CLAIMS

I/We claim:

1. A solid state transducer system, comprising:

a support substrate;

a solid state emitter carried by the support substrate, the solid state emitter comprising a first semiconductor component, a second semiconductor component, and an active region between the first and second semiconductor components; and

a state device carried by the support substrate and positioned to detect a state of at least one of the solid state emitter and an electrical path of which the solid state emitter forms a part, wherein the state device is formed from at least one state-sensing component having a composition different than that of the first semiconductor component, the second semiconductor component, and the active region, and wherein the state device and the solid state emitter are stacked along a common axis.

2. The system of claim 1 wherein the state device includes at least one of a thermal sensor and a photosensor, and wherein the system further comprises:

a controller operatively coupled to the solid state emitter and the state device to receive a signal from the state device and control the solid state emitter based at least in part on the signal received from the state device.

3. The system of claim 2 wherein the state device includes a photosensor positioned to receive radiation emitted by the solid state emitter, and wherein the signal corresponds to a characteristic of the radiation.

4. The system of claim 2 wherein the state device includes a thermal sensor positioned to receive thermal energy produced by the solid state emitter, and wherein the signal corresponds to a temperature.

5. The system of claim 1 wherein the state device includes an electrostatic discharge device coupled in parallel with the solid state emitter, and wherein the electrostatic discharge device is responsive to a voltage applied to the state emitter.

6. The system of claim 1 wherein the solid state emitter, the state device, and the support substrate form a single die, and wherein the support substrate is the only support substrate of the die.

7. The system of claim 1 wherein the state device is formed from a plurality of materials disposed conformally and sequentially on the solid state emitter.

8. The system of claim 1 wherein the active region of the solid state emitter includes a first semiconductor material having a first composition and wherein the state-sensing component includes a second semiconductor material having a second composition different than the first composition.

9. The system of claim 1, further comprising a reflective material positioned between the solid state emitter and the state device to reflect radiation emitted by the solid state emitter, wherein the reflective material includes an aperture positioned between the active region and the state device to pass radiation from the active region to the state device.

10. The system of claim 1, further comprising an external surface through which radiation emitted by the active region passes, and wherein the state device is positioned off an optical axis between the active region and the external surface.

11. The system of claim 1, further comprising an external surface through which radiation emitted by the active region passes, and wherein the state device is positioned on an optical axis between the active region and the external surface.

12. The system of claim 1, further comprising:

first and second emitter contacts, the first emitter contact electrically connected to the first semiconductor component, the second emitter contact electrically connected to the second semiconductor component; and

first and second state device contacts connected to the state device, the emitter contacts being addressable separately from the state device contacts.

13. The system of claim 1 wherein the emitter contacts and the state device contacts are accessible from the same side of the solid state emitter.

14. The system of claim 1 wherein the state device contacts and one of the emitter contacts are accessible from one side of the solid state emitter, and the other emitter contact is accessible from an opposite side of the solid state emitter.

15. The system of claim 1 wherein the solid state emitter and the state device are integrally formed from portions of a common epitaxial growth substrate.

16. The system of claim 15, further comprising the epitaxial growth substrate.

17. The system of claim 1 wherein:

the state device is formed from a plurality of materials disposed conformally and sequentially on the solid state emitter;

the solid state emitter, the state device, and the support substrate form a single die;

the support substrate is the only support substrate of the die; and

the solid state emitter and the state device are integrally formed from portions of a common epitaxial growth substrate.

18. A solid state lighting system, comprising:

a support substrate;

a solid state emitter carried by the support substrate, the solid state emitter comprising a first semiconductor component, a second semiconductor component, and an active region between the first and second semiconductor components; and

a thermal sensor carried by the support substrate and positioned to detect a thermal state of the solid state emitter, wherein the thermal sensor and the solid state emitter are stacked along a common axis.

19. The system of claim 18, further comprising a controller operatively coupled to the solid state emitter and the thermal sensor to receive a signal from the thermal sensor and control the solid state emitter based at least in part on the signal received from the thermal sensor.

20. The system of claim 18, further comprising a reflective material positioned between the solid state emitter and the thermal sensor to reflect radiation emitted by the solid state emitter.

21. The system of claim 18 wherein the thermal sensor includes a serpentine thermistor element, and wherein an impedance of the thermistor element changes as a function of temperature.

22. The system of claim 18, further comprising:

first and second emitter contacts, the first emitter contact electrically connected to the first semiconductor component, the second emitter contact electrically connected to the second semiconductor component; and

first and second thermal sensor contacts connected to the thermal sensor, the emitter contacts being addressable separately from the thermal sensor contacts.

23. A method for forming a solid state lighting device, comprising:

forming a solid state emitter to include a first semiconductor material, a second semiconductor material, and an active region between the first and second semiconductor materials; and

forming a state device carried by the solid state emitter by disposing on the solid state emitter in a sequence of process steps and in a stacked manner, state device components, including at least one state-sensing component having a composition different than that of the first semiconductor material, the second semiconductor material, and the active region, wherein the at least one state-sensing component is positioned to detect a state of at least one of the solid state emitter and an electrical path of which the solid state emitter forms a part.

24. The method of claim 23 wherein forming the state device includes forming a thermal sensor in thermal communication with the active region of the solid state emitter.

25. The method of claim 23 wherein forming the state device includes forming a photosensor positioned to receive radiation emitted by the active region of the solid state emitter.

26. The method of claim 23 wherein disposing the at least one state-sensing component includes disposing an electrostatic discharge component.

27. The method of claim 23 wherein forming the solid state emitter includes epitaxially forming at least one component of the solid state emitter on an epitaxial growth substrate, and wherein forming the state device includes forming the state device from a portion of the epitaxial growth substrate.

28. A method for forming a solid state lighting device, comprising:

forming a solid state emitter to include a first semiconductor material, a second semiconductor material, and an active region between the first and second semiconductor materials; and

stacking a thermal sensor relative to the solid state emitter.

29. The method of claim 28 wherein stacking the thermal sensor includes sequentially disposing components of the thermal sensor on the solid state emitter.

30. The method of claim 28 wherein stacking the thermal sensor includes pre-forming at least a portion of the thermal sensor and attaching the thermal sensor to the solid state emitter.

31. The method of claim 28 wherein stacking the thermal sensor includes positioning the thermal sensor in direct contact with the solid state emitter.

32. The method of claim 28 wherein stacking the thermal sensor includes carrying both the thermal sensor and the solid state emitter with a common support substrate.

CLAIMS

I/We claim:

1. A solid state transducer system, comprising:

a support substrate;

a solid state emitter carried by the support substrate, the solid state emitter comprising a first semiconductor component, a second semiconductor component, and an active region between the first and second semiconductor components; and

a state device carried by a surface of the solid state emitter facing away from the support substrate and positioned to detect a state of at least one of the solid state emitter and an electrical path of which the solid state emitter forms a part, wherein the state device includes an electrostatic discharge device coupled in parallel with the solid state emitter, wherein the electrostatic discharge device is formed from at least one state-sensing component having a silicon semiconductor material with a composition different than that of the first semiconductor component, the second semiconductor component, and the active region, and wherein the silicon semiconductor material is electrically coupled to the solid state emitter,

wherein the state device and the solid state emitter are stacked along a common axis, and wherein the electrostatic discharge device is responsive to a voltage applied to the solid state emitter.

2. The system of claim 1 , further comprising a controller operatively coupled to the solid state emitter and the state device to receive a signal from the state device and control the solid state emitter based at least in part on the signal received from the state device.

3. The system of claim 1 wherein the solid state emitter, the state device, and the support substrate form a single die, and wherein the support substrate is the only support substrate of the die.

4. The system of claim 1 wherein the state device is formed from a plurality of materials disposed conformally and sequentially on the solid state emitter.

5. The system of claim 1 wherein the active region of the solid state emitter includes a first semiconductor material having a first composition and wherein the state-sensing component includes a second semiconductor material having a second composition different than the first composition.

6. The system of claim 1, further comprising a reflective material positioned between the solid state emitter and the state device to reflect radiation emitted by the solid state emitter.

7. The system of claim 1, further comprising:

first and second emitter contacts, the first emitter contact electrically connected to the first semiconductor component, the second emitter contact electrically connected to the second semiconductor component; and

first and second state device contacts connected to the state device, the emitter contacts being addressable separately from the state device contacts.

8. The system of claim 7 wherein the emitter contacts and the state device contacts are accessible from the same side of the solid state emitter.

9. The system of claim 7 wherein the state device contacts and one of the emitter contacts are accessible from one side of the solid state emitter, and the other emitter contact is accessible from an opposite side of the solid state emitter.

10. The system of claim 1 wherein the solid state emitter and the state device are integrally formed from portions of a common epitaxial growth substrate.

11. The system of claim 10, further comprising the common epitaxial growth substrate.

12. The system of claim 1 wherein:

the state device is formed from a plurality of materials disposed conformally and sequentially on the solid state emitter;

the solid state emitter, the state device, and the support substrate form a single die;

the support substrate is the only support substrate of the die; and

the solid state emitter and the state device are integrally formed from portions of a common epitaxial growth substrate.

13. A solid state transducer, comprising:

a support substrate;

a solid state emitter having a first semiconductor component, a second semiconductor component, and an active region therebetween; and

a state device carried by the support substrate and including an electrostatic discharge device, wherein the electrostatic discharge device includes a state sensing component that is electrically coupled in parallel with the solid state emitter, wherein the state sensing component is formed from a silicon semiconductor material and positioned to detect a state of at least one of the solid state emitter and an electrical path of which the solid state emitter forms a part, and wherein the silicon semiconductor material has a composition different than that of the first semiconductor component, the second semiconductor component, and the active region,

wherein the state device and the solid state emitter are stacked along a common axis, and wherein at least a portion of the state device is formed epitaxially with the solid state emitter.

14. The solid state transducer system of claim 1, further comprising a reflector between the silicon semiconductor material and the solid state emitter.

15. The solid state transducer system of claim 1 wherein the silicon semiconductor material comprises amorphous silicon.

16. The solid state transducer system of claim 1 wherein:

the electrostatic discharge device includes an electrostatic junction;

the electrostatic junction includes a first conductive material and a second conductive material; and

the silicon semiconductor material is between the first and second conductive materials.

17. The solid state transducer system of claim 16 wherein the electrostatic junction is a first electrostatic junction, and wherein the electrostatic discharge device includes a second electrostatic junction connected in series with the first electrostatic junction.

18. The solid state transducer of claim 13 wherein at least one of the first and second semiconductor components comprises gallium nitride.

19. A solid state transducer system, comprising:

a solid state emitter including a first semiconductor material, a second semiconductor material, and an active region between the first and second semiconductor materials; and

a state device stacked on the solid state emitter along a common axis, wherein the state device is positioned to detect a state of at least one of the solid state emitter and an electrical path of which the solid state emitter forms a part, wherein the state device includes an electrostatic discharge device electrically coupled in parallel with the solid state emitter,

wherein—

the electrostatic discharge device is formed from at least one state-sensing component having a silicon semiconductor material that is electrically coupled to the solid state emitter, and

the silicon semiconductor material includes a composition different than that of the first semiconductor material, the second semiconductor material, and the active region.

20. The solid state transducer system of claim 19 wherein the electrostatic discharge device includes an electrostatic junction, and wherein the silicon semiconductor material is a component of the electrostatic junction.

21. The solid state transducer system of claim 19 wherein the electrostatic discharge device includes a plurality of electrostatic junctions, and wherein the silicon semiconductor material is a component of at least one of the electrostatic junctions.

22. The solid state transducer system of claim 21, wherein the electrostatic junctions are electrically connected in series.

23. The solid state transducer system of claim 19 wherein the silicon semiconductor material and the state device are integrally formed from portions of a common epitaxial growth substrate.

24. The solid state transducer system of claim 23 wherein at least one of the first and second semiconductor materials comprises gallium nitride.