SEMICONDUCTOR DEVICE ~~AND METHOD OF MOUNTING~~ INCLUDING PRE-FABRICATED SHIELDING FRAME DISPOSED OVER SEMICONDUCTOR DIE

Field of the Invention

The present invention relates in general to semiconductor devices and, more particularly, to a semiconductor device and method of mounting a pre-fabricated shielding frame over a semiconductor die for isolation from electromagnetic interference (EMI) and radio frequency interference (RFI), or other inter-device interference.

Background of the Invention

Semiconductor devices are commonly found in modern electronic products. Semiconductor devices vary in the number and density of electrical components. Discrete semiconductor devices generally contain one type of electrical component, e.g., light emitting diode (LED), transistor, resistor, capacitor, inductor, and power metal oxide semiconductor field effect transistor (MOSFET). Integrated semiconductor devices typically contain hundreds to millions of electrical components. Examples of integrated semiconductor devices include microcontrollers, microprocessors, charged-coupled devices

Claims

What is claimed:

1. ~~A semiconductor device, comprising:~~
~~a semiconductor die;~~
~~a first interconnect structure disposed over a first surface of the semiconductor die and electrically connected to the semiconductor die;~~
~~a body disposed over a second surface of the semiconductor die;~~
~~a second interconnect structure disposed over the body and second surface of the semiconductor die;~~
~~a conductive pillar electrically connected between the first interconnect structure and second interconnect structure; and~~
~~an encapsulant formed around the semiconductor die, body, and conductive pillar; wherein~~
~~the body and conductive pillar include a material capable of blocking or absorbing inter-device interference.~~

~~2. The semiconductor device of claim 1, further including a shielding layer disposed around a portion of the semiconductor die and between the first interconnect structure and second interconnect structure.~~

~~3. The semiconductor device of claim 1, wherein the body and the conductive pillar are composed of the same material.~~

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

a frame including,

(a) a plate,

(b) a body integrated on a surface of the plate, and

(c) a conductive pillar integrated on the surface of the plate and adjacent to the body;

a semiconductor die disposed over the body including a back surface of the semiconductor die oriented toward the body; and

an encapsulant ~~formed around the semiconductor die, body, and conductive pillar~~ disposed around the semiconductor die, body, and conductive pillar including a surface of the encapsulant coplanar with an active surface of the semiconductor die opposite the back surface.

~~5~~2. The semiconductor device of claim ~~4~~1, wherein the frame further includes an opening through the plate.

~~6~~3. The semiconductor device of claim ~~4~~1, wherein the body contacts ~~a~~ the back surface of the semiconductor die.

~~7~~4. The semiconductor device of claim ~~4~~1, further including a conductive via formed in the semiconductor die and electrically connected to the body.

~~8~~5. The semiconductor device of claim ~~4~~1, wherein the body contacts ~~a~~ the back surface of the semiconductor die through an adhesive or thermal interface material.

~~9~~6. The semiconductor device of claim ~~4~~1, further including a shielding layer integrated on the surface of the plate and disposed through the encapsulant and around a portion of the

semiconductor die.

~~10. The semiconductor device of claim 4, wherein the plate, body, and conductive pillar are composed of the same material.~~

~~11~~7. The semiconductor device of claim ~~4~~ 1, wherein the body includes a material capable of blocking or absorbing inter-device interference.

~~12~~8. A frame for use in a semiconductor device, comprising:

a plate including a flat surface;

a plurality of bodies integrated to and extending from the flat ~~a~~ surface ~~of the plate~~, wherein a thickness of the bodies is greater than a thickness of the plate; ~~and~~

a plurality of conductive pillars integrated to the flat surface of the plate and adjacent to the bodies~~;~~,

~~wherein~~ the frame is adaptable for providing shielding and electrical interconnect in a semiconductor device; and

an encapsulant disposed around the body and conductive pillar, wherein opposing surfaces of the conductive pillar are devoid of the encapsulant.

~~13~~9. The frame of claim ~~12~~8, wherein each of the bodies includes a material capable of blocking or absorbing inter-device interference.

1~~4~~0. The frame of claim ~~12~~8, further including a plurality of openings formed through the flat surface of the plate between at least one of the bodies and the conductive pillars.

1~~5~~1. The frame of claim ~~12~~8, wherein ~~the~~a distance ~~that~~ the conductive pillars extend away from the plate is greater than ~~the~~a distance ~~that~~ the bodies extend away from the plate.

1~~6~~2. The frame of claim ~~12~~8, further including a plurality of shielding layers integrated to the surface of the plate and

adjacent to the conductive pillars.

1~~7~~3. The frame of claim ~~1~~2~~8~~, further including a gap between at least one of the bodies and at least one of the conductive pillars.

~~18. The frame of claim 12, wherein the plate, bodies, and conductive pillars are composed of the same material.~~

~~19~~14. A frame for use in a semiconductor device, comprising:

a plate;

a body integrated to and extending from a surface of the plate; wherein a thickness of the body is greater than a thickness of the plate; ~~and~~

a conductive pillar integrated to and extending from the surface of the plate and adjacent to the body, wherein the frame is adaptable for providing shielding and electrical interconnect in the semiconductor device;

~~wherein the frame is adaptable for providing shielding and electrical interconnect in a semiconductor device~~ a semiconductor die disposed over the body; and

an encapsulant disposed around the semiconductor die, body, and conductive pillar including a surface of the encapsulant coplanar with an active surface of the semiconductor die.

~~20~~15. The frame of claim 1~~9~~4, wherein the body includes a material capable of blocking or absorbing inter-device interference.

~~21~~16. The frame of claim 1~~4~~9, further including an opening through the plate between the body and conductive pillar.

~~22~~17. The frame of claim 1~~9~~4, wherein~~:~~

~~the body has a first height; and~~

~~the conductive pillar has a second height;~~

~~wherein the first height is different from the second height~~ the thickness of the body is different than a thickness of the conductive pillar.

~~23~~18. The frame of claim 1~~9~~4, further including a shielding layer integrated to the surface of the plate and disposed around a portion of the body.

~~24~~19. The frame of claim 1~~9~~4, further including a gap between the body and conductive pillar.

~~25. The frame of claim 19, wherein the plate, body, and conductive pillar are composed of the same material.~~

20. A semiconductor device, comprising:

a frame including,

(a) a plate including an opening formed in a flat surface of the plate,

(b) a body integrated on the flat surface of the plate, wherein a thickness of the body is greater than a thickness of the plate,

(c) a conductive pillar integrated on the flat surface of the plate and adjacent to the body, wherein the opening in the flat surface of the plate is between the body and the conductive pillar;

a semiconductor die disposed over the body opposite the flat surface; and

a cavity formed between the semiconductor die and the conductive pillar and in fluid communication with the opening.

21. The semiconductor device of claim 20, wherein the body contacts a surface of the semiconductor die.

22. The semiconductor device of claim 20, further including a conductive via formed in the semiconductor die and electrically connected to the body.

23. The semiconductor device of claim 20, wherein the body contacts a surface of the semiconductor die through an adhesive or thermal interface material.

24. The semiconductor device of claim 20, wherein the body includes a material capable of blocking or absorbing inter-device interference.