Claims

What is claimed:

1. A semiconductor device, comprising:

a semiconductor die;

a plurality of bumps disposed adjacent to the semiconductor die; and

a multi-layer film encapsulant including,

(a) a ~~penetrable~~ thermo-setting adhesive film layer ~~disposed~~ pressed over the semiconductor die and in contact with the bumps to embed the semiconductor die and a first portion of the bumps, ~~while leaving exposed a second portion of the bumps~~ (b) a ultraviolet B-stage film adhesive layer in contact with a first surface of the thermo-setting adhesive film layer with a second portion of the bumps extending into the ultraviolet B-stage film adhesive layer, and

(c) a base layer in contact with a surface of the ultraviolet B-stage film adhesive layer opposite the thermo-setting adhesive film layer.

~~2. The semiconductor device of claim 1, further including an interconnect structure formed over the semiconductor die and penetrable film layer.~~

~~3. The semiconductor device of claim 2, wherein the interconnect structure is electrically coupled to the bumps and semiconductor die.~~

~~4. The semiconductor device of claim 2, further including a plurality of stacked semiconductor devices electrically~~

~~connected through the bumps and interconnect structure.~~

~~5. The semiconductor device of claim 1, further including a conductive layer formed over the penetrable film layer and electrically coupled to the bumps.~~

~~6~~2. The semiconductor device of claim 1, wherein a second surface of the ~~penetrable~~ thermo-setting adhesive film layer opposite the first surface of the thermo-setting adhesive film layer is coplanar with a surface of the semiconductor die.

~~7~~3. A semiconductor device, comprising:

a semiconductor die;

a first interconnect structure disposed adjacent to the semiconductor die; and

a multi-layer film encapsulant including,

(a) a ~~penetrable~~ thermo-setting adhesive film layer disposed over the semiconductor die and first interconnect structure to embed the semiconductor die and a first portion of the first interconnect structure ~~while leaving exposed a second portion of the first interconnect structure~~,

(b) a ultraviolet B-stage film adhesive layer in contact with a first surface of the thermo-setting adhesive film layer with a second portion of the first interconnect structure extending into the ultraviolet B-stage film adhesive layer, and

(c) a base layer in contact with a surface of the ultraviolet B-stage film adhesive layer opposite the thermo-setting adhesive film layer.

~~8~~4. The semiconductor device of claim ~~7~~3, wherein the first interconnect structure includes a bump~~s~~ or a conductive pillar~~s~~.

~~9. The semiconductor device of claim 7, further including a second interconnect structure formed over the semiconductor die and penetrable film layer.~~

~~10. The semiconductor device of claim 9, further including a plurality of bumps disposed between the semiconductor die and second interconnect structure.~~

~~11. The semiconductor device of claim 7, further including a plurality of stacked semiconductor devices electrically~~

~~connected through the first interconnect structure.~~

~~12. The semiconductor device of claim 7, further including a conductive layer formed over the penetrable film layer and electrically coupled to the first interconnect structure.~~

~~13~~5. The semiconductor device of claim ~~7~~3, wherein a second surface of the ~~penetrable~~ thermo-setting adhesive film layer opposite the first surface of the thermo-setting adhesive film layer is coplanar with a surface of the semiconductor die.

~~14~~6. A semiconductor device, comprising:

a semiconductor die;

a first interconnect structure disposed adjacent to the semiconductor die; and

a multi-layer film encapsulant including,

(a) a penetrable film layer disposed over the semiconductor die and first interconnect structure to embed the semiconductor die and a first portion of the first interconnect structure, the penetrable film layer coplanar with a first and second surface of the semiconductor die,

(b) a film adhesive layer in contact with a surface of the penetrable film layer with a second portion of the first interconnect structure extending into the film adhesive layer, and

(c) a base layer in contact with a surface of the film adhesive layer opposite the penetrable film layer.

~~15~~7. The semiconductor device of claim ~~14~~6, wherein the first interconnect structure includes a bump~~s~~ or a conductive pillar~~s~~.

~~16. The semiconductor device of claim 14, further including a second interconnect structure formed over the semiconductor die and penetrable film layer.~~

~~17. The semiconductor device of claim 16, wherein the second interconnect structure is electrically coupled to the bumps and semiconductor die.~~

~~18. The semiconductor device of claim 16, further including a plurality of bumps disposed between the semiconductor die and second interconnect structure.~~

~~19. The semiconductor device of claim 14, further including a plurality of stacked semiconductor devices electrically connected through the first interconnect structure.~~

~~20. The semiconductor device of claim 14, further including a conductive layer formed over the penetrable film layer and electrically coupled to the first interconnect structure.~~

~~21~~8. A semiconductor device, comprising:

a semiconductor die;

a first interconnect structure disposed adjacent to the semiconductor die; and

a multi-layer film encapsulant including,

(a) a penetrable film layer ~~disposed~~ pressed over the semiconductor die and first interconnect structure ~~while leaving exposed a portion of the first interconnect structure~~ to embed the semiconductor die and a first portion of the first interconnect structure,

(b) a film adhesive layer in contact with a surface of the penetrable film layer with a second portion of the first interconnect structure extending into the film adhesive layer, and

(c) a base layer in contact with a surface of the film adhesive layer opposite the penetrable film layer.

~~22~~9. The semiconductor device of claim ~~21~~8, wherein the first interconnect structure includes a bump~~s~~ or a conductive pillar~~s~~.

~~23. The semiconductor device of claim 21, further including a second interconnect structure formed over the semiconductor die and penetrable film layer.~~

~~24. The semiconductor device of claim 21, further including a plurality of stacked semiconductor devices electrically connected through the first interconnect structure.~~

~~25. The semiconductor device of claim 21, further including a conductive layer formed over the penetrable film layer and electrically coupled to the first interconnect structure.~~