Claims

What is claimed:

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

providing a substrate ~~having~~ including first and second opposing surfaces;

forming a plurality of ~~conductive~~ vias partially through the first surface of the substrate;

~~forming a first conductive layer over the first surface of the substrate electrically connected to the conductive vias~~ completely filling the plurality of vias with a conductive material to form a plurality of conductive vias;

~~mounting a first semiconductor die~~ forming a conductive layer over the first surface of the substrate electrically connected to the ~~first conductive layer~~conductive vias;

~~providing a carrier~~ disposing an insulating layer around the conductive layer to completely cover side surfaces of the conductive layer;

~~mounting the first semiconductor die and substrate to the carrier;~~

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

~~removing a portion of the second surface of the substrate to expose the conductive vias; and~~

~~forming an interconnect structure over a surface of the substrate opposite the first semiconductor die.~~

disposing a first semiconductor die over the first surface of the substrate electrically connected to the conductive layer;

depositing an encapsulant over the first semiconductor die and substrate including a side surface of the substrate;

removing a portion of the second surface of the substrate to expose the conductive vias coplanar with the second surface of the substrate after disposing the first semiconductor die over the substrate;

forming a redistribution layer over the encapsulant and substrate opposite the first semiconductor die and electrically connected to the first semiconductor die; and

forming a conductive via through the encapsulant and electrically connected to the redistribution layer.

2. The method of claim 1, further including:

forming ~~a first~~the insulating layer~~ over the first surface of the substrate prior to mounting the first semiconductor die~~ prior to disposing the first semiconductor die over the first surface of the substrate; and

forming a plurality of bumps over the ~~first~~ conductive layer.

3. The method of claim 1, further including depositing an underfill material beneath the first semiconductor die.

4. The method of claim 1, further including ~~stacking~~ disposing a second semiconductor die over the first semiconductor die.

5. The method of claim 1, further including ~~stacking~~ disposing a plurality of second semiconductor die over the first semiconductor die.

6. The method of claim 1, further including ~~mounting~~ disposing a second semiconductor die over the first surface of the substrate adjacent to the first semiconductor die.

7. The method of claim 1, further including forming an interconnect structure over the second surface of the substrate.

~~7~~8. A method of making a semiconductor device, comprising:

providing a substrate ~~having first and second opposing surfaces~~;

forming a ~~plurality of~~ first conductive via~~s~~ within the substrate;

~~mounting a first semiconductor die over the first surface of the substrate~~ forming a conductive layer, including a redistribution layer and a second conductive via, over the first conductive via;

~~providing a carrier;~~

~~mounting the first semiconductor die and substrate to the carrier;~~

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

~~forming an interconnect structure over the second surface of the substrate opposite the first semiconductor die~~

forming an insulating layer over the substrate after forming the redistribution layer and second conductive via;

disposing a first semiconductor die over the substrate;

disposing an encapsulant over the semiconductor die and substrate including a side surface of the substrate;

removing a portion of the substrate to expose the first conductive via; and

forming a build-up interconnect structure over the exposed first conductive via, encapsulant, and first semiconductor die.

~~8~~9. The method of claim ~~7~~8, further including~~:~~

forming the ~~plurality of~~ first conductive via~~s~~ partially through ~~the~~ a first surface of the substrate~~; and~~

~~removing a portion of the second surface of the substrate to expose the conductive vias~~.

~~9~~10. The method of claim ~~7~~8, further including~~:~~

forming~~ a first conductive layer over the first surface of the substrate electrically connected to the conductive vias prior to mounting the first semiconductor die; and~~

~~forming a first insulating layer over the first surface of the substrate~~ an interconnect structure over the substrate opposite the first semiconductor die.

1~~0~~1. The method of claim ~~7~~8, further including ~~stacking~~ disposing a second semiconductor die over the first semiconductor die.

1~~1~~2. The method of claim ~~10~~8,~~ wherein the second semiconductor die includes a memory circuit~~ further including forming a third conductive via through the first semiconductor die.

1~~2~~3. The method of claim ~~7~~8, further including ~~mounting~~ disposing a ~~discrete~~second semiconductor device including a memory circuit over the first semiconductor die~~over the substrate~~.

1~~3~~4. The method of claim ~~7~~8, further including ~~mounting~~ disposing a second semiconductor die over ~~the~~ a first surface of the substrate adjacent to the first semiconductor die.

~~14. A method of making a semiconductor device, comprising:~~

~~providing a substrate;~~

~~forming a plurality of conductive vias within the substrate;~~

~~mounting a first semiconductor die over a first surface of the substrate;~~

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

~~forming an interconnect structure over a second surface of the substrate opposite the first semiconductor die.~~

~~15. The method of claim 14, further including:~~

~~forming the plurality of conductive vias partially through the first surface of the substrate; and~~

~~removing a portion of the second surface of the substrate to expose the conductive vias.~~

~~16. The method of claim 14, further including:~~

~~forming a first conductive layer over the first surface of the substrate electrically connected to the conductive vias prior to mounting the first semiconductor die; and~~

~~forming a first insulating layer over the first surface of the substrate.~~

~~17. The method of claim 14, further including stacking a second semiconductor die over the first semiconductor die.~~

~~18. The method of claim 14, further including forming a plurality of conductive vias through the first semiconductor die.~~

~~19. The method of claim 14, wherein the second semiconductor die includes a memory circuit.~~

~~20. The method of claim 14, further including mounting a second semiconductor die over the first surface of the substrate adjacent to the first semiconductor die.~~

~~21. A semiconductor device, comprising:~~

~~a substrate;~~

~~a plurality of conductive vias formed within the substrate;~~

~~a first semiconductor die mounted over a first surface of the substrate;~~

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

~~an interconnect structure formed over a second surface of the substrate opposite the first semiconductor die.~~

~~22. The semiconductor device of claim 21, wherein the plurality of conductive vias is formed partially through the first surface of the substrate and a portion of the second surface of the substrate is removed to expose the conductive vias.~~

~~23. The semiconductor device of claim 21, further including a second semiconductor die mounted over the first semiconductor die.~~

~~24. The semiconductor device of claim 21, wherein the second semiconductor die includes a memory circuit.~~

~~25. The semiconductor device of claim 21, further including a second semiconductor die mounted over the first surface of the substrate adjacent to the first semiconductor die.~~