Claims

Claim 1. A method of forming an insulating spacer comprising:

providing a base layer;

providing an intermediate layer above an upper surface of the base layer;

etching a first trench in the intermediate layer;

depositing a first insulating material portion within the first trench;

depositing a second insulating material portion above an upper surface of the intermediate layer;

forming an upper layer above an upper surface of the second insulating material portion;

etching a second trench in the upper layer; and

depositing a third insulating material portion within the second trench and on the upper surface of the second insulating material portion.

Claim 2. The method of claim 1, further comprising;

forming an etch stop on the upper surface of the second insulating material portion prior to forming the upper layer; and

removing the formed etch stop prior to depositing the third insulating material portion.

Claim 3. The method of claim 1, further comprising:

patterning the second insulating material portion above the upper surface of the intermediate layer; and

etching the patterned second insulating material portion above the upper surface of the intermediate layer, such that a remainder portion of the second insulating material portion remains directly above the upper surface of the intermediate layer.

Claim 4. The method of claim 1, wherein etching a second trench in the upper layer comprises:

etching a second trench in the upper layer that is axially aligned with the first insulating material portion.

Claim 5. The method of claim 1, wherein:

the first insulating material portion comprises a first set of material characteristics;

the third insulating material portion comprises a second set of material characteristics; and

the first set of material characteristics is different from the second set of material characteristics.

Claim 6. The method of claim 1, wherein:

the intermediate layer comprises a third set of material characteristics;

the upper layer comprises a fourth set of material characteristics; and

the third set of material characteristics is different from the fourth set of material characteristics.

Claim 7. The method of claim 1, further comprising:

depositing a fourth insulating material portion directly above an upper surface of the upper layer and on the third insulating material portion;

forming a top layer above an upper surface of the fourth insulating material portion;

etching a third trench in the top layer; and

depositing a fifth insulating material portion within the third trench and on the upper surface of the fourth insulating material portion.

Claim 8. The method of claim 1, further comprising:

etching a fourth trench in the intermediate layer; and

depositing a sixth insulating material portion within the fourth trench, wherein depositing a second insulating material portion comprises:

depositing a second insulating material portion above an upper surface of the intermediate layer, the second insulating material portion extending from the first insulating material portion to the sixth insulating material portion.

Claim 9. The method of claim 8, further comprising:

lining the first trench with a first sacrificial layer portion prior to depositing the first insulating material portion;

removing the first sacrificial layer portion after depositing the first insulating material portion;

lining the fourth trench with a second sacrificial layer portion prior to depositing the sixth insulating material portion;

removing the second sacrificial layer portion after depositing the sixth insulating material portion;

lining the upper surface of the intermediate layer with a third sacrificial layer portion prior to depositing the second insulating material portion; and

removing the third sacrificial layer portion after depositing the second insulating material portion.

Claim 10. A wafer comprising:

a base layer;

a first layer portion above an upper surface of the base layer;

a first trench in the first layer portion;

a first insulating material portion within the first trench;

a second insulating material portion extending horizontally above an upper surface of the first layer portion and connected to the first insulating material portion;

a second layer portion above an upper surface of the second insulating material portion;

a second trench in the second layer portion; and

a third insulating material portion within the second trench and on the upper surface of the second insulating material portion.

Claim 11. The wafer of claim 10, wherein the second insulating material portion extends outwardly of the first insulating material portion on opposite sides of the first insulating material portion.

Claim 12. The wafer of claim 10, wherein the third insulating material portion is axially aligned with the first insulating material portion.

Claim 13. The wafer of claim 10, wherein:

the first insulating material portion comprises a first set of material characteristics;

the third insulating material portion comprises a second set of material characteristics; and

the first set of material characteristics is different from the second set of material characteristics.

Claim 14. The wafer of claim 10, wherein:

the first layer portion comprises a third set of material characteristics;

the second layer portion comprises a fourth set of material characteristics; and

the third set of material characteristics is different from the fourth set of material characteristics.

Claim 15. The wafer of claim 10, further comprising:

a fourth insulating material portion above an upper surface of the second layer portion;

a top layer above an upper surface of the fourth insulating material portion;

a third trench in the top layer; and

a fifth insulating material portion within the third trench and on the upper surface of the fourth insulating material portion.

Claim 16. The wafer of claim 10, further comprising:

a fourth trench in the first layer portion; and

a sixth insulating material portion within the fourth trench, wherein the second insulating material portion above an upper surface of the first layer portion extends from the first insulating material portion to the sixth insulating material portion.

Claim 17. The wafer of claim 16, wherein:

the first insulating material portion is not adhered to the first layer portion;

the sixth insulating material portion is not adhered to the first layer portion; and

the second insulating material portion is not adhered to the upper surface of the first layer portion.

The invention claimed is:

1. A method of forming an insulating spacer in a device comprising: providing a base layer; providing an intermediate layer above an upper surface of the base layer; etching a first trench in the intermediate layer; defining adjacent portions of the intermediate layer using the first trench; depositing a first insulating material portion within the first trench; isolating the adjacent portions of the intermediate layer from each other using the first insulating material; depositing a second insulating material portion above an upper surface of the intermediate layer; forming an upper layer above an upper surface of the second insulating material portion; etching a second trench in the upper layer; and depositing a third insulating material portion within the second trench and on the upper surface of the second insulating material portion, wherein the adjacent portions of the intermediate layer are a part of the final device.

2. The method of claim 1, further comprising; forming an etch stop on the upper surface of the second insulating material portion prior to forming the upper layer; and removing the formed etch stop prior to depositing the third insulating material portion.

3. The method of claim 1, further comprising: patterning the second insulating material portion above the upper surface of the intermediate layer; and etching the patterned second insulating material portion above the upper surface of the intermediate layer, such that a remainder portion of the second insulating material portion remains directly above the upper surface of the intermediate layer.

4. The method of claim 1, wherein etching a second trench in the upper layer comprises: etching a second trench in the upper layer that is axially aligned with the first insulating material portion.

5. The method of claim 1, wherein: the first insulating material portion comprises a first set of material characteristics; the third insulating material portion comprises a second set

of material characteristics; and the first set of material characteristics is different from the second set of material characteristics.

6. The method of claim 1, wherein: the intermediate layer comprises a third set of material characteristics; the upper layer comprises a fourth set of material characteristics; and the third set of material characteristics is different from the fourth set of material characteristics.

7. The method of claim 1, further comprising: depositing a fourth insulating material portion directly above an upper surface of the upper layer and on the third insulating material portion; forming a top layer above an upper surface of the fourth insulating material portion; etching a third trench in the top layer; and depositing a fifth insulating material portion within the third trench and on the upper surface of the fourth insulating material portion.

8. The method of claim 1, further comprising: etching a fourth trench in the intermediate layer; and depositing a sixth insulating material portion within the fourth trench, wherein depositing a second insulating material portion comprises: depositing a second insulating material portion above an upper surface of the intermediate layer, the second insulating material portion extending from the first insulating material portion to the sixth insulating material portion.

9. The method of claim 8, further comprising: lining the first trench with a first sacrificial layer portion prior to depositing the first insulating material portion; removing the first sacrificial layer portion after depositing the first insulating material portion; lining the fourth trench with a second sacrificial layer portion prior to depositing the sixth insulating material portion; removing the second sacrificial layer portion after depositing the sixth insulating material portion; lining the upper surface of the intermediate layer with a third sacrificial layer portion prior to depositing the second insulating material portion; and removing the third sacrificial layer portion after depositing the second insulating material portion.

10. The method of claim 1, further comprising: defining adjacent portions of the upper layer using the second trench; and isolating the adjacent portions of the upper layer using the third insulating material, wherein the adjacent portions of the upper layer are a part of the final device.

11. The method of claim 1, wherein depositing a first insulating material portion within the first trench comprises: depositing a silicon nitride material portion within the first trench.

12. The method of claim 1, wherein the adjacent portions of the intermediate layer are electrically conductive portions.

13. The method of claim 1, further comprising forming a membrane using the intermediate layer.

14. The method of claim 13, wherein forming a membrane using the intermediate layer comprises: forming a first air gap between the base layer and the adjacent portions of the intermediate layer; and forming a second air gap above the adjacent portions of the intermediate layer.

15. A method of insulating adjacent portions within a layer from each other comprising: providing a base layer; providing a first device layer portion above an upper surface of the base layer; etching a first trench in the first device layer portion to define a first segment of the first device layer portion and a second segment of the first device layer portion, the first segment separated from the second segment by the first trench; isolating the first segment from the second segment by depositing a first insulating material portion within the first trench; depositing a second insulating material portion above an upper surface of the first segment; depositing a third insulating material portion above an upper surface of the second segment; forming an second device layer portion above an upper surface of the second insulating material portion and above an upper surface of the third

insulating material; etching a second trench in the second device layer portion; and depositing a fourth insulating material portion within the second trench and on the upper surface of the second insulating material portion and on the upper surface of the third insulating material portion.

16. The method of claim 15, further comprising: defining a third segment of the second device layer portion and a fourth segment of the second device layer portion using the second trench; and isolating the third segment from the fourth segment using the fourth insulating material.

17. The method of claim 16, wherein isolating the first segment from the second segment comprises: isolating the first segment from the second segment by depositing a silicon nitride material portion within the first.

18. The method of claim 15, wherein the first segment and the second segment of the intermediate layer are electrically conductive segments.

19. The method of claim 15, further comprising forming a membrane using the first device layer portion.

20. The method of claim 19, wherein forming a membrane using the first device layer portion comprises: forming a first air gap between the base layer and the first segment and the second segment of the first device layer portion; and forming a second air gap above the third segment and the fourth segment of the second device layer portion.