

METHOD FOR PRODUCING SEMICONDUCTOR DEVICE
AND APPARATUS USABLE THEREIN

Background of the Invention and Related Art Statement

The present invention relates to a method for producing semiconductor devices, and to a packaging device usable in the method.

5 JP-A-3-131048 discloses a burn-in test method in which semiconductor chips are mounted directly on a substrate to be tested on the substrate.

JP-63-204621 discloses an aging test device in which wafers each including thereon semiconductor
10 chips are mounted on a container plate to be tested on the container plate by a probe body.

Object and Summary of the Invention

An object of the present invention is to provide a method for producing semiconductor devices,
15 and to a packaging device usable in the method, whereby each of the semiconductor devices is easily and securely inspected.

According to the present invention, a method for producing semiconductor devices, comprises the
20 steps of:

forming electric circuits on a semiconductor wafer,

cutting off the semiconductor wafer to be divided to the semiconductor devices respectively

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including the electric circuits so that the semiconductor devices are separated away from each other,

mounting a plurality of the semiconductor devices onto a packaging device for keeping a

5 positional relationship among the semiconductor devices and a positional relationship between the packaging device and each of the semiconductor devices constant with a spacing between the semiconductor devices on the packaging device,

10 transferring the packaging device holding thereon the plurality of the semiconductor devices onto an inspection device so that each of the semiconductor devices on the packaging device is inspected on the inspection device while the positional relationship
15 among the semiconductor devices and the positional relationship between the packaging device and the each of the semiconductor devices are kept constant on the packaging device, and

removing the semiconductor devices from the
20 packaging device after the each of the semiconductor devices on the packaging device is inspected on the inspection device, so that the semiconductor devices are separated away from each other to be useable independent of each other.

25 Since, when the plurality of the discrete semiconductor devices are transferred onto the inspection device and are inspected on the inspection device, the plurality of the discrete semiconductor devices are

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held in the packaging device so that at least a part of the electrode of each of the semiconductor devices is covered by the packaging device to prevent the at least a part of the electrode of the each of the semiconductor devices from facing to an environment surrounding the packaging device in the thickness direction of the semiconductor devices, the positional relationship among the discrete semiconductor devices and the positional relationship between the packaging device and the each of the discrete semiconductor devices are kept constant with the spacing between the discrete semiconductor devices on the packaging device, the each of the discrete semiconductor devices is easily and securely inspected without an interference between the semiconductor devices and a direct damage of the each of the discrete semiconductor devices from the environment surrounding the packaging device.

At least one of an inspection for judging whether or not the each of the semiconductor devices is useable after at least one of a predetermined temperature and a predetermined voltage is applied to the each of the semiconductor devices during a predetermined time period and an inspection for judging whether or not the each of the semiconductor devices performs a predetermined operating characteristic in a predetermined environment condition may be carried out on the inspection device. The method may further comprise the step of selecting the semiconductor devices to be

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mounted onto the packaging device from the semiconductor devices formed on the semiconductor wafer on the basis of a relationship between an electrical input and an electrical output on each of the semiconductor devices. The selecting step may be carried out after the semiconductor wafer is cut off to be divided to the semiconductor devices or before the semiconductor wafer is cut off to be divided to the semiconductor devices. A number of the semiconductor devices held on the packaging device when the packaging device is transferred onto the inspection device may be smaller than a number of the semiconductor devices formed on the semiconductor wafer.

If all of the semiconductor devices are pressed against the packaging device by an elastic member while the each of the semiconductor devices on the packaging device is inspected on the inspection device, the inspection on the each of the semiconductor devices is stably carried out while preventing an interference between the semiconductor devices. It is preferable for stable inspection on the each of the semiconductor devices that a direction in which all of the semiconductor devices are pressed against the packaging device by the elastic member is opposite to a direction in which an electrically conductive member of the packaging device is pressed against an electrode of the each of the semiconductor devices on the packaging device, in a thickness direction of the semiconductor

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devices.

The packaging device may be pressed against the inspection device while the each of the semiconductor devices on the packaging device is inspected on the inspection device. It is preferable for stable inspection on the each of the semiconductor devices that a direction in which the packaging device is pressed against the inspection device is opposite to the direction in which the electrically conductive member of the packaging device is pressed against the electrode of the each of the semiconductor devices on the packaging device.

According to the present invention, a packaging device for holding thereon a plurality of semiconductor devices to be inspected on an inspection device including a probe to be electrically connected to an electrode of each of the semiconductor devices, comprises,

holes for respectively receiving detachably therein the semiconductor devices to keep a positional relationship among the semiconductor devices and a positional relationship between the packaging device and each of the semiconductor devices constant with a spacing between the semiconductor devices, in a direction perpendicular to a thickness direction of the semiconductor devices or directions perpendicular to each other and perpendicular to the thickness direction of the semiconductor devices, and

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electrically conductive members adapted to be connected respectively to the electrodes of the semiconductor devices, and extending to an exterior of the packaging device so that the probe is connected to
5 each of the electrically conductive members.

Since the semiconductor devices are received respectively by the holes to keep the positional relationship among the semiconductor devices and the positional relationship between the packaging device
10 and each of the semiconductor devices constant with the spacing between the semiconductor devices, in the direction perpendicular to the thickness direction of the semiconductor devices or directions perpendicular to each other and perpendicular to the thickness
15 direction of the semiconductor devices, and the electrically conductive members are connected respectively to the electrodes of the semiconductor devices when the each of the semiconductor devices is inspected, and extend to an exterior of the packaging
20 device so that the probe is connected to the each of the electrically conductive members, the each of the discrete semiconductor devices is easily and securely inspected without an interference between the discrete semiconductor devices and a direct damage of the each
25 of the discrete semiconductor devices from the environment surrounding the packaging device.

Ends of the electrically conductive members exposed to the exterior of the packaging device may be

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more widely distributed over a surface of the packaging device in comparison with an arrangement of the electrodes on the semiconductor devices.

If a main component (for example, Si) of a part of the packaging device surrounding the holes is equal to that (for example, Si) of the semiconductor devices, a thermal stress between the holes and the semiconductor devices is decreased irrespective of temperature change of the packaging device.

10 If an elastic member presses all of the semiconductor devices against the packaging device in the thickness direction of the semiconductor devices when the each of the semiconductor devices on the packaging device is inspected on the inspection device, 15 the inspection on the each of the semiconductor devices is stably carried out while preventing an interference between the semiconductor devices. It is preferable for stable inspection on the each of the semiconductor devices that a direction in which all of the semiconductor devices are pressed against the packaging device 20 by the elastic member is opposite to a direction in which the electrically conductive members are pressed against respectively the semiconductor devices, in the thickness direction of the semiconductor devices. The 25 probe and the each of the electrically conductive members may be elastically connected to each other.

If the packaging device includes a first sheet for supporting the semiconductor devices in the

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thickness direction of the semiconductor devices, and a second sheet having the holes, the first and second sheets are stacked in the thickness direction of the semiconductor devices, and the electrically conductive members extending through the first sheet in the thickness direction of the semiconductor devices, a complex structure of the packaging device can be easily and correctly formed. If a main component of the second sheet (for example, Si) is equal to that of the semiconductor devices, a thermal stress between the second sheet and the semiconductor devices is decreased irrespective of temperature change of the packaging device. The packaging device may further comprise a third sheet having through holes and covering the second sheet, wherein the first, second and third sheets are stacked in the thickness direction of the semiconductor devices while the through holes are aligned respectively with the holes in the thickness direction of the semiconductor devices, and opening areas of the through holes are larger than those of the holes to prevent the semiconductor devices from being positioned respectively by the through holes, so that the second sheet made with high-accuracy for positioning correctly the semiconductor devices is wholly protected by the third sheet while the third sheet is prevented from deteriorating the positioning of the semiconductor devices in the holes.

If the packaging device further comprises a

support part on which an end of the each of the electrically conductive members is arranged, wherein the support part has a pair of projections between which the end of the each of the electrically conductive members is arranged in the direction perpendicular to the thickness direction of the semiconductor devices, and the end of the each of the electrically conductive members and both of the projections are adapted to contact with the each of the semiconductor devices so that an area of the support part between the end of the each of the electrically conductive members and each of the projections is prevented from contacting with the each of the semiconductor devices, an area of the each of the semiconductor devices adjacent to the electrode is prevented from being pressed by the support part while the electrode and another area of the each of the semiconductor devices distant away from the electrode are pressed by the support member and an attitude of the end of the each of the electrically conductive members relative to the each of electrodes is correctly kept by the projections of the support part both contacting with the each of the semiconductor devices. Generally, the area of the each of the semiconductor devices or chips adjacent to the electrode includes an easily-breakable electric circuit.

If a clearance is formed between each of the holes and each of the semiconductor devices in both

directions perpendicular to each other and perpendicular to the thickness direction of the semiconductor device to prevent the each of the semiconductor devices from being compressed in the each of the holes in the both directions irrespective of temperature change of at least one of the packaging device and the each of the semiconductor devices when the each of the semiconductor devices is inspected on the inspection device, the each of the semiconductor devices can be inspected by stress-free condition in the both directions even when a difference in expansion or contraction between of the packaging device and the each of the semiconductor devices is caused by the temperature change.

15 If at least a part of the electrode of each of the semiconductor devices is covered by the packaging device to prevent the at least a part of the electrode of the each of the semiconductor devices from facing to an environment surrounding the packaging device in the thickness direction of the semiconductor devices, the part of the electrode of the each of the semiconductor devices is restrained from being damaged from the environment.

25 If the packaging device comprises support parts on each of which an end of the each of the electrically conductive members is arranged, and a pair of slits between which each of the support part with the end is arranged in the direction perpendicular to

the thickness direction of the semiconductor devices, a rigidity of the support part is decreased effectively even when a size of the support part and a distance between the support parts are significantly small.

5 If an exposed area of an end of the each of the electrically conductive members adapted to face to the each of the semiconductor devices is smaller than an exposed area of another end of the each of the electrically conductive members on the exterior of the
10 packaging device as seen in the thickness direction of the semiconductor devices, an electrical capacitance between the end of the each of the electrically conductive members facing to the each of the semiconductor devices and the each of the electrodes contacting with
15 the end of the each of the electrically conductive members is kept small while the exposed area of the another end of the each of the electrically conductive members on the exterior of the packaging device is sufficiently large for being easily and securely
20 contacted with the probe of the inspection device.

Brief Description of the Drawings

Fig. 1 is a schematic oblique-projection view showing a packaging device of the invention mounted on an inspection device.

25 Fig. 2 is a flow chart carried out in a method of the invention.

Fig. 3 is a schematic oblique-projection view

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showing a wafer on which semiconductor devices are formed.

Fig. 4 is a schematic oblique-projection view showing an example of a semiconductor device to be
5 produced by the method or to be housed by the packaging device.

Fig. 5 is a schematic oblique-projection view showing elements of the packaging device.

Fig. 6 is a schematic oblique-projection view
10 showing one of the elements for supporting the semiconductor devices in a thickness direction of the semiconductor devices with electrically conductive members therein for connecting each of electrodes of the semiconductor devices to a probe of the inspection
15 device.

Fig. 7a is a schematic oblique-projection view showing a surface of the one of the elements facing to the semiconductor devices.

Fig. 7b is a schematic oblique-projection
20 view showing a reverse surface of the one of the elements facing to the inspection device.

Fig. 8 is a schematic oblique-projection view showing the packaging device of the invention onto which the semiconductor devices are being mounted.

25 Fig. 9a is a schematic oblique-projection view showing a surface of the packaging device in which the semiconductor devices are set completely.

Fig. 9b is a schematic oblique-projection

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view showing a reverse surface of the packaging device of Fig. 9a.

Fig. 10a is a schematic oblique-projection view showing the inspection device before the packaging device is mounted on the inspection device.

Fig. 10b is a schematic oblique-projection view showing the inspection device after the packaging device is mounted on the inspection device.

Fig. 11 is a partially cross-sectional view showing a connection from electrodes of the semiconductor devices to the probe through the electrically conductive members.

Fig. 12 is a partially cross-sectional side view showing the probes to be connected to the electrically conductive members.

Fig. 13 is a partially cross-sectional side view showing a structure of the packaging device for supporting an area adjacent to each of the electrodes while the electrodes contact respectively with the electrically conductive members.

Detailed Description of Preferred Embodiments

Along a flow chart shown in Fig. 2, in a method for producing semiconductors the following processes are carried out:

- (1) preparation process (for example, forming electric circuits on a wafer),
- (2) pre-inspection by probe,

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- (3) dicing wafer to form semiconductor devices,
- (4) mounting the semiconductor device into a packaging device,
- (5) burn-in treatment,
- 5 (5-1) mounting the packaging device onto a burn-in device,
- (5-2) performing burn-in treatment,
- (5-3) taking out the packaging device from the burn-in device,
- 10 (6) transferring the packaging device from the burn-in device to an operation inspection device,
- (7) operation inspection,
- (7-1) mounting the packaging device onto the operation inspection device,
- 15 (7-2) performing operation inspection,
- (7-3) taking out the packaging device from the operation inspection device,
- (8) taking out the semiconductor device from the packaging device.
- 20 (1) preparation process

The semiconductor devices (for example, LSI circuits) 1b are formed on a semiconductor wafer 1a in a wafer process apparatus including a diffusion device, a photo-etching device, an epitaxial device and so forth. As shown in Fig. 4, each of the semiconductor devices 1b has a group of electrodes 1c of Al or Cu each of which has a length of 10-200 μm and a thickness of about 1 μm . The electrodes 1c are surrounded by a

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protect layer 1b1 of synthetic resin with a thickness of about 1-10 μm . The protect layer 1b1 may be prevented from extending to an outer peripheral edge of the semiconductor device 1b to form a non-protect-layer bare chip area 1b2 of a width about 10-300 μm between the outer peripheral edge and the protect layer 1b1, after the semiconductor devices 1a are cut out from the wafer. The non-protect-layer bare chip area 1b2 may be arranged at another area or various areas other than an outer peripheral area of the semiconductor device 1b.

(2) pre-inspection by probe

Each of the semiconductor devices 1b on the wafer is inspected by contacting a probe of a pre-inspection device with each of the electrodes 1c.

(3) dicing wafer to form semiconductor devices

The wafer is cut off by a dicer or the like to be divided to the semiconductor devices 1b as shown in Fig. 4.

(4) mounting the semiconductor device into a packaging device

The semiconductor devices 1b of a predetermined number not less than two and less than a number of the semiconductor devices 1b formed on the wafer are mounted onto a packaging device.

As shown in Fig. 5, the packaging device includes a base 3, a contact member 5 as the claimed first sheet, a positioning tray 4 as the claimed second sheet, a tray cover 4b as the claimed third sheet,

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elastic members 9 and a closure cover 9.

The base 3 and the closure cover 9 are made of thermosetting resin, aluminum, stainless steel or ceramic, and are machined after being molded. The base
5 3 and the closure cover 9 reinforce the contact member 5 and the positioning tray 4 to keep their shape constant against a force applied to the packaging device. The closure cover 9 is swingably supported on the base 3 through hinges 3a.

10 The positioning tray 4 has holes 4a distant from each other. The positioning tray 4 may be divided to a plurality of positioning tray elements as shown in Fig. 5. A main component of the positioning tray 4 is preferably equal to that (for example, Si) of the
15 semiconductor devices 1b to decrease a difference in coefficient of thermal expansion between the positioning tray 4 and the semiconductor devices 1b. A metallic material or ceramic (for example, aluminum-nitride) whose coefficient of thermal expansion is
20 similar to a coefficient of thermal expansion of the semiconductor devices 1b may be used as a material of the positioning tray 4. The semiconductor devices 1b are accurately positioned in the holes 4a in both directions perpendicular to each other and perpendicular
25 ular to a thickness direction of the semiconductor devices 1b.

As shown in Figs. 6 and 7a, a surface of the contact member 5 facing to the semiconductor devices 1b

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includes ends 5a of electrically conductive members 5b to be contacted respectively with the electrodes 1c.

As shown in Fig. 7b, another or reverse surface of the contact member 5 arranged on an exterior of the

5 packaging device includes ends 5c of the electrically conductive members 5b to be contacted respectively with a probe of an inspection device. The electrically conductive members 5b extend through or over the contact member 5 from the ends 5a to the ends 5c.

(10 A main component of the contact member 5 is preferably equal to that (for example, Si) of the semiconductor devices 1b to decrease a difference in coefficient of thermal expansion between the contact member 5 and the semiconductor devices 1b. A metallic 15 material or ceramic (for example, aluminum-nitride) whose coefficient of thermal expansion is similar to a coefficient of thermal expansion of the semiconductor devices 1b may be used as a material of the contact member 5. The contact member 5 may be made of glass- 20 epoxy, ceramic or organic material such as polyimide.

The elastic members 8 press respectively the semiconductor devices 1b against the contact member 5, and are made of an elastomer such as silicone-rubber. The elastic members 8 may be springs such as coil- 25 springs.

The tray cover 4b and the is made of thermo-setting resin, aluminum, stainless steel or ceramic as similar to the base 3 and the closure cover 9, and are

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machined after being molded. The tray cover 4b protects the positioning tray 4 and the contact member 5 against the semiconductor devices 1b to be inserted in the holes 4a or contaminant.

5 The closure cover 9 covers wholly the semiconductor devices 1b as seen in the thickness direction of the semiconductor devices 1b.

 The ends 5c of the electrically conductive members 5b exposed to the exterior of the packaging
10 device are more widely distributed over the another or reverse surface of the packaging device in comparison with an arrangement of the electrodes 1c on the semiconductor devices 1b, and an exposed area of each of the ends 5c is significantly larger than an exposed
15 area of each of the electrodes 1c and an exposed area of each of the ends 5a on the surface of the contact member 5 facing to the semiconductor devices 1b as seen in the thickness direction of the semiconductor devices 1b so that a capacitance between the each of the
20 electrodes 1c and each of the ends 5a is kept small while the exposed area of each of the ends 5c is sufficiently large for being easily and securely contacted with a probe of an inspection device. A distance between central positions of the ends 5c is
25 preferably about 0.5-1.5 mm, and an area of the ends 5c as seen in the semiconductor thickness direction is preferably about 0.1-1 mm².

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(5) burn-in treatment

The packaging device containing the semiconductor devices 1b is heated to keep temperature of the semiconductor devices 1b at 100-150 °C for a
5 predetermined time period while an electric stress (voltage) is applied to each of the semiconductor devices 1b through the electrode 1c and the electrically conductive member 5b, so that an occurrence of problem of each of the semiconductor devices 1b is
10 accelerated.

(5-1) mounting the packaging device onto a burn-in device

The packaging device is put into a socket 10 on an printed plate 6 through which the electric stress
15 (voltage) is applied to the each of the semiconductor devices 1b in the packaging device during the burn-in treatment, as shown in Fig. 10a. The packaging device is compressed into the socket 10 by a cover to keep the electrical communication between the electrically
20 conductive members 5b and the printed plate 6, as shown in Fig. 10b. As shown in Fig. 11, contact probes 6a extending from the printed plate 6 contact respectively with the ends 5c of the electrically conductive members 5b to energize the semiconductor devices 1b during the
25 burn-in treatment. The contact probes 6a of bent metallic plate as shown in Fig. 12 may be replaced by land areas contacting with the ends 5c or coil-spring-supported bars as shown in Fig. 13.

As shown in Fig. 13, a support surface of the contact member 5 on which the ends 5a of the electrically conductive members 5b are arranged has spacer projections 5d between which each of the ends 5a is arranged (a pair of the spacer projections and the each of the ends 5a between the spacer projections 5d of the pair are aligned along a substantially straight imaginary line on the support surface). The spacer projections 5d and the ends 5a contact with the semiconductor devices 1b to form securely a space between the contact member 5 and the semiconductor devices 1b at a region of the support surface between the each of the ends 5a and each of the spacer projections 5d of the pair along the substantially straight imaginary line. The spacer projections 5d preferably contact with the non-protect-layer bare chip area 1b2.

By the space between the contact member 5 and the semiconductor devices 1b at the region of the support surface between the each of the ends 5a and the each of the spacer projections 5d of the pair along the substantially straight imaginary line:

an easily breakable important area of the semiconductor device 1b including thereon an electric circuit under and around the electrodes 1c (corresponding to substantially an area of the protect layer 1b1 is prevented from being compressed by the contact member 5, and an unimportant area of the semiconductor

device 1b is compressed by the contact member 5 to hold the semiconductor device 1b,

a capacitance between the contact member 5 and the semiconductor device 1b is decreased to improve a responding characteristic of the semiconductor device 1b relative to a high-frequency input signal,

the easily breakable important area of the semiconductor device 1b is prevented from being pressed to be damaged by contaminant between the contact member 5 and the semiconductor device 1b, and

an attitude of the ends 5a to be freely changeable in accordance with a shape of the electrode 1c is prevented from being undesirably and strongly fixed by a region of the support surface close to the electrodes.

(5-2) performing burn-in treatment

A thermal stress and the electric stress are applied to the semiconductor devices 1b for a long time period, so that an occurrence of problem of each of the semiconductor devices 1b is accelerated.

(5-3) taking out the packaging device from the burn-in device

The packaging device is removed from the socket 10 after the burn-in treatment

(6) transferring the packaging device from the burn-in device to an operation inspection device

(7) operation inspection

(7-1) mounting the packaging device onto the

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operation inspection device

The packaging device is put into a socket on
an printed plate for operation inspection

(7-2) performing operation inspection

5 An operational characteristic of each of the
semiconductor devices 1b is inspected by energizing the
semiconductor devices 1b and detecting output signals
of the semiconductor devices 1b through the electrodes
1c and the electrically conductive members 5b while the
10 semiconductor devices 1b are heated to 25-75°C.

(7-3) taking out the packaging device from the
operation inspection device

The packaging device is taken out from the
socket.

15 (8) taking out the semiconductor device from the
packaging device

The semiconductor devices 1b are taken out
from the packaging device to be used independent of
each other.

What is claimed is:

1. A method for producing semiconductor devices, comprising the steps of:

- forming electric circuits on a semiconductor wafer,
- cutting off the semiconductor wafer to be divided to the semiconductor devices respectively including the electric circuits so that the semiconductor devices are separated away from each other,
- mounting a plurality of the semiconductor devices onto a packaging device for keeping a positional relationship among the semiconductor devices and a positional relationship between the packaging device and each of the semiconductor devices constant with a spacing between the semiconductor devices on the packaging device,
- transferring the packaging device holding thereon the plurality of the semiconductor devices onto an inspection device so that each of the semiconductor devices on the packaging device is inspected on the inspection device, while the positional relationship among the semiconductor devices and the positional relationship between the packaging device and each of the semiconductor devices are kept constant on the packaging device, and
- removing the semiconductor devices from the packaging device after each of the semiconductor devices on the packaging device is inspected on the inspection device, so that the semiconductor devices are separated away from each other to be useable independent of each other.

2. A method according to claim 1, wherein at least one of an inspection for judging whether or not each of the semiconductor devices is useable after at least one of a predetermined temperature and a predetermined voltage is applied to each of the semiconductor devices during a predetermined time period and an inspection for judging whether or not each of the semiconductor devices performs a predetermined operating characteristic in a predetermined environment condition is carried out on the inspection device.

3. A method for producing semiconductor devices, comprising the steps of:

- forming electric circuits on a semiconductor wafer,
- cutting off the semiconductor wafer to be divided to the semiconductor devices respectively including the electric circuits so that the semiconductor devices are separated away from each other,
- mounting a plurality of the semiconductor devices onto a packaging device for keeping a positional relationship among the semiconductor devices and a positional relationship between the packaging device and each of the semiconductor devices constant with a spacing between the semiconductor devices on the packaging device,
- transferring the packaging device holding thereon the plurality of the semiconductor devices onto an inspection device so that each of the semiconductor devices on the packaging device is inspected on the inspection device, while the positional relationship among the semiconductor devices and the positional relationship between the packaging device and the each of the semiconductor devices are kept constant on the packaging device, and
- removing the semiconductor devices from the packaging device after the each of the semiconductor devices on the packaging device is inspected on the inspection device, so that the semiconductor devices are separated away from each other to be useable independent of each other, further comprising the step of selecting the semiconductor devices to be mounted onto the packaging device from the semiconductor devices formed on the semiconductor wafer on the basis of a relationship between an electrical input and an electrical output on each of the semiconductor devices.

4. A method according to claim 3, wherein the selecting step is carried out after the semiconductor wafer is cut off to be divided to the semiconductor devices.

5. A method according to claim 3, wherein the selecting step is carried out before the semiconductor wafer is cut off to be divided to the semiconductor devices.

6. A method according to claim 1, wherein a number of the semiconductor devices held on the packaging device when the packaging device is transferred onto the inspection device is smaller than a number of the semiconductor devices formed on the semiconductor wafer.

7. A method for producing semiconductor devices, comprising the steps of:

- forming electric circuits on a semiconductor wafer,
- cutting off the semiconductor wafer to be divided to the semiconductor devices respectively including the electric circuits so that the semiconductor devices are separated away from each other,
- mounting a plurality of the semiconductor devices onto a packaging device for keeping a positional relationship among the semiconductor devices and a positional relationship between the packaging device and each of the semiconductor devices constant with a spacing between the semiconductor devices on the packaging device,
- transferring the packaging device holding thereon the plurality of the semiconductor devices onto an inspection device so that each of the semiconductor devices on the packaging device is inspected on the inspection device, while the positional relationship among the semiconductor devices and the positional relationship between the packaging device and the each of the semiconductor devices are kept constant on the packaging device, and
- removing the semiconductor devices from the packaging device after the each of the semiconductor devices on the packaging device is inspected on the inspection device, so that the semiconductor devices are separated away from each other to be useable independent of each other, wherein all of the semiconductor devices are pressed against the packaging device by an elastic member while the each of the semiconductor devices on the packaging device is inspected on the inspection device.

8. A method according to claim 7, wherein a direction in which all of the semiconductor devices are pressed against the packaging device by the elastic member is opposite to a direction in which electrically conductive member of the

packaging device is pressed against an electrode of the each of the semiconductor devices on the packaging device, in a thickness direction of the semiconductor devices.

9. A method for producing semiconductor devices, comprising the steps of:

- forming electric circuits on a semiconductor wafer,
- cutting off the semiconductor wafer to be divided to the semiconductor devices respectively including the electric circuits so that the semiconductor devices are separated away from each other,
- mounting a plurality of the semiconductor devices onto a packaging device for keeping a positional relationship among the semiconductor devices and a positional relationship between the packaging device and each of the semiconductor devices constant with a spacing between the semiconductor devices on the packaging device,
- transferring the packaging device holding thereon the plurality of the semiconductor devices onto an inspection device so that each of the semiconductor devices on the packaging device is inspected on the inspection device, while the positional relationship among the semiconductor devices and the positional relationship between the packaging device and the each of the semiconductor devices are kept constant on the packaging device, and
- removing the semiconductor devices from the packaging device after the each of the semiconductor devices on the packaging device is inspected on the inspection device, so that the semiconductor devices are separated away from each other to be useable independent of each other, wherein the packaging device is pressed again the inspection device while the each of the semiconductor devices on the packaging device is inspected on the inspection device.

10. A method according to claim 9, wherein a direction in which the packaging device is pressed against the inspection device is opposite to a direction in which an electrically conductive member of the packaging device is pressed against an

electrode of the each of the semiconductor devices on the packaging device.

11. A method for producing semiconductor devices, comprising the steps of:

- forming electric circuits on a semiconductor wafer,
- cutting off the semiconductor wafer to be divided to the semiconductor devices respectively including the electric circuits so that the semiconductor devices are separated away from each other,
- mounting a plurality of the semiconductor devices onto a packaging device for keeping a positional relationship among the semiconductor devices and a positional relationship between the packaging device and the semiconductor devices,
- transferring the packaging device holding thereon the plurality of the semiconductor devices onto an inspection device so that each of the semiconductor devices on the packaging device is inspected on the inspection device by electrically connecting the semiconductor devices to the inspection device, while the semiconductor devices are held by the packaging device, and
- removing the semiconductor devices from the packaging device after the semiconductor devices on the packaging device are inspected on the inspection device.

12. A method according to claim 11, wherein at least one of an inspection for judging whether or not the each of the semiconductor devices is useable after at least one of a predetermined temperature and a predetermined voltage is applied to the each of the semiconductor devices during a predetermined time period and an inspection for judging whether or not the each of the semiconductor devices performs a predetermined operating characteristic in a predetermined environment condition is carried out on the inspection device.

13. A method according to claim 11, further comprising the step of selecting the semiconductor devices to be mounted onto the packaging device from the semiconductor devices formed on the semiconductor wafer on the basis of a

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relationship between an electrical input and an electrical output on each of the semiconductor devices.

14. A method according to claim 13, wherein the selecting step is carried out after the semiconductor wafer is cut off to be divided to the semiconductor devices.

15. A method according to claim 13, wherein the selecting step is carried out before the semiconductor wafer is cut off to be divided to the semiconductor devices.

16. A packaging device for holding thereon a plurality of semiconductor devices to be inspected on an inspection device including a probe to be electrically connected to an electrode of each of the semiconductor devices, comprising,

holes for respectively receiving detachably therein the semiconductor devices to keep a positional relationship among the semiconductor devices and a positional relationship between the packaging device and each of the semiconductor devices constant with a spacing between the semiconductor devices, in a direction perpendicular to a thickness direction of the semiconductor devices, and

electrically conductive members adapted to be connected respectively to the electrodes of the semiconductor devices, and extending to an exterior of the packaging device so that the probe is connected to each of the electrically conductive members.

17. A packaging device according to claim 16, wherein a main component of a part of the packaging device surrounding the holes is equal to that of the

semiconductor devices.

18. A packaging device according to claim 16, further comprising an elastic member for pressing all of the semiconductor devices on the packaging device against the packaging device in the thickness direction of the semiconductor devices when the each of the semiconductor devices on the packaging device is inspected on the inspection device.

19. A packaging device according to claim 18, wherein a direction in which all of the semiconductor devices are pressed against the packaging device by the elastic member is opposite to a direction in which the electrically conductive members are pressed against respectively the semiconductor devices, in the thickness direction of the semiconductor devices.

20. A packaging device according to claim 16, wherein the probe and the each of the electrically conductive members are elastically connected to each other.

21. A packaging device according to claim 16, wherein the packaging device includes a first sheet for supporting the semiconductor devices in the thickness direction of the semiconductor devices, and a second sheet having the holes, the first and second sheets are stacked in the thickness direction of the semiconductor devices, and the electrically conductive members extend through the first sheet in the thickness direction of the semiconductor devices.

22. A packaging device according to claim 21, wherein a main component of the second sheet is equal to that of the semiconductor devices.

23. A packaging device according to claim 21, further comprising a third sheet having through holes and covering the second sheet, wherein the first, second and third sheets are stacked in the thickness direction of the semiconductor devices while the through holes are aligned respectively with the holes in the thickness direction of the semiconductor devices, and opening areas of the through holes are larger than those of the holes to prevent the semiconductor devices from being positioned respectively by the through holes.

24. A packaging device according to claim 16, further comprising a support part on which an end of the each of the electrically conductive members is arranged, wherein the support part has a pair of projections between which the end of the each of the electrically conductive members is arranged in the direction perpendicular to the thickness direction of the semiconductor devices, and the end of the each of the electrically conductive members and both of the projections are adapted to contact with the each of the semiconductor devices so that an area of the support part between the end of the each of the electrically conductive members and each of the projections is prevented from contacting with the each of the semiconductor devices.

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25. A packaging device according to claim 16, wherein a clearance is formed between each of the holes and each of the semiconductor devices in both directions perpendicular to each other and perpendicular to the thickness direction of the semiconductor device to prevent the each of the semiconductor devices from being compressed in the each of the holes in the both directions when the each of the semiconductor devices is inspected on the inspection device.

26. A packaging device according to claim 16, wherein at least a part of the electrode of each of the semiconductor devices is covered by the packaging device to prevent the at least a part of the electrode of the each of the semiconductor devices from facing to an environment surrounding the packaging device in the thickness direction of the semiconductor devices.

27. A packaging device according to claim 16, further comprising a support part on which an end of the each of the electrically conductive members is arranged, and a pair of slits between which the support part with the end is arranged in the direction perpendicular to the thickness direction of the semiconductor devices.

28. A packaging device according to claim 16, wherein an exposed area of an end of the each of the electrically conductive members adapted to face to the each of the semiconductor devices is smaller than an exposed area of another end of the each of the electrically conductive members on the exterior of the packaging device, as seen in the thickness direction of the semiconductor devices.