機電致發光元件

SEMICONDUCTOR STRUCTURE AND ORGANIC  
ELECTROLUMINESCENCE DEVICE

## 二、中文發明摘要：

本發明提出一種半導體結構及應用此半導體結構的有機電致發光元件。其中，閘極與閘絕緣層配置於基板上，且閘絕緣層覆蓋閘極。通道層位於閘絕緣層上，且位於閘極上方。通道層沿一通道方向上具有一通道長度  $L$ ，且通道層具有第一側邊以及相對於第一側邊的一第二側邊。源極以及汲極位於通道層的相對兩側，且分別電性連接通道層的第一側邊與第二側邊。介電層覆蓋源極、汲極以及通道層。導電遮光圖案層配置於介電層上。導電遮光圖案層跟部份源極與通道層在垂直投影上重疊，其中導電遮光圖案層跟通道層具有重疊長度  $d1$ ，且  $0.3 \leq d1/L \leq 0.85$ 。

## 三、英文發明摘要：

A semiconductor structure and an organic electroluminescence device applying the same are provided.

The semiconductor structure includes a gate electrode, a gate insulating layer, a source electrode, a drain electrode and a conductive light-shielding patterned layer. The gate insulating layer covers the gate electrode disposed on a substrate. The channel layer has a channel length L along a channel direction and is provided with a first side and a second side opposite to the first side. The channel layer is located on the gate insulating layer over the gate. The source electrode and the drain electrode are located at and electrically connected to the first side and the second side of the channel layer respectively. The conductive light-shielding patterned layer is disposed on a dielectric layer covering the source electrode, the drain electrode and the channel layer to overlap a portion of the source electrode and a portion of the channel layer in a vertical projection. The conductive light-shielding patterned layer and the channel layer are overlapped with each other in a length d1; and,  $0.3 \leq d1/L \leq 0.85$ .

#### 四、指定代表圖：

(一) 本案之指定代表圖：圖 1A

(二) 本代表圖之元件符號簡單說明：

12：基板

100：半導體結構

110：閘極  
120：閘絕緣層  
130：通道層  
140：源極  
150：汲極  
160：介電層  
170：導電遮光圖案層  
D：通道方向  
L：通道長度  
d1：導電遮光圖案層與通道層的重疊長度  
S1：通道層的第一側邊  
S2：通道層的第二側邊  
S3：導電遮光圖案層的第三側邊  
S4：導電遮光圖案層的第四側邊

五、本案若有化學式時，請揭示最能顯示發明特徵的化學式：

無。

## 六、發明說明：

### 【發明所屬之技術領域】

本發明是有關於一種半導體結構，且特別是有關於一種適用於發光元件的半導體結構。

### 【先前技術】

薄膜電晶體的通道層以氧化物半導體來製作(此稱氧化物半導體薄膜電晶體)，可有效提升元件之載子移動率。同時，由於氧化物半導體具有透明、導電、非晶態、低溫製程等特性，因此氧化物半導體薄膜電晶體適於應用在顯示面板上。

然而，將氧化物半導體薄膜電晶體應用於主動式矩陣液晶顯示器(active matrix liquid crystal display, AMLCD)或主動式矩陣有機發光顯示器(active matrix organic light emitting display, AMOLED)時，需要在封裝或是透明化(UV-bleach)的過程進行紫外光(UV-light)照射。如此，因為氧化物半導體薄膜電晶體的通道層受到紫外光照射，將導致元件特性的不穩定，例如可能發生汲極引發能障降低(Drain Induced Barrier Lowering, DIBL)效應，而使元件容易產生漏電流現象，影響顯示品質。

### 【發明內容】

本申請提供一種半導體結構，可有效防止光線照射元件造成的元件特性變異。

本申請提供一種有機電致發光元件，應用本發明的半導體結構來提供良好、穩定的元件特性。

在此提出一種半導體結構，其設置於一基板上。所述半導體結構包括一閘極、一閘絕緣層、一通道層、一源極、一汲極、一介電層以及一導電遮光圖案層。閘極與閘絕緣層配置於基板上，且閘絕緣層覆蓋閘極。通道層位於閘絕緣層上，且位於閘極上方。通道層沿一通道方向上具有一通道長度  $L$ ，且通道層具有一第一側邊以及相對於該第一側邊的一第二側邊。源極以及汲極位於通道層的相對兩側，且分別電性連接通道層的第一側邊與第二側邊。介電層覆蓋源極、汲極以及通道層。導電遮光圖案層配置於介電層上。導電遮光圖案層跟部份源極與通道層在垂直投影上重疊，其中導電遮光圖案層跟通道層具有一重疊長度  $d1$ ，且  $0.3 \leq d1/L \leq 0.85$ 。

在一實施例中，通道層的材質包括氧化物半導體。

在一實施例中，氧化物半導體包括銦鎵鋅氧化物 (IGZO)。

在一實施例中，導電遮光圖案層沿通道方向具有一第三側邊與一第四側邊。第四側邊跟通道層重疊，其中重疊長度等於第四側邊跟通道層的第一側邊在通道方向上的距離。

在一實施例中，通道層覆蓋部分的源極以及部分的汲極。

在一實施例中，源極以及汲極分別覆蓋部分的通道

層。

在一實施例中，所述半導體結構更包括一蝕刻阻擋層(etching stop layer)，配置於通道層上，且源極以及汲極更分別覆蓋部分的蝕刻阻擋層。

在一實施例中，汲極沿通道方向具有一第五側邊，其中第五側邊跟通道層重疊，第五側邊與第二側邊在通道方向上相距  $t_1$ ，且  $0 < t_1/L < 0.15$ 。

此外，本申請提出的有機電致發光元件包括：設置於基板上的前述半導體結構；一有機發光層，配置於半導體結構的導電遮光圖案層上；以及，一上電極，配置於有機發光層上。

為讓本發明之上述特徵和優點能更明顯易懂，下文特舉實施例，並配合所附圖式作詳細說明如下。

### 【實施方式】

為了改善照光對薄膜電晶體所造成的影響，例如可能發生的汲極引發能障降低(DIBL)效應以及漏電流現象，吾人初步思考，利用光罩定義出覆蓋元件的遮光層，藉以遮擋光線直射通道層。然，若遮光層覆蓋元件的汲極，會在元件操作時產生額外的電場，如此將導致高源極電壓驅動下的元件產生臨界電壓(threshold voltage)的漂移與下降，同樣會導致漏電流的發生。

基此，吾人進一步調整遮光層的覆蓋區域，以求得遮光效果與元件效能之間的良好平衡。

圖 1A 繪示依照本申請之一實施例的一種半導體結構的剖面圖，圖 1B 繪示圖 1A 之半導體結構的上視圖。為清楚表達圖式內容，圖 1B 僅繪出圖 1A 之半導體結構的部分構件。如圖 1A 與 1B 所示，半導體結構 100 的閘極 110 配置於基板 12 上。閘絕緣層 120 配置於基板 12 上，並且覆蓋閘極 110。通道層 130 位於閘絕緣層 120 上，並且位於閘極 110 上方。在本實施例中，通道層 130 的材質例如是氧化物半導體(Oxide Semiconductor)材質，比如是銦鎵鋅氧化物(IGZO)、銦鎵氧化物(IGO)、銦鋅氧化物(IZO)等半導體材質，且較佳是銦鎵鋅氧化物半導體。通道層 130 沿一通道方向 D 上，具有一通道長度 L，且通道層 130 具有一第一側邊 S1 以及相對於第一側邊 S1 的一第二側邊 S2。

半導體結構 100 的源極 140 以及汲極 150 位於通道層 130 的相對兩側，且源極 140 以及汲極 150 分別電性連接通道層 130 的第一側邊 S1 以及第二側邊 S2。在本實施例中，通道層 130 覆蓋部分的源極 140 以及部分的汲極 150。換言之，通道層 130 的第一側邊 S1 以及第二側邊 S2 分別位於源極 140 以及汲極 150 上。此外，介電層 160 覆蓋源極 140、汲極 150 以及通道層 130。本實施例所形成的半導體結構為氧化半導體薄膜電晶體結構。

本實施例將導電遮光圖案層 170 配置於介電層 160 上，導電遮光圖案層 170 為電性浮接(electrically floating)，不跟其他電極電性連接，且導電遮光圖案層 170 跟部份的源極 140 與部份的通道層 130 在垂直投影上重疊。導電遮

光圖案層 170 可由金屬層所構成，亦可由金屬層與透明導電層的疊層所構成。此外，導電遮光圖案層 170 跟通道層 130 沿通道方向 D 具有一重疊長度 d1。在本發明中，導電遮光圖案層可以是任何具有遮光效果的可能的圖形。例如，本實施例的導電遮光圖案層 170 為矩形，而沿通道方向 D 具有一第三側邊 S3 與一第四側邊 S4，且第四側邊 S4 跟通道層 130 在垂直投影上重疊。在此，所述重疊長度 d1 可進一步被定義為第四側邊 S4 跟通道層 130 的第一側邊 S1 在通道方向上 D 的距離。

為了兼顧遮光效果與良好的元件效能，包括汲極引發能障降低(DIBL)效應，本實施例中所述重疊長度 d1 的範圍較佳是  $0.3 \leq d1/L \leq 0.85$ ，且更佳是  $0.4 \leq d1/L \leq 0.7$ 。更詳細而言，導電遮光圖案層 170 跟通道層 130 在垂直投影上會有部份重疊，重疊長度在 0.3L 以上，可以達到減少汲極引發能障降低(DIBL)效應，同時可以在照光步驟中遮蔽一定數量的光線(例如紫外光)，降低光線對通道層 130 造成的影響。另一方面，導電遮光圖案層 170 跟通道層 130 在垂直投影上的重疊長度被限制在 0.85L 以下，使得導電遮光圖案層 170 不會過度接近或甚至覆蓋汲極 150，避免在元件操作時產生額外電場，防止漏電流的發生。

本申請所提出的半導體結構適於應用在例如有機電致發光元件上。請參考圖 2，其繪示應用圖 1A 與 1B 之半導體結構 100 的一種有機電致發光元件 20。有機電致發光元件 20 包括前述設置於基板 12 上的半導體結構 100，以

及有機發光二極體 200。在一實施例中，半導體結構 100 可以作為一切換電晶體(switching transistor)，經由其他電路(未圖示)電性連接至有機發光二極體 200，如圖 2 所示。在另一實施例中，半導體結構 100 亦可以作為一驅動電晶體(driving transistor)，有機發光二極體 200 可經由一接觸窗開口電性連接至半導體結構 100 的汲極 150，上述部分為該項技藝者所熟知，因此不再贅述。藉由製作有機發光二極體 200 的下電極 174 時，同時製作導電遮光圖案層 172。在本實施例中，製作導電層 170 的圖案時，除了形成用以遮蔽部份源極 140 與部份通道層 130 的導電遮光圖案層 172 之外，還同時形成下電極 174。換言之，導電遮光圖案層 172 以及下電極 174 是對同一層的材料層進行圖案化來獲得。有機發光層 210 配置於導電遮光圖案層 170 上。上電極 220 配置於有機發光層 210 上。藉此，可經由上電極 220 與下電極 174 施加電壓，以驅動有機發光層 210 發光。

在一實施例中，導電層 170 可以是金屬層，或是金屬層與透明導電層的疊層，導電層 170 圖案化後形成導電遮光圖案層 172 以及下電極 174，接著製作有機發光層 210 與上電極 220，此時上電極 220 為透明導電層，可形成向上發光的有機電致發光元件 20。在另一實施例中，導電層 170 可以是金屬層與透明導電層的疊層，導電層 170 圖案化後形成導電遮光圖案層 172 以及下電極 174，並且移除下電極 174 上的金屬層而僅剩下透明導電層，接著製作有

機發光層 210 與上電極 220，此時上電極 220 可為不透明導電層，藉此可形成向下發光的有機電致發光元件 20。

前述實施例的薄膜電晶體結構還可能因實際需求而有其他變化。

圖 3A 繪示依照本申請之另一實施例的一種半導體結構的剖面圖，圖 3B 繪示圖 3A 之半導體結構的上視圖。為清楚表達圖式內容，圖 3B 僅繪出圖 3A 之半導體結構的部分構件。如圖 3A 與 3B 所示，半導體結構 300 與前述實施例的半導體結構 100 類似，除了：兩者的源極 340、汲極 350 以及通道層 330 的相對位置不同。更具體而言，本實施例的源極 340 以及汲極 350 分別覆蓋部分的通道層 330，即通道層 330 的第一側邊 S1 以及第二側邊 S2 分別位於源極 340 以及汲極 350 下。介電層 360 覆蓋源極 340、汲極 350 以及通道層 330。導電遮光圖案層 370 配置於介電層 360 上。類似地，導電遮光圖案層 370 跟通道層 330 在通道方向 D 上的重疊長度為  $d1$ ，且較佳是  $0.3 \leq d1/L \leq 0.85$ ，且更佳是  $0.4 \leq d1/L \leq 0.7$ 。

另外，由於源極 340 以及汲極 350 分別覆蓋部分的通道層 330，本實施例可以考慮進一步限定汲極 350 與通道層 330 的重疊位置，以避免導電遮光圖案層 370 覆蓋汲極 350。在本實施例中，汲極 350 沿通道方向 D 具有一第五側邊 S5，且第五側邊 S5 跟通道層 330 重疊。如此，第五側邊 S5 與第二側邊 S2 在通道方向 D 的距離即被定義為汲極 350 與通道層 330 的重疊長度  $t1$ 。對比前述導電遮光圖

案層 170 與通道層 130 的重疊長度  $d1$  的範圍較佳為  $0.3 \leq d1/L \leq 0.85$ ，且更佳是  $0.4 \leq d1/L \leq 0.7$ ，本實施例可以將汲極 350 與通道層 330 的重疊長度  $t1$  的範圍較佳為： $0 < t1/L < 0.15$ 。如此，便可確保導電遮光圖案層 370 不會過度接近或甚至覆蓋汲極 350，避免在元件操作時產生額外電場，防止漏電流的發生。

圖 4A 繪示依照本申請之又一實施例的一種半導體結構的剖面圖，圖 4B 繪示圖 4A 之半導體結構的上視圖。為清楚表達圖式內容，圖 4B 僅繪出圖 4A 之半導體結構的部分構件。如圖 4A 與 4B 所示，半導體結構 400 與前述實施例的半導體結構 300 類似，除了：本實施例的半導體結構 400 更包括一蝕刻阻擋層 480，配置於通道層 430 上，且源極 440 以及汲極 450 更分別覆蓋部分的蝕刻阻擋層 480。本實施例的其他構件以及重疊長度  $d1$ 、 $t1$  等結構參數皆可沿用半導體結構 300 的設計，因此不再贅述。

此外，如圖 3A、3B 以及圖 4A、4B 所示的半導體結構 300 與 400 同樣可應用在如圖 2 所示的有機電致發光元件 200 上，以得到類似的技術效果。

圖 5A 為依據本申請之一實施例實際量測重疊長度  $d1$  相對於薄膜電晶體之臨界電壓(threshold voltage)以及載子移動率(carrier mobility)的關係曲線。圖 5B 為依據本申請之一實施例實際量測重疊長度  $d1$  相對於薄膜電晶體之次臨界斜率(sub-threshold swing)以及汲極引發能障降低(DIBL)效應的關係曲線。在圖 5A 與圖 5B 的實施例中，薄

膜電晶體的通道層的長度約為 23 微米( $\mu\text{m}$ )，而圖 5A 與圖 5B 的相關曲線表示了導電遮光圖案層跟通道層由相互遠離( $-6\mu\text{m}$ )到相互重疊( $20\mu\text{m}$ )所造成的薄膜電晶體的前述電氣特性的變化。由圖 5A 與圖 5B 可知，薄膜電晶體的載子移動率以及次臨界斜率在不同的重疊長度下維持穩定。此外，薄膜電晶體的汲極引發能障降低(DIBL)效應在重疊長度大於  $4\mu\text{m}$  之後有顯著的改善，此時薄膜電晶體的臨界電壓也趨於穩定。本實施例的重疊長度  $d1$  較佳是不超過  $20\mu\text{m}$ ，以避免導電遮光圖案層與汲極重疊。在重疊長度  $d1$  為  $7\sim 20\mu\text{m}$  的區間內，汲極引發能障降低(DIBL)效應獲得更為良好的改善，且在  $10\sim 16\mu\text{m}$  的區間內更佳。此範圍為  $7\sim 20\mu\text{m}$  的重疊長度  $d1$  與通道層的長度( $23\mu\text{m}$ )的比值大致符合上文提到的  $0.3 \leq d1/L \leq 0.85$ ，且更佳是  $0.4 \leq d1/L \leq 0.7$ 。

綜上所述，本發明為了改善照光對薄膜電晶體所造成的影響，在半導體結構上製作金屬遮光圖案層，藉以遮擋光線直射通道層。同時，考量遮光層覆蓋元件的汲極可能導致漏電流的發生，本發明進一步調整金屬遮光圖案層與通道層的重疊長度，藉以求得遮光效果與元件效能之間的良好平衡。如此，不僅可以有效防止光線照射元件造成的元件特性變異，更可進一步提供良好、穩定的元件特性。

雖然本發明已以實施例揭露如上，然其並非用以限定本發明，任何所屬技術領域中具有通常知識者，在不脫離本發明之精神和範圍內，當可作些許之更動與潤飾，故本

發明之保護範圍當視後附之申請專利範圍所界定者為準。

#### 【圖式簡單說明】

圖 1A 繪示依照本申請之一實施例的一種半導體結構的剖面圖。

圖 1B 繪示圖 1A 之半導體結構的上視圖。

圖 2 繪示應用圖 1A 與 1B 之半導體結構的一種有機電致發光元件。

圖 3A 繪示依照本申請之另一實施例的一種半導體結構的剖面圖。

圖 3B 繪示圖 3A 之半導體結構的上視圖。

圖 4A 繪示依照本申請之又一實施例的一種半導體結構的剖面圖。

圖 4B 繪示圖 4A 之半導體結構的上視圖。

圖 5A 為依據本申請之一實施例實際量測重疊長度  $d1$  相對於薄膜電晶體之臨界電壓以及載子移動率的關係曲線。

圖 5B 為依據本申請之一實施例實際量測重疊長度  $d1$  相對於薄膜電晶體之次臨界斜率以及汲極引發能障降低效應的關係曲線。

#### 【主要元件符號說明】

12：基板

20：有機電致發光元件

100、300、400：半導體結構  
110：閘極  
120：閘絕緣層  
130、330、430：通道層  
140、340、440：源極  
150、350、450：汲極  
160、360：介電層  
170、370：導電遮光圖案層  
172：遮光部  
174：下電極  
210：有機發光層  
220：上電極  
200：有機發光二極體  
480：蝕刻阻擋層  
D：通道方向  
L：通道長度  
d1：導電遮光圖案層與通道層的重疊長度  
t1：汲極與通道層的重疊長度  
S1：通道層的第一側邊  
S2：通道層的第二側邊  
S3：導電遮光圖案層的第三側邊  
S4：導電遮光圖案層的第四側邊  
S5：汲極的第五側邊

## 七、申請專利範圍：

1. 一種半導體結構，設置於一基板上，包括：
  - 一閘極，配置於該基板上；
  - 一閘絕緣層，配置於該基板上，並且覆蓋該閘極；
  - 一通道層，位於該閘絕緣層上，且位於該閘極上方，該通道層沿一通道方向上，具有一通道長度  $L$ ，該通道層具有一第一側邊，以及一第二側邊相對於該第一側邊；
  - 一源極以及一汲極，位於該通道層的相對兩側，且分別電性連接該通道層的該第一側邊與該第二側邊；
  - 一介電層，覆蓋該源極、該汲極以及該通道層；以及
  - 一導電遮光圖案層，配置於該介電層上，該導電遮光圖案層跟部份該源極與該通道層在垂直投影上重疊，其中該導電遮光圖案層跟該通道層具有一重疊長度  $d1$ ，且  $0.3 \leq d1/L \leq 0.85$ 。
2. 如申請專利範圍第 1 項所述的半導體結構，其中該通道層之材質包括氧化物半導體。
3. 如申請專利範圍第 2 項所述的半導體結構，其中該氧化物半導體包括銦鎵鋅氧化物(IGZO)。
4. 如申請專利範圍第 1 項所述的半導體結構，其中該導電遮光圖案層沿該通道方向具有一第三側邊與一第四側邊，該第四側邊跟該通道層在垂直投影上重疊，其中該重疊長度  $d1$  等於該第四側邊跟該通道層的第一側邊在該通道方向上的距離。
5. 如申請專利範圍第 1 項所述的半導體結構，其中該

通道層覆蓋部分的該源極以及部分的該汲極。

6. 如申請專利範圍第 1 項所述的半導體結構，其中該源極以及該汲極分別覆蓋部分的該通道層。

7. 如申請專利範圍第 6 項所述的半導體結構，更包括一蝕刻阻擋層(etching stop layer)，配置於該通道層上，且該源極以及該汲極更分別覆蓋部分的該蝕刻阻擋層。

8. 如申請專利範圍第 6 項所述的半導體結構，其中該汲極沿該通道方向具有一第五側邊，其中該第五側邊跟該通道層重疊，且該第五側邊與該第二側邊在該通道方向上相距  $t1$ ，且  $0 < t1/L < 0.15$ 。

9. 一種有機電致發光元件，設置於一基板上，包括：

一閘極，配置於該基板上；

一閘絕緣層，配置於該基板上，並且覆蓋該閘極；

一通道層，位於該閘絕緣層上，且位於該閘極上方，該通道層沿一通道方向上，具有一通道長度  $L$ ，該通道層具有一第一側邊，以及一第二側邊相對於該第一側邊；

一源極以及一汲極，位於該通道層的相對兩側，且分別電性連接該通道層的該第一側邊與該第二側邊；

一介電層，覆蓋該源極、該汲極以及該通道層；

一導電遮光圖案層，配置於該介電層上，該導電遮光圖案層跟部份該源極與該通道層在垂直投影上重疊，其中該導電遮光圖案層跟該通道層具有一重疊長度  $d1$ ，且  $0.3 \leq d1/L \leq 0.85$ ；

一有機發光層，配置於該導電遮光圖案層上；以及

一上電極，配置於該有機發光層上。

10. 如申請專利範圍第 9 項所述的有機電致發光元件，其中該通道層之材質包括氧化物半導體。

11. 如申請專利範圍第 10 項所述的有機電致發光元件，其中該氧化物半導體包括銦鎵鋅氧化物(IGZO)。

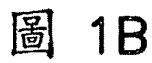
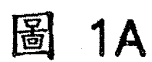
12. 如申請專利範圍第 9 項所述的有機電致發光元件，其中該導電遮光圖案層沿該通道方向具有一第三側邊與一第四側邊，該第四側邊跟該通道層重疊，其中該重疊長度等於該第四側邊跟該通道層的第一側邊在該通道方向上的距離。

13. 如申請專利範圍第 9 項所述的有機電致發光元件，其中該通道層覆蓋部分的該源極以及部分的該汲極。

14. 如申請專利範圍第 9 項所述的有機電致發光元件，其中該源極以及該汲極分別覆蓋部分的該通道層。

15. 如申請專利範圍第 14 項所述的有機電致發光元件，更包括一蝕刻阻擋層(etching stop layer)，配置於該通道層上，且該源極以及該汲極更分別覆蓋部分的該蝕刻阻擋層。

16. 如申請專利範圍第 14 項所述的有機電致發光元件，其中該汲極沿該通道方向具有一第五側邊，其中該第五側邊跟該通道層重疊，且該第五側邊與該第二側邊在該通道方向上相距  $t1$ ，且  $0 < t1/L < 0.15$ 。



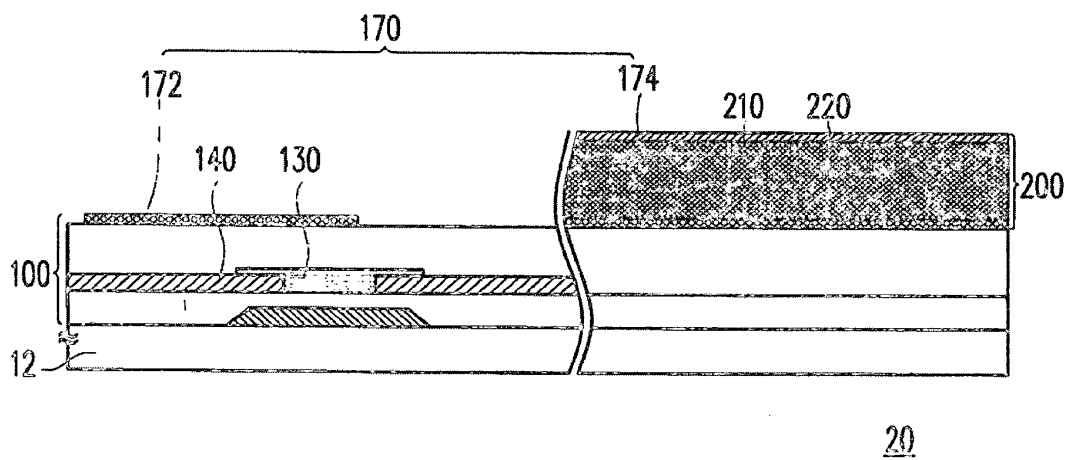


圖 2

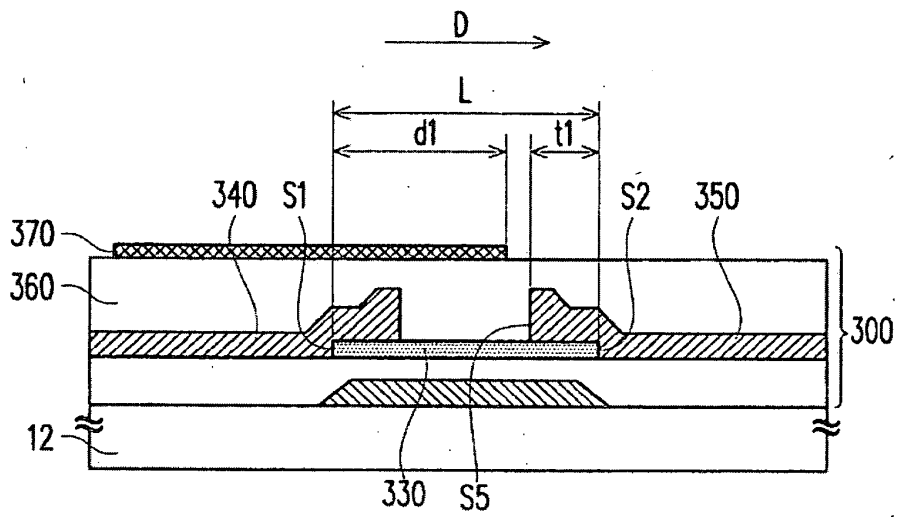


圖 3A

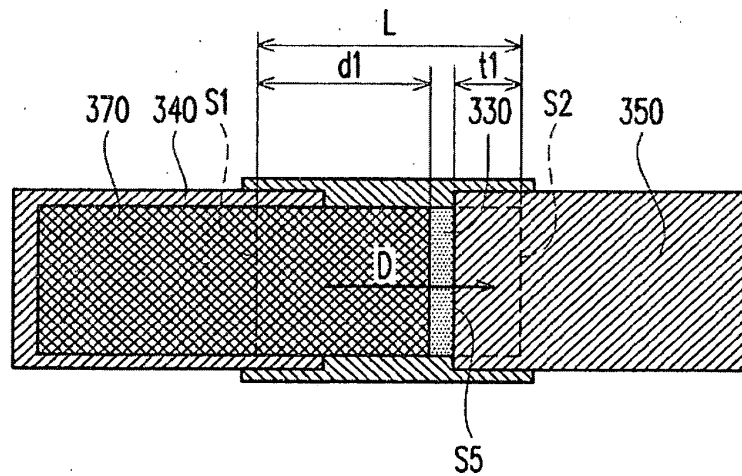


圖 3B

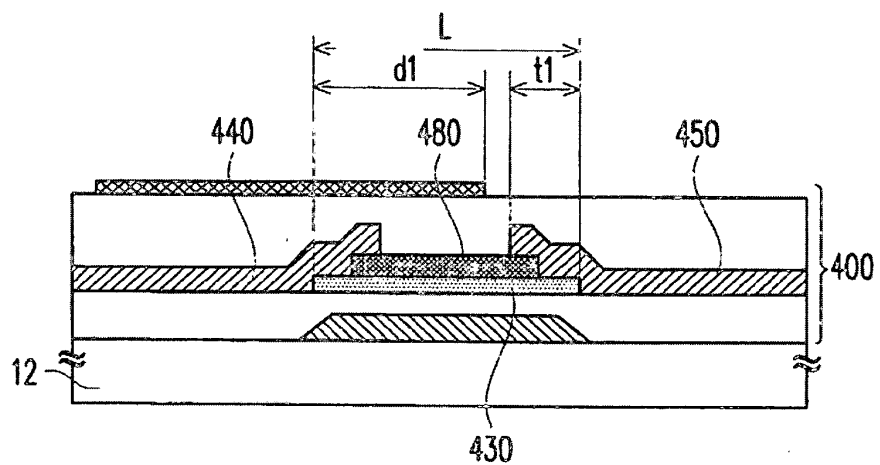


圖 4A

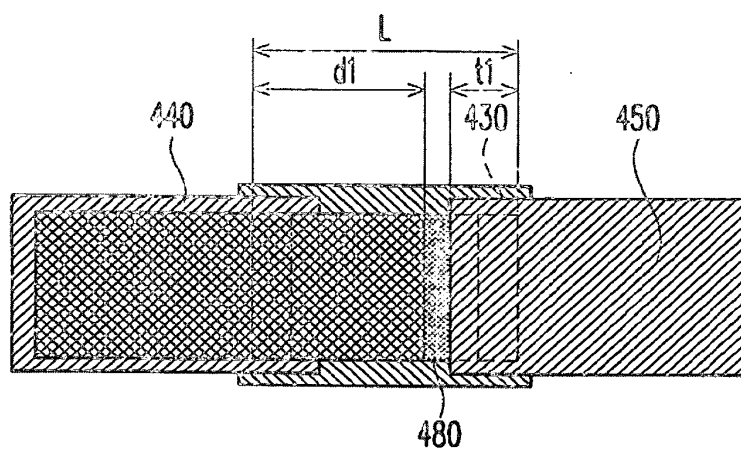


圖 4B

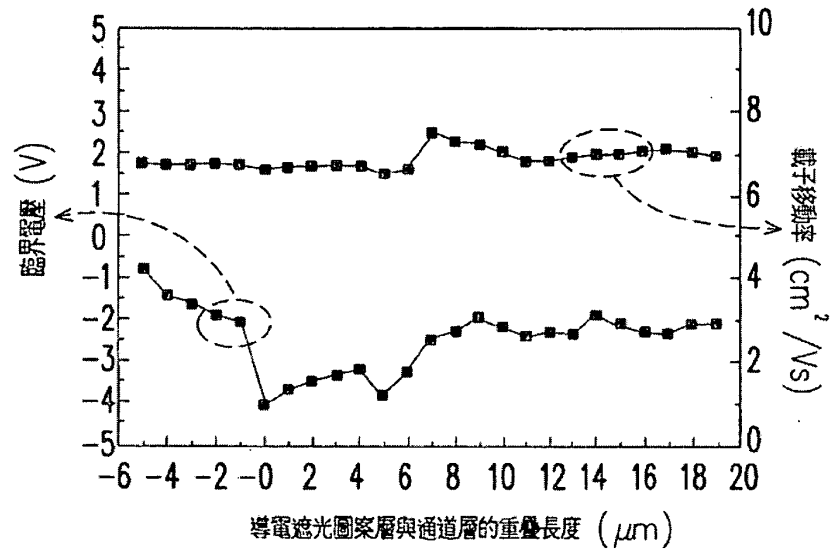


圖 5A

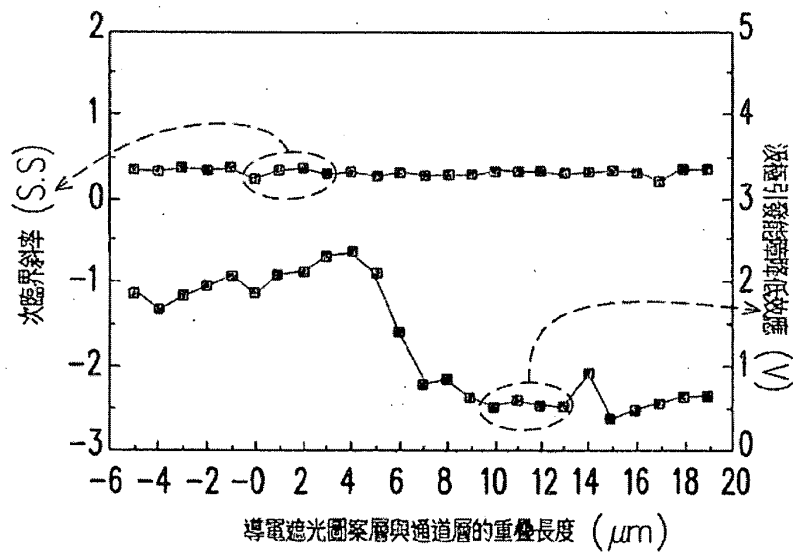


圖 5B

Patent



*Jm*

Customer No. 31561

Application No.: 13/208,360

Docket No. 37986-US-PA

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of

Applicant : Chang et al.  
Application No. : 13/208,360  
Filed : Aug 12, 2011  
For : SEMICONDUCTOR STRUCTURE AND ORGANIC  
ELECTROLUMINESCENCE DEVICE  
Examiner :  
Art Unit : 2811

---

ASSISTANT COMMISSIONER FOR PATENTS

Alexandria, VA22314

Dear Sirs:

Transmitted herewith is a certified copy of TW Application No.: 100118144, filed on: 2011/5/24.

A return prepaid postcard is also included herewith.

Respectfully Submitted,  
JIANQ CHYUN Intellectual Property Office

Dated: Sep 16, 2011

By: /Belinda Lee/  
Belinda Lee  
Registration No.: 46,863

**Please send future correspondence to:**

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**Sec. 2, Taipei 100, Taiwan, R.O.C.**

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**E-MAIL: BELINDA@JCIPGroup.com.tw; USA@JCIPGroup.com.tw**

|                                                                                                     |                        |                 |            |  |
|-----------------------------------------------------------------------------------------------------|------------------------|-----------------|------------|--|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |                 | 13208360   |  |
|                                                                                                     | Filing Date            |                 | 2011-08-12 |  |
|                                                                                                     | First Named Inventor   | Chih-Pang Chang |            |  |
|                                                                                                     | Art Unit               | 2826            |            |  |
|                                                                                                     | Examiner Name          | ERDEM, FAZLI    |            |  |
|                                                                                                     | Attorney Docket Number | 37986-US-PA     |            |  |

| U.S.PATENTS                                                                                                |         |                                      |                           |                        |                                                 |                                                                        | Remove                                                                 |                          |
|------------------------------------------------------------------------------------------------------------|---------|--------------------------------------|---------------------------|------------------------|-------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------|
| Examiner Initial*                                                                                          | Cite No | Patent Number                        | Kind Code <sup>1</sup>    | Issue Date             | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |                                                                        |                          |
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|                                                                                                            | 1       | 2010199459                           | JP                        |                        | 2010-09-09                                      | DAINIPPON PRINTING CO LTD                                              |                                                                        | <input type="checkbox"/> |
|                                                                                                            | 2       | 1743930                              | CN                        |                        | 2006-03-08                                      | LG PHILIPS LCD CO LTD                                                  |                                                                        | <input type="checkbox"/> |
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| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number   |                 | 13208360   |
|                                                                                                     | Filing Date          |                 | 2011-08-12 |
|                                                                                                     | First Named Inventor | Chih-Pang Chang |            |
|                                                                                                     | Art Unit             | 2826            |            |
|                                                                                                     | Examiner Name        | ERDEM, FAZLI    |            |
| Attorney Docket Number                                                                              |                      | 37986-US-PA     |            |

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T <sup>5</sup>           |
|--------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                    | 1       | "First Office Action of China Counterpart Application", issued on August 14, 2012, p1-p9, in which the listed references were cited.                                                                                                                            | <input type="checkbox"/> |

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#### EXAMINER SIGNATURE

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| Examiner Signature |  | Date Considered |  |
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

|                                                                                                     |                        |                 |
|-----------------------------------------------------------------------------------------------------|------------------------|-----------------|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     | 13208360        |
|                                                                                                     | Filing Date            | 2011-08-12      |
|                                                                                                     | First Named Inventor   | Chih-Pang Chang |
|                                                                                                     | Art Unit               | 2826            |
|                                                                                                     | Examiner Name          | ERDEM, FAZLI    |
|                                                                                                     | Attorney Docket Number | 37986-US-PA     |

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

|            |               |                     |            |
|------------|---------------|---------------------|------------|
| Signature  | /Belinda Lee/ | Date (YYYY-MM-DD)   | 2012-10-24 |
| Name/Print | Belinda Lee   | Registration Number | 46863      |

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The information provided by you in this form will be subject to the following routine uses:

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.



Espacenet

**Bibliographic data: CN1743930 (A) — 2006-03-08**

Method for making organic thin film transistor and method for making liquid crystal display using same

**Inventor(s):** NACK-BONG NAM DAE-HYAN SEO HYU [KR] ± (NAM DAE-HYAN, SEO HYUN-SIK, CHOI NACK-BONG)

**Applicant(s):** LG PHILIPS LCD CO LTD [KR] ± (LG PHILIPS LCD CO., LTD)

**Classification:** - international: **G02F1/133; G02F1/136; G03F7/20; H01L21/027; H01L29/786**

- European:

**Application number:** CN20051077422 20050616

**Priority number (s):** KR20040068693 20040830

**Also published as:** CN100445852 (C) KR20060019976 (A) KR100675639 (B1)

Abstract not available for CN1743930 (A)

Last updated: 24.09.2012 Worldwide Database 5.7.42; 93p

Abstract:

A method of forming an organic thin film transistor and a liquid crystal display device is provided. The method of forming the organic thin film transistor comprises forming a gate electrode on a substrate. A gate insulating layer is formed on the substrate including the gate electrode. An organic active pattern is formed on the gate insulating layer by back exposing process. A source electrode and a drain electrode are formed on the organic active pattern.

[19] 中华人民共和国国家知识产权局



# [12] 发明专利申请公开说明书

[21] 申请号 200510077422. X

[51] Int. Cl.

G02F 1/136 (2006.01)

G02F 1/133 (2006.01)

H01L 29/786 (2006.01)

H01L 21/027 (2006.01)

G03F 7/20 (2006.01)

[43] 公开日 2006 年 3 月 8 日

[11] 公开号 CN 1743930A

[22] 申请日 2005.6.16

[21] 申请号 200510077422. X

[30] 优先权

[32] 2004.8.30 [33] KR [31] 10-2004-0068693

[32] 2004.8.30 [33] KR [31] 10-2004-0068694

[71] 申请人 LG. 飞利浦 LCD 株式会社

地址 韩国首尔

[72] 发明人 徐铉植 南大铉 崔洛奉

[74] 专利代理机构 北京三友知识产权代理有限公司  
代理人 李 辉

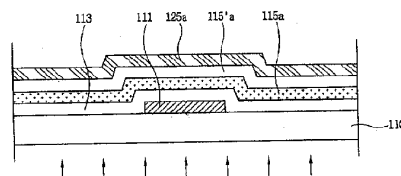
权利要求书 5 页 说明书 12 页 附图 11 页

## [54] 发明名称

制造有机薄膜晶体管的方法和用其制造液晶显示器件的方法

## [57] 摘要

制造有机薄膜晶体管的方法和用其制造液晶显示器件的方法。制造有机薄膜晶体管的方法包括在基板上形成栅极，在包含栅极的基板上形成栅绝缘层，用背面曝光工艺在栅绝缘层上形成有机有源图案，和在有机有源图案上形成源极和漏极。



1. 一种制造有机薄膜晶体管的方法，包括以下步骤：  
在基板上形成栅极；  
5 在包含所示栅极的所述基板上形成栅绝缘层；  
使用背面曝光工艺在所述栅绝缘层上形成有机有源图案；和  
在所述有机有源图案上形成源极和漏极。
2. 根据权利要求1所述的方法，其特征在于，形成有机有源图案的步骤包括：  
10 在所述栅绝缘层上堆叠有机膜和无机膜；  
在所述无机膜上涂布光刻胶膜；  
通过所述基板的背面照射光线，使所述光刻胶膜曝光；  
显影已曝光的所述光刻胶膜，以在对应于所述栅极的区域形成光刻  
胶图案；和  
15 使用所述光刻胶图案作为掩膜，蚀刻所述有机膜和无机膜。
3. 根据权利要求2所述的方法，其特征在于，所述堆叠有机膜的步骤包括在所述栅绝缘层上淀积并五苯和聚丙烯酰胺（PAA）中的一种。
4. 根据权利要求2所述的方法，其特征在于，堆叠无机膜的步骤包括在所述有机膜上淀积硅氮化物（SiN<sub>x</sub>）、硅氧化物（SiO<sub>x</sub>）和铟氧化物  
20 （InO<sub>x</sub>）中的一种。
5. 根据权利要求1所述的方法，其特征在于，形成有机有源图案的步骤包括：  
在栅绝缘层上堆叠有机膜和无机膜；  
在所述无机膜上涂布光刻胶膜；  
25 通过经由所述基板的背面照射光线，使所述光刻胶膜曝光；  
显影已曝光的光刻胶膜，以在对应于所述栅极的区域形成第一光刻  
胶图案；  
使用所述第一光刻胶图案作为掩膜，蚀刻所述有机膜和无机膜；  
去除部分所述第一光刻胶图案，以形成第二光刻胶图案，所述第二

光刻胶图案露出蚀刻过的无机膜的一部分；和

使用所述第二光刻胶图案作为掩膜，对蚀刻过的无机膜的露出部分进行蚀刻。

6. 根据权利要求5所述的方法，其特征在于，所述堆叠有机膜的步骤包括在所述栅绝缘层上淀积并五苯和聚丙烯酰胺（PAA）中的一种。

7. 根据权利要求5所述的方法，其特征在于，所述堆叠无机膜的步骤包括在所述有机膜上淀积硅氮化物（SiNx）、硅氧化物（SiOx）和铟氧化物（InOx）中的一种。

8. 根据权利要求1所述的方法，其特征在于，形成所述栅极的步骤包括：

淀积金属材料；和

使用光刻工艺对金属材料进行构图。

9. 根据权利要求1所述的方法，其特征在于，形成所述栅极的步骤包括在所述基板上印制银浆。

10. 根据权利要求1所述的方法，其特征在于，形成所述栅绝缘层的步骤包括在基板上涂布有机材料。

11. 根据权利要求10所述的方法，其特征在于，所述栅绝缘层的有机材料包括聚乙烯基吡咯烷酮（PVP）和聚甲基丙烯酸甲酯（PMMA）中的一种。

12. 根据权利要求1所述的方法，其特征在于，形成源极和漏极的步骤包括在所述有机有源图案上印制或涂布导电聚合物。

13. 根据权利要求1所述的方法，还包括：

在包含所述源极和漏极的所述基板的整个表面上形成钝化膜；

在钝化膜中形成接触孔，所述接触孔露出部分漏极；和

在钝化膜上形成像素电极，所述像素电极通过所述接触孔与所述漏极电连接。

14. 根据权利要求13所述的方法，其特征在于，所述钝化膜包括有机材料。

15. 根据权利要求14所述的方法，其特征在于，所述钝化膜的有机

材料包括丙稀和苯并环丁烷（BCB）中的一种。

16. 根据权利要求 13 所述的方法，其特征在于，所述像素电极包括有机材料。

17. 根据权利要求 16 所述的方法，其特征在于，所述像素电极的有机材料包括亚乙基二氧硫代酚（PEDOT）。

18. 一种制造液晶显示器件的方法，包括以下步骤：

在第一基板上形成栅极；

在包含所述栅极的所述第一基板上形成栅绝缘层；

用背面曝光工艺在所述栅绝缘层上形成有机有源图案；

10 在所述有机有源图案上形成源极和漏极；

将所述第一基板附接到第二基板上，其间具有间隔；和

在所述第一基板和所述第二基板之间的所述间隔中形成液晶层。

19. 根据权利要求 18 所述的方法，其特征在于，所述形成有机有源图案的步骤包括：

15 在所述栅绝缘层上堆叠有机膜和无机膜；

在所述无机膜上涂布光刻胶膜；

通过经由所述第一基板的背面照射光线，使所述光刻胶膜曝光；

显影已曝光的光刻胶膜，以在对应于所述栅极的区域形成光刻胶图案；和

20 用所述光刻胶图案作为掩膜，蚀刻所述有机膜和无机膜。

20. 根据权利要求 19 所述的方法，其特征在于，堆叠所述有机膜的步骤包括在所述栅绝缘层上淀积并五苯和聚丙烯酰胺（PAA）中的一种。

21. 根据权利要求 18 所述的方法，其特征在于，所述形成有机有源图案的步骤包括：

25 在所述栅绝缘层上堆叠有机膜和无机膜；

在所述无机膜上涂布光刻胶膜；

通过经由所述第一基板的背面照射光线，使所述光刻胶膜曝光；

显影已曝光的光刻胶膜，以在对应于所述栅极的区域形成第一光刻胶图案；

使用第一光刻胶图案作为掩膜，蚀刻所述有机膜和无机膜；

去除部分第一光刻胶图案，以形成第二光刻胶图案，所述第二光刻胶图案露出部分已蚀刻过的无机膜；和

5 使用所述第二光刻胶图案作为掩膜，对被蚀刻过的无机膜的露出部分进行蚀刻。

22. 根据权利要求 21 所述的方法，其特征在于，所述堆叠有机膜的步骤包括在所述栅绝缘层上淀积并五苯和聚丙烯酰胺（PAA）中的一种。

23. 根据权利要求 18 所述的方法，还包括：

在包含所述源极和漏极的基板的整个表面上形成钝化膜；

10 在所述钝化膜中形成接触孔，所述接触孔露出部分漏极；和

在所述钝化膜上形成像素电极，所述像素电极通过所述接触孔与所述漏极电连接。

24. 根据权利要求 18 所述的方法，还包括：

在所述第二基板上形成黑底；

15 在所述黑底上形成滤色器；和

在所述滤色器上形成公共电极。

25. 一种有机薄膜晶体管，包括：

在第一基板上的栅极；

在第一基板上、覆盖了所述栅极的栅绝缘层；

20 在所述栅绝缘层上与所述栅极对应的有机有源层；

在所述有机有源层上的无机图案；和

在所述无机图案上的源极和漏极，所述源极和漏极与所述有机有源层电连接。

26. 根据权利要求 25 所述的有机薄膜晶体管，其特征在于，所述无机图案具有比所述有机有源层小的表面积。

27. 根据权利要求 25 所述的有机薄膜晶体管，其特征在于，所述源极接触所述有机有源层的一部分上表面，所述漏极接触所述有机有源层的另一部分上表面。

28. 根据权利要求 25 所述的有机薄膜晶体管，其特征在于，所述有

机有源层包括并五苯和聚丙烯酰胺（PAA）中的一种。

29. 一种带有权利要求 25 所述的有机薄膜晶体管的第一基板的液晶显示器件，包括：

附加到所述第一基板上的第二基板；和

5 在所述第一基板和所述第二基板间形成的液晶层。

## 制造有机薄膜晶体管的方法和用其制造液晶显示器件的方法

### 5 技术领域

本发明涉及一种制造有机薄膜晶体管的方法，特别涉及一种采用背面曝光工艺（rear exposing process）形成有源层的用于制造有机薄膜晶体管的方法和使用该方法来制造液晶显示器件的方法。

### 10 背景技术

随着聚乙炔（具有半导体特性的共轭有机聚合物）的发展，因为有机半导体易于形成薄膜型，以及其柔韧性、传导性和低生产成本方面的优越性，所以其得到了积极的研究。有机半导体可以用于电子器件或光学器件。

15 在使用半导体聚合体的器件中，使用有机材料的有机薄膜晶体管（OTFT）已成为很多正在进行的研究的焦点。通常，OTFT 具有与 Si-TFT 相似的结构，但是，在半导体区域中，OTFT 使用有机材料代替了 Si。

OTFT 有很多优势：可以通过大气压下的印制工艺形成薄膜，代替了需要次大气压（sub-atmospheric pressure）的用于形成现有 Si 薄膜的  
20 等离子体增强化学气相淀积（PECVD）；可以进行使用塑料基板的辊对辊工艺（roll-to-roll process），并且可以实现低成本的晶体管。

图 1A 到 1E 示出了依照现有技术制造有机薄膜晶体管（OTFT）的方法的剖面图。在图 1A 中，依照现有技术制造 OTFT 的方法包括制备透明基板 10。具体地，淀积第一金属材料，并用光刻工艺对其构图以形成栅极 11。该光刻工艺包括：光刻胶膜涂布工艺，其在将形成图案的蚀刻目标层上涂布光刻胶膜；曝光工艺，将掩膜在光刻胶膜上对准，并经该掩膜照射光；显影工艺，通过使用显影器去除光刻胶膜的被照射过的部分，  
25 在蚀刻目标层上形成光刻胶图案；蚀刻工艺，其用光刻胶图案作为掩膜，对蚀刻目标层进行蚀刻，形成所需的图案；和剥离工艺，其去除残留在

图案上的光刻胶图案。例如，第一金属材料是蚀刻目标层，在第一金属材料被蚀刻时，形成栅极 11 的图案。

随后，使用等离子增强化学气相淀积法将  $\text{SiN}_x$  或  $\text{SiO}_x$  淀积在包含栅极 11 的第一基板 10 的整个表面上，以形成栅绝缘层 13。

5 在图 1B 中，在栅绝缘层 13 的上表面上淀积低分子有机材料（如并五苯），以在栅绝缘层 13 与栅极 11 对应的部分上形成有源图案 15。因为光刻胶膜改变了并五苯的电特性，所以不能使用传统的光刻工艺。因此，用荫罩（shadow mask）形成有源图案 15。荫罩具有允许形成图案的特定开放区，并且其原理与用于传统曝光工艺的掩膜不同。例如，用于传统  
10 曝光工艺的掩膜被分为阻光或透光的多个区域，而荫罩被分为开放区和封闭区，从而用于形成图案的材料仅通过开放区淀积，形成与开放区相同的图案。但是，用荫罩形成的图案与用掩膜形成的图案相比，精确度较差。

如图 1C 所示，在有源层 15 上淀积第二金属材料，并对其构图以在  
15 有源层 15 上形成源极 16 和漏极 17。具体地，与形成栅极 11 类似，利用光刻工艺构图该第二金属材料以形成源极 16 和漏极 17。

在图 1D 中，无机薄膜或有机薄膜淀积在包含源极 16 和漏极 17 的基板 10 的整个表面上，而形成了钝化膜 18。利用光刻工艺对钝化膜 18 构图，形成露出漏极 17 的接触孔 19。

20 此外，如图 1E 所示，透明导电材料（如 ITO）淀积在包含接触孔 19 的基板 10 的整个表面上，并被构图而形成通过接触孔 19 与漏极 17 电连接的像素电极 20。利用光刻工艺对透明导电材料进行构图，以形成接触孔 19。

但是，因为按照现有技术制造 OTFT 的方法需要荫罩来形成有源图  
25 案，所以有源图案的精度降低，而掩膜使用的数量增加，从而降低了制造效率，使 OTFT 的电特性劣化。

#### 发明内容

因此，本发明旨在提供一种制造有机薄膜晶体管的方法和使用该方

法制造液晶显示器件的方法，基本解决了因现有技术的局限和缺点导致的一个或更多的问题。

本发明的目的是提供一种形成精确图案的制造有机薄膜晶体管（OTFT）的方法。

- 5        本发明的另一目的是提供一种通过省略荫罩和减少掩膜数量来简化制造工艺的制造 OTFT 的方法。

本发明又一目的是提供一种通过增加 OTFT 的有源层和源极/漏极之间的接触面积来提高 OTFT 电性能的制造 OTFT 的方法。

- 10       本发明的其它特点和优点将在下面的说明中阐明，并且部分地在说明中变得明显，或通过实践本发明而习得。所撰写的说明书和权利要求书以及附图中特别指出的结构将实现和获得本发明的这些目的和其它的优点。

- 为了实现这些和其它的优点，并依据本发明的目的，如所示例和广义描述的，一种制造有机薄膜晶体管的方法包括：在基板上形成栅极；  
15       在包含所述栅极的所述基板上形成栅绝缘层；利用背面曝光工艺在所述栅绝缘层上形成有机有源图案；以及在所述有机有源图案上形成源极和漏极。

- 另一方面，一种制造液晶显示器件的方法包括：在第一基板上形成栅极；在包含栅极的第一基板上形成栅绝缘层；利用背面曝光工艺在所述栅绝缘层上形成有机有源图案；在所述有机有源图案上形成源极和漏极；将第一基板附加到第二基板上，其间具有预定的间隔；以及在所述第一和第二基板之间形成液晶层。  
20

- 再一方面，一种有机薄膜晶体管包括：在第一基板上的栅极；在所述第一基板上、覆盖了所述栅极的栅绝缘层；在所述栅绝缘层上、与所述栅极对应的有机有源层；在所述有机有源层上的无机图案，在所述无机图案上的源极和漏极，所述源极和漏极与所述有机有源层电连接。  
25

应该理解，前面的一般描述和下面的详细描述都是示例性的和说明性的，并且意在对所要求的本发明提供进一步的说明。

### 附图说明

所包括的附图用于进一步理解本发明，其被并入且构成本说明书的一部分。附图示出了本发明的实施例，并与说明书一起用于解释本发明的原理。在附图中：

5 图 1A 到 1E 示出了按照现有技术的制造有机薄膜晶体管（OTFT）的方法的剖面图；

图 2A 到 2E 示出了按照本发明的实施例制造 OTFT 的方法的剖面图；

图 3A 到 3C 示出了用于形成图 2B 中所示的 OTFT 的有源层的方法的剖面图；

10 图 4 示出了利用图 2A 到图 2E 的工艺形成的液晶显示（LCD）器件的剖面图；

图 5A 到图 5E 示出了按照本发明的另一实施例的制造 OTFT 的方法的剖面图；

15 图 6A 到图 6E 示出了形成图 5B 中所示的 OTFT 的有源层的方法的剖面图；和

图 7 示出了利用图 5A 到图 5E 的工艺形成的 LCD 器件的剖面图。

### 具体实施方式

现在将详细地说明本发明的优选实施例，其示例在附图中示出。

20 图 2A 到图 2E 示出了按照本发明的实施例的制造 OTFT 的方法的剖面图，图 3A 到图 3C 示出了形成图 2B 中所示的 OTFT 的有源层的方法的剖面图。如图 2A 所示，制造 OTFT 的方法包括制备第一透明基板 110。具体地，淀积第一导电材料，并对其构图以形成栅极 111。

25 第一导电材料可以包括铜（Cu）、钛（Ti）、铬（Cr）、铝（Al）、钼（Mo）、钽（Ta）和铝合金中的一种，并可以利用光刻工艺对该第一导电材料进行构图。光刻工艺可以包括：光刻胶膜的涂布工艺，用于在其上将形成图案的蚀刻目标层上涂布光刻胶膜；曝光工艺，其在光刻胶膜上对准掩膜并通过该掩膜照射光；显影工艺，通过使用显影器去除光刻胶膜被照射过的部分而在蚀刻目标层上形成光刻胶图案；蚀刻工艺，其利

用光刻胶图案作为掩膜，对蚀刻目标层进行蚀刻，形成所需的图案；剥离工艺，其去除图案上残留的光刻胶图案。第一导电材料例如可以是蚀刻目标层，并在蚀刻该第一导电材料时构图栅极 111。

另选地，第一导电材料可以包括银浆 (Ag paste)，第一导电材料可以被印制在第一基板 110 上以形成栅极 111。由于印制工艺可以在大气压下进行，比光刻工艺简单得多，所以提高了生产效率。

在第一基板 110 上形成栅极 111 之后，在包括栅极 111 的第一基板 110 整个表面上形成无机材料，以形成栅绝缘层 113。无机材料可以包括硅氮化物 (SiNx) 膜和硅氧化物 (SiOx) 膜中的一种。另选地，代替无机材料，可以在第一基板 110 的整个表面上形成有机材料。有机材料可以包括聚乙烯基吡咯烷酮 (PVP, poly-vinyl-pyrrolidone) 和聚甲基丙烯酸甲酯 (PMMA, poly-methyl-methacrylate) 之一，并可以在第一基板 110 上涂布有机材料，以形成栅绝缘层 113。由于涂布工艺可以不使用真空设备在大气压下进行，因此提高了生产效率。

在图 2B 中，在栅绝缘层 113 上依次形成有机膜和无机膜，然后对其构图以形成有源层 115 和无机图案 115'。例如，可以利用背面曝光工艺对有机膜和无机膜构图，以分别形成有源层 115 和无机图案 115'。具体地，在形成有机膜和无机膜之后，可在无机膜上涂布光刻胶膜。然后，通过第一基板 110 的背面照射光，以形成光刻胶图案。即，在第一基板 110 的第一表面上形成栅极 111、栅绝缘层 113、有机膜、无机膜和光刻胶膜。并将光照射到第一基板的与第一表面相对的第二表面上，形成光刻胶图案。然后，用光刻胶图案作为掩膜，蚀刻该无机膜和有机膜，形成有源层 115 和无机图案 115'。

如图 3A 所示，在第一基板 110 的第一表面上的栅绝缘层 113 上依次堆叠有机膜 115a 和无机膜 115'。有机膜 115a 可以包括：可通过淀积方法在第一基板 110 上形成的低分子有机材料（如并五苯），或可通过涂布法在第一基板 110 上形成的有机材料，如聚丙烯酰胺 (PAA, polyacrylamine)。

为了构图有机膜 115a，需要在其上涂布光刻胶膜 125a。但是，如果

光刻胶膜 125a 直接涂布在有机膜 115a 上, 则光刻胶膜 125a 中包含的水分能够渗透到有机膜 115a 中。具体地, 如果有机膜 115a 被暴露在湿气中, 它的电特性被降低。因而, 在有机膜 115a 上形成无机膜 115a', 来防止湿气, 保护有机膜 115a, 从而提高产品可靠性。无机膜 115a' 可以包  
5 括无机材料 (如  $\text{SiN}_x$ 、 $\text{SiO}_x$  或氧化铟) 中的一种。然后, 在无机膜 115a 上堆叠光刻胶膜 125a。

其后, 如向上箭头所示, 通过第一基板 110 的第二表面照射光, 使光刻胶膜 125a 曝光。具体地, 由于栅极 111 阻挡了光线, 因而具有掩膜的功能, 光线不能照射到光刻胶膜 125a 的与栅极 111 相对应的部分。

10 如图 3B 所示, 在栅极 111 的上侧形成光刻胶图案 125。具体地, 在光刻胶膜 125a 被光局部照射之后 (如图 3A 所示), 用显影器来去除光刻胶图案 125 的被照过的部分, 从而, 形成光刻胶图案 125。

如图 3C 所示, 依次形成有源层 115 和无机图案 115'。具体地, 利用光刻胶图案 125 作为掩膜, 蚀刻有机膜 115a 和无机膜 115'a (如图 3B 所  
15 示)。尽管未示出, 但随后利用剥离工艺去除了光刻胶图案 125。此外, 无机图案 115' 也可由干蚀刻工艺去除或在有源层 115 上保留。

返回到图 2C, 在形成有源层 115 之后, 第二导电材料被淀积在包括有源层 115 的第一基板 110 的整个表面上, 并对其构图以形成与有源层 115 接触的源极 116 和漏极 117。第二导电材料可包括铜 (Cu)、钛 (Ti)、  
20 铬 (Cr)、铝 (Al)、钼 (Mo)、钽 (Ta) 和铝合金 (Al alloy) 中的一种, 并可使用光刻工艺对其构图以形成源极 116 和漏极 117。具体地, 第二导电材料可以是与第一导电材料相同的材料。另选地, 第二导电材料可包括导电聚合体材料, 并可被涂布或印制在第一基板 110 上, 以形成源极 116 和漏极 117。由于涂布或印制工艺可在大气压下进行, 比光刻工艺简  
25 单得多, 因而提高了生产效率。

在图 2D 中, 在包含源极 116 和漏极 117 的第一基板 110 的整个表面上形成钝化膜 118。钝化膜 118 可包括无机材料 (如  $\text{SiN}_x$  或  $\text{SiO}_x$ ), 或有机材料 (如苯并环丁烷 (BCB) 或丙烯酸)。此外, 去除部分钝化膜 118 以形成露出部分漏极 117 的接触孔 119。可使用光刻工艺形成接触孔 119。

具体地，当用有机材料形成钝化膜 118 时，工艺可在大气压下进行，其比使用无机材料时简单，因而提高了生产效率。

在图 2E 中，在包含钝化膜 118 和接触孔 119 的第一基板 110 上形成像素电极 120。具体地，形成通过接触孔 119 与漏极 117 电连接的像素电极 120。像素电极 120 可包括透明的导电材料。透明导电材料可形成在第一基板 110 上，并可利用光刻工艺对其构图。此外，透明导电材料可包括铟锡氧化物 (ITO) 或铟锌氧化物 (IZO)。另选地，高分子有机材料（如亚乙基二氧硫代酚 (PEDOT, poly ethylene dioxy thiospene)）可用于形成像素电极 120，由于其相关工艺可在大气压下进行，因而其具有更多优势。

虽然未示出，但第一基板 110 随后与含有滤色器和公共电极的第二基板相附接，并在第一基板 110 和第二基板间形成液晶层，从而形成 LCD 器件。

图 4 示出了用图 2A 到 2E 中的工艺形成的 LCD 器件的剖面图。在图 4 中，LCD 器件 200 包括第一基板 210 和第二基板 230。具体地，第一基板 210 包括 OTFT 和像素电极 220。OTFT 包括栅极 211、栅绝缘层 213、有源层 215、无机图案 215'、源极 216 和漏极 217，并且可以用图 2A 到 2E 所示的方法形成钝化膜 218。

此外，第二基板 230 包括在其上依次形成的黑底 231、滤色器 233 和公共电极 235。然后，第一基板 210 和第二基板 230 相互附接，其间带有间距，并在第一基板 210 和第二基板 230 间形成液晶层 240。

虽然没有详细说明在第二基板 230 上形成黑底 231、滤色器 233 和公共电极 235 的方法，但黑底 231 可以用有机材料或金属材料来形成。公共电极 235 可以用导电材料（如 ITO 或 IZO）或聚合体导电材料（如与像素极 220 一样的 PEDOT 材料）形成。

另选地，虽然未示出，但可以在第一基板 210 上形成公共电极 235 和像素电极 220 两者。在同一基板（例如第一基板 210）上形成公共电极 235 和像素电极 220，由于液晶层 240 的液晶分子水平驱动，所以可改善视角特性。

因此,依照本发明的实施例的 OTFT 包括用背面曝光工艺形成的有源层,从而省掉了荫罩工艺。另外,与现有技术比较,能更精确地形成有源层。例如,在现有技术中,利用荫罩形成有机有源图案,但是,根据荫罩的特点,其不能提供精细的图案,并容易与基板错位 (misalign),以致不能精确地形成有源图案。相反,在本发明的实施例中,在有机膜上形成无机膜,使用可提供精细图案的背面曝光工艺,栅极选择性地阻止了光线,从而限定了光刻胶图案。因而,可更精确地形成有源层。

图 5A 到 5E 示出了按照本发明另一实施例制造 OTFT 的方法的剖面图。图 6A 到 6E 示出了形成图 5B 中所示的 OTFT 的有源层的方法的剖面图。如图 5A 所示,制造 OTFT 的方法包括制备第一透明基板 310。具体地,淀积第一导电材料并对其构图以形成栅极 311。

第一导电材料可以包括铜 (Cu)、钛 (Ti)、铬 (Cr)、铝 (Al)、钼 (Mo)、钽 (Ta) 和铝合金 (Al alloy) 中的一种,并可利用光刻工艺对该第一导电材料构图。光刻工艺可以包括:光刻胶膜的涂布工艺,其在将形成图案的蚀刻目标层上涂布光刻胶膜;曝光工艺,在光刻胶膜上对准掩膜,通过该掩膜照射光线;显影工艺,通过使用显影器去除光刻胶膜被照射过的部分而在蚀刻目标层上形成光刻胶图案;蚀刻工艺,其利用光刻胶图案作为掩膜,对蚀刻目标层进行蚀刻,形成所需的图案;以及剥离工艺,其去除图案上残留的光刻胶图案。第一导电材料例如可以是蚀刻目标层,并在蚀刻该第一导电材料时构图栅极 311。

另选地,第一导电材料可以包括银浆,第一导电材料可以被印制在第一基板 310 上以形成栅极 311。由于印制工艺可以在大气压下进行,比光刻工艺简单得多,所以提高了生产效率。

在第一基板 310 上形成了栅极 311 之后,在包括栅极 311 的第一基板 310 的整个表面上形成无机材料,以形成栅绝缘层 313。无机材料可以包括硅氮化物 (SiNx) 膜和硅氧化物 (SiOx) 膜中的一种。另选地,代替无机材料,可以在第一基板 310 的整个表面上形成有机材料。有机材料可以包括聚乙烯基吡咯烷酮 (PVP, poly-vinyl-pyrrolidone) 和聚甲基丙烯酸甲酯 (PMMA, poly-methyl-methacrylate) 之一,并可以在第

一基板 310 上涂布有机材料，以形成栅绝缘层 313。由于涂布工艺可以不使用真空设备在大气压下进行，因此提高了生产效率。

在图 5B 中，在栅绝缘层 313 上依次形成有机膜和无机膜，然后对其构图以形成有源层 315 和无机图案 315'。例如，可以利用背面曝光工艺对有机膜和无机膜构图，以分别形成有源层 315 和无机图案 315'。具体地，在形成有机膜和无机膜之后，可在无机膜上涂布光刻胶膜。然后，通过第一基板 310 的背面照射光，以形成光刻胶图案。即，在第一基板 310 的第一表面上形成栅极 311、栅绝缘层 313、有机膜、无机膜和光刻胶膜。并将光照射到第一基板 310 的与第一表面相对的第二表面上，形成光刻胶图案。然后，用光刻胶图案作为掩膜，蚀刻该无机膜和有机膜，形成有源层 315 和无机图案 315'。

如图 6A 所示，在第一基板 310 的第一表面上的栅绝缘层 113 上依次堆叠有机膜 315a 和无机膜 315'。有机膜 315a 可以包括：可通过淀积法在第一基板 110 上形成的低分子有机材料（如并五苯），或可通过涂布法在第一基板 110 上形成的有机材料，如聚丙烯酰胺（PAA）。

为了构图有机膜 315a，需要在其上涂布光刻胶膜 325a。但是，如果光刻胶膜 325a 直接涂布在有机膜 315a 上，则光刻胶膜 325a 中包含的水分能够渗透到有机膜 315a 中。具体地，如果有机膜 315a 被暴露在湿气中，则它的电特性被降低。因而，在有机膜 315a 上形成无机膜 315'a，来防止湿气，保护有机膜 315a，从而提高产品可靠性。无机膜 315'a 可以包括无机材料（如  $\text{SiN}_x$ 、 $\text{SiO}_2$  或氧化铪）中的一种。然后，在无机膜 315'a 上堆叠光刻胶膜 325a。

其后，如向上箭头所示，通过第一基板 310 的第二表面照射光，使光刻胶膜 325a 曝光。具体地，由于栅极 311 阻挡了光线，因而具有掩膜的功能，光线不能照射到光刻胶膜 325a 的与栅极 311 相对应的部分。

如图 6B 所示，在栅极 311 的上侧形成光刻胶图案 325。具体地，在光刻胶膜 325a 被光局部照射之后（如图 6A 所示），用显影器来去除光刻胶图案 325a 的被照过的部分，从而，形成第一光刻胶图案 325。

如图 6C 所示，依次形成有源层 315 和第一无机图案 315''。具体地，

利用第一光刻胶图案 325 作为掩膜, 蚀刻有机膜 315a 和无机膜 315'a (如图 6B 所示)。

在图 6D 中, 在包含有源层 315 和第一无机图案 315'' 的第一基板 310 上形成第二光刻胶图案 335。具体地, 在形成有源层 315 和第一无机图案 315'' 之后, 利用灰化工艺 (ashing process) 部分去除第一光刻胶图案 325 (图 6C 中所示)。例如, 灰化工艺可以灰化光刻胶材料, 露出第一无机图案 315'' 的边。当灰化第一光刻胶图案 325 的表面时, 就去除了第一光刻胶图案 325 的表面和边, 随着这些边被去除, 就露出了第一无机图案 315'' 的特定部分, 并且其厚度被减少。

如图 6E 所示, 随后形成无机图案 315'。具体地, 利用第二光刻胶图案 335 作为掩膜, 蚀刻第一无机图案 315'' (图 6D 中所示) 的露出部分。结果露出了有源层 315 的部分上表面和边。此外, 尽管未示出, 但随后利用剥离工艺去除了第二光刻胶图案 335。

返回到图 5C, 在形成有源层 315 之后, 第二导电材料被淀积在包括有源层 315 的第一基板 110 的整个表面上, 并对其构图以形成与有源层 315 接触的源极 316 和漏极 317。具体地, 由于露出了有源层 315 的部分上表面, 有源层 315 和源极 316/漏极 317 之间的接触面增加, 从而提高了 OTFT 的电特性。

第二导电材料可包括铜 (Cu)、钼 (Mo)、钽 (Ta)、铝 (Al)、铬 (Cr)、钛 (Ti) 和铝合金中的一种, 并可使用光刻工艺对其构图以形成源极 116 和漏极 117。具体地, 第二导电材料可以是与第一导电材料相同的材料。另选地, 第二导电材料可包括导电聚合体材料, 并可被涂布或印制在第一基板 310 上, 以形成源极 316 和漏极 317。由于涂布工艺或印制工艺可在大气压下进行, 比光刻工艺简单得多, 因而提高了生产效率。

在图 5D 中, 在包含源极 316 和漏极 317 的第一基板 310 的整个表面上形成钝化膜 318。钝化膜 318 可包括无机材料 (如  $\text{SiN}_x$  或  $\text{SiO}_x$ ), 或有机材料 (如苯并环丁烷 (BCB) 或丙烯酸)。此外, 去除部分钝化膜 318 以形成露出部分漏极 317 的接触孔 319。可使用光刻工艺形成接触孔 319。具体地, 当用有机材料形成钝化膜 318 时, 工艺可在大气压下进行, 其

比使用无机材料时简单，因而提高了生产效率。

在图 5E 中，在包含钝化膜 318 和接触孔 319 的第一基板 310 上形成像素电极 320。具体地，形成通过接触孔 319 与漏极 317 电连接的像素电极 320。像素电极 120 可包括透明的导电材料。该透明导电材料可形成在  
5 第一基板 310 上，并可利用光刻工艺对其构图。此外，透明导电材料可包括铟锡氧化物（ITO）或铟锌氧化物（IZO）。另选地，高分子有机材料（如亚乙基二氧硫代酚（PEDOT）），可用于形成像素电极 320，由于其相关工艺可在大气压下进行，因而其具有更多优势。

虽然未示出，但第一基板 310 可随后与含有滤色器和公共电极的第二基板相附接，并在第一基板 310 和第二基板间形成液晶层，从而形成  
10 LCD 器件。

因此，按照本发明的实施例，源极和漏极接触有源层上表面的露出部分以及有源层的边。结果由于去除了无机图案 315' 的边，露出了有源层的部分上表面，所以增加了有源层 315 和源极 316/漏极 317 之间的接  
15 触面积。

图 7 示出了用图 5A 到 5E 中的工艺形成的 LCD 器件的剖面图。在图 7 中，LCD 器件 400 包括第一基板 410 和第二基板 430。具体地，第一基板 410 包括 OTFT 和像素电极 420。OTFT 包括栅极 411、栅绝缘层 413、有源层 415、无机图案 415'、源极 416 和漏极 417，并且可以用图 5A 到  
20 5E 中的方法形成钝化膜 418。

此外，第二基板 430 包括在其上依次形成的黑底 431、滤色器 433 和公共电极 435。然后，第一基板 410 和第二基板 430 相互附接，其间带有间距，并在第一基板 410 和第二基板 430 间形成液晶层 440。

虽然没有详细说明在第二基板 430 上形成黑底 431、滤色器 433 和  
25 公共电极 435 的方法，但黑底 431 可以用有机材料或金属材料来形成。公共电极 435 可以用导电材料（如 ITO 或 IZO）或聚合物导电材料（如与像素极 240 一样的 PEDOT 材料）形成。

另选地，虽然未示出，但可以在第一基板 410 上形成公共电极 435 和像素电极 420 两者。在同一基板（例如第一基板 410）上形成公共电极

435 和像素电极 420，由于液晶层 440 的液晶分子水平驱动，所以可改善视角特性。

因此，按照本发明的实施例的制造 OTFT 的方法不需要荫罩来形成 OTFT 的有源层，从而简化了制造工艺。具体地，在按照本发明的实施例  
5 的制造 OTFT 的方法中，代替荫罩，在有机膜上形成无机膜，在无机膜涂布光刻胶膜，利用背面曝光工艺在栅极上部形成光刻胶图案，然后用光刻胶图案作为掩膜，蚀刻有机膜和无机膜，而精确地形成有源层。

此外，在按照本发明的实施例的制造 OTFT 的方法中，在形成源极和漏极之前，无机膜的边沿部分被蚀刻，露出了有源层的部分上表面，结  
10 果增加了有源层和源极/漏极之间的接触面积，因而增强了 OTFT 的特性。

此外，因为用背面曝光工艺形成有源图案，所以减少了制造过程中使用的掩膜数量。此外，由于荫罩通常是昂贵的，所以按照本发明的实施例的制造 OTFT 的方法还减少了制造成本并提高了生产率。

此外，在按照本发明实施例的制造 OTFT 的方法中，可以使用有机材  
15 料或电浆用涂布法或印制法在大气压下来形成栅极、源极、漏极或钝化膜，而不用淀积设备，因而进一步提高了生产效率。

虽然未示出，但除 LCD 器件之外，按照本发明实施例的制造薄膜晶体管的方法还可用于制造利用 TFT 的任何器件。

对本领域技术人员来说，显而易见地，可以在不脱离本发明的精神和  
20 和范围的情况下对本发明的制造有机薄膜晶体管的方法以及使用该方法制造液晶显示器件的方法进行多种修改和变型。因此，本发明意在覆盖了本发明的这些修改和变型，只要它们在所附的权利要求及其等同的范围内。

本发明要求于 2004 年 8 月 30 日在韩国提交的韩国专利申请  
25 No. 68693/2004 和于 2004 年 8 月 30 日提交的韩国专利申请 No. 68694/2004 的优先权，通过引用将其合并在本文中。

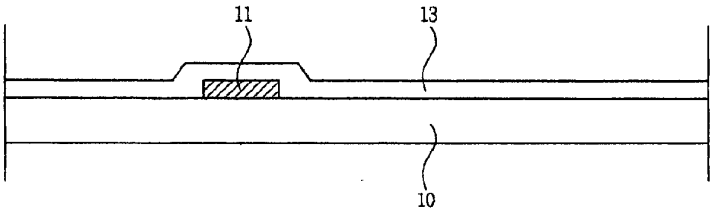


图 1A  
现有技术

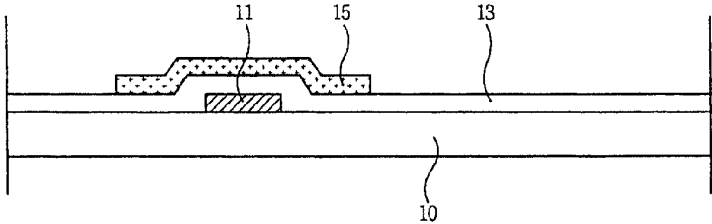


图 1B  
现有技术

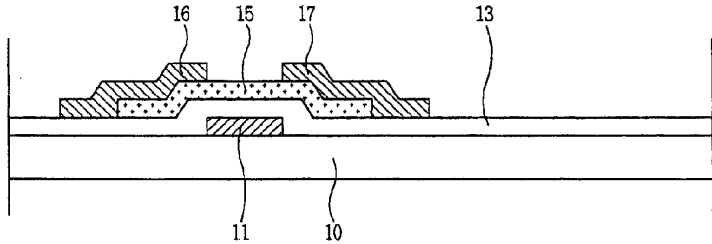


图 1C  
现有技术

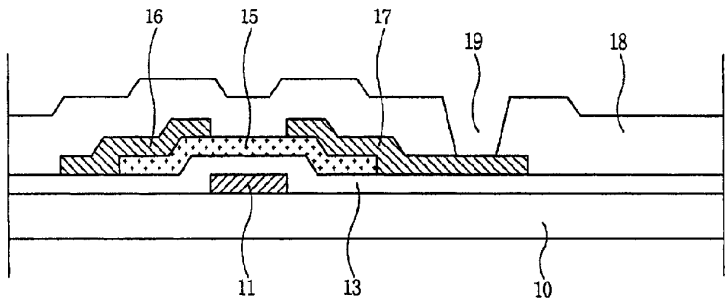


图 1D  
现有技术

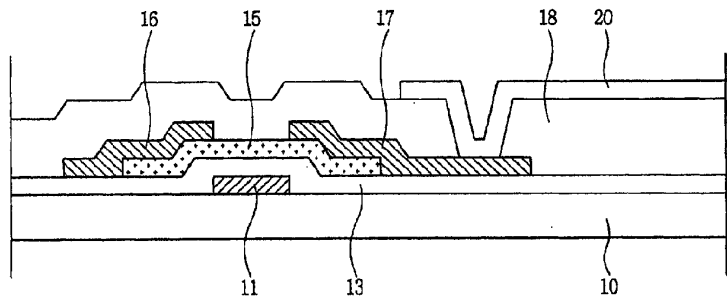


图 1E  
现有技术

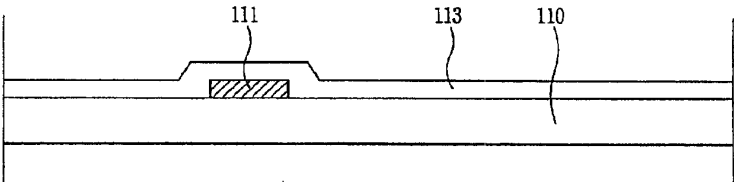


图 2A

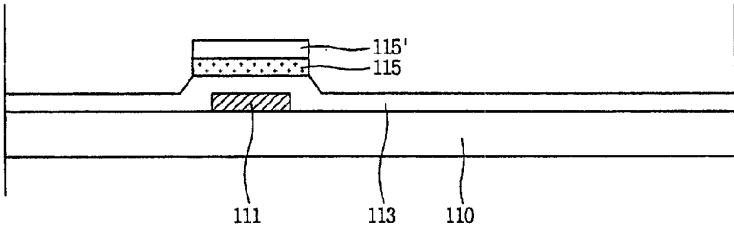


图 2B

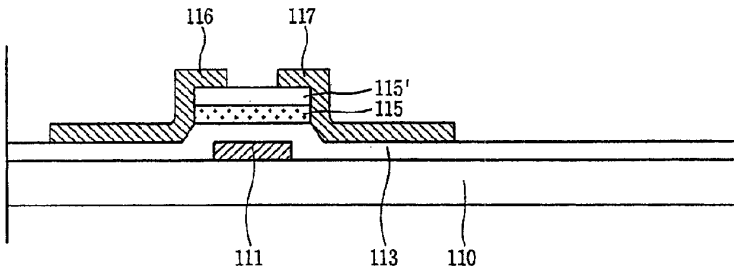


图 2C

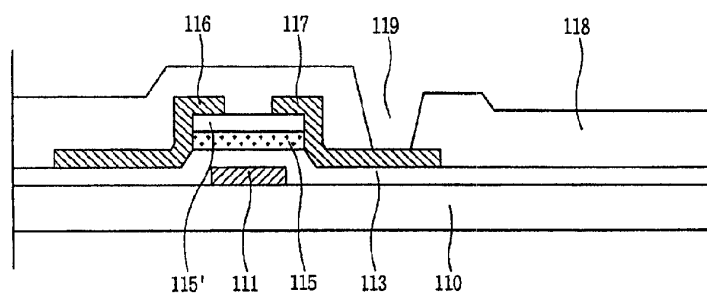


图 2D

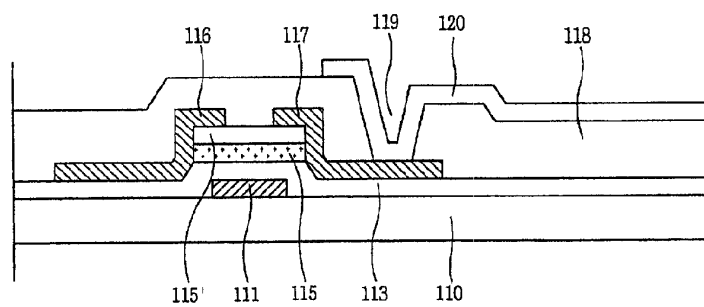


图 2E

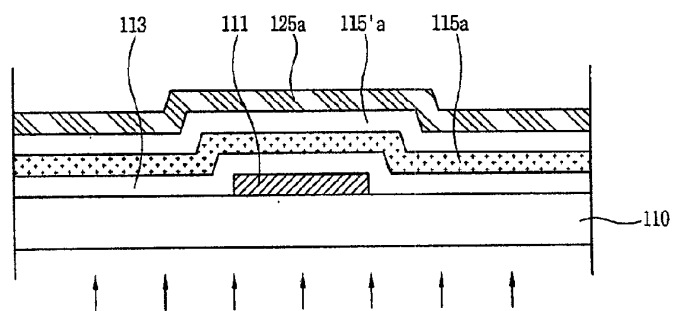


图 3A

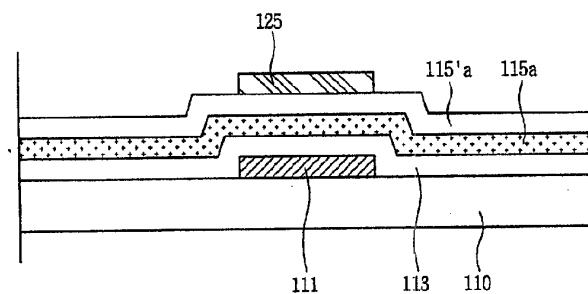


图 3B

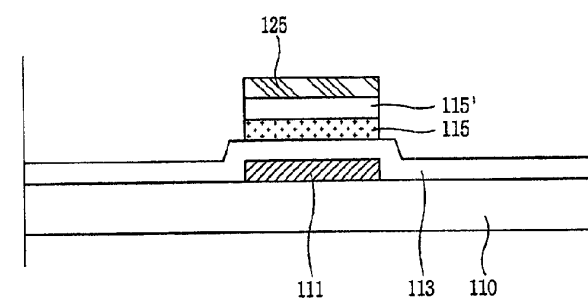


图 3C

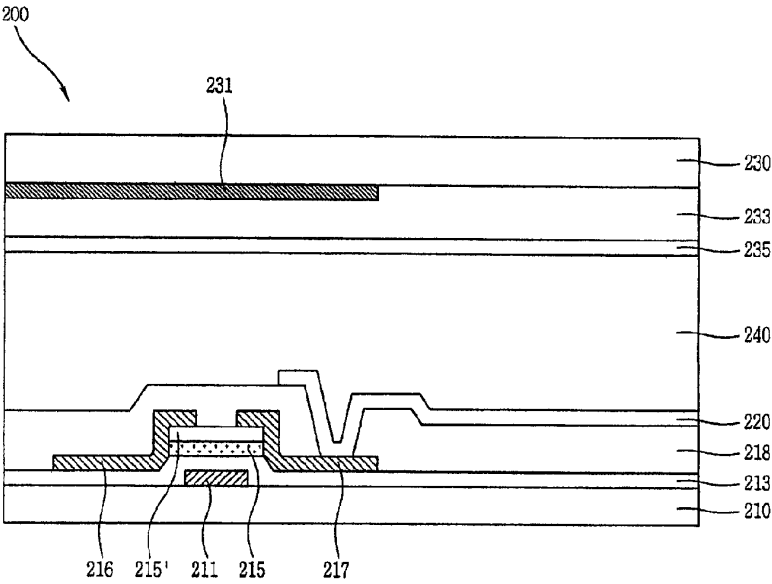


图 4

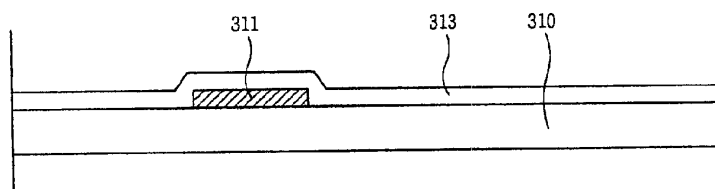


图 5A

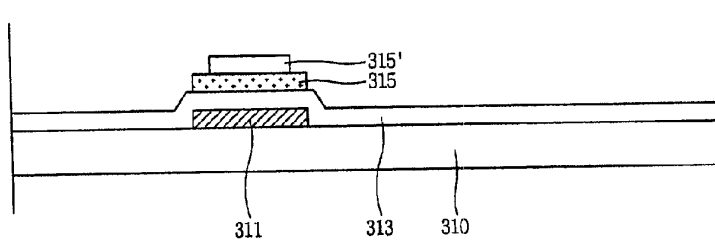


图 5B

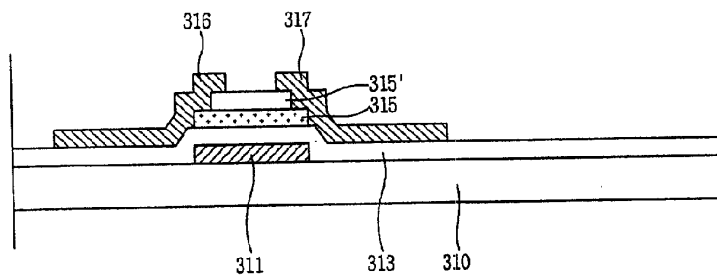


图 5C

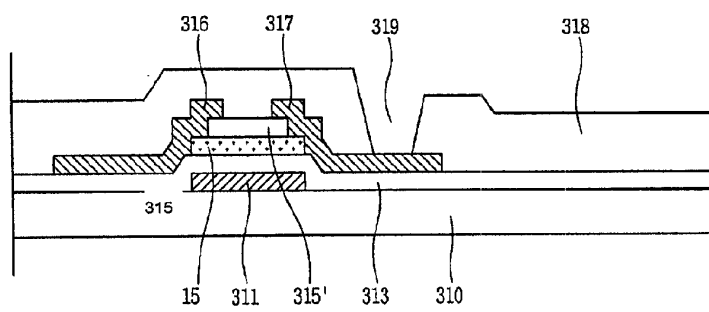


图 5D

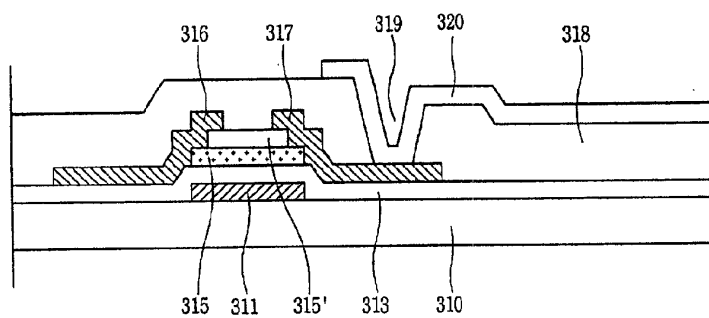


图 5E

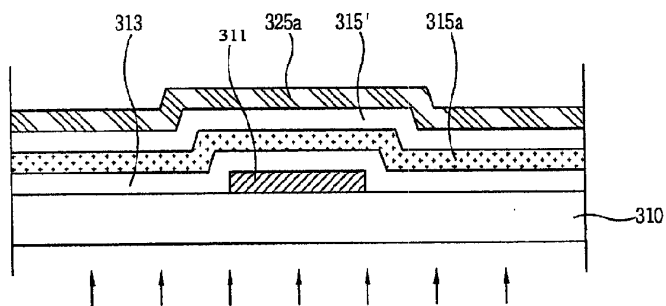


图 6A

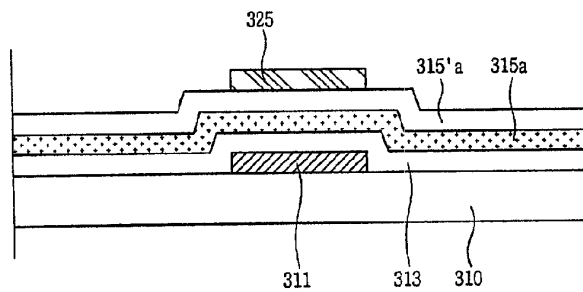


图 6B

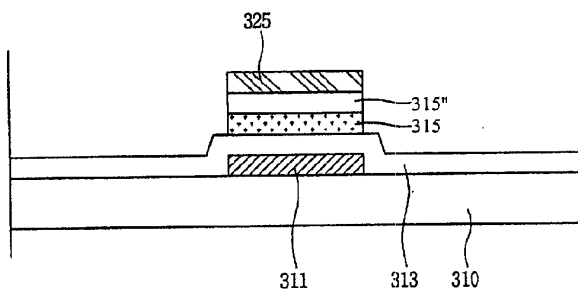


图 6C

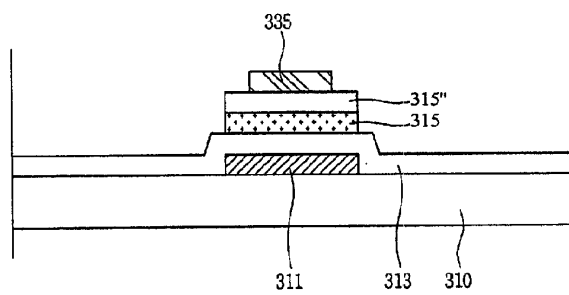


图 6D

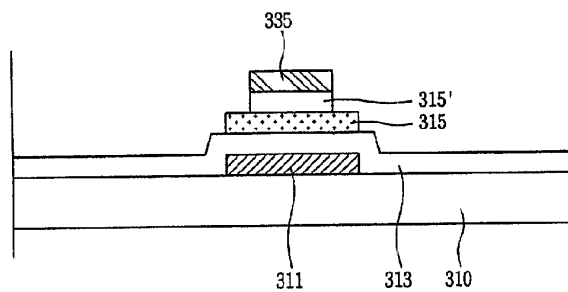


图 6E

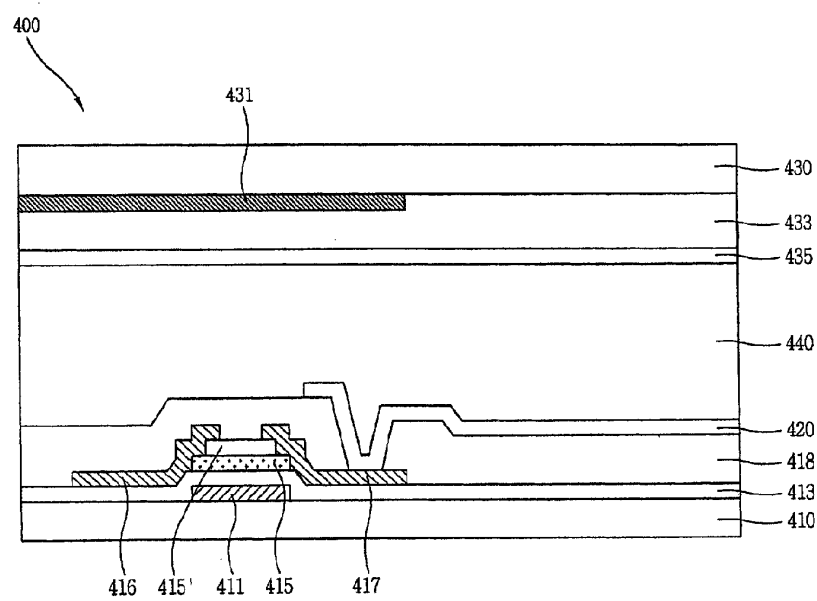
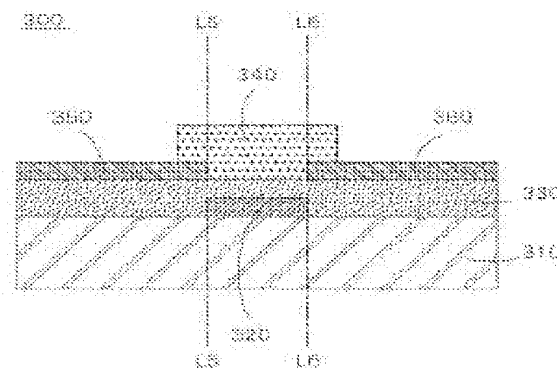


图 7

**Espacenet****Bibliographic data: JP2010199459 (A) — 2010-09-09****METHOD OF MANUFACTURING TRANSISTOR ELEMENT**

**Inventor(s):** ICHIMURA KOJI ± (ICHIMURA KOJI)  
**Applicant(s):** DAINIPPON PRINTING CO LTD ± (DAINIPPON PRINTING CO LTD)  
**Classification:** - international: *H01L21/28; H01L21/336; H01L29/417; H01L29/423; H01L29/49; H01L29/786*  
- European:  
**Application number:** JP20090045019 20090227  
**Priority number (s):** JP20090045019 20090227

**Abstract of JP2010199459 (A)**

PROBLEM TO BE SOLVED: To suppress generation of parasitic capacitance by accurately aligning source and drain electrodes to gate electrodes. ; SOLUTION: By a method of manufacturing transistor elements, the gate electrode 320 made of metal is formed on a transparent glass substrate 310, a transparent gate insulating layer 330 is formed on the gate electrode, further a conductive layer comprising an ITO, namely the origin of the source and drain electrodes 350, 360, is formed, and the upper surface of the conductive layer is covered with a negative resist layer. A mask, wherein a prescribed region including source/drain formation regions is translucent, is disposed at a lower-surface-side of a substrate. Light is applied from a lower part to perform back exposure, wherein a shadow generated by a light-shielding region of the mask and that generated by the gate electrode 320 become non-exposure regions of a resist layer, and patterning is performed to form the source and drain electrodes 350, 360. On the source and drain electrodes, a channel layer 340 of a semiconductor oxide made of InGaZnO<sub>4</sub> is directly formed, and satisfactory ohmic contact is obtained while omitting a heavily doped layer. ; COPYRIGHT: (C)2010,JPO&INPIT

Last updated: 24.09.2012    Worldwide Database    5.7.42; 93p

(19) 日本国特許庁 (JP)

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(11) 特許出願公開番号

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(43) 公開日 平成22年9月9日 (2010. 9. 9)

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| HO 1 L                               | 29/786                     | (2006. 01) | HO 1 L     | 29/78                  | 6 1 6 V | 5 F 1 1 O   |      |      |
| HO 1 L                               | 21/28                      | (2006. 01) | HO 1 L     | 29/78                  | 6 1 7 M |             |      |      |
| HO 1 L                               | 29/417                     | (2006. 01) | HO 1 L     | 29/78                  | 6 1 8 B |             |      |      |
| HO 1 L                               | 29/423                     | (2006. 01) | HO 1 L     | 29/78                  | 6 1 7 T |             |      |      |
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|                                      |                            |            |            |                        |         |             |      | CC05 |
|                                      |                            |            |            |                        | DD37    | DD51        | DD62 | DD63 |
|                                      |                            |            |            |                        |         |             |      | DD71 |
|                                      |                            |            |            |                        | EE17    | FF02        | GG09 | GG10 |
|                                      |                            |            |            |                        |         |             |      | GG14 |
|                                      |                            |            |            |                        |         |             |      | HH15 |
|                                      |                            |            |            |                        | 5F110   | AA02        | CC03 | DD01 |
|                                      |                            |            |            |                        |         |             |      | DD02 |
|                                      |                            |            |            |                        |         | EE04        | FF01 | FF02 |
|                                      |                            |            |            |                        |         |             |      | FF03 |
|                                      |                            |            |            |                        |         | GG43        | HK07 | QQ12 |

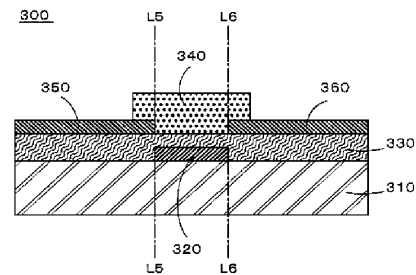
(54) 【発明の名称】 トランジスタ素子の製造方法

## (57) 【要約】

【課題】 ゲート電極に対して、ソース・ドレイン電極を正確に位置合わせし、寄生容量の発生を抑制する。

【解決手段】 透明ガラス基板 3 1 0 上に金属からなるゲート電極 3 2 0 を形成し、その上に、透明なゲート絶縁層 3 3 0 を形成し、更に、ソース・ドレイン電極 3 5 0 ・ 3 6 0 の元になる I T O からなる導電層を形成し、その上面をネガ型レジスト層で覆う。ソース・ドレイン形成領域を含む所定領域が透光性を有するマスクを、基板の下面側に配置する。下方から光を照射し、マスクの遮光領域によって生じる影とゲート電極 3 2 0 によって生じる影とが、レジスト層の非露光領域となるような背面露光を行い、パターニングしてソース電極 3 5 0 およびドレイン電極 3 6 0 を形成する。その上に、 $\text{InGaZnO}_4$  からなる酸化物半導体のチャネル層 3 4 0 を直接形成して、高濃度不純物拡散層を省略しつつ、良好なオーミック接触を得る。

【選択図】 図 5



## 【特許請求の範囲】

## 【請求項1】

半導体チャネル層を介してソース・ドレイン間を流れる電流をゲート電極への印加電圧により制御するトランジスタ素子を、所定の感光波長域の光に対して感光性を有するレジストを利用したソース・ドレイン電極形成用パターニング処理を含む工程により製造する方法であって、

少なくとも上面が絶縁性を有し、前記感光波長域の光に関して透明な材料からなる基板を用意する第1の段階と、

前記基板上に、前記感光波長域の光に関して不透明な導電性材料からなるゲート電極層を形成する第2の段階と、

前記ゲート電極層を含めた前記基板上に、前記感光波長域の光に関して透明な絶縁性材料からなるゲート絶縁層を形成し、その上面に前記感光波長域の光に関して透明な導電性材料からなる導電層を形成する第3の段階と、

前記導電層の上面に、前記感光波長域の光に対して感光性を有するネガ型レジスト層を形成し、上方から観察したときに前記ゲート電極層に部分的に重複する透光領域を有するソース・ドレイン電極形成用のフォトリソマスクを、前記基板の下方に配置し、基板下方側から前記感光波長域の光を照射し、前記フォトリソマスクの遮光領域によって生じる影と前記ゲート電極層によって生じる影とが、前記ネガ型レジスト層上の非露光領域となるような背面露光を行い、前記導電層の前記非露光領域に対応する部分を除去するパターニングを行い、前記導電層の残存部分によって、相互間に空隙部を介して配置されたソース電極層およびドレイン電極層を形成する第4の段階と、

インジウム・ガリウム・亜鉛の複合酸化物からなり、前記ソース電極層の一部分および前記ドレイン電極層の一部分に跨るように前記空隙部に配置された半導体チャネル層を形成する第5の段階と、

を有することを特徴とするトランジスタ素子の製造方法。

## 【請求項2】

半導体チャネル層を介してソース・ドレイン間を流れる電流をゲート電極への印加電圧により制御するトランジスタ素子を、所定の感光波長域の光に対して感光性を有するレジストを利用したソース・ドレイン電極形成用パターニング処理を含む工程により製造する方法であって、

少なくとも上面が絶縁性を有し、前記感光波長域の光に関して透明な材料からなる基板を用意する第1の段階と、

前記基板上に、前記感光波長域の光に関して不透明な導電性材料からなるゲート電極層を形成する第2の段階と、

前記ゲート電極層を含めた前記基板上に、前記感光波長域の光に関して透明な絶縁性材料からなるゲート絶縁層を形成し、その上面に前記感光波長域の光に関して透明な導電性材料からなる導電層を形成する第3の段階と、

前記導電層に対して、ソース・ドレイン電極形成用のフォトリソマスクを用いたパターニングを行い、上方から観察したときに前記ゲート電極層を跨ぐように配置され、前記ゲート電極層に対して部分的に重複した領域をなすソース・ドレイン電極準備層を形成する第4の段階と、

前記ソース・ドレイン電極準備層の上面に、前記感光波長域の光に対して感光性を有するネガ型レジスト層を形成し、基板下方側から前記感光波長域の光を照射し、前記ゲート電極層によって生じる影が、前記ネガ型レジスト層上の非露光領域となるような背面露光を行い、前記ソース・ドレイン電極準備層の前記非露光領域に対応する部分を除去するパターニングを行い、前記ソース・ドレイン電極準備層の残存部分により、相互間に空隙部を介して配置されたソース電極層およびドレイン電極層を形成する第5の段階と、

インジウム・ガリウム・亜鉛の複合酸化物からなり、前記ソース電極層の一部分および前記ドレイン電極層の一部分に跨るように前記空隙部に配置された半導体チャネル層を形

成する第6の段階と、

を有することを特徴とするトランジスタ素子の製造方法。

【請求項3】

半導体チャネル層を介してソース・ドレイン間を流れる電流をゲート電極への印加電圧により制御するトランジスタ素子を、所定の感光波長域の光に対して感光性を有するレジストを利用したソース・ドレイン電極形成用パターニング処理を含む工程により製造する方法であって、

少なくとも上面が絶縁性を有し、前記感光波長域の光に関して透明な材料からなる基板を用意する第1の段階と、

前記基板上に、前記感光波長域の光に関して不透明な導電性材料からなるゲート電極層を形成する第2の段階と、

前記ゲート電極層を含めた前記基板上に、前記感光波長域の光に関して透明な絶縁性材料からなるゲート絶縁層を形成し、その上面に前記感光波長域の光に関して透明な導電性材料からなる導電層を形成する第3の段階と、

前記導電層の上面に、前記感光波長域の光に対して感光性を有するネガ型レジスト層を形成し、基板下方側から前記感光波長域の光を照射し、前記ゲート電極層によって生じる影が、前記ネガ型レジスト層上の非露光領域となるような背面露光を行い、前記導電層の前記非露光領域に対応する部分を除去するパターニングを行い、前記導電層の残存部分により、ソース・ドレイン電極準備層を形成する第4の段階と、

上方から観察したときに前記ゲート電極層を跨ぐような閉領域のパターンを有するソース・ドレイン電極形成用のフォトリソマスクを用いて、前記ソース・ドレイン電極準備層に対して、前記閉領域に対応する部分を残すパターニングを行い、前記ソース・ドレイン電極準備層の残存部分により、相互間に空隙部を介して配置されたソース電極層およびドレイン電極層を形成する第5の段階と、

インジウム・ガリウム・亜鉛の複合酸化物からなり、前記ソース電極層の一部分および前記ドレイン電極層の一部分に跨るように前記空隙部に配置された半導体チャネル層を形成する第6の段階と、

を有することを特徴とするトランジスタ素子の製造方法。

【請求項4】

請求項1～3のいずれかに記載のトランジスタ素子の製造方法において、

第1の段階で、ガラスもしくは合成樹脂からなる基板を用意し、

第2の段階で、ゲート電極層を形成する材料として金属を用いることを特徴とするトランジスタ素子の製造方法。

【請求項5】

請求項1～4のいずれかに記載のトランジスタ素子の製造方法において、

第3の段階で、ゲート絶縁層を形成する材料として、酸化シリコンもしくは窒化シリコンを用いることを特徴とするトランジスタ素子の製造方法。

【請求項6】

請求項1～5のいずれかに記載のトランジスタ素子の製造方法において、

第3の段階で、導電層を形成する材料として、ITOもしくはIZOを用いることを特徴とするトランジスタ素子の製造方法。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、トランジスタ素子の製造方法に関し、特に、「逆スタガード (inverted staggered) 型」の薄膜トランジスタ素子の製造技術に関する。

【背景技術】

【0002】

薄膜トランジスタは、半導体チャネル層を介してソース・ドレイン間を流れる電流を、ゲート電極への印加電圧により制御する電界効果型トランジスタの一種であり、液晶ディスプレイの駆動素子などに広く利用されている。また、今後は、電子ペーパーやRFID

タグなどへの利用も期待されている。

【0003】

薄膜トランジスタの構造には、様々なタイプのものが知られており、たとえば、下記の特許文献1には、基板上にソース電極およびドレイン電極を形成する、いわゆる「順スタガード(staggered)型」の薄膜トランジスタの製造方法が開示されており、特許文献2には、基板上にゲート電極を形成する、いわゆる「逆スタガード(inverted staggered)型」の薄膜トランジスタの製造方法が開示されている。また、薄膜トランジスタを構成する半導体チャネル層(半導体活性層)としては、古くから、アモルファスシリコンやポリシリコンなどのシリコン系の半導体が利用されてきていたが、最近では、有機半導体や酸化物半導体を利用した例も提案されている。たとえば、下記の特許文献3には、ZnOを含む酸化物半導体を半導体チャネル層として用いた電界効果型トランジスタが開示されている。

【図面の簡単な説明】

【0015】

【図1】「逆スタガード(inverted staggered)・トップコンタクト型」の薄膜トランジスタ素子の基本構造を示す側断面図である。

【図2】「逆スタガード(inverted staggered)・ボトムコンタクト型」の薄膜トランジスタ素子の基本構造を示す側断面図である。

【図3】図2に示す薄膜トランジスタ素子において、寄生容量が生じる原因を示す側断面図である。

【図4】図3に示す薄膜トランジスタ素子の上面図である。

【図5】本発明に係る製造方法で作成される「逆スタガード・ボトムコンタクト型」の薄膜トランジスタ素子の基本構造を示す側断面図である。

【図6】図5に示す薄膜トランジスタ素子の上面図である。

【図7】本発明に係る製造方法の第1の段階～第3の段階のプロセスを示す側断面図である。

【図8】本発明に係る製造方法に用いられる第1のフォトマスクM1の平面図である。

【図9】本発明に係る製造方法の第4の段階の前段プロセスを示す側断面図である。

【図10】本発明に係る製造方法に用いられる第2のフォトマスクM2の平面図である。

【図11】本発明に係る製造方法の第4の段階の中段プロセスを示す側断面図である。

【図12】本発明に係る製造方法において、フォトマスクM1\*として機能するゲート電極層の平面図である。

【図13】図12に示すフォトマスクM1\*と図10に示すフォトマスクM2とを合成することにより得られるフォトマスクの平面図である。

【図14】本発明に係る製造方法の第4の段階の後段プロセスを示す側断面図である。

【図15】本発明に係る製造方法の第5の段階のプロセスを示す側断面図である。

【図16】本発明に係る製造方法に用いられる第3のフォトマスクM3の平面図である。

【図17】本発明に係る製造方法の別な実施形態に用いられる第2のフォトマスクM2\*の平面図である。

【図18】本発明に係る製造方法の別な実施形態において、ソース電極層およびドレイン電極層を形成する第1のプロセスを示す側断面図である。

【図19】本発明に係る製造方法の別な実施形態において、ソース電極層およびドレイン電極層を形成する第2のプロセスを示す側断面図である。

【符号の説明】

【0078】

3、5：切断線

100：逆スタガード・トップコンタクト型の薄膜トランジスタ素子

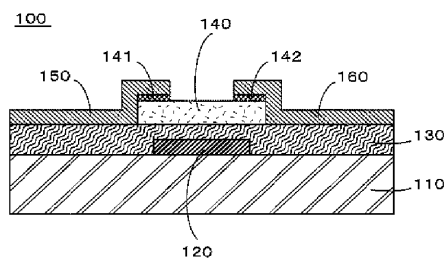
110：ガラス基板

120：ゲート電極層

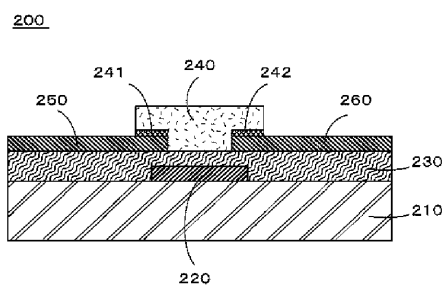
130：ゲート絶縁層

140 : 半導体チャネル層 (シリコン系)  
141, 142 : 高濃度不純物拡散層  
150 : ソース電極層  
160 : ドレイン電極層  
200 : 逆スタガード・ボトムコンタクト型の薄膜トランジスタ素子  
210 : ガラス基板  
220 : ゲート電極層  
230 : ゲート絶縁層  
240 : 半導体チャネル層 (シリコン系)  
241, 242 : 高濃度不純物拡散層  
250 : ソース電極層  
260 : ドレイン電極層  
300 : 逆スタガード・ボトムコンタクト型の薄膜トランジスタ素子  
310 : ガラス基板  
320 : ゲート電極層 (金属)  
325 : 第1の導電層 (金属)  
330 : ゲート絶縁層  
340 : 半導体チャネル層 (IGZOからなる酸化物半導体)  
350 : ソース電極層  
360 : ドレイン電極層  
370 : 第2の導電層 (ITO)  
375 : ソース・ドレイン電極準備層  
380 : ネガ型レジスト層  
381 : ポジ型レジスト層  
382 : ネガ型レジスト層  
390 : 半導体層 (IGZOからなる酸化物半導体)  
395 : ネガ型レジスト層  
A1～A9 : フォトマスクの透光領域  
A1\*, A2\* : フォトマスクの遮光領域  
D1, D2 : 重複領域  
L1～L6 : 各電極の輪郭基準線  
M1～M3, M1\*, M2\* : フォトマスク

【図1】



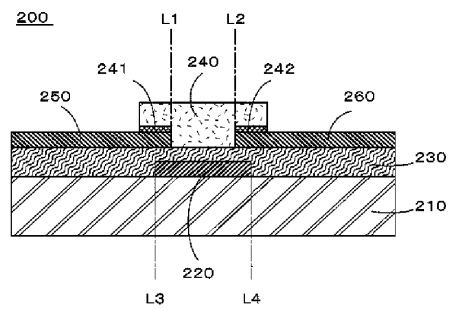
【図2】



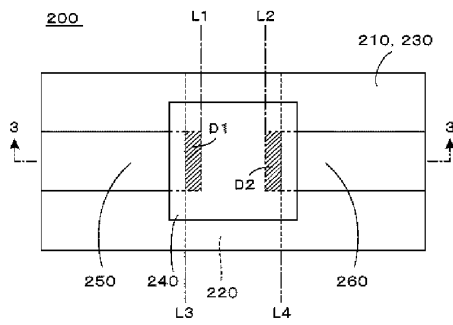
( 8 )

特開2010-199459 (P2010-199459A)

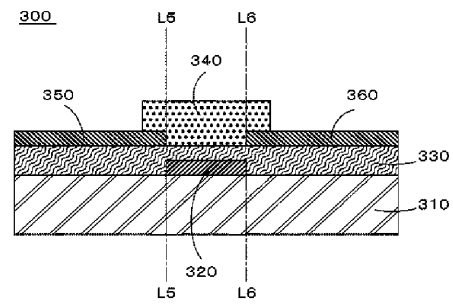
【図3】



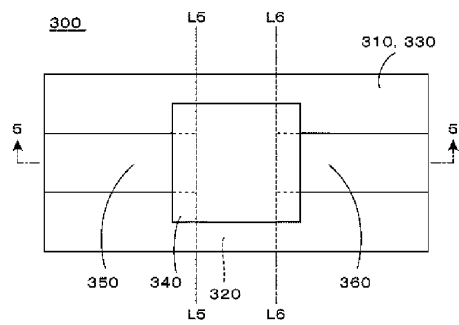
【図4】



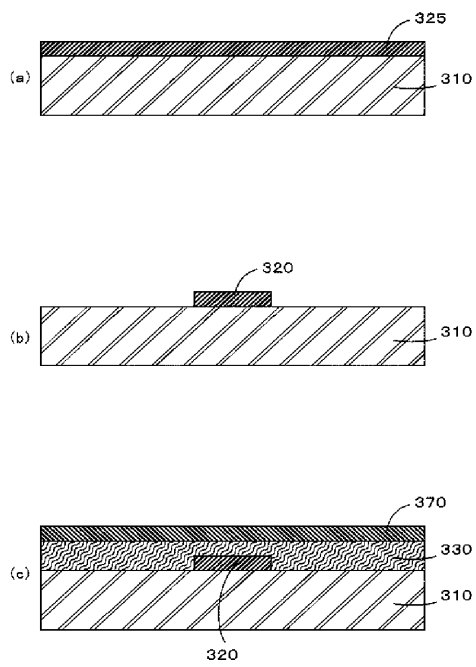
【図5】



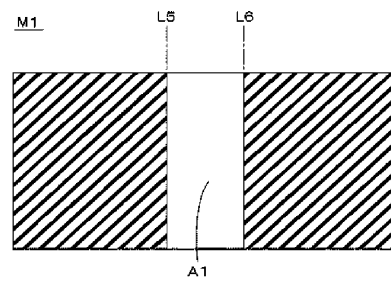
【図6】



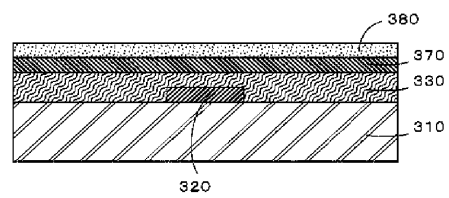
【図7】



【図8】

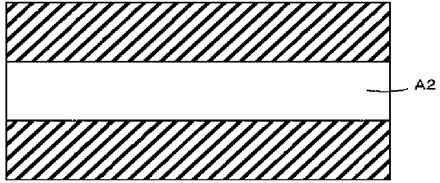


【図9】

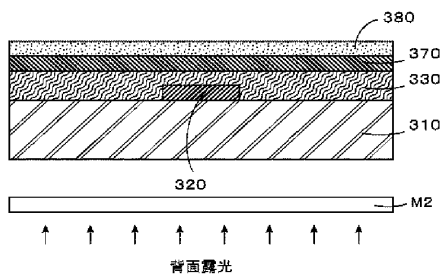


【図10】

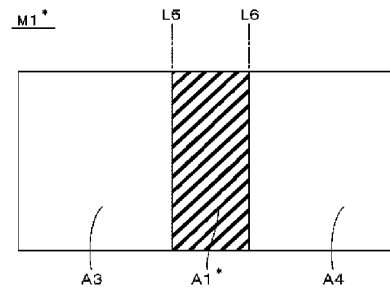
M2



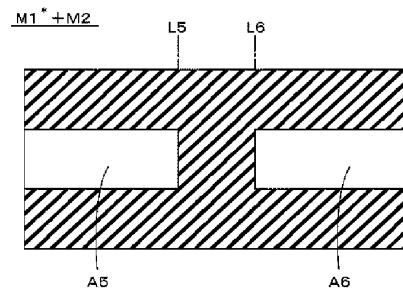
【図11】



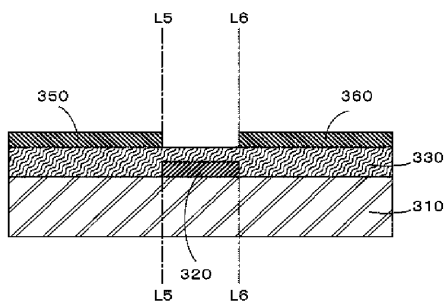
【図12】



【図13】



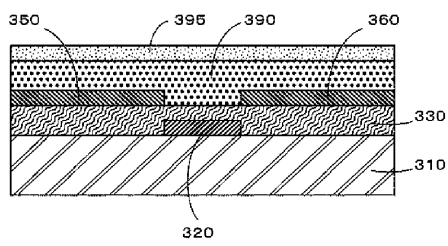
【図14】



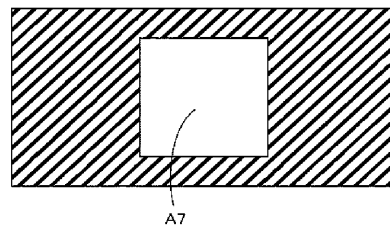
【図15】

【図17】

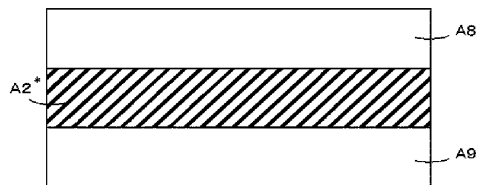
【図16】



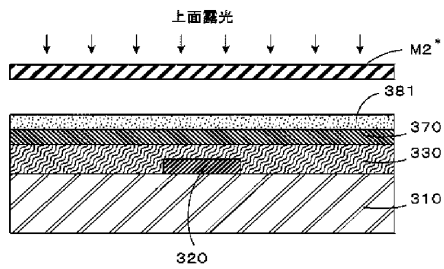
M3



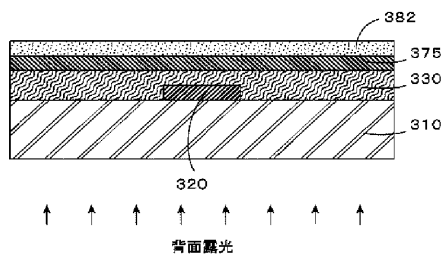
M2<sup>+</sup>



【図18】



【図19】



| (51)Int.Cl. |       |           | F I           | テーマコード (参考) |   |
|-------------|-------|-----------|---------------|-------------|---|
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|             |       |           | H O 1 L 21/28 | 3 0 1 R     |   |
|             |       |           | H O 1 L 29/50 |             | M |
|             |       |           | H O 1 L 29/58 |             | G |
|             |       |           | H O 1 L 21/28 | 3 0 1 B     |   |

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| <b>First Named Inventor/Applicant Name:</b> | Chih-Pang Chang                                                |
| <b>Customer Number:</b>                     | 31561                                                          |
| <b>Filer:</b>                               | Belinda Lee                                                    |
| <b>Filer Authorized By:</b>                 |                                                                |
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| <b>Application Type:</b>                    | Utility under 35 USC 111(a)                                    |

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| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                       |                    |                                                     |    |    |
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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 13/208,360         | 08/12/2011            | Chih-Pang Chang       | 37986-US-PA            |

**CONFIRMATION NO. 7890**

**PUBLICATION NOTICE**

31561  
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN



\*OC000000057860448\*

**Title:**SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE

**Publication No.**US-2012-0298983-A1

**Publication Date:**11/29/2012

**NOTICE OF PUBLICATION OF APPLICATION**

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publicly available Searchable Databases via the Internet at [www.uspto.gov](http://www.uspto.gov). The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

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Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

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| APPLICATION NO.                                                                                                                               | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.             | CONFIRMATION NO.            |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------|---------------------------------|-----------------------------|
| 13/208,360                                                                                                                                    | 08/12/2011  | Chih-Pang Chang      | 37986-US-PA                     | 7890                        |
| 31561 7590 03/29/2013<br>JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE<br>7 FLOOR-1, NO. 100<br>ROOSEVELT ROAD, SECTION 2<br>TAIPEI, 100<br>TAIWAN |             |                      | EXAMINER<br>ERDEM, FAZLI        |                             |
|                                                                                                                                               |             |                      | ART UNIT<br>2826                | PAPER NUMBER                |
|                                                                                                                                               |             |                      | NOTIFICATION DATE<br>03/29/2013 | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USA@JCIPGROUP.COM.TW  
Belinda@JCIPGROUP.COM.TW

|                              |                        |                     |  |
|------------------------------|------------------------|---------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b> | <b>Applicant(s)</b> |  |
|                              | 13/208,360             | CHANG ET AL.        |  |
|                              | <b>Examiner</b>        | <b>Art Unit</b>     |  |
|                              | FAZLI ERDEM            | 2826                |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 August 2011.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 5) ☒ Claim(s) 1-16 is/are pending in the application.
- 5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 1-16 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

**Application Papers**

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 8/12/2011 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 8/12/11, 10/25/12
- 3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 4) ☐ Other: \_\_\_\_.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song et al. (2008/0278435) in view of Egami (2011/0215337) further in view of Mori et al. (2011/0198607).

Regarding Claim 1 in Figs. 2 and 7E, Song et al. disclose a semiconductor structure, disposed on a substrate 101, and comprising: a gate electrode 112, disposed on the substrate; a gate insulating layer 120, disposed on the substrate, and covering the gate electrode; a channel layer 131/132/133/134, disposed on the gate insulating layer and located above the gate electrode, wherein the channel layer has a channel length L along a channel direction and has a first side and a second side opposite to the first side; a source electrode 146 and a drain electrode 147, located at the two opposite sides of the channel layer, and electrically connected to the first side and the second side of the channel layer, respectively; a layer 150, covering the source electrode, the drain electrode and the channel layer; and a conductive light-shielding pattern layer 165, disposed on the dielectric layer, and overlapped to a portion of the source electrode and a portion of the channel layer. Song et al. fail to disclose the layer to be dielectric and the required length relationship among light shielding, source, drain and

channel. However, Egami disclose a semiconductor device where in Fig. 7F dielectric/insulating layer 42 is disclosed. Furthermore, Mori discloses a thin film transistor where in Fig. 5 and paragraphs 0474, 0477, 0478, it is possible to get the required relationship among light shielding, channel, source and drain.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required dielectric/insulating layer in Song et al. as taught by Egami in order to protect the light emitting device. It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required relationship among light shield, channel, source and drain in Song et al. and Egami combination as taught by Mori et al. in order to have semiconductor device with low leakage.

Regarding Claim 4, in Fig. 1 of Mori et al. it is disclosed that conductive light-shielding pattern layer 2 has a third side and a fourth side along the channel direction, the fourth side is overlapped to the channel layer in the vertical projection, wherein the overlapping length equal to a distance between the fourth side and the first side of the channel layer along the channel direction.

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song et al. (2008/0278435) in view of Egami (2011/0215337) further in view of Mori et al. (2011/0198607) as applied above further in view of Koji (JP 2010199459) (Submitted by the applicant on 10/25/2012).

Regarding Claim 2, in combination Song et al., Egami and Mori et al. combination teach everything except the oxide semiconductor channel layer. However, Koji discloses semiconductor device where in Fig. 5, the oxide semiconductor channel 340 is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required oxide semiconductor device in Song et al., Egami and Mori et al. combination as taught by Koji in order suppress parasitic capacitance.

Regarding Claim 3, Koji discloses InGaZnO channel layer 340 in Fig. 5.

Claim 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song et al. (2008/0278435) in view of Egami (2011/0215337) further in view of Mori et al. (2011/0198607) as applied above further in view of Seo et al. (2006/0046339).

Regarding Claim 5, in combination Song et al., Egami and Mori et al. combination teach everything except the channel, source/drain configuration. However, Koji discloses semiconductor device where in Figs. 3-5, the required configuration for channel 415 and source/drain is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required oxide semiconductor device in Song et al., Egami and Mori et al. combination as taught by Seo et al. in order make OLED device.

Regarding Claim 6, in Figs. 3-5 of Seo et al., the source electrode and the drain electrode respectively cover a portion of the channel layer.

Regarding Claim 7, in Figs. 3-5 of Seo et al. it is disclosed etching stop layer 415' disposed on the channel layer, wherein the source electrode and the drain electrode respectively cover a portion of the etching stop layer.

Regarding Claim 8, in Fig 1 of Mori et al. it is disclosed that the drain electrode has a fifth side along the channel direction, wherein the fifth side is overlapped to the channel layer, and the fifth side and the second side are spaced by a distance.

Claims 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song et al. (2008/0278435) in view of Kwak (2007/0176554) further in view of Mori et al. (2011/0198607).

Regarding Claim 9, in Figs. 2 and 7E, Song et al. disclose a semiconductor structure, disposed on a substrate 101, and comprising: a gate electrode 112, disposed on the substrate; a gate insulating layer 120, disposed on the substrate, and covering the gate electrode; a channel layer 131/132/133/134, disposed on the gate insulating layer and located above the gate electrode, wherein the channel layer has a channel length L along a channel direction and has a first side and a second side opposite to the first side; a source electrode 146 and a drain electrode 147, located at the two opposite sides of the channel layer, and electrically connected to the first side and the second side of the channel layer, respectively; a layer 150, covering the source electrode, the

drain electrode and the channel layer; and a conductive light-shielding pattern layer 165, disposed on the dielectric layer, and overlapped to a portion of the source electrode and a portion of the channel layer. Song et al. fail to disclose the layer to be dielectric/organic light emitting layer and the required length relationship among light shielding, source, drain and channel. However, Kwak discloses a semiconductor device where in Fig. 3 the required dielectric/organic light emitting layer is disclosed. Furthermore, Mori discloses a thin film transistor where in Fig. 5 and paragraphs 0474, 0477, 0478, it is possible to get the required relationship among light shielding, channel, source and drain.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required dielectric/insulating layer in Song et al. as taught by Egami in order to protect the light emitting device. It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required relationship among light shield, channel, source and drain in Song et al. and Egami in combination as taught by Mori et al. in order to have semiconductor device with low leakage.

Regarding Claim 12, in Fig. 1 of Mori et al. it is disclosed that conductive light-shielding pattern layer 2 has a third side and a fourth side along the channel direction, the fourth side is overlapped to the channel layer in the vertical projection, wherein the overlapping length equal to a distance between the fourth side and the first side of the channel layer along the channel direction.

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song et al. (2008/0278435) in view of Kwak (2007/0176554) further in view of Mori et al. (2011/0198607) as applied above further in view of Koji (JP 2010199459) (Submitted by the applicant on 10/25/2012).

Regarding Claim 10, in combination Song et al., Kwak and Mori et al. combination teach everything except the oxide semiconductor channel layer. However, Koji discloses semiconductor device where in Fig. 5, the oxide semiconductor channel 340 is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required oxide semiconductor device in Song et al., Kwak and Mori et al. combination as taught by Koji in order suppress parasitic capacitance.

Regarding Claim 11, Koji discloses InGaZnO channel layer 340 in Fig. 5.

Claims 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song et al. (2008/0278435) in view of Kwak (2007/0176554) further in view of Mori et al. (2011/0198607) as applied above further in view of Seo et al. (2006/0046339).

Regarding Claim 13, in combination Song et al., Kwak and Mori et al. combination teach everything except the channel, source/drain configuration. However, Koji discloses semiconductor device where in Figs. 3-5, the required configuration for channel 415 and source/drain is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required oxide semiconductor device in Song et al., Kwak and Mori et al. combination as taught by Seo et al. in order make OLED device.

Regarding Claim 14, in Figs. 3-5 of Seo et al., the source electrode and the drain electrode respectively cover a portion of the channel layer.

Regarding Claim 15, in Figs. 3-5 of Seo et al. it is disclosed etching stop layer 415' disposed on the channel layer, wherein the source electrode and the drain electrode respectively cover a portion of the etching stop layer.

Regarding Claim 16, in Fig 1 of Mori et al. it is disclosed that the drain electrode has a fifth side along the channel direction, wherein the fifth side is overlapped to the channel layer, and the fifth side and the second side are spaced by a distance.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FAZLI ERDEM whose telephone number is (571)272-1914. The examiner can normally be reached on M-F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Davienne Monbleau can be reached on 571-272-1945. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/FAZLI ERDEM/  
Examiner, Art Unit 2826  
03/19/2013

/MINH-LOAN T TRAN/  
Primary Examiner  
Art Unit 2826

|                                   |                                       |                                                            |             |
|-----------------------------------|---------------------------------------|------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/208,360 | Applicant(s)/Patent Under<br>Reexamination<br>CHANG ET AL. |             |
|                                   | Examiner<br>FAZLI ERDEM               | Art Unit<br>2826                                           | Page 1 of 1 |

**U.S. PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name            | Classification |
|---|---|--------------------------------------------------|-----------------|-----------------|----------------|
| * | A | US-2007/0176554                                  | 08-2007         | Kwak, Won Kyu   | 313/512        |
| * | B | US-2006/0046339                                  | 03-2006         | Seo et al.      | 438/057        |
| * | C | US-2011/0198607                                  | 08-2011         | MORI et al.     | 257/72         |
| * | D | US-2011/0215337                                  | 09-2011         | EGAMI, Takafumi | 257/72         |
| * | E | US-2008/0278435                                  | 11-2008         | SONG et al.     | 345/107        |
|   | F | US-                                              |                 |                 |                |
|   | G | US-                                              |                 |                 |                |
|   | H | US-                                              |                 |                 |                |
|   | I | US-                                              |                 |                 |                |
|   | J | US-                                              |                 |                 |                |
|   | K | US-                                              |                 |                 |                |
|   | L | US-                                              |                 |                 |                |
|   | M | US-                                              |                 |                 |                |

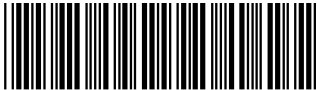
**FOREIGN PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Country | Name | Classification |
|---|---|--------------------------------------------------|-----------------|---------|------|----------------|
|   | N |                                                  |                 |         |      |                |
|   | O |                                                  |                 |         |      |                |
|   | P |                                                  |                 |         |      |                |
|   | Q |                                                  |                 |         |      |                |
|   | R |                                                  |                 |         |      |                |
|   | S |                                                  |                 |         |      |                |
|   | T |                                                  |                 |         |      |                |

**NON-PATENT DOCUMENTS**

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

|                                                                                                                                       |                                            |                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------|
| <p align="center"><b><i>Index of Claims</i></b></p>  | <b>Application/Control No.</b><br>13208360 | <b>Applicant(s)/Patent Under Reexamination</b><br>CHANG ET AL. |
|                                                                                                                                       | <b>Examiner</b><br>FAZLI ERDEM             | <b>Art Unit</b><br>2826                                        |

|   |                 |   |                   |   |                     |   |                 |
|---|-----------------|---|-------------------|---|---------------------|---|-----------------|
| ✓ | <b>Rejected</b> | - | <b>Cancelled</b>  | N | <b>Non-Elected</b>  | A | <b>Appeal</b>   |
| = | <b>Allowed</b>  | ÷ | <b>Restricted</b> | I | <b>Interference</b> | O | <b>Objected</b> |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant |          |            |      |  |  |  |  |  |  | <input type="checkbox"/> CPA |  |  |  |  |  |  |  |  |  | <input type="checkbox"/> T.D. |  |  |  |  |  |  |  |  |  | <input type="checkbox"/> R.1.47 |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------|----------|------------|------|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|--|--|---------------------------------|--|--|--|--|--|--|--|--|--|
| CLAIM                                                                                  |          |            | DATE |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
| Final                                                                                  | Original | 03/19/2013 |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 1        | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 2        | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 3        | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 4        | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 5        | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 6        | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 7        | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 8        | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 9        | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 10       | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 11       | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 12       | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 13       | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 14       | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 15       | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |
|                                                                                        | 16       | ✓          |      |  |  |  |  |  |  |                              |  |  |  |  |  |  |  |  |  |                               |  |  |  |  |  |  |  |  |  |                                 |  |  |  |  |  |  |  |  |  |

|                                                                                                          |                                            |                                                                |
|----------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------|
| <b>Search Notes</b><br> | <b>Application/Control No.</b><br>13208360 | <b>Applicant(s)/Patent Under Reexamination</b><br>CHANG ET AL. |
|                                                                                                          | <b>Examiner</b><br>FAZLI ERDEM             | <b>Art Unit</b><br>2826                                        |

| CPC- SEARCHED |      |          |
|---------------|------|----------|
| Symbol        | Date | Examiner |
|               |      |          |

| CPC COMBINATION SETS - SEARCHED |      |          |
|---------------------------------|------|----------|
| Symbol                          | Date | Examiner |
|                                 |      |          |

| US CLASSIFICATION SEARCHED |          |      |          |
|----------------------------|----------|------|----------|
| Class                      | Subclass | Date | Examiner |
|                            |          |      |          |

| SEARCH NOTES                                              |            |          |
|-----------------------------------------------------------|------------|----------|
| Search Notes                                              | Date       | Examiner |
| Assignee is searched                                      | 03/19/2013 | FE       |
| Inventors are searched                                    | 03/19/2013 | FE       |
| EAST Text Search history is attached                      | 03/19/2013 | FE       |
| Searched 257/43, 59, 72, E29.296 limited with text search | 03/19/2013 | FE       |

| INTERFERENCE SEARCH     |                         |      |          |
|-------------------------|-------------------------|------|----------|
| US Class/<br>CPC Symbol | US Subclass / CPC Group | Date | Examiner |
|                         |                         |      |          |

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Receipt date: 10/25/2012

13208360 - GAI-2826

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

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|-----------------------------------------------------------------------------------------------------|------------------------|-----------------|------------|--|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |                 | 13208360   |  |
|                                                                                                     | Filing Date            |                 | 2011-08-12 |  |
|                                                                                                     | First Named Inventor   | Chih-Pang Chang |            |  |
|                                                                                                     | Art Unit               | 2826            |            |  |
|                                                                                                     | Examiner Name          | ERDEM, FAZLI    |            |  |
|                                                                                                     | Attorney Docket Number | 37986-US-PA     |            |  |

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|------------------------------------------------------------------------------------------------------------|---------|--------------------------------------|---------------------------|------------------------|-------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------|
| Examiner Initial*                                                                                          | Cite No | Patent Number                        | Kind Code <sup>1</sup>    | Issue Date             | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |                                                                        |                          |
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|                                                                                                            | 1       | 2010199459                           | JP                        |                        | 2010-09-09                                      | DAINIPPON PRINTING CO LTD                                              |                                                                        | <input type="checkbox"/> |
|                                                                                                            | 2       | 1743930                              | CN                        |                        | 2006-03-08                                      | LG PHILIPS LCD CO LTD                                                  |                                                                        | <input type="checkbox"/> |
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| <b>Receipt date: 10/25/2012</b><br><br><b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><b>( Not for submission under 37 CFR 1.99)</b> | Application Number     |                 | 13208360   | 13208360 - GAU: 2826 |
|                                                                                                                                                   | Filing Date            |                 | 2011-08-12 |                      |
|                                                                                                                                                   | First Named Inventor   | Chih-Pang Chang |            |                      |
|                                                                                                                                                   | Art Unit               | 2826            |            |                      |
|                                                                                                                                                   | Examiner Name          | ERDEM, FAZLI    |            |                      |
|                                                                                                                                                   | Attorney Docket Number | 37986-US-PA     |            |                      |

| Examiner Initials* | Cite No | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published. | T <sup>5</sup>           |
|--------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                    | 1       | "First Office Action of China Counterpart Application", issued on August 14, 2012, p1-p9, in which the listed references were cited.                                                                                                                            | <input type="checkbox"/> |

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#### EXAMINER SIGNATURE

|                    |                            |                 |            |
|--------------------|----------------------------|-----------------|------------|
| Examiner Signature | /Fazli Erdem/ (03/19/2013) | Date Considered | 03/19/2013 |
|--------------------|----------------------------|-----------------|------------|

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

|                                                                                                                                                   |                        |                 |            |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------|------------|----------------------|
| <b>Receipt date: 10/25/2012</b><br><br><b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><b>( Not for submission under 37 CFR 1.99)</b> | Application Number     |                 | 13208360   | 13208360 - GAU: 2826 |
|                                                                                                                                                   | Filing Date            |                 | 2011-08-12 |                      |
|                                                                                                                                                   | First Named Inventor   | Chih-Pang Chang |            |                      |
|                                                                                                                                                   | Art Unit               | 2826            |            |                      |
|                                                                                                                                                   | Examiner Name          | ERDEM, FAZLI    |            |                      |
|                                                                                                                                                   | Attorney Docket Number | 37986-US-PA     |            |                      |

#### CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

#### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

|            |               |                     |            |
|------------|---------------|---------------------|------------|
| Signature  | /Belinda Lee/ | Date (YYYY-MM-DD)   | 2012-10-24 |
| Name/Print | Belinda Lee   | Registration Number | 46863      |

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.E./

**EAST Search History****EAST Search History (Prior Art)**

| Ref # | Hits | Search Query                                                                                                                                                                                                                          | DBs                                                                        | Default Operator | Plurals | Time Stamp          |
|-------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------|---------|---------------------|
| L1    | 1272 | ((light adj (shielding or blocking)) with (overlap or overlapping or overlapped)).clm.                                                                                                                                                | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/03/19<br>08:54 |
| L2    | 93   | ((light adj (shielding or blocking)) with (overlap or overlapping or overlapped) same channel).clm.                                                                                                                                   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/03/19<br>08:55 |
| L3    | 53   | ((light adj (shielding or blocking)) with (overlap or overlapping or overlapped) same channel same source).clm.                                                                                                                       | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/03/19<br>08:56 |
| L4    | 47   | ((light adj (shielding or blocking)) with (overlap or overlapping or overlapped) same channel same source same drain).clm.                                                                                                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/03/19<br>08:56 |
| L5    | 33   | ((light adj (shielding or blocking)) near5 (overlap or overlapping or overlapped) same channel same source same drain).clm.                                                                                                           | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/03/19<br>08:59 |
| L6    | 9    | ((light adj (shielding or blocking)) near5 (overlap or overlapping or overlapped) same channel same source same drain).clm. and (light adj (shielding or blocking)) near5 (overlap or overlapping or overlapped).ab.                  | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/03/19<br>09:00 |
| L7    | 2    | ((light adj (shielding or blocking)) near5 (overlap or overlapping or overlapped) same channel same source same drain).clm. and ((light adj (shielding or blocking)) near5 (overlap or overlapping or overlapped) near10 channel).ab. | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/03/19<br>09:11 |
| L8    | 22   | ((light adj (shielding or blocking)) near5                                                                                                                                                                                            | US-PGPUB;                                                                  | OR               | ON      | 2013/03/19          |

|     |    |                                                                                                                                                                                                                                            |                                                                            |    |    |                     |
|-----|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |    | ((overlap or overlapping or overlapped) near10 channel).ab.                                                                                                                                                                                | USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB              |    |    | 09:11               |
| L9  | 11 | ((light adj (shielding or blocking)) near5 (overlap or overlapping or overlapped) near10 channel near10 (length or distance or partially or portion)).ab.                                                                                  | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:12 |
| L10 | 11 | ((light adj (shielding or blocking)) near10 (overlap or overlapping or overlapped) near10 channel near10 (length or distance or partially or portion)).ab.                                                                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:12 |
| L11 | 24 | ((light adj (shielding or blocking)) near10 (overlap or overlapping or overlapped) near10 channel near10 (length or distance or partially or portion or region or "at least")).ab.                                                         | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:14 |
| L12 | 52 | ((light adj (shielding or blocking)) near10 (overlap or overlapping or overlapped) near10 channel near10 (length or distance or partially or portion or region or "at least")).clm.                                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:14 |
| L13 | 8  | ((conductive or conducting) near10 (light adj (shielding or blocking)) near10 (overlap or overlapping or overlapped) near10 channel near10 (length or distance or partially or portion or region or "at least")).clm.                      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:15 |
| L14 | 3  | ((conductive or conducting) near10 (light adj (shielding or blocking)) near10 (overlap or overlapping or overlapped) near10 channel near10 (length or distance or partially or portion or region or "at least")) same source same drain    | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:16 |
| L15 | 1  | ((conductive or conducting) near10 (light adj (shielding or blocking)) near10 (overlap or overlapping or overlapped) near10 channel near10 (length or distance or partially or portion or region or "at least")) same (length or distance) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:17 |
| L16 | 7  | ((light adj (shielding or blocking)) near10 (overlap or overlapping or overlapped) near10 channel near10 (length or distance or partially or portion or region or "at least")) same (length or distance)                                   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;            | OR | ON | 2013/03/19<br>09:17 |

|     |     |                                                                                                                                                            |                                                                            |    |    |                     |
|-----|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |     |                                                                                                                                                            | IBM_TDB                                                                    |    |    |                     |
| L17 | 395 | ((light adj (shielding or blocking)) near10 (distance or length) near10 ("L" or "t" or "d"))                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:20 |
| L18 | 58  | ((light adj (shielding or blocking)) near10 (distance or length) near10 ("L" or "t" or "d")).clm.                                                          | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:20 |
| L19 | 18  | ((light adj (shielding or blocking)) near10 (distance or length) near10 ("L" or "t" or "d")) same channel                                                  | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:21 |
| L20 | 8   | ((light adj (shielding or blocking)) near10 (distance or length) near10 ("L" or "t" or "d")) same channel same side                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:23 |
| L21 | 3   | ((light adj (shielding or blocking)) near10 (distance or length) near10 ("L" or "t" or "d")) same channel same side same (relationship or expression)      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:25 |
| L22 | 2   | ((light adj (shielding or blocking)) same channel same (overlap or overlapping or overlapped) same (length or distance) same (relationship or expression)) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:27 |
| L23 | 5   | ((light adj (shielding or blocking)) near10 channel near10 (overlap or overlapping or overlapped) near2 (length or distance))                              | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:34 |
| L24 | 5   | ((light adj (shielding or blocking)) same channel near10 (overlap or overlapping or overlapped) near2 (length or distance)).clm.                           | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:36 |
| L25 | 3   | ((light adj (shielding or blocking)) same channel same (overlap or overlapping or overlapped) near2 (length or distance)).clm.                             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;                                     | OR | ON | 2013/03/19<br>09:36 |

|     |     |                                                                                                                                                                                                                                 |                                                                            |    |    |                     |
|-----|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |     |                                                                                                                                                                                                                                 | EPO; JPO;<br>DERWENT;<br>IBM_TDB                                           |    |    |                     |
| L26 | 3   | ((light adj (shielding or blocking)) same channel same (overlap or overlapping or overlapped) near2 (length or distance))                                                                                                       | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:36 |
| L27 | 1   | ((light adj (shielding or blocking)) same channel same (overlap or overlapping or overlapped) near (length or distance))                                                                                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:36 |
| L28 | 655 | (light adj (block or blocking or shade or shading or prevent or preventing or preventive or prevention or shield or shielding)) same channel same (overlap or overlapping or overlapped)                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:37 |
| L29 | 213 | ((light adj (block or blocking or shade or shading or prevent or preventing or preventive or prevention or shield or shielding)) same channel same (overlap or overlapping or overlapped)).ti,ab,clm.                           | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:38 |
| L30 | 157 | ((light adj (block or blocking or shade or shading or prevent or preventing or preventive or prevention or shield or shielding)) with channel same (overlap or overlapping or overlapped)).ti,ab,clm.                           | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:38 |
| L31 | 119 | ((light adj (block or blocking or shade or shading or prevent or preventing or preventive or prevention or shield or shielding)) with channel with (overlap or overlapping or overlapped)).ti,ab,clm.                           | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:38 |
| L32 | 119 | ((light adj (block or blocking or shade or shading or prevent or preventing or preventive or prevention or shield or shielding)) with channel with (overlap or overlapping or overlapped)).ti,ab,clm.                           | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:39 |
| L33 | 10  | ((light adj (block or blocking or shade or shading or prevent or preventing or preventive or prevention or shield or shielding)) with channel with (overlap or overlapping or overlapped) with (distance or length)).ti,ab,clm. | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:40 |
| L34 | 8   | ((light adj (block or blocking or shade or shading or prevent or preventing or                                                                                                                                                  | US-PGPUB;<br>USPAT;                                                        | OR | ON | 2013/03/19<br>09:41 |

|     |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |    |    |                  |
|-----|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----|----|------------------|
|     |    | preventive or prevention or shield or shielding)) with channel near10 (overlap or overlapping or overlapped) with (distance or length)).ti,ab,clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB                  |    |    |                  |
| L35 | 7  | ((light adj (block or blocking or shade or shading or prevent or preventing or preventive or prevention or shield or shielding)) with channel near10 (overlap or overlapping or overlapped) with (distance or length)).clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 09:42 |
| L36 | 10 | ((light adj (block or blocking or shade or shading or prevent or preventing or preventive or prevention or shield or shielding)) with channel near10 (overlap or overlapping or overlapped) same (distance or length) same drain)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 09:42 |
| L37 | 9  | ((light adj (block or blocking or shade or shading or prevent or preventing or preventive or prevention or shield or shielding)) with channel near10 (overlap or overlapping or overlapped) same (distance or length) same drain same source same between)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 09:43 |
| L38 | 66 | (US-20120298983-\$ or US-20060046339-\$ or US-20120270397-\$ or US-20110297947-\$ or US-20110053323-\$ or US-20090057666-\$ or US-20090047750-\$ or US-20080203395-\$ or US-20110198607-\$ or US-20100012979-\$ or US-20080017885-\$ or US-20070103575-\$ or US-20040262703-\$ or US-20040149989-\$ or US-20060170048-\$ or US-20040218111-\$ or US-20080073718-\$ or US-20080315262-\$ or US-20110147752-\$ or US-20050077520-\$ or US-20010030722-\$ or US-20010019384-\$ or US-20090033819-\$ or US-20080203396-\$ or US-20020113914-\$ or US-20070268206-\$).did. or (US-7754523-\$ or US-8153337-\$ or US-8030652-\$ or US-7662660-\$ or US-7459725-\$ or US-8334553-\$ or US-8168982-\$ or US-8023042-\$ or US-7190422-\$ or US-8300170-\$ or US-7105905-\$ or US-6319760-\$ or US-6310372-\$ or US-6066860-\$ or US-5416340-\$ or US-7790523-\$ or US-8120130-\$ or US-7102164-\$ or US-6800873-\$ or US-6704068-\$ or US-7800718-\$ or US-8130335-\$ or US-8144281-\$ or US-7460190-\$).did. or (JP-2010199459-\$ or JP-2010199458-\$ or JP-2010199457-\$ or JP-2011187931-\$ or JP-2008040399-\$ or JP-2011242784-\$ or JP-2009027132-\$ or JP-2001313397-\$ or JP-2010072219-\$ or JP-2009053660-\$).did. or (US-20060046339-\$ or US-20110180798-\$ or JP-2010074030-\$ or | US-PGPUB; USPAT; JPO; DERWENT                            | OR | ON | 2013/03/19 09:45 |

|     |    |                                                                                                                        |                                                                            |    |    |                     |
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|     |    | US-20040149989-\$ or US-20110198607-\$ or US-20090033819-\$).did.                                                      |                                                                            |    |    |                     |
| L39 | 21 | I38 and ((length or distance) near10 (l or d))                                                                         | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:45 |
| L40 | 20 | I38 and ((length or distance) near10 (l or d)) same channel                                                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:46 |
| L41 | 18 | I38 and ((length or distance) near10 (l or d)) same channel same light                                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:47 |
| L42 | 11 | I38 and ((length or distance) near10 (l or d)) same channel same light same (overlap or overlapping or overlapped)     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:47 |
| L43 | 7  | I38 and ((length or distance) near10 (l or d)) same light same channel near10 (overlap or overlapping or overlapped)   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:49 |
| L44 | 4  | I38 and ((length or distance) near10 (l or d)) same light near10 channel near10 (overlap or overlapping or overlapped) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:50 |
| L45 | 3  | I38 and ((length or distance) near10 light near10 channel near10 (overlap or overlapping or overlapped))               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:51 |
| L46 | 3  | I38 and ((length or distance) near10 light near10 channel near10 (overlap or overlapping or overlapped))               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:51 |
| L47 | 33 | ((length or distance) near10 light near10 channel near10 (overlap or overlapping or overlapped))                       | US-PGPUB;<br>USPAT;<br>USOCR;                                              | OR | ON | 2013/03/19<br>09:52 |

|     |     |                                                                                                                                                                                                               |                                                                            |    |    |                     |
|-----|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |     |                                                                                                                                                                                                               | FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB                                  |    |    |                     |
| L48 | 4   | ((length or distance) near10 light adj (shield or shielding or block or blocking or shade or shading or preventive or preventing or prevention) near10 channel near10 (overlap or overlapping or overlapped)) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:53 |
| L49 | 8   | ((length or distance) with light adj (shield or shielding or block or blocking or shade or shading or preventive or preventing or prevention) near10 channel near10 (overlap or overlapping or overlapped))   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:54 |
| L50 | 200 | (light adj (shield or shielding or block or blocking or shade or shading or preventive or preventing or prevention) near10 channel near10 (overlap or overlapping or overlapped))                             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:56 |
| L51 | 98  | I50 and (light adj (shield or shielding or block or blocking or shade or shading or preventive or preventing or prevention)).ab.                                                                              | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:57 |
| L52 | 62  | I51 and (light adj (shield or shielding or block or blocking or shade or shading or preventive or preventing or prevention)).clm.                                                                             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:57 |
| L53 | 50  | I52 and (overlap or overlapping or overlapped).clm.                                                                                                                                                           | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:57 |
| L54 | 28  | I53 and (overlap or overlapping or overlapped).ab.                                                                                                                                                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>09:58 |
| L55 | 7   | (overlap or overlapping or overlapped) near10 (length or distance) near10 channel near10 (light adj (shade or shading or shield or shielding or preventive or preventive or prevention or block or blocking)) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:01 |
| L56 | 1   | (overlap or overlapping or overlapped)                                                                                                                                                                        | US-PGPUB;                                                                  | OR | ON | 2013/03/19          |

|     |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                            |    |    |                     |
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|     |     | near (length or distance) near10 channel near10 (light adj (shade or shading or shield or shielding or preventing or preventive or prevention or block or blocking))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB              |    |    | 10:02               |
| L57 | 1   | (overlap or overlapping or overlapped) near2 (length or distance) near10 channel near10 (light adj (shade or shading or shield or shielding or preventing or preventive or prevention or block or blocking))                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:02 |
| L58 | 5   | (overlap or overlapping or overlapped) near2 (length or distance or amount) near10 channel near10 (light adj (shade or shading or shield or shielding or preventing or preventive or prevention or block or blocking))                                                                                                                                                                                                                                                                                                                                                                                                                                                          | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:02 |
| L59 | 5   | (overlap or overlapping or overlapped) near5 (length or distance or amount) near10 (portion or partly or region or "at least") near10 channel near10 (light adj (shade or shading or shield or shielding or preventing or preventive or prevention or block or blocking))                                                                                                                                                                                                                                                                                                                                                                                                       | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:04 |
| L60 | 9   | (overlap or overlapping or overlapped) near10 (length or distance or amount) near10 (portion or partly or region or "at least") near10 channel near10 (light adj (shade or shading or shield or shielding or preventing or preventive or prevention or block or blocking))                                                                                                                                                                                                                                                                                                                                                                                                      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:04 |
| L61 | 1   | (overlap or overlapping or overlapped) near10 (length or distance or amount) near10 (portion or partly or region or "at least") near10 channel near10 (light adj (shade or shading or shield or shielding or preventing or preventive or prevention or block or blocking)) and dibl                                                                                                                                                                                                                                                                                                                                                                                             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:06 |
| L62 | 120 | (US-20120298983-\$ or US-20060046339-\$ or US-20120270397-\$ or US-20110297947-\$ or US-20110053323-\$ or US-20090057666-\$ or US-20090047750-\$ or US-20080203395-\$ or US-20110198607-\$ or US-20100012979-\$ or US-20080017885-\$ or US-20070103575-\$ or US-20040262703-\$ or US-20040149989-\$ or US-20060170048-\$ or US-20040218111-\$ or US-20080073718-\$ or US-20080315262-\$ or US-20110147752-\$ or US-20050077520-\$ or US-20010030722-\$ or US-20010019384-\$ or US-20090033819-\$ or US-20080203396-\$ or US-20020113914-\$ or US-20070268206-\$).did. or (US-20130037815-\$ or US-20120314151-\$ or US-20120256184-\$ or US-20120249940-\$ or US-20120218325-\$ | US-PGPUB;<br>USPAT;<br>JPO;<br>DERWENT                                     | OR | ON | 2013/03/19<br>10:06 |

|     |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                            |    |    |                     |
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|     |       | or US-20120205671-\$ or US-20120188478-\$ or US-20120146035-\$<br>or US-20120127146-\$ or US-20120119322-\$ or US-20120033151-\$<br>or US-20120002127-\$ or US-20110284860-\$ or US-20110242468-\$<br>or US-20110242443-\$ or US-20110215337-\$ or US-20110199698-\$<br>or US-20110180798-\$ or US-20110163311-\$ or US-20110121290-\$<br>or US-20100233834-\$ or US-20090135111-\$ or US-20080278435-\$<br>or US-20080061394-\$ or US-20070216832-\$ or US-20070113455-\$<br>or US-20070035676-\$).did. or (US-20050140858-\$ or US-20040239825-\$<br>or US-20040140515-\$ or US-20040017162-\$ or US-20030025848-\$<br>or US-20020063261-\$ or US-20020037600-\$ or US-20020036818-\$<br>or US-20020018278-\$ or US-20020017645-\$ or US-20010040655-\$<br>or US-20010038485-\$).did. or (US-7754523-\$ or US-8153337-\$ or US-8030652-\$ or US-7662660-\$ or US-7459725-\$ or US-8334553-\$ or US-8168982-\$ or US-8023042-\$ or US-7190422-\$ or US-8300170-\$ or US-7105905-\$ or US-6319760-\$ or US-6310372-\$ or US-6066860-\$ or US-5416340-\$ or US-7790523-\$ or US-8120130-\$ or US-7102164-\$ or US-6800873-\$ or US-6704068-\$ or US-7800718-\$ or US-8130335-\$ or US-8144281-\$ or US-7460190-\$ or US-8248329-\$ or US-8212976-\$).did. or (US-8164718-\$ or US-8130333-\$ or US-7952659-\$ or US-7888679-\$ or US-7804552-\$ or US-6346717-\$ or US-6556265-\$ or US-6573589-\$ or US-6636284-\$ or US-6690437-\$ or US-7027109-\$ or US-7750999-\$ or US-7728400-\$).did. or (JP-2010199459-\$ or JP-2010199458-\$ or JP-2010199457-\$ or JP-2011187931-\$ or JP-2008040399-\$ or JP-2011242784-\$ or JP-2009027132-\$ or JP-2001313397-\$ or JP-2010072219-\$ or JP-2009053660-\$).did. or (US-20060046339-\$ or US-20110180798-\$ or JP-2010074030-\$ or US-20040149989-\$ or US-20110198607-\$ or US-20090033819-\$).did. |                                                                            |    |    |                     |
| L63 | 30330 | l62 nad dibl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:07 |
| L64 | 1     | l62 and dibl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;                        | OR | ON | 2013/03/19<br>10:07 |

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|     |    |                                                                                                                                                                                                                                                                                                                            | DERWENT;<br>IBM_TDB                                                        |    |    |                     |
| L65 | 76 | l62 and ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped)).ti,ab,clm.                                                                                                                      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:08 |
| L66 | 76 | l62 and ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped)).ti,ab,clm.                                                                                                                      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:09 |
| L67 | 69 | (Au near optronics).as. and ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped))                                                                                                             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:12 |
| L68 | 4  | (Au near optronics).as. and ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped)) near10 (semiconductor or active or semiconductor) same source same drain                                    | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:13 |
| L69 | 5  | (Au near optronics).as. and ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped)) near10 (semiconductor or active or channel) same source same drain                                          | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:14 |
| L70 | 4  | (Au near optronics).as. and ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped)) near10 (semiconductor or active or channel) same source same drain same electrode                           | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:14 |
| L71 | 4  | (Au near optronics).as. and ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped)) near10 (semiconductor or active or channel) same source same drain same electrode same (length or distance) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:16 |
| L72 | 4  | (Au near optronics) and ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped))                                                                                                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;                        | OR | ON | 2013/03/19<br>10:16 |

|     |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                            |    |    |                     |
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|     |     | overlapped)) near10 (semiconductor or active or channel) same source same drain same electrode same (length or distance)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | DERWENT;<br>IBM_TDB                                                        |    |    |                     |
| L73 | 13  | ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped)) near10 (semiconductor or active or channel) same source same drain same electrode same (length or distance)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:17 |
| L74 | 123 | (US-20120298983-\$ or US-20060046339-\$ or US-20120270397-\$ or US-20110297947-\$ or US-20110053323-\$ or US-20090057666-\$ or US-20090047750-\$ or US-20080203395-\$ or US-20110198607-\$ or US-20100012979-\$ or US-20080017885-\$ or US-20070103575-\$ or US-20040262703-\$ or US-20040149989-\$ or US-20060170048-\$ or US-20040218111-\$ or US-20080073718-\$ or US-20080315262-\$ or US-20110147752-\$ or US-20050077520-\$ or US-20010030722-\$ or US-20010019384-\$ or US-20090033819-\$ or US-20080203396-\$ or US-20020113914-\$ or US-20070268206-\$).did. or (US-20130037815-\$ or US-20120314151-\$ or US-20120256184-\$ or US-20120249940-\$ or US-20120218325-\$ or US-20120205671-\$ or US-20120188478-\$ or US-20120146035-\$ or US-20120127146-\$ or US-20120119322-\$ or US-20120033151-\$ or US-20120002127-\$ or US-20110284860-\$ or US-20110242468-\$ or US-20110242443-\$ or US-20110215337-\$ or US-20110199698-\$ or US-20110180798-\$ or US-20110163311-\$ or US-20110121290-\$ or US-20100233834-\$ or US-20090135111-\$ or US-20080278435-\$ or US-20080061394-\$ or US-20070216832-\$ or US-20070113455-\$ or US-20070035676-\$).did. or (US-20050140858-\$ or US-20040239825-\$ or US-20040140515-\$ or US-20040017162-\$ or US-20030025848-\$ or US-20020063261-\$ or US-20020037600-\$ or US-20020036818-\$ or US-20020018278-\$ or US-20020017645-\$ or US-20010040655-\$ or US-20010038485-\$ or US-20110309397-\$ or US-20080308803-\$).did. or (US-7754523-\$ or US-8153337-\$ or US-8030652-\$ or US-7662660-\$ or US-7459725-\$ or US-8334553-\$ or US-8168982-\$ or US-8023042-\$ or US-7190422-\$ or US-8300170-\$ or US-7105905-\$ or US-6319760-\$ or US-6310372-\$ or US- | US-PGPUB;<br>USPAT;<br>JPO;<br>DERWENT                                     | OR | ON | 2013/03/19<br>10:22 |

|     |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                            |    |    |                     |
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|     |    | 6066860-\$ or US-5416340-\$ or US-7790523-\$ or US-8120130-\$ or US-7102164-\$ or US-6800873-\$ or US-6704068-\$ or US-7800718-\$ or US-8130335-\$ or US-8144281-\$ or US-7460190-\$ or US-8248329-\$ or US-8212976-\$).did. or (US-8164718-\$ or US-8130333-\$ or US-7952659-\$ or US-7888679-\$ or US-7804552-\$ or US-6346717-\$ or US-6556265-\$ or US-6573589-\$ or US-6636284-\$ or US-6690437-\$ or US-7027109-\$ or US-7750999-\$ or US-7728400-\$ or US-7855405-\$).did. or (JP-2010199459-\$ or JP-2010199458-\$ or JP-2010199457-\$ or JP-2011187931-\$ or JP-2008040399-\$ or JP-2011242784-\$ or JP-2009027132-\$ or JP-2001313397-\$ or JP-2010072219-\$ or JP-2009053660-\$).did. or (US-20060046339-\$ or US-20110180798-\$ or JP-2010074030-\$ or US-20040149989-\$ or US-20110198607-\$ or US-20090033819-\$).did. |                                                                            |    |    |                     |
| L75 | 13 | I74 and ((light adj (shade or shading or shield or shielding or block or blocking or preventive or preventing or preventive or prevention)) near10 (overlap or overlapping or overlapped)) near10 (semiconductor or active or channel) same source same drain same electrode same (length or distance)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:23 |
| L76 | 33 | I74 and (distance or length).clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:23 |
| L77 | 18 | I74 and ((distance or length) same (overlap or overlapping or overlapped)).clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:23 |
| L78 | 15 | I74 and ((distance or length) same (overlap or overlapping or overlapped) same source same drain).clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:24 |
| L79 | 15 | I74 and ((distance or length) same (overlap or overlapping or overlapped) same source same drain same (active or semiconductor or channel)).clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:25 |
| L80 | 12 | I74 and ((distance or length) same (overlap or overlapping or overlapped) same source same drain same (active or                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | US-PGPUB;<br>USPAT;<br>USOCR;                                              | OR | ON | 2013/03/19<br>10:25 |

|     |     |                                                                                                                                                                                                                                                                                                     |                                                                            |    |    |                     |
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|     |     | semiconductor or channel) same light).clm.                                                                                                                                                                                                                                                          | FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB                                  |    |    |                     |
| L81 | 1   | I74 and ((distance or length) same (overlap or overlapping or overlapped) same source same drain same (active or semiconductor or channel) same (conductive or conducting) near2 light).clm.                                                                                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:25 |
| L82 | 2   | ((distance or length) same (overlap or overlapping or overlapped) same source same drain same (active or semiconductor or channel) same (conductive or conducting) near2 light).clm.                                                                                                                | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:26 |
| L83 | 4   | ((distance or length) same (overlap or overlapping or overlapped) same source same drain same (active or semiconductor or channel) same (conductive or conducting) near2 light)                                                                                                                     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:26 |
| L84 | 84  | ((overlap or overlapping or overlapped) same source same drain same (active or semiconductor or channel) same (conductive or conducting) near2 light)                                                                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:27 |
| L85 | 44  | ((distance or length) same (overlap or overlapping or overlapped) same source same drain same (active or semiconductor or channel) same light near (shield or shielding or shade or shading or preventive or preventing or prevention or block or blocking))                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:28 |
| L86 | 8   | ((distance or length) same (overlap or overlapping or overlapped) same source same drain same (active or semiconductor or channel) same light near (shield or shielding or shade or shading or preventive or preventing or prevention or block or blocking)) same ((drain near induced) or leakage) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:32 |
| L87 | 3   | "20060046339"                                                                                                                                                                                                                                                                                       | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:38 |
| L88 | 146 | (US-20120298983-\$ or US-20060046339-\$ or US-20120270397-\$ or US-20110297947-\$ or US-20110053323-\$ or US-20090057666-\$ or US-20090047750-\$ or US-20080203395-\$ or US-20110198607-\$ or US-20100012979-\$ or US-                                                                              | US-PGPUB;<br>USPAT;<br>USOCR;<br>JPO;<br>DERWENT;<br>IBM_TDB               | OR | ON | 2013/03/19<br>10:38 |

20080017885-\$ or US-20070103575-\$  
or US-20040262703-\$ or US-  
20040149989-\$ or US-20060170048-\$  
or US-20040218111-\$ or US-  
20080073718-\$ or US-20080315262-\$  
or US-20110147752-\$ or US-  
20050077520-\$ or US-20010030722-\$  
or US-20010019384-\$ or US-  
20090033819-\$ or US-20080203396-\$  
or US-20020113914-\$ or US-  
20070268206-\$).did. or (US-  
20130037815-\$ or US-20120314151-\$  
or US-20120256184-\$ or US-  
20120249940-\$ or US-20120218325-\$  
or US-20120205671-\$ or US-  
20120188478-\$ or US-20120146035-\$  
or US-20120127146-\$ or US-  
20120119322-\$ or US-20120033151-\$  
or US-20120002127-\$ or US-  
20110284860-\$ or US-20110242468-\$  
or US-20110242443-\$ or US-  
20110215337-\$ or US-20110199698-\$  
or US-20110180798-\$ or US-  
20110163311-\$ or US-20110121290-\$  
or US-20100233834-\$ or US-  
20090135111-\$ or US-20080278435-\$  
or US-20080061394-\$ or US-  
20070216832-\$ or US-20070113455-\$  
or US-20070035676-\$).did. or (US-  
20050140858-\$ or US-20040239825-\$  
or US-20040140515-\$ or US-  
20040017162-\$ or US-20030025848-\$  
or US-20020063261-\$ or US-  
20020037600-\$ or US-20020036818-\$  
or US-20020018278-\$ or US-  
20020017645-\$ or US-20010040655-\$  
or US-20010038485-\$ or US-  
20110309397-\$ or US-20080308803-\$  
or US-20110084282-\$ or US-  
20080211751-\$ or US-20040263702-\$  
or US-20030202134-\$ or US-  
20010019376-\$ or US-20020142505-\$  
or US-20100197086-\$ or US-  
20070181877-\$).did. or (US-7754523-\$  
or US-8153337-\$ or US-8030652-\$ or  
US-7662660-\$ or US-7459725-\$ or US-  
8334553-\$ or US-8168982-\$ or US-  
8023042-\$ or US-7190422-\$ or US-  
8300170-\$ or US-7105905-\$ or US-  
6319760-\$ or US-6310372-\$ or US-  
6066860-\$ or US-5416340-\$ or US-  
7790523-\$ or US-8120130-\$ or US-  
7102164-\$ or US-6800873-\$ or US-  
6704068-\$ or US-7800718-\$ or US-  
8130335-\$ or US-8144281-\$ or US-  
7460190-\$ or US-8248329-\$ or US-  
8212976-\$).did. or (US-8164718-\$ or  
US-8130333-\$ or US-7952659-\$ or US-  
7888679-\$ or US-7804552-\$ or US-  
6346717-\$ or US-6556265-\$ or US-  
6573589-\$ or US-6636284-\$ or US-  
6690437-\$ or US-7027109-\$ or US-  
7750999-\$ or US-7728400-\$ or US-  
7855405-\$ or US-6618033-\$ or US-

|     |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                            |    |    |                     |
|-----|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |     | 7956944-\$ or US-7932961-\$ or US-7317496-\$ or US-6791630-\$ or US-6580473-\$ or US-6262784-\$ or US-7125757-\$ or US-7960221-\$ or US-7719008-\$ or US-8111359-\$).did. or (US-3411199-\$).did. or (JP-2010199459-\$ or JP-2010199458-\$ or JP-2010199457-\$ or JP-2011187931-\$ or JP-2008040399-\$ or JP-2011242784-\$ or JP-2009027132-\$ or JP-2001313397-\$ or JP-2010072219-\$ or JP-2009053660-\$ or JP-2008070579-\$ or JP-09033951-\$).did. or (US-20060046339-\$ or US-20110180798-\$ or JP-2010074030-\$ or US-20040149989-\$ or US-20110198607-\$ or US-20090033819-\$).did. or (NN9612175).tban. |                                                                            |    |    |                     |
| L89 | 101 | l88 and ((metal or metallic or conductive or conducting) near10 light near10 (shield or shielding or block or blocking or preventing or preventive or prevention))                                                                                                                                                                                                                                                                                                                                                                                                                                              | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:41 |
| L90 | 87  | l88 and ((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention))                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:42 |
| L91 | 29  | l88 and ((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) with (passivation or dielectric or insulating or insulation)                                                                                                                                                                                                                                                                                                                                                                                    | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:42 |
| L92 | 16  | l88 and ((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near10 (passivation or dielectric or insulating or insulation)                                                                                                                                                                                                                                                                                                                                                                                  | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:43 |
| L93 | 4   | l88 and ((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near10 (passivation or interlayer or inter-layer)                                                                                                                                                                                                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:45 |
| L94 | 375 | ((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near10 (passivation or interlayer or inter-layer)                                                                                                                                                                                                                                                                                                                                                                                                       | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:47 |
| L95 | 43  | ((((metal or metallic or conductive or conducting) near10 light adj (shield or                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US-PGPUB;<br>USPAT;                                                        | OR | ON | 2013/03/19<br>10:47 |

|      |    |                                                                                                                                                                                                                                                                                          |                                                          |    |    |                  |
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|      |    | shielding or block or blocking or preventing or preventive or prevention)) near10 (passivation or interlayer or inter-layer)).clm.                                                                                                                                                       | USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB                  |    |    |                  |
| L96  | 16 | ((((metal or metallic or conductive or conducting) near light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near10 (passivation or interlayer or inter-layer)).clm.                                                                          | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 10:47 |
| L97  | 13 | ((((metal or metallic or conductive or conducting) near light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near10 (passivation or interlayer or inter-layer or insulating or dielectric) near10 disposed).clm.                              | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 10:48 |
| L98  | 5  | ((((metal or metallic or conductive or conducting) near light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near10 (passivation or interlayer or inter-layer or insulating or dielectric) near10 disposed) same leakage                      | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 10:50 |
| L99  | 0  | ((((metal or metallic or conductive or conducting) near light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near2 "on" near2 (passivation or interlayer or inter-layer or insulating or dielectric) near10 disposed)                         | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 10:56 |
| L100 | 0  | ((dispose or disposing or disposed) near2 ((metal or metallic or conductive or conducting) near light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near2 "on" near2 (passivation or interlayer or inter-layer or insulating or dielectric)) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 10:56 |
| L101 | 4  | ((dispose or disposing or disposed) near2 ((metal or metallic or conductive or conducting) near light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near2 (passivation or interlayer or inter-layer or insulating or dielectric))            | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 10:57 |
| L102 | 4  | ((dispose or disposing or disposed) near2 ((metal or metallic or conductive or conducting) near light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near2 (passivation or interlayer or inter-layer or insulating or dielectric))            | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 10:57 |
| L103 | 4  | ((((metal or metallic or conductive or conducting) near light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near2 (dispose or disposing or disposed) near2 (passivation or interlayer or inter-                                              | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;         | OR | ON | 2013/03/19 10:58 |

|      |     |                                                                                                                                                                                                                                                                                                                          |                                                                            |    |    |                     |
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|      |     | layer or insulating or dielectric))                                                                                                                                                                                                                                                                                      | IBM_TDB                                                                    |    |    |                     |
| L104 | 4   | ((((metal or metallic or conductive or conducting) adj light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near2 (dispose or disposing or disposed) near2 (passivation or interlayer or inter-layer or insulating or dielectric))                                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:59 |
| L105 | 40  | ((((metal or metallic or conductive or conducting) adj light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near2 (passivation or interlayer or inter-layer or insulating or dielectric))                                                                                     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>10:59 |
| L106 | 170 | ((((metal or metallic or conductive or conducting) adj light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near5 (passivation or interlayer or inter-layer or insulating or dielectric))                                                                                     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:00 |
| L107 | 42  | ((((metal or metallic or conductive or conducting) adj light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near5 (passivation or interlayer or inter-layer or insulating or dielectric)).clm.                                                                                | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:00 |
| L108 | 26  | ((((metal or metallic or conductive or conducting) adj light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near2 (pattern or layer or film) near2 (passivation or interlayer or inter-layer or insulating or dielectric)).clm.                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:01 |
| L109 | 40  | ((((metal or metallic or conductive or conducting) adj light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near5 (pattern or layer or film) near2 (passivation or interlayer or inter-layer or insulating or dielectric)).clm.                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:02 |
| L110 | 48  | ((((metal or metallic or conductive or conducting) adj light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near5 (pattern or layer or film) near5 (passivation or interlayer or inter-layer or insulating or dielectric)).clm.                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:02 |
| L111 | 3   | ((((metal or metallic or conductive or conducting) adj light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near5 (pattern or layer or film) near5 (passivation or interlayer or inter-layer or insulating or dielectric) near10 (overlap or overlapping or overlapped)).clm. | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:03 |
| L112 | 5   | ((((metal or metallic or conductive or conducting) adj light adj (shield or shielding or block or blocking or                                                                                                                                                                                                            | US-PGPUB;<br>USPAT;<br>USOCR;                                              | OR | ON | 2013/03/19<br>11:04 |

|      |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                            |    |    |                     |
|------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|      |     | preventing or preventive or prevention))<br>near5 (pattern or layer or film) near5<br>(passivation or interlayer or inter-layer or<br>insulating or dielectric) near10 (overlap<br>or overlapping or overlapped))                                                                                                                                                                                                                                                                                                                    | FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB                                  |    |    |                     |
| L113 | 5   | ((((metal or metallic or conductive or<br>conducting) adj light adj (shield or<br>shielding or block or blocking or<br>preventing or preventive or prevention))<br>near5 (pattern or layer or film) near5<br>(passivation or interlayer or inter-layer or<br>insulating or dielectric) with (overlap or<br>overlapping or overlapped))                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:05 |
| L114 | 10  | ((((metal or metallic or conductive or<br>conducting) adj light adj (shield or<br>shielding or block or blocking or<br>preventing or preventive or prevention))<br>near5 (pattern or layer or film) near5<br>(passivation or interlayer or inter-layer or<br>insulating or dielectric) same (overlap or<br>overlapping or overlapped))                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:06 |
| L115 | 14  | ((((metal or metallic or conductive or<br>conducting) near2 light adj (shield or<br>shielding or block or blocking or<br>preventing or preventive or prevention))<br>near5 (pattern or layer or film) near5<br>(passivation or interlayer or inter-layer or<br>insulating or dielectric) same (overlap or<br>overlapping or overlapped))                                                                                                                                                                                             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:07 |
| L116 | 69  | ((((metal or metallic or conductive or<br>conducting) near10 light adj (shield or<br>shielding or block or blocking or<br>preventing or preventive or prevention))<br>near5 (pattern or layer or film) near5<br>(passivation or interlayer or inter-layer or<br>insulating or dielectric) same (overlap or<br>overlapping or overlapped))                                                                                                                                                                                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:07 |
| L117 | 5   | ((((metal or metallic or conductive or<br>conducting) near10 light adj (shield or<br>shielding or block or blocking or<br>preventing or preventive or prevention))<br>near5 (pattern or layer or film) near5<br>(passivation or interlayer or inter-layer or<br>insulating or dielectric) same (overlap or<br>overlapping or overlapped) same source<br>same drain same (channel or active or<br>semiconductor))                                                                                                                     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:08 |
| L128 | 154 | ((US-20120298983-\$ or US-<br>20060046339-\$ or US-20120270397-\$<br>or US-20110297947-\$ or US-<br>20110053323-\$ or US-20090057666-\$<br>or US-20090047750-\$ or US-<br>20080203395-\$ or US-20110198607-\$<br>or US-20100012979-\$ or US-<br>20080017885-\$ or US-20070103575-\$<br>or US-20040262703-\$ or US-<br>20040149989-\$ or US-20060170048-\$<br>or US-20040218111-\$ or US-<br>20080073718-\$ or US-20080315262-\$<br>or US-20110147752-\$ or US-<br>20050077520-\$ or US-20010030722-\$<br>or US-20010019384-\$ or US- | US-PGPUB;<br>USPAT;<br>USOCR;<br>JPO;<br>DERWENT;<br>IBM_TDB               | OR | ON | 2013/03/19<br>11:09 |

20090033819-\$ or US-20080203396-\$  
or US-20020113914-\$ or US-  
20070268206-\$).did. or (US-  
20130037815-\$ or US-20120314151-\$  
or US-20120256184-\$ or US-  
20120249940-\$ or US-20120218325-\$  
or US-20120205671-\$ or US-  
20120188478-\$ or US-20120146035-\$  
or US-20120127146-\$ or US-  
20120119322-\$ or US-20120033151-\$  
or US-20120002127-\$ or US-  
20110284860-\$ or US-20110242468-\$  
or US-20110242443-\$ or US-  
20110215337-\$ or US-20110199698-\$  
or US-20110180798-\$ or US-  
20110163311-\$ or US-20110121290-\$  
or US-20100233834-\$ or US-  
20090135111-\$ or US-20080278435-\$  
or US-20080061394-\$ or US-  
20070216832-\$ or US-20070113455-\$  
or US-20070035676-\$).did. or (US-  
20050140858-\$ or US-20040239825-\$  
or US-20040140515-\$ or US-  
20040017162-\$ or US-20030025848-\$  
or US-20020063261-\$ or US-  
20020037600-\$ or US-20020036818-\$  
or US-20020018278-\$ or US-  
20020017645-\$ or US-20010040655-\$  
or US-20010038485-\$ or US-  
20110309397-\$ or US-20080308803-\$  
or US-20110084282-\$ or US-  
20080211751-\$ or US-20040263702-\$  
or US-20030202134-\$ or US-  
20010019376-\$ or US-20020142505-\$  
or US-20100197086-\$ or US-  
20070181877-\$ or US-20110263060-\$  
or US-20100210057-\$).did. or (US-  
7754523-\$ or US-8153337-\$ or US-  
8030652-\$ or US-7662660-\$ or US-  
7459725-\$ or US-8334553-\$ or US-  
8168982-\$ or US-8023042-\$ or US-  
7190422-\$ or US-8300170-\$ or US-  
7105905-\$ or US-6319760-\$ or US-  
6310372-\$ or US-6066860-\$ or US-  
5416340-\$ or US-7790523-\$ or US-  
8120130-\$ or US-7102164-\$ or US-  
6800873-\$ or US-6704068-\$ or US-  
7800718-\$ or US-8130335-\$ or US-  
8144281-\$ or US-7460190-\$ or US-  
8248329-\$ or US-8212976-\$).did. or  
(US-8164718-\$ or US-8130333-\$ or US-  
7952659-\$ or US-7888679-\$ or US-  
7804552-\$ or US-6346717-\$ or US-  
6556265-\$ or US-6573589-\$ or US-  
6636284-\$ or US-6690437-\$ or US-  
7027109-\$ or US-7750999-\$ or US-  
7728400-\$ or US-7855405-\$ or US-  
6618033-\$ or US-7956944-\$ or US-  
7932961-\$ or US-7317496-\$ or US-  
6791630-\$ or US-6580473-\$ or US-  
6262784-\$ or US-7125757-\$ or US-  
7960221-\$ or US-7719008-\$ or US-  
8111359-\$ or US-5859677-\$ or US-  
7233033-\$).did. or (US-5956103-\$ or

|      |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                          |    |    |                  |
|------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----|----|------------------|
|      |    | US-5276349-\$ or US-7989234-\$).did. or (US-3411199-\$).did. or (JP-2010199459-\$ or JP-2010199458-\$ or JP-2010199457-\$ or JP-2011187931-\$ or JP-2008040399-\$ or JP-2011242784-\$ or JP-2009027132-\$ or JP-2001313397-\$ or JP-2010072219-\$ or JP-2009053660-\$ or JP-2008070579-\$ or JP-09033951-\$ or JP-2008164668-\$).did. or (US-20060046339-\$ or US-20110180798-\$ or JP-2010074030-\$ or US-20040149989-\$ or US-20110198607-\$ or US-20090033819-\$).did. or (NN9612175).tban. |                                                          |    |    |                  |
| L129 | 11 | I128 and (((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near5 (pattern or layer or film) near5 (passivation or interlayer or inter-layer or insulating or dielectric) same (overlap or overlapping or overlapped))                                                                                                                                                                   | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:10 |
| L130 | 17 | I128 and (((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near5 (pattern or layer or film) near5 (passivation or interlayer or inter-layer or insulating or dielectric))                                                                                                                                                                                                               | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:11 |
| L131 | 22 | I128 and (((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention)) near10 (passivation or interlayer or inter-layer or insulating or dielectric))                                                                                                                                                                                                                                               | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:13 |
| L132 | 29 | I128 and (((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention))) .clm.                                                                                                                                                                                                                                                                                                                       | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:14 |
| L133 | 21 | I128 and (((metal or metallic or conductive or conducting) near10 light adj (shield or shielding or block or blocking or preventing or preventive or prevention))) .clm. and (overlap or overlapping or overlapped) .clm.                                                                                                                                                                                                                                                                      | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:15 |
| L134 | 47 | I128 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) with (overlap or overlapping or overlapped) with (channel or semiconductor or active) with source with drain)                                                                                                                                                                                                                                                            | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:19 |
| L135 | 11 | I128 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) with (overlap or overlapping or                                                                                                                                                                                                                                                                                                                                          | US-PGPUB; USPAT; USOCR; FPRS;                            | OR | ON | 2013/03/19 11:20 |

|      |    |                                                                                                                                                                                                                                                                                                                    |                                                          |    |    |                  |
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|      |    | overlapped) with (channel or semiconductor or active) with source with drain with (length or distance))                                                                                                                                                                                                            | EPO; JPO; DERWENT; IBM_TDB                               |    |    |                  |
| L136 | 6  | 1128 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) with (overlap or overlapping or overlapped) with (channel or semiconductor or active) with source with drain with (length or distance) same (L or d or L1 or d1 or I1 or d1))                | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:21 |
| L137 | 30 | 1128 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same (length or distance) same (L or d or L1 or d1 or I1 or d1))                | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:22 |
| L138 | 30 | 1128 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same (length or distance) same (L or d or L1 or d1 or I1 or d1) same electrode) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:24 |
| L139 | 6  | 1128 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) with (overlap or overlapping or overlapped) with (channel or semiconductor or active) with source with drain with (length or distance) same (L or d or L1 or d1 or I1 or d1))                | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:24 |
| L140 | 1  | 1128 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) near (length or distance) same (channel or semiconductor or active) same source same drain same (L or d or L1 or d1 or I1 or d1) same electrode) | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:25 |
| L141 | 1  | ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) near (length or distance) same (channel or semiconductor or active) same source same drain same (L or d or L1 or d1 or I1 or d1) same electrode)          | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:26 |
| L142 | 1  | ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) near (length or distance) same (channel or semiconductor or active) same source same drain same electrode)                                                | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:26 |
| L143 | 4  | ((light adj (shield or shielding or block or                                                                                                                                                                                                                                                                       | US-PGPUB;                                                | OR | ON | 2013/03/19       |

|      |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                            |    |    |                     |
|------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|      |     | blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) near2 (length or distance) same (channel or semiconductor or active) same source same drain same electrode)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB              |    |    | 11:26               |
| L144 | 9   | ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) near5 (length or distance) same (channel or semiconductor or active) same source same drain same electrode)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:27 |
| L155 | 154 | (US-20120298983-\$ or US-20060046339-\$ or US-20120270397-\$ or US-20110297947-\$ or US-20110053323-\$ or US-20090057666-\$ or US-20090047750-\$ or US-20080203395-\$ or US-20110198607-\$ or US-20100012979-\$ or US-20080017885-\$ or US-20070103575-\$ or US-20040262703-\$ or US-20040149989-\$ or US-20060170048-\$ or US-20040218111-\$ or US-20080073718-\$ or US-20080315262-\$ or US-20110147752-\$ or US-20050077520-\$ or US-20010030722-\$ or US-20010019384-\$ or US-20090033819-\$ or US-20080203396-\$ or US-20020113914-\$ or US-20070268206-\$).did. or (US-20130037815-\$ or US-20120314151-\$ or US-20120256184-\$ or US-20120249940-\$ or US-20120218325-\$ or US-20120205671-\$ or US-20120188478-\$ or US-20120146035-\$ or US-20120127146-\$ or US-20120119322-\$ or US-20120033151-\$ or US-20120002127-\$ or US-20110284860-\$ or US-20110242468-\$ or US-20110242443-\$ or US-20110215337-\$ or US-20110199698-\$ or US-20110180798-\$ or US-20110163311-\$ or US-20110121290-\$ or US-20100233834-\$ or US-20090135111-\$ or US-20080278435-\$ or US-20080061394-\$ or US-20070216832-\$ or US-20070113455-\$ or US-20070035676-\$).did. or (US-20050140858-\$ or US-20040239825-\$ or US-20040140515-\$ or US-20040017162-\$ or US-20030025848-\$ or US-20020063261-\$ or US-20020037600-\$ or US-20020036818-\$ or US-20020018278-\$ or US-20020017645-\$ or US-20010040655-\$ or US-20010038485-\$ or US-20110309397-\$ or US-20080308803-\$ or US-20110084282-\$ or US-20080211751-\$ or US-20040263702-\$ or US-20030202134-\$ or US-20010019376-\$ or US-20020142505-\$ or US-20100197086-\$ or US-20070181877-\$ or US-20110263060-\$ | US-PGPUB;<br>USPAT;<br>USOCR;<br>JPO;<br>DERWENT;<br>IBM_TDB               | OR | ON | 2013/03/19<br>11:28 |

|      |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |    |    |                  |
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|      |    | or US-20100210057-\$).did. or (US-7754523-\$ or US-8153337-\$ or US-8030652-\$ or US-7662660-\$ or US-7459725-\$ or US-8334553-\$ or US-8168982-\$ or US-8023042-\$ or US-7190422-\$ or US-8300170-\$ or US-7105905-\$ or US-6319760-\$ or US-6310372-\$ or US-6066860-\$ or US-5416340-\$ or US-7790523-\$ or US-8120130-\$ or US-7102164-\$ or US-6800873-\$ or US-6704068-\$ or US-7800718-\$ or US-8130335-\$ or US-8144281-\$ or US-7460190-\$ or US-8248329-\$ or US-8212976-\$).did. or (US-8164718-\$ or US-8130333-\$ or US-7952659-\$ or US-7888679-\$ or US-7804552-\$ or US-6346717-\$ or US-6556265-\$ or US-6573589-\$ or US-6636284-\$ or US-6690437-\$ or US-7027109-\$ or US-7750999-\$ or US-7728400-\$ or US-7855405-\$ or US-6618033-\$ or US-7956944-\$ or US-7932961-\$ or US-7317496-\$ or US-6791630-\$ or US-6580473-\$ or US-6262784-\$ or US-7125757-\$ or US-7960221-\$ or US-7719008-\$ or US-8111359-\$ or US-5859677-\$ or US-7233033-\$).did. or (US-5956103-\$ or US-5276349-\$ or US-7989234-\$).did. or (US-3411199-\$).did. or (JP-2010199459-\$ or JP-2010199458-\$ or JP-2010199457-\$ or JP-2011187931-\$ or JP-2008040399-\$ or JP-2011242784-\$ or JP-2009027132-\$ or JP-2001313397-\$ or JP-2010072219-\$ or JP-2009053660-\$ or JP-2008070579-\$ or JP-09033951-\$ or JP-2008164668-\$).did. or (US-20060046339-\$ or US-20110180798-\$ or JP-2010074030-\$ or US-20040149989-\$ or US-20110198607-\$ or US-20090033819-\$).did. or (NN9612175).tban. |                                                          |    |    |                  |
| L156 | 70 | I155 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:29 |
| L157 | 52 | I155 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 11:30 |
| L158 | 9  | I155 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;         | OR | ON | 2013/03/19 11:31 |

|      |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                            |    |    |                     |
|------|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|      |    | same drain same electrode same (length or distance or between)) same (leak or leakage)                                                                                                                                                                                                                                                                                                                                                                                      | IBM_TDB                                                                    |    |    |                     |
| L159 | 24 | 1155 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between)).clm.                                                                                                                                                                                | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:32 |
| L160 | 32 | 1155 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between)) and (leak or leakage) near10 (light near (shield or shielding or block or blocking or prevent or preventing or prevention or preventive or shade or shading))                       | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:34 |
| L161 | 32 | 1155 and ((light adj (shade or shading or shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between)) and (leak or leakage) near10 (light near (shield or shielding or block or blocking or prevent or preventing or prevention or preventive or shade or shading))   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:34 |
| L162 | 32 | 1155 and ((light adj (shade or shading or shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between)) and ((leak or leakage) near10 (light near (shield or shielding or block or blocking or prevent or preventing or prevention or preventive or shade or shading))) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:34 |
| L163 | 32 | 1155 and ((light adj (shade or shading or shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between)) and ((leak or leakage) near10 (light near (shield or shielding or block or blocking or prevent or preventing or prevention or preventive or shade or shading))) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:36 |
| L164 | 32 | 1163 and (overlap or overlapping or overlapped).clm.                                                                                                                                                                                                                                                                                                                                                                                                                        | US-PGPUB;<br>USPAT;<br>USOCR;                                              | OR | ON | 2013/03/19<br>11:42 |

|      |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                            |    |    |                     |
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|      |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                       | FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB                                  |    |    |                     |
| L166 | 24    | I164 and (overlap or overlapping or overlapped).ab.                                                                                                                                                                                                                                                                                                                                                                                                   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:42 |
| L167 | 12    | I164 and ((overlap or overlapping or overlapped) with (length or distance or between)).clm.                                                                                                                                                                                                                                                                                                                                                           | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:43 |
| L168 | 4     | I167 and ((overlap or overlapping or overlapped) with (length or distance or between)).ab.                                                                                                                                                                                                                                                                                                                                                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:43 |
| L169 | 14    | (chih near2 pang near2 chang).in. or (hsing near2 hung near2 hsieh).in.                                                                                                                                                                                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:44 |
| L170 | 15371 | (au near2 optronics).as.                                                                                                                                                                                                                                                                                                                                                                                                                              | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:45 |
| L171 | 4     | I170 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between)) and (leak or leakage) near10 (light near (shield or shielding or block or blocking or prevent or preventing or prevention or preventive or shade or shading)) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:45 |
| L172 | 11483 | 257/43.ccls. or 257/59.ccls. or 257/72.ccls. or 257/E29.296.ccls.                                                                                                                                                                                                                                                                                                                                                                                     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:47 |
| L173 | 21    | I172 and ((light adj (shield or shielding or block or blocking or prevent or preventing or preventive or prevention))                                                                                                                                                                                                                                                                                                                                 | US-PGPUB;<br>USPAT;<br>USOCR;                                              | OR | ON | 2013/03/19<br>11:47 |

|      |    |                                                                                                                                                                                                                                                                                                                                 |                                                                            |    |    |                     |
|------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|      |    | same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between)) and (leak or leakage) near10 (light near (shield or shielding or block or blocking or prevent or preventing or prevention or preventive or shade or shading)) | FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB                                  |    |    |                     |
| L174 | 11 | 1173 and ((light adj (shade or shading or shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between)).clm.                | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:48 |
| L175 | 3  | 1174 and ((light adj (shade or shading or shield or shielding or block or blocking or prevent or preventing or preventive or prevention)) same (overlap or overlapping or overlapped) same (channel or semiconductor or active) same source same drain same electrode same (length or distance or between)).ab.                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>11:49 |

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Receipt date: 08/12/2011

13208360 - GAI-2826

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

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| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br>( Not for submission under 37 CFR 1.99) | Application Number     |                 |  |
|                                                                                                     | Filing Date            |                 |  |
|                                                                                                     | First Named Inventor   | Chih-Pang Chang |  |
|                                                                                                     | Art Unit               |                 |  |
|                                                                                                     | Examiner Name          |                 |  |
|                                                                                                     | Attorney Docket Number | 37986-US-PA     |  |

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| Examiner Initial*                                                                           | Cite No | Patent Number      | Kind Code <sup>1</sup> | Issue Date       | Name of Patentee or Applicant of cited Document | Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear |
|                                                                                             | 1       | 5838399            |                        | 1998-11-17       | Someya et al.                                   |                                                                        |
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|                                                                                             | 1       | 20070051943        |                        | 2007-03-08       | Lee et al.                                      |                                                                        |
|                                                                                             | 2       | 20070290227        |                        | 2007-12-20       | Liang et al.                                    |                                                                        |
|                                                                                             | 3       | 20100295042        |                        | 2010-11-25       | Yano et al.                                     |                                                                        |
|                                                                                             | 4       | 20100244022        |                        | 2010-09-30       | Takahashi et al.                                |                                                                        |
|                                                                                             | 5       | 20080217618        |                        | 2008-09-11       | Deane                                           |                                                                        |

|                                                                                                                                                   |                        |                 |                      |  |
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| <b>Receipt date: 08/12/2011</b><br><br><b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><b>( Not for submission under 37 CFR 1.99)</b> | Application Number     |                 | 13208360 - GAU: 2826 |  |
|                                                                                                                                                   | Filing Date            |                 |                      |  |
|                                                                                                                                                   | First Named Inventor   | Chih-Pang Chang |                      |  |
|                                                                                                                                                   | Art Unit               |                 |                      |  |
|                                                                                                                                                   | Examiner Name          |                 |                      |  |
|                                                                                                                                                   | Attorney Docket Number |                 | 37986-US-PA          |  |

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|--|---|-------------|--|------------|------------|--|
|  | 6 | 20070296333 |  | 2007-12-27 | Kim et al. |  |
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| Examiner Signature | /Fazli Erdem/ (03/19/2013) |  | Date Considered 03/19/2013 |

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|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------|----------------------|
| <b>Receipt date: 08/12/2011</b><br><br><b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><b>( Not for submission under 37 CFR 1.99)</b> | Application Number     |                 | 13208360 - GAU: 2826 |
|                                                                                                                                                   | Filing Date            |                 |                      |
|                                                                                                                                                   | First Named Inventor   | Chih-Pang Chang |                      |
|                                                                                                                                                   | Art Unit               |                 |                      |
|                                                                                                                                                   | Examiner Name          |                 |                      |
|                                                                                                                                                   | Attorney Docket Number | 37986-US-PA     |                      |

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

#### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

|            |               |                     |            |
|------------|---------------|---------------------|------------|
| Signature  | /Belinda Lee/ | Date (YYYY-MM-DD)   | 2011-08-08 |
| Name/Print | Belinda Lee   | Registration Number | 46863      |

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.E./

## EAST Search History

## EAST Search History (Prior Art)

| Ref # | Hits | Search Query                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DBs                                                          | Default Operator | Plurals | Time Stamp          |
|-------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------|---------|---------------------|
| L12   | 177  | (US-20120298983-\$ or US-20060046339-\$ or US-20120270397-\$ or US-20110297947-\$ or US-20110053323-\$ or US-20090057666-\$ or US-20090047750-\$ or US-20080203395-\$ or US-20110198607-\$ or US-20100012979-\$ or US-20080017885-\$ or US-20070103575-\$ or US-20040262703-\$ or US-20040149989-\$ or US-20060170048-\$ or US-20040218111-\$ or US-20080073718-\$ or US-20080315262-\$ or US-20110147752-\$ or US-20050077520-\$ or US-20010030722-\$ or US-20010019384-\$ or US-20090033819-\$ or US-20080203396-\$ or US-20020113914-\$ or US-20070268206-\$).did. or (US-20130037815-\$ or US-20120314151-\$ or US-20120256184-\$ or US-20120249940-\$ or US-20120218325-\$ or US-20120205671-\$ or US-20120188478-\$ or US-20120146035-\$ or US-20120127146-\$ or US-20120119322-\$ or US-20120033151-\$ or US-20120002127-\$ or US-20110284860-\$ or US-20110242468-\$ or US-20110242443-\$ or US-20110215337-\$ or US-20110199698-\$ or US-20110180798-\$ or US-20110163311-\$ or US-20110121290-\$ or US-20100233834-\$ or US-20090135111-\$ or US-20080278435-\$ or US-20080061394-\$ or US-20070216832-\$ or US-20070113455-\$ or US-20070035676-\$).did. or (US-20050140858-\$ or US-20040239825-\$ or US-20040140515-\$ or US-20040017162-\$ or US-20030025848-\$ or US-20020063261-\$ or US-20020037600-\$ or US-20020036818-\$ or US-20020018278-\$ or US-20020017645-\$ or US-20010040655-\$ or US-20010038485-\$ or US-20110309397-\$ or US-20080308803-\$ or US-20110084282-\$ or US-20080211751-\$ or US-20040263702-\$ or US-20030202134-\$ or US-20010019376-\$ or US-20020142505-\$ or US-20100197086-\$ or US-20070181877-\$ or US-20110263060-\$ or US-20100210057-\$ or US-20130049640-\$ or US-20130017497-\$ or US-20130015448-\$).did. or (US-20120329189-\$ or US-20120162271-\$ or US-20110248245-\$ or US-20110240986-\$ or US-20110017989-\$ or US-20090226634-\$ or US-20040188694-\$ or US- | US-PGPUB;<br>USPAT;<br>USOCR;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/03/19<br>14:13 |

|     |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                            |    |    |                     |
|-----|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |    | 20100230682-\$ or US-20090065783-\$ or US-20090032818-\$ or US-20080169473-\$ or US-20060243979-\$ or US-20030201439-\$).did. or (US-7754523-\$ or US-8153337-\$ or US-8030652-\$ or US-7662660-\$ or US-7459725-\$ or US-8334553-\$ or US-8168982-\$ or US-8023042-\$ or US-7190422-\$ or US-8300170-\$ or US-7105905-\$ or US-6319760-\$ or US-6310372-\$ or US-6066860-\$ or US-5416340-\$ or US-7790523-\$ or US-8120130-\$ or US-7102164-\$ or US-6800873-\$ or US-6704068-\$ or US-7800718-\$ or US-8130335-\$ or US-8144281-\$ or US-7460190-\$ or US-8248329-\$ or US-8212976-\$).did. or (US-8164718-\$ or US-8130333-\$ or US-7952659-\$ or US-7888679-\$ or US-7804552-\$ or US-6346717-\$ or US-6556265-\$ or US-6573589-\$ or US-6636284-\$ or US-6690437-\$ or US-7027109-\$ or US-7750999-\$ or US-7728400-\$ or US-7855405-\$ or US-6618033-\$ or US-7956944-\$ or US-7932961-\$ or US-7317496-\$ or US-6791630-\$ or US-6580473-\$ or US-6262784-\$ or US-7125757-\$ or US-7960221-\$ or US-7719008-\$ or US-8111359-\$ or US-5859677-\$ or US-7233033-\$).did. or (US-5956103-\$ or US-5276349-\$ or US-7989234-\$ or US-8299460-\$ or US-8277903-\$ or US-6905977-\$ or US-7977679-\$ or US-7646023-\$ or US-7633090-\$ or US-7576359-\$).did. or (US-3411199-\$).did. or (JP-2010199459-\$ or JP-2010199458-\$ or JP-2010199457-\$ or JP-2011187931-\$ or JP-2008040399-\$ or JP-2011242784-\$ or JP-2009027132-\$ or JP-2001313397-\$ or JP-2010072219-\$ or JP-2009053660-\$ or JP-2008070579-\$ or JP-09033951-\$ or JP-2008164668-\$).did. or (US-20060046339-\$ or US-20110180798-\$ or JP-2010074030-\$ or US-20040149989-\$ or US-20110198607-\$ or US-20090033819-\$).did. or (NN9612175).tban. |                                                                            |    |    |                     |
| L13 | 7  | l12 and ((organic near light near emitting) same ((lower or bottom or first) adj electrode) same ((upper or top or second) adj electrode))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:16 |
| L14 | 3  | l12 and ((organic near light near emitting) or oled).clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:18 |
| L15 | 17 | l12 and ((organic near light near emitting) or oled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | US-PGPUB;<br>USPAT;                                                        | OR | ON | 2013/03/19<br>14:19 |

|     |    |                                                                                                                                                                              |                                                                            |    |    |                     |
|-----|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |    |                                                                                                                                                                              | USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB                        |    |    |                     |
| L16 | 5  | l15 and (light adj (shade or shading or shield or shielding or block or blocking)).clm.                                                                                      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:20 |
| L17 | 2  | l12 and ((light adj (shade or shading or shield or shielding or block or blocking)) same ((organic near light near emitting) or oled))                                       | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:22 |
| L18 | 9  | l12 and ((light adj (shade or shading or shield or shielding or block or blocking)) and ((organic near light near emitting) or oled))                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:24 |
| L19 | 2  | l12 and amoled                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:28 |
| L20 | 29 | amoled and (light adj (block or blocking or shield or shielding or shade or shading)).clm.                                                                                   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:29 |
| L21 | 2  | l20 and (channel near10 semiconductor near10 oxide)                                                                                                                          | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:29 |
| L22 | 97 | amoled and (light adj (block or blocking or shield or shielding or shade or shading)) near10 (conductive or conducting or metal or metallic)                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:31 |
| L23 | 68 | amoled and (light adj (block or blocking or shield or shielding or shade or shading)) near10 (conductive or conducting or metal or metallic) and (oxide near2 semiconductor) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:31 |

|     |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                          |    |    |                  |
|-----|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----|----|------------------|
| L24 | 1   | amoled and ((light adj (block or blocking or shield or shielding or shade or shading)) near10 (conductive or conducting or metal or metallic)).clm. and (oxide near2 semiconductor)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 14:32 |
| L25 | 65  | amoled and ((light adj (block or blocking or shield or shielding or shade or shading)) near10 (conductive or conducting or metal or metallic)) and (oxide near2 semiconductor).clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 14:33 |
| L26 | 2   | amoled and ((light adj (block or blocking or shield or shielding or shade or shading)) near10 (conductive or conducting or metal or metallic)) and (oxide near2 semiconductor).clm. and (light adj (block or blocking or shield or shielding or shade or shading)).clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/03/19 14:33 |
| L38 | 178 | (US-20120298983-\$ or US-20060046339-\$ or US-20120270397-\$ or US-20110297947-\$ or US-20110053323-\$ or US-20090057666-\$ or US-20090047750-\$ or US-20080203395-\$ or US-20110198607-\$ or US-20100012979-\$ or US-20080017885-\$ or US-20070103575-\$ or US-20040262703-\$ or US-20040149989-\$ or US-20060170048-\$ or US-20040218111-\$ or US-20080073718-\$ or US-20080315262-\$ or US-20110147752-\$ or US-20050077520-\$ or US-20010030722-\$ or US-20010019384-\$ or US-20090033819-\$ or US-20080203396-\$ or US-20020113914-\$ or US-20070268206-\$).did. or (US-20130037815-\$ or US-20120314151-\$ or US-20120256184-\$ or US-20120249940-\$ or US-20120218325-\$ or US-20120205671-\$ or US-20120188478-\$ or US-20120146035-\$ or US-20120127146-\$ or US-20120119322-\$ or US-20120033151-\$ or US-20120002127-\$ or US-20110284860-\$ or US-20110242468-\$ or US-20110242443-\$ or US-20110215337-\$ or US-20110199698-\$ or US-20110180798-\$ or US-20110163311-\$ or US-20110121290-\$ or US-20100233834-\$ or US-20090135111-\$ or US-20080278435-\$ or US-20080061394-\$ or US-20070216832-\$ or US-20070113455-\$ or US-20070035676-\$).did. or (US-20050140858-\$ or US-20040239825-\$ or US-20040140515-\$ or US-20040017162-\$ or US-20030025848-\$ or US-20020063261-\$ or US-20020037600-\$ or US-20020036818-\$ or US-20020018278-\$ or US-20020017645-\$ or US-20010040655-\$ or US-20010038485-\$ or US-20110309397-\$ or US-20080308803-\$ or US-20110084282-\$ or US-20080211751-\$ or US- | US-PGPUB; USPAT; USOCR; JPO; DERWENT; IBM_TDB            | OR | ON | 2013/03/19 14:34 |

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|     |   | 20040263702-\$ or US-20030202134-\$ or<br>US-20010019376-\$ or US-20020142505-\$<br>or US-20100197086-\$ or US-<br>20070181877-\$ or US-20110263060-\$ or<br>US-20100210057-\$ or US-20130049640-\$<br>or US-20130017497-\$ or US-<br>20130015448-\$).did. or (US-20120329189-<br>\$ or US-20120162271-\$ or US-<br>20110248245-\$ or US-20110240986-\$ or<br>US-20110017989-\$ or US-20090226634-\$<br>or US-20040188694-\$ or US-<br>20100230682-\$ or US-20090065783-\$ or<br>US-20090032818-\$ or US-20080169473-\$<br>or US-20060243979-\$ or US-<br>20030201439-\$).did. or (US-7754523-\$ or<br>US-8153337-\$ or US-8030652-\$ or US-<br>7662660-\$ or US-7459725-\$ or US-<br>8334553-\$ or US-8168982-\$ or US-<br>8023042-\$ or US-7190422-\$ or US-<br>8300170-\$ or US-7105905-\$ or US-<br>6319760-\$ or US-6310372-\$ or US-<br>6066860-\$ or US-5416340-\$ or US-<br>7790523-\$ or US-8120130-\$ or US-<br>7102164-\$ or US-6800873-\$ or US-<br>6704068-\$ or US-7800718-\$ or US-<br>8130335-\$ or US-8144281-\$ or US-<br>7460190-\$ or US-8248329-\$ or US-<br>8212976-\$).did. or (US-8164718-\$ or US-<br>8130333-\$ or US-7952659-\$ or US-<br>7888679-\$ or US-7804552-\$ or US-<br>6346717-\$ or US-6556265-\$ or US-<br>6573589-\$ or US-6636284-\$ or US-<br>6690437-\$ or US-7027109-\$ or US-<br>7750999-\$ or US-7728400-\$ or US-<br>7855405-\$ or US-6618033-\$ or US-<br>7956944-\$ or US-7932961-\$ or US-<br>7317496-\$ or US-6791630-\$ or US-<br>6580473-\$ or US-6262784-\$ or US-<br>7125757-\$ or US-7960221-\$ or US-<br>7719008-\$ or US-8111359-\$ or US-<br>5859677-\$ or US-7233033-\$).did. or (US-<br>5956103-\$ or US-5276349-\$ or US-<br>7989234-\$ or US-8299460-\$ or US-<br>8277903-\$ or US-6905977-\$ or US-<br>7977679-\$ or US-7646023-\$ or US-<br>7633090-\$ or US-7576359-\$ or US-<br>8395716-\$).did. or (US-3411199-\$).did. or<br>(JP-2010199459-\$ or JP-2010199458-\$ or<br>JP-2010199457-\$ or JP-2011187931-\$ or<br>JP-2008040399-\$ or JP-2011242784-\$ or<br>JP-2009027132-\$ or JP-2001313397-\$ or<br>JP-2010072219-\$ or JP-2009053660-\$ or<br>JP-2008070579-\$ or JP-09033951-\$ or JP-<br>2008164668-\$).did. or (US-20060046339-\$<br>or US-20110180798-\$ or JP-2010074030-\$<br>or US-20040149989-\$ or US-<br>20110198607-\$ or US-20090033819-<br>\$).did. or (NN9612175).tban. |                                                                 |    |    |                     |
| L39 | 3 | 138 and (organic near light near<br>emitting).clm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT; | OR | ON | 2013/03/19<br>14:35 |

|     |      |                                                                                                                                                               |                                                                            |    |    |                     |
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|     |      |                                                                                                                                                               | IBM_TDB                                                                    |    |    |                     |
| L40 | 3    | I38 and (organic near light near emitting) and amoled                                                                                                         | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:36 |
| L41 | 2    | I38 and (organic near light near emitting near layer) and amoled                                                                                              | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:37 |
| L42 | 8    | I38 and (organic near light near emitting near layer)                                                                                                         | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:37 |
| L43 | 2    | I38 and (organic near light near emitting near layer).clm.                                                                                                    | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:38 |
| L44 | 2057 | (organic near light near emitting near layer).clm. and (light adj (shield or shielding or block or blocking or shade or shading) ner2 layer).clm.             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:39 |
| L45 | 56   | (organic near light near emitting near layer).clm. and (light adj (shield or shielding or block or blocking or shade or shading) ner2 layer).clm. and amoled  | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:39 |
| L46 | 2    | (organic near light near emitting near layer).clm. and (light adj (shield or shielding or block or blocking or shade or shading) near2 layer).clm. and amoled | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:41 |
| L47 | 5    | (organic near light near emitting near layer) same (light adj (shield or shielding or block or blocking or shade or shading) near2 layer) and amoled          | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/03/19<br>14:41 |
| L48 | 24   | ("20060046339"   "20080217618"  <br>"20070051943"   "20080278435"  <br>"20110215337"   "20070296333"  <br>"20110198607"   "20070290227"                       | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS;                                     | OR | ON | 2013/03/19<br>14:57 |

EAST Search History

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|  | "20100244022"   "20100295042"  <br>"5838399"   "20070176554").PN. | EPO; JPO;<br>DERWENT;<br>IBM_TDB |  |  |  |
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Customer No.: 31561  
Application No.: 13/208,360  
Docket No.: 37986-US-PA

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Examiner: ERDEM, FAZLI

Group Art Unit: 2826

In re PATENT APPLICATION of  
Applicants: Chang et al.

Serial No.: 13/208,360

Filed: 08/12/2011

For: SEMICONDUCTOR STRUCTURE  
AND ORGANIC  
ELECTROLUMINESCENCE DEVICE

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) Attorney Docket: 37986-US-PA  
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**The Commissioner is authorized to charge any fees required in connection with the filing of this paper to account No. 50-2620 (Order No.: 37986-US-PA).**

**AMENDMENT AND RESPONSE TO OFFICE ACTION**

United States Patent and Trademark Office  
Customer Service Window  
Mail Stop Amendment  
Randolph Building  
401 Dulany Street  
Alexandria, VA 22314

Dear Sir,

The Office Action electronically delivered on March 29, 2013, has been carefully considered. In response thereto, please consider the following amendments and the following remarks.

## AMENDMENTS

### To the claims:

1. (Currently amended) A semiconductor structure, disposed on a substrate, and comprising:
  - a gate electrode, disposed on the substrate;
  - a gate insulating layer, disposed on the substrate, and covering the gate electrode;
  - a channel layer, disposed on the gate insulating layer and located above the gate electrode, wherein the channel layer has a channel length  $L$  along a channel direction and has a first side and a second side opposite to the first side;
  - a source electrode and a drain electrode, located at the two opposite sides of the channel layer, and electrically connected to the first side and the second side of the channel layer, respectively;
  - a dielectric layer, covering the source electrode, the drain electrode and the channel layer; and
  - a conductive light-shielding pattern layer, disposed on the dielectric layer, and overlapped to a portion of the source electrode and a portion of the channel layer in a vertical projection, wherein the conductive light-shielding pattern layer does not overlap to the drain in the vertical projection, and the conductive light-shielding pattern layer and the channel layer have an overlapping length  $d_1$ , and  $0.3 \leq d_1/L \leq 0.85$ .
2. (original) The semiconductor structure as claimed in claim 1, wherein a material of the channel layer comprises oxide semiconductor.
3. (original) The semiconductor structure as claimed in claim 2, wherein the oxide

semiconductor comprises indium gallium zinc oxide (IGZO).

4. (original)The semiconductor structure as claimed in claim 1, wherein the conductive light-shielding pattern layer has a third side and a fourth side along the channel direction, the fourth side is overlapped to the channel layer in the vertical projection, wherein the overlapping length  $d1$  is equal to a distance between the fourth side and the first side of the channel layer along the channel direction.

5. (original)The semiconductor structure as claimed in claim 1, wherein the channel layer covers a portion of the source electrode and a portion of the drain electrode.

6. (original)The semiconductor structure as claimed in claim 1, wherein the source electrode and the drain electrode respectively cover a portion of the channel layer.

7. (original)The semiconductor structure as claimed in claim 6, further comprising an etching stop layer disposed on the channel layer, wherein the source electrode and the drain electrode respectively cover a portion of the etching stop layer.

8. (original) The semiconductor structure as claimed in claim 6, wherein the drain electrode has a fifth side along the channel direction, wherein the fifth side is overlapped to the channel layer, and the fifth side and the second side are spaced by a distance  $t1$  along the channel direction, and  $0 < t1/L < 0.15$ .

9. (Currently amended) An organic electroluminescence device, disposed on a substrate, and comprising:

a gate electrode, disposed on the substrate;

a gate insulating layer, disposed on the substrate, and covering the gate electrode;

a channel layer, disposed on the gate insulating layer and located above the gate

electrode, wherein the channel layer has a channel length  $L$  along a channel direction and has a first side and a second side opposite to the first side;

a source electrode and a drain electrode, located at the two opposite sides of the channel layer, and electrically connected to the first side and the second side of the channel layer, respectively;

a dielectric layer, covering the source electrode, the drain electrode and the channel layer;

a conductive light-shielding pattern layer, disposed on the dielectric layer, and overlapped to a portion of the source electrode and a portion of the channel layer in a vertical projection, wherein the conductive light-shielding pattern layer does not overlap to the drain in the vertical projection, and the conductive light-shielding pattern layer and the channel layer have an overlapping length  $d_1$ , and  $0.3 \leq d_1/L \leq 0.85$ ;

a lower electrode, disposed on the dielectric layer and electrically connected to the drain electrode;

an organic light emitting layer, disposed on the lower electrode; and

an upper electrode, disposed on the organic light emitting layer.

10. (original) The organic electroluminescence device as claimed in claim 9, wherein a material of the channel layer comprises oxide semiconductor.

11. (original) The organic electroluminescence device as claimed in claim 10, wherein the oxide semiconductor comprises indium gallium zinc oxide (IGZO).

12. (original) The organic electroluminescence device as claimed in claim 9, wherein the conductive light-shielding pattern layer has a third side and a fourth side

along the channel direction, the fourth side is overlapped to the channel layer in the vertical projection, wherein the overlapping length  $d1$  is equal to a distance between the fourth side and the first side of the channel layer along the channel direction.

13. (original)The organic electroluminescence device as claimed in claim 9, wherein the channel layer covers a portion of the source electrode and a portion of the drain electrode.

14. (original)The organic electroluminescence device as claimed in claim 9, wherein the source electrode and the drain electrode respectively cover a portion of the channel layer.

15. (original)The organic electroluminescence device as claimed in claim 14, further comprising an etching stop layer disposed on the channel layer, wherein the source electrode and the drain electrode respectively cover a portion of the etching stop layer.

16. (original)The organic electroluminescence device as claimed in claim 14, wherein the drain electrode has a fifth side along the channel direction, wherein the fifth side is overlapped to the channel layer, and the fifth side and the second side are spaced by a distance  $t1$  along the channel direction, and  $0 < t1/L < 0.15$ .

17. (new) The semiconductor structure as claimed in claim 1, wherein the conductive light-shielding pattern layer and the drain electrode are spaced by a distance along the channel direction in the vertical projection.

18. (new)The organic electroluminescence device as claimed in claim 9, wherein the conductive light-shielding pattern layer and the drain electrode are spaced by a

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distance along the channel direction in the vertical projection.

## **REMARKS**

### **Present Status of the Application**

The Office Action rejected all presently-pending claims 1-16.

Specifically, the Office Action rejected claim 1 and claim 4 under 35 U.S.C. 103(a) as being unpatentable over Song et al. (US application 2008/0278435; herein referred to as “Song”) in view of Egami et al. (US application 2011/0215337; herein referred to as “Egami”) and further in view of Mori et al. (US application 2011/0198607; herein referred to as “Mori ”).

Claims 2 and 3 were rejected under 35 U.S.C. 103(a) as being unpatentable over Song, Egami, Mori and Koji (JP2010199459; herein referred to as “Koji”).

Claims 5 to 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over Song, Egami, Mori and Seo et al. (US application 2006/0046339; herein referred to as “Seo”).

Claims 9 and 12 were rejected under 35 U.S.C. 103(a) as being unpatentable over Song and Kwak et al. (US application 2007/0176554; herein referred to as “Kwak”). Claims 10 and 11 were rejected under 35 U.S.C. 103(a) as being unpatentable over Song, Kwak, Mori and Koji.

Claims 13 to 16 were rejected under 35 U.S.C. 103(a) as being unpatentable over Song, Kwak, Mori and Seo.

Applicants have amended claims 1 and 9 to more clearly define the present invention. In addition, Applicants respectfully traverse the rejections addressed to claims 1 and 9 for at least the reasons set forth below.

**Rejections under 35 U.S.C 103 (a)**

Claim 1 was rejected under 35 U.S.C. 103(a) as being unpatentable over Song, Egami and Mori.

Claim 9 was rejected under 35 U.S.C. 103(a) as being unpatentable over Song and Kwak.

In response thereto, Applicants have amended claims 1 and 9 based on the description of paragraph [0031] of the specification and FIGs. 1A to 4B of the present application. After entry of the amendment, both of claims 1 and 9 recite “**the conductive light-shielding pattern layer does not overlap to the drain in the vertical projection, and** the conductive light-shielding pattern layer and the channel layer have an overlapping length  $d1$ , and  $0.3 \leq d1/L \leq 0.85$ ”.

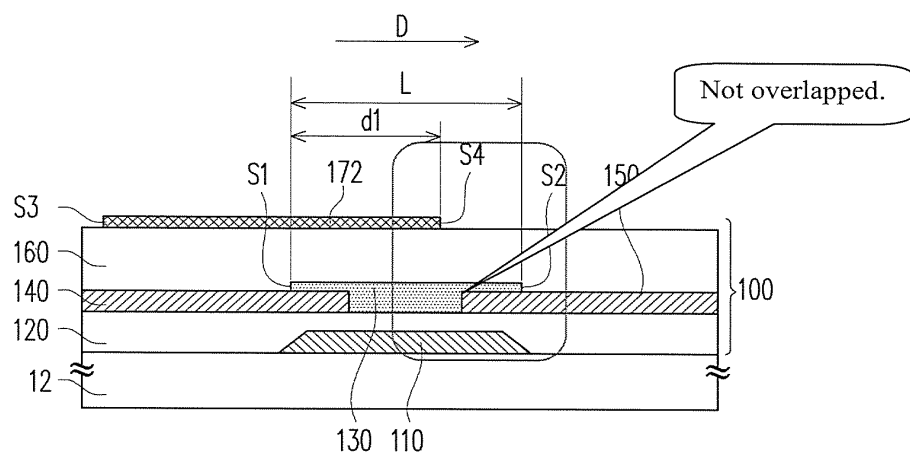


FIG. 1A

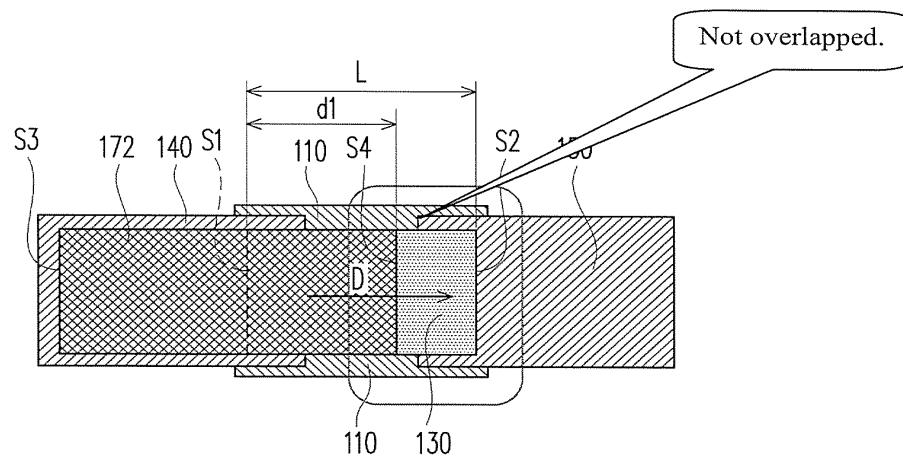


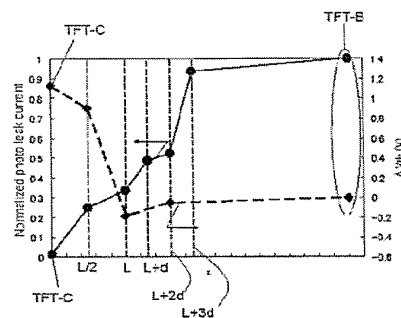
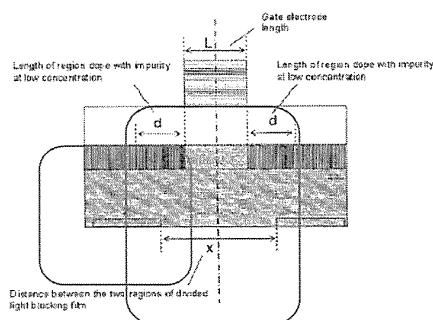
FIG. 1B

Applicants respectfully submit that Song, Egami, Mori and Kwak fail to teach, disclose or suggest the features of “the conductive light-shielding pattern layer does not overlap to the drain in the vertical projection”, as recited in claims 1 and 9. **According to paragraph [0031] of the specification of the application, when the light-shielding pattern layer does not overlap to the drain in the vertical projection, such a structure will avoid the extra electric field generated during operation of the device and prevent the occurrence of current leakage.**

Furthermore, the Office states “Mori discloses a thin film transistor where in Fig 5 and paragraphs 0474, 0477,0478, it is possible to get the required relationship among light shielding, channel, source, and drain.” Applicants respectfully disagree. In fact, figure 5 and paragraphs [0474], [0477], and [0478] of Mori merely mentions about a relationship between  $x$ ,  $L$  and  $d$ , wherein  $x$  is the distance between two light blocking films,  $L$  is the length of the gate electrode, and  $d$  is the length of the LDD region (doped region) provided on both sides of the gate electrode.

FIG. 5

FIG. 4



[0477] As length  $x$  between the drain side region of the light blocking film and the source side region of the light blocking film increases, the “normalized photo leak current” increases. When  $x$  is set in a range of  $L \leq x \leq L+2d$ , the “normalized photo leak current” is measured in a range of 0.35 to 0.55. However, when  $x$  increases to  $x=L+3d$ , the “normalized photo leak current” suddenly increases to 0.95. Therefore, when  $x$  is set in the range of  $L \leq x \leq L+2d$ , an effect of suppressing a sudden increase in the “normalized photo leak current” is obtained.

Especially, the **length  $x$**  indicates the region that is **NOT** covered by the light blocking films (the drain side region of the light blocking film and the source side region of the light blocking film), as shown in paragraph [0477] and FIGs. 4 and 5. Accordingly, Mori fails to disclose that **“the conductive light-shielding pattern layer does not overlap to the drain in the vertical projection, and the conductive light-shielding pattern layer and the channel layer have an overlapping length  $d_1$ , and  $0.3 \leq d_1/L \leq 0.85$ ”** as provided by the present invention.

It is clearly that the source side region of the light blocking film increased distance  $x \leq L+2d$  away from the channel layer. Accordingly, Mori fails to disclose **the conductive light-shielding pattern layer and the channel layer have an overlapping length  $d_1$ , and  $0.3 \leq d_1/L \leq 0.85$ .** Therefore, Mori fails to disclose the relationship among light shield, channel, source and drain as stated by the Examiner.

In other words, Mori fails to disclose the relationship between the overlapping length  $d_1$  (between the conductive light-shielding pattern layer and the channel layer) and the channel length  $L$ ,  $0.3 \leq d_1/L \leq 0.85$ , as defined in claims 1 and 9. People having ordinary skill in the art at the time the invention was made are unable to obtain the relationship of claims 1 and 9 based on the disclosure of Mori or other cited

references.

Accordingly, it is believed that both of the independent claims 1 and 9 of the present application stand no-obvious over the prior art of record, and should be allowable.

Since independent claims 1 and 9 are allowable, their dependent claims are also allowable as a matter of law.

**Newly Added Claim**

Claims 17 and 18 are newly added based on paragraph [0031] and FIGs. 1A to 4B and the present application. It is believed that the newly added claims are supported by the original specification and no new matter is introduced.

Since claims 1 and 9 are allowable over the prior art, then their dependent claims 17 and 18 are also allowable as a matter of law.

**CONCLUSION**

In view of the foregoing, it is believed that claims 1-18 are in proper condition for allowance. If the Office believes that a conference would be of value in expediting the prosecution of this application, he or she is cordially invited to telephone the undersigned counsel to arrange for such a conference.

Respectfully submitted,

Date :

Jun. 28, 2013

  
James J. Kong

Registration No. 68665

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| <b>EFS ID:</b>                              | 16181177                                                       |
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| <b>International Application Number:</b>    |                                                                |
| <b>Confirmation Number:</b>                 | 7890                                                           |
| <b>Title of Invention:</b>                  | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |
| <b>First Named Inventor/Applicant Name:</b> | Chih-Pang Chang                                                |
| <b>Customer Number:</b>                     | 31561                                                          |
| <b>Filer:</b>                               | Belinda Lee                                                    |
| <b>Filer Authorized By:</b>                 |                                                                |
| <b>Attorney Docket Number:</b>              | 37986-US-PA                                                    |
| <b>Receipt Date:</b>                        | 28-JUN-2013                                                    |
| <b>Filing Date:</b>                         | 12-AUG-2011                                                    |
| <b>Time Stamp:</b>                          | 05:41:37                                                       |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)                                    |

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| 1                      |                      | 37986_OA.pdf | 513255                                   | yes              | 13               |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Claims                                                | 2      | 6   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Applicant Arguments/Remarks Made in an Amendment      | 7      | 13  |
| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                       |        |     |
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| <p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p> |                                                       |        |     |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------------|-------|------------------------------------|---------------|---------------------------------------|--|
| <b>PATENT APPLICATION FEE DETERMINATION RECORD</b><br>Substitute for Form PTO-875                                                                                                                                                                                                                                                                                                                                                    |                                                                                          |                                                                                                                                                                                                                               |                                  | Application or Docket Number<br><b>13/208,360</b> |       | Filing Date<br><b>08/12/2011</b>   |               | <input type="checkbox"/> To be Mailed |  |
| ENTITY: <input checked="" type="checkbox"/> LARGE <input type="checkbox"/> SMALL <input type="checkbox"/> MICRO                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
| <b>APPLICATION AS FILED – PART I</b>                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                          | (Column 2)                                                                                                                                                                                                                    |                                  |                                                   |       |                                    |               |                                       |  |
| FOR                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                          | NUMBER FILED                                                                                                                                                                                                                  |                                  | NUMBER EXTRA                                      |       | RATE (\$)                          |               | FEE (\$)                              |  |
| <input type="checkbox"/> BASIC FEE<br>(37 CFR 1.16(a), (b), or (c))                                                                                                                                                                                                                                                                                                                                                                  |                                                                                          | N/A                                                                                                                                                                                                                           |                                  | N/A                                               |       | N/A                                |               |                                       |  |
| <input type="checkbox"/> SEARCH FEE<br>(37 CFR 1.16(k), (i), or (m))                                                                                                                                                                                                                                                                                                                                                                 |                                                                                          | N/A                                                                                                                                                                                                                           |                                  | N/A                                               |       | N/A                                |               |                                       |  |
| <input type="checkbox"/> EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q))                                                                                                                                                                                                                                                                                                                                                            |                                                                                          | N/A                                                                                                                                                                                                                           |                                  | N/A                                               |       | N/A                                |               |                                       |  |
| TOTAL CLAIMS<br>(37 CFR 1.16(i))                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                          | minus 20 =                                                                                                                                                                                                                    |                                  | *                                                 |       | X \$ =                             |               |                                       |  |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h))                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                          | minus 3 =                                                                                                                                                                                                                     |                                  | *                                                 |       | X \$ =                             |               |                                       |  |
| <input type="checkbox"/> APPLICATION SIZE FEE<br>(37 CFR 1.16(s))                                                                                                                                                                                                                                                                                                                                                                    |                                                                                          | If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). |                                  |                                                   |       |                                    |               |                                       |  |
| <input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))                                                                                                                                                                                                                                                                                                                                                           |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
| * If the difference in column 1 is less than zero, enter "0" in column 2.                                                                                                                                                                                                                                                                                                                                                            |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       | TOTAL                              |               |                                       |  |
| <b>APPLICATION AS AMENDED – PART II</b>                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                          | (Column 2)                                                                                                                                                                                                                    |                                  | (Column 3)                                        |       |                                    |               |                                       |  |
| <b>AMENDMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>06/28/2013</b>                                                                        |                                                                                                                                                                                                                               | CLAIMS REMAINING AFTER AMENDMENT |                                                   |       | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | Total (37 CFR 1.16(i))                                                                   |                                                                                                                                                                                                                               | * 18                             |                                                   | Minus | ** 20                              | = 0           |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | Independent (37 CFR 1.16(h))                                                             |                                                                                                                                                                                                                               | * 2                              |                                                   | Minus | ***3                               | = 0           |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                           |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       | RATE (\$)                          |               | ADDITIONAL FEE (\$)                   |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       | x \$80 =                           |               | 0                                     |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       | x \$420 =                          |               | 0                                     |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       | TOTAL ADD'L FEE                    |               | <b>0</b>                              |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                          | (Column 2)                                                                                                                                                                                                                    |                                  | (Column 3)                                        |       |                                    |               |                                       |  |
| <b>AMENDMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                          |                                                                                                                                                                                                                               | CLAIMS REMAINING AFTER AMENDMENT |                                                   |       | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | Total (37 CFR 1.16(i))                                                                   |                                                                                                                                                                                                                               | *                                |                                                   | Minus | **                                 | =             |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | Independent (37 CFR 1.16(h))                                                             |                                                                                                                                                                                                                               | *                                |                                                   | Minus | ***                                | =             |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                           |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       | RATE (\$)                          |               | ADDITIONAL FEE (\$)                   |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       | X \$ =                             |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       | X \$ =                             |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       | TOTAL ADD'L FEE                    |               |                                       |  |
| <p>* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.</p> <p>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".</p> <p>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".</p> <p>The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.</p> |                                                                                          |                                                                                                                                                                                                                               |                                  |                                                   |       |                                    |               |                                       |  |

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

## NOTICE OF ALLOWANCE AND FEE(S) DUE

31561 7590 09/16/2013  
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN

EXAMINER

ERDEM, FAZLI

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 09/16/2013

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 13/208,360      | 08/12/2011  | Chih-Pang Chang      | 37986-US-PA         | 7890             |

TITLE OF INVENTION: SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE

| APPLN. TYPE    | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|---------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | UNDISCOUNTED  | \$1780        | \$300               | \$0                  | \$2080           | 12/16/2013 |

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

# PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE  
**Commissioner for Patents**  
**P.O. Box 1450**  
**Alexandria, Virginia 22313-1450**  
**or Fax** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

31561 7590 09/16/2013  
**JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE**  
**7 FLOOR-1, NO. 100**  
**ROOSEVELT ROAD, SECTION 2**  
**TAIPEI, 100**  
**TAIWAN**

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

## Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

|                    |
|--------------------|
| (Depositor's name) |
| (Signature)        |
| (Date)             |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 13/208,360      | 08/12/2011  | Chih-Pang Chang      | 37986-US-PA         | 7890             |

TITLE OF INVENTION: SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE

| APPLN. TYPE    | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|---------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | UNDISCOUNTED  | \$1780        | \$300               | \$0                  | \$2080           | 12/16/2013 |

| EXAMINER     | ART UNIT | CLASS-SUBCLASS |
|--------------|----------|----------------|
| ERDEM, FAZLI | 2826     | 257-043000     |

|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. <b>Use of a Customer Number is required.</b></p> | <p>2. For printing on the patent front page, list</p> <p>(1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____</p> <p>(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____</p> <p>3 _____</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

|                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>4a. The following fee(s) are submitted:</p> <p><input type="checkbox"/> Issue Fee</p> <p><input type="checkbox"/> Publication Fee (No small entity discount permitted)</p> <p><input type="checkbox"/> Advance Order - # of Copies _____</p> | <p>4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)</p> <p><input type="checkbox"/> A check is enclosed.</p> <p><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.</p> <p><input type="checkbox"/> The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

---

Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Registration No. \_\_\_\_\_

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This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 13/208,360      | 08/12/2011  | Chih-Pang Chang      | 37986-US-PA         | 7890             |

| EXAMINER     |  |
|--------------|--|
| ERDEM, FAZLI |  |

| ART UNIT | PAPER NUMBER |
|----------|--------------|
| 2826     |              |

31561 7590 09/16/2013  
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN

DATE MAILED: 09/16/2013

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 168 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 168 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

## Privacy Act Statement

**The Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

|                               |                                      |                                     |                                                  |
|-------------------------------|--------------------------------------|-------------------------------------|--------------------------------------------------|
| <b>Notice of Allowability</b> | <b>Application No.</b><br>13/208,360 | <b>Applicant(s)</b><br>CHANG ET AL. |                                                  |
|                               | <b>Examiner</b><br>FAZLI ERDEM       | <b>Art Unit</b><br>2826             | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed on 6/28/2013.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 1-18. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
**Certified copies:**  
a) ☒ All    b) ☐ Some    \*c) ☐ None of the:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).  
\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.  
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.  
**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

|                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)<br>2. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date _____<br>3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material<br>4. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____ | 5. <input type="checkbox"/> Examiner's Amendment/Comment<br>6. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance<br>7. <input type="checkbox"/> Other _____ |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                       |  |
|-------------------------------------------------------|--|
| /MINH-LOAN T TRAN/<br>Primary Examiner, Art Unit 2826 |  |
|-------------------------------------------------------|--|

The present application is being examined under the pre-AIA first to invent provisions.

#### **DETAILED ACTION**

##### ***Allowable Subject Matter***

Claims 1-18 are allowed.

The following is an examiner's statement of reasons for allowance: Prior art failed to establish the amended conductive light shielding pattern that does not overlap with the drain electrode.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

##### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FAZLI ERDEM whose telephone number is (571)272-1914. The examiner can normally be reached on M-F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Davienne Monbleau can be reached on 571-272-1945. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/FAZLI ERDEM/  
Examiner, Art Unit 2826  
9/3/2013

/MINH-LOAN T TRAN/  
Primary Examiner, Art Unit 2826

**EAST Search History****EAST Search History (Prior Art)**

| Ref # | Hits | Search Query                                                                                                                                     | DBs                                                                        | Default Operator | Plurals | Time Stamp          |
|-------|------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------|---------|---------------------|
| L1    | 1    | 13/208360                                                                                                                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/09/03<br>08:28 |
| L2    | 765  | (conducting or conductive) near light near (shield or shielding or block or blocking)                                                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/09/03<br>08:33 |
| L3    | 4    | (conducting or conductive) near light near (shield or shielding or block or blocking) near10 (overlap or overlapping or overlapped) near10 drain | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/09/03<br>08:34 |
| L4    | 247  | light near (shield or shielding or block or blocking) near10 (overlap or overlapping or overlapped) near10 drain                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/09/03<br>08:35 |
| L5    | 67   | light near (shield or shielding or block or blocking) near10 (overlap or overlapping or overlapped) near10 drain.clm.                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/09/03<br>08:35 |
| L6    | 0    | light near (shield or shielding or block or blocking) near10 does near10 (overlap or overlapping or overlapped) near10 drain.clm.                | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/09/03<br>08:35 |
| L7    | 0    | light near (shield or shielding or block or blocking) near10 does near10 (overlap or overlapping or overlapped) near10 drain                     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2013/09/03<br>08:36 |
| L8    | 79   | light near (shield or shielding or block or                                                                                                      | US-PGPUB;                                                                  | OR               | ON      | 2013/09/03          |

|     |    |                                                                                                                                                                                                                          |                                                                            |    |    |                     |
|-----|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |    | blocking) near5 (overlap or overlapping or overlapped) near5 drain near electrode                                                                                                                                        | USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB              |    |    | 08:36               |
| L9  | 0  | light near (shield or shielding or block or blocking) near5 "does" near5 (overlap or overlapping or overlapped) near5 drain near electrode                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:37 |
| L10 | 79 | light near (shield or shielding or block or blocking) near5 (overlap or overlapping or overlapped) near5 drain near electrode                                                                                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:37 |
| L11 | 15 | light near (shield or shielding or block or blocking) near5 (overlap or overlapping or overlapped) near5 drain near electrode.clm.                                                                                       | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:37 |
| L12 | 8  | light near (shield or shielding or block or blocking) near5 (overlap or overlapping or overlapped) near5 drain near electrode.clm. and ((overlap or overlapping or overlapped) near5 (distance or area or portion)).clm. | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:53 |
| L13 | 18 | light near (shield or shielding or block or blocking) near5 (overlap or overlapping or overlapped) near5 drain near electrode same ((overlap or overlapping or overlapped) near5 (distance or area or portion))          | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:54 |
| L14 | 36 | light near5 (overlap or overlapping or overlapped) near5 drain near electrode same ((overlap or overlapping or overlapped) near5 (distance or area or portion))                                                          | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:54 |
| L15 | 3  | (conductive or conducting) near5 light near5 (overlap or overlapping or overlapped) near5 drain near electrode same ((overlap or overlapping or overlapped) near5 (distance or area or portion))                         | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:55 |
| L16 | 4  | (conductive or conducting) near5 light near5 (overlap or overlapping or overlapped) near5 drain near electrode and ((overlap or overlapping or overlapped) near5 (distance or area or portion))                          | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;            | OR | ON | 2013/09/03<br>08:55 |

|     |     |                                                                                                                                                                                                            |                                                                            |    |    |                     |
|-----|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |     |                                                                                                                                                                                                            | IBM_TDB                                                                    |    |    |                     |
| L17 | 4   | (conductive or conducting) near5 light near5 (overlap or overlapping or overlapped) near5 drain near electrode and ((overlap or overlapping or overlapped) near5 (length or distance or area or portion))  | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:56 |
| L18 | 9   | (conductive or conducting) near5 light near5 (overlap or overlapping or overlapped) near10 drain near electrode and ((overlap or overlapping or overlapped) near5 (length or distance or area or portion)) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:56 |
| L19 | 4   | (conductive or conducting) near5 light near5 (overlap or overlapping or overlapped) near5 drain adj electrode                                                                                              | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:57 |
| L20 | 4   | (conductive or conducting) near5 light near5 (overlap or overlapping or overlapped) with drain adj electrode                                                                                               | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:58 |
| L21 | 17  | (conductive or conducting) near5 light near5 (overlap or overlapping or overlapped) with drain                                                                                                             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:58 |
| L22 | 145 | (conductive or conducting) near5 light with drain.clm.                                                                                                                                                     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:59 |
| L23 | 25  | (conductive or conducting) near5 light with source with channel with drain.clm.                                                                                                                            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>08:59 |
| L24 | 136 | (conductive or conducting) near5 light with source with channel with drain                                                                                                                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:00 |
| L25 | 12  | (conductive or conducting) near5 light with source with channel with drain with (overlap or overlapping or overlapped)                                                                                     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;                                | OR | ON | 2013/09/03<br>09:01 |

|     |     |                                                                                                                                                             |                                                                            |    |    |                     |
|-----|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |     |                                                                                                                                                             | JPO;<br>DERWENT;<br>IBM_TDB                                                |    |    |                     |
| L26 | 0   | (conductive or conducting) near5 light with source with channel with drain with (overlap or overlapping or overlapped) with (distance or length)            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:02 |
| L27 | 1   | (conductive or conducting) near5 light with source with channel with drain with (overlap or overlapping or overlapped) same (distance or length)            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:02 |
| L28 | 1   | (conductive or conducting) near5 light with source same channel same drain same (overlap or overlapping or overlapped) same (distance or length)            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:02 |
| L29 | 4   | (conductive or conducting) near5 light same source same channel same drain same (overlap or overlapping or overlapped) same (distance or length)            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:02 |
| L30 | 3   | (conductive or conducting) near2 light same source same channel same drain same (overlap or overlapping or overlapped) same (distance or length)            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:03 |
| L31 | 57  | (conductive or conducting) near2 light same source same channel same drain same (overlap or overlapping or overlapped)                                      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:03 |
| L32 | 8   | (conductive or conducting) near2 light same source same channel same drain same (overlap or overlapping or overlapped).clm.                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:05 |
| L33 | 3   | (conductive or conducting) near2 light same source same channel same drain same (overlap or overlapping or overlapped) same (distance or length or spacing) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:06 |
| L34 | 148 | light same source same channel same drain same (overlap or overlapping or                                                                                   | US-PGPUB;<br>USPAT;                                                        | OR | ON | 2013/09/03<br>09:07 |

|     |     |                                                                                                                                                                                                                                                          |                                                                            |    |    |                     |
|-----|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |     | overlapped) same (distance or length or spacing)                                                                                                                                                                                                         | USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB                        |    |    |                     |
| L35 | 30  | light same source same channel same drain same (overlap or overlapping or overlapped) same (distance or length or spacing).clm.                                                                                                                          | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:07 |
| L36 | 9   | light same (block or blocking or prevent or preventing or prevention or preventive or shade or shading or shield or shielding) same source same channel same drain same (overlap or overlapping or overlapped) same (distance or length or spacing).clm. | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:07 |
| L37 | 63  | light same (block or blocking or prevent or preventing or prevention or preventive or shade or shading or shield or shielding) same source same channel same drain same (overlap or overlapping or overlapped) same (distance or length or spacing)      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:10 |
| L38 | 33  | light same (block or blocking or prevent or preventing or prevention or preventive or shade or shading or shield or shielding) same source same channel same drain near5 (overlap or overlapping or overlapped) same (distance or length or spacing)     | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:10 |
| L39 | 74  | (conductive or conducting) near2 light near5 drain adj electrode                                                                                                                                                                                         | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:51 |
| L40 | 155 | (conductive or conducting) near2 light near10 drain adj electrode                                                                                                                                                                                        | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:52 |
| L41 | 1   | (conductive or conducting) near2 light near10 drain adj electrode same (length or distance)                                                                                                                                                              | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:52 |
| L42 | 1   | (conductive or conducting) near5 light near10 drain adj electrode same (length or distance)                                                                                                                                                              | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:53 |

|     |       |                                                                                                                                                                                                                                                                                     |                                                                            |    |    |                     |
|-----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
| L43 | 3     | (conductive or conducting) near5 light near10 drain adj electrode same (length or distance)                                                                                                                                                                                         | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:53 |
| L44 | 44    | (conductive or conducting or shield or shielding or shielded or block or blocking or blocked or shade or shading or prevent or preventing or prevention or preventive) near2 light near10 drain adj electrode same (length or distance)                                             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:54 |
| L45 | 15    | (conductive or conducting or shield or shielding or shielded or block or blocking or blocked or shade or shading or prevent or preventing or prevention or preventive) near2 light near10 drain adj electrode same (length or distance) same (overlap or overlapping or overlapped) | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:55 |
| L46 | 16083 | (au near optronics).as.                                                                                                                                                                                                                                                             | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:57 |
| L47 | 9     | l46 and (conductive or conducting or shield or shielding or shielded or block or blocking or blocked or shade or shading or prevent or preventing or prevention or preventive) near2 light near10 drain adj electrode same (overlap or overlapping or overlapped)                   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:57 |
| L48 | 13    | (chih-pang near2 chang).in. or (hsing-hung near2 hsieh).in.                                                                                                                                                                                                                         | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:59 |
| L49 | 18    | l46 and (conductive or conducting or shield or shielding or shielded or block or blocking or blocked or shade or shading or prevent or preventing or prevention or preventive) near2 light near10 drain same (overlap or overlapping or overlapped)                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:59 |
| L50 | 1     | l48 and (conductive or conducting or shield or shielding or shielded or block or blocking or blocked or shade or shading or prevent or preventing or prevention or preventive) near2 light near10 drain same (overlap or overlapping or overlapped)                                 | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>09:59 |
| L51 | 13638 | 257/43.ccls. or 257/59.ccls. or 257/72.ccls. or 257/E29.296.ccls.                                                                                                                                                                                                                   | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;                                | OR | ON | 2013/09/03<br>10:00 |

|     |       |                                                                                                                                                                                                                                                                                          |                                                                            |    |    |                     |
|-----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----|----|---------------------|
|     |       |                                                                                                                                                                                                                                                                                          | JPO;<br>DERWENT;<br>IBM_TDB                                                |    |    |                     |
| L52 | 108   | I51 and (conductive or conducting or shield or shielding or shielded or block or blocking or blocked or shade or shading or prevent or preventing or prevention or preventive) near2 light near10 drain same (overlap or overlapping or overlapped)                                      | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>10:00 |
| L53 | 10    | I51 and (conductive or conducting or shield or shielding or shielded or block or blocking or blocked or shade or shading or prevent or preventing or prevention or preventive) near2 light near10 drain same (overlap or overlapping or overlapped) same (distance or length)            | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>10:00 |
| L54 | 18331 | 257/43.ccls. or 257/59.ccls. or 257/72.ccls. or 257/E29.296.ccls. or 257/E29.291.ccls. or 257/E29.294.ccls. or 257/E29.003.ccls. or 349/43.ccls. or 349/44.ccls.                                                                                                                         | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>10:02 |
| L55 | 5     | I54 and (conductive or conducting or shield or shielding or shielded or block or blocking or blocked or shade or shading or prevent or preventing or prevention or preventive) near2 light near10 drain same (overlap or overlapping or overlapped) same (distance or length).ti,ab,clm. | US-PGPUB;<br>USPAT;<br>USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/03<br>10:02 |

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| <b>Issue Classification</b><br> | <b>Application/Control No.</b><br>13208360 | <b>Applicant(s)/Patent Under Reexamination</b><br>CHANG ET AL. |  |
|                                                                                                                  | <b>Examiner</b><br>FAZLI ERDEM             | <b>Art Unit</b><br>2826                                        |  |

| CPC    |  |  |  |      |         |
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| CPC Combination Sets |  |  |  |      |     |
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|---------------------------------------------------------------------------------|----------------------|------------------------------------|-------------------------|
| /FAZLI ERDEM/<br>Examiner. Art Unit 2826<br><br>(Assistant Examiner)            | 9/3/2013<br>(Date)   | <b>Total Claims Allowed:</b><br>18 |                         |
| /MINH-LOAN T TRAN/<br>Primary Examiner. Art Unit 2826<br><br>(Primary Examiner) | 09/09/2013<br>(Date) | O.G. Print Claim(s)<br>1           | O.G. Print Figure<br>4A |

|                                                                                                                  |                                            |                                                                |
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| <b>Issue Classification</b><br> | <b>Application/Control No.</b><br>13208360 | <b>Applicant(s)/Patent Under Reexamination</b><br>CHANG ET AL. |
|                                                                                                                  | <b>Examiner</b><br>FAZLI ERDEM             | <b>Art Unit</b><br>2826                                        |

| US ORIGINAL CLASSIFICATION |                                   |    |          |  |  | INTERNATIONAL CLASSIFICATION |   |   |   |                       |             |  |  |  |  |
|----------------------------|-----------------------------------|----|----------|--|--|------------------------------|---|---|---|-----------------------|-------------|--|--|--|--|
| CLASS                      |                                   |    | SUBCLASS |  |  | CLAIMED                      |   |   |   |                       | NON-CLAIMED |  |  |  |  |
| 257                        |                                   |    | 43       |  |  | H                            | 0 | 1 | L | 29 / 786 (2006.01.01) |             |  |  |  |  |
| CROSS REFERENCE(S)         |                                   |    |          |  |  |                              |   |   |   |                       |             |  |  |  |  |
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| CLASS                      | SUBCLASS (ONE SUBCLASS PER BLOCK) |    |          |  |  |                              |   |   |   |                       |             |  |  |  |  |
| 257                        | 59                                | 72 | E29.296  |  |  |                              |   |   |   |                       |             |  |  |  |  |
| 349                        | 43                                | 44 |          |  |  |                              |   |   |   |                       |             |  |  |  |  |
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|---------------------------------------------------------------------------------|----------------------|------------------------------------|-------------------------|
| /FAZLI ERDEM/<br>Examiner. Art Unit 2826<br><br>(Assistant Examiner)            | 9/3/2013<br>(Date)   | <b>Total Claims Allowed:</b><br>18 |                         |
| /MINH-LOAN T TRAN/<br>Primary Examiner. Art Unit 2826<br><br>(Primary Examiner) | 09/09/2013<br>(Date) | O.G. Print Claim(s)<br>1           | O.G. Print Figure<br>4A |



|                                                                                                              |                                                |                                                                    |
|--------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------|
| <b>Search Notes</b><br><br> | <b>Application/Control No.</b><br><br>13208360 | <b>Applicant(s)/Patent Under Reexamination</b><br><br>CHANG ET AL. |
|                                                                                                              | <b>Examiner</b><br><br>FAZLI ERDEM             | <b>Art Unit</b><br><br>2826                                        |

| CPC- SEARCHED |      |          |
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| CPC COMBINATION SETS - SEARCHED |      |          |
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| US CLASSIFICATION SEARCHED |          |      |          |
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| Class                      | Subclass | Date | Examiner |
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| SEARCH NOTES                                                                         |            |          |
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| Search Notes                                                                         | Date       | Examiner |
| Assignee is searched                                                                 | 03/19/2013 | FE       |
| Inventors are searched                                                               | 03/19/2013 | FE       |
| EAST Text Search history is attached                                                 | 03/19/2013 | FE       |
| Searched 257/43, 59, 72, E29.296 limited with text search                            | 03/19/2013 | FE       |
| Assignee is searched                                                                 | 9/3/2013   | FE       |
| Inventors are searched                                                               | 9/3/2013   | FE       |
| Searched 257/43, 59, 72, E29.291, E29.294, E29.296, E29.003 limited with text search | 9/3/2013   | FE       |
| Searched 349/43, 44 limited with text search                                         | 9/3/2013   | FE       |

| INTERFERENCE SEARCH     |                         |          |          |
|-------------------------|-------------------------|----------|----------|
| US Class/<br>CPC Symbol | US Subclass / CPC Group | Date     | Examiner |
| 257                     | 43, 59, 72              | 9/3/2013 | FE       |
| 349                     | 43, 44                  | 9/3/2013 | FE       |

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## BIB DATA SHEET

CONFIRMATION NO. 7890

| SERIAL NUMBER                                                                                                                                                                                                                                                                                | FILING or 371(c)<br>DATE                                                                                          | CLASS                                                    | GROUP ART UNIT                    | ATTORNEY DOCKET<br>NO.                                                                                                                                                                                                                                                    |                                           |                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------|
| 13/208,360                                                                                                                                                                                                                                                                                   | 08/12/2011                                                                                                        | 257                                                      | 2826                              | 37986-US-PA                                                                                                                                                                                                                                                               |                                           |                                |
| <b>APPLICANTS</b><br>Chih-Pang Chang, Taipei City, TAIWAN;<br>Hsing-Hung Hsieh, Changhua County, TAIWAN;<br><b>** CONTINUING DATA *****</b><br><b>** FOREIGN APPLICATIONS *****</b><br>TAIWAN 100118144 05/24/2011<br><b>** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **</b><br>08/22/2011 |                                                                                                                   |                                                          |                                   |                                                                                                                                                                                                                                                                           |                                           |                                |
| Foreign Priority claimed <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br>35 USC 119(a-d) conditions met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br>Verified and Acknowledged <u>/FAZLI ERDEM/</u><br>Examiner's Signature                 |                                                                                                                   | <input type="checkbox"/> Met after Allowance<br>Initials | <b>STATE OR COUNTRY</b><br>TAIWAN | <b>SHEETS DRAWINGS</b><br>5                                                                                                                                                                                                                                               | <b>TOTAL CLAIMS</b><br><del>=16</del> =18 | <b>INDEPENDENT CLAIMS</b><br>2 |
| <b>ADDRESS</b><br>JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE<br>7 FLOOR-1, NO. 100<br>ROOSEVELT ROAD, SECTION 2<br>TAIPEI, 100<br>TAIWAN                                                                                                                                                       |                                                                                                                   |                                                          |                                   |                                                                                                                                                                                                                                                                           |                                           |                                |
| <b>TITLE</b><br>SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE                                                                                                                                                                                                               |                                                                                                                   |                                                          |                                   |                                                                                                                                                                                                                                                                           |                                           |                                |
| <b>FILING FEE RECEIVED</b><br>1090                                                                                                                                                                                                                                                           | FEES: Authority has been given in Paper<br>No. _____ to charge/credit DEPOSIT ACCOUNT<br>No. _____ for following: |                                                          |                                   | <input type="checkbox"/> All Fees<br><input type="checkbox"/> 1.16 Fees (Filing)<br><input type="checkbox"/> 1.17 Fees (Processing Ext. of time)<br><input type="checkbox"/> 1.18 Fees (Issue)<br><input type="checkbox"/> Other _____<br><input type="checkbox"/> Credit |                                           |                                |

**EAST Search History****EAST Search History (Interference)**

| <b>Ref #</b> | <b>Hits</b> | <b>Search Query</b>                                                                                                                                                                                                                                                           | <b>DBs</b>                  | <b>Default Operator</b> | <b>Plurals</b> | <b>Time Stamp</b> |
|--------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------------|----------------|-------------------|
| L56          | 13639       | 257/43.ccls. or 257/59.ccls. or 257/72.ccls. or 349/43.ccls. or 349/44.ccls.                                                                                                                                                                                                  | US-PGPUB;<br>USPAT;<br>UPAD | OR                      | ON             | 2013/09/03 10:04  |
| L57          | 11          | l56 and (conductive or conducting or shield or shielding or shielded or block or blocking or blocked or shade or shading or prevent or preventing or prevention or preventive) near2 light near10 drain same (overlap or overlapping or overlapped) same (distance or length) | US-PGPUB;<br>USPAT;<br>UPAD | OR                      | ON             | 2013/09/03 10:04  |
| L58          | 11          | l57 and (overlap or overlapping or overlapped).ti,ab,clm.                                                                                                                                                                                                                     | US-PGPUB;<br>USPAT;<br>UPAD | OR                      | ON             | 2013/09/03 10:04  |

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# PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE  
**Commissioner for Patents**  
**P.O. Box 1450**  
**Alexandria, Virginia 22313-1450**  
**or Fax** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

31561 7590 09/16/2013  
**JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE**  
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**TAIWAN**

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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

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| (Depositor's name) |
| (Signature)        |
| (Date)             |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 13/208,360      | 08/12/2011  | Chih-Pang Chang      | 37986-US-PA         | 7890             |

TITLE OF INVENTION: SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE

| APPLN. TYPE    | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|---------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | UNDISCOUNTED  | \$1780        | \$300               | \$0                  | \$2080           | 12/16/2013 |

| EXAMINER     | ART UNIT | CLASS-SUBCLASS |
|--------------|----------|----------------|
| ERDEM, FAZLI | 2826     | 257-043000     |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.  
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,  
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 \_\_\_\_\_  
2 **Jiang Chyun IP Office**  
3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

**Au Optonics Corporation**

(B) RESIDENCE: (CITY AND STATE OR COUNTRY)

**Hsinchu, Taiwan, R.O.C.**

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

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5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

**NOTE:** Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

**NOTE:** If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

**NOTE:** Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

**NOTE:** The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature / Belinda Lee /

Date OCT 31 2013

Typed or printed name Belinda Lee

Registration No. 46,863

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| Electronic Patent Application Fee Transmittal |          |                                                                |        |                      |
|-----------------------------------------------|----------|----------------------------------------------------------------|--------|----------------------|
| Application Number:                           |          | 13208360                                                       |        |                      |
| Filing Date:                                  |          | 12-Aug-2011                                                    |        |                      |
| Title of Invention:                           |          | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |        |                      |
| First Named Inventor/Applicant Name:          |          | Chih-Pang Chang                                                |        |                      |
| Filer:                                        |          | Belinda Lee/Doris Huang                                        |        |                      |
| Attorney Docket Number:                       |          | 37986-US-PA                                                    |        |                      |
| Filed as Large Entity                         |          |                                                                |        |                      |
| Utility under 35 USC 111(a) Filing Fees       |          |                                                                |        |                      |
| Description                                   | Fee Code | Quantity                                                       | Amount | Sub-Total in USD(\$) |
| Basic Filing:                                 |          |                                                                |        |                      |
| Pages:                                        |          |                                                                |        |                      |
| Claims:                                       |          |                                                                |        |                      |
| Miscellaneous-Filing:                         |          |                                                                |        |                      |
| Petition:                                     |          |                                                                |        |                      |
| Patent-Appeals-and-Interference:              |          |                                                                |        |                      |
| Post-Allowance-and-Post-Issuance:             |          |                                                                |        |                      |
| Utility Appl Issue Fee                        | 1501     | 1                                                              | 1780   | 1780                 |
| Publ. Fee- Early, Voluntary, or Normal        | 1504     | 1                                                              | 300    | 300                  |

| Description        | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|--------------------|----------|----------|--------|----------------------|
| Extension-of-Time: |          |          |        |                      |
| Miscellaneous:     |          |          |        |                      |
| Total in USD (\$)  |          |          |        | 2080                 |

| Electronic Acknowledgement Receipt          |                                                                |
|---------------------------------------------|----------------------------------------------------------------|
| <b>EFS ID:</b>                              | 17287206                                                       |
| <b>Application Number:</b>                  | 13208360                                                       |
| <b>International Application Number:</b>    |                                                                |
| <b>Confirmation Number:</b>                 | 7890                                                           |
| <b>Title of Invention:</b>                  | SEMICONDUCTOR STRUCTURE AND ORGANIC ELECTROLUMINESCENCE DEVICE |
| <b>First Named Inventor/Applicant Name:</b> | Chih-Pang Chang                                                |
| <b>Customer Number:</b>                     | 31561                                                          |
| <b>Filer:</b>                               | Belinda Lee                                                    |
| <b>Filer Authorized By:</b>                 |                                                                |
| <b>Attorney Docket Number:</b>              | 37986-US-PA                                                    |
| <b>Receipt Date:</b>                        | 03-NOV-2013                                                    |
| <b>Filing Date:</b>                         | 12-AUG-2011                                                    |
| <b>Time Stamp:</b>                          | 22:16:28                                                       |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)                                    |

### Payment information:

|                                                                                                                                                                                                                                                                                                                   |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Submitted with Payment                                                                                                                                                                                                                                                                                            | yes             |
| Payment Type                                                                                                                                                                                                                                                                                                      | Deposit Account |
| Payment was successfully received in RAM                                                                                                                                                                                                                                                                          | \$ 2080         |
| RAM confirmation Number                                                                                                                                                                                                                                                                                           | 8065            |
| Deposit Account                                                                                                                                                                                                                                                                                                   | 502620          |
| Authorized User                                                                                                                                                                                                                                                                                                   |                 |
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# File Listing:

| Document Number | Document Description        | File Name      | File Size(Bytes)/ Message Digest                  | Multi Part /.zip | Pages (if appl.) |
|-----------------|-----------------------------|----------------|---------------------------------------------------|------------------|------------------|
| 1               | Issue Fee Payment (PTO-85B) | 37986usFee.pdf | 98870<br>03c67bd8b121f9dd85e1dead7251dfeff9d842c1 | no               | 2                |

## Warnings:

## Information:

|   |                      |              |                                                  |    |   |
|---|----------------------|--------------|--------------------------------------------------|----|---|
| 2 | Fee Worksheet (SB06) | fee-info.pdf | 31989<br>255d59e973fc52f46ada44cd1cd1e554cf97d1f | no | 2 |
|---|----------------------|--------------|--------------------------------------------------|----|---|

## Warnings:

## Information:

Total Files Size (in bytes): 130859

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### New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

### National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

### New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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| APPLICATION NO. | ISSUE DATE | PATENT NO. | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|------------|------------|---------------------|------------------|
| 13/208,360      | 12/10/2013 | 8604471    | 37986-US-PA         | 7890             |

31561 7590 11/20/2013  
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN

## ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

### **Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)** (application filed on or after May 29, 2000)

The Patent Term Adjustment is 168 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Chih-Pang Chang, Taipei City, TAIWAN;  
Hsing-Hung Hsieh, Changhua County, TAIWAN;

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