Claims

What is claimed is:

1. A pixel unit structure, comprising:

   a display medium module comprising a first electrode, a second electrode and a display medium, wherein the first electrode and the second electrode are separated from each other, and the display medium is disposed between the first electrode and the second electrode; and

   an active switching element electrically connected to the first electrode for allowing the first electrode and the second electrode to change the state of the display medium, wherein the active switching element comprises a wafer portion and a transistor portion with the transistor portion formed on the wafer portion, and the wafer portion is part of a silicon wafer, gallium arsenide wafer, sapphire wafer, indium phosphide wafer or gallium nitride wafer wherein elements of the pixel unit structure is not connected and integrated to any elements of another pixel unit structure.

2. The pixel unit structure of claim 1, wherein the display medium module further comprises a first substrate and a second substrate, which are disposed facing each other and separated from each other; wherein the first electrode is disposed on the first substrate and the second electrode is disposed on the first substrate or the second substrate; wherein the active switching element is disposed on the first substrate and/or the second substrate.

3. The pixel unit structure of claim 2, wherein the first substrate or the second substrate is made of at least one of transparent material, opaque material, flexible material, rigid material, metallic material, ceramic material, insulating material, metal compound material, metal alloy material, organic material, inorganic material, composite material and semiconductor material.

4. The pixel unit structure of claim 1, further comprising a package carrier, therein is packaged the active switching element.
5. The pixel unit structure of claim 4, further comprising a functional element packaged in the package carrier, the functional element comprising at least one of a displacement sensing functional element, a hygrothermal sensing functional element, an acoustic sensing functional element, an electromagnetic sensing functional element, a touch sensing functional element, an image capturing functional element, a memory functional element, a control functional element, a wireless communication functional element, a passive functional element, a self-luminous functional element and a photovoltaic functional element.
6. The pixel unit structure of claim 3, further comprising a functional element disposed on the first substrate and/or the second substrate, the functional element comprising at least one of a displacement sensing functional element, a hygrothermal sensing functional element, an acoustic sensing functional element, an electromagnetic sensing functional element, a touch sensing functional element, an image capturing functional element, a memory functional element, a control functional element, a wireless communication functional element, a passive functional element, a self-luminous functional element and a photovoltaic functional element.
7. The pixel unit structure of claim 2, wherein the first substrate and/or the second substrate comprise a concave groove or a through hole, and the active switching element is disposed in the concave groove or the through hole.
8. The pixel unit structure of claim 1, further comprising a carrier board, wherein the display medium module is disposed on the carrier board and the active switching element is disposed on the carrier board.
9. The pixel unit structure of claim 8, wherein the carrier board includes a concave groove or a through hole and the active

switching element is disposed in the concave groove or the through hole.

10. The pixel unit structure of claim 8, further comprising a control signal line and a data signal line, wherein the control signal line and the data signal line are formed on the carrier board and electrically connected to the active switching element.
11. The pixel unit structure of claim 2, further comprising a control signal line and a data signal line, wherein the control signal line and the data signal line are formed on the first substrate and/or the second substrate of the display medium module and electrically connected to the active switching element.
12. The pixel unit structure of claim 1, wherein the display medium module further comprises an optical element optically coupled with the display medium and the optical element comprises at least one of a convex lens, a concave lens and an optical prism.
13. The pixel unit structure of claim 1, wherein the display medium comprises at least one of self-luminous medium material, non-self-luminous medium material, light-filtering material, electric conductive material, insulating material, light absorbing material, light reflecting material, photorefractive material, light deflecting material and light diffusing material.
14. The pixel unit structure of claim 13, wherein the non-self-luminous medium material comprises at least one of electrophoretic material, electric fluid material, liquid crystal material, micro electromechanical reflective material, electrowetting material, electric ink material, magnetic fluid material, electrochromic material, electromorphous material and thermochromic material; the self-luminous medium material may include at least one of electroluminescent material, photoluminescent material, cathodoluminescent material, field emissive luminescent material, vacuum fluorescent material and light-emitting diode material.

15. A display device, comprising at least a pixel unit structure of claim 1 and a housing structure, wherein the pixel unit structure is disposed in the housing structure.
16. The display device of claim 15, further comprising a light source module, which is disposed in the housing structure and positioned on any side of the display medium module of the pixel unit structure.
17. A method of manufacturing pixel unit structures, comprising:
manufacturing an active switching element in advance, the active switching element comprising a wafer portion and a transistor portion with the transistor portion formed physically contacting the wafer portion, and the wafer portion is part of a silicon wafer, gallium arsenide wafer, sapphire wafer, indium phosphide wafer or gallium nitride wafer; and
assembling the active switching element on a display medium module such that elements of one of the pixel unit structures is not connected and integrated to any elements of another pixel unit structure;
wherein the display medium module comprises a first electrode, a second electrode and a display medium, the first electrode and the second electrode are separated from each other, the display medium is disposed between the first electrode and the second electrode, and the active switching element includes a chip part and a transistor portion with the transistor portion formed on the chip part; and
wherein the active switching element is electrically connected to the first electrode for allowing the first electrode and the second electrode to change the state of the display medium.
18. The method of manufacturing pixel unit structures of claim 17, wherein the active switching element is manufactured on a wafer by a semiconductor manufacturing process.
19. The method of manufacturing pixel unit structures of claim 18, wherein the active switching element is packaged in a package carrier before being assembled on the display medium module.

20. The method of manufacturing pixel unit structures of claim 19, further comprising: package a functional element in the package carrier along with the active switching element.