Claims

Claim 1

An electroluminescent substrate comprising:

a gate insulating film;

a transistor;

an electroluminescent element;

a capacitor section; and

a protective layer,

a semiconductor layer of the transistor, a lower part electrode of the electroluminescent element, and an upper part electrode of the capacitor section being provided on the gate insulating film, and the protective layer being provided over the semiconductor layer, the lower part electrode, and the upper part electrode,

the protective layer having an opening through which the lower part electrode and the upper part electrode are exposed,

the semiconductor layer being an oxide semiconductor layer, and

each of the lower part electrode and the upper part electrode being a reduction electrode of the oxide semiconductor layer provided.

Claim 2

The electroluminescent substrate as set forth in claim 1, wherein:

a gate electrode of the transistor has a transparent conductive layer and a metal layer; and

the transparent conductive layer and a lower part electrode of the capacitor section are provided on a same plane and are made of a same material.

Claim 3

The electroluminescent substrate as set forth in claim 2, wherein:

an electrode, which is made of a material identical with that of an upper part electrode of the electroluminescent element, is provided on the upper part electrode of the capacitor section via a luminescent layer.

Claim 4

The electroluminescent substrate as set forth in claim 1, wherein:

a gate electrode of the transistor and a lower part electrode of the capacitor section are respective metal layers which are provided on a same plane and are made of a same material.

Claim 5

The electroluminescent substrate as set forth in any one of claims 1 through 4, wherein:

the lower part electrode of the electroluminescent element is integrated with the semiconductor layer of the transistor which is connected with the electroluminescent element.

Claim 6

The electroluminescent substrate as set forth in any one of claims 1 through 5, wherein:

the transistor has a top contact structure in which a source electrode and a drain electrode are provided on the semiconductor layer; and

one of the source electrode and the drain electrode of the transistor, which is connected with the electroluminescent element, is making contact with an upper surface end of the lower part electrode of the electroluminescent element.

Claim 7

The electroluminescent substrate as set forth in any one of claims 1 through 5, wherein:

the transistor has a bottom contact structure in

which the semiconductor layer is provided on the gate insulating film so as to cover a source electrode and a drain electrode; and

the lower part electrode of the electroluminescent element is making contact with a lateral surface of one of the source electrode and the drain electrode of the transistor which is connected with the electroluminescent element.

Claim 8

An electroluminescent display panel comprising an electroluminescent substrate recited in any one of claims 1 through 7.

Claim 9

An electroluminescent display device comprising an electroluminescent substrate recited in any one of claims 1 through 7.

Claim 10

A method for producing an electroluminescent substrate, said method comprising the steps of:

(A) forming an oxide semiconductor layer on a gate insulating film;

(B) shaping the oxide semiconductor layer into a pattern that corresponds to a semiconductor layer of a transistor, a lower part electrode of an electroluminescent element, and an upper part electrode of a capacitor section;

(C) forming a protective film over the pattern of the oxide semiconductor layer, the protective film having an opening through which a part of the pattern, which part corresponds to the lower part electrode and the upper part electrode, is exposed; and

(D) forming the lower part electrode and the upper part electrode, which are made of a reduction electrode of the oxide semiconductor layer, by reducing the part of the pattern, which part corresponds to the lower part electrode and the upper part electrode, while using the protective film as a mask.

Claim 11

The method as set forth in claim 10, further comprising the steps of:

(E) stacking a transparent conductive layer and a metal layer on a substrate in this order;

(F) forming (i) a gate electrode of the transistor from the transparent conductive layer and the metal layer and (ii) a lower part electrode of the capacitor section from the

transparent conductive layer by (i) forming a photoresist on the metal layer, (ii) forming a photoresist pattern by carrying out half-tone exposure with respect to the photoresist, and then (iii) carrying out ashing and etching, the photoresist pattern being formed in a formation region of the gate electrode and in a formation region of the lower part electrode of the capacitor section and having a thickness which is greater in the formation region of the gate electrode than in the formation region of the lower part electrode of the capacitor section; and

(G) forming a gate insulating film on the substrate so that the gate insulating film covers the gate electrode and the lower part electrode of the capacitor section,

the steps (E), (F), and (G) being carried out before the step (A).

Claim 12

The method as set forth in claim 11, further comprising the steps of:

(H) forming a luminescent layer on the lower part electrode of the electroluminescent element and the upper part electrode of the capacitor section; and

(I) forming (i) a first electrode pattern that faces the lower part electrode of the electroluminescent element via

the luminescent layer and (ii) a second electrode pattern that faces the upper part electrode of the capacitor section via the luminescent layer by stacking a transparent conductive film on the luminescent layer and patterning the transparent conductive film, the first electrode pattern serving as an upper part electrode of the electroluminescent element.

Claim 13

The method as set forth in claim 10, further comprising the steps of:

(J) forming a metal layer on a substrate;

(K) shaping the metal layer into a pattern that corresponds to a gate electrode of the transistor and a lower part electrode of the capacitor section; and

(L) forming a gate insulating film on the substrate so that the gate insulating film covers the gate electrode and the lower part electrode of the capacitor section,

the steps (J), (K), and (L) being carried out before the step (A).

Claim 14

The method as set forth in any one of claims 10 through 13, wherein:

in the step (B), a pattern corresponding to the lower part electrode of the electroluminescent element and a pattern corresponding to the semiconductor layer of the transistor, which is connected with the electroluminescent element, are formed integrally; and

said method further comprises the step of (M) forming one of a source electrode and a drain electrode of the transistor, which is connected with the electroluminescent element, such that the one of the source electrode and the drain electrode covers an end of a part of the pattern of the oxide semiconductor layer which part corresponds to the lower part electrode of the electroluminescent element, the step (M) being carried out before the step (C).

Claim 15

The method as set forth in any one of claims 10 through 13, further comprising the step of:

(N) forming a pattern of a source electrode and a drain electrode on a part of the pattern of the oxide semiconductor layer, which part corresponds to the semiconductor layer of the transistor, such that one of the source electrode and the drain electrode makes contact with an upper surface end of a part of the pattern of the

oxide semiconductor layer which part corresponds to the lower part electrode of the electroluminescent element, the step (N) being carried out before the step (C).

Claim 16

The method as set forth in any one of claims 10 through 13, further comprising the step of:

(O) forming a pattern of a source electrode and a drain electrode on the gate insulating film, the step (O) being carried out before the step (A),

in the step (A), the oxide semiconductor layer being formed on the gate insulating film so that the oxide semiconductor layer covers the source electrode and the drain electrode,

in the step (B), a pattern corresponding to the lower part electrode of the electroluminescent element and a pattern corresponding to the semiconductor layer of the transistor, which is connected with the electroluminescent element, being formed integrally, and

in the step (C), the protective film being formed such that, when viewed from above, an end part of the opening, through which a part of the pattern of the oxide semiconductor layer which part corresponds to the lower part electrode of the electroluminescent element is exposed,

overlaps with an end part of one of the source electrode and the drain electrode which one is electrically connected with the lower part electrode of the electroluminescent element.