Claims

What is claimed:

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

providing a semiconductor die;

disposing the semiconductor die on a carrier with an active surface of the semiconductor die oriented toward the carrier;

disposing a vertical interconnect structure on the carrier adjacent to the semiconductor die, wherein the vertical interconnect structure includes an insulating material and a conductive via formed through the insulating material;

depositing an encapsulant over the semiconductor die and vertical interconnect structure;

removing the carrier after depositing the encapsulant to expose the active surface of the semiconductor die and a surface of the encapsulant;

forming a build-up interconnect structure over the active surface of the semiconductor die after removing the carrier;

backgrinding the encapsulant to expose a back surface of the semiconductor die opposite the active surface;

providing a substrate including a bump and an opening formed through the substrate;

disposing the substrate over the semiconductor die with the opening over the back surface of the semiconductor die, wherein a footprint of the opening is smaller than a footprint of the semiconductor die;

bonding the bump of the substrate to the vertical interconnect structure by reflowing the bump with the bump vertically aligned to the conductive via; and

disposing an adhesive through an opening in the substrate

and between the substrate and the semiconductor die after bonding the bump of the substrate to the vertical interconnect structure, wherein the adhesive contacts the bump and covers the back surface of the semiconductor die.

2. The method of claim 1, further including forming a plurality of openings in the substrate.

3. The method of claim 1, wherein a pitch of the substrate is greater than a pitch of the the build-up interconnect structure.

4. The method of claim 1, wherein a pitch of the substrate is less than a pitch of the build-up interconnect structure.

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

providing a semiconductor package including,

a semiconductor die,

a vertical interconnect structure disposed adjacent to the semiconductor die, and

an encapsulant deposited between the semiconductor die and vertical interconnect structure, wherein an active surface of the semiconductor die is coplanar with a first surface of the encapsulant and a back surface of the semiconductor die opposite the active surface is coplanar with a second surface of the encapsulant;

providing a substrate including an opening in the substrate;

disposing the substrate over the semiconductor package with the back surface of the semiconductor die oriented toward the substrate; and

disposing an adhesive through the opening and between

the substrate and the semiconductor package after disposing the substrate over the semiconductor package, wherein the adhesive contacts the back surface of the semiconductor die and the surface of the encapsulant.

6. The method of claim 5, further including forming a plurality of openings in the substrate.

7. The method of claim 5, wherein the semiconductor package further includes a redistribution layer (RDL) over the active surface of the semiconductor die.

8. The method of claim 7, wherein a pitch of the substrate is greater than a pitch of the RDL.

9. The method of claim 7, wherein a pitch of the substrate is less than a pitch of the RDL.

10. The method of claim 5, wherein the adhesive extends to the vertical interconnect structure.

11. The method of claim 5, further including:
forming an interconnect structure over the substrate; and
self-aligning the interconnect structure of the substrate with the vertical interconnect structure of the semiconductor package.

12. A method of making a semiconductor device, comprising:
providing a semiconductor die;
depositing an encapsulant around the semiconductor die;
backgrinding the encapsulant to expose a surface of the semiconductor die;

providing a substrate including an opening and an interconnect structure disposed on a surface of the substrate;

disposing the substrate over the surface of the semiconductor die and encapsulant with the surface of the substrate oriented toward the semiconductor die, wherein the opening is smaller than the semiconductor die; and

depositing an adhesive between the semiconductor die and substrate through the opening.

13. The method of claim 12, further including providing the substrate including a plurality of openings.

14. The method of claim 12, further including forming a redistribution layer (RDL) over the semiconductor die and encapsulant.

15. The method of claim 12, further including forming a conductive bump over the substrate, wherein depositing the adhesive includes depositing the adhesive extending to the conductive bump.

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

providing a semiconductor die;

depositing an encapsulant over the semiconductor die, wherein an active surface of the semiconductor die is coplanar with a first surface of the encapsulant and a back surface of the semiconductor die opposite the active surface is coplanar with a second surface of the encapsulant;

providing a substrate including an opening;

disposing the substrate over the semiconductor die with a bottom surface of the substrate oriented toward the semiconductor die and the back surface of the semiconductor die oriented toward the substrate; and

depositing an adhesive between the back surface of the semiconductor die and the bottom surface of the substrate through the opening.

17. The method of claim 16,further including forming a plurality of openings in the substrate.

18. The method of claim 16, further including forming a redistribution layer (RDL) over the active surface of the semiconductor die and the encapsulant.

19. The method of claim 18, wherein a pitch of the substrate is greater than a pitch of the RDL.

20. The method of claim 18, wherein a pitch of the substrate is less than a pitch of the RDL.

21. The method of claim 16, further including providing an interconnect structure electrically coupled between the substrate and semiconductor die, wherein depositing the adhesive includes depositing the adhesive extending to the interconnect structure.

22. The method of claim 12, further including:

disposing a vertical interconnect structure adjacent to the semiconductor die;

depositing the encapsulant over the vertical interconnect structure; and

wherein the encapsulant remains covering the vertical interconnect structure after the backgrinding step.

23. The method of claim 22, wherein the vertical interconnect structure includes:

an insulating material; and

a conductive via extending through the insulating material.

24. The method of claim 5, wherein the active surface of the semiconductor die is oriented in substantially the same direction as the first surface of the encapsulant.

25. The method of claim 24, wherein the back surface of the semiconductor die is oriented in substantially the same direction as the second surface of the encapsulant.