

Claims

What is claimed:

1. A method of making a semiconductor device, comprising:
providing a substrate;
forming a conductive layer over the substrate;
disposing a semiconductor die over the conductive layer;
disposing a first encapsulant over the semiconductor die, substrate, and conductive layer;
removing a portion of the substrate to expose the conductive layer after depositing the first encapsulant;
disposing a second encapsulant around the first encapsulant and conductive layer after removing the portion of the substrate; and
forming an interconnect structure over the conductive layer and second encapsulant.
2. The method of claim 1, further including disposing a first passive device over the conductive layer.
3. The method of claim 2, further including disposing a second passive device adjacent to the conductive layer.
4. The method of claim 1, further including:
providing the substrate to include an insulating layer;
forming the conductive layer over the insulating layer substrate; and
forming a plurality of openings in the insulating layer over the conductive layer.

5. The method of claim 4, further including removing the portion of the substrate prior to forming the openings in the insulating layer.

6. The method of claim 1, further including disposing an interconnect unit including a conductive via in a peripheral region of the semiconductor die.

7. A method of making a semiconductor device, comprising:
providing a substrate;
forming a first conductive layer over the substrate;
disposing a first semiconductor die over the first conductive layer;
disposing a second semiconductor die over the first conductive layer adjacent to the first semiconductor die;
disposing a first encapsulant over the first semiconductor die, second semiconductor die, and first conductive layer;
singulating through the first encapsulant with the first semiconductor die remaining attached to the second semiconductor die by the first encapsulant;
removing a portion of the substrate over the first conductive layer;
depositing a second encapsulant over the first semiconductor die, second semiconductor die, first conductive layer, and first encapsulant after singulating through the first encapsulant; and
forming an interconnect structure over the first conductive layer opposite the first semiconductor die.

8. The method of claim 7, wherein forming the interconnect structure includes forming a second conductive layer over the

first encapsulant and first conductive layer by performing a metal deposition technique onto the first conductive layer.

9. The method of claim 7, further including disposing a passive device in a peripheral region of the first semiconductor die.

10. The method of claim 9, further including depositing the second encapsulant over the passive device and first semiconductor die.

11. The method of claim 7, further including:
disposing vertical interconnect structure in a peripheral region of the first semiconductor die;
depositing the first encapsulant around the first semiconductor die and vertical interconnect structure; and
forming an opening in the first encapsulant over the vertical interconnect structure.

12. The method of claim 7, further including forming a composite interconnect structure over the first semiconductor die.

13. A method of making a semiconductor device, comprising:
providing a substrate;
forming a first interconnect structure over the substrate;
disposing a first semiconductor die over the first interconnect structure;
disposing a second encapsulant over the first semiconductor die and first interconnect structure;
singulating through the second encapsulant;

disposing a first encapsulant over the first semiconductor die and first interconnect structure after singulating through the second encapsulant;

removing a portion of the substrate over the first interconnect structure; and

forming a second interconnect structure over the first encapsulant and first interconnect structure.

14. The method of claim 13, further including disposing a passive device over the first interconnect structure.

15. The method of claim 13 further including disposing a passive device adjacent to the first interconnect structure.

16. The method of claim 13, further including disposing a vertical interconnect structure in a peripheral region of the first semiconductor die.

17. The method of claim 16, further including forming an opening in the first encapsulant over the vertical interconnect structure.

18. The method of claim 13, further including disposing a second semiconductor die over the first interconnect structure.

19. A method of making a semiconductor device, comprising:
providing a substrate including an insulating layer and a conductive layer;

forming a first interconnect structure over the substrate and connected to the conductive layer;

disposing a semiconductor die over the first interconnect structure;

disposing a first encapsulant over the substrate, first interconnect structure, and semiconductor die; and

removing a portion of the insulating layer after forming the first interconnect structure to expose the conductive layer.

20. The method of claim 19, further including disposing a second encapsulant around the substrate, semiconductor die, first interconnect structure, and first encapsulant.

21. The method of claim 19, further including disposing a vertical interconnect structure in a peripheral region of the semiconductor die.

22. The method of claim 20, further including forming a second interconnect structure over the second encapsulant outside a footprint of the first encapsulant.

23. The method of claim 20, further including singulating through the first encapsulant prior to depositing the second encapsulant.