

SPECIFICATION

TITLE OF INVENTION: ADHESIVE FILM AND MANUFACTURING METHOD OF
ELECTRONIC DEVICE

5

TECHNICAL FIELD

[0001]

The present invention relates to an adhesive film and a
manufacturing method of an electronic device.

10

BACKGROUND ART

[0002]

As a technology capable of reducing the size and weight of
an electronic device (for example, a semiconductor device), a
fan-out type package has been developed.

In embedded wafer level ball grid array (eWLB), which is
one of manufacturing methods of the fan-out type package, a
plurality of electronic components such as a semiconductor chip
are temporarily fixed on the adhesive film attached to the
support substrate in a spaced state, and the plurality of
electronic components are collectively sealed with a sealing
material. Here, the adhesive film needs to be fixed to the
electronic component and the support substrate in the sealing
process or the like and needs to be removed from the sealed
electronic component and the support substrate after the
sealing.

25

[0003]

Examples of the technology related to the manufacturing method of the fan-out type package include the technology described in Patent Document 1.

[0004]

5 Patent Document 1 discloses a heat-resistant adhesive sheet for manufacturing a semiconductor device, which is used by being attached when resin-sealing a substrate-less semiconductor chip as a method for solving problems such as a chip not being held in position and being displaced from a specified location due to
10 pressure during resin sealing, or a package being damaged due to strong adhesion to a chip surface caused by curing of a sealing material or by heat when peeling a heat-resistant adhesive sheet for manufacturing a semiconductor device. The heat-resistant adhesive sheet includes a base material layer and an adhesive
15 layer, and the adhesive layer is a layer having an adhesive strength to SUS304 after lamination of equal to or more than 0.5 N/20 mm, and being cured by a stimulus received until completion of the resin sealing process to have a peeling force from a package of equal to or less than 2.0 N/20 mm.

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RELATED DOCUMENT

PATENT DOCUMENT

[0005]

Patent Document 1: Japanese Unexamined Patent Publication
25 No. 2011-134811

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[0006]

The present invention provides an adhesive film that enables visual recognition that the adhesive film is attached to a support substrate, and a manufacturing method of an electronic device using the adhesive film.

SOLUTION TO PROBLEM

[0007]

The present inventors conducted a thorough investigation in order to achieve the above-described object. As a result, the present inventors have found that the state in which the adhesive film is attached to the support substrate is visually recognized by coloring any layer of the adhesive film, and have completed the present invention.

15 [0008]

[1]

An adhesive film including:

a base material layer (A),

an adhesive resin layer (B) for temporarily fixing an electronic component on a first surface side of the base material layer (A), and

an adhesive resin layer (C) on a second surface side of the base material layer (A),

in which at least one layer of layers constituting the adhesive film is a colored layer.

[2]

The adhesive film according to [1], in which the colored

layer includes a layer other than the adhesive resin layer (B).

[3]

The adhesive film according to [1] or [2], in which the colored layer includes the adhesive resin layer (C).

5 [4]

The adhesive film according to any one of [1] to [3], further including an intermediate layer (D), in which the colored layer includes the intermediate layer (D).

10 [5]

The adhesive film according to [4], in which the intermediate layer (D) is located at at least one selected from between the base material layer (A) and the adhesive resin layer (C) or between the base material layer (A) and the adhesive resin layer (B).

[6]

The adhesive film according to [4] or [5], in which a resin constituting the intermediate layer (D) includes one or two or more selected from the group consisting of a polyolefin-based resin, a polystyrene-based resin, and a (meth)acrylic-based resin.

20 [7]

The adhesive film according to any one of [4] to [6], in which a thickness of the intermediate layer (D) is equal to or more than 1 μm and equal to or less than 500 μm .

[8]

The adhesive film according to any one of [1] to [7], in

which the colored layer contains a colorant.

[9]

The adhesive film according to [8], in which a content of the colorant is equal to or more than 0.01% by mass and equal to
5 or less than 2.0% by mass with respect to a total mass of the colored layer.

[10]

The adhesive film according to any one of [1] to [9], in which a value of L^* of the adhesive film in an $L^*a^*b^*$ color system
10 defined in JIS Z 8781-4:2013 is equal to or less than 90.

[11]

The adhesive film according to any one of [1] to [10], in which a layer other than the colored layer is colorless and transparent.

15 [12]

The adhesive film according to any one of [1] to [11], in which the adhesive resin layer (C) contains a heat-expansion type adhesive.

[13]

20 The adhesive film according to [12], in which the heat-expansion type adhesive is an adhesive whose adhesive strength is reduced or lost by heating at a temperature exceeding 100°C.

[14]

A manufacturing method of an electronic device, including:
25 a step of attaching a support substrate to an adhesive resin layer (C) side of the adhesive film according to any one of [1] to [13], and

a step of confirming that the adhesive film is attached to the support substrate by a color of the adhesive film.

[15]

The manufacturing method of an electronic device according to [14], further including, in this order:

a step of placing an electronic component over the adhesive resin layer (B) of the adhesive film after the step of confirming that the adhesive film is attached to the support substrate, and

a step of sealing the electronic component with a sealing material.

[16]

The manufacturing method of an electronic device according to [15], in which the sealing material includes an epoxy resin-based sealing material.

[17]

The manufacturing method of an electronic device according to any one of [14] to [16], in which the electronic device includes a fan-out type package.

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ADVANTAGEOUS EFFECTS OF INVENTION

[0009]

According to the present invention, it is possible to provide an adhesive film that enables visual recognition that the adhesive film is attached to a support substrate, and a manufacturing method of an electronic device using the adhesive film.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

[FIG. 1] A cross-sectional view schematically showing an
5 example of a structure of an adhesive film of an embodiment
according to the present invention.

[FIG. 2] A cross-sectional view schematically showing an
example of a structure of an adhesive film of an embodiment
according to the present invention.

10 [FIG. 3] A cross-sectional view schematically showing an
example of a manufacturing method of an electronic device of an
embodiment according to the present invention.

DESCRIPTION OF EMBODIMENTS

15 [0011]

Hereinafter, an embodiment of the present invention will be
described with reference to the drawings. In all the drawings,
the same components are represented by common reference
numerals, and the description thereof will not be repeated. In
20 addition, the figures are schematic views and do not correspond
to the actual dimensional ratios. In addition, in the present
embodiment, "(meth)acrylic" means acrylic, methacrylic, or both
acrylic and methacrylic.

[0012]

25 In the present specification, the notation "X to Y" in the
description of a numerical range represents equal to or more
than X and equal to or less than Y unless otherwise specified.

For example, "1% to 5% by mass" means "equal to or more than 1% by mass and equal to or less than 5% by mass".

[0013]

[Adhesive Film]

5 The adhesive film according to the present embodiment will be described. FIG. 1 is a cross-sectional view schematically showing an example of a structure of an adhesive film 100 according to the present embodiment.

 The adhesive film 100 according to the present embodiment
10 includes a base material layer (A), an adhesive resin layer (B) for temporarily fixing an electronic component on a first surface side A1 of the base material layer (A), and an adhesive resin layer (C) on a second surface side A2 of the base material layer (A), in which at least one layer of layers constituting
15 the adhesive film 100 is a colored layer.

[0014]

 In the manufacturing method of the electronic device, the electronic component is disposed on the adhesive film attached to the support substrate in a spaced state, and is collectively
20 sealed with a sealing resin. One surface of the adhesive film is an adhesive layer for holding the electronic component.

 Here, in a step of attaching the adhesive film to the support substrate and disposing the electronic component, in a case where a transparent adhesive film is used, there is a case
25 where the visibility of whether or not the adhesive film is attached to the support substrate is poor. In a case where the electronic component is disposed on the support substrate

without noticing that the adhesive film is not attached to the support substrate, the electronic component cannot be held, and a large amount of the electronic component is wasted.

As a result of studies, the present inventors have found
5 that the state in which the adhesive film is attached to the support substrate is visually recognized by making at least one layer constituting the adhesive film a colored layer, and have completed the present invention.

[0015]

10 In the adhesive film 100 according to the present embodiment, the colored layer may be one layer or two or more layers.

The colored layer preferably includes a layer other than the adhesive resin layer (B). As a result, it is possible to
15 further suppress the contamination of the electronic component by the colorant contained in the colored layer described later. Examples of the layer other than the adhesive resin layer (B) include the base material layer (A), the adhesive resin layer (C), and an intermediate layer (D) described later.

20 Among the layers other than the adhesive resin layer (B), from the viewpoint of further suppressing the contamination of the electronic component by the colorant contained in the colored layer, in a case where the adhesive film 100 does not include the intermediate layer (D) described later, the colored
25 layer more preferably includes the adhesive resin layer (C).

[0016]

In addition, the adhesive film 100 according to the present

embodiment may further include the intermediate layer (D).

In a case where the adhesive film 100 includes the intermediate layer (D), the colored layer more preferably includes the intermediate layer (D).

5 As a result, it is possible to further suppress the contamination of not only the electronic component but also the support substrate by the colorant contained in the colored layer.

[0017]

10 The colored layer in the adhesive film 100 according to the present embodiment preferably contains a colorant. As a result, the adhesive film 100 is colored, and it is possible to visually recognize that the adhesive film 100 is attached to the support substrate.

15 As the colorant, one or two or more selected from the group consisting of a dye and a pigment can be preferably used, and a pigment can be more preferably used. In a case where the colored layer includes at least one layer constituting the adhesive film 100, for example, one or two selected from the
20 group consisting of the base material layer (A) and the intermediate layer (D) located between the base material layer (A) and the adhesive resin layer (C), the pigment contained in the colored layer is less likely to diffuse into the adhesive resin layer (C), and it is possible to further suppress the
25 contamination of the support substrate.

[0018]

In a case where the pigment is used as the colorant, an

average particle diameter D_{50} in terms of volume average, which is measured by a laser diffraction-type particle size distribution measurement of the pigment, is preferably equal to or more than 1 nm, more preferably equal to or more than 10 nm, 5 and still more preferably equal to or more than 30 nm, and is preferably equal to or less than 1000 nm, more preferably equal to or less than 500 nm, and still more preferably equal to or less than 300 nm.

In addition, the average particle diameter D_{50} in terms of 10 volume average, which is measured by a laser diffraction-type particle size distribution measurement of the pigment, is preferably equal to or more than 1 nm and equal to or less than 1000 nm, more preferably equal to or more than 10 nm and equal to or less than 500 nm, and still more preferably equal to or 15 more than 30 nm and equal to or less than 300 nm.

By setting the average particle diameter D_{50} of the pigment within the above-described range, the visibility of the colored layer is further improved, and the diffusion of the pigment into a layer other than the colored layer, for example, the adhesive 20 resin layer (C) is suppressed, and the contamination of the support substrate can be further suppressed.

[0019]

The color of the colorant is not limited, but preferably, examples thereof include one or two or more selected from the 25 group consisting of red, pink, blue, green, yellow, purple, and orange. In a case of these colors, since the colors are different from the tint of the support substrate composed of a

stainless steel plate or the like, it is possible to more accurately visually recognize that the adhesive film 100 is attached to the support substrate.

In the manufacturing of the adhesive film 100, from the
5 viewpoint of suppressing the fading of the color of the colorant during heating, it is preferable to use a color other than red and pink.

In addition, as will be described later, in a case where the confirmation of the attachment of the adhesive film to the
10 support substrate is performed using a sensor, a color that can be detected by the sensor can also be selected.

As a commercially available product of the colorant, for example, PS Red G (manufactured by Mitsui Chemicals Fine Chemicals Co., Ltd., dye, dark brown powder solid), product
15 name: KP Plast Blue GR, KP Plast Blue R (manufactured by KIWA CHEMICAL INDUSTRY CO., LTD.), and the like can be used.

[0020]

In a case where the colored layer contains the colorant, a content of the colorant is preferably equal to or more than
20 0.01% by mass, more preferably equal to or more than 0.03% by mass, still more preferably equal to or more than 0.05% by mass, even more preferably equal to or more than 0.1% by mass, and even still more preferably equal to or more than 0.15% by mass, and is preferably equal to or less than 2.0% by mass, more
25 preferably equal to or less than 1.5% by mass, still more preferably equal to or less than 1.0% by mass, even more preferably equal to or less than 0.8% by mass, and even still

more preferably equal to or less than 0.5% by mass with respect to the total mass of the colored layer.

In addition, the content of the colorant is preferably equal to or more than 0.01% by mass and equal to or less than 2.0% by mass, more preferably equal to or more than 0.03% by mass and equal to or less than 1.5% by mass, still more preferably equal to or more than 0.05% by mass and equal to or less than 1.0% by mass, even more preferably equal to or more than 0.1% by mass and equal to or less than 0.8% by mass, and even still more preferably equal to or more than 0.15% by mass and equal to or less than 0.5% by mass with respect to the total mass of the colored layer.

By setting the content of the colorant to be equal to or higher than the lower limit value, the visibility of the attachment of the adhesive film 100 to the support substrate can be further improved. In addition, by setting the content of the colorant to be equal to or lower than the upper limit value, the contamination of the electronic component or the support substrate by the colorant can be further suppressed, the transparency of the adhesive film 100 can be further improved, and it is possible to more easily find an abnormality between the adhesive film 100 and the support substrate.

[0021]

A value of L^* of the adhesive film in an $L^*a^*b^*$ color system defined in JIS Z 8781-4:2013 is preferably equal to or less than 90, more preferably equal to or less than 80, and still more preferably equal to or less than 70.

By setting the absolute value of L^* of the adhesive film in an $L^*a^*b^*$ color system defined in JIS Z 8781-4:2013 to be equal to or lower than the upper limit value, the visibility of the attachment of the adhesive film to the support substrate can be further improved.

An absolute value of a^* of the adhesive film in an $L^*a^*b^*$ color system defined in JIS Z 8781-4:2013 is preferably equal to or more than 1, more preferably equal to or more than 5, and still more preferably equal to or more than 10.

By setting the absolute value of a^* of the adhesive film in an $L^*a^*b^*$ color system defined in JIS Z 8781-4:2013 to be equal to or higher than the lower limit value, the visibility of the attachment of the adhesive film to the support substrate can be further improved.

An absolute value of b^* of the adhesive film in an $L^*a^*b^*$ color system defined in JIS Z 8781-4:2013 is preferably equal to or more than 1, more preferably equal to or more than 5, and still more preferably equal to or more than 10.

By setting the absolute value of b^* of the adhesive film in an $L^*a^*b^*$ color system defined in JIS Z 8781-4:2013 to be equal to or higher than the lower limit value, the visibility of the attachment of the adhesive film to the support substrate can be further improved.

[0022]

In the adhesive film 100 according to the present embodiment, the layer other than the colored layer is preferably colorless and transparent. By making the layer other than the

colored layer colorless and transparent, the visibility of the attachment of the adhesive film 100 to the support substrate can be further improved, and it is possible to easily find an abnormality between the adhesive film 100 and the support substrate.

[0023]

Hereinafter, each layer of the adhesive film 100 will be described.

<Intermediate Layer (D)>

As described above, the adhesive film 100 according to the present embodiment may further include the intermediate layer (D).

The intermediate layer (D) is preferably positioned at at least one selected from between the base material layer (A) and the adhesive resin layer (C) or between the base material layer (A) and the adhesive resin layer (B), and more preferably positioned between the base material layer (A) and the adhesive resin layer (C). FIG. 2 is a cross-sectional view schematically showing a structure of the adhesive film 100 in a case where the intermediate layer (D) is located between the base material layer (A) and the adhesive resin layer (C).

In a case where the colored layer includes the intermediate layer (D), the intermediate layer (D) is located at the above-described position, so that it is possible to further suppress the contamination of the support substrate and the electronic component by the colorant contained in the colored layer.

[0024]

The intermediate layer (D) can be provided for a purpose such as an unevenness absorbing resin layer, an impact absorbing layer, and an easy adhesion layer, in addition to the function as the colored layer.

5 [0025]

As a resin constituting the intermediate layer (D), a thermoplastic resin can be preferably used.

As the thermoplastic resin, one or two or more kinds selected from the group consisting of a polyolefin-based resin, a polystyrene-based resin, a (meth)acrylic-based resin, a urethane-based resin, a silicone-based resin, a polyester-based resin, a polyamide-based resin, and a fluorine-based resin are preferably contained, and one or two or more kinds selected from the group consisting of a polyolefin-based resin, a polystyrene-based resin, and a (meth)acrylic-based resin are more preferably contained.

The resins forming the intermediate layer (D) may be used alone, or two or more types may be blended together.

By including the above-described resin, the intermediate layer (D) can easily exhibit an original function, and in a case where the colored layer includes the intermediate layer (D), the dispersibility of the colorant in the resin constituting the intermediate layer (D) can be further improved.

[0026]

25 A thickness of the intermediate layer (D) is preferably equal to or more than 1 μm , more preferably equal to or more than 5 μm , still more preferably equal to or more than 10 μm ,

even more preferably equal to or more than 20 μm , even still more preferably equal to or more than 30 μm , and even still more preferably equal to or more than 50 μm , and is preferably equal to or less than 500 μm , more preferably equal to or less than 400 μm , still more preferably equal to or less than 300 μm , even more preferably equal to or less than 200 μm , and even still more preferably equal to or less than 150 μm .

In addition, the thickness of the intermediate layer (D) is preferably equal to or more than 1 μm and equal to or less than 500 μm , more preferably equal to or more than 5 μm and equal to or less than 400 μm , still more preferably equal to or more than 10 μm and equal to or less than 300 μm , even more preferably equal to or more than 20 μm and equal to or less than 200 μm , even still more preferably equal to or more than 30 μm and equal to or less than 150 μm , and even still more preferably equal to or more than 50 μm and equal to or less than 150 μm .

By setting the thickness of the intermediate layer (D) within the above-described range, the intermediate layer (D) can more easily exhibit an original function, and the adhesive film 100 can be more easily peeled off from the support substrate.

[0027]

<Adhesive Resin Layer (C)>

The adhesive resin layer (C) is a layer provided on the second surface side A2 of the base material layer (A).

The adhesive resin layer (C) is preferably a layer in which the adhesive strength is reduced by an external stimulus. Due to this, it is possible to easily peel the adhesive film 100

from the support substrate by applying an external stimulus.

Examples of the adhesive resin layer (C) in which the adhesive strength is reduced by an external stimulus include a heat-peeling type adhesive resin layer in which the adhesive strength is reduced by heating, and a light irradiation type adhesive resin layer in which the adhesive strength is reduced by light such as ultraviolet rays and radiation. Examples of a method of applying the external stimulus include light irradiation and a heating treatment.

10 [0028]

Examples of the heat-peeling type adhesive resin layer include an adhesive resin layer composed of a heat-expansion type adhesive containing an adhesive resin (C1) and further containing a gas generation component, a heat-expansion type adhesive containing thermally expandable microspheres that can reduce the adhesive strength upon expansion, and a heat-expansion type adhesive in which the adhesive strength is reduced by a crosslinking reaction of an adhesive component by heat. Among these, from the viewpoint of further suppressing the displacement of the electronic component and the viewpoint of further simplifying the manufacturing method, the adhesive resin layer (C) according to the present embodiment preferably contains a heat-expansion type adhesive.

[0029]

25 The heat-expansion type adhesive used in the adhesive resin layer (C) is preferably an adhesive whose adhesive strength is reduced or lost by heating at a temperature exceeding 100°C,

more preferably a temperature equal to or higher than 110°C,
still more preferably a temperature equal to or higher than
120°C, even more preferably a temperature equal to or higher
than 130°C, even still more preferably a temperature equal to or
5 higher than 150°C, even still more preferably a temperature
equal to or higher than 180°C, even still more preferably a
temperature equal to or higher than 200°C, even still more
preferably a temperature equal to or higher than 210°C, and even
still more preferably a temperature equal to or higher than
10 230°C.

As the heat-expansion type adhesive used in the adhesive
resin layer (C), for example, a material that is not peeled off
at equal to or lower than 100°C and is peeled off at a
temperature exceeding 100°C can be selected, and it is
15 preferable that the adhesive strength is such that the adhesive
film 100 is not peeled off from the support substrate during the
manufacturing step of the electronic device.

Here, it is possible to evaluate the reduction or loss of
the adhesive strength by heating at a temperature over 100°C,
20 for example, by the peeling strength from a stainless-steel
plate, measured after attaching the adhesive resin layer (C)
side to the stainless-steel plate, performing a heating
treatment at 90°C for one hour, and then heating at a
temperature exceeding 100°C for two minutes. The specific
25 heating temperature when heating at a temperature exceeding
100°C is set to a temperature exceeding the temperature at which
gas is generated or the temperature at which thermally

expandable microspheres undergo heat expansion and is set as appropriate depending on the type of gas to be generated or the thermally expandable microspheres. In the present embodiment, loss of adhesive strength means, for example, a case where the
5 180° peeling strength measured under conditions of 23°C and a tensile speed of 300 mm/min is less than 0.5 N/25 mm.

[0030]

As the gas generation component used in the heat-expansion type adhesive, for example, it is possible to use an azo
10 compound, an azide compound, a Meldrum's acid derivative, or the like. In addition, it is also possible to use inorganic foaming agents such as ammonium carbonate, ammonium hydrogen carbonate, sodium hydrogen carbonate, ammonium nitrite, sodium borohydride, and various azides, and water; chlorofluoroalkane-based
15 compounds such as trichloromonofluoromethane and dichloromonofluoromethane; azo-based compounds such as azobisisobutyronitrile, azodicarbonamide, and barium azodicarboxylate; hydrazine-based compounds such as paratoluenesulfonyl hydrazide, diphenylsulfone-3,3'-
20 disulfonylhydrazide, 4,4'-oxybis(benzenesulfonyl hydrazide) and allylbis(sulfonylhydrazide); semicarbazide-based compounds such as p-toluylenesulfonyl semicarbazide, and 4,4'-oxybis(benzenesulfonyl semicarbazide); triazole-based compounds such as 5-morpholyl-1,2,3,4-thiatriazole; organic foaming agents
25 such as N-nitroso compounds such as N,N'-dinitrosopentamethylenetetramine, and N,N'-dimethyl-N,N'-dinitrosoterephthalamide, and the like. The gas generation

component may be added to the adhesive resin (C1) or may be directly bonded to the adhesive resin (C1).

[0031]

As the thermally expandable microspheres used for the heat-expansion type adhesive, for example, it is possible to use a microencapsulated foaming agent. Examples of such thermally expandable microspheres include microspheres in which a substance that is easily gasified and expanded by heating such as isobutane, propane, and pentane is sealed in a shell having elasticity, or the like. Examples of the material forming the shell include vinylidene chloride-acrylonitrile copolymer, polyvinyl alcohol, polyvinyl butyral, polymethyl methacrylate, polyacrylonitrile, polyvinylidene chloride, polysulfone, and the like. It is possible to manufacture thermally expandable microspheres by, for example, a coacervation method, an interfacial polymerization method, or the like.

It is possible to add thermally expandable microspheres to the adhesive resin.

[0032]

The lower limit value of the content of at least one selected from the gas generation component or the thermally expandable microspheres can be appropriately set according to the expansion ratio of the heat-peeling type adhesive resin layer (C), the reducibility of the adhesive strength, or the like, and is not particularly limited, but is preferably equal to or more than 1 part by mass, more preferably equal to or more than 10 parts by mass, and still more preferably equal to or

more than 12 parts by mass with respect to 100 parts by mass of the adhesive (C1) in the heat-peeling type adhesive resin layer (C).

In addition, the upper limit value of the content of at least one selected from the gas generation component or the thermally expandable microspheres is preferably equal to or less than 150 parts by mass, more preferably equal to or less than 130 parts by mass, and still more preferably equal to or less than 100 parts by mass with respect to 100 parts by mass of the adhesive (C1) in the heat-peeling type adhesive resin layer (C).

In addition, the content of at least one selected from the gas generation component or the thermally expandable microspheres is preferably equal to or more than 1 part by mass and equal to or less than 150 parts by mass, more preferably equal to or more than 10 parts by mass and equal to or less than 130 parts by mass, and still more preferably equal to or more than 12 parts by mass and equal to or less than 100 parts by mass with respect to 100 parts by mass of the adhesive (C1) in the heat-peeling type adhesive resin layer (C).

It is preferable that the content of at least one selected from the gas generation component or the thermally expandable microspheres is designed such that the temperature at which the gas is generated or the temperature at which the thermally expandable microspheres are thermally expanded is a temperature exceeding 100°C.

[0033]

Examples of the adhesive resin (C1) constituting the heat-

expansion type adhesive include one or two or more selected from the group consisting of a (meth)acrylic-based resin, a urethane-based resin, a silicone-based resin, a polyolefin-based resin, a polyester-based resin, a polyamide-based resin, a fluorine-based resin, and a styrene-diene block copolymer-based resin. Among these, the (meth)acrylic-based resin is preferable.

[0034]

It is preferable that the adhesive resin layer (C) according to the present embodiment further includes a crosslinking agent (C2) having two or more crosslinkable functional groups in one molecule, in addition to the adhesive (C1).

The crosslinking agent (C2) having two or more crosslinkable functional groups in one molecule is used to react with the functional group of the adhesive resin (C1) and adjust the adhesive strength and aggregating force.

Examples of such crosslinking agents (C2) include one or two or more selected from the group consisting of epoxy-based compounds such as sorbitol polyglycidyl ether, polyglycerol polyglycidyl ether, pentaerythritol polyglycidyl ether, diglycerol polyglycidyl ether, glycerol polyglycidyl ether, neopentyl glycol diglycidyl ether, and resorcinol diglycidyl ether; isocyanate-based compounds such as tetramethylene diisocyanate, hexamethylene diisocyanate, trimethylolpropane adduct with 3 mols of toluene diisocyanate, polyisocyanate, diphenylmethane diisocyanate, and tolylene diisocyanate; aziridine-based compounds such as trimethylolpropane tri- β -

aziridinyl propionate, tetramethylolmethane-tri- β -aziridinyl propionate, N,N'-diphenylmethane-4,4'-bis(1-aziridinecarboxamide), N,N'-hexamethylene-1,6-bis(1-aziridinecarboxamide), N,N'-toluene 2,4-bis(1-aziridinecarboxamide), and trimethylolpropane-tri- β -(2-methylaziridine) propionate; tetrafunctional epoxy-based compounds such as N,N,N',N'-tetraglycidyl-m-xylenediamine, and 1,3-bis(N,N'-diglycidylaminomethyl)cyclohexane; melamine-based compounds such as hexamethoxymethyl melamine. These may be used alone or in a combination of two or more types.

Among the above, it is preferable to include one type or two or more types selected from an epoxy-based compound, an isocyanate-based compound, and an aziridine-based compound.

[0035]

The content of the crosslinking agent (C2) is usually preferably in a range in which the number of functional groups in the crosslinking agent (C2) does not exceed the number of functional groups in the adhesive resin (C1). However, in a case where a functional group is newly generated in the crosslinking reaction, a case where the crosslinking reaction is slow, or the like, the amount thereof may be greater as necessary.

From the viewpoint of further suppressing the displacement of the electronic component in the sealing step, the lower limit value of the content of the crosslinking agent (C2) in the adhesive resin layer (C) is preferably equal to or more than 0.1 parts by mass and more preferably equal to or more than 0.5

parts by mass with respect to 100 parts by mass of the adhesive (C1).

In addition, from the viewpoint of storage stability, the upper limit value of the content of the crosslinking agent (C2) in the adhesive resin layer (C) is preferably equal to or less than 10 parts by mass and more preferably equal to or less than 5 parts by mass with respect to 100 parts by mass of the adhesive (C1).

[0036]

From the viewpoint of improving the adhesiveness to the support substrate, it is preferable that the adhesive resin layer (C) according to the present embodiment further includes a tackifying resin in addition to the adhesive resin (C1). Containing a tackifying resin in the adhesive resin layer (C) is preferable for facilitating adjustment of the adhesiveness to the support substrate near room temperature. A tackifying resin in which the softening point is equal to or higher than 100°C is preferable. Specific examples of the tackifying resin include one or two or more selected from the group consisting of rosin-based resins such as rosin-based derivatives subjected to a treatment such as esterification; terpene-based resins such as α -pinene-based, β -pinene-based, dipentene-based, and terpene phenol-based resins; natural rosin such as gum-based, wood-based, and tall oil-based rosin; petroleum resins obtained by hydrogenating, disproportionating, polymerizing, or maleating the natural rosin; and coumarone-indene resins.

Among these, examples having a softening point in the range

of 100°C to 160°C are more preferable and examples having a softening point in the range of 120°C to 150°C are still more preferable.

[0037]

5 From the viewpoint of further improving the adhesiveness to the support substrate during work, the formulation proportion of the tackifying resin is preferably equal to or more than 1 part by mass and more preferably equal to or more than 2 parts by mass with respect to 100 parts by mass of the adhesive resin
10 (C1). From the viewpoint of further improving the adhesiveness to the support substrate and the attachability at room temperature, the formulation proportion of the tackifying resin is preferably equal to or less than 100 parts by mass and more preferably equal to or less than 50 parts by mass.

15 In addition, the acid value of the tackifying resin is preferably equal to or less than 30. As a result, the adhesive film 100 tends to be less likely to cause a residue of the adhesive on the support substrate during peeling.

[0038]

20 The adhesive resin layer (C) may include additives such as plasticizers as other components. In a case where the entire adhesive resin layer (C) is set to 100% by mass, the lower limit value of the total content of the adhesive (C1), the crosslinking agent (C2), and the tackifying resin in the
25 adhesive resin layer (C) is preferably equal to or more than 50% by mass, more preferably equal to or more than 70% by mass, still more preferably equal to or more than 90% by mass, and

even more preferably equal to or more than 95% by mass.

Further, in a case where the adhesive resin layer (C) is composed of a heat-expansion type adhesive, in a case where the entire adhesive resin layer (C) is set to 100% by mass, the lower limit value of the total content of the adhesive (C1), the crosslinking agent (C2), the tackifying resin, the gas generation component, and the thermally expandable microspheres in the adhesive resin layer (C) is preferably equal to or more than 50% by mass, more preferably equal to or more than 70% by mass, still more preferably equal to or more than 90% by mass, and even more preferably equal to or more than 95% by mass.

The upper limit value thereof is not particularly limited, but is, for example, equal to or less than 100% by mass.

[0039]

Examples of the light irradiation type adhesive resin layer (C) include an adhesive resin layer composed of an ultraviolet expandable adhesive containing an ultraviolet reactive adhesive (C3), further containing a gas generation component, an ultraviolet expandable adhesive containing ultraviolet expandable microspheres that can reduce the adhesive strength upon expansion, and an ultraviolet expandable adhesive in which the adhesive strength is reduced by a crosslinking reaction of an adhesive component by ultraviolet irradiation.

The light source used in this case is not particularly limited, but it is preferable to use a light source capable of emitting ultraviolet rays or visible light having a wavelength of equal to or more than 200 nm and equal to or less than 500

nm. Examples of such a light source include a high-pressure mercury lamp, a low-pressure mercury lamp, a metal halide lamp, and a super UV lamp.

In a case of ultraviolet crosslinking, for example, the adhesive resin layer (C) can be expanded to reduce the adhesive strength and peeled off by irradiating the adhesive resin layer (C) with ultraviolet rays having a main wavelength of 365 nm at an irradiation intensity of 10 to 350 mW/cm² under conditions of an ultraviolet dose of 100 to 20,000 mJ/cm² in an environment of 0°C to 60°C using a high-pressure mercury lamp.

[0040]

The adhesive resin layer (C) may be a single layer or a multilayer. For example, by laminating two or more layers having different degrees of expansion by heating to form the adhesive resin layer (C), the adhesiveness and the thermal peelability can be changed between one surface and the other surface of the adhesive resin layer (C).

From the viewpoint of further improving the adhesiveness and the thermal peelability, the thickness of the adhesive resin layer (C) is preferably equal to or more than 3 μm and more preferably equal to or more than 20 μm. From the viewpoint of improving the handleability of the adhesive film 100, the thickness of the adhesive resin layer (C) is preferably equal to or less than 300 μm and more preferably equal to or less than 150 μm.

In addition, the thickness of the adhesive resin layer (C) is preferably equal to or more than 3 μm and equal to or less

than 300 μm , and more preferably equal to or more than 20 μm and equal to or less than 150 μm .

[0041]

<Base Material Layer (A)>

5 The base material layer (A) is a layer provided for the purpose of further improving the handleability, the mechanical characteristics, the heat resistance, and the like of the adhesive film 100.

 The base material layer (A) is not particularly limited,
10 but examples thereof include a resin film.

 Examples of the resin constituting the resin film include known thermoplastic resins. Examples thereof include one type or two or more types selected from the group consisting of polyolefins such as polyethylene, polypropylene, poly(4-methyl-
15 1-pentene), and poly(1-butene); polyesters such as polyethylene terephthalate, polybutylene terephthalate, and polyethylene naphthalate; polyamides such as nylon-6, nylon-66, and polymetaxylene adipamide; polyacrylates; polymethacrylates; polyvinyl chloride; polyvinylidene chloride; polyimide;
20 polyetherimide; ethylene vinyl acetate copolymer; polyacrylonitrile; polycarbonate; polystyrene; ionomer; polysulfone; polyethersulfone; polyphenylene ether.

 Among these, from the viewpoint of an excellent balance between the transparency, mechanical strength, price, and the
25 like, one type or two or more types selected from polypropylene, polyethylene terephthalate, polyethylene naphthalate, polyamide, and polyimide are preferable, and at least one type selected

from the group consisting of polyethylene terephthalate and polyethylene naphthalate is more preferable.

[0042]

The base material layer (A) may be a single layer or two or
5 more layers.

In addition, the form of the resin film used to form the base material layer (A) may be an unstretched film or a film stretched in the uniaxial or biaxial direction; however, from the viewpoint of improving the mechanical strength of the base
10 material layer (A), a film stretched in the uniaxial or biaxial direction is preferable.

[0043]

From the viewpoint of obtaining more favorable film characteristics, the thickness of the base material layer (A) is
15 preferably equal to or more than 1 μm , more preferably equal to or more than 5 μm , and still more preferably equal to or more than 10 μm , and is preferably equal to or less than 500 μm , more preferably equal to or less than 300 μm , and still more preferably equal to or less than 250 μm .

20 In addition, from the viewpoint of obtaining more favorable film characteristics, the thickness of the base material layer (A) is preferably equal to or more than 1 μm and equal to or less than 500 μm , more preferably equal to or more than 5 μm and equal to or less than 300 μm , and still more preferably equal to
25 or more than 10 μm and equal to or less than 250 μm .

The base material layer (A) may be subjected to a surface treatment in order to further improve the adhesiveness to other

layers. Specifically, a corona treatment, a plasma treatment, an undercoating treatment, a primer coating treatment, or the like may be performed.

[0044]

5 <Adhesive Resin Layer (B)>

The adhesive resin layer (B) is a layer provided on the first surface side A1 of the base material layer (A). The adhesive resin layer (B) is a layer for contacting the surface of the electronic component to temporarily fix the electronic
10 component when the electronic component is sealed with a sealing material in the electronic device manufacturing process.

[0045]

The adhesive constituting the adhesive resin layer (B) preferably includes one or two or more selected from the group
15 consisting of a (meth)acrylic-based adhesive, a silicone-based adhesive, a urethane-based adhesive, an olefin-based adhesive, and a styrene-based adhesive, and from the viewpoint of being able to more easily adjust the adhesiveness, it more preferably includes a (meth)acrylic-based adhesive having a (meth)acrylic-
20 based polymer as a base polymer.

[0046]

As the adhesive constituting the adhesive resin layer (B), a radiation crosslinking type adhesive that reduces the adhesive strength by radiation can be preferably used. The adhesive
25 resin layer (B) composed of the radiation crosslinking type adhesive is crosslinked by irradiation with radiation, and the adhesive strength is significantly reduced. Therefore, in the

electronic component pickup process, the electronic component is more easily picked up from the adhesive resin layer (B).

Examples of the radiation include ultraviolet rays, electron beams, infrared rays, and the like.

- 5 As a radiation crosslinking type adhesive, an ultraviolet cross-linking adhesive is preferable.

[0047]

- Examples of the (meth)acrylic-based polymer included in the (meth)acrylic-based adhesive include a homopolymer of a
- 10 (meth)acrylic acid ester compound, a copolymer of a (meth)acrylic acid ester compound and a comonomer. Examples of the (meth)acrylic acid ester compound include one or two or more selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, butyl (meth)acrylate, 2-ethylhexyl
- 15 (meth)acrylate, hydroxyethyl (meth)acrylate, hydroxypropyl (meth)acrylate, dimethylaminoethyl (meth)acrylate, and glycidyl (meth)acrylate. These (meth)acrylic acid ester compounds may be used alone or in combination of two or more kinds thereof.

- In addition, examples of the comonomer constituting the
- 20 (meth)acrylic copolymer include one or two or more selected from the group consisting of vinyl acetate, (meth)acrylonitrile, (meth)acrylamide, styrene, (meth)acrylic acid, itaconic acid, (meth)acrylamide, methylol (meth)acrylamide, and maleic anhydride. One type of these comonomers may be used alone, or
- 25 two or more may be used in combination.

[0048]

A radiation crosslinking type adhesive includes, for

example, an adhesive such as the (meth)acrylic-based adhesive described above, a cross-linking compound (a component having carbon-carbon double bonds), and a photopolymerization initiator or a thermal polymerization initiator.

5 [0049]

Examples of the cross-linking compound include monomers, oligomers, polymers, or the like which have carbon-carbon double bonds in the molecule and are able to be cross-linked by radical polymerization. Examples of such cross-linking compounds
10 include one or two or more selected from the group consisting of esters of (meth)acrylic acid with polyhydric alcohols such as trimethylolpropane tri(meth)acrylate, pentaerythritol tri(meth)acrylate, tetraethylene glycol di(meth)acrylate, 1,6-hexanediol di(meth)acrylate, neopentyl glycol di(meth)acrylate,
15 and dipentaerythritol hexa(meth)acrylate; ester (meth)acrylate oligomers; isocyanurates or isocyanurate compounds such as 2-propenyl di-3-butenyl cyanurate, 2-hydroxyethyl bis(2-(meth)acryloxyethyl)isocyanurate, and tris(2-methacryloxyethyl)isocyanurate.

20 In a case where the adhesive is a radiation-cross-linked polymer having carbon-carbon double bonds in the side chain of the polymer, a cross-linking compound may not be added.

[0050]

The content of the cross-linking compound is preferably 5
25 to 100 parts by mass with respect to 100 parts by mass of adhesive, and more preferably 10 to 50 parts by mass. Due to the content of the cross-linking compound being in the range

described above, it is easier to adjust the adhesive strength in comparison with a case where the content is less than the range described above, and a decrease in storage stability is less likely to occur due to excessive sensitivity with respect to heat or light in comparison with a case where the content is greater than the range described above.

[0051]

The photopolymerization initiator may be any compound which cleaves and generates radicals upon being irradiated with radiation and examples thereof include one or two or more selected from the group consisting of benzoin alkyl ethers such as benzoin methyl ether, benzoin isopropyl ether, and benzoin isobutyl ether; aromatic ketones such as benzil, benzoin, benzophenone, and α -hydroxycyclohexylphenyl ketone; aromatic ketals such as benzil dimethyl ketal; polyvinyl benzophenone; thioxanthenes such as chlorothioxanthone, dodecyl thioxanthone, dimethyl thioxanthone, and diethyl thioxanthone.

[0052]

Examples of thermal polymerization initiators include organic peroxide derivatives, azo-based polymerization initiators, and the like. From the point of view that nitrogen is not generated during heating, an organic peroxide derivative is preferable. Examples of the thermal polymerization initiator include one or two or more selected from the group consisting of ketone peroxide, peroxyketal, hydroperoxide, dialkyl peroxide, diacyl peroxide, peroxyester, and peroxydicarbonate.

[0053]

A crosslinking agent may be added to the adhesive. Examples of crosslinking agents include one or two or more selected from the group consisting of epoxy-based compounds such as sorbitol polyglycidyl ether, polyglycerol polyglycidyl ether, 5 pentaerythritol polyglycidyl ether, and diglycerol polyglycidyl ether; aziridine-based compounds such as tetramethylolmethane-tri- β -aziridinyl propionate, trimethylolpropane-tri- β -aziridinyl propionate, N,N'-diphenylmethane-4,4'-bis(1-aziridinecarboxamide), and N,N'-hexamethylene-1,6-bis(1-10 aziridinecarboxamide); isocyanate-based compounds such as tetramethylene diisocyanate, hexamethylene diisocyanate, and polyisocyanate, and the like. From the viewpoint of improving the balance between the heat resistance and the adhesiveness of the adhesive resin layer (B), the content of the crosslinking 15 agent is preferably equal to or more than 0.1 parts by mass and equal to or less than 10 parts by mass with respect to 100 parts by mass of the adhesive.

[0054]

The thickness of the adhesive resin layer (B) is preferably 20 equal to or more than 1 μm , more preferably equal to or more than 3 μm , and still more preferably equal to or more than 5 μm , and is preferably equal to or less than 100 μm , more preferably equal to or less than 50 μm , and still more preferably equal to or less than 40 μm .

25 In addition, the thickness of the adhesive resin layer (B) is preferably equal to or more than 1 μm and equal to or less than 100 μm , more preferably equal to or more than 3 μm and

equal to or less than 50 μm , and still more preferably equal to or more than 5 μm and equal to or less than 40 μm .

[0055]

From the viewpoint of further improving the performance
5 balance between the mechanical characteristics and the
handleability, the thickness of the entire adhesive film 100
according to the present embodiment is preferably equal to or
more than 25 μm , more preferably equal to or more than 30 μm ,
and is preferably equal to or less than 800 μm , more preferably
10 equal to or less than 500 μm , and still more preferably equal to
or less than 300 μm .

In addition, from the viewpoint of further improving the
performance balance between the mechanical characteristics and
the handleability, the thickness of the entire adhesive film 100
15 according to the present embodiment is preferably equal to or
more than 25 μm and equal to or less than 800 μm , more
preferably equal to or more than 30 μm and equal to or less than
500 μm , and still more preferably equal to or more than 30 μm
and equal to or less than 300 μm .

20 [0056]

[Manufacturing Method of Adhesive Film]

Next, a description will be given of an example of a
manufacturing method of the adhesive film 100 according to the
present embodiment.

25 the adhesive film 100 according to the present embodiment
can be formed by, for example, a method of applying an adhesive
coating liquid to the base material layer (A) to form the

adhesive resin layer (B) and the adhesive resin layer (C), a method of transferring the adhesive resin layer (B) and the adhesive resin layer (C) formed on a separator to the base material layer (A), or the like.

5 In addition, the base material layer (A) and the adhesive resin layer (B) may be formed by co-extrusion molding, or may be formed by laminating (layering) a film-like base material layer (A) and a film-like adhesive resin layer (B). The same applies to the base material layer (A) and the adhesive resin layer (C).

10 In addition, the adhesive resin layer (B), the base material layer (A), and the adhesive resin layer (C) may be formed in this order by co-extrusion molding.

 In a case where the intermediate layer (D) is included, for example, the base material layer (A) and the intermediate layer
15 (D) may be formed by co-extrusion molding, may be formed by laminating (layering) a film-like base material layer (A) and a film-like intermediate layer (D), or may be formed by a method of applying a coating liquid onto another layer.

 In addition, for example, the adhesive resin layer (C) can
20 be formed by applying an adhesive coating liquid onto a separator and drying the adhesive coating liquid, the base material layer (A) can be formed on the adhesive resin layer (C) by an extrusion lamination method, and the adhesive resin layer (B) can be formed by applying an adhesive coating liquid onto
25 the base material layer (A) and drying the adhesive coating liquid.

[0057]

The colored layer in the adhesive film 100 can be formed, for example, by dispersing the colorant in advance in the resin constituting each layer and then performing co-extrusion molding. In addition, the colored layer can be formed by
5 laminating (layering) a film obtained by blending the colorant in advance. In addition, the colored layer can be formed by applying and drying a coating liquid containing the colorant.
[0058]

As a method for applying the coating liquid, it is possible
10 to adopt a coating method known in the related art, for example, a roll coater method, a reverse roll coater method, a gravure roll method, a bar coating method, a comma coater method, a die coater method, or the like. The drying conditions of the coating liquid are not particularly limited, but are generally
15 preferably drying for 10 seconds to 10 minutes in a temperature range of 80°C to 200°C. More preferably, the drying is performed at 80°C to 170°C for 15 seconds to 5 minutes.

In the adhesive coating liquid, in order to sufficiently promote the crosslinking reaction between the crosslinking agent
20 and the adhesive, the adhesive coating liquid may be heated at 40°C to 80°C for about 5 to 300 hours after the drying of the adhesive coating liquid is completed.

[0059]

[Manufacturing Method of Electronic Device]

25 The manufacturing method of the electronic device according to the present embodiment will be described with reference to the drawings. FIG. 3 is a cross-sectional view schematically

showing a manufacturing method of an electronic device of the embodiment according to the present invention.

The manufacturing method of the electronic device according to the present embodiment includes a step (a) of attaching a
5 support substrate 80 to the adhesive resin layer (C) of the adhesive film 100 and a step (b) of confirming that the adhesive film 100 is attached to the support substrate 80 by the color of the adhesive film 100.

Since the manufacturing method of the electronic device
10 according to the present embodiment uses the adhesive film 100 according to the present embodiment, the color of the colorant contained in the colored layer of the adhesive film 100 is recognized when viewed from the surface of the adhesive film 100, and it is possible to easily confirm whether or not the
15 adhesive film 100 is attached to the support substrate 80.

As a result, the electronic component 70 can be disposed on the support substrate 80 in a state where the adhesive film 100 is not attached to the support substrate 80, and a large amount of the electronic component 70 can be prevented from being
20 wasted without being temporarily fixed.

[0060]

In the step (b), the confirmation of the attachment of the adhesive film 100 to the support substrate 80 by the color of the adhesive film 100 can be performed by visual inspection or
25 can be performed by using a sensor capable of identifying the color.

In both a case of performing the confirmation by visual

inspection and a case of performing the confirmation by using a sensor, it is preferable to perform the confirmation from a normal direction of the surface of the adhesive film 100. As a result, the reflection of the surface of the adhesive film 100 is suppressed, the color of the colored layer of the adhesive film 100 can be more accurately recognized, and it is possible to more accurately confirm that the adhesive film 100 is attached to the support substrate 80.

In a case of performing the confirmation of the attachment of the adhesive film 100 to the support substrate 80 by visual inspection, it is preferable to perform the confirmation from a position that is equal to or more than 5 cm and equal to or less than 100 cm away from the surface of the adhesive film 100 in an illuminance environment of equal to or more than 50 lux and equal to or less than 100000 lux. As a result, it is possible to more accurately confirm that the adhesive film 100 is attached to the support substrate 80.

In a case of performing the confirmation of the attachment of the adhesive film 100 to the support substrate 80 by using a sensor, for example, a photoelectric sensor that emits light to the adhesive film 100 and detects the reflected light of the adhesive film 100 with a light-receiving unit can be used. Examples of a commercially available product that can be used as the sensor include a product manufactured by Keyence Corporation, product name: white spot photoelectric sensor LR-W series.

From the viewpoint of further suppressing the displacement of the electronic component 70, the support substrate 80 preferably includes at least one selected from the group consisting of a stainless steel substrate and a glass substrate.

5 [0062]

In addition, the manufacturing method of the electronic device according to the present embodiment may further include, in this order, a step (c) of placing the electronic component 70 onto the adhesive resin layer (B) of the adhesive film 100 after
10 the step of confirming that the adhesive film 100 is attached to the support substrate 80, and a step (d) of sealing the electronic component 70 with a sealing material 90.

Examples of the electronic component 70 include a semiconductor chip such as an IC, LSI, discrete component, light
15 emitting diode, or light receiving element, a semiconductor panel, a semiconductor package, and the like.

The surface of the electronic component 70 has the uneven structure, for example, by having electrodes.

In addition, the electrodes are, for example, bonded with
20 respect to the electrodes formed on the mounting surface when the electronic device is mounted on the mounting surface, so as to form an electrical connection between the electronic device and the mounting surface (mounting surface of a printed substrate or the like).

25 Examples of electrodes include bump electrodes such as ball bumps, printing bumps, stud bumps, plating bumps, pillar bumps, and the like. That is, the electrode is usually a protruding

electrode. These bump electrodes may be used alone or in combination of two or more kinds thereof.

In addition, the type of the metal forming the bump electrode is not particularly limited and examples thereof
5 include silver, gold, copper, tin, lead, bismuth, alloys thereof, and the like. These types of metal may be used alone or in combination of two or more kinds thereof.

[0063]

In the step (d), the plurality of electronic components 70
10 may be collectively sealed with the sealing material 90 or may be individually sealed.

As a method of individually coating each of the plurality of electronic components 70 with the sealing material 90, it is preferable to use one or two or more methods selected from the
15 group consisting of a 3D printer method, a spray method, a screen printing method, and an ink jet method, and it is more preferable to use the 3D printer method.

By individually coating each of the plurality of electronic components 70 with the sealing material 90 using the above-
20 described method, it is possible to suppress the displacement of the electronic component 70 in the step (d).

[0064]

As the sealing material 90, a known sealing material can be used as long as the sealing material has high insulating
25 properties, but from the viewpoint of further improving the affinity of the sealing material 90 to the adhesive film 100 and further sealing the electronic component 70 more uniformly, the

sealing material 90 preferably includes an epoxy resin-based sealing material.

As such an epoxy resin-based sealing material, for example, it is possible to use the T693/R4000 series, the T693/R1000
5 series, the T693/R5000 series, and the like, manufactured by Nagase Chemtex Corporation.

The sealing material 90 may be in a solid state or a liquid state, but from the viewpoint of being able to perform the sealing step at a low temperature and low pressure and further
10 suppress the displacement of the electronic component 70 in the sealing step, the sealing material is preferably in a liquid state.

[0065]

From the viewpoint of further suppressing the displacement
15 of the electronic component 70, a thickness of the sealing material 90 after coating the electronic component 70 is preferably equal to or more than 1.0 μm , more preferably equal to or more than 1.5 μm , still more preferably equal to or more than 5.0 μm , even more preferably equal to or more than 10.0 μm ,
20 even still more preferably equal to or more than 30.0 μm , and even still more preferably equal to or more than 50.0 μm , and is preferably equal to or less than 2.0 mm, more preferably equal to or less than 1.5 mm, still more preferably equal to or less than 1.0 mm, and even more preferably equal to or less than 0.5
25 mm.

[0066]

From the viewpoint of further improving the work efficiency

of the step (d), a sealing temperature in the step (d) is preferably equal to or higher than 10°C, more preferably equal to or higher than 15°C, and still more preferably equal to or higher than 20°C, and from the viewpoint of further suppressing the displacement of the electronic component 70, the sealing temperature in the step (d) is preferably equal to or lower than 45°C, more preferably equal to or lower than 40°C, still more preferably equal to or lower than 35°C, and even more preferably equal to or lower than 30°C.

10 The sealing temperature in the present embodiment refers to a set temperature in a device used for sealing the electronic component 70.

[0067]

From the viewpoint of improving the reliability of the electronic device, a sealing pressure in the step (d) is preferably equal to or more than 30 kPa, more preferably equal to or more than 50 kPa, still more preferably equal to or more than 70 kPa, and even more preferably equal to or more than 90 kPa, and from the viewpoint of further suppressing the displacement of the electronic component 70, the sealing pressure in the step (d) is preferably equal to or less than 150 kPa, more preferably equal to or less than 130 kPa, and still more preferably equal to or less than 110 kPa. In addition, the sealing pressure in the step (d) is still more preferably normal pressure.

25 The sealing pressure in the present embodiment refers to a set pressure in a device used for sealing the electronic

component 70.

[0068]

It is preferable that the manufacturing method of the electronic device according to the present embodiment further includes a step (e) (not shown) of curing the sealing material 90. As a result, the electronic component 70 can be fixed, and the displacement of the electronic component 70 can be further suppressed.

Examples of a method of curing the sealing material 90 include a method of treating the sealing material 90 with one or two methods selected from the group consisting of light irradiation and a heating treatment, and from the viewpoint of further suppressing the displacement of the electronic component 70, it is preferable to cure the sealing material 90 by light irradiation.

[0069]

As the light irradiation, preferably, the sealing material 90 is crosslinked and cured by irradiating the sealing material 90 with light such as ultraviolet rays. As the light source used in this case, it is preferable to use a light source capable of emitting ultraviolet rays including a wavelength component capable of exciting a photoinitiator, and it is more preferable to use a light source capable of emitting ultraviolet rays including a component having a wavelength of less than 300 nm.

Preferred examples of the heating treatment include thermal crosslinking with an oven, thermal crosslinking with a hot

plate, and thermal crosslinking with infrared irradiation. In a case of thermal crosslinking, the heating temperature is, for example, 100°C to 180°C, and the heating treatment time is, for example, 10 to 180 minutes. It is preferable that the heating
5 temperature does not exceed the temperature at which the gas is generated in the adhesive film 100 or the temperature at which the thermally expandable microspheres are thermally expanded.
[0070]

It is preferable that the manufacturing method of the
10 electronic device according to the present embodiment further includes a step (f) (not shown) of applying an external stimulus to the adhesive resin layer (C) to reduce the adhesive strength of the adhesive resin layer (C) and peel off the support
substrate 80 from the adhesive film 100 after the step (e).

15 After sealing the electronic component 70, for example, it is possible to easily remove the support substrate 80 from the adhesive film 100 by heating to a temperature exceeding 100°C to reduce the adhesive strength of the adhesive resin layer (C).
[0071]

20 It is preferable that the manufacturing method of the electronic device according to the present embodiment further includes a step (g) (not shown) of peeling off the adhesive film 100 from the plurality of electronic components 70 after the step (f). As a result of this step, the electronic device is
25 obtained.

Examples of the method for peeling the adhesive film 100 from the electronic component 70 include a mechanical peeling

method, a method of peeling after reducing the adhesive strength on the surface of the adhesive film 100, or the like.

[0072]

The manufacturing method of the electronic device according to the present embodiment can be preferably used to manufacture an electronic device including a fan-out type package. That is, the electronic device obtained by the manufacturing method of the electronic device according to the present embodiment includes a fan-out type package. In the fan-out type package, since the terminals can be spread to the outside of the chip (fan out), the fan-out type package can be adopted even in an application in which the number of terminals is larger than the chip area. In addition, since the package substrate is not required, thinning is also possible.

[0073]

Although the embodiments of the present invention have been described above, these are examples of the present invention, and various configurations other than the above can be adopted.

[0074]

In addition, the present invention is not limited to the above-described embodiments, and modifications, improvements, and the like within a range where the object of the present invention can be achieved are included in the present invention.

[0075]

This application claims priority based on Japanese Patent Application No. 2023-124158 filed on July 31, 2023, the entire disclosure of which is incorporated herein by reference.

REFERENCE SIGNS LIST

[0076]

- A base material layer (A)
- 5 B adhesive resin layer (B)
- C adhesive resin layer (C)
- D intermediate layer (D)
- A1 first surface side of base material layer (A)
- A2 second surface side of base material layer (A)
- 10 70 electronic component
- 80 support substrate
- 90 sealing material
- 100 adhesive film

CLAIMS

[Claim 1]

An adhesive film comprising:

5 a base material layer (A);

an adhesive resin layer (B) for temporarily fixing an electronic component on a first surface side of the base material layer (A); and

10 an adhesive resin layer (C) on a second surface side of the base material layer (A),

wherein at least one layer of layers constituting the adhesive film is a colored layer.

[Claim 2]

15 The adhesive film according to Claim 1, wherein the colored layer includes a layer other than the adhesive resin layer (B).

[Claim 3]

20 The adhesive film according to Claim 1 or 2, wherein the colored layer includes the adhesive resin layer (C).

[Claim 4]

The adhesive film according to any one of Claims 1 to 3, further comprising:

25 an intermediate layer (D),

wherein the colored layer includes the intermediate layer (D).

[Claim 5]

The adhesive film according to Claim 4, wherein the intermediate layer (D) is located at at least one selected from
5 between the base material layer (A) and the adhesive resin layer (C) or between the base material layer (A) and the adhesive resin layer (B).

[Claim 6]

10 The adhesive film according to Claim 4 or 5, wherein a resin constituting the intermediate layer (D) includes one or two or more selected from the group consisting of a polyolefin-based resin, a polystyrene-based resin, and a (meth)acrylic-based resin.

15

[Claim 7]

The adhesive film according to any one of Claims 4 to 6, wherein a thickness of the intermediate layer (D) is equal to or more than 1 μm and equal to or less than 500 μm .

20

[Claim 8]

The adhesive film according to any one of Claims 1 to 7, wherein the colored layer contains a colorant.

25 [Claim 9]

The adhesive film according to Claim 8, wherein a content of the colorant is equal to or more than 0.01% by mass and equal

to or less than 2.0% by mass with respect to a total mass of the colored layer.

[Claim 10]

5 The adhesive film according to any one of Claims 1 to 9,
wherein a value of L^* of the adhesive film in an $L^*a^*b^*$ color
system defined in JIS Z 8781-4:2013 is equal to or less than 90.

[Claim 11]

10 The adhesive film according to any one of Claims 1 to 10,
wherein a layer other than the colored layer is colorless and
transparent.

[Claim 12]

15 The adhesive film according to any one of Claims 1 to 11,
wherein the adhesive resin layer (C) contains a heat-expansion
type adhesive.

[Claim 13]

20 The adhesive film according to Claim 12, wherein the heat-
expansion type adhesive is an adhesive whose adhesive strength
is reduced or lost by heating at a temperature exceeding 100°C.

[Claim 14]

25 A manufacturing method of an electronic device, comprising:
a step of attaching a support substrate to an adhesive
resin layer (C) side of the adhesive film according to any one

of Claims 1 to 13; and

a step of confirming that the adhesive film is attached to the support substrate by a color of the adhesive film.

5 [Claim 15]

The manufacturing method of an electronic device according to Claim 14, further comprising, in this order:

a step of placing an electronic component over the adhesive resin layer (B) of the adhesive film after the step of
10 confirming that the adhesive film is attached to the support substrate; and

a step of sealing the electronic component with a sealing material.

15 [Claim 16]

The manufacturing method of an electronic device according to Claim 15, wherein the sealing material includes an epoxy resin-based sealing material.

20 [Claim 17]

The manufacturing method of an electronic device according to any one of Claims 14 to 16, wherein the electronic device includes a fan-out type package.