Claims

1. An active-matrix substrate comprising:

a plurality of data lines;

a plurality of lines crossing the plurality of data lines and including at least gate lines;

a plurality of control signal lines provided in a display region that includes pixel regions defined by the data lines and the gate lines, the plurality of control signal lines being provided with a control signal from outside the display region; and

a driving circuit including a plurality of switching elements connected to the plurality of the control signal lines, the driving circuit being connected with at least one of the gate lines and applying one of a selection voltage and a non-selection voltage to the at least one of the gate lines by driving the plurality of the switching elements in response to the control signal supplied via the plurality of the control signal lines,

wherein at least one of the plurality of switching elements is located in the pixel regions,

wherein the active-matrix substrate further comprises:

a pixel electrode in the pixel regions, and

a shield layer made of conductive film provided between portions of the plurality of the control signal lines overlapping the pixel electrode and the pixel electrode.

2. The active-matrix substrate according to claim 1, wherein the shield layer also is provided between the switching elements located in the pixel region and the pixel electrode.

3. The active-matrix substrate according to claim 1, further comprising: a pixel electrode located in one of the pixel regions and connected with one of the gate lines and one of the data lines,

wherein one of the switching elements of the driving circuit that is located in the pixel region is disposed so as not to overlie the pixel electrode.

4. The active-matrix substrate according to any one of claims 1 to 3, wherein an adjustment line is further provided in a pixel region in which the

switching element of the driving circuit is not provided such that this pixel region has an aperture ratio substantially equal to that of a pixel region in which a switching element of the driving circuit is provided.

5. The active-matrix substrate according to any one of claims 1 to 4, further comprising:

a first insulating layer located between a gate line layer forming the gate lines and a data line layer forming the data lines;

a second insulating layer having a greater thickness than the first insulating layer and provided on the data line layer and including a contact hole extending therethrough to the data line layer; and

a conductive layer portion provided in the contact hole,

wherein the control signal lines are disposed in the data line layer so as to be generally parallel to the data lines in the pixel regions,

wherein the control signal lines are interrupted at locations overlying the gate lines, and

wherein interrupted portions of each of the control signal lines are connected via the conductive layer portion in the contact hole of the second insulating layer.

6. The active-matrix substrate according to any one of claims 1 to 5, wherein at least a portion of the control signal line is disposed to be generally parallel to the data lines and located at generally the same distance from two data lines in the pixel region.

7. The active-matrix substrate according to any one of claims 1 to 6, further comprising: a pixel switching element located in one of the pixel regions and connected with one of the data lines and one of the gate lines,

wherein the gate line has portions with a width smaller than the maximum width of the gate line, one of these portions being located between the point on the gate line to which a gate terminal of the pixel switching element is connected and the intersection of the data line and the gate line, and the other one of the portions being located near the intersection of a portion of the gate line to which the gate terminal is not connected and the data line.

8. The active-matrix substrate according to any one of claims 1 to 7, wherein a pixel region in which a switching element of the driving circuit is provided has a lager dimension in a direction in which at least one of the gate line and the data line extends than other pixel regions.

9. The active-matrix substrate according to any one of claims 1 to 8, further comprising an auxiliary capacitance electrode,

an outer auxiliary capacitance line located outside the display region and connected with the auxiliary capacitance electrode for supplying a predetermined potential to the auxiliary capacitance electrode; and

a low-impedance line located in the pixel region and connected with the auxiliary capacitance electrode in the pixel regions and connected with the outer auxiliary capacitance line.

10. The active-matrix substrate according to any one of claims 1 to 9, wherein a plurality of driving circuits are provided, each for one of the gate lines.

11. The active-matrix substrate according to any one of claims 1 to 10, wherein the display region is divided into a plurality of sub-regions arranged in a direction in which the gate lines are arranged, and a driving circuit provided for a gate line disposed in each of the plurality of sub-regions applies one of a selection voltage and a non-selection voltage to the gate line at a frequency that is specified for the sub-region.

12. The active-matrix substrate according to any one of claims 1 to 11, wherein the pixel region corresponds to one of a plurality of colors, and the control signal lines are provided in a pixel region corresponding to one of the plurality of colors.

13. The active-matrix substrate according to any one of claims 1 to 12, further comprising:

a first terminal located outside the display region for supplying a data signal to the plurality of data lines; and

a second terminal located outside the display region for supplying the control signal to the plurality of the control signal lines,

wherein the first and second terminals are located outside a side of the display region that is parallel to the gate lines.

14. The active-matrix substrate according to any one of claims 1 to 13, wherein

N gate lines (N is a natural number) are provided as the plurality of the gate lines,

M driving circuits (M is a natural number, $M \geqq 2$) consisting of a first to Mth driving circuits, are provided for each of the gate lines,

the M driving circuits provided for the nth gate line ($1 \leqq n \leqq N$) apply a selection voltage to the nth gate line in the order beginning with the first driving circuit and ending with the Mth driving circuit, the second one of the M driving circuits to the Mth drive circuit apply the selection voltage to the nth gate line at a time point at which the preceding driving circuit applies the selection voltage to the n+1th gate line, and

a data signal is supplied to one of the data lines at a time point at which the Mth driving circuit applies the selection voltage to the nth gate line, the data signal being for an image to be written to the pixel region defined by the nth gate line and said one of the data line.

15. The active-matrix substrate according to any one of claims 1 to 13, wherein the pixel region includes a plurality of sub-pixel regions,

the lines include the gate lines and sub-gate lines,

one of the sub-pixel regions includes a sub-pixel electrode driven by one of the gate lines and one of the data lines,

the other one of the sub-pixel regions includes a sub-pixel electrode driven by one of the sub-gate lines and said one of the data lines and a capacitor connected between the sub-pixel electrode in the other one of the sub-pixel regions and the pixel electrode in the one of the sub-pixel regions,

the driving circuit includes a sub-gate line driver located in a pixel region in which the switching element is not provided, and provided for one of the sub-gate lines for applying one of the selection voltage and the non-selection voltage to the sub-gate line in response to the control signal, and

the sub-gate line driver applies the selection voltage to the sub-gate line in one horizontal interval after the selection voltage is applied to the

gate line.

16. The active-matrix substrate according to any one of claims 1 to 13, wherein the pixel region includes a plurality of sub-pixel regions,

the lines include the gate lines, sub-gate lines and auxiliary capacitance lines,

the plurality of sub-pixel regions each include a sub-pixel electrode driven by one of the gate lines and one of the data lines,

one of the sub-pixel regions includes an auxiliary capacitance connected with one of the auxiliary capacitance lines, and a sub-pixel switching element including a gate terminal connected with one of the sub-gate lines, a source terminal connected with the sub-pixel electrode in the one of the sub-pixel regions, and a drain terminal connected with the auxiliary capacitance,

the driving circuit includes a sub-gate line driver located in a pixel region in which the switching element is not provided, and provided for one of the sub-gate lines for applying one of the selection voltage and the non-selection voltages to the sub-gate line, and

the sub-gate line driver applies the selection voltage to the sub-gate line in response to the control signal after the selection voltage is applied to the gate line.

17. The active-matrix substrate according to any one of claims 1 to 13, wherein the pixel region includes a plurality of sub-pixel regions,

the lines include the gate lines, first auxiliary capacitance lines and second auxiliary capacitance lines,

the plurality of sub-pixel regions each include a sub-pixel electrode driven by one of the gate lines and one of the data lines,

one of the sub-pixel regions includes a first auxiliary capacitance connected with the sub-pixel electrode in the one of the sub-pixel region and one of the first auxiliary capacitance lines,

the other one of the sub-pixel regions includes a second auxiliary capacitance connected with the sub-pixel electrode in the other one of the sub-pixel regions and one of the second auxiliary capacitance line,

the driving circuit includes an auxiliary capacitance line control element provided inside the display region for controlling a potential of the

first auxiliary capacitance line and a potential of the second auxiliary capacitance line, and

the auxiliary capacitance line control element applies voltages to the first auxiliary capacitance line and the second auxiliary capacitance line such that the potential of the first auxiliary capacitance line and the potential of the second auxiliary capacitance line have opposite phases after the selection voltage is applied to the gate line.

18. The active-matrix substrate according to any one of claims 1 to 13, wherein the lines include the gate lines and auxiliary capacitance lines,

the pixel region includes an auxiliary capacitance connected with the pixel electrode and one of the auxiliary capacitance lines,

the driving circuit includes auxiliary capacitance line drivers each provided for one of the auxiliary capacitance lines, and

the auxiliary capacitance line driver applies a voltage with the same polarity as the voltage on the data line to the auxiliary capacitance line in response to the control signal.

19. The active-matrix substrate according to any one of claims 1 to 10, 13 and 15-18 wherein the driving circuit is provided in each of K regions (K is a natural number, $K \geqq 2$) arranged in a direction in which the gate lines of the display region extend, each driving circuit being provided for every K gate lines, driving circuits being provided on different gate lines in different regions.

20. The active-matrix substrate according to any one of claims 1 to 14, wherein the lines include the gate lines and common electrode lines,

the pixel region includes an auxiliary capacitance connected with the pixel electrode and one of the common electrode lines,

the driving circuit includes common electrode drivers each located in a pixel region in which the switching element is not provided, and provided for one of the common electrode lines, and

the common electrode driver applies to the common electrode line a voltage with a polarity opposite that of the potential of the data line in response to the control signal.

21. The active-matrix substrate according to claim 20, wherein the driving circuit is provided in each of K regions (K is a natural number, $K \geqq 2$) arranged in a direction in which the gate lines of the display region extend, each driving circuit being provided for every K gate lines, driving circuits being provided on different gate lines in different regions.

22. A display panel comprising:

the active-matrix substrate according to any one of claims 1 to 19;

a counter-substrate having a color filters and a counter-substrate; and

a liquid crystal layer sandwiched between the active-matrix substrate and the counter-substrate.

23. A display panel comprising:

the active-matrix substrate according to any one of claims 1 to 14 and 19-21;

a counter-substrate having a color filter; and

a liquid crystal layer sandwiched between the active-matrix substrate and the counter-substrate.

24. The display panel according to any one of claims 22 to 23, wherein at least one element of the driving circuit is provided on the active-matrix substrate in a dark-line region that is produced depending on orientation in the liquid crystal layer within the pixel region.

25. A display device comprising:

the display panel according to any one of claims 22 to 24; and

a housing containing the display panel,

the housing including a first cover portion located to overlie a portion of a picture frame region of the display panel and a portion of the display region and having a lens with a viewer's side that is curved in shape, and a second cover portion covering at least a side of the display panel.