

SPECIFICATION

TITLE OF INVENTION: ADHESIVE FILM, SEPARATOR FOR ADHESIVE FILM,
MANUFACTURING METHOD OF ADHESIVE FILM, AND MANUFACTURING METHOD
5 OF ELECTRONIC DEVICE

TECHNICAL FIELD

[0001]

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

BACKGROUND ART

15 [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
20 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
25 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.

[0003]

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

[0004]

Patent Document 1 discloses a heat-resistant adhesive sheet for manufacturing a semiconductor device, which is used by being
10 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 pressure during resin sealing, or a package being damaged due to strong adhesion to a chip surface caused by curing of a sealing
15 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 layer, and the adhesive layer is a layer having an adhesive strength to SUS304 after lamination of equal to or more than 0.5
20 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.

RELATED DOCUMENT

25 PATENT DOCUMENT

[0005]

Patent Document 1: Japanese Unexamined Patent Publication

No. 2011-134811

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

5 [0006]

The present invention provides an adhesive film including a separator, the adhesive film enabling visual recognition that the separator has been peeled from the adhesive film, a separator for an adhesive film, a manufacturing method of an adhesive film, and a manufacturing method of an electronic device.

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 by marking the separator, it can be visually confirmed whether the separator has been peeled from the adhesive film, and have completed the present invention.

20 [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),

an adhesive resin layer (C) on a second surface side of the

base material layer (A), and

a separator (D) on a surface of the adhesive resin layer (B) opposite to the base material layer (A),

in which the separator (D) has a marker by which the
5 presence of the separator (D) is visually identified.

[2]

The adhesive film according to [1],

in which the marker is positioned on a surface of the separator (D), and

10 a thickness of the marker is equal to or more than 0.1 μm and equal to or less than 10 μm .

[3]

The adhesive film according to [1] or [2], in which the marker is linear.

15 [4]

The adhesive film according to any one of [1] to [3], in which the adhesive resin layer (C) contains a heat-expansion type adhesive.

[5]

20 The adhesive film according to [4], 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.

[6]

The adhesive film according to any one of [1] to [5], in
25 which the adhesive film is wound on a winding core in a roll shape.

[7]

A separator for an adhesive film used to temporarily fix an electronic component when sealing the electronic component, the separator including a marker by which the presence of the separator can be visually identified.

5 [8]

The separator for an adhesive film according to [7], which is applicable to the separator (D) constituting the adhesive film according to any one of [1] to [6].

[9]

10 A manufacturing method of the adhesive film according to any one of [1] to [6], the method including:

a step of preparing a laminated film including the 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), an adhesive resin layer (C) on a second surface side of the base material layer (A), and a separator (D) on a surface of the adhesive resin layer (B) opposite to the base material layer (A), and

a step of applying a marker on the separator (D) while
20 slitting the laminated film to a predetermined size.

[10]

A manufacturing method of an electronic device, the method comprising a step of confirming that the separator (D) is peeled off from the adhesive film, based on a presence or absence of the marker in the adhesive film according to any one of [1] to [6].

[11]

The manufacturing method of an electronic device according to [10], further including a step of peeling the separator (D) constituting the adhesive film from the adhesive film before the step of confirming that the separator (D) is peeled off.

5 [12]

The manufacturing method of an electronic device according to [10] or [11], further including, in this order:

a step of attaching a support substrate to the adhesive resin layer (C) of the adhesive film,

10 a step of placing an electronic component over the adhesive resin layer (B) of the adhesive film, and

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

[13]

15 The manufacturing method of an electronic device according to [12], in which the sealing material includes an epoxy resin-based sealing material.

[14]

20 The manufacturing method of an electronic device according to any one of [10] to [13], in which the electronic device includes a fan-out type package.

ADVANTAGEOUS EFFECTS OF INVENTION

[0009]

25 According to the present invention, it is possible to provide an adhesive film including a separator, the adhesive film enabling visual recognition that the separator has been

peeled from the adhesive film, a separator for an adhesive film, a manufacturing method of an adhesive film, and a manufacturing method of an electronic device.

5 BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

[FIG. 1] 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. 2] A cross-sectional view schematically showing an example of a manufacturing method for 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 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 of the base material layer (A), an adhesive resin layer (C) on a second surface side of the base material layer (A), and a separator (D) on a surface of the adhesive resin
15 layer (B) opposite to the base material layer (A), in which the separator (D) has a marker 10 by which the presence of the separator (D) can be visually identified.

[0014]

 In the manufacturing method of the electronic device, the
20 electronic component is disposed on the adhesive film attached to the support substrate in a spaced state, and is collectively sealed with a sealing resin. In a case where one surface of the adhesive film is an adhesive layer for holding the electronic component, a separator for protecting the adhesive layer may be
25 attached to a surface of the adhesive layer. The separator is peeled off immediately before the electronic component is disposed.

Here, in the step of disposing the electronic component on the adhesive film 100 on the support substrate, there is a case where the visibility of whether or not the separator is peeled off from the adhesive film 100 is poor. In a case where the electronic component is disposed on the support substrate without noticing that the separator is not peeled off from the adhesive film 100, the electronic component cannot be held because the adhesive layer is not exposed, and a large amount of the electronic component is wasted.

As a result of studies, the present inventors have found that by applying a marker that is visually identifiable to identify the presence of the separator to the separator, it can be visually confirmed whether the separator has been peeled from the adhesive film, and have completed the present invention.

[0015]

The marker 10 included in the separator (D) according to the present embodiment is not limited as long as the presence of the separator (D) is visually identifiable, and examples thereof include one or two or more selected from the group consisting of a marker applied by an oil-based marker (also referred to as a felt-tip pen or an oil-based pen), a marker applied by an ink jet, a tape attached to the surface of the separator (D), and a color separator.

Among these, from the viewpoint of further improving the availability and the simplicity of applying the marker 10, one or two or more selected from the group consisting of the marker applied by an oil-based marker and the marker applied by an ink

jet is preferable, and the marker applied by an oil-based marker is more preferable. By applying the marker by an oil-based marker, as will be described later, it is possible to more easily apply the marker 10 to the surface of the separator (D),
5 apply the linear marker, and adjust the thickness of the marker 10. In addition, as will be described later, the time until the marker 10 is dried and fixed on the separator (D) after the application of the marker 10 can be further shortened.

[0016]

10 In the adhesive film 100 according to the present embodiment, the marker 10 is preferably positioned on the surface of the separator (D). As a result, it is easier to visually recognize that the separator (D) is peeled off from the adhesive film 100. For example, in a case where the marker 10
15 is positioned between the separator (D) and the adhesive resin layer (B), even in a case where the separator (D) is peeled off, the ink or the like constituting the separator (D) may remain on the surface on the adhesive resin layer (B) side, and it may be difficult to recognize that the separator (D) is peeled off.

20 [0017]

In the adhesive film 100 according to the present embodiment, the marker 10 is preferably linear. Specifically, the marker 10 is more preferably linear and parallel to a long side direction of the separator (D).

25 As a result, the marker 10 can be more easily applied to the separator (D), the area of the marker 10 can be minimized, and it is easier to visually recognize that the separator (D) is

peeled off from the adhesive film 100.

In a case where the marker 10 is linear, a width of the line of the marker 10 is preferably equal to or more than 0.5 mm, more preferably equal to or more than 0.8 mm, and preferably
5 equal to or less than 2.0 mm, more preferably equal to or less than 1.8 mm, and still more preferably equal to or less than 1.5 mm.

In addition, the width of the line of the marker 10 is preferably equal to or more than 0.5 mm and equal to or less
10 than 2.0 mm, more preferably equal to or more than 0.8 mm and equal to or less than 1.8 mm, and still more preferably equal to or more than 0.8 mm and equal to or less than 1.5 mm.

By setting the width of the line of the marker 10 within the above-described range, the area of the marker 10 can be
15 minimized, and it is easier to visually recognize that the separator (D) is peeled off from the adhesive film 100.

[0018]

In the adhesive film 100 according to the present embodiment, a thickness of the marker 10 is preferably equal to
20 or more than 0.1 μm , more preferably equal to or more than 0.3 μm , still more preferably equal to or more than 0.5 μm , and even more preferably equal to or more than 1.0 μm , and preferably equal to or less than 10 μm , more preferably equal to or less than 8.0 μm , and still more preferably equal to or less than 5.0
25 μm .

In addition, the thickness of the marker 10 is preferably equal to or more than 0.1 μm and equal to or less than 10 μm ,

more preferably equal to or more than 0.3 μm and equal to or less than 8.0 μm , still more preferably equal to or more than 0.5 μm and equal to or less than 8.0 μm , and even more preferably equal to or more than 1.0 μm and equal to or less than 5.0 μm .

By setting the thickness of the marker 10 in the adhesive film 100 within the above-described range, as will be described later, even in a case of winding the adhesive film 100 in a roll shape, the thickness of the marker 10 is less likely to be affected, and it is possible to suppress the formation of unevenness on a surface of the roll-shaped wound material or the deviation of an end surface of the roll-shaped wound material, and to more cleanly form the roll-shaped wound material.

In a case where the marker 10 is applied by an oil-based marker, as will be described later, the thickness of the marker 10 can be set within the above-described range by adjusting the type of the oil-based marker or the pressure in a case of pressing the oil-based marker against the surface of the separator (D) of the adhesive film 100.

[0019]

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

[0020]

<Base Material Layer (A)>

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, but examples thereof include a resin film.

Examples of the resin constituting the resin film include
5 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-
1-pentene), and poly(1-butene); polyesters such as polyethylene
terephthalate, polybutylene terephthalate, and polyethylene
10 naphthalate; polyamides such as nylon-6, nylon-66, and
polymetaxylene adipamide; polyacrylates; polymethacrylates;
polyvinyl chloride; polyvinylidene chloride; polyimide;
polyetherimide; ethylene vinyl acetate copolymer;
polyacrylonitrile; polycarbonate; polystyrene; ionomer;
15 polysulfone; polyethersulfone; polyphenylene ether.

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

[0021]

The base material layer (A) may be a single layer or two or
25 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 material layer (A), a film stretched in the uniaxial or biaxial direction is preferable.

5 [0022]

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 , more preferably equal to or more than 5 μm , and still more preferably equal to or more
10 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 .

In addition, from the viewpoint of obtaining more favorable film characteristics, the thickness of the base material layer
15 (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 or more than 10 μm and equal to or less than 250 μm .

The base material layer (A) may be subjected to a surface
20 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.

[0023]

25 <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 component when the electronic component is sealed with a sealing material in the electronic device manufacturing process.

5 [0024]

The adhesive constituting the adhesive resin layer (B) preferably includes one or two or more selected from the group 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-based polymer as a base polymer.

[0025]

15 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 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.

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

[0026]

Examples of the (meth)acrylic-based polymer included in the (meth)acrylic-based adhesive include a homopolymer of a (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 (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 (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 two or more may be used in combination.

[0027]

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.

[0028]

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 include one or two or more selected from the group consisting of esters of (meth)acrylic acid with polyhydric alcohols such as
5 trimethylolpropane tri(meth)acrylate, pentaerythritol tri(meth)acrylate, tetraethylene glycol di(meth)acrylate, 1,6-hexanediol di(meth)acrylate, neopentyl glycol di(meth)acrylate, and dipentaerythritol hexa(meth)acrylate; ester (meth)acrylate oligomers; isocyanurates or isocyanurate compounds such as 2-
10 propenyl di-3-butenyl cyanurate, 2-hydroxyethyl bis(2-(meth)acryloxyethyl)isocyanurate, and tris(2-methacryloxyethyl)isocyanurate.

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

[0029]

The content of the cross-linking compound is preferably 5 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
20 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
25 heat or light in comparison with a case where the content is greater than the range described above.

[0030]

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.

[0031]

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.

[0032]

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, 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-
aziridinecarboxamide); isocyanate-based compounds such as
tetramethylene diisocyanate, hexamethylene diisocyanate, and
5 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
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
10 by mass of the adhesive.

[0033]

The thickness of the adhesive resin layer (B) is preferably
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 ,
15 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 .

In addition, the thickness of the adhesive resin layer (B)
is preferably equal to or more than 1 μm and equal to or less
20 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 .

[0034]

<Adhesive Resin Layer (C)>

25 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
5 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
10 method of applying the external stimulus include light irradiation and a heating treatment.

[0035]

Examples of the heat-peeling type adhesive resin layer include an adhesive resin layer composed of a heat-expansion
15 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
20 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
25 contains a heat-expansion type adhesive.

[0036]

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 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 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 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, 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 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 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.

[0037]

As the gas generation component used in the heat-expansion type adhesive, for example, it is possible to use an azo 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 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'-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 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).

5 [0038]

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
10 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,
15 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
20 the adhesive resin.

[0039]

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
25 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.

[0040]

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.

[0041]

10 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).

15 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
20 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
25 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 -
 aziridiny propionate, tetramethylolmethane-tri- β -aziridiny
 propionate, N,N'-diphenylmethane-4,4'-bis(1-
 5 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
 10 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
 15 isocyanate-based compound, and an aziridine-based compound.
 [0042]

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
 20 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.

25 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).

5 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
10 adhesive (C1).

[0043]

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
15 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
20 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
25 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
5 preferable.

[0044]

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
10 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 (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
15 is preferably equal to or less than 100 parts by mass and more preferably equal to or less than 50 parts by mass.

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
20 adhesive on the support substrate during peeling.

[0045]

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
25 value of the total content of the adhesive (C1), the crosslinking agent (C2), and the tackifying resin 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.

Further, in a case where the adhesive resin layer (C) is

5 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
10 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,
15 but is, for example, equal to or less than 100% by mass.

[0046]

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
20 (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
25 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,
5 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
10 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.

[0047]

The adhesive resin layer (C) may be a single layer or a
15 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).

20 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
25 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 .

5 [0048]

<Separator (D)>

The separator (D) according to the present embodiment is a layer provided on a surface of the adhesive resin layer (B) opposite to the base material layer (A).

10 The separator (D) has a marker 10 by which the presence of the separator (D) can be visually identified. As a result, it is easier to visually recognize that the separator (D) is peeled off from the adhesive film 100.

[0049]

15 The material of the separator (D) is not limited, but for example, it preferably includes one or two or more kinds selected from the group consisting of polyolefin such as polyethylene, polypropylene, poly(4-methyl-1-pentene), and poly(1-butene); and polyester such as polyethylene
20 terephthalate, polybutylene terephthalate, and polyethylene naphthalate. As a result, the strength of the separator (D) is further improved, the function of the separator (D) of protecting the adhesive resin layer (B) of the adhesive film 100 can be further exhibited, the peelability of the separator (D)
25 can be further improved, and the marker 10 can be more easily applied to the separator (D). More specifically, in a case where the marker 10 is applied by an oil-based marker, the

affinity between the oil-based ink and the separator (D) is further improved by the material of the separator (D) being the above-described material, and the marker 10 can be reliably fixed to the surface of the separator (D).

5 In addition, from the viewpoint of further improving the peelability from the adhesive film, the surface of the separator (D) on the adhesive resin layer (B) side may be subjected to a surface treatment such as a silicone release treatment.

[0050]

10 A thickness of the separator (D) is 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 preferably equal to or less than 200 μm , more preferably equal to or less than 100 μm , and still more preferably equal to or
15 less than 50 μm .

 In addition, the thickness of the separator (D) is preferably equal to or more than 1 μm and equal to or less than 200 μm , more preferably equal to or more than 5 μm and equal to or less than 100 μm , and still more preferably equal to or more
20 than 10 μm and equal to or less than 50 μm .

 By setting the thickness of the separator (D) to be equal to or higher than the lower limit value, the strength is further improved, and the adhesive resin layer (B) of the adhesive film 100 can be more reliably protected, the peeling of the separator
25 (D) can be made easier, and the damage to the separator (D) in a case of applying the marker 10 can be further suppressed. In addition, by setting the thickness of the separator (D) to be

equal to or lower than the upper limit value, the handleability of the adhesive film 100 can be further improved, and more specifically, the winding of the adhesive film 100 in a roll shape can be made easier.

5 [0051]

In addition, the adhesive film 100 according to the present embodiment may further include a separator (E) on the side of the adhesive resin layer (C) opposite to the base material layer (A), separately from the separator (D). As a result, the
10 adhesive resin layer (C) can be protected.

The material and thickness of the separator (E) are, for example, the same as the material and thickness of the separator (D).

[0052]

15 From the viewpoint of further improving the performance 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 ,
20 and is preferably equal to or less than 800 μm , more preferably 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
25 the handleability, the thickness of the entire adhesive film 100 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 .

By setting the total thickness of the adhesive film 100 to
5 be equal to or higher than the lower limit value, the mechanical characteristics can be further improved. In addition, by setting the total thickness of the adhesive film 100 to be equal to or lower than the upper limit value, the handleability can be further improved.

10 [0053]

The adhesive film 100 according to the present embodiment may be wound around a winding core in a roll shape. By forming the adhesive film 100 in a roll shape, the handleability, workability, and ease of transport and delivery of the adhesive
15 film 100 can be further improved.

In the adhesive film 100 according to the present embodiment, since the thicknesses of the base material layer (A), the adhesive resin layer (B), the adhesive resin layer (C), and the separator (D), and the thickness of the marker 10
20 included in the separator (D) are within an appropriate range, the adhesive film 100 can be more easily formed into a roll shape, and the deviation and distortion of the end part in a case of forming the adhesive film 100 into a roll shape can be further suppressed.

25 [0054]

[Manufacturing Method of Adhesive Film]

A manufacturing method of the adhesive film 100 according

to the present embodiment preferably includes a step (X) of preparing a laminated film including the base material layer (A), the adhesive resin layer (B) for temporarily fixing an electronic component on the first surface side of the base material layer (A), the adhesive resin layer (C) on the second surface side of the base material layer (A), and the separator (D) on the surface of the adhesive resin layer (B) opposite to the base material layer (A), and a step (Y) of applying the marker 10 to the separator (D) while slitting the laminated film to a predetermined size.

[0055]

(Step (X))

The step of preparing the laminated film in the step (X) can be performed by a method known in the related art, but for example, can be performed as follows.

The adhesive resin layer (B) is formed by applying an adhesive coating liquid for manufacturing the adhesive resin layer (B) onto the separator (D), and then bonding the adhesive resin layer (B) to the first surface side of the film-shaped base material layer (A). In addition, the adhesive resin layer (C) is formed by applying an adhesive coating liquid for manufacturing the adhesive resin layer (C) onto the separator (E). Then, the manufacturing can be performed by bonding the second surface side of the exposed base material layer (A) to the surface of the adhesive resin layer (C) opposite to the separator (E).

In addition, the manufacturing can be performed by bonding

the separator (D) and the separator (E) onto the base material layer (A) on which the adhesive coating liquid of the adhesive resin layer (B) and the adhesive resin layer (C) is applied.

In addition, the base material layer (A) and the adhesive
5 resin layer (B) may be formed on the separator (D) by co-extrusion molding, or may be formed by laminating (layering) the film-shaped base material layer (A) and the film-shaped adhesive resin layer (B). The same applies to the base material layer (A) and the adhesive resin layer (C). In addition, the adhesive
10 resin layer (B), the base material layer (A), and the adhesive resin layer (C) may be formed in this order by co-extrusion molding.

[0056]

As a method for applying the coating liquid, it is possible
15 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
20 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
25 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.

[0057]

(Step (Y))

The step (Y) will be specifically described in a case where the marker 10 is applied to the separator (D) using the oil-based marker while the laminated film is slit to a predetermined size.

A jig for installing the oil-based marker is further installed on a jig on which a cutter for slitting the laminated film is mounted, and a spring is further mounted on the jig.

10 The tip of the oil-based marker opposite to the tip on the side where the marker 10 is applied is pressed by the spring, whereby the oil-based marker can be pressed against the surface of the separator (D) of the adhesive film 100 to apply the marker 10.

That is, for example, in a case where the laminated film is slit and divided into three laminated films, it is preferable that the marker 10 is applied to the surfaces of the three laminated films using three oil-based markers, and the marker 10 is applied to each of the cut laminated films.

As a result, the marker 10 can be applied to any surface of the cut laminated film.

[0058]

Here, the pressure in a case of pressing the oil-based marker against the surface of the separator (D) is preferably equal to or more than 1 gf, more preferably equal to or more than 5 gf, and still more preferably equal to or more than 10 gf, and preferably equal to or less than 100 gf, more preferably equal to or less than 70 gf, and still more preferably equal to

or less than 50 gf.

In addition, the pressure in a case of pressing the oil-based marker against the surface of the separator (D) is preferably equal to or more than 1 gf and equal to or less than 100 gf, more preferably equal to or more than 5 gf and equal to or less than 70 gf, and still more preferably equal to or more than 10 gf and equal to or less than 50 gf.

By setting the pressure in a case of pressing the oil-based marker against the surface of the separator (D) to be equal to or higher than the lower limit value, the linear marker 10 can be stably applied to the separator (D). In addition, by setting the pressure in a case of pressing the oil-based marker against the surface of the separator (D) to be equal to or lower than the upper limit value, the occurrence of unevenness of the adhesive resin layer (B) can be further suppressed. In addition, in a case where the electronic component 70 is disposed in the recess portion, in the step of sealing the electronic component 70, the scattering of the electronic component 70 can be further suppressed.

[0059]

In the laminated film, it is preferable that the marker 10 is applied at a position of equal to or more than 10 mm and equal to or less than 60 mm from the end part of the laminated film in the long side direction after the slitting.

As a result, it is easier to visually recognize that the separator (D) is peeled off from the adhesive film 100.

[0060]

(Step (Z))

In addition, the manufacturing method of the adhesive film according to the present embodiment may further include a step (Z) of winding the laminated film after the slitting in a roll shape after the step (Y).

In a case where the manufacturing method of the adhesive film includes the step (Z), the ink of the oil-based marker used in the step (Y) is preferably quick-drying. More specifically, the drying time of the ink of the oil-based marker is preferably equal to or less than 8 seconds, more preferably equal to or less than 6 seconds, still more preferably equal to or less than 5 seconds, even more preferably equal to or less than 4 seconds, and even still more preferably equal to or less than 3 seconds from the application of the marker 10 to the surface of the separator (D).

As a result, the time from the application of the marker 10 in the step (Y) to the winding of the laminated film in the step (Z) can be further shortened, and the production efficiency of the adhesive film 100 can be further improved.

In addition, in a case where the drying time of the ink of the oil-based marker is equal to or lower than the upper limit value, the laminated film is wound in a roll shape before the marker 10 is dried, whereby the ink of the marker 10 is prevented from being transferred to the adhesive resin layer (C) or the separator (E) on the adhesive resin layer (C) side in the adhesive film 100, and it is possible to prevent the adhesive resin layer (B) side (that is, the side on which the electronic

component is disposed) and the adhesive resin layer (C) side (that is, the side to be attached to the support substrate) in the adhesive film 100 from being indistinguishable.

[0061]

5 In the step (Z), the speed of winding the laminated film after the slitting can be, for example, about 25 m/min.

[0062]

[Manufacturing Method of Electronic Device]

The manufacturing method of the electronic device according
10 to the present embodiment will be described with reference to the drawings. FIG. 2 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
15 to the present embodiment includes a step of confirming that the separator (D) is peeled off from the adhesive film 100 based on the presence or absence of the marker 10 in the adhesive film 100 according to the embodiment of the present invention.

In the manufacturing method of the electronic device
20 according to the present embodiment, since the adhesive film 100 according to the present embodiment is used, the presence or absence of the marker 10 is recognized from the surface of the adhesive film 100 after the separator (D) is peeled off by the marker 10 of the separator (D) of the adhesive film 100, and it
25 is possible to easily confirm whether or not the separator (D) is peeled off from the adhesive film 100.

As a result, the electronic component 70 can be disposed on

the adhesive film 100, more specifically, on the separator (D), in a state where the separator (D) is not peeled off from the adhesive film 100, that is, in a state where the adhesive resin layer (B) is not exposed, and it is possible to prevent the
5 electronic component 70 from being wasted in a large amount without being temporarily fixed.

[0063]

In a case of confirming whether or not the separator (D) is peeled off from the adhesive film 100 based on the presence or
10 absence of the marker 10 of the separator (D), the confirmation can be performed by visual observation, or can be performed by using a sensor capable of identifying a color.

In both a case of performing the confirmation by visual observation and a case of performing the confirmation by using
15 the sensor, it is preferable to perform the confirmation from the 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 presence or absence of the marker 10 of the separator (D) can be more accurately recognized, and it is
20 possible to more accurately confirm whether or not the separator (D) is peeled off from the adhesive film 100.

In a case of visually confirming that the separator (D) is peeled off from the adhesive film 100, it is preferable to perform the confirmation from a position of equal to or more
25 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 100,000 lux.

As a result, it is possible to more accurately confirm that the separator (D) is peeled off from the adhesive film 100.

In a case of confirming that the separator (D) is peeled off from the adhesive film 100 by using the sensor, for example, a photoelectric sensor that emits light by aiming at the position of the marker 10 on the separator (D) of the adhesive film 100 and detects the light reflected from 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 white spot photoelectric sensor LR-W series manufactured by Keyence Corporation.

[0064]

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.

[0065]

The manufacturing method of the electronic device according to the present embodiment may further include a step of peeling off the separator (D) constituting the adhesive film 100 from the adhesive film 100 before the step of confirming that the separator (D) is peeled off.

[0066]

In addition, the manufacturing method of the electronic device according to the present embodiment may further include, in the following order, a step of attaching the support substrate 80 to the adhesive resin layer (C) of the adhesive

film 100, a step of placing the electronic component 70 on the adhesive resin layer (B) of the adhesive film 100, and a step of sealing the electronic component 70 with a sealing material 90.

Here, it is preferable that there is a step of peeling off
5 the separator (D) constituting the adhesive film 100 from the adhesive film 100 after the step of attaching the support substrate 80 to the adhesive resin layer (C) of the adhesive film 100. As a result, after the step of peeling off the separator (D) from the adhesive film 100, the step of placing
10 the electronic component 70 on the adhesive resin layer (B) of the adhesive film 100 can be performed without going through any step, and it is possible to further suppress the resin layers (B) of the adhesive film 100 from sticking to each other or other substances from adhering to the adhesive resin layer (B)
15 other than the electronic component 70, and the manufacturing of the electronic device can be more smoothly performed.

[0067]

Examples of the electronic component 70 include a semiconductor chip such as an IC, LSI, discrete component, light
20 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
25 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).

Examples of electrodes include bump electrodes such as ball bumps, printing bumps, stud bumps, plating bumps, pillar bumps, 5 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 10 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.

[0068]

In the step of sealing the electronic component 70 with the 15 sealing material 90, a plurality of the electronic components 70 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 20 preferable to use one or two or more methods selected from the 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 25 components 70 with the sealing material 90 using the above-described method, it is possible to suppress the displacement of the electronic component 70.

[0069]

As the sealing material 90, a known sealing material can be used as long as the sealing material has high insulating 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 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 suppress the displacement of the electronic component 70 in the sealing step, the sealing material is preferably in a liquid state.

[0070]

From the viewpoint of further suppressing the displacement 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 , 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 mm.

5 [0071]

From the viewpoint of further improving the work efficiency, a sealing temperature in the step of sealing the electronic component 70 with the sealing material 90 is preferably equal to or higher than 10°C, more preferably equal
10 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
15 preferably equal to or lower than 35°C, and even more preferably equal to or lower than 30°C.

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

20 [0072]

From the viewpoint of improving the reliability of the electronic device, a sealing pressure in the step of sealing the electronic component 70 with the sealing material 90 is preferably equal to or more than 30 kPa, more preferably equal
25 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 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 or. In addition, the
5 sealing pressure in the step of sealing the electronic component 70 with the sealing material 90 is still more preferably normal pressure.

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

[0073]

The manufacturing method of the electronic device according to the present embodiment preferably further includes a step (not shown) of curing the sealing material 90 after the step of
15 sealing the electronic component 70 with 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
20 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
25 irradiation.

[0074]

In the manufacturing method of the electronic device

according to the present embodiment, it is preferable to further include a step (not shown) of peeling off the support substrate 80 from the adhesive film 100 by applying an external stimulus to the adhesive resin layer (C) to reduce the adhesive strength of the adhesive resin layer (C) after the step of curing the sealing material 90.

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).
[0075]

In the manufacturing method of the electronic device according to the present embodiment, it is preferable to further include a step (not shown) of peeling off the adhesive film 100 from the plurality of electronic components 70 after the step of peeling off the support substrate 80 from the adhesive film 100. As a result of this step, the electronic device is 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.
[0076]

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
5 chip area. In addition, since the package substrate is not required, thinning is also possible.

[0077]

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

[0078]

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
15 invention can be achieved are included in the present invention.

[0079]

This application claims priority based on Japanese Patent Application No. 2023-124160 filed on July 31, 2023, the entire disclosure of which is incorporated herein by reference.

20

REFERENCE SIGNS LIST

[0080]

- A base material layer (A)
- B adhesive resin layer (B)
- 25 C adhesive resin layer (C)
- D separator (D)
- A1 first surface side of base material layer (A)

- A2 second surface side of base material layer (A)
- 10 marker
- 70 electronic component
- 80 support substrate
- 5 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);

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

a separator (D) on a surface of the adhesive resin layer (B) opposite to the base material layer (A),

wherein the separator (D) has a marker by which the presence of the separator (D) is visually identified.

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[Claim 2]

The adhesive film according to Claim 1, wherein the marker is positioned on a surface of the separator (D), and a thickness of the marker is equal to or more than 0.1 μm and equal to or less than 10 μm .

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[Claim 3]

The adhesive film according to Claim 1 or 2, wherein the marker is linear.

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[Claim 4]

The adhesive film according to any one of Claims 1 to 3, wherein the adhesive resin layer (C) contains a heat-expansion type adhesive.

5 [Claim 5]

The adhesive film according to Claim 4, wherein the heat-expansion type adhesive is an adhesive whose adhesive strength is reduced or lost by heating at a temperature exceeding 100°C.

10 [Claim 6]

The adhesive film according to any one of Claims 1 to 5, wherein the adhesive film is wound on a winding core in a roll shape.

15 [Claim 7]

A separator for an adhesive film used to temporarily fix an electronic component when sealing the electronic component, the separator comprising a marker by which the presence of the separator can be visually identified.

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[Claim 8]

The separator for an adhesive film according to Claim 7, which is applicable to the separator (D) constituting the
25 adhesive film according to any one of claims 1 to 6.

[Claim 9]

A manufacturing method of the adhesive film according to any one of Claims 1 to 6, the method comprising:

- 5 a step of preparing a laminated film including the 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), an adhesive resin layer (C) on a second surface side of the base material layer (A), and a separator (D) on a surface of the adhesive resin layer (B) opposite to the base material layer (A); and
- 10 a step of applying a marker on the separator (D) while slitting the laminated film to a predetermined size.

[Claim 10]

- A manufacturing method of an electronic device, the method
- 15 comprising a step of confirming that the separator (D) is peeled off from the adhesive film, based on a presence or absence of the marker in the adhesive film according to any one of claims 1 to 6.

20 [Claim 11]

The manufacturing method of an electronic device according to Claim 10, further comprising a step of peeling the separator (D) constituting the adhesive film from the adhesive film before the step of confirming that the separator (D) is peeled off.

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[Claim 12]

The manufacturing method of an electronic device according

to Claim 10 or 11, further comprising, in this order:

a step of attaching a support substrate to the adhesive resin layer (C) of the adhesive film;

a step of placing an electronic component over the adhesive
5 resin layer (B) of the adhesive film; and

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

[Claim 13]

10 The manufacturing method of an electronic device according to Claim 12, wherein the sealing material includes an epoxy resin-based sealing material.

[Claim 14]

15 The manufacturing method of an electronic device according to any one of Claims 10 to 13, wherein the electronic device includes a fan-out type package.