Claims

1. A micro-LED pixel unit for a display panel, comprising:

a first LED structure that emits a first color, formed on an IC substrate;

a first transparent dielectric bonding layer having a first flat top surface, covering the first LED structure;

a second LED structure that emits a second color, formed on the first flat top surface of the first transparent dielectric bonding layer;

a second transparent dielectric bonding layer having a second flat top surface, covering the second LED structure; and

a top electrode layer, covering the micro-LED pixel unit and electrically contacting with the first LED structure and the second LED structure;

wherein the IC substrate is electrically connected with the first LED structure and the second LED structure, and

wherein the first LED structure is embedded within a first planarized transparent dielectric layer.

2. The micro-LED pixel unit according to claim 1, wherein the first planarized transparent dielectric layer is composed of solid inorganic materials or plastic materials.

3. The micro-LED pixel unit according to claim 1, wherein the second LED structure is embedded within a second planarized transparent dielectric layer.

4. The micro-LED pixel unit according to claim 3, wherein the second planarized transparent dielectric layer is composed of solid inorganic materials or plastic materials.

5. The micro-LED pixel unit according to claim 1, wherein the first transparent dielectric bonding layer is composed of solid inorganic materials or plastic materials.

6. The micro-LED pixel unit according to claim 1, wherein:

the first LED structure includes a first bottom electrode conductive contact layer formed on a bottom of the first LED structure;

the second LED structure includes a second bottom electrode conductive contact layer formed on a bottom of the second LED structure;

the first bottom electrode conductive contact layer is electrically connected with the IC substrate by a first contact in a first via at a bottom of the first bottom electrode conductive contact layer; and

the second bottom electrode conductive contact layer is electrically connected with the IC substrate by a second contact in a second via through the first transparent dielectric bonding layer.

7. The micro-LED pixel unit according to claim 6, wherein the first bottom electrode conductive contact layer is transparent, and the second bottom electrode conductive contact layer is transparent.

8. The micro-LED pixel unit according to claim 1, wherein:

the first LED structure includes a first light emitting layer;

a first side portion is extended from a side of the first light emitting layer;

the second LED structure includes a second light emitting layer;

a second side portion is extended from a side of the second light emitting layer; and

a third contact in a third via connects the first side portion and the second side portion to the top electrode layer through the second transparent dielectric bonding layer.

9. The micro-LED pixel unit according to claim 1, wherein an optical isolation structure is formed around the micro-LED pixel unit.

10. The micro-LED pixel unit according to claim 1, wherein the optical isolation structure is a reflective cup.

11. The micro-LED pixel unit according to claim 1, wherein lateral dimension of the first LED structure is the same as that of the second LED structure.

12. The micro-LED pixel unit according to claim 1, wherein the first LED structure and the second LED structure have a same central axis.

13. The micro-LED pixel unit according to claim 1, wherein a first reflective structure is formed at a bottom of the first LED structure; and a second reflective structure is formed at a bottom of the second LED structure.

14. The micro-LED pixel unit according to claim 13, wherein the first reflective structure includes two first reflective layers and refractive indices of the two first reflective layers are different, and wherein the second reflective structure includes two second reflective layers and refractive indices of the two second reflective layers are different.

15. The micro-LED pixel unit according to claim 14, wherein the two first reflective layers comprise SiO_2 and Ti_3O_5 respectively, and the two second reflectivity layers comprise SiO_2 and Ti_3O_5 respectively.

16. The micro-LED pixel unit according to claim 13, wherein the first reflective structure further includes a first transparent layer on the first reflective layer, and the second reflective structure further includes a second transparent layer on the second reflective layer.

17. The micro-LED pixel unit according to claim 16, wherein the first transparent layer comprises one or more of indium tin oxide (ITO) or SiO_2, and the second transparent layer comprises one or more of ITO or SiO_2.

18. The micro-LED pixel unit according to claim 13, wherein:

a thickness of the first reflective structure is 5 to 10 nm; and

a thickness of the second reflective structure is 5 to 10 nm.

19. The micro-LED pixel unit according to claim 1, wherein:

a thickness of the first LED structure is not more than 300 nm; and

a thickness of the second LED structure is not more than 300 nm.

20. The micro-LED pixel unit according to claim 1, wherein a bonding metal layer is formed at a bottom of the first LED structure.