Claims

What is claimed:

1. A semiconductor device, comprising:

a first semiconductor die;

a~~n~~ pre-formed interposer substrate including a plurality of conductive pillars extending from a surface of the pre-formed interposer substrate with the conductive pillars disposed ~~over~~around the first semiconductor die and a gap between the semiconductor die and pre-formed interposer substrate;

an encapsulant deposited through an opening in the pre-formed interposer substrate over the first semiconductor die, the opening disposed outside a footprint of the first semiconductor die; and

an interconnect structure formed over the encapsulant and first semiconductor die and electrically connected to the pre-formed interposer substrate through the conductive pillars.

2. The semiconductor device of claim 1, further including a cavity formed in the pre-formed interposer substrate to contain a portion of the first semiconductor die.

3. The semiconductor device of claim 1, further including a second semiconductor die disposed over the first semiconductor die.

4. The semiconductor device of claim 1, further including a second semiconductor die disposed over the pre-formed interposer substrate.

5. The semiconductor device of claim 4, further including a bond wire formed between the second semiconductor die and the pre-formed interposer substrate.

6. The semiconductor device of claim 1, further including a plurality of stacked semiconductor devices electrically

connected through the pre-formed interposer substrate and interconnect structure.

7. The semiconductor device of claim 1, wherein the encapsulant covers a side surface of the pre-formed interposer substrate.

~~7~~8. A semiconductor device, comprising:

a first semiconductor die;

a substrate including an opening formed through the substrate and a plurality of conductive pillars extending from a surface of the substrate, the substrate being disposed over a first surface of the first semiconductor die and the conductive pillars disposed around a second surface of the first semiconductor die adjacent to the first surface ~~formed over the substrate, the first semiconductor die being disposed over the substrate between the conductive pillars~~;

an encapsulant deposited over the first semiconductor die; and

an interconnect structure formed over the encapsulant and ~~first semiconductor die~~ substrate and electrically connected to the conductive pillars.

~~8~~9. The semiconductor device of claim ~~7~~8, wherein the opening in the substrate is adapted for injecting encapsulant or exhausting excess encapsulant.

~~9~~10. The semiconductor device of claim ~~7~~8, further including a cavity formed in the substrate to contain a portion of the first semiconductor die.

~~10~~11. The semiconductor device of claim ~~7~~8, further including a second semiconductor die disposed over the first semiconductor die.

~~11~~12. The semiconductor device of claim ~~7~~8, further including a plurality of stacked semiconductor devices electrically connected through the substrate and interconnect structure.

~~12~~13. The semiconductor device of claim ~~7~~8, further including a second semiconductor die disposed over the substrate.

~~13~~14. The semiconductor device of claim 1~~2~~3, further including a bond wire formed between the second semiconductor die and substrate.

15. The semiconductor device of claim 8, wherein the encapsulant covers a side surface of the pre-formed substrate.

~~14~~16. A semiconductor device, comprising:

a plurality of first semiconductor dies;

a pre-formed substrate disposed over the first semiconductor dies;

a plurality of conductive pillars extending from a surface of the pre-formed substrate and disposed around the first semiconductor dies to provide standoff leaving a gap between the first semiconductor dies and the surface of the pre-formed substrate;

a first encapsulant deposited ~~over the first semiconductor die~~ around the first semiconductor dies and conductive pillars with an opening in the pre-formed substrate located between the first semiconductor dies; and

~~a substrate including an opening formed through the substrate and a plurality of conductive pillars formed over the substrate, the substrate being disposed over the first semiconductor die and first encapsulant~~ an interconnect structure formed over the first encapsulant and first semiconductor dies opposite the pre-formed substrate and electrically connected to the pre-formed substrate through the

conductive pillars.

~~15. The semiconductor device of claim 14, further including an interconnect structure formed over the first encapsulant and first semiconductor die.~~

16~~6~~7. The semiconductor device of claim 14~~6~~, wherein the opening in the pre-formed substrate is adapted for injecting encapsulant or exhausting excess encapsulant.

17~~8~~. The semiconductor device of claim 14~~6~~, further including a cavity formed in the pre-formed substrate to contain a portion of one of the first semiconductor die~~s~~.

18~~9~~. The semiconductor device of claim 14~~6~~, further including a second semiconductor die disposed over one of the first semiconductor die~~s~~.

~~19~~20. The semiconductor device of claim 14, further including a second semiconductor die disposed over the pre-formed substrate.

2~~0~~1. The semiconductor device of claim ~~19~~20, further including a second encapsulant deposited over the second semiconductor die.

22. The semiconductor device of claim 16, wherein the first encapsulant covers a side surface of the pre-formed substrate.

2~~1~~3. A semiconductor device, comprising:

a first semiconductor die;

a pre-formed substrate including ~~an opening formed through the substrate and a plurality of conductive pillars formed over the substrate, the first semiconductor die being disposed over the substrate between the conductive pillars~~ a plurality of conductive pillars extending from a surface of the pre-formed substrate, the pre-formed substrate being disposed over the first semiconductor die with the conductive pillars disposed around the first semiconductor die; ~~and~~

an encapsulant deposited ~~over the first semiconductor die and substrate~~ around the first semiconductor die and conductive pillars with an opening in the pre-formed substrate; and

an interconnect structure formed over the first semiconductor die and encapsulant opposite the pre-formed substrate and coupled to the conductive pillars.

~~22. The semiconductor device of claim 21, further including an interconnect structure formed over the encapsulant and first semiconductor die.~~

~~23. The semiconductor device of claim 21, wherein the opening in the substrate is adapted for injecting encapsulant or exhausting excess encapsulant.~~

24. The semiconductor device of claim 2~~1~~3, further including a cavity formed in the pre-formed substrate to contain a portion of the first semiconductor die.

25. The semiconductor device of claim 2~~1~~3, further including a second semiconductor die disposed over the pre-formed substrate.

26. The semiconductor device of claim 23, wherein the encapsulant covers a side surface of the pre-formed substrate.

27. The semiconductor device of claim 23, further including a gap between the first semiconductor die and pre-formed substrate.