Claims

What is claimed:

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

providing a substrate including ~~an~~a first insulating layer and a conductive layer embedded in the first insulating layer and a first opening extending completely through the substrate;

~~forming a first opening in the substrate;~~

disposing a first semiconductor die within the first opening of the substrate;

depositing ~~a first~~ an encapsulant over the first semiconductor die and substrate; and

forming a second opening through the ~~first~~ encapsulant and ~~insulating layer to expose~~ substrate extending to the conductive layer.

2. The method of claim 1, further including forming an interconnect structure over the first semiconductor die and substrate.

~~2~~3. The method of claim 1, further including forming a bump within the second opening over the conductive layer.

~~3~~4. The method of claim 1, further including ~~forming a second encapsulant between the conductive layer and the insulating layer~~ removing a portion of the first semiconductor die and encapsulant.

~~4~~5. The method of claim 1, wherein providing the substrate further includes:

providing the conductive layer;

forming a bump over the conductive layer; and

forming the first insulating layer over the conductive layer and the bump.

56. The method of claim 1, further including patterning the conductive layer to form conductive pads or conductive pillars disposing a second semiconductor die over the first semiconductor die.

~~6~~7. A method of making a semiconductor device, comprising:

providing a substrate including ~~an~~a first insulating layer and a conductive layer;

forming a first opening ~~in~~through the substrate;

disposing a first semiconductor die within the first opening of the substrate; and

forming a second opening ~~in~~ partially through the ~~insulating layer to expose~~ substrate extending to the conductive layer.

~~7.~~8 The method of claim ~~6~~7, further including forming an interconnect structure over the first semiconductor die and substrate ~~to electrically connect the semiconductor die and conductive layer~~.

~~8. The method of claim 6, wherein providing the substrate includes:~~

~~providing the insulating layer;~~

~~forming a third opening partially through the insulating layer; and~~

~~forming the conductive layer over the insulating layer and within the third opening.~~

9. The method of claim ~~6~~7, further including:

depositing an encapsulant over the first semiconductor die and ~~insulating layer~~substrate; and

forming the second opening through the encapsulant and substrate extending to ~~expose~~ the conductive layer.

10. The method of claim ~~6~~7, further including~~:~~

~~singulating the substrate into individual units; and~~

~~mounting the individual units to a carrier~~ forming a bump within the second opening over the conductive layer.

11. The method of claim 7, further including forming the first opening or second opening by stamping or laser direct ablation.

1~~1~~2. A semiconductor device, comprising:

a substrate including a first opening extending through the substrate;

a first semiconductor die disposed in the first opening of the substrate;

an ~~first~~ encapsulant deposited over the first semiconductor die and substrate; and

a second opening formed through the ~~first~~ encapsulant and partially through the substrate.

1~~2~~3. The semiconductor device of claim 1~~1~~2, wherein the substrate further includes:

an insulating layer; and

a conductive layer embedded within the insulating layer.

~~13. The semiconductor device of claim 11, wherein the substrate further includes:~~

~~an insulating layer;~~

~~a conductive layer formed over the insulating layer; and~~

~~a second encapsulant formed over the conductive layer.~~

~~14. The semiconductor device of claim 13, further including the second opening formed through the insulating layer and second encapsulant to expose the conductive layer.~~

~~15. The semiconductor device of claim 11, further including a bump formed in the second opening.~~

14. The semiconductor device of claim 13, wherein the conductive layer includes conductive pads or pillars having a pitch of 0.50 millimeters or less.

15. The semiconductor device of claim 12, further including an interconnect structure formed over the first semiconductor die and substrate.

16. The semiconductor device of claim 12, further including a bump formed in the second opening.

17. A semiconductor device, comprising:

a substrate including a first insulating layer and a conductive layer, wherein a first surface of the conductive layer and a second surface of the conductive layer opposite the first surface are devoid of the first insulating layer and a height of the conductive layer is less than a height of the first insulating layer; and

a first semiconductor die disposed adjacent to the substrate.

18. The semiconductor device of claim 17, further including an interconnect structure formed over the first semiconductor die and substrate.

19. The semiconductor device of claim 17, further including a bump formed in the second opening over the conductive layer.

20. The semiconductor device of claim 17, further including an encapsulant deposited over the first semiconductor die and substrate.

21. The semiconductor device of claim 17, further including a second semiconductor die disposed over the first semiconductor die.

22. The semiconductor device of claim 20, wherein the second opening extends through the encapsulant and partially through the substrate.

23. The semiconductor device of claim 17, further including a heat sink disposed over the first semiconductor die.

24. The semiconductor device of claim 17, further including a second insulating layer formed over the first insulating layer.

25. The method of claim 1, further including forming the first opening or second opening by stamping or laser direct ablation.

26. The method of claim 1, further including forming a second insulating layer over the first insulating layer.

27. The method of claim 7, further including forming a second insulating layer over the first insulating layer.

28. The method of claim 7, further including disposing a second semiconductor die over the first semiconductor die.

29. The semiconductor device of claim 12, further including a second semiconductor die disposed over the first semiconductor die.

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

providing a plurality of substrate units each including an insulating layer and a conductive layer embedded in the insulating layer;

arranging the substrate units to form a space between the substrate units;

disposing a first semiconductor die in the space between the substrate units; and

forming an opening in the substrate units extending to the conductive layer.

31. The method of claim 30, further including forming an interconnect structure over the first semiconductor die and substrate units.

32. The method of claim 30, further including depositing an encapsulant over the first semiconductor die and substrate units.

33. The method of claim 32, further including forming the opening through the encapsulant and substrate units extending to the conductive layer.

34. The method of claim 30, further including forming a bump within the opening over the conductive layer.

35. The method of claim 30, further including disposing a second semiconductor die over the first semiconductor die.