

ROLLED BODY OF ELONGATED LAMINATED SHEET

BACKGROUND OF THE INVENTION

Field of the Invention

[0001]

The present invention relates to a rolled body obtained by winding up, into a roll, a resin film formation layer-equipped support sheet which is used to form a resin layer such as an adhesive layer or a protective film on a semiconductor package comprising a plurality of semiconductor chips sealed in resin, and to dice the semiconductor package. The present invention particularly relates to a technique for reducing winding marks that may occur in the resin film formation layer due to winding pressure on the rolled body.

Description of the Related Art

[0002]

In recent years, electronic devices have become smaller, lighter, and high functional. Accordingly, semiconductor devices mounted in electronic devices are also required to be smaller, thinner, and higher in density. A semiconductor chip may be mounted in a package close to its size. Such a package is sometimes called a chip scale package (CSP). Examples of a CSP include a wafer level package (WLP) which is completed by processing continued with the wafer size to the final packaging step, and a panel level package (PLP) which is completed by processing continued with the panel size larger than the wafer size to the final packaging step.

[0003]

WLP and PLP are classified into Fan-In packaging and Fan-Out packaging. In fan-out WLP and PLP, a semiconductor chip is covered with sealing material so as to have a region larger than the chip size to form a sealing structure of semiconductor chips, and a rewiring layer and external electrodes are formed not only on the circuit

surface of the semiconductor chip but also on the surface region of the sealing material.

[0004]

For example, Patent Document 1 discloses a method of manufacturing a semiconductor package by forming an extended wafer by surrounding a plurality of semiconductor chips diced from a semiconductor wafer, excluding their circuit formation surface, with a mold member, and providing an extended rewinding pattern in a region outside the semiconductor chips. In the manufacturing method disclosed in Patent Document 1, a semiconductor wafer is subjected to a dicing step in which it is separated into individual pieces while being adhered to an adhesive tape for dicing (hereinafter, also referred to as "dicing sheet"). The resin sealing structure including such a plurality of semiconductor chips may be hereinafter referred to as a "chip group package". The step of dicing it into individual CSPs may be referred to as "package dicing".

[0005]

In general, in the package dicing method, a plurality of semiconductor chips are placed on a rectangular substrate, collective resin sealing is performed, external terminals are formed, and a rectangular package (chip group package) comprising chip groups sealed with resin is obtained. This is because the rectangular shape is preferable in terms of efficiency in chip arrangement and the subsequent package transportation and storage.

[0006]

Next, this chip group package is diced into semiconductor devices such as CSPs. In the step of dicing the chip group package, a rectangular dicing sheet conforming to the shape of the package is spread on a dicing frame, the chip group package is attached to the dicing sheet, and the package is diced (Patent Document 2 and Patent Document 3).

[0007]

There are various proposals for methods of manufacturing chip group packages. In one example, semiconductor chips are temporarily attached to a holder such as a resin tape. At this time, a circuit surface and a bump surface of the semiconductor chip face upward, and a back surface of the chip is temporarily attached to the resin tape. Next, leads are attached to the circuit surface and the bump surface for external connection, and collective resin sealing is performed. The resin tape is then removed to obtain a chip group package. The chip group package obtained through these steps has a structure in which the back surface of the chip is exposed. Dicing is then performed using the aforementioned dicing sheet to obtain divided semiconductor devices.

[0008]

If the back surface of the chip is exposed, the durability and reliability of the semiconductor device may be impaired. For this reason, a protective film is usually formed on the exposed surface of the chip. This protective film enhances the bending strength and also effectively functions when a product number or the like is printed on the semiconductor device. Further, to mount the diced semiconductor devices on a different member, an adhesive layer is attached to the exposed surface of the chip of the semiconductor device.

[0009]

It is troublesome to form a protective film and attach an adhesive layer individually on the divided semiconductor devices. Besides, individually forming thereof makes the thicknesses of the protective films and the adhesive layers non-uniform, which may cause variations in the product quality. For this reason, the process of collectively forming a protective film and an adhesive layer on the chip group package in which the back surface of the chip is exposed, and then dicing would be advantageous in view of working efficiency. A layer for forming a resin film such as a protective film or an adhesive layer may be hereinafter referred to as a "resin film formation layer".

[0010]

There are various known methods for forming a resin film formation layer on a semiconductor chip. In particular, a resin film formation layer such as a precursor layer of a protective film or an adhesive layer is adhered on one surface of a semiconductor wafer, and the semiconductor wafer and the resin film formation layer are then concurrently diced to obtain semiconductor chips having the resin film formation layer on one surface. A known measure to continuously perform this step is a wafer processing sheet such as a dicing die bond sheet or a protective film formation layer-equipped dicing sheet (Patent Document 4). Since these wafer processing sheets are supposed to be attached to a silicon wafer of approximately round shape, a circular resin film formation layer is removably laminated on the circular dicing sheet.

[0011]

The chip group package is however formed into a rectangular shape as described above. This is because the rectangular shape is preferable in terms of efficiency in chip arrangement and the subsequent package transportation and storage.

[0012]

When a conventional circular resin film formation layer-equipped dicing sheet is applied to such a rectangular chip group package, only the largest square part of the circular resin film formation layer can be used, and the surrounding part is discarded as unused. To be specific, in the case where the resin film formation layer is a circle with a radius of 10 cm (having an area of about 314 cm^2), the maximum area of the square in it is 200 cm^2 ($2^{1/2} \times 10 \text{ cm}$ square), so that the effective area percentage is only 63.7%.

[0013]

Therefore, to increase the effective area percentage of the resin film formation layer, it should be considered to use a rectangular resin film formation layer-

equipped support sheet in which the rectangular resin film formation layer is formed on the support sheet such as the aforementioned rectangular dicing sheet.

[0014]

In the resin film formation layer-equipped support sheet, in some cases, a support sheet having a relatively large area is overlaid by a resin film formation layer having a slightly smaller area than the support sheet. An adhesive ring frame holding means for temporary attachment to a ring frame is provided surrounding the usage area of the resin film formation layer. This resin film formation layer-equipped support sheet is laminated on a continuous release sheet. This continuous laminated sheet is wound up into a roll shape and put on the market. The continuous laminated sheet has a portion on which the resin film formation layer-equipped support sheet is laminated and a portion on which the resin film formation layer-equipped support sheet is not laminated, which inevitably produces portions having different thicknesses. When a continuous laminated sheet with a non-uniform thickness is wound into a roll, roll collapse may occur. Besides, a gap may be formed at the side portions of the roll due to the difference in thickness, and dust and the like may enter through the gap and contaminate the resin film formation layer.

[0015]

A conceivable way of eliminating such an inconvenience is to leave an auxiliary sheet lying along the longitudinal direction of the continuous laminated sheet at both traverse ends of the continuous laminated sheet. The auxiliary sheet unifies the thickness of the continuous laminated sheet, prevents the roll collapse of the rolled body, and improves the running stability at the time of unwinding. Further, since the auxiliary sheet exists in the gap at the side portions of the roll, entry of dust can be prevented.

[0016]

However, if the auxiliary sheet has a fixed width, the thickness differs between one resin film formation layer-equipped support sheet and the adjacent resin film formation layer-equipped support sheet. In other words, in portions where a resin film formation layer-equipped support sheet is provided, the auxiliary sheet on its side portions makes the thickness uniform. However, no auxiliary sheet but only a release sheet exists between one resin film formation layer-equipped support sheet and the adjacent resin film formation layer-equipped support sheet, so that the thickness difference is not eliminated.

[0017]

Moreover, the resin film formation layer-equipped support sheet and the auxiliary sheet are made of substantially the same material, and when the resin film formation layer-equipped support sheet is cut into a rectangular shape, the auxiliary sheet is left near the side edges of the resin film formation layer-equipped support sheet. In particular, the resin film formation layer-equipped support sheet and the auxiliary sheet are die-cut into a predetermined shape, and the redundant portion (scrap portion) between the resin film formation layer-equipped support sheet and the auxiliary sheet is removed, leaving a resin film formation layer-equipped support sheet having a predetermined shape on the release sheet and the auxiliary sheet remaining at both traverse ends of the release sheet 14. The cutting at this time is continuously performed using a roll-shaped punching blade, and the redundant portion is removed by continuously pulling up the redundant portion (scrap raising).

[0018]

When the width of the auxiliary sheet is fixed, the area of the redundant portion suddenly changes at the transition point from where the resin film formation layer-equipped support sheet exists to where the sheet does not exist. Consequently, the peeling force in the redundant portion also changes. If the peeling force of the redundant portion suddenly increases, the redundant portion is torn when the scrap is raised, and continuous scrap raising cannot be performed.

[0019]

In order to eliminate the inconvenience caused by the thickness difference and to gradually change the peeling force in the redundant portion, in a portion where no sheet exists between one resin film formation layer-equipped support sheet and the adjacent resin film formation layer-equipped support sheet, the auxiliary sheet is extended inward to form a relatively wide portion. Hence, the thickness difference between the portion where the resin film formation layer-equipped support sheet exists and the portion where the sheet does not exist is reduced and the area of the redundant portion gradually changes, which eliminates a sudden change in the peeling force of the redundant portion at the time of scrap raising and leads to stable scrap raising.

[0020]

Therefore, as shown in FIG. 5, in a resin film formation layer-equipped support sheet having a rectangular resin film formation layer on a rectangular support sheet, an auxiliary sheet is provided near the side edges of the resin film formation layer-equipped support sheet, and a wide portion is formed between the resin film formation layer-equipped support sheet and the adjacent resin film formation layer-equipped support sheet, by extending the auxiliary sheet inward.

[0021]

In order to reduce the thickness difference between the resin film formation layer-equipped support sheet and the portion where the sheet does not exist, and to prevent a sudden change in the area of the redundant portion, the larger size of the wide portion of the auxiliary sheet is probably more preferable.

Prior Art Documents

Patent Documents

[0022]

Patent Document 1: WO2010/058646

Patent Document 2: JP 2002-3798A

Patent Document 3: JP 2010-83921A

Patent Document 4: WO2013/047674

[0023]

The resin film formation layer-equipped support sheet is put on the market in the form of a rolled body obtained by winding up, into a roll, in which a plurality of resin film formation layer-equipped support sheets are releasably, independently, and temporarily attached along the longitudinal direction of a continuous release sheet and continuous auxiliary sheets are seamlessly laminated at both traverse ends of the release sheet.

[0024]

However, if the wide portion of the auxiliary sheet is too large, winding marks may occur on the resin film formation layer. When the continuous laminated sheet is wound into a roll, the radius increases as the winding progresses, so that the wide portion sometimes overlaps the upper side or underside of the resin film formation layer. When the winding is continued in this state, the wide portion is pressed against the resin film formation layer with the winding pressure, and convex portions and concave portions conforming to the shape of the wide portion are formed in the resin film formation layer (see FIG. 5). Such convex and concave portions are called winding marks.

[0025]

When a winding mark is left on the resin film formation layer, the accuracy of the thickness of the resin film formation layer is reduced and air entrapment occurs when the resin film formation layer is attached to the chip group package, and the adhesiveness to the package becomes insufficient. It also causes a reduction in adhesiveness and voids when the divided package is adhered to the mounting portion of the package via the resin film formation layer in a method of manufacturing a semiconductor device. This makes it difficult to obtain a semiconductor device

having excellent reliability. Further, when a resin film is used as a protective film, a winding mark on the resin film formation layer causes poor appearance.

[0026]

Therefore, an object of the present invention is to prevent forming of winding marks on a resin film formation layer, particularly in a portion to which a chip group package is attached, even when a continuous laminated sheet having the aforementioned structure is a rolled body.

SUMMARY OF THE INVENTION

[0027]

The present invention, which solves the aforementioned problem, provides a rolled body of a continuous laminated sheet explained below.

A rolled body of a continuous laminated sheet includes: a resin film formation layer-equipped support sheet including an approximately rectangular support sheet, an approximately rectangular resin film formation layer formed on the support sheet, and an approximately rectangular ring frame holding means, that is used to hold a ring frame in a region surrounding the resin film formation layer in a plan view; and a continuous release sheet, wherein continuous auxiliary sheets are seamlessly laminated at both traverse ends of a release treatment surface of the release sheet, the continuous laminated sheet in which a plurality of resin film formation layer-equipped support sheets are releasably, independently, and temporarily attached on a lateral inner portion of the release treatment surface of the release sheet along a longitudinal direction of the release sheet is wound into a roll, thereby preventing winding marks that may occur on the resin film formation layer. This continuous laminated sheet satisfies $W2/W1 \leq 1.6$ where $W1$ is a distance between the resin film formation layer and an outer end of the auxiliary sheet in a plan view from the resin film formation layer side after removal of the release sheet, and $W2$ is a width of the auxiliary sheet in a widest portion of the auxiliary sheet in the plan view.

[0028]

In a rolled body of a continuous laminated sheet of the present invention, a wide portion of an auxiliary sheet does not overlap the portion (usage area) of the resin film formation layer to which a chip group package is attached, so that no winding marks occur in the usage area of the resin film formation layer. Consequently, the chip group package can be stably attached and the resulting resin film has a uniform thickness.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

FIG. 1A shows a state in which a part of a rolled body of a continuous laminated sheet of a first embodiment has been unwound;

FIG. 1B is a cross-sectional view taken along line A-A of FIG. 1A;

FIG. 1C is a cross-sectional view taken along line B-B of FIG. 1A;

FIG. 2A shows a state in which a part of a rolled body of a continuous laminated sheet of a second embodiment has been unwound;

FIG. 2B is a cross-sectional view taken along line A-A of FIG. 2A;

FIG. 2C is a cross-sectional view taken along line B-B of FIG. 2A;

FIG. 3A shows a state in which a part of a rolled body of a continuous laminated sheet of a third embodiment has been unwound;

FIG. 3B is a cross-sectional view taken along line A-A of FIG. 3A;

FIG. 3C is a cross-sectional view taken along line B-B of FIG. 3A;

FIG. 4 is an explanatory diagram of W1 and W2;

FIG. 5 shows winding marks left;

FIG. 6A shows a state in which a resin film formation layer-equipped support sheet is being transferred from a continuous laminated sheet to an adherend; and

FIG. 6B is a perspective view of FIG. 6A.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030]

The details of a rolled body of a continuous laminated sheet of the present invention will be described.

In the present invention, the term "approximately rectangular shape" includes not only a strict square shape and rectangular shape but also a slightly distorted shape similar to these. For example, each side of a square or rectangle may be curved or bent, the corners may be rounded curves, and short straight lines whose directions change continuously may form rounded portions.

The term "support sheet" means a sheet-like member capable of releasably supporting a resin film formation layer, and may be a release sheet or an adhesive sheet such as a so-called dicing sheet.

The term "resin film formation layer" is used to include both a precursor layer for forming a protective film and an adhesive layer. The precursor layer for forming the protective film is cured by predetermined operation, thereby forming the protective film.

[0031]

The term "resin film formation layer-equipped support sheet" refers to a laminate of the support sheet and the resin film formation layer. It also includes approximately rectangular ring frame holding means for holding a ring frame.

The term "release sheet" is a sheet whose surface peeling force is controlled, and may be made of resin, paper, or cloth. The peeling force of the surface is controlled by a peeling agent or the like, but this is not necessarily the case.

The term "continuous" refers to a rectangular shape whose longitudinal length is sufficiently longer than its lateral length.

The term "auxiliary sheet" refers to a lamellar body formed at both traverse ends of a continuous release sheet.

The "continuous laminated sheet" includes a continuous release sheet, a continuous auxiliary sheet seamlessly laminated at both traverse ends of the release sheet, and a resin film formation layer-equipped support sheet temporarily attached to laterally inward of the release sheet so that it can be peeled.

The term "rolled body" refers to a roll obtained by winding the continuous laminated sheet.

[0032]

A resin film formation layer-equipped support sheet, a continuous laminated sheet including it, and its rolled body will now be described with reference to the drawings.

The resin film formation layer-equipped support sheet has an approximately rectangular support sheet and an approximately rectangular resin film formation layer releasably formed on the support sheet, and has ring frame holding means that is approximately rectangular in a plan view from the resin film formation layer side and is used to hold a ring frame in a region surrounding the resin film formation layer.

[0033]

This resin film formation layer-equipped support sheet is releasably and temporarily attached to the lateral inner portion of the release treatment surface of the continuous release sheet along the longitudinal direction of the release sheet. In addition, continuous auxiliary sheets are seamlessly laminated on both traverse ends of the release treatment surface of the continuous release sheet, thereby forming a continuous laminated sheet.

Specific embodiments of the continuous laminated sheet will now be described, but these are not necessarily the case.

[0034]

[Continuous laminated sheet: First Embodiment]

FIG. 1 shows a first embodiment of a continuous laminated sheet. FIG. 1A shows a state in which a rolled body of a continuous laminated sheet 2 has been unwound, FIG. 1B is a cross-sectional view taken along line A-A of FIG. 1A, and FIG. 1C is a cross-sectional view taken along line B-B of FIG. 1A.

[0035]

As shown in FIG. 1B, a resin film formation layer-equipped support sheet 10 has a support sheet 11, a resin film formation layer 12 entirely formed on one side of the support sheet 11, and ring frame holding means 13 formed on the outer peripheral portion of one side of the resin film formation layer 12. The support sheet 11 and the resin film formation layer 12 are releasably laminated. When the support sheet 11 is a release sheet, the resin film formation layer 12 is formed on the release treatment surface. When the support sheet 11 is an adhesive sheet such as a dicing sheet, the resin film formation layer 12 is formed on the adhesive layer. When the support sheet 11 is an adhesive sheet, a specific mode of the adhesive sheet is the same as an adhesive sheet of a second embodiment described later.

[0036]

A plurality of resin film formation layer-equipped support sheets 10 are independently, releasably, and temporarily attached to the lateral inner portion of a continuous release sheet 14 along the longitudinal direction.

[0037]

A continuous auxiliary sheet 15 is laminated at both traverse ends of the continuous release sheet 14 along the longitudinal direction. The auxiliary sheet 15 has the same laminated structure as the outer peripheral portion of the resin film formation layer-equipped support sheet 10. In other words, the auxiliary sheet 15 is composed of the same material as the support sheet 11, the resin film formation layer 12, and the ring frame holding means 13.

[0038]

The release sheet 14 is exposed between the resin film formation layer-equipped support sheets between which the auxiliary sheet 15 extends laterally inward. In other words, the width of the auxiliary sheet is not uniform, and the formed auxiliary sheet is wide in a portion between the resin film formation layer-equipped support sheets (hereinafter also referred to as "wide portion"). A cross-sectional view of the wide portion is shown in FIG. 1C.

[0039]

Such a continuous laminated sheet 2 can be manufactured in the following manner, for example.

An adhesive layer (which may be a double-sided adhesive tape) to be the ring frame holding means 13 is adhered to the continuous release sheet 14. The adhesive layer is die-cut into a rectangular shape. At this time, the adhesive layer is completely cut, and the release sheet is cut with a punching blade so that a shallow cut is formed. The die-cut adhesive layer is then removed, leaving the adhesive layer having a rectangular opening on the release sheet 14.

[0040]

A laminate of the support sheet and the resin film formation layer, which was prepared in advance, is laminated on the surface of the release sheet 14 on which the adhesive layer is provided.

Next, the laminate is cut into the shape of the ring frame. At this time, a cut is formed so that the rectangular opening in the adhesive layer is located substantially at the center of the die-cut shape. At the same time, a cut is made into the predetermined shape of the auxiliary sheet 15. At this time also, as in the above case, the laminate is completely cut, and the release sheet is cut with a punching blade so that a shallow cut is formed. After that, the redundant portion (scrap portion) between the resin film formation layer-equipped support sheet and the auxiliary sheet is removed, so that the resin film formation layer-equipped support sheet 10 having a predetermined shape on the release sheet 14 and the auxiliary

sheets 15 remaining at both traverse ends of the release sheet 14 are remained. Thus, the continuous laminated sheet 2 having the aforementioned structure is obtained.

[0041]

[Continuous laminated sheet: Second Embodiment]

FIG. 2 shows a second embodiment of a continuous laminated sheet. FIG. 2A shows a state in which a rolled body of the continuous laminated sheet 4 has been unwound, FIG. 2B is a cross-sectional view taken along line A-A of FIG. 2A, and FIG. 2C is a cross-sectional view taken along line B-B of FIG. 2A.

[0042]

As shown in FIG. 2B, a resin film formation layer-equipped support sheet 20 has a support sheet 21 and a resin film formation layer 22 laminated on the inner peripheral portion of one side of the support sheet 21. The support sheet 21 and the resin film formation layer 22 are releasably laminated. The support sheet 21 in the second embodiment is an adhesive sheet such as a dicing sheet. The adhesive sheet has a base 21A and an adhesive layer 21B. When a release sheet 24 is removed, the adhesive layer 21B is exposed on the outer periphery of the resin film formation layer 22 and functions as a ring frame holding means 23.

[0043]

A plurality of resin film formation layer-equipped support sheets 20 are independently, releasably, and temporarily attached to the lateral inner portion of the continuous release sheet 24 along the longitudinal direction.

[0044]

A continuous auxiliary sheet 25 is laminated at both traverse ends of the continuous release sheet 24 along the longitudinal direction. The auxiliary sheet 25 has the same laminated structure as the outer peripheral portion of the resin film formation layer-equipped support sheet 20. In other words, the auxiliary sheet 25 is composed of the same material as the base 21A and the adhesive layer 22B.

[0045]

The release sheet 24 is exposed between the resin film formation layer-equipped support sheets between which the auxiliary sheet 25 extends laterally inward. In other words, the width of the auxiliary sheet is not uniform, and the formed auxiliary sheet is wide in a portion between the resin film formation layer-equipped support sheets (hereinafter also referred to as "wide portion"). A cross-sectional view of the wide portion is shown in FIG. 2C.

[0046]

Such a continuous laminated sheet 4 can be manufactured in the following manner, for example.

A resin layer to be the resin film formation layer is formed on the entire continuous release sheet 24, and the resin layer is die-cut into a rectangular shape. At this time, the resin film formation layer is completely cut, and the release sheet is cut with a punching blade so that a shallow cut is formed. The outer periphery of the die-cut resin film formation layer is then removed, leaving the rectangular resin film formation layer 22 on the release sheet 24.

[0047]

An adhesive sheet having the base 21A and the adhesive layer 21B, which was prepared in advance, is laminated on the surface of the release sheet 24 on which the resin film formation layer 22 is provided.

Next, the adhesive sheet is cut into the shape of the ring frame. At this time, the resin film formation layer 22 is placed substantially in the center of the cut shape. At the same time, a cut is made in the adhesive sheet into a predetermined shape of the auxiliary sheet 25. At this time, the adhesive sheet is completely cut, and the release sheet is cut with a punching blade so that a shallow cut is formed. After that, the redundant portion (scrap portion) between the resin film formation layer-equipped support sheet and the auxiliary sheet is removed, so that the resin film formation layer-equipped support sheet 20 having a predetermined shape on the

release sheet 24 and the auxiliary sheets 25 at both traverse ends of the release sheet 24 are remained. Thus, the continuous laminated sheet 4 having the aforementioned structure is obtained.

[0048]

[Continuous laminated sheet: Third Embodiment]

FIG. 3 shows a third embodiment of a continuous laminated sheet. FIG. 3A shows a state in which rolled body of a continuous laminated sheet 6 has been unwound, FIG. 3B is a cross-sectional view taken along line A-A of FIG. 3A, and FIG. 3C is a sectional view taken along line B-B of FIG. 3A.

[0049]

As shown in FIG. 3B, a resin film formation layer-equipped support sheet 30 has a support sheet 31, a resin film formation layer 32 laminated on the inner peripheral portion of one side of the support sheet 31, and a ring frame holding means 33 formed on the outer peripheral portion of the resin film formation layer 32. The support sheet 31 and the resin film formation layer 32 are releasably laminated. When the support sheet 31 is a release sheet, the resin film formation layer 32 is formed on the release treatment surface. When the support sheet 31 is an adhesive sheet such as a dicing sheet, the resin film formation layer 32 is formed on the adhesive layer. When the support sheet 31 is an adhesive sheet, a specific mode of the adhesive sheet is the same as the adhesive sheet of the second embodiment described above.

[0050]

A plurality of resin film formation layer-equipped support sheets 30 are independently, releasably, and temporarily attached to the lateral inner portion of a continuous release sheet 34 along the longitudinal direction.

[0051]

A continuous auxiliary sheet 35 is laminated at both traverse ends of the continuous release sheet 34 along the longitudinal direction. The auxiliary sheet 35

has the same laminated structure as the outer peripheral portion of the resin film formation layer-equipped support sheet 30. In other words, the auxiliary sheet 35 is composed of the same material as the support sheet 31 and the ring frame holding means 33.

[0052]

The release sheet 34 is exposed between the resin film formation layer-equipped support sheets between which the auxiliary sheet 35 extends laterally inward. In other words, the width of the auxiliary sheet is not uniform, and the formed auxiliary sheet is wide in a portion between the resin film formation layer-equipped support sheets (hereinafter also referred to as "wide portion"). A cross-sectional view of the wide portion is shown in FIG. 3C.

[0053]

Such a continuous laminated sheet 6 can be manufactured in the following manner, for example.

A resin layer to be a resin film formation layer is formed on the entire continuous release sheet 34, and the resin layer is die-cut into a rectangular shape. At this time, the resin film formation layer is completely cut, and the release sheet is cut with a punching blade so that a shallow cut is formed. The outer periphery of the die-cut resin film formation layer is then removed, leaving the rectangular resin film formation layer 32 on the release sheet 34.

[0054]

An adhesive layer (which may be a double-sided adhesive tape) to be the ring frame holding means 33 is adhered to a separate continuous support sheet. The adhesive layer is die-cut into a rectangular shape. At this time, the adhesive layer is completely cut, and the support sheet is cut with a punching blade so that a shallow cut is formed. The die-cut adhesive layer is then removed, leaving the adhesive layer having a rectangular opening on the continuous support sheet.

[0055]

Next, the continuous release sheet 34 having the resin film formation layer 32 and the continuous support sheet on which the adhesive layer having the rectangular opening is laminated are positioned so that the resin film formation layer 32 coincides with the rectangular opening, and are pressed together.

[0056]

Next, this laminate is cut from the support sheet side into the shape of the ring frame. At this time, the resin film formation layer 32 is placed substantially in the center of the cut shape. At the same time, a cut is made in the laminate into a predetermined shape of the auxiliary sheet 35. At this time, the laminate is completely cut, and the release sheet is cut with a punching blade so that a shallow cut is formed. After that, the redundant portion (scrap portion) between the resin film formation layer-equipped support sheet and the auxiliary sheet is removed, so that the resin film formation layer-equipped support sheet 30 having a predetermined shape on the release sheet 34 and the auxiliary sheets 35 at both traverse ends of the release sheet 34 are remained. Thus, the continuous laminated sheet 6 having the aforementioned structure is obtained.

[0057]

[Wide portion]

In the present invention, when forming the auxiliary sheets 15, 25, and 35, between one resin film formation layer-equipped support sheet and the adjacent resin film formation layer-equipped support sheet, the auxiliary sheet is extended inwardly to form a relatively wide portion (wide portion) (see FIG. 4). Hence, the thickness difference between the resin film formation layer-equipped support sheet and the adjacent resin film formation layer-equipped support sheet is reduced and the area of the redundant portion gradually changes, which eliminates a sudden change in the peeling force of the redundant portion at the time of scrap raising and leads to stable scrap raising.

[0058]

When a rolled body is prepared, the wide portion is formed so as not to overlap the usage area of the resin film formation layer. The resin film formation layer is not entirely used and is formed with a slight margin left in its peripheral portion. The size of the resin film formation layer is set slightly larger than that of the chip group package, and even if the chip group package is adhered, there is a portion around the resin film formation layer that is not used for bonding. In this unused portion, the resin film formation layer and the wide portion may overlap. Even if the wide portion overlaps a part of the usage area of the resin film formation layer and a winding mark thus occurs, if the winding mark is small enough to not affect the adhesiveness, it is acceptable in the present invention.

[0059]

In the first to third embodiments, a plan view from the resin film formation layer side after removal of the release sheet from the laminate sheet is shown in FIG. 4. In FIG. 4, a portion surrounded by a dotted line shows the usage area of the resin film formation layer. Although FIG. 4 shows the first embodiment as an example, the plan view from the resin film formation layer side after removal of the release sheet is the same in the first to third embodiments. Therefore, explanation will be given using the reference numerals used in the first embodiment.

[0060]

In any case, there is a ring frame holding means 13 surrounding the exposed resin film formation layer 12, and the auxiliary sheets 15 are provided at both traverse ends thereof.

Here, in the plan view of FIG. 4, when the distance between the resin film formation layer 12 and the outer end of the auxiliary sheet 15 is $W1$, and the width of the auxiliary sheet in the widest part in the plan view is $W2$, the auxiliary sheet is formed so that $W1$ and $W2$ satisfy $W2/W1 \leq 1.6$. It is preferable that $W2/W1 \leq 1.4$ and $W2/W1 \leq 1.2$ be satisfied. The lower limit of $W2/W1$ is 0.2, and preferably satisfies $0.4 \leq W2/W1$.

Note that W1 in the first embodiment is shown in FIG. 1B, and W2 is shown in FIG. 1C. W1 in the second embodiment is shown in FIG. 2B, and W2 is shown in FIG. 2C. W1 in the third embodiment is shown in FIG. 3B, and W2 is shown in FIG. 3C.

[0061]

In a rolled body of a continuous laminated sheet of the present invention, the wide portion of the auxiliary sheet does not overlap the portion of the resin film formation layer (usage area) to which a chip group package is attached, so that no winding marks occur in the usage area of the resin film formation layer. Further, even if the wide portion and the resin film formation layer overlap, winding marks that occur in the resin film formation layer are small and do not affect the adhesiveness. Consequently, the chip group package can be stably attached and the resulting resin film has a uniform thickness.

[0062]

The support sheet, the resin film formation layer, the ring frame holding means, and the continuous release sheet will be described below, but these are non-limiting illustrative examples.

[Support sheet]

Examples of the support sheets 11 and 31 include release sheets, and adhesive sheets such as dicing sheets described later can also be used. An adhesive sheet is used as the support sheet 21 in the second embodiment.

[0063]

Examples of the release sheet include a polyethylene film, a polypropylene film, a polybutene film, a polybutadiene film, a polymethylpentene film, a polyvinyl chloride film, a vinyl chloride copolymer film, a polyethylene terephthalate film, a polyethylene naphthalate film, a polybutylene terephthalate film, a polyurethane film, an ethylene/vinyl acetate copolymer film, an ionomer resin film, an ethylene/(meth)acrylic acid copolymer film, an ethylene/(meth)acrylate copolymer

film, a polystyrene film, a polycarbonate film, a polyimide film, and a fluororesin film. Films made of crosslinked products thereof are also used. The laminated films thereof may also be used.

[0064]

The surface tension of the surface of the release sheet that is in contact with the resin film formation layer is preferably 40 mN/m or less, more preferably 37 mN/m or less, particularly preferably 35 mN/m or less. The lower limit is usually about 25 mN/m. Note that its release strength is preferably greater than that of the "continuous release sheet" which will be described later. Such a release sheet having a relatively low surface tension can be obtained by selecting an appropriate material, or can be obtained by applying a release agent to the surface of the release sheet for release treatment.

[0065]

As the release agent for the release treatment, an alkyd-based, silicone-based, fluorine-based, unsaturated polyester-based, polyolefin-based, or wax-based release agent is used, and alkyd-based, silicone-based, and fluorine-based release agents, which have heat resistance, are preferable.

[0066]

In order to perform release treatment on the surface of a film or the like to be the base of the release sheet using the aforementioned release agent, the release agent may be used as it is without a solvent, or may be diluted with a solvent or emulsified and be applied with a gravure coater, a Meyer bar coater, an air knife coater, a roll coater or the like. A release sheet coated with a release agent may be held at room temperature or under heating, or may be cured with an electron beam to form a release agent layer.

[0067]

Further, the surface tension of the release sheet may be adjusted by film lamination by wet lamination, dry lamination, hot melt lamination, melt extrusion

lamination, coextrusion processing, or the like. In other words, a film at least one side of which has a surface tension in a range preferable for a surface in contact with the resin film formation layer of the release sheet described above is prepared, and then this film is laminated on a different film so that the aforementioned surface is in contact with the resin film formation layer.

[0068]

The support sheet may be an adhesive sheet, such as a dicing sheet, in which an adhesive layer is formed on a base film. In this embodiment, the resin film formation layer is laminated on the adhesive layer of the adhesive sheet. Examples of the base of the adhesive sheet include the aforementioned films that have been taken as an example of the release sheet. The adhesive layer may be a weak adhesive layer that has adhesion such that the resin film formation layer can be removed, or an energy ray-curable adhesive layer wherein the adhesion of which decreases by irradiation with energy rays. The adhesive layer can be formed using various known adhesives (for example, general-purpose adhesives, such as rubber-based, acrylic-based, silicone-based, urethane-based, and vinyl ether-based adhesives, adhesives with surface irregularities, energy ray-curable adhesives, and adhesives containing a thermally expanding component).

[0069]

The thickness of the support sheet is usually 10 to 500 μm , preferably 15 to 300 μm , particularly preferably 20 to 250 μm . When the support sheet is an adhesive sheet having an adhesive layer formed on a base, the thickness of the adhesive layer is 3 to 50 μm in the support sheet.

[0070]

[Resin film formation layer]

The resin film formation layers 12, 22, and 32 are precursor layers for forming a protective film or an adhesive layer. The functions required as the resin

film formation layer are (1) sheet shape retention, (2) initial adhesion, and (3) curability.

[0071]

Adding a binder component imparts (1) sheet shape retention and (3) curability to the resin film formation layer. The binder component can be a first binder component that contains a polymer component (A) and a curable component (B), or a second binder component that contains a curable polymer component (AB) having both the properties of the component (A) and the component (B).

Note that (2) initial adhesion, which is a function for temporarily adhering the resin film formation layer to the package until it is cured, may be pressure-sensitive adhesion, or adhesion given by thermal softening. (2) Initial adhesion is usually controlled, for example, by adjusting various properties of the binder component or adjusting the content of the inorganic filler (C) which will be described later.

[0072]

(First binder component)

The first binder component, which contains the polymer component (A) and the curable component (B), imparts sheet shape retention and curability to the resin film formation layer. The first binder component does not contain the curable polymer component (AB) for convenience of distinguishing it from the second binder component.

[0073]

(A) Polymer component

The polymer component (A) is added to the resin film formation layer mainly for the purpose of imparting sheet shape retention to the resin film formation layer.

To achieve the above object, the weight average molecular weight (M_w) of the polymer component (A) is usually 20,000 or more, preferably 20,000 to 3,000,000. The weight average molecular weight (M_w) is a value measured by the gel permeation chromatography (GPC) method (polystyrene standard). The

measurement by such a method is performed, for example, using a high-speed GPC device "HLC-8120GPC" manufactured by Tosoh Corporation, and a high-speed column "TSK gurd column H_{XL}-H", "TSK Gel GMH_{XL}", and "TSK Gel G2000 H_{XL}" (which are manufactured by Tosoh Corporation) connected in this order to the high-speed GPC device, and a detector as a differential refractometer at a column temperature of 40°C and a solution feeding rate of 1.0 mL/min.

Note that, for distinguishing from the curable polymer (AB) which will be described later, the polymer component (A) does not have a curable functional group which will be described later.

[0074]

The polymer component (A) may be an acrylic polymer, polyester, phenoxy resin (limited to those having no epoxy group for distinguishing from the curable polymer (AB) described later), polycarbonate, polyether, polyurethane, polysiloxane, rubber-based polymer or the like. Alternatively, it may be a combination of two or more of these, for example, an acrylic urethane resin obtained by reacting an acrylic polyol, which is an acrylic polymer having a hydroxyl group, with a urethane prepolymer having an isocyanate group at a molecular end. Alternatively, two or more kinds of these may be used in combination, including a polymer in which two or more kinds are bonded.

[0075]

(A1) Acrylic polymer

An acrylic polymer (A1) is preferably used as the polymer component (A). The glass transition temperature (T_g) of the acrylic polymer (A1) is preferably in the range of -60 to 50°C, more preferably -50 to 40°C, further preferably -40 to 30°C. If the glass transition temperature of the acrylic polymer (A1) is high, the adhesion of the resin film formation layer is deteriorated, which may hinder transfer to the work and may cause, for example, the trouble that a resin film formation layer or a resin film obtained by curing a resin film formation layer peels off from the work after the

transfer. In contrast, if the glass transition temperature of the acrylic polymer (A1) is low, the peeling force between the resin film formation layer and the support sheet increases, which may cause a trouble in transferring the resin film formation layer.

[0076]

The weight average molecular weight of the acrylic polymer (A1) is preferably 100,000 to 1,500,000. If the weight average molecular weight of the acrylic polymer (A1) is high, the adhesion of the resin film formation layer is deteriorated, which may hinder transfer to the work and may cause, for example, the trouble that a resin film formation layer or a resin film peels off from the work after the transfer. In contrast, if the weight average molecular weight of the acrylic polymer (A1) is low, the adhesion between the resin film formation layer and the support sheet increases, which may cause a trouble in transferring the resin film formation layer.

[0077]

The acrylic polymer (A1) contains a (meth)acrylate as a constituent monomer.

Examples of the (meth)acrylate include an alkyl (meth)acrylate having an alkyl group having 1 to 18 carbon atoms, specifically, methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, butyl (meth)acrylate, and 2-ethylhexyl (meth)acrylate; (meth)acrylate having a cyclic skeleton, specifically, cycloalkyl (meth)acrylate, benzyl (meth)acrylate, isobornyl (meth)acrylate, dicyclopentanylmethyl (meth)acrylate, dicyclopentenyl (meth)acrylate, dicyclopentenylmethoxymethyl (meth)acrylate, and imide (meth)acrylate. Among the ones given as examples of a monomer having a hydroxyl group, a monomer having a carboxyl group, and a monomer having an amino group, which will be described later, a (meth)acrylate can be given as an example.

[0078]

In this specification, (meth)acrylic may be used to include both acrylic and methacrylic.

[0079]

A monomer having a hydroxyl group may be used as a monomer constituting the acrylic polymer (A1). Use of such monomer introduces a hydroxyl group into the acrylic polymer (A1), and when the resin film formation layer contains the energy ray-curable component (B2), compatibility between this and the acrylic polymer (A1) is improved. Examples of the monomer having a hydroxyl group include (meth)acrylate having a hydroxyl group such as 2-hydroxyethyl (meth)acrylate or 2-hydroxypropyl (meth)acrylate; and N-methylol (meth)acrylamide.

[0080]

The monomer having a carboxyl group may be used as a monomer constituting the acrylic polymer (A1). Use of such monomer introduces a carboxyl group into the acrylic polymer (A1), and when the resin film formation layer contains the energy ray-curable component (B2), compatibility between this and the acrylic polymer (A1) is improved. Examples of the monomer having a carboxyl group include (meth)acrylate having a carboxyl group such as 2-(meth)acryloyloxyethyl phthalate or 2-(meth)acryloyloxypropyl phthalate; (meth)acrylic acid, maleic acid, fumaric acid, and itaconic acid. When an epoxy thermosetting component is used as the curable component (B) described later, the carboxyl group reacts with the epoxy group in the epoxy thermosetting component; for this reason, the amount of use of a monomer having a carboxyl group is preferably small.

[0081]

A monomer having an amino group may be used as a monomer constituting the acrylic polymer (A1). Examples of such monomer include (meth)acrylate having an amino group such as monoethylamino (meth)acrylate.

[0082]

Apart from these, vinyl acetate, styrene, ethylene, α -olefin or the like may be used as a monomer constituting the acrylic polymer (A1).

[0083]

The acrylic polymer (A1) may be crosslinked. Cross-linking is carried out by adding a cross-linking agent to a composition used to form the resin film formation layer which includes the acrylic polymer (A1) having cross-linkable functional group such as a hydroxyl group, to bring reaction between the cross-linkable functional group and the functional group of the crosslinking agent. By crosslinking the acrylic polymer (A1), the cohesive force of the resin film formation layer can be adjusted.

[0084]

Examples of the cross-linking agent include organic polyvalent isocyanate compounds and organic polyvalent imine compounds.

[0085]

Examples of the organic polyvalent isocyanate compound include aromatic polyvalent isocyanate compounds, aliphatic polyvalent isocyanate compounds, alicyclic polyvalent isocyanate compounds, and trimers of these organic polyvalent isocyanate compounds, and terminal isocyanate urethane prepolymers obtained by reaction between a polyol compound and these organic polyvalent isocyanate compounds.

[0086]

Specific examples of the organic polyvalent isocyanate compound include 2,4-tolylene diisocyanate, 2,6-tolylene diisocyanate, 1,3-xylylene diisocyanate, 1,4-xylylene diisocyanate, diphenylmethane-4,4'-diisocyanate, diphenylmethane-2,4'-diisocyanate, 3-methyldiphenylmethane diisocyanate, hexamethylene diisocyanate, isophorone diisocyanate, dicyclohexylmethane-4,4'-diisocyanate, dicyclohexylmethane-2,4'-diisocyanate, lysine diisocyanate, and polyhydric alcohol adducts of these.

[0087]

Specific examples of the organic polyvalent imine compound include N,N'-diphenylmethane-4,4'-bis(1-aziridinecarboxamide), trimethylolpropane-tri- β -aziridinypropionate, tetramethylolmethane-tri- β -aziridinypropionate, and N,N'-toluene-2,4-bis(1-aziridinecarboxamide) triethylenemelamine.

[0088]

The amount of the crosslinking agent is usually 0.01 to 20 parts by mass, preferably 0.1 to 10 parts by mass, more preferably 0.5 to 5 parts by mass on the basis of 100 parts by mass of the acrylic polymer (A1) that has yet to be crosslinked.

[0089]

When the contents of the components of the resin film formation layer are explained with reference to the content of the polymer component (A), even if the polymer component (A) is a crosslinked acrylic polymer, the content is the amount of the acrylic polymer that has yet to be crosslinked (i.e., based on uncrosslinked polymer).

[0090]

(A2) Non-acrylic resin

The polymer component (A) may be a non-acrylic resin(s) (A2) which may be alone or in combination of two or more selected from polyester, phenoxy resin (limited to those having no epoxy group for distinguishing from the curable polymer (AB) described later), polycarbonate, polyether, polyurethane, polysiloxane, and rubber-based polymer, and a component in which two or more of these are bonded. Such a resin preferably has a weight average molecular weight of 20,000 to 100,000, more preferably 20,000 to 80,000.

[0091]

The glass transition temperature of the non-acrylic resin (A2) is preferably in the range of -30 to 150°C, more preferably -20 to 120°C.

[0092]

When the non-acrylic resin (A2) is used in combination with the aforementioned acrylic polymer (A1), it becomes possible to facilitate ply separation between the support sheet and the resin film formation layer at the time of transfer of the resin film formation layer to the package, and makes the resin film formation layer follow the transfer surface, thereby suppressing voids.

[0093]

When the non-acrylic resin (A2) is used in combination with the aforementioned acrylic polymer (A1), as for the content of the non-acrylic resin (A2), the mass ratio between the non-acrylic resin (A2) and the acrylic polymer (A1) (A2: A1) is usually in the range of 1:99 to 60:40, preferably 1:99 to 30:70. When the content of the non-acrylic resin (A2) is in this range, the aforementioned effects can be obtained.

[0094]

(B) Curable component

The curable component (B) is added to the resin film formation layer mainly for the purpose of imparting curability to the resin film formation layer. A thermosetting component (B1) or an energy ray-curable component (B2) can be used as the curable component (B). These materials can also be used in combination. The thermosetting component (B1) contains a compound having a functional group that reacts when heated. Further, the energy ray-curable component (B2) contains a compound (B21) having a functional group that reacts upon energy ray irradiation, and is polymerized and cured when irradiated with energy rays such as ultraviolet rays and electron beams. The functional groups of these curable components react with each other to form a three-dimensional network structure, thereby achieving curing. Since the curable component (B) is used in combination with the polymer component (A), for suppressing the viscosity of the coating composition for forming the resin film formation layer and improving the handleability, its weight average molecular weight (Mw) is usually 10,000 or less, preferably 100 to 10,000.

[0095]

(B1) Thermosetting component

The thermosetting component is preferably, for example, an epoxy thermosetting component.

The epoxy thermosetting component contains an epoxy group-containing compound (B11) and is preferably a composition in which an epoxy group-containing compound (B11) and a thermosetting agent (B12) are combined.

[0096]

(B11) Epoxy group-containing compound

The epoxy group-containing compound (B11) (hereinafter also referred to as "epoxy compound (B11)") may be a known compound. Specific examples include epoxy compounds having two or more functional groups in the molecule, such as polyfunctional epoxy resins, bisphenol A diglycidyl ethers and hydrogenated products thereof, ortho-cresol novolac epoxy resin, dicyclopentadiene epoxy resin, biphenyl epoxy resin, bisphenol A epoxy resin, bisphenol F epoxy resin, and phenylene skeleton epoxy resin. These can be used alone or in combination of two or more.

[0097]

When the epoxy compound (B11) is used, preferably 1 to 1500 parts by mass, more preferably 3 to 1200 parts by mass of the epoxy compound (B11) is contained in the resin film formation layer on the basis of 100 parts by mass of the polymer component (A). If the content of the epoxy compound (B11) is small, the adhesion of the resin film formation layer after curing tends to be deteriorated. In contrast, if the content of the epoxy compound (B11) is large, the peeling force between the resin film formation layer and the support sheet increases, which may cause a trouble in transferring the resin film formation layer.

[0098]

(B12) Thermosetting agent

The thermosetting agent (B12) functions as a curing agent for the epoxy compound (B11). Examples of preferred thermosetting agents include compounds having two or more functional groups that can react with an epoxy group in one molecule. Examples of this functional group include a phenolic hydroxyl group, an alcoholic hydroxyl group, an amino group, a carboxyl group, and an acid anhydride. Of these, preferred examples include a phenolic hydroxyl group, an amino group, and an acid anhydride, and more preferable examples include a phenolic hydroxyl group and an amino group.

[0099]

Specific examples of the phenol-based curing agent include polyfunctional phenol resins, biphenols, novolac phenol resins, dicyclopentadiene phenol resins, xyloc phenol resins, and aralkylphenol resins.

Specific examples of the amine-based curing agent include DICY (dicyandiamide).

These may be used alone or in combination of two or more.

[0100]

The content of the thermosetting agent (B12) is preferably 0.1 to 500 parts by mass, more preferably 1 to 200 parts by mass on the basis of 100 parts by mass of the epoxy compound (B11). If the content of the thermosetting agent is small, the adhesion after curing tends to be deteriorated.

[0101]

(B13) Curing accelerator

The curing accelerator (B13) may be used to adjust the rate of thermal curing of the resin film formation layer. The curing accelerator (B13) is preferably used particularly when an epoxy thermosetting component is used as the thermosetting component (B1).

[0102]

Examples of preferred curing accelerators include tertiary amines such as triethylenediamine, benzyldimethylamine, triethanolamine, dimethylaminoethanol, and tris(dimethylaminomethyl)phenol; imidazoles such as 2-methylimidazole, 2-phenylimidazole, 2-phenyl-4-methylimidazole, 2-phenyl-4,5-dihydroxymethylimidazole, and 2-phenyl-4-methyl-5-hydroxymethylimidazole; organic phosphines such as tributylphosphine, diphenylphosphine, and triphenylphosphine; and tetraphenylboron salts such as tetraphenylphosphonium tetraphenylborate and triphenylphosphine tetraphenylborate. These may be used alone or in combination of two or more.

[0103]

The content of the curing accelerator (B13) is preferably 0.01 to 10 parts by mass, more preferably 0.1 to 1 part by mass, on the basis of 100 parts by mass of the total amount of the epoxy compound (B11) and the thermosetting agent (B12). With this range of content of the curing accelerator (B13), excellent adhesion even at high temperature and high humidity, and high reliability even under severe reflow conditions can be exhibited. Addition of the curing accelerator (B13) improves the adhesion of the resin film formation layer after curing. This effect becomes stronger with an increase in the content of the curing accelerator (B13).

[0104]

(B2) Energy ray-curable component

When the resin film formation layer contains the energy ray-curable component, the resin film formation layer can be cured without a thermal curing step that requires a large amount of energy and long time. This can reduce the manufacturing cost.

For the energy ray-curable component, a compound (B21) having a functional group that reacts upon energy ray irradiation may be used alone, but a combination of the compound (B21) having a functional group that reacts upon energy ray irradiation and a photopolymerization initiator (B22) is preferably used.

[0105]

(B21) A compound having a functional group that reacts upon energy ray irradiation

Specific examples of the compound (B21) having a functional group that reacts upon energy ray irradiation (hereinafter also referred to as "energy ray reactive compound (B21)") include acrylate compounds such as trimethylolpropane triacrylate, pentaerythritol triacrylate, pentaerythritol tetraacrylate, dipentaerythritol monohydroxypentaacrylate, dipentaerythritol hexaacrylate, 1,4-butylene glycol diacrylate and 1,6-hexanediol diacrylate, and acrylate compounds that have a relatively low molecular weight and a polymerized structure of acrylate compounds such as oligoester acrylate, urethane acrylate oligomer, epoxy acrylate, polyether acrylate, and itaconic acid oligomer. Such a compound has at least one polymerizable double bond in the molecule.

[0106]

When an energy ray-reactive compound (B21) is used, preferably 1 to 1500 parts by mass, more preferably 3 to 1200 parts by mass of the energy ray-reactive compound (B21) is contained in the resin film formation layer on the basis of 100 parts by mass of the polymer component (A).

[0107]

(B22) Photopolymerization initiator

Combining the energy ray-reactive compound (B21) with the photopolymerization initiator (B22) shortens the polymerization and curing time and reduces the amount of light irradiation.

[0108]

Specific examples of such a photopolymerization initiator (B22) include benzophenone, acetophenone, benzoin, benzoin methyl ether, benzoin ethyl ether, benzoin isopropyl ether, benzoin isobutyl ether, benzoylbenzoic acid, methyl benzoylbenzoate, benzoin dimethyl ketal, 2,4-diethylthioxanthone, α -hydroxycyclohexyl phenyl ketone, benzyl diphenyl sulfide, tetramethyl thiuram

monosulfide, azobisisobutyronitrile, benzyl, dibenzyl, diacetyl, 1,2-diphenylmethane, 2-hydroxy-2-methyl-1-[4-(1-methylvinyl)phenyl]propanone, 2,4,6-trimethylbenzoyldiphenylphosphine oxide, and β -chloroanthraquinone. The photopolymerization initiator (B22) may be used alone or in combination of two or more.

[0109]

The content of the photopolymerization initiator (B22) is preferably 0.1 to 10 parts by mass, more preferably 1 to 5 parts by mass on the basis of 100 parts by mass of the energy ray-reactive compound (B21).

If the content of the photopolymerization initiator (B22) is less than 0.1 parts by mass, satisfactory curability may not be obtained due to insufficient photopolymerization, and if it exceeds 10 parts by mass, the residue that does not contribute to photopolymerization occurs, which may cause a malfunction.

[0110]

(Second binder component)

The second binder component contains the curable polymer component (AB) to impart sheet shape retention and curability to the resin film formation layer.

[0111]

(AB) Curable polymer component

The curable polymer component is a polymer having curing functional groups. The curing functional groups can react with each other to form a three-dimensional network structure, and examples of the curing functional group include functional groups that reacts upon heating and functional groups that react with energy rays.

The curing functional group may be bonded to a unit of continuous skeleton structures of the curable polymer (AB), or may be bonded to the terminal. When the curing functional group is bonded to the unit of continuous skeleton structures of the curable polymer component (AB), the curable functional group may be bonded to a side chain or directly bonded to the main chain. The weight average molecular

weight (M_w) of the curable polymer component (AB) is usually 20,000 or more in order to achieve the purpose of imparting sheet shape retention to the resin film formation layer.

[0112]

Examples of functional group which reacts upon heating include an epoxy group. Examples of the curable polymer component (AB) having an epoxy group include high molecular weight epoxy group-containing compounds and phenoxy resins having an epoxy group. High molecular weight epoxy group-containing compounds are disclosed, for example, in JP 2001-261789A.

Alternatively, it may be a polymer similar to the aforementioned acrylic polymer (A1), which is obtained by polymerizing a monomer having an epoxy group as a monomer (epoxy group-containing acrylic polymer). Examples of the monomer having an epoxy group include (meth)acrylate having a glycidyl group such as glycidyl (meth)acrylate.

When an epoxy group-containing acrylic polymer is used, its preferred mode is similar to that of the acrylic polymer (A1) except for the epoxy group.

[0113]

When the curable polymer component (AB) having an epoxy group is used, the thermosetting agent (B12) and the curing accelerator (B13) may be used in combination as in the case of using an epoxy thermosetting component as the curable component (B).

[0114]

Examples of a functional group which reacts by energy rays irradiation include (meth)acryloyl groups. The curable polymer component (AB) having a functional group that reacts with energy rays may be a high-molecular weight acrylate compound having a polymerized structure such as polyether acrylate.

In addition, a polymer which is prepared by reaction of a source polymer, which has a functional group X such as a hydroxyl group, for example in a side chain,

with a low-molecular weight compound having a functional group Y that can react with the functional group X (for example, an isocyanate group when the functional group X is a hydroxyl group) and a functional group that reacts upon energy ray irradiation may be used.

In this case, when the source polymer corresponds to the aforementioned acrylic polymer (A1), the preferable mode of the source polymer is similar to that of the acrylic polymer (A1).

[0115]

When the curable polymer component (AB) having a functional group that reacts with energy rays is used, it may be used in combination with a photopolymerization initiator (B22) as in the case of using the energy ray-curable component (B2).

[0116]

The second binder component may contain the aforementioned polymer component (A) and curable component (B) together with the curable polymer component (AB).

[0117]

The resin film formation layer may contain the following components in addition to the binder component.

[0118]

(C) Inorganic filler

The resin film formation layer may contain an inorganic filler (C). Addition of the inorganic filler (C) to the resin film formation layer enables adjustment of the thermal expansion coefficient of the cured resin film and optimization of the thermal expansion coefficient of the cured resin film with respect to the package improves the reliability of the semiconductor device. This can also reduce in the hygroscopicity of the cured resin film.

[0119]

Further, when the resin film obtained by curing the resin film formation layer of the present invention functions as a protective film, laser marking is applied to the protective film, so that the inorganic filler (C) is exposed on a portion scraped off by laser beams and the reflected light diffuses, producing a color close to white. Therefore, when the resin film formation layer contains the colorant (D) described later, a contrast difference is obtained between the laser marked portion and other portions, making printing clearer.

[0120]

Examples of preferred inorganic fillers include powders of silica, alumina, talc, calcium carbonate, titanium oxide, iron oxide, silicon carbide, boron nitride, and the like, spherical beads thereof, single crystal fibers, and glass fibers. Of these, the silica filler and alumina filler are preferred. The aforementioned inorganic fillers (C) can be used alone or in combination of two or more.

[0121]

The range of the content of the inorganic filler (C) for more reliably obtaining the aforementioned effect is preferably 1 to 80 parts by mass, more preferably 20 to 75 parts by mass, more preferably 40 to 70 parts by mass on the basis of 100 parts by mass of the total solids constituting the resin film formation layer.

[0122]

(D) Colorant

The resin film formation layer may be transparent. Further, the resin film formation layer may be mixed with a colorant (D) for coloring. The addition of the colorant provides the effect of making it easier to recognize marks such as characters and symbols when the resin film is etched by means such as laser marking. In particular, on a package having the resin film, a product number or the like is usually printed on the surface of the resin film by a laser marking method (a method in which the protective film surface is etched by laser beam for printing), and if the resin film contains a colorant (D), an adequate contrast difference is sufficiently

obtained between a portion of the resin film etched by the laser beam and other portions, and the visibility is improved.

[0123]

Organic or inorganic pigments and dyes are used as the colorant. Of these, black pigments are preferred to block electromagnetic waves and infrared rays. Examples of black pigments include, but are not limited to, carbon black, iron oxide, manganese dioxide, aniline black, and activated carbon. Carbon black is particularly preferred to enhance the reliability of the semiconductor device. The colorant (D) may be used alone or in combination of two or more. When the semiconductor device is inspected using infrared rays, an infrared ray-transmitting colorant may be used.

The content of the colorant (D) is preferably 0.1 to 35 parts by mass, more preferably 0.5 to 25 parts by mass, particularly preferably 1 to 15 parts by mass on the basis of the 100 parts by mass of the total solids constituting the resin film formation layer.

[0124]

(E) Coupling agent

A coupling agent (E) having a functional group that reacts with an inorganic substance and a functional group that reacts with an organic functional group may be used to improve the adhesion, adhesiveness of the resin film formation layer to the package and/or the resin film's cohesiveness. In addition, use of the coupling agent (E) enhances the water resistance without impairing the heat resistance of the resin film obtained by curing the resin film formation layer. Examples of such coupling agents include titanate coupling agents, aluminate coupling agents, silane coupling agents. Of these, silane coupling agents are preferable.

[0125]

The silane coupling agent is preferably a silane coupling agent in which the functional group that reacts with the organic functional group is a group that reacts

with a functional group contained in the polymer component (A), the curable component (B), the curable polymer component (AB), or the like.

Examples of such a silane coupling agent include γ -glycidoxypropyltrimethoxysilane, γ -glycidoxypropylmethyldiethoxysilane, β -(3,4-epoxycyclohexyl)ethyltrimethoxysilane, γ -(methacryloxypropyl)trimethoxysilane, γ -aminopropyltrimethoxysilane, N-6-(aminoethyl)- γ -aminopropyltrimethoxysilane, N-6-(aminoethyl)- γ -aminopropylmethyldiethoxysilane, N-phenyl- γ -aminopropyltrimethoxysilane, γ -ureidopropyltriethoxysilane, γ -mercaptopropyltrimethoxysilane, γ -mercaptopropylmethyldimethoxysilane, bis(3-triethoxysilylpropyl)tetrasulfane, methyltrimethoxysilane, methyltriethoxysilane, vinyltrimethoxysilane, vinyltriacetoxysilane, and imidazolesilane. These may be used alone or in combination of two or more.

[0126]

The content of the silane coupling agent is usually 0.1 to 20 parts by mass, preferably 0.2 to 10 parts by mass, more preferably 0.3 to 5 parts by mass on the basis of 100 parts by mass of the total content of the polymer component (A), the curable component (B) and the curable polymer component (AB). If the content of the silane coupling agent is less than 0.1 parts by mass, the aforementioned effect may not be obtained, and if it exceeds 20 parts by mass, outgas may occur.

[0127]

(F) General-purpose additive

In addition to the aforementioned components, various additives may be added to the resin film formation layer as necessary. Examples of various additives include leveling agents, plasticizers, antistatic agents, antioxidants, ion scavengers, gettering agents, chain transfer agents, and release agents.

[0128]

The resin film formation layer is obtained, for example, using a composition (resin film forming composition) obtained by mixing the aforementioned

components in appropriate proportions. The resin film forming composition may be previously diluted with a solvent, or may be added to the solvent at the time of mixing. When the resin film forming composition is used, it may be diluted with a solvent.

[0129]

Examples of such a solvent include ethyl acetate, methyl acetate, diethyl ether, dimethyl ether, acetone, methyl ethyl ketone, acetonitrile, hexane, cyclohexane, toluene, heptane.

[0130]

The resin film formation layer exhibits initial adhesion and curability and in the uncured state, is easily adhered to the chip group package when pressed at room temperature or under heating. The resin film formation layer may be heated when pressed. After curing, a resin film having high impact resistance can be finally provided, which has excellent adhesive strength and can maintain sufficient reliability even under severe conditions: at high temperature and high humidity. Note that the resin film formation layer may have a single-layer structure or a multi-layer structure.

[0131]

The thickness of the resin film formation layer is preferably 1 to 100 μm , more preferably 2 to 90 μm , particularly preferably 3 to 80 μm . When the thickness of the resin film formation layer is in the aforementioned ranges, the resin film formation layer functions as a highly reliable protective film or adhesive.

[0132]

[Ring frame holding means]

In the resin film formation layer-equipped support sheet of the second embodiment, the support sheet 21 comprising an adhesive sheet, and the adhesive layer 21B exposed in the outer peripheral portion of the resin film formation layer 22 functions as a ring frame holding means.

[0133]

In the first embodiment, the ring frame holding means 13 is provided in the outer peripheral portion of the surface of the resin film formation layer. In the third embodiment, the ring frame holding means 33 is provided surrounding the resin film formation layer. The ring frame holding means may be an adhesive member consisting of an adhesive layer alone, an adhesive member comprising a base and an adhesive layer, or a double-sided adhesive member with a core material.

[0134]

The ring frame holding means 13 and 33 have an approximately rectangular outer peripheral shape, and have a rectangular hollow portion (inner opening) in the inner peripheral portion. Its outer peripheral shape has a size such that it can be fixed to the ring frame. The inner opening is made larger than the chip group package. Note that the ring frame is usually a molded article of metal or plastic.

[0135]

When an adhesive member consisting of an adhesive layer alone is used as the ring frame holding means, it is preferably, but not necessarily, to be composed of an acrylic adhesive, a rubber-based adhesive, or a silicone adhesive. Of these, acrylic adhesives are preferable in consideration of removability from the ring frame. The aforementioned adhesives may be used alone or in combination of two or more.

[0136]

The adhesive layer constituting the ring frame holding means preferably has a thickness of 2 to 20 μm , more preferably 3 to 15 μm , further preferably 4 to 10 μm . When the thickness of the adhesive layer is less than 2 μm , adequate adhesion may not be exhibited. When the thickness of the adhesive layer exceeds 20 μm , peeling it from the ring frame may leave the residue of the adhesive on the ring frame and contaminate the ring frame.

[0137]

When an adhesive member comprising a base and an adhesive layer is used as the ring frame holding means, the ring frame is adhered to the adhesive layer constituting the adhesive member.

The adhesive component in the adhesive layer is similar to the adhesive in the aforementioned adhesive layer in the adhesive member consisting of the adhesive layer alone. The thickness of the adhesive layer is also similar.

[0138]

Examples of the base constituting the ring frame holding means include, but not limited to, polyethylene films, polypropylene films, ethylene-vinyl acetate copolymer films, ethylene-(meth)acrylic acid copolymer films, ethylene-(meth)acrylic acid ester copolymer films, polyolefin films such as ionomer resin films, polyvinyl chloride films, and polyethylene terephthalate films. Of these, polyethylene films and polyvinyl chloride films are preferable, and polyvinyl chloride films are more preferable, considering the expandability.

[0139]

The base constituting the ring frame holding means preferably has a thickness of 5 to 200 μm , more preferably 10 to 150 μm , further preferably 20 to 100 μm .

[0140]

When a double-sided adhesive member having a core material is used as the ring frame holding means, the double-sided adhesive member comprises the core material, a lamination adhesive layer formed on its one side, and a fixation adhesive layer formed on the other side. The lamination adhesive layer is an adhesive layer attached to the resin film formation layer, and the fixation adhesive layer is an adhesive layer attached to the ring frame.

[0141]

Examples of the core material of the double-sided adhesive member are similar to those for the base of the aforementioned adhesive member. Of these,

polyolefin films and plasticized polyvinyl chloride films are preferable, considering the expandability.

[0142]

The thickness of the core material is usually 5 to 200 μm , preferably 10 to 150 μm , more preferably 20 to 100 μm .

[0143]

The lamination adhesive layer and the fixation adhesive layer of the double-sided adhesive member may be layers of the same adhesive or different adhesives. The adhesive is appropriately selected so that the adhesive force between the fixation adhesive layer and the ring frame becomes weaker than the adhesive force between the resin film formation layer and the lamination adhesive layer. Examples of such an adhesive include acrylic adhesives, rubber-based adhesives, and silicone adhesives. Of these, acrylic adhesives are preferable in consideration of removability from the ring frame. The adhesive in the fixation adhesive layer may be a single adhesive or a mixture of two or more adhesives. The same applies to the lamination adhesive layer.

[0144]

The thickness of the lamination adhesive layer and the fixation adhesive layer is the same as the thickness of the adhesive layer of the aforementioned adhesive member.

[0145]

The ring frame holding means makes it easy to adhere the resin film formation layer-equipped support sheet to a jig such as a ring frame.

[0146]

[Continuous release sheet]

The continuous release sheets 14, 24, and 34 serve as a carrier film during use of a resin film forming sheet, and the release sheets taken as examples of the aforementioned support sheet can be used as these sheets.

[0147]

The surface tension of the surface of the continuous release sheet that is in contact with the resin film formation layer is preferably 40 mN/m or less, more preferably 37 mN/m or less, particularly preferably 35 mN/m or less. The lower limit value is usually about 25 mN/m. However, when a release sheet is used as the support sheet, the continuous release sheet is preferably of a light peeling type.

Specific examples, the release agent, the release treatment method, and the like of the continuous release sheet are the same as those of the release sheet as an example of the support sheet described above.

[0148]

The thickness of the continuous release sheet, which is not limited to a particular one, is preferably 30 μm or more, more preferably 50 to 200 μm . When the release film has a thickness of less than 30 μm , winding the resin film forming sheet into a roll may leave winding marks on the resin film formation layer.

[0149]

A usage mode of the rolled body of the aforementioned continuous laminated sheet will be briefly described with reference to FIGS. 6A and 6B, taking the continuous laminated sheet according to the first embodiment as an example.

First, the continuous laminated sheet 2 is unwound from the rolled body 1, the resin film formation layer-equipped support sheet 10 is peeled from the continuous release sheet 14 while being bent at a steep angle by a peel plate 40, and the resin film formation layer-equipped support sheet 10 is attached to a chip group package 44. At the same time, a ring frame 45 is fixed to the ring frame holding means 13. The redundant sheets (the release sheet 14 and the auxiliary sheet 15) are wound via guide rollers 42 and 43 and collected as a waste tape 46. Note that the auxiliary sheet 15 is not shown in FIG. 6A. Next, the resin film formation layer 12 and the chip group package 44 are completely cut and diced, and the support sheet 11 is not completely cut. A package divided after the dicing is separated from the support

sheet 11 together with the resin film formation layer 12 to obtain a package to which the resin film formation layer is transferred. When the resin film formation layer is used as a protective film, the resin film formation layer may be cured before dicing or after dicing to obtain the protective film. When the resin film formation layer is used as an adhesive layer, the package is attached to a predetermined adherend with the resin film formation layer therebetween, and the resin film formation layer is cured if necessary.

Such a process is performed according to the method described in WO2015/146254 relating to formation or transfer of protective film or adhesive layer on semiconductor wafers or chips.

[0150]

With the rolled body of the continuous laminated sheet of the present invention, the wide portion of the auxiliary sheet does not overlap the portion (usage area) of the resin film formation layer to which the chip group package is attached; thus, no winding marks occur on the usage area of the resin film formation layer. Further, even if the wide portion and the resin film formation layer overlap with each other, winding marks on the resin film formation layer are small and do not affect the adhesiveness. This leads to stable attachment of the chip group package and makes the thickness of the obtained resin film uniform.

Reference Signs List

[0151]

1, 3, 5...Rolled body

2, 4, 6...Continuous laminated sheet

10...Resin film formation layer-equipped support sheet of first embodiment

11...Support sheet

12...Resin film formation layer

13...Ring frame holding means

14...Continuous release sheet

15...Auxiliary sheet

20...Resin film formation layer-equipped support sheet of second embodiment

21...Support sheet

21A...Base

21B...Adhesive layer

22...Resin film formation layer

23...Ring frame holding means

24...Continuous release sheet

25...Auxiliary sheet

30...Resin film formation layer-equipped support sheet of third embodiment

31...Support sheet

32...Resin film formation layer

33...Ring frame holding means

34...Continuous release sheet

35...Auxiliary sheet

40...Peel plate

41, 42, 43...Guide roller

44...Chip group package

45...Ring frame

46...Waste tape

What is claimed is:

1. A rolled body of a continuous laminated sheet, comprising:
a resin film formation layer-equipped support sheet including an approximately rectangular support sheet, an approximately rectangular resin film formation layer formed on the support sheet, and an approximately rectangular ring frame holding means, that is used to hold a ring frame in a region surrounding the resin film formation layer in a plan view; and
a continuous release sheet, wherein
continuous auxiliary sheets are seamlessly laminated at both traverse ends of a release treatment surface of the release sheet,
the continuous laminated sheet in which a plurality of resin film formation layer-equipped support sheets are releasably, independently, and temporarily attached on a lateral inner portion of the release treatment surface of the release sheet along a longitudinal direction of the release sheet is wound into a roll, and
 $W2/W1 \leq 1.6$ is satisfied where W1 is a distance between the resin film formation layer and an outer end of the auxiliary sheet in a plan view from the resin film formation layer side after removal of the release sheet, and W2 is a width of the auxiliary sheet in a widest portion of the auxiliary sheet in the plan view.