Claims

What is claimed:

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

providing a plurality of semiconductor wafers, each semiconductor wafer including a first number of semiconductor die;

singulating the semiconductor die from the semiconductor wafers including singulating the semiconductor wafers through a first portion of a base semiconductor material to separate the semiconductor die and singulating through a second portion of the base semiconductor material to remove the second portion of the base semiconductor material from a side of the semiconductor die;

providing a standardized carrier;

disposing a second number of the semiconductor die over the standardized carrier, the second number greater than the first number;

depositing an encapsulant over the semiconductor die and standardized carrier; and

singulating through the encapsulant to form a semiconductor package.

2. The method of claim 1, wherein singulating through the encapsulant further includes removing the encapsulant from a side of the semiconductor die.

3. The method of claim 1, wherein singulating through the encapsulant further includes leaving a portion of the encapsulant disposed over a side of the semiconductor die.

4. The method of claim 1, further including forming an interconnect structure over the semiconductor die while leaving the encapsulant devoid of the interconnect structure.

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

providing a first carrier;

disposing a plurality of first semiconductor die over the first carrier, wherein a size of the first carrier is independent of a size of the first semiconductor die;

depositing an encapsulant in a peripheral region around the first semiconductor die to cover a side surface of the first semiconductor die;

removing the first carrier; and

forming an interconnect structure within a footprint of the first semiconductor die by,

(a) forming a first insulating layer over the first semiconductor die, wherein the first insulating layer terminates prior to the side surface of the first semiconductor die,

(b) forming a conductive layer over the first insulating layer, wherein the conductive layer terminates prior to a side surface of the first insulating layer, and

(c) forming a second insulating layer over the conductive layer and first insulating layer.

6. The method of claim 5, further including

singulating through the encapsulant to leave the encapsulant disposed over the side surface of the first semiconductor die.

7. The method of claim 5, further including:

providing a semiconductor wafer including the first semiconductor die containing a base semiconductor material; and

singulating the semiconductor wafer through a first portion of the base semiconductor material to separate the first semiconductor die.

8. The method of claim 7, further including singulating through a second portion of the base semiconductor material to remove the second portion of the base semiconductor material from the side surface of the first semiconductor die.

9. The method of claim 5, further including:

depositing the encapsulant over a surface of the first semiconductor die opposite the interconnect structure; and

singulating through the encapsulant to remove the encapsulant from the peripheral region around the first semiconductor die.

10. The method of claim 5, wherein the second insulating layer extends over the encapsulant in the peripheral region around the first semiconductor die.

11. The method of claim 5, wherein the second insulating layer terminates prior to the side surface of the first insulating layer.

12. The method of claim 5, further including:

providing a second carrier, wherein dimensions of the second carrier is equal to dimensions of the first carrier; and

disposing a plurality of second semiconductor die over the second carrier, wherein a size of the second semiconductor die is smaller than the size of the first semiconductor die and a number of the first semiconductor die disposed over the first carrier is less than a number of the second semiconductor die disposed over the second carrier.

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

providing a first carrier;

disposing a plurality of first semiconductor die over the first carrier, wherein a size of the first carrier is independent of a size of the first semiconductor die;

depositing an encapsulant around the first semiconductor die;

removing the first carrier; and

forming an interconnect structure entirely within a footprint of the first semiconductor die by,

(a) forming a first insulating layer over the first semiconductor die, wherein the first insulating layer terminates prior to a side surface of the first semiconductor die,

(b) forming a conductive layer over the first insulating layer, and

(c) forming a second insulating layer over the conductive layer, first insulating layer, and encapsulant.

14. The method of claim 13, further including singulating through the encapsulant to leave the encapsulant disposed over the side surface of the first semiconductor die.

15. The method of claim 13, further including:

providing a semiconductor wafer including the first semiconductor die containing a base semiconductor material;

singulating the semiconductor wafer through a first portion of the base semiconductor material to separate the first semiconductor die; and

singulating through a second portion of the base semiconductor material to remove the second portion of the base semiconductor material from the side surface of the first semiconductor die.

16. The method of claim 13, further including:

providing a second carrier, wherein dimensions of the second carrier is equal to dimensions of the first carrier; and

disposing a plurality of second semiconductor die over the second carrier, wherein a size of the second semiconductor die is smaller than the size of the first semiconductor die and a number of the first semiconductor die disposed over the first carrier is less than a number of the second semiconductor die disposed over the second carrier.

17. The method of claim 13, further including depositing the encapsulant over a surface of the first semiconductor die opposite the interconnect structure.

18. The method of claim 17, further including removing a portion of the encapsulant over the surface of the first semiconductor die.

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

providing a semiconductor wafer including a plurality of first semiconductor die containing a base semiconductor material;

singulating the semiconductor wafer through a first portion of the base semiconductor material to separate the first semiconductor die;

providing a first standardized carrier;

disposing the first semiconductor die over the first standardized carrier, wherein a size of the first standardized carrier is independent of a size of the first semiconductor die;

providing a second standardized carrier, wherein dimensions of the second standardized carrier is equal to dimensions of the first standardized carrier;

disposing a plurality of second semiconductor die over the second standardized carrier, wherein a size of the second semiconductor die is smaller than a size of the first semiconductor die and a number of the first semiconductor die disposed over the first standardized carrier is less than a number of the second semiconductor die disposed over the second standardized carrier;

depositing an encapsulant over the first semiconductor die and first standardized carrier; and

singulating through the encapsulant to form a semiconductor package and further singulating through a second portion of the base semiconductor material to remove the second portion of the base semiconductor material from a side of the first semiconductor die.

20. The method of claim 19, further including forming an interconnect structure within a footprint of the first semiconductor die by,

(a) forming a first insulating layer over the first semiconductor die, wherein the first insulating layer terminates prior to a side surface of the first semiconductor die,

(b) forming a conductive layer over the first insulating layer, and

(c) forming a second insulating layer over the conductive layer and first insulating layer.

21. The method of claim 20, wherein the second insulating layer extends over the encapsulant.

22. The method of claim 20, wherein the second insulating layer terminates prior to the side surface of the first insulating layer.