CLAIMS

I claim:

1. A solid state lighting (SSL) device, comprising:

a first semiconductor material;

a second semiconductor material spaced apart from the first semiconductor material;

an active region between the first and second semiconductor materials;

an indentation in the first semiconductor material, the active region, and the second semiconductor material;

an insulating material in the indentation covering the second semiconductor material and the active region and exposing a portion of the first semiconductor material; and

a conductive material in the indentation and adjacent the insulating material, the conductive material being in direct contact with the first semiconductor material.

2. The SSL device of claim 1 wherein:

the first semiconductor material includes an N-type gallium nitride (GaN) material;

the second semiconductor material includes a P-type GaN material;

the active region includes GaN/indium gallium nitride (InGaN) multiple quantum wells;

the indentation has a triangular cross section with a first sidewall and a second sidewall extending into the first semiconductor material from a surface of the second semiconductor material;

the insulating material includes a first insulating portion substantially covering the first sidewall and a second portion partially covering the second sidewall;

the first insulating portion has a first surface opposite a second surface;

the first surface of the first insulating portion is generally co-planar with the surface of the second semiconductor material;

the second surface of the first insulating portion is proximate the first semiconductor material;

the second insulating portion has a first end opposite a second end;

the first end of the second insulating portion extends beyond the surface of the second semiconductor material;

the second end of the second insulating portion extends toward the first semiconductor material;

the insulating material includes a gap between the first and second insulating portions, the gap exposing a portion of the first semiconductor material proximate the second sidewall;

the conductive material is in direct contact with the first semiconductor material through the gap between the first and second insulating portions.

3. The SSL device of claim 1 wherein:

the indentation has a sidewall extending into the first semiconductor material from a surface of the second semiconductor material; and

the insulating material partially covers the sidewall with a portion of the first semiconductor material exposed through the insulating material.

4. The SSL device of claim 1 wherein:

the indentation has a sidewall extending into the first semiconductor material from a surface of the second semiconductor material;

the sidewall includes a first part corresponding to the first semiconductor material, a second part corresponding to the active region, and a third part corresponding to the second semiconductor material; and

the insulating material substantially covers the second and third parts of the sidewall and at least does not completely cover the first part of the sidewall.

5. The SSL device of claim 1 wherein:

the indentation has a sidewall extending into the first semiconductor material from a surface of the second semiconductor material;

the sidewall includes a first part corresponding to the first semiconductor material, a second part corresponding to the active region, and a third part corresponding to the second semiconductor material;

the insulating material substantially covers the second and third parts of the sidewall and at least does not completely cover the first part of the sidewall; and

the conductive material is in direct contact with the first semiconductor material at the first part of the sidewall.

6. The SSL device of claim 1 wherein:

the indentation has a triangular cross section with a first sidewall and a second sidewall extending into the first semiconductor material from a surface of the second semiconductor material; and

the insulating material includes a first insulating portion substantially covering the first sidewall and a second portion partially covering the second sidewall.

7. The SSL device of claim 1 wherein:

the indentation has a sidewall extending into the first semiconductor material from a surface of the second semiconductor material;

the insulating material partially covers the sidewall with a portion of the first semiconductor material exposed through the insulating material;

the insulating material has a first end opposite a second end;

the first end of the insulating material extends beyond the surface of the second semiconductor material; and

the second end of the insulating material extends toward the first semiconductor material.

8. The SSL device of claim 1 wherein:

the indentation has a sidewall extending into the first semiconductor material from a surface of the second semiconductor material; and

the insulating material partially covers the sidewall with a portion of the first semiconductor material exposes through the insulating material.

the insulating material has a first end opposite a second end;

the first end of the insulating material extends beyond the surface of the second semiconductor material;

the second end of the insulating material extends toward the first semiconductor material; and

the SSL device further includes a first electrode element and a second electrode element on the surface of the second semiconductor material, the first end of the insulating material electrically isolates the first and second electrode elements.

9. The SSL device of claim 1 wherein:

the indentation has a sidewall extending into the first semiconductor material from a surface of the second semiconductor material;

the insulating material has a first end opposite a second end;

the first end of the insulating material extends beyond the surface of the second semiconductor material;

the second end of the insulating material extends toward the first semiconductor material; and

the SSL device further includes:

a first electrode element and a second electrode element on the surface of the second semiconductor material, the first end of the insulating material electrically isolates the first and second electrode elements; and

a contact in the first semiconductor material opposite the first electrode element and laterally spaced apart from the second electrode element.

10. The SSL device of claim 1 wherein:

the indentation has a sidewall extending into the first semiconductor material from a surface of the second semiconductor material;

the sidewall includes a first part corresponding to the first semiconductor material, a second part corresponding to the active region, and a third part corresponding to the second semiconductor material;

the insulating material substantially covers the second and third parts of the sidewall and at least does not completely cover the first part of the sidewall;

the insulating material has a first end opposite a second end;

the conductive material is in direct contact with the first part of the sidewall;

the first end of the insulating material extends beyond the surface of the second semiconductor material;

the second end of the insulating material extends toward the first semiconductor material; and

the SSL device further includes:

a first electrode element and a second electrode element on the surface of the second semiconductor material, the first end of the insulating material electrically isolates the first and second electrode elements; and

a contact in the first semiconductor material opposite the first electrode element and laterally spaced apart from the second electrode element.

11. A solid state lighting (SSL) device, comprising:

an SSL structure having a first region and a second region laterally spaced apart from the first region;

an insulating material between the first and second regions, the insulating material electrically isolating the first and second regions; and

a conductive material between the first and second regions and adjacent the insulating material, the conductive material electrically coupling the first and second regions in series.

12. The SSL device of claim 11 wherein:

the first and second regions of the SSL structure individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements; and

the first and/or second semiconductor elements of the first and second regions have a thickness less than about 2μm.

13. The SSL device of claim 11 wherein:

the first and second regions of the SSL structure individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements;

the first semiconductor element, the active element, and the second semiconductor element of the first region form a first electrical path;

the first semiconductor element, the active element, and the second semiconductor element of the second region form a second electrical path; and

the conductive material electrically couples the first and second electrical paths in series.

14. The SSL device of claim 11 wherein:

the first and second regions of the SSL structure individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements;

the first and/or second semiconductor elements of the first and second regions have a thickness less than about 2μm;

the first region includes a contact and a first electrode element;

the contact is in the first semiconductor element of the first region;

the first electrode element is adjacent the second semiconductor element of the first region;

the second region includes a second electrode element laterally spaced apart from the first electrode element;

the SSL structure further includes an indentation directly between the first and second regions;

the insulating material is at least partially located in the indentation;

the insulating material includes a first insulating portion and a second insulation portion;

the first insulating portion is adjacent the first region and electrically isolates the first semiconductor element, the active element, and the second semiconductor element of the first region from the conductive material;

the second insulating portion is adjacent the second region and electrically isolates the active element and the second semiconductor element of the second region from the conductive material;

the second insulating portion also electrically isolates the first electrode element from the second electrode element;

the conductive material is in the indentation and between the first and second insulating portions; and

the conductive material forms an electrical path from the first electrode element to the first semiconductor element of the second region.

15. The SSL device of claim 11 wherein:

the first region includes a contact and a first electrode element spaced apart from the contact;

the second region includes a second electrode element laterally spaced apart and electrically isolated from the first electrode element; and

the conductive material forms an electrical path from the first electrode element, through the second region, and to the second electrode element.

16. The SSL device of claim 11 wherein:

the first region includes a contact and a first electrode element spaced apart from the contact;

the second region includes a second electrode element laterally spaced apart and electrically isolated from the first electrode element; and

the conductive material is directly between and electrically connects the first electrode element to the second region.

17. The SSL device of claim 11 wherein:

the first and second regions of the SSL structure individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements;

the first region includes a contact in the first semiconductor element and a first electrode element adjacent the second semiconductor element of the first region;

the second region includes a second electrode element adjacent the second semiconductor element of the second region; and

the conductive material electrically connects the first electrode element of the first region to the first semiconductor element of the second region.

18. The SSL device of claim 11 wherein:

the first and second regions of the SSL structure individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements;

the first region includes a first electrode element adjacent the second semiconductor element of the first region;

the second region includes a second electrode element adjacent the second semiconductor element of the second region and laterally spaced apart from the first electrode element of the first region; and

the insulating material electrically isolates the first electrode element from the second electrode element.

19. The SSL device of claim 11 wherein:

the first and second regions of the SSL structure individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements;

the first region includes a first electrode element adjacent the second semiconductor element of the first region;

the second region includes a second electrode element adjacent the second semiconductor element of the second region and laterally spaced apart from the first electrode element of the first region;

the insulating material electrically isolates the first electrode element from the second electrode element; and

the conductive material electrically connects the first electrode element of the first region to the second electrode element of the second region via the first semiconductor element, the active element, and the second semiconductor element of the second region.

20. A solid state lighting (SSL) device, comprising:

an SSL structure having a first region and a second region laterally spaced apart from the first region;

the first region includes a first electrode element;

the second region includes a second electrode element laterally spaced apart from the first electrode element of the first region; and

an insulating material between and electrically isolating the first and second electrode elements.

21. The SSL device of claim 20 wherein:

the first and second regions of the SSL structure individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements; and

the SSL device further includes a conductive material electrically connecting the first electrode element to the first semiconductor element of the second region.

22. The SSL device of claim 20 wherein:

the first and second regions of the SSL structure individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements;

the first electrode element is in contact with the second semiconductor element of the first region;

the second electrode element is in contact with the second semiconductor element of the second region; and

the insulating material extends beyond the second semiconductor elements of the first and second regions and is directly between the first and second electrode elements.

23. A method of forming a solid state lighting (SSL) device, comprising:

forming an SSL structure on a substrate material, the SSL structure having a first semiconductor material proximate the substrate material, a second semiconductor material spaced apart from the first semiconductor material, and an active region between the first and second semiconductor materials;

forming an indentation in the SSL structure, the indentation extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation with an insulating material, the insulating material exposing a portion of the first semiconductor material; and

disposing a conductive material in the indentation and adjacent the insulating material, the conductive material being in electrical contact with the first semiconductor material.

24. The method of claim 23 wherein:

forming the SSL structure includes forming the first semiconductor material, the active region, and the second semiconductor material via epitaxial growth, the first semiconductor material having a thickness of less than about 2μm;

forming the indentation in the SSL structure includes forming an indentation having a sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes:

depositing the insulating material on the sidewall of the indentation, the insulating material being generally conforming to the sidewall; and

partially removing the insulating material from the sidewall, thereby forming a gap exposing the portion of the first semiconductor material;

disposing the conductive material includes disposing the conductive material in the gap of the insulating material; and

the method further includes forming an electrode on the second semiconductor material and the conductive material, the electrode having first and second electrode elements separated by the insulating material.

25. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the indentation having a sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes:

depositing the insulating material on the sidewall of the indentation; and

partially removing the insulating material from the sidewall, thereby forming a gap exposing the portion of the first semiconductor material.

26. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the indentation having a sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material; and

insulating the indentation includes insulating the indentation with the insulating material that does not cover at least a portion of the first semiconductor material.

27. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the indentation having a sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material; and

insulating the indentation includes insulating the indentation with the insulating material having a first end opposite a second end, the first end does not cover at least a

portion of the first semiconductor material and the second end extends beyond the second semiconductor material.

28. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the indentation having a sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes insulating the indentation with the insulating material having a first end opposite a second end;

the first end does not cover at least a portion of the first semiconductor material;

the second end extends beyond the second semiconductor material; and

the insulating material electrically isolates the active region and the second semiconductor material from the conductive material in the indentation.

29. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the indentation having a first sidewall facing a second sidewall, both the first and second sidewalls extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes insulating the first and second sidewalls with the insulating material;

the insulating material has a first insulating portion on the first sidewall and a second insulating portion on the second sidewall;

the first insulating portion substantially covers the first sidewall; and

the second insulating portion partially covers the second sidewall, thereby forming a gap in the insulating material exposing the portion of the first semiconductor material.

30. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the indentation having a first sidewall facing a second sidewall, both the first and second sidewalls extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes insulating the first and second sidewalls with the insulating material;

the insulating material has a first insulating portion on the first sidewall and a second insulating portion on the second sidewall;

the first insulating portion substantially covers the first sidewall;

the second insulating portion partially covers the second sidewall, thereby forming a gap in the insulating material exposing the portion of the first semiconductor material; and

disposing the conductive material includes disposing the conductive material between the first and second insulating portions and in the gap.

31. A method of operating a solid state lighting (SSL) device having an SSL structure, the SSL structure having a first region and a second region laterally spaced apart from the first region, the first and second regions individually having a first semiconductor element, a second semiconductor element spaced apart from the first semiconductor element, and an active element between the first and second semiconductor elements, the first region having a contact and a first electrode element, the second region having a second electrode element electrically isolated from the first electrode element, the method comprising:

flowing a current from the contact, through the first semiconductor element, the active element, and the second semiconductor element of the first region to the first electrode element;

conducting the current from the first electrode element to the first semiconductor element of the second region; and

flowing the current from the first semiconductor element of the second region, through the active element and second semiconductor element of the second region to the second electrode element.

32. The method of claim 31 wherein conducting the current includes:

conducting the current from the first electrode element to the first semiconductor element of the second region through a conductive material in an indentation between the first and second regions of the SSL structure; and

the conductive material is electrically isolated from the active elements and second semiconductor elements of the first and second regions of the SSL structure.

33. The method of claim 31 wherein:

flowing the current from the contact includes flowing the current from the contact, through the first semiconductor element, the active element, and the second semiconductor element of the first region to the first electrode element in a first direction; and

conducting the current includes conducting the current from the first electrode element to the first semiconductor element of the second region in a second direction generally opposite the first direction.

34. The method of claim 31 wherein:

flowing the current from the contact includes flowing the current in a first direction;

conducting the current includes conducting the current in a second direction generally opposite the first direction; and

flowing the current from the first semiconductor element includes flowing the current in a third direction generally opposite the second direction.

CLAIMS

I claim:

1. A solid state lighting (SSL) device, comprising:

a first semiconductor material;

a second semiconductor material spaced apart from the first semiconductor material;

an active region between the first and second semiconductor materials;

an indentation in the first semiconductor material, the active region, and the second semiconductor material;

an insulating material in the indentation covering the second semiconductor material and the active region, wherein the insulating material partially covers a sidewall of the indentation with a portion of the first semiconductor material exposed through the insulating material; and

a conductive material in the indentation and adjacent the insulating material, the conductive material being in direct contact with the first semiconductor material.

2. The SSL device of claim 1 wherein:

the first semiconductor material includes an N-type gallium nitride (GaN) material;

the second semiconductor material includes a P-type GaN material;

the active region includes GaN/indium gallium nitride (InGaN) multiple quantum wells;

the indentation has a triangular cross section and the sidewall includes a first sidewall and a second sidewall extending into the first semiconductor material from a surface of the second semiconductor material;

the insulating material includes a first insulating portion substantially covering the first sidewall and a second portion partially covering the second sidewall;

the first insulating portion has a first surface opposite a second surface;

the first surface of the first insulating portion is generally co-planar with the surface of the second semiconductor material;

the second surface of the first insulating portion is proximate the first semiconductor material;

the second insulating portion has a first end opposite a second end;

the first end of the second insulating portion extends beyond the surface of the second semiconductor material;

the second end of the second insulating portion extends toward the first semiconductor material;

the insulating material includes a gap between the first and second insulating portions, the gap exposing a portion of the first semiconductor material proximate the second sidewall;

the conductive material is in direct contact with the first semiconductor material through the gap between the first and second insulating portions.

3. The SSL device of claim 1 wherein:

the sidewall extends into the first semiconductor material from a surface of the second semiconductor material.

4. The SSL device of claim 1 wherein:

the sidewall extends into the first semiconductor material from a surface of the second semiconductor material;

the sidewall includes a first part corresponding to the first semiconductor material, a second part corresponding to the active region, and a third part corresponding to the second semiconductor material; and

the insulating material substantially covers the second and third parts of the sidewall and at least does not completely cover the first part of the sidewall.

5. The SSL device of claim 1 wherein:

the sidewall extends into the first semiconductor material from a surface of the second semiconductor material;

the sidewall includes a first part corresponding to the first semiconductor material, a second part corresponding to the active region, and a third part corresponding to the second semiconductor material;

the insulating material substantially covers the second and third parts of the sidewall and at least does not completely cover the first part of the sidewall; and

the conductive material is in direct contact with the first semiconductor material at the first part of the sidewall.

6. The SSL device of claim 1 wherein:

the indentation has a triangular cross section and the sidewall includes a first sidewall and a second sidewall extending into the first semiconductor material from a surface of the second semiconductor material; and

the insulating material includes a first insulating portion substantially covering the first sidewall and a second portion partially covering the second sidewall.

7. The SSL device of claim 1 wherein:

the sidewall extends into the first semiconductor material from a surface of the second semiconductor material;

the insulating material has a first end opposite a second end;

the first end of the insulating material extends beyond the surface of the second semiconductor material; and

the second end of the insulating material extends toward the first semiconductor material.

8. The SSL device of claim 1 wherein:

the sidewall extends into the first semiconductor material from a surface of the second semiconductor material; and

the insulating material has a first end opposite a second end;

the first end of the insulating material extends beyond the surface of the second semiconductor material;

the second end of the insulating material extends toward the first semiconductor material; and

the SSL device further includes a first electrode element and a second electrode element on the surface of the second semiconductor material, the first end of the insulating material physically isolates the first and second electrode elements.

9. The SSL device of claim 1 wherein:

the sidewall extends into the first semiconductor material from a surface of the second semiconductor material;

the insulating material has a first end opposite a second end;

the first end of the insulating material extends beyond the surface of the second semiconductor material;

the second end of the insulating material extends toward the first semiconductor material; and

the SSL device further includes:

a first electrode element and a second electrode element on the surface of the second semiconductor material, the first end of the insulating material physically isolates the first and second electrode elements; and

a contact in the first semiconductor material opposite the first electrode element and laterally spaced apart from the second electrode element.

10. The SSL device of claim 1 wherein:

the sidewall extends into the first semiconductor material from a surface of the second semiconductor material;

the sidewall includes a first part corresponding to the first semiconductor material, a second part corresponding to the active region, and a third part corresponding to the second semiconductor material;

the insulating material substantially covers the second and third parts of the sidewall and at least does not completely cover the first part of the sidewall;

the insulating material has a first end opposite a second end;

the conductive material is in direct contact with the first part of the sidewall;

the first end of the insulating material extends beyond the surface of the second semiconductor material;

the second end of the insulating material extends toward the first semiconductor material; and

the SSL device further includes:

a first electrode element and a second electrode element on the surface of the second semiconductor material, the first end of the insulating material physically isolates the first and second electrode elements; and

a contact in the first semiconductor material opposite the first electrode element and laterally spaced apart from the second electrode element.

11. A solid state lighting (SSL) device, comprising:

an SSL structure having a first region and a second region laterally spaced apart from the first region by an indentation, wherein the first and second regions individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements;

an insulating material between the first and second regions, the insulating material covering the second semiconductor element and the active region in an indentation of the SSL structure, the insulating material physically isolating the first and second regions, wherein the insulating material partially covers a sidewall of the indentation with a portion of the first semiconductor element exposed through the insulating material; and

a conductive material between the first and second regions and adjacent the insulating material, the conductive material electrically coupling the first and second regions in series.

12. The SSL device of claim 11 wherein:

the first and/or second semiconductor elements of the first and second regions have a thickness less than about 2μm.

13. The SSL device of claim 11 wherein:

the first semiconductor element, the active element, and the second semiconductor element of the first region form a first electrical path;

the first semiconductor element, the active element, and the second semiconductor element of the second region form a second electrical path; and

the conductive material electrically couples the first and second electrical paths in series.

14. The SSL device of claim 11 wherein:

the first and/or second semiconductor elements of the first and second regions have a thickness less than about 2μm;

the first region includes a contact and a first electrode element;

the contact is in the first semiconductor element of the first region;

the first electrode element is adjacent to the second semiconductor element of the first region;

the second region includes a second electrode element laterally spaced apart from the first electrode element;

the indentation is directly between the first and second regions;

the insulating material is at least partially located in the indentation;

the insulating material includes a first insulating portion and a second insulation portion;

the first insulating portion is adjacent to the first region and physically isolates the first semiconductor element, the active element, and the second semiconductor element of the first region from the conductive material;

the second insulating portion is adjacent the second region and physically isolates the active element and the second semiconductor element of the second region from the conductive material;

the second insulating portion also physically isolates the first electrode element from the second electrode element;

the conductive material is in the indentation and between the first and second insulating portions; and

the conductive material forms an electrical path from the first electrode element to the first semiconductor element of the second region.

15. The SSL device of claim 11 wherein:

the first region includes a contact and a first electrode element spaced apart from the contact;

the second region includes a second electrode element laterally spaced apart and physically isolated from the first electrode element; and

the conductive material forms an electrical path from the first electrode element, through the second region, and to the second electrode element.

16. The SSL device of claim 11 wherein:

the first region includes a contact and a first electrode element spaced apart from the contact;

the second region includes a second electrode element laterally spaced apart and physically isolated from the first electrode element; and

the conductive material is directly between and electrically connects the first electrode element to the second region.

17. The SSL device of claim 11 wherein:

the first region includes a contact in the first semiconductor element and a first electrode element adjacent the second semiconductor element of the first region;

the second region includes a second electrode element adjacent the second semiconductor element of the second region; and

the conductive material electrically connects the first electrode element of the first region to the first semiconductor element of the second region.

18. The SSL device of claim 11 wherein:

the first region includes a first electrode element adjacent the second semiconductor element of the first region;

the second region includes a second electrode element adjacent the second semiconductor element of the second region and laterally spaced apart from the first electrode element of the first region; and

the insulating material physically isolates the first electrode element from the second electrode element.

19. The SSL device of claim 11 wherein:

the first region includes a first electrode element adjacent to the second semiconductor element of the first region;

the second region includes a second electrode element adjacent to the second semiconductor element of the second region and laterally spaced apart from the first electrode element of the first region;

the insulating material physically isolates the first electrode element from the second electrode element; and

the conductive material electrically connects the first electrode element of the first region to the second electrode element of the second region via the first semiconductor element, the active element, and the second semiconductor element of the second region.

20. A solid state lighting (SSL) device, comprising:

an SSL structure having a first region and a second region laterally spaced apart from the first region, wherein the first and second regions individually include a first semiconductor element, a second semiconductor element, and an active element between the first and second semiconductor elements;

the first region includes a first electrode element;

the second region includes a second electrode element laterally spaced apart from the first electrode element of the first region; and

an insulating material between and physically isolating the first and second electrode elements, wherein the insulating material covers the second semiconductor element and the active region in an indentation of the SSL structure, and wherein the insulating material partially covers a sidewall of the indentation with a portion of the first semiconductor element exposed through the insulating material.

21. The SSL device of claim 20 wherein:

the SSL device further includes a conductive material electrically connecting the first electrode element to the first semiconductor element of the second region.

22. The SSL device of claim 20 wherein:

the first electrode element is in contact with the second semiconductor element of the first region;

the second electrode element is in contact with the second semiconductor element of the second region; and

the insulating material extends beyond the second semiconductor elements of the first and second regions and is directly between the first and second electrode elements.

23. A method of forming a solid state lighting (SSL) device, comprising:

forming an SSL structure on a substrate material, the SSL structure having a first semiconductor material proximate the substrate material, a second semiconductor material spaced apart from the first semiconductor material, and an active region between the first and second semiconductor materials;

forming an indentation in the SSL structure, the indentation extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation with an insulating material, the insulating material exposing a portion of the first semiconductor material by partially removing the insulating material from a sidewall of the indentation, thereby forming a gap exposing the portion of the first semiconductor material; and

disposing a conductive material in the indentation and adjacent the insulating material, the conductive material being in electrical contact with the first semiconductor material.

24. The method of claim 23 wherein:

forming the SSL structure includes forming the first semiconductor material, the active region, and the second semiconductor material via epitaxial growth, the first semiconductor material having a thickness of less than about $2\mu m$;

forming the indentation in the SSL structure includes forming the sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes:

depositing the insulating material on the sidewall of the indentation, the insulating material being generally conforming to the sidewall;

disposing the conductive material includes disposing the conductive material in the gap of the insulating material; and

the method further includes forming an electrode on the second semiconductor material and the conductive material, the electrode having first and second electrode elements separated by the insulating material.

25. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes:

depositing the insulating material on the sidewall of the indentation.

26. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material; and

insulating the indentation includes insulating the indentation with the insulating material that does not cover at least the portion of the first semiconductor material.

27. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material; and

insulating the indentation includes insulating the indentation with the insulating material having a first end opposite a second end, the first end does not cover at least a portion of the first semiconductor material and the second end extends beyond the second semiconductor material.

28. The method of claim 23 wherein:

forming the indentation in the SSL structure includes forming the sidewall extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes insulating the indentation with the insulating material having a first end opposite a second end;

the first end does not cover at least a portion of the first semiconductor material;

the second end extends beyond the second semiconductor material; and

the insulating material physically isolates the active region and the second semiconductor material from the conductive material in the indentation.

29. The method of claim 23 wherein:

the sidewall includes a first sidewall and a second sidewall facing the first sidewall, both the first and second sidewalls extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes insulating the first and second sidewalls with the insulating material;

the insulating material has a first insulating portion on the first sidewall and a second insulating portion on the second sidewall;

the first insulating portion substantially covers the first sidewall; and

the second insulating portion partially covers the second sidewall, thereby forming the gap in the insulating material exposing the portion of the first semiconductor material.

30. The method of claim 23 wherein:

the sidewall includes a first sidewall and a second sidewall facing the first sidewall, both the first and second sidewalls extending from the second semiconductor material, through the active region, and into the first semiconductor material;

insulating the indentation includes insulating the first and second sidewalls with the insulating material;

the insulating material has a first insulating portion on the first sidewall and a second insulating portion on the second sidewall;

the first insulating portion substantially covers the first sidewall;

the second insulating portion partially covers the second sidewall, thereby forming the gap in the insulating material exposing the portion of the first semiconductor material; and

disposing the conductive material includes disposing the conductive material between the first and second insulating portions and in the gap.

31. A method of operating a solid state lighting (SSL) device having an SSL structure, the SSL structure having a first region and a second region laterally spaced apart from the first region, the first and second regions individually having a first semiconductor element, a second semiconductor element spaced apart from the first semiconductor element, and an active element between the first and second semiconductor elements, the first region having a contact and a first electrode element, the second region having a second electrode element physically isolated from the first electrode element, the method comprising:

flowing a current from the contact, through the first semiconductor element, the active element, and the second semiconductor element of the first region to the first electrode element;

conducting the current from the first electrode element to the first semiconductor element of the second region in an indentation between the first and second regions of the SSL structure, and wherein an insulating material in the indentation covers the second semiconductor material and the active region, and wherein the insulating material partially covers a sidewall of the indentation with a portion of the first semiconductor material exposed through the insulating material; and

flowing the current from the first semiconductor element of the second region, through the active element and second semiconductor element of the second region to the second electrode element.

32. The method of claim 31 wherein conducting the current includes:

conducting the current from the first electrode element to the first semiconductor element of the second region through a conductive material in the indentation between the first and second regions of the SSL structure; and

the conductive material is physically isolated from the active elements and semiconductor elements of the first and second regions of the SSL structure.

33. The method of claim 31 wherein:

flowing the current from the contact includes flowing the current from the contact, through the first semiconductor element, the active element, and the second semiconductor element of the first region to the first electrode element in a first direction; and

conducting the current includes conducting the current from the first electrode element to the first semiconductor element of the second region in a second direction generally opposite the first direction.

34. The method of claim 31 wherein:

flowing the current from the contact includes flowing the current in a first direction;

conducting the current includes conducting the current in a second direction generally opposite the first direction; and

flowing the current from the first semiconductor element includes flowing the current in a third direction generally opposite the second direction.