Claims

What is claimed:

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

providing a substrate ~~with~~including a contact pad;

forming a first insulation layer over the substrate and contact pad;

forming a first under bump metallization (UBM) over the first insulati~~ng~~on layer and electrically connected to the contact pad;

forming a second insulation layer over the first UBM;

forming a second UBM over the second insulation layer after the second insulation layer is cured, the second UBM electrically connected to the first UBM such that the second insulation layer is between and separates portions of the first and second UBMs;

forming a photoresist layer over the second UBM and removing a portion of the photoresist layer to form an opening in the photoresist layer over the contact pad;

depositing a conductive bump material within the opening in the photoresist layer;

removing the photoresist layer;

removing a peripheral portion of the second UBM such that the conductive bump material overhangs the second UBM;

removing a peripheral portion of the first UBM such that the second insulation layer overhangs the first UBM; and

reflowing the conductive bump material to form a spherical bump.

2. The method of claim 1, wherein the second insulation layer ~~is polyimide that is~~includes polyimide that is cured, the curing including ~~with~~ a high temperature excursion.

3. The method of claim 1, wherein the conductive bump material is lead free.

4. The method of claim 1, wherein the first UBM ~~is~~includes titanium, titanium tungsten, or chromium.

5. The method of claim 1, wherein the second UBM ~~is~~includes titanium and copper, titanium tungsten and copper, or chromium and copper.

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

providing a substrate ~~with~~including a contact pad formed over a surface of the substrate;

forming a first under bump metallization (UBM) over the substrate and electrically connected to the contact pad;

forming an insulation layer over the first UBM;

forming a second UBM over the insulation layer~~ after the insulation layer is cured, the second UBM electrically connected to the first UBM such that the second insulation layer separates portions of the first and second UBMs~~ and in contact with the first UBM within a footprint of the contact pad;

forming a first recess between the insulation layer and the substrate by removing a portion of the first UBM; and

forming a bump over the second UBM, wherein the insulation layer is disposed between the first UBM and second UBM within a footprint of the bump.

7. The method of claim 6, ~~wherein the insulation layer is polyimide that is cured with a high temperature excursion~~ further including:

forming the insulation layer with a high temperature excursion; and

forming the second UBM after the high temperature excursion.

8. The method of claim 6, wherein the bump is lead free.

9. The method of claim 6, wherein the first UBM ~~is~~includes titanium, titanium tungsten, or chromium.

10. The method of claim 6, wherein the second UBM ~~is~~includes titanium and copper, titanium tungsten and copper, or chromium and copper.

11. The method of claim 6, wherein the first UBM ~~has~~includes an area larger than an area of the contact pad.

12. The method of claim 6, further including

forming a second recess between the bump and the substrate by removing a portion of the second UBM~~ wherein peripheral portions of the first and second UBMs are removed such that the bump overhangs the second UBM and the insulation layer overhangs the first UBM~~.

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

providing a substrate ~~with~~ including a contact pad;

forming a first under bump metallization (UBM) over the substrate and electrically connected to the contact pad;

forming an insulation layer over the first UBM;

forming a second UBM over the insulation layer~~ after the insulation layer is cured~~ and in contact with a first portion of the first UBM; ~~and~~

~~forming a bump over the second UBM~~ forming a bump over the second UBM while the insulation layer is disposed between the first UBM and second UBM, the bump including a footprint encompassing the first portion of the first UBM; and

forming a first recess between the insulation layer and the substrate by removing a second portion of the first UBM.

14. The method of claim 13, ~~wherein the insulation layer is polyimide that is cured with a high temperature excursion~~ further including:

forming the insulation layer with a high temperature excursion; and

forming the second UBM after the high temperature excursion.

15. The method of claim 13, wherein the bump is lead free.

16. The method of claim 13, wherein the first UBM ~~is~~includes titanium, titanium tungsten, or chromium, and the second UBM ~~is~~includes titanium and copper, titanium tungsten and copper, or chromium and copper.

17. The method of claim 13, wherein the first UBM ~~has~~includes an area larger than an area of the contact pad.

18. The method of claim 13, further including forming a second recess between the bump and the substrate by removing a portion of the second UBM ~~wherein portions of the first and second UBMs are removed such that the bump overhangs the second UBM and the insulation layer overhangs the first UBM~~.

19. The method of claim 13, wherein the insulation layer is disposed between ~~portions of~~ the first and second UBMs.

~~20. A semiconductor device, comprising:~~

~~a substrate with a contact pad;~~

~~a first under bump metallization (UBM) with an area larger than an area of the contact pad formed over the substrate and electrically connected to the contact pad;~~

~~an insulation layer formed over the first UBM;~~

~~a second UBM formed over the insulation layer and electrically connected to the first UBM such that the insulation layer is between portions of the first and second UBMs; and~~

~~a bump formed over the second UBM.~~

~~21. The semiconductor device of claim 20, wherein the insulation layer is high temperature cured polyimide.~~

~~22. The semiconductor device of claim 20, wherein the bump is lead free.~~

~~23. The semiconductor device of claim 20, wherein the first UBM is titanium, titanium tungsten, or chromium.~~

~~24. The semiconductor device of claim 20, wherein the second UBM is titanium and copper, titanium tungsten and copper, or chromium and copper.~~

~~25. The semiconductor device of claim 20, wherein the bump overhangs the second UBM and the insulation layer overhangs the first UBM.~~

20. The method of claim 13, further including the first UBM contacting the contact pad within the footprint of the bump.

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

providing a substrate including a conductive layer formed over a surface of the substrate;

forming a first under bump metallization (UBM) over and electrically connected to the conductive layer, the first UBM including a first portion contacting the conductive layer;

forming an insulation layer over the first UBM;

forming a second UBM over the insulation layer and contacting the first portion of the first UBM;

forming a bump electrically connected to the second UBM and including a footprint encompassing the first portion of the first UBM and a portion of the insulation layer; and

forming a first recess between the insulation layer and the substrate by removing a second portion of the first UBM.

22. The method of claim 21, further including the first UBM contacting the conductive layer within the footprint of the bump.

23. The method of claim 21, wherein the first UBM includes titanium, chromium, or tungsten.

24. The method of claim 21, wherein the insulation layer includes polyimide, benzocyclobutene, or polybenzoxazole.

25. The method of claim 21, further including:

forming the insulation layer with a high temperature excursion; and

forming the second UBM after the high temperature excursion.

26. The method of claim 21, further including forming the bump devoid of direct contact with the insulation layer.

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

providing a substrate including a conductive layer;

forming a first under bump metallization (UBM) including a first portion contacting the conductive layer;

forming an insulation layer over the first UBM;

forming a second UBM over the insulation layer and contacting the first portion of the first UBM;

forming a bump over the second UBM and over the first portion of the first UBM; and

forming a first recess between the insulation layer and the substrate by removing a second portion of the first UBM.

28. The method of claim 27, further including curing the insulation layer prior to forming the second UBM.

29. The method of claim 27, further including forming a second recess between the bump and the substrate by removing a portion

of the second UBM.

30. The method of claim 27, further including forming the bump over the insulation layer and devoid of direct contact with the insulation layer.