Claims

What is claimed:

1. A semiconductor device, comprising:

a first semiconductor die ~~with~~including a first surface and a second surface opposite the first surface;

a second semiconductor die laterally separated from the first semiconductor die;

an insulating material disposed between the first and second semiconductor die ~~that~~and extend~~s~~ing between a level of the first surface and a level of the second surface;

a conductive ~~through hole~~ via ~~(THV)~~ formed through the insulating material disposed between the first and second semiconductor die;

a conductive layer extending from the conductive via to the first semiconductor die; and

a plurality of electromagnetic interference (EMI) shielding particles dispersed within the insulating material around the conductive via between the level of the first surface and the level of the second surface, each EMI shielding particle being separated from the conductive via by the insulating material~~;~~

~~a conductive layer formed between the conductive THV and contact pads on the first and second semiconductor die; and~~

~~noise absorbing material disposed around the conductive THV to isolate the first and second semiconductor die from intra-device interference~~.

~~2. The semiconductor device of claim 1, wherein the noise absorbing material extends between the level of the first surface to the level of the second surface.~~

~~3. The semiconductor device of claim 1, wherein the noise absorbing material has an angular, semi-circular, or rectangular shape.~~

~~4~~2. The semiconductor device of claim 1, further including a plurality of conductive ~~THVs~~ vias with the EMI shielding particles ~~such that the noise absorbing material is~~ dispersed between the plurality of conductive ~~THVs~~vias.

~~5. The semiconductor device of claim 1, wherein the noise absorbing material is disposed around a plurality of conductive THVs.~~

~~6~~3. The semiconductor device of claim 1, further including a barrier layer formed between the ~~noise absorbing material and conductive THV~~ EMI shielding particles and conductive via.

~~7~~4. A semiconductor device, comprising:

a semiconductor die ~~with~~including a first surface and a second surface opposite the first surface;

an insulating material disposed completely around the semiconductor die that extend~~s~~ing between a level of the first surface and a level of the second surface;

a conductive ~~through hole~~ via ~~(THV)~~ formed through the insulating material and extending between the level of the first surface and the level of the second surface;and

~~a conductive layer formed between the conductive THV and a contact pad on the first surface of the semiconductor die; and~~

a shielding region disposed around the conductive via ~~THV to isolate the semiconductor die from intra device interference~~and extending through the insulating material between the level of the first surface and the level of the second surface, wherein the shielding region is physically separated from the conductive via by the insulating material.

~~8. The semiconductor device of claim 7, wherein the shielding region extends through the insulating material.~~

~~9~~5. The semiconductor device of claim ~~7~~4, wherein the shielding region has an angular, semi-circular, or rectangular shape.

~~106~~. The semiconductor device of claim ~~7~~4, ~~further including shielding material dispersed in the insulating material between conductive THVs~~ wherein the shielding region includes a plurality of electromagnetic interference (EMI) shielding particles dispersed within the insulating material around the conductive via.

~~11~~7. The semiconductor device of claim ~~7~~4, further including the shielding region formed completely around the conductive ~~THV~~via.

~~12~~8. The semiconductor device of claim ~~7~~4, further including a barrier layer disposed between the shielding region and conductive ~~THV~~via.

~~13~~9. The semiconductor device of claim ~~7~~4, further including ~~the shielding region formed around~~ a plurality of conductive ~~THVs~~vias, wherein the shielding region is formed around the plurality of conductive vias.

1~~4~~0. A semiconductor device, comprising:

a semiconductor die~~; with a first surface and a second surface opposite the first surface;~~

an insulating material disposed in a peripheral region around the semiconductor die;

a conductive via formed through~~ hole via (THV) laterally separated from the semiconductor die that extends between the first and second surfaces~~ the insulating material in the peripheral region around the semiconductor die;and

~~a conductive layer formed between the conductive THV and a contact pad of the semiconductor die; and~~

a shielding region~~ formed around the conductive THV to isolate the semiconductor die with respect to interference~~ extending through the insulating material, wherein the shielding region is separated from the conductive via by the insulating material.

1~~5~~1. The semiconductor device of claim 1~~4~~0, wherein the shielding region has an angular, semi-circular, or rectangular

shape.

162. The semiconductor device of claim 140, further including a plurality of conductive ~~THVs~~vias ~~such that~~ with the shielding region ~~is~~ formed between the plurality of conductive ~~THVs~~vias.

173. The semiconductor device of claim 140, further including the shielding region formed completely around the conductive ~~THV~~via.

1~~8~~4. The semiconductor device of claim 1~~4~~0, ~~further including the shielding region formed around a plurality of conductive THVs~~ wherein the shield region includes a plurality of electromagnetic interference (EMI) shielding particles dispersed within the insulating material around the conductive via.

1~~9~~5. The semiconductor device of claim 1~~4~~0, further including a barrier layer formed between the shielding region and conductive ~~THV~~via.

~~20~~16. A semiconductor device, comprising:

a semiconductor die;

an insulating material disposed in a peripheral region around the semiconductor die;

a conductive via formed through the insulating material and laterally separated from the semiconductor die~~through hole via (THV) laterally separated from the semiconductor die~~;

a conductive layer ~~formed between~~ extends from the conductive ~~THV~~via ~~and~~to a contact pad on a surface of the semiconductor die; and

a shielding material extending through the insulating material and disposed ~~around the conductive THV to isolate the semiconductor die with respect to interference~~ outside a footprint of the semiconductor die to shield the conductive via.

~~21~~17. The semiconductor device of claim ~~20~~16, wherein the shielding material extends from a first side of the semiconductor die to a second side of the semiconductor die opposite the first side.

~~22~~18. The semiconductor device of claim ~~20~~16, wherein the

shielding material has an angular, semi-circular, or rectangular shape.

~~23~~19. The semiconductor device of claim ~~20~~16, wherein the shield material includes a plurality of electromagnetic interference (EMI) shielding particles dispersed within the insulating material around the conductive via~~ further including the shielding material dispersed between a plurality of conductive THVs~~.

2~~4~~0. The semiconductor device of claim ~~20~~16, further including the shielding material formed completely around the conductive ~~THV~~via.

2~~5~~1. The semiconductor device of claim ~~20~~16, further including a barrier layer formed between the shielding material and conductive ~~THV~~via.

22. A semiconductor device, comprising:

a semiconductor die including an active surface, a back surface, and a side surface;

an insulating material formed around the side surface of the semiconductor die;

a conductive via formed through the insulating material; and

a shielding material disposed around the conductive via and extending through the insulating material to shield the conductive via, wherein the shielding region is separated from the conductive via by the insulating material.

23. The semiconductor device of claim 22, wherein the shielding material extends from the active surface of the semiconductor die to the back surface of the semiconductor die opposite the active surface.

24. The semiconductor device of claim 22, wherein the shielding material has an angular, semi-circular, or rectangular shape.

25. The semiconductor device of claim 22, wherein the shield material includes a plurality of electromagnetic interference (EMI) shielding particles dispersed within the insulating material around the conductive via.

26. The semiconductor device of claim 22, further including the shielding material formed completely around the conductive via.

27. The semiconductor device of claim 22, further including a barrier layer formed between the shielding material and conductive via.

28. The semiconductor device of claim 22, wherein the shielding material is disposed between the semiconductor die and the conductive via.

29. The semiconductor device of claim 1, wherein the EMI shielding particles are disposed between the first semiconductor die and the conductive via.

30. The semiconductor device of claim 4, wherein the shielding region is disposed between the semiconductor die and the conductive via.

31. The semiconductor device of claim 10, wherein the shielding region is formed between the semiconductor die and the conductive via.

32. The semiconductor device of claim 16, wherein the shielding material is disposed between the semiconductor die and the conductive via.