Claims

What is claimed:

1. A method of making a semiconductor device, comprising:

providing a carrier;

disposing a semiconductor die on the carrier;

disposing a modular interconnect unit on the carrier with a first side surface of the modular interconnect unit adjacent to a first side surface of the semiconductor die and a second side surface of the modular interconnect unit adjacent to a second side surface of the semiconductor die, wherein the modular interconnect unit includes a plurality of conductive vias oriented in an L-shape;

depositing an encapsulant extending from the first side surface of the modular interconnect unit to the first side surface of the semiconductor die and from the second side surface of the modular interconnect unit to the second side surface of the semiconductor die;

forming a first insulating layer over the encapsulant, semiconductor die, and modular interconnect unit;

forming a plurality of openings through the first insulating layer and encapsulant to expose the conductive vias of the modular interconnect units;

providing a semiconductor component;

forming a plurality of contact pads on the semiconductor component oriented in an L-shape;

forming a second insulating layer over the semiconductor component around the contact pads; and

disposing the semiconductor component over the semiconductor die and modular interconnect unit with the first

insulating layer directly contacting the second insulating layer and including a plurality of conductive bumps extending through the openings in the encapsulant and first insulating layer from the contact pads of the semiconductor component to the conductive vias of the modular interconnect unit, wherein the semiconductor component includes a first side surface completely outside a footprint of the semiconductor die adjacent to the first side surface of the semiconductor die, a second side surface of the semiconductor component completely outside the footprint of the semiconductor die adjacent to the second side surface of the semiconductor die, and a third side surface of the semiconductor component extending directly over the footprint of the semiconductor die.

2. The method of claim 1, wherein the modular interconnect unit includes an L-shape and the first side surface of the semiconductor die and second side surface of the semiconductor die are adjacent side surfaces.

3. The method of claim 1, wherein the first insulating layer includes a polymer matrix composite film.

4. The method of claim 1, further including removing the carrier to expose the modular interconnect unit and semiconductor die.

5. The method of claim 1, further including a fourth side surface of the semiconductor component extending over the footprint of the semiconductor die, wherein the third side surface and fourth side surface of the semiconductor component

form a corner of the semiconductor component within the footprint of the semiconductor die.

6. The method of claim 5, further including disposing an underfill dot between the semiconductor die and semiconductor component.

7. The method of claim 1, further including forming the plurality of conductive bumps in an L-shape on the semiconductor component prior to disposing the semiconductor component over the semiconductor die and modular interconnect unit.

8. A method of making a semiconductor device, comprising:

providing a semiconductor die;

disposing a first modular interconnect unit with a side surface of the first modular interconnect unit adjacent to a side surface of the semiconductor die;

depositing an encapsulant extending from the first modular interconnect unit to the semiconductor die;

forming a first insulating layer over the semiconductor die, first modular interconnect unit, and encapsulant;

forming a plurality of openings through the first insulating layer and encapsulant to expose conductive vias of the first modular interconnect unit;

providing a semiconductor component; and

disposing the semiconductor component over the semiconductor die and first modular interconnect unit with a first side surface of the semiconductor component completely outside a footprint of the semiconductor die adjacent to the first modular interconnect unit and a second side surface of the semiconductor component opposite the first side surface of the

semiconductor component directly within the footprint of the semiconductor die.

9. The method of claim 8, further including

forming a first conductive layer over the first modular interconnect unit opposite the semiconductor component.

10. The method of claim 8, wherein the first modular interconnect unit includes an L-shape and is disposed along first and second adjacent side surfaces of the semiconductor die.

11. The method of claim 8, further including:

forming a second insulating layer over the semiconductor component; and

disposing the semiconductor component over the semiconductor die with the second insulating layer contacting the first insulating layer.

12. The method of claim 8, further including singulating through the encapsulant and first insulating layer prior to disposing the semiconductor component over the semiconductor die.

13. A semiconductor device, comprising:

a semiconductor die;

a first modular interconnect unit disposed adjacent to a first side surface of the semiconductor die;

a first insulating layer formed over the semiconductor die and first modular interconnect unit;

a semiconductor component disposed over the semiconductor die and first modular interconnect unit including a second insulating layer of the semiconductor component contacting the first insulating layer; and

a conductive bump extending from a first conductive layer of the first modular interconnect unit to a second conductive layer of the semiconductor component.

14. The semiconductor device of claim 13, wherein the first modular interconnect unit includes an L-shape and is disposed along first and second adjacent side surfaces of the semiconductor die.

15. The semiconductor device of claim 13, further including an underfill dot disposed between the semiconductor die and semiconductor component.

16. The semiconductor device of claim 13, wherein the first modular interconnect unit includes:

a substrate; and

a plurality of conductive vias formed in the substrate.

17. The semiconductor device of claim 13, wherein the semiconductor die extends outside a footprint of the semiconductor component opposite the first side surface of the semiconductor die.

18. A semiconductor device, comprising:

a semiconductor die;

a first modular interconnect unit disposed adjacent to a first side surface of the semiconductor die with a surface of

the first modular interconnect unit substantially coplanar with a second surface of the semiconductor die;

a first interconnect structure formed over the semiconductor die and first modular interconnect unit;

a first insulating layer formed over the semiconductor die and first modular interconnect unit opposite the first interconnect structure including an opening formed through the first insulating layer over the first modular interconnect unit; and

a semiconductor component comprising a conductive bump disposed in the opening of the first insulating layer and electrically coupled to the first interconnect structure through the conductive bump and first modular interconnect unit.

19. The semiconductor device of claim 18, wherein the first modular interconnect unit includes:

a substrate; and

a plurality of conductive vias formed in the substrate, wherein the opening in the first insulating layer exposes one of the plurality of conductive vias.

20. The semiconductor device of claim 18, wherein the first modular interconnect unit includes an L-shape.

21. The semiconductor device of claim 18, wherein the semiconductor component rests on the first insulating layer with no gap between the semiconductor component and the first insulating layer.

22. The semiconductor device of claim 18, further including a corner of the semiconductor component over the semiconductor die.

23. The semiconductor device of claim 22, further including an underfill dot disposed between the semiconductor component and semiconductor die.

24. A semiconductor device, comprising:

a semiconductor die;

a modular interconnect unit disposed adjacent to a side surface of the semiconductor die;

an encapsulant contacting the semiconductor die and modular interconnect unit;

a semiconductor component disposed over the semiconductor die, wherein the semiconductor die extends outside a footprint of the semiconductor component opposite the side surface of the semiconductor die; and

a second interconnect structure disposed through the encapsulant and extending from the modular interconnect unit to the semiconductor component.

25. The semiconductor device of claim 24, wherein the modular interconnect unit includes an L-shape.

26. The semiconductor device of claim 24, further including a first interconnect structure formed over the modular interconnect unit and semiconductor die opposite the semiconductor component.

27. The semiconductor device of claim 24, further including an underfill dot disposed between the semiconductor component and semiconductor die.

28. The semiconductor device of claim 24, further including a first insulating layer formed over the encapsulant with the second interconnect structure extending through an opening of the first insulating layer.

29. The semiconductor device of claim 28, further including a second insulating layer formed over the semiconductor component and in contact with the first insulating layer.