

CLAIMS

[Claim 1].—A method for manufacturing a semiconductor device, the method comprising steps of:

—preparing a film-shaped adhesive for adhering a semiconductor element to a member for mounting the semiconductor element; and

—pressure-bonding the semiconductor element to a surface of the member in a state that the film-shaped adhesive and the semiconductor element are stacked on the surface,

—wherein an absolute value of a difference between a value E_1 (mJ/m²) of surface free energy of the film-shaped adhesive and a value E_2 (mJ/m²) of surface free energy of the member is in a range of 6.0 to 10.0. A dicing/die-bonding integrated film comprising: a film-shaped adhesive, a tacky adhesive layer and a base material film, and having these materials laminated in this order,

wherein the film-shaped adhesive comprises a heat-curable resin composition including an epoxy resin having an alicyclic structure, a curing agent and an elastomer,

wherein a value E_1 of surface free energy of the film-shaped adhesive is 38 to 41 mJ/m².

[Claim 2].—The method for manufacturing a semiconductor device according to claim 1,

—wherein the semiconductor device is a chip-embedded type semiconductor package,

—the member is a structure including a substrate and a chip mounted on a surface of the substrate, and

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~~the semiconductor element is pressure-bonded to the surface of the substrate such that the chip is embedded in the film-shaped adhesive. The dicing/die-bonding integrated film according to claim 1, further comprising a protective film provided so as to cover the film-shaped adhesive.~~

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[Claim 3].—~~The method for manufacturing a semiconductor device according to claim 1,~~

~~wherein the semiconductor device is a wire-embedded type semiconductor package,~~

~~the member is a structure including a substrate and a wire~~

~~provided on a surface of the substrate, and~~

~~the semiconductor element is pressure-bonded to the surface of the substrate such that the wire is embedded in the film-shaped adhesive. The dicing/die-bonding integrated film according to claim 1 or 2,~~

~~wherein the heat-curable resin composition includes an epoxy resin being liquid at 25°C, and a content percentage of the epoxy resin being liquid at 25°C is 5% to 40% by mass based on a total mass of epoxy resins included in the heat-curable resin composition.~~

~~[Claim 4].— The method for manufacturing a semiconductor device according to any one of claims 1 to 3, the method comprising steps of:~~

~~preparing a dicing/die-bonding integrated film including the film-shaped adhesive, a tacky adhesive layer, and a base material film and having these materials laminated in this order;~~

~~sticking together the film-shaped adhesive of the dicing/die-bonding integrated film and a wafer;~~

~~singulating the wafer in a state of being stuck together with the film-shaped adhesive into a plurality of semiconductor elements;~~

~~picking up a laminated body from the tacky adhesive layer, the laminated body including an adhesive piece formed by singulating the film-shaped adhesive and the semiconductor element;~~

~~pressure-bonding the laminated body to the member; and~~

~~curing the adhesive piece by a heating treatment. The dicing/die-bonding integrated film according to any one of claims 1 to 3, wherein a content percentage of the epoxy resin having an alicyclic structure is 5% to 30% by mass based on a total mass of epoxy resins~~

included in the heat-curable resin composition.

[Claim 5].— ~~A film-shaped adhesive comprising a heat-curable resin composition,~~

~~— wherein a value E_t of surface free energy is 38 to 41 mJ/m². The~~
5 ~~dicing/die-bonding integrated film according to any one of claims 1 to 4, wherein the curing agent is a phenol resin.~~

[Claim 6].— ~~The film-shaped adhesive according to claim 5, wherein a content percentage of an epoxy resin, the epoxy resin being liquid at 25°C, is 5% to 40% by mass based on a total mass of epoxy resins included in the heat-curable resin composition. The dicing/die-bonding integrated film according to any one of claims 1 to 5, wherein the elastomer is an acrylic resin.~~

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[Claim 7].— ~~The film-shaped adhesive according to claim 5 or 6, wherein the~~

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~~heat-curable resin composition includes an epoxy resin having an alicyclic structure, a curing agent, and an elastomer. The dicing/die-bonding integrated film according to any one of claims 1 to 6, wherein the heat-curable resin composition includes an inorganic filler.~~

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~~[Claim 8].— The film-shaped adhesive according to claim 7, wherein a content percentage of the epoxy resin having an alicyclic structure is 5% to 30% by mass based on a total mass of epoxy resins included in the heat-curable resin composition. The dicing/die-bonding integrated film according to any one of claims 1 to 7, wherein the heat-curable resin composition includes a curing accelerator.~~

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~~[Claim 9].— The film-shaped adhesive according to claim 7 or 8, wherein the curing agent is a phenol resin. A method for manufacturing a semiconductor device, the method comprising a step of adhering a semiconductor element to a member for mounting the semiconductor element,~~

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~~_____ wherein the method comprising steps of:
_____ preparing the dicing/die-bonding integrated film according to any one of claims 1 to 8;~~

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~~_____ sticking together the film-shaped adhesive of the dicing/die-bonding integrated film and a wafer;
_____ singulating the wafer in a state of being stuck together with the film-shaped adhesive into a plurality of semiconductor elements;
_____ picking up a laminated body from the tacky adhesive layer, the~~

laminated body including an adhesive piece formed by singulating the film-shaped adhesive and the semiconductor element;

pressure-bonding the laminated body to the member; and

curing the adhesive piece by a heating treatment.

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[Claim 10].— The film-shaped adhesive according to any one of claims 7 to 9, wherein the elastomer is an acrylic resin. The method for manufacturing a semiconductor device according to claim 9, wherein an absolute value of a difference between a value E1 (mJ/m²) of surface free energy of the film-shaped adhesive and a value E2 (mJ/m²) of surface free energy of the member is in a range of 6.0 to 10.0.

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[Claim 11].— The film-shaped adhesive according to any one of claims 5 to 10, wherein the heat-curable resin composition includes an inorganic filler. The method for manufacturing a semiconductor device according to claim 9 or 10,

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wherein the semiconductor device is a chip-embedded type semiconductor package,

the member is a structure including a substrate and a chip mounted on a surface of the substrate, and

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the laminated body is pressure-bonded to the surface of the substrate such that the chip is embedded in the adhesive piece.

[Claim 12].— The film-shaped adhesive according to any one of claims 5 to 11, wherein the heat-curable resin composition includes a curing accelerator. The method for manufacturing a semiconductor device

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according to claim 9 or 10,

wherein the semiconductor device is a wire-embedded type semiconductor package,

the member is a structure including a substrate and a wire provided on a surface of the substrate, and

the laminated body is pressure-bonded to the surface of the substrate such that the wire is embedded in the adhesive piece.

13. ~~An adhesive film comprising:~~

~~the film-shaped adhesive according to any one of claims 5 to 12; and~~

~~a base material film provided on one surface of the film-shaped adhesive.~~

14. ~~A dicing/die-bonding integrated film comprising the film-shaped adhesive according to any one of claims 5 to 12, a tacky adhesive layer, and a base material film and having these materials laminated in this order.~~

15. ~~The dicing/die-bonding integrated film according to claim 14, further comprising a protective film provided so as to cover the film-shaped adhesive.~~