[CLAIMS]

1. A field-effect transistor comprising:

a semiconductor film formed on a base;

a gate insulating film formed on a part of the semiconductor film;

a gate electrode including a plurality of layers formed on the gate insulating film; and

a source electrode and a drain electrode formed in contact with the semiconductor film,

wherein

widths of some of the plurality of layers become narrower layer-by-layer toward the gate insulating film, and

a width of the gate insulating film (13) is wider than the width of at least one of the plurality of layers (141, 142) of the gate electrode such that an outer edge portion of an upper surface of the gate insulating film protrudes from a periphery of the narrowest layer of the gate electrode,

a thickness of the source electrode and the drain electrode is smaller than a thickness of the gate insulating film, and

the gate insulating film includes a region

that is not in contact with the source electrode or the drain electrode.

2. A field-effect transistor comprising:

a semiconductor film formed on a base;

a gate insulating film formed on a part of the semiconductor film;

a gate electrode including a plurality of layers formed on the gate insulating film; and

a source electrode and a drain electrode formed in contact with the semiconductor film,

wherein

widths of some of the plurality of layers become narrower layer by layer toward the gate insulating film, and

a width of the gate insulating film (13) is wider than the width of at least one of the plurality of layers (141, 142) of the gate electrode such that an outer edge portion of an upper surface of the gate insulating film protrudes from a periphery of the narrowest layer of the gate electrode

a thickness of the source electrode and the drain electrode is smaller than a total thickness of the gate insulating film and the gate

electrode excluding an uppermost layer, and

the gate insulating film includes a region that is not in contact with the source electrode or the drain electrode.

3. The field-effect transistor according to claim 1 or 2, wherein the semiconductor film includes an oxide semiconductor.

4. A display element comprising:

a driving circuit; and

a light control element configured to control light output in accordance with a driving signal from the driving circuit,

wherein the light control element is driven by the field-effect transistor according to any one of claims 1 to 3.

5. The display element according to claim 4, wherein the light control element is an electroluminescent element, an electrochromic element, a liquid crystal element, an electrophoretic element, or an electrowetting element.

6. A display device comprising:

a display unit in which a plurality of display elements are arranged, each of the plurality of display elements being the display element according to claim 4 or 5, and

a display control unit configured to control the plurality of display elements individually.

7. The field-effect transistor according to any one of claims 1 to 6, comprising a conductive film formed on the gate electrode and made of the same material as a material of the source electrode and the drain electrode.

8. A system comprising:

the display device according to claim 6; and

an image data generating device configured to supply image data to the display device.

9. A method for producing a field-effect transistor, comprising:

forming a semiconductor film on a base;

forming a gate insulating film on a part

of the semiconductor film;

forming a gate electrode including a plurality of conductive films on the gate insulating film;

patterning the gate electrode and the gate insulating film by etching using a same mask; and

forming a source electrode and a drain electrode in contact with the semiconductor film,

wherein, in the patterning, etching is performed such that:

widths of some of the plurality of conductive films become narrower layer-by-layer toward the gate insulating film, and

a width of the gate insulating film (13) is wider than the width of at least one of the plurality of conductive films (141, 142) of the gate electrode such that an outer edge portion of an upper surface of the gate insulating film protrudes from a periphery of the narrowest conductive film of the gate electrode,

wherein, in the forming of the source electrode and the drain electrode, the source electrode and the drain electrode are formed such that a thickness of the source electrode and the drain electrode is smaller than a

thickness of the gate insulating film, and the gate insulating film has a region that is not in contact with either the source electrode or the drain electrode.

10. The method for producing a field-effect transistor according to claim 9, wherein, in the forming of the source electrode and the drain electrode, a conductive film made of the same material as a material of the source electrode and the drain electrode is formed on the gate electrode.

11. The method for producing a field-effect transistor according to claim 9 or 10, wherein

in the forming of the source electrode and the drain electrode, the plurality of conductive films are laminated on the gate insulating film.

12. The method of any one of claims 9 to 11, wherein the gate electrode (14) is formed of aluminum (Al), molybdenum (Mo), or an alloy containing one of Al and Mo, the gate electrode is configured to be etched by using a PAN (phosphoric-acetic-nitric-acid) based etching solution.

13. The method of any one of claims 9 to 12, wherein the gate insulating film (13) is an oxide film containing at least a Group A element and a Group B element, the gate insulating film is configured to be etched by using an etching solution containing at least any one of hydrochloric acid, oxalic acid, nitric acid, phosphoric acid, acetic acid, sulfuric acid, and hydrogen peroxide, wherein the Group A element is an alkaline earth metal and the Group B element is at least one of gallium (Ga), scandium (Sc), yttrium (Y), and a lanthanoid excluding cerium (Ce).

14. The method of any one of claims 9 to 12, wherein the gate insulating film is an oxide film containing Si, the gate insulating film is configured to be etched by using an etching solution containing at least any one of hydrofluoric acid, ammonium fluoride, hydrogen fluoride ammonium, and organic alkali.