



**SEMICONDUCTOR INTEGRATED CIRCUIT CARD MANUFACTURING
METHOD, AND SEMICONDUCTOR INTEGRATED CIRCUIT CARD**

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to semiconductor integrated circuit device and card manufacturing methods and semiconductor integrated circuit devices and cards.

DESCRIPTION OF THE RELATED ART

A semiconductor integrated circuit chip (IC chip) charged in a semiconductor integrated card (IC card) is sealed by the screen printing of resin.

The IC chip charged in such an IC card has a drawback that the strength thereof is low and dispersion of seal shape and seal thickness thereof is large because it is sealed by the screen printing of resin. If the strength of the IC chip is low, there is a fear that the IC chip is damaged or the connection of the electrodes of the IC chip to the circuit pattern of a substrate comes off when the IC card is bent by an external pressure. If the dispersion of the seal shape and the seal thickness of the IC chip is large, it becomes difficult to control the quality and yield of the IC card.

SUMMARY OF THE INVENTION

In view of such a point, an object of the present invention is to propose a semiconductor integrated circuit



chip seal method and a semiconductor integrated circuit chip device capable of providing a semiconductor integrated circuit chip device having extremely high strength and less dispersion of seal shape and seal thickness.

Furthermore, the present invention is about to propose such a semiconductor integrated circuit card that there is no fear that a semiconductor integrated circuit chip device is damaged or connection of the electrode thereof to the circuit pattern of a substrate comes off, and control of quality and yield thereof is easy.

A method for manufacturing a semiconductor integrated circuit card according to a first aspect of the present invention comprises a method for manufacturing a semiconductor integrated circuit device comprising the steps of:

forming a plurality of circuit patterns on a substrate;

bonding a plurality of semiconductor integrated circuit chips onto a first surface of said substrate having the circuit patterns formed thereon, and connecting electrodes of said semiconductor integrated circuit chips to each of said circuit patterns;

applying a first seal resin onto each of said semiconductor integrated circuit chips;

disposing a first reinforcement metal plate above

said first seal resin;

applying a second seal resin onto a second reinforcement metal plate;

disposing said second reinforcement metal plate on a second surface of said substrate; and

pressurizing said first and second seal resins via said first and second reinforcement metal plates so as to let flow said first and second seal resins along peripheral faces of said semiconductor integrated circuit chips;

hardening said seal resins flown along the peripheral faces of said semiconductor integrated circuit chips; and

thereafter dividing said substrate into a semiconductor integrated circuit device at every semiconductor integrated circuit chip.

According to a second aspect of the present invention, there is provided a semiconductor integrated circuit device comprising:

a substrate having a circuit pattern formed thereon;

a semiconductor integrated circuit chip bonded onto said substrate and having an electrode connected to said circuit pattern;

a first reinforcement metal plate disposed on a first surface of said semiconductor integrated circuit chip;

a second reinforcement metal plate disposed on a second surface of said semiconductor integrated circuit chip; and

a seal resin portion disposed on peripheral faces of said semiconductor integrated circuit chip and bonding said first reinforcement metal plate.

The above method and device may then be used in the manufacture of integrated circuit chip cards.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A and 1B are each a process diagram showing a semiconductor integrated circuit device according to an embodiment of the present invention;

FIGS. 2A and 2F are each a process diagram showing a seal method for an IC chip of the embodiment; and

FIG. 3 is a cross-sectional view showing an IC card by the embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A semiconductor integrated circuit chip (IC chip) seal method, a semiconductor integrated circuit chip device (IC chip device) and a semiconductor integrated circuit card (IC card), which are concrete examples of the present invention, will be described.

First of all, an IC chip seal method and an IC chip device (FIG. 1B), which are concrete examples of the present invention, will be described with reference to FIGS. 1A, 1B and FIGS. 2A and 2F. As shown in FIG. 2A, a

film substrate 401 having a plurality of circuit patterns KP formed thereon is prepared. As shown in FIG. 2B, a small quantity (fixed quantity) of bonding agent BD1 is applied onto each circuit pattern KP of the film substrate 401 of FIG. 2A or onto the film substrate 401 in each circuit pattern KP by using a dispenser. As shown in FIG. 2C, each IC chip 402 is placed on the bonding agent BD1 of each circuit pattern KP of the film substrate 401, and each IC chip 402 is pressurized. In addition, each IC chip 402 and the film substrate 401 are heated, and each IC chip 402 is bonded (stuck) to a predetermined portion of each circuit pattern KP of the film substrate 401. In addition, the electrode of each IC chip 402 is connected to a predetermined portion of a corresponding circuit pattern KP by using a solder.

As shown in FIG. 1A and FIG. 2D, a plurality of second reinforcement metal plates 405 (rectangular) each having a figure similar to the bottom face (rectangular) of the IC chip 402 and having a wider area than the bottom face of the chip 402 are provided. Onto each of the first reinforcement metal plates MP1, a predetermined quantity (fixed quantity) of seal resin 403 (bonding agent BD2) is applied by using a dispenser. This process may be conducted before, after, or in the middle of the process described above with reference to FIGS. 2A to 2C.

As shown in FIG. 2E, the film substrate FB having the IC chips 402 bonded thereto is placed on the second reinforcement metal plates 405 via the applied seal resin 403 (bonding agent BD2).

Then, as shown in FIG. 2E and FIG. 1A, a predetermined quantity (fixed quantity) of seal resin 403 (bonding agent BD3) is applied onto each IC chip 402 by using a dispenser, and the seal resin 403 (bonding agent BD3) is irradiated with ultraviolet rays and thus subjected to a temporary hardening. As shown in FIG. 2E, FIG. 1A, and FIG. 1B, a plurality of first reinforcement metal plates 404 (rectangular) each having a figure similar to the top face (rectangular) of each IC chip 402 and having a wider area than the top face of each IC chip 402 are attached to a jig, moved horizontally, and are disposed above the temporarily hardened seal resin 403 (bonding agent BD3). By using a pressurizing jig, a portion between the first and second reinforcement metal plates 404 and 405 is uniformly pressurized, while holding the parallel state among the first and second reinforcement metal plates 404 and 405 and each IC chip 402. As shown in FIG. 1B, the seal thickness is thus made constant, and also the seal resin 403 (bonding agent BD3) is let flow along the peripheral face of each IC chip 402 to bond each second reinforcement metal plate 405 to the film substrate 401 and bond each first reinforcement metal

plate 404 onto each IC chip 402 to thereby cover the peripheral face of each IC chip 402. The seal resin 403 (bonding agent BD3) is irradiated with the ultraviolet rays and thereby hardened to form a seal resin portion 406. As a result, a plurality of IC chip devices CPD each having a fixed shape and having a fixed seal thickness as shown in FIG. 1B are obtained.

Although not illustrated, the plurality of IC chip devices CPD are punched out at every circuit pattern KP, and are placed on a roll film. In addition, thin film coating is conducted over each of the IC chip device CPDs and the roll film. Thereafter, the IC chip device CPDs and the roll film are passed between heating rollers. As a result, a card coupling plate having a number of IC cards coupled in a line is obtained. This card coupling plate is cut at a fixed interval. A plurality of fixed length card coupling plates each having a predetermined number of IC cards coupled in a line are obtained. The fixed length card coupling plate is punched out at every IC card. Individual IC cards are thus obtained.

The structure of the IC card (semiconductor integrated circuit card) having an IC chip 402 enclosed therein will now be described with reference to FIG. 3. The IC chip device CPD is charged in a card substrate. In other words, the IC chip device CPD is charged in a filled resin layer 407 made of, for example, epoxy resin.

Armouring resin plates 408 and 409 made of, for example, polyethylene terephthalate are bonded to the front and the rear of the filled resin layer 407, respectively. An IC card is thus formed.

The IC card by the above-mentioned manufacturing method includes a substrate having a circuit pattern formed thereon; a semiconductor integrated circuit chip bonded onto the substrate and having an electrode connected to the circuit pattern; first and second reinforcement metal plates; and a seal resin portion for covering a peripheral face of the semiconductor integrated circuit chip, sticking the first reinforcement metal plate onto the substrate, and sticking the second reinforcement metal plate onto the semiconductor integrated circuit chip. Therefore, it is possible to obtain such a semiconductor integrated circuit chip device in which the semiconductor integrated circuit chip, the first and second reinforcement metal plates gripping the semiconductor integrated circuit chip interposed between, and the seal resin become an integral structure, so that the strength thereof is extremely high, i.e., durability against an external force, such as bending, load, and shock, applied from both the front and the rear thereof is extremely high, and the seal shape and the seal thickness have less dispersion. Therefore, such a semiconductor

integrated circuit chip device is extremely suited to be mounted on a semiconductor integrate circuit card.

According to the third present invention, a semiconductor integrated circuit chip device including a substrate having a circuit pattern formed thereon; a semiconductor integrated circuit chip bonded onto the substrate and having an electrode connected to the circuit pattern; first and second reinforcement metal plates; and a seal resin portion for covering a peripheral face of the semiconductor integrated circuit chip, sticking the first reinforcement metal plate onto the substrate and sticking the second reinforcement metal plate onto the semiconductor integrated circuit chip, is charged in a card substrate.

Therefore, it is possible to obtain such a semiconductor integrated circuit chip device or card that there is no fear of a semiconductor integrated circuit chip device being damaged or the connection of an electrode to a circuit pattern of a substrate coming off, and that control of quality and yield is easy.

Having described preferred embodiments of the present invention with reference to the accompanying drawings, it is to be understood that the present invention is not limited to the above-mentioned embodiments and that various changes and modifications can be effected therein by one skilled in the art without departing from the scope

of the present invention as defined in the appended claims.

CLAIMS

1. A method for manufacturing a semiconductor integrated circuit device comprising the steps of:

forming a plurality of circuit patterns on a substrate;

bonding a plurality of semiconductor integrated circuit chips onto a first surface of said substrate having the circuit patterns formed thereon, and connecting electrodes of said semiconductor integrated circuit chips to each of said circuit patterns;

applying a first seal resin onto each of said semiconductor integrated circuit chips;

disposing a first reinforcement metal plate above said first seal resin;

applying a second seal resin onto a second reinforcement metal plate;

disposing said second reinforcement metal plate on a second surface of said substrate; and

pressurizing said first and second seal resins via said first and second reinforcement metal plates so as to let flow said first and second seal resins along peripheral faces of said semiconductor integrated circuit chips;

hardening said seal resins flown along the peripheral faces of said semiconductor integrated circuit chips; and thereafter dividing said substrate into a semiconductor integrated circuit device at every semiconductor integrated circuit chip.

2. A method for manufacturing a semiconductor integrated circuit card, comprising :

the method of claim 1; and

the step of disposing an individually divided semiconductor circuit chip on a roll film and coating the same.

3. A method for manufacturing a semiconductor integrated circuit card according to claim 2, further comprising the step of:

heating said thin film roll on which said semiconductor integrated circuit chip coated with the thin film.

4. A method for manufacturing a semiconductor integrated circuit card according to claim 3, further comprising the step of:

thereafter manufacturing a card connected plate in which a plurality of semiconductor integrated circuit cards are connected in line; and

dividing said card connected plate into individual semiconductor integrated circuit cards.

5. A semiconductor integrated circuit device

comprising:

a substrate having a circuit pattern formed thereon;
a semiconductor integrated circuit chip bonded onto said substrate and having an electrode connected to said circuit pattern;

a first reinforcement metal plate disposed on a first surface of said semiconductor integrated circuit chip;

a second reinforcement metal plate disposed on a second surface of said semiconductor integrated circuit chip; and

a seal resin portion disposed on peripheral faces of said semiconductor integrated circuit chip and bonding said first reinforcement metal plate.

6. A semiconductor integrated circuit device according to claim 5, further comprising:

an armouring resin layer formed on both faces of said substrate having said sealed semiconductor integrated circuit chip.

7. A semiconductor integrated circuit device as claimed in claim 5 or 6, wherein said second reinforcement metal plate is bonded onto said substrate via said seal resin.

8. A semiconductor integrated circuit device as claimed in claim 5, 6 or 7, wherein said substrate is a film substrate.

9. A semiconductor integrated circuit device as

claimed in any one of claims 5 to 8, wherein said substrate is a film substrate.

10. A semiconductor integrated circuit device as claimed in any one of claims 5 to 9, wherein said second reinforcement metal plate has a surface which is similar to and larger in area than a lower face of said semiconductor integrated circuit chip.

11. A semiconductor integrated circuit device according to any one of claims 6 to 10, wherein said device is a card.

12. A semiconductor integrated circuit card comprising:

a substrate having a circuit pattern formed thereon;

a semiconductor integrated circuit chip bonded onto said substrate and having an electrode connected to said circuit pattern;

a first reinforcement metal plate disposed on a first surface of said semiconductor integrated circuit chip;

a second reinforcement metal plate disposed on a second surface which opposite side of said first surface of said semiconductor integrated circuit chip; and

a seal resin portion disposed on peripheral faces of said semiconductor integrated circuit chip and bonding said first and second reinforcement metal plates;

a pair of exterior substrates having said semiconductor circuit chip therebetween through a packing resin layer.