## Claims

What is claimed:

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

providing a first semiconductor die including a plurality of contact pads formed over a central region of the first semiconductor die;

forming a first conductive layer over the first semiconductor die and extending from the contact pads to a peripheral region of the first semiconductor die;

forming a plurality of first interconnect structures over the ~~in a peripheral region~~ first conductive layer in the peripheral region of the first semiconductor die;

forming a first protective coating over the first semiconductor die and around the first interconnect structures;

removing a portion of the first semiconductor die opposite the first interconnect structures after forming the first protective coating;

removing the first protective coating after removing the portion of the first semiconductor die;

providing a second semiconductor die including a plurality of bumps formed on an active surface of the second semiconductor die; ~~and~~

~~disposing a second semiconductor die over the first semiconductor die between the interconnect structures~~disposing the first semiconductor die over the second semiconductor die with the bumps oriented away from the first semiconductor die and with the first interconnect structures disposed around the second semiconductor die;

depositing an encapsulant around the first semiconductor

die and second semiconductor die; and

forming a second conductive layer contacting the bumps and first interconnect structures.

2. The method of claim 1, further including ~~forming a conductive layer between a central region~~ removing a portion of the ~~first~~ second semiconductor die ~~and the peripheral region of the first semiconductor die~~.

~~3. The method of claim 1, further including forming a redistribution layer over the first semiconductor die and second semiconductor die.~~

~~4~~3. The method of claim 1, further including:

forming a second protective coating over the second ~~providing a semiconductor wafer including the first~~ semiconductor die; ~~and~~

removing a portion of the second semiconductor ~~wafer to a thickness of 30 to 100 micrometers~~ die after forming the second protective coating; and

removing the second protective coating after removing the portion of the second semiconductor die.

~~5~~4. The method of claim ~~4~~1, ~~further including forming the interconnect structures~~ wherein the first protective coating ~~before removing the portion of the semiconductor wafer~~ includes a water soluble polymer material.

5. The method of claim 1, wherein the first interconnect structures include a non-fusible portion and a fusible portion.

6. The method of claim 1, further including forming a plurality of second interconnect structures across the central region of the first semiconductor die to divide the central region of the first semiconductor die into first and second regions devoid of the first and second interconnect structures.

7. The method of claim 6, further including:

disposing the second semiconductor die in the first region; and

disposing a third semiconductor die in the second region.

~~6~~8. A method of making a semiconductor device, comprising:

providing a first semiconductor die;

forming a first ~~interconnect structure and a second interconnect structure; and~~ conductive layer over the first semiconductor and extending from a central region of the first semiconductor die to a peripheral region of the first semiconductor die;

forming a plurality of first interconnect structures over the first conductive layer in the peripheral region of the first semiconductor die;

providing a second semiconductor die including a plurality of bumps formed over an active surface of the second semiconductor die;

providing a carrier;

disposing the second semiconductor die over the carrier with the bumps oriented toward the carrier;

disposing ~~a second semiconductor die over the first semiconductor die between the first interconnect structure and the second interconnect structure~~ the first semiconductor die with the first interconnect structures over the second semiconductor die on the carrier, wherein the first interconnect structures are disposed around the second semiconductor die;

depositing an encapsulant over the first semiconductor die, second semiconductor die, and carrier and further around the first interconnect structures;

removing the carrier; and

forming a second interconnect structure over the encapsulant and in contact with the first interconnect structures and bumps after removing the carrier.

~~7~~9. The method of claim ~~6~~8, further including removing a portion of the first semiconductor die after forming the first interconnect structure.

10. The method of claim 8, wherein forming the first interconnect structures includes forming a plurality of conductive pillars.

~~8~~11. The method of claim ~~6~~8, ~~wherein forming the first interconnect structure~~ further includ~~es~~ing:

forming a ~~first conductive pillar in a peripheral region of the first semiconductor die; and~~

~~forming a bump over the conductive pillar~~ protective coating over an active surface of the first semiconductor die;

removing a portion of the first semiconductor die opposite the active surface after forming the protective coating; and

removing the protective coating after removing the portion of the first semiconductor die.

~~9~~12. The method of claim ~~6~~8, further including forming a ~~conductive layer between a central region of the first semiconductor die and a peripheral region of the first semiconductor die~~ plurality of second interconnect structures across the central region of the first semiconductor die to divide the central region of the first semiconductor die into a first region and a second region devoid of the first and second interconnect structures.

13. The method of claim 12, further including:

disposing the second semiconductor die in the first region; and

disposing a third semiconductor die in the second region.

10~~4~~. The method of claim ~~6~~8, further including ~~disposing the~~ forming a ~~second semiconductor die over a central region of the first semiconductor die~~ second conductive layer over the first interconnect structures and active surface of the second semiconductor die after depositing the encapsulant.

15. The method of claim 8, further including:

forming a protective coating over the second semiconductor die;

removing a portion of the second semiconductor die after forming the protective coating; and

removing the protective coating after removing the portion of the second semiconductor die.

11~~6~~. A semiconductor device, comprising:

a first semiconductor die;

a ~~first interconnect structure and a second interconnect structure formed in a peripheral region of the first semiconductor die; and~~ plurality of first interconnect structures formed over a peripheral region of the first semiconductor die;

a second semiconductor die disposed over the first semiconductor die and between the first interconnect structures ~~and the second interconnect structure~~ with an active surface of the second semiconductor die oriented away from the first semiconductor die and a gap between the first semiconductor die and second semiconductor die;

a plurality of second interconnect structures formed on the active surface of the second semiconductor die opposite the first semiconductor die;

an encapsulant deposited around the first semiconductor die and second semiconductor die and further in the gap over an entirety of a second surface of the second semiconductor die opposite the active surface; and

a first conductive layer formed over and contacting the first interconnect structures and second interconnect structures.

1~~2~~7. The semiconductor device of claim 1~~1~~6, ~~further including~~ wherein a height of the second semiconductor die is less than a height of the first interconnect structures.

~~13. The semiconductor device of claim 11, further including a footprint of the second semiconductor die smaller than a central region of the first semiconductor die.~~

1~~4~~8. The semiconductor device of claim 1~~1~~6, wherein the first interconnect structure~~s~~ ~~further~~ include~~s~~:

a conductive pillar~~ formed in the peripheral region of the first semiconductor die~~; and

a bump formed over the conductive pillar.

~~15. The semiconductor device of claim 14, further including a redistribution layer formed over the first semiconductor die and second semiconductor die.~~

19. The semiconductor device of claim 16, further including a plurality of third interconnect structures formed across a central region of the first semiconductor die and dividing the central region of the first semiconductor die into a first region and second region devoid of the first and third interconnect structures.

20. The semiconductor device of claim 19, wherein the second semiconductor die is disposed in the first region between the first and third interconnect structures.

21. The semiconductor device of claim 20, further including a third semiconductor die disposed in the second region between the first and third interconnect structures.

22. The semiconductor device of claim 16, further including a second conductive layer extending from a contact pad in a central region of the first semiconductor die to the peripheral region of the first semiconductor die.

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

providing a first semiconductor die;

forming a plurality of first interconnect structures over the first semiconductor die;

providing a second semiconductor die including a plurality of bumps formed over an active surface of the second semiconductor die;

providing a carrier;

disposing the second semiconductor die over the carrier with the bumps oriented toward the carrier;

disposing the first semiconductor die with the first interconnect structures over the second semiconductor die on the carrier, wherein the second semiconductor die is disposed between the first interconnect structures and the first interconnect structures contact the carrier leaving a gap between the first semiconductor die and second semiconductor die;

depositing an encapsulant over the first semiconductor die, second semiconductor die, and carrier and further around the first interconnect structures and in the gap over an entirety of a second surface of the second semiconductor die opposite the active surface;

removing the carrier; and

forming a second interconnect structure over the encapsulant and in contact with the first interconnect structures and bumps after removing the carrier.

24. The method of claim 23, further including:

forming a protective coating over the first semiconductor die and around the first interconnect structures;

removing a portion of the first semiconductor die after forming the protective coating; and

removing the protective coating after removing the portion of the first semiconductor die.

25. The method of claim 24, wherein the protective coating includes a water soluble polymer material.

26. The method of claim 23, further including:

forming a protective coating over the second semiconductor die;

removing a portion of the second semiconductor die after forming the protective coating;

removing the protective coating after removing the portion of the second semiconductor die.

27. The method of claim 23, wherein forming the first interconnect structures includes forming a plurality of conductive pillars.