CLAIMS

1. A semiconductor photomultiplier device comprising:

a substrate having a front side and a back side;

a common electrode of a first conductivity type adjacent to the back side;

a cell comprising an active region of a second conductivity type adjacent to the front side; and

a contact region of the second conductivity type adjacent to the front side, the contact region being spaced apart from the active region by a separation region,

wherein the separation region defines a resistor between the active region and the contact region to allow a current to flow between the active region and the contact region through the separation region.

2. The semiconductor photomultiplier device of claim 1, wherein the contact region at least substantially surrounds the active region.

3. The semiconductor photomultiplier device of claim 2, wherein the contact region is discontinuous, the contact region being defined by a plurality of portions arranged spaced apart from each other.

4. The semiconductor photomultiplier device of claim 1, wherein the separation region is between about 0.1 μm and about 2 μm.

5. The semiconductor photomultiplier device of claim 1, wherein the resistor defined by the separation region has a resistance that is higher than respective resistances of the active region and the contact region.

6. The semiconductor photomultiplier device of claim 1, wherein the active region is formed in a first portion of the substrate, and wherein the contact region is formed in a second portion of the substrate, the first portion being spaced apart from the second portion by the separation region.

7. The semiconductor photomultiplier device of claim 1, further comprising an electrical interconnection electrically coupled to the contact region.

8. The semiconductor photomultiplier device of claim 1, wherein the area of the front side to which the active region is adjacent and overlaps with is free of electrical interconnections.

9. The semiconductor photomultiplier device of claim 1, wherein the contact region comprises dopants of the second conductivity type at a concentration higher than dopants of the second conductivity type in the active region.

10. The semiconductor photomultiplier device of claim 1, wherein the cell further comprises an intermediate region of the first conductivity type between the active region and the common electrode.

11. The semiconductor photomultiplier device of claim 10, wherein the intermediate region at least substantially contacts the active region.

12. The semiconductor photomultiplier device of claim 10, wherein the intermediate region comprises dopants of the first conductivity type at a concentration lower than dopants of the first conductivity type in the common electrode.

13. The semiconductor photomultiplier device of claim 1, wherein the cell further comprises an intermediate region of the second conductivity type between the active region and the common electrode.

14. The semiconductor photomultiplier device of claim 13, wherein the intermediate region is spaced apart from the active region.

15. The semiconductor photomultiplier device of claim 13, wherein the intermediate region comprises dopants of the second conductivity type at a concentration equal to or lower than dopants of the second conductivity type in the active region.

16. The semiconductor photomultiplier device of claim 1, comprising a plurality of cells, each cell comprising a respective active region of the second conductivity type adjacent to the front side.

17. The semiconductor photomultiplier device of claim 1, wherein the first conductivity type is n-type conductivity type and the second conductivity type is p-type conductivity type.

18. The semiconductor photomultiplier device of claim 1, wherein the first conductivity type is p-type conductivity type and the second conductivity type is n-type conductivity type.

19. The semiconductor photomultiplier device of claim 1, wherein the surface of the front side is free of integrated resistors.

20. A semiconductor photomultiplier device comprising:

a substrate having a front side and a back side;

a common electrode of a first conductivity type adjacent to the back side;

a cell comprising an active region of a second conductivity type adjacent to the front side; and

a contact region of the second conductivity type adjacent to the front side, the contact region being spaced apart from the active region by a separation region,

wherein the separation region has a resistance that is higher than respective resistances of the active region and the contact region.

21. A semiconductor photomultiplier device comprising:

a substrate having a front side and a back side;

a common electrode of a first conductivity type adjacent to the back side;

a cell comprising an active region of a second conductivity type adjacent to the front side; and an intermediate region of the second conductivity type between the active region and the common electrode; and

a contact region of the second conductivity type adjacent to the front side, the contact region being spaced apart from the active region by a separation region,

CLAIMS

1. A semiconductor photomultiplier device comprising:

a substrate having a front side and a back side;

a common electrode of a first conductivity type adjacent to the back side;

a cell comprising an active region of a second conductivity type adjacent to the front side; and

a contact region of the second conductivity type adjacent to the front side, the contact region being spaced apart from the active region by a separation region.

2. The semiconductor photomultiplier device of claim 1, wherein the contact region at least substantially surrounds the active region.

3. The semiconductor photomultiplier device of claim 2, wherein the contact region is discontinuous.

4. The semiconductor photomultiplier device of claim 1, wherein the separation region is between about 0.1 μm and about 2 μm.

5. The semiconductor photomultiplier device of claim 1, wherein the separation region has a resistance that is higher than respective resistances of the active region and the contact region.

6. The semiconductor photomultiplier device of claim 1, wherein the active region is formed in a first portion of the substrate, and wherein the contact region is formed in a second portion of the substrate, the first portion being spaced apart from the second portion by the separation region.

7. The semiconductor photomultiplier device of claim 1, further comprising an electrical interconnection electrically coupled to the contact region.

8. The semiconductor photomultiplier device of claim 1, wherein the area of the front side to which the active region is adjacent is free of electrical interconnections.

9. The semiconductor photomultiplier device of claim 1, wherein the contact region comprises dopants of the second conductivity type at a concentration higher than dopants of the second conductivity type in the active region.

10. The semiconductor photomultiplier device of claim 1, wherein the cell further comprises an intermediate region of the first conductivity type between the active region and the common electrode.

11. The semiconductor photomultiplier device of claim 10, wherein the intermediate region at least substantially contacts the active region.

12. The semiconductor photomultiplier device of claim 10, wherein the intermediate region comprises dopants of the first conductivity type at a concentration lower than dopants of the first conductivity type in the common electrode.

13. The semiconductor photomultiplier device of claim 1, wherein the cell further comprises an intermediate region of the second conductivity type between the active region and the common electrode.

14. The semiconductor photomultiplier device of claim 13, wherein the intermediate region is spaced apart from the active region.

15. The semiconductor photomultiplier device of claim 13, wherein the intermediate region comprises dopants of the second conductivity type at a concentration equal to or lower than dopants of the second conductivity type in the active region.

16. The semiconductor photomultiplier device of claim 1, comprising a plurality of cells, each cell comprising a respective active region of the second conductivity type adjacent to the front side.

17. The semiconductor photomultiplier device of claim 1, wherein the separation region defines a resistance between the active region and the contact region.

18. The semiconductor photomultiplier device of claim 1, wherein the first conductivity type is n-type conductivity type and the second conductivity type is p-type conductivity type.

19. The semiconductor photomultiplier device of claim 1, wherein the first conductivity type is p-type conductivity type and the second conductivity type is n-type conductivity type.

20. The semiconductor photomultiplier device of claim 1, wherein the surface of the front side is free of integrated resistors.