die package. FIG. 8a shows a plan view of carrier or temporary substrate 170 containing sacrificial base material such as silicon, polymer, beryllium oxide, glass, tape, or other suitable low-cost, rigid material for structural support. Carrier 170 can be wafer-shaped or rectangular. An adhesive layer or tape 172 is applied to carrier 170. FIG. 8b shows a cross-sectional view of carrier 170 and adhesive layer 172.

In FIG. 8c, substrate 140 is positioned over carrier 170 with conductive posts 144 oriented toward the carrier. FIG. 8d shows substrate 140 mounted to carrier 170 with conductive posts 144 secured to adhesive layer 172, taken along line 8d-8d of FIG. 8e, which shows a plan view of substrate 140 mounted to carrier 170.

If FIG. 8f, semiconductor die 124 from FIG. 3c is mounted to carrier 170 through opening 146 in substrate 140 using, for example, a pick and place operation with active surface 130 oriented toward the carrier. Semiconductor die 124 can also be mounted to carrier 170 through opening 156 in substrate 150, or through opening 166 in substrate 160. FIG. 8g shows semiconductor die 124 mounted to adhesive layer 172 of carrier 170 within opening 146 of substrate 140 and back surface 128 extending above substrate 140. FIG. 8h shows an alternate embodiment with semiconductor die 124 mounted to adhesive layer 172 of carrier 170 within opening 146 of substrate 140 and back surface 128 disposed below base 142 of substrate 140. FIG. 8i shows a plan view of semiconductor die 124 mounted to carrier 170 within openings 146 of substrate 140.

In FIG. 8j, an encapsulant or molding compound 174 is deposited over semiconductor die 124, substrate 140, and carrier 170 using a paste printing, compressive molding, transfer molding, liquid encapsulant molding, vacuum lamination, spin

Claims

What is claimed:

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

providing a substrate including a base and a plurality of conductive posts extending from the base;

disposing a semiconductor die through an opening in the base between the conductive posts;

depositing an encapsulant over the semiconductor die and around the conductive posts; and

removing the base to electrically isolate the conductive posts.

2. The method of claim 1, further including forming an interconnect structure over the semiconductor die, encapsulant, and conductive posts.

3. The method of claim 1, further including forming an insulating layer over the semiconductor die, encapsulant, and conductive posts.

4. The method of claim 1, wherein a height of the semiconductor die is greater than a height of the conductive posts.

5. The method of claim 1, wherein the semiconductor die is within a height of the conductive posts.

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

providing a substrate including a base and a plurality of conductive posts extending from the base;

disposing the substrate over a carrier with the conductive posts disposed between the base and carrier;

disposing a semiconductor die onto the carrier through an opening in the base of the substrate while the conductive posts remain between the base and carrier; and

forming an interconnect structure over the semiconductor die and conductive posts.

7. The method of claim 6, further including forming an insulating layer over the semiconductor die, encapsulant, and conductive posts.

8. The method of claim 6, wherein a height of the semiconductor die is greater than a height of the conductive posts.

9. The method of claim 6, wherein the semiconductor die is within a height of the conductive posts.

10. The method of claim 6, wherein the conductive posts include a circular, rectangular, tapered, or thinner intermediate shape.

11. The method of claim 6, further including removing the base of the substrate to electrically isolate the conductive posts.

12. The method of claim 6, further including disposing a semiconductor package over the semiconductor die and electrically connected to the conductive posts.

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

providing a substrate including a plurality of conductive posts and an opening formed completely through the substrate;

disposing a semiconductor die through the opening and between the conductive posts; and

removing a portion of the substrate to electrically isolate the conductive posts.

14. The method of claim 13, further including forming an interconnect structure over the semiconductor die and conductive posts.

15. The method of claim 13, further including forming an insulating layer over the semiconductor die and conductive posts.

16. The method of claim 13, wherein the conductive posts include a circular, rectangular, tapered, or thinner intermediate shape.

17. The method of claim 13, wherein a height of the semiconductor die is greater than a height of the conductive posts.

18. The method of claim 13, wherein the semiconductor die is within a height of the conductive posts.

19. The method of claim 1, further i1ncluding:

disposing the substrate over a carrier; and

depositing the encapsulant between the base and carrier.