# BGA PACKAGE VACUUM PAD

## BACKGROUND OF THE INVENTION

### Field of the Invention

**[01]** The present invention relates to a vacuum pad for adsorptively fixing or transferring a BGA (Ball Grid Array) package, and more particularly, to a BGA package vacuum pad, which can adsorb even a BGA package having a narrow space (hereinafter, referred to as “ball land”) between balls arranged on the outermost position of a BGA package, namely, balls arranged furthest from the center of the BGA package, and the edge of the BGA package without loss of vacuum adsorptive force.

### Background of the Related Art

**[02]** In general, a BGA package is configured in such a way that solder balls (hereinafter, referred to as “balls”) each of which is an electrical connection terminal connected with a chip pad are arranged and bonded on a mounting substrate. The BGA package restrains bending occurring due to the external impact since the external terminal is short, makes transmission of an electrical signal easy, reduces a mounting period since it is mounted on a PCB (Printed Circuit

Board) after reflowed in a furnace, and realizes multiple pins on a given area, and so, is being widely used recently.

**[03]** The BGA package has to be handled after being transferred or fixed to each process stage since finally finished through various processes, In particular, a process for fixing or transferring the BGA package after the balls are arranged and bonded on the mounting substrate is generally carried out by adsorbing the BGA package with vacuum adsorptive force applied through a vacuum line. A chuck table and a vacuum pad seated on the chuck table shown in Figs. 1a to 1c will be described. Fig. 1a shows the chuck table for adsorbing and fixing the BGA package in a sawing process of dividing materials of a strip state, where a number of semiconductor packages are molded by a group unit, into unit packages. On the chuck table, a number of vacuum pads 10 for adsorbing and fixing each unit package are seated on a body A. The multiple vacuum pads are divided into an integrated type where they are molded integrally and a separate type where they are molded separately. In this case, the vacuum pads 10 are the separate type. Each vacuum pad includes a vacuum hole 11 formed therein and communicating with a vacuum line and a contact part 12 protruding from the edge of the upper surface thereof to be in contact with a

ball land. Fig. 1b is an exploded perspective view showing a state where the vacuum pad of the separate type and the unit package are combined with each other, and Fig. 1c is a sectional view showing an adsorbed state. Referring to Figs. 1b and 1c, an operation of the vacuum pad 10 will be described. The unit package is adsorbed and fixed when the contact part 12 contacts to the ball land 22 of the BGA package 20 and vacuum adsorptive force is applied through a vacuum line (not shown). Of course, the balls 21 are received inside the contact part 12.

**[04]** The conventional vacuum pad has no problem if the BGA package secures the ball land to a certain extent. However, if the ball land is narrow, namely, in case of the BGA package in which the balls are arranged and bonded on positions too near the ends of the BGA package, when the contact part is in contact only with the ball land, holding power and air-tightness are deteriorated since the contact part is too thin. Moreover, if the contact part has the minimized thickness to avoid the above, it contacts the balls, and so, the vacuum pad has several problems in that it is deteriorated in air-tightness against the BGA package and cannot adsorb and fix the BGA package due to loss of the vacuum adsorptive force.

## SUMMARY OF THE INVENTION

**[05]** Accordingly, the present device has been made in view of the above problems occurring in the prior art, and it is an object of the present invention to provide a BGA package vacuum pad, which can adsorb even a BGA package having a narrow ball land without loss of vacuum adsorptive force.

**[06]** To achieve these objects and other advantages, in an aspect of the present invention, the BGA (Ball Grid Array) package vacuum pad which includes a vacuum hole communicating with a vacuum line and a contact part protruding from the edge of the upper surface thereof, wherein the contact part has recesses formed thereon for accommodating balls of a BGA package.

**[07]** In the BGA package vacuum pad, the recesses are formed in a row or multiple rows according to the balls which will be in contact with the contact part. Moreover, the recesses are selectively formed on a position corresponding to a ball arrangement of the BGA package, or formed on the whole surface of the contact part at the same pitch as a pitch between the balls of the BGA package.

**[08]** In another aspect of the present invention, the BGA package vacuum pad which includes a vacuum hole communicating with a vacuum line and a contact part protruding from the edge of the upper surface thereof, wherein the contact part has a groove formed thereon for accommodating balls of a BGA package.

**[09]** It is preferable that the BGA package vacuum pad further includes a protrusion formed on the top surface of the vacuum pad and a inner portion the contact part to the same height as the contact part in such a manner as to be positioned at the opposite sides of the vacuum hole and to be adjacent to the contact part.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[10]** The above and other objects, features and advantages of the present invention will be apparent from the following detailed description of the preferred embodiments of the invention in conjunction with the accompanying drawings, in which:

**[11]** Fig 1a is a view of a conventional chuck table for adsorbing a BGA package and a vacuum pad of a separate type seated on the chuck table;

**[12]** Fig. 1b is an exploded perspective view of the vacuum pad and the BGA package;

**[13]** Fig. 1c is a sectional view showing a state where the BGA package is adsorbed on the vacuum pad;

**[14]** Fig. 2a is a perspective view of a vacuum pad according to a first preferred embodiment of the present invention;

**[15]** Fig. 2b is an exploded perspective view of a BGA package which will be adsorbed to the vacuum pad according to the first preferred embodiment;

**[16]** Fig. 2c is a sectional view showing a state where the BGA package is adsorbed according to the first preferred embodiment;

**[17]** Fig. 3 is a perspective view of a vacuum pad according to a second preferred embodiment of the present invention;

**[18]** Fig. 4 is a perspective view of a vacuum pad according to a third preferred embodiment of the present invention; and

**[19]** Fig. 5 is a perspective view of a vacuum pad according to a fourth preferred embodiment of the present invention;

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

**[20]** Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

**[21]** Fig. 2a is a perspective view of a vacuum pad 10 according to a first preferred embodiment of the present invention, and Fig. 2b is an exploded perspective view of a BGA package 20 which will be adsorbed to the vacuum pad 10. The vacuum pad 10 includes a contact part 12 and a number of recesses 13. As shown in Figs. 2a and 2b, the contact part 12 secures the thickness of a certain extent to prevent deterioration of holding power and air-tightness which may occur if a thin contact part 12 is in contact only with a narrow ball land 22 of the BGA package 20 when the BGA package 20 having the narrow ball land 22 is adsorbed, and the recesses 13 are to prevent contact between the contact part 12 and balls 21 of the BGA package 20.

**[22]** The recesses 13 are selectively formed on the contact part 12 corresponding to positions of the balls 21 arranged on the BGA package 20, particularly, the balls 21 arranged on the outermost positions of the BGA package 20, and so, the location of the recesses 13 may be changed

according to the ball arrangement of the BGA package 20. Furthermore, in this embodiment, the recesses 13 are formed in a row to receive the balls arranged on the outermost positions, but if necessary, the recesses 13 may be formed in two or more rows to receive balls arranged on the inner positions of the balls arranged on the outermost positions of the BGA package 20.

**[23]** Fig. 2c is a sectional view showing a state where the BGA package 20 is adsorbed. Referring to Fig. 2c, the operation of this embodiment will be described. When the vacuum adsorptive force is applied through a vacuum hole 11, the outer edge of the contact part 12 in standard the recesses is in contact with the narrow ball land 22 and the balls arranged on the outermost positions of the BGA package are received in the recesses 13, and then, the inner edge of the contact part 12 in standard the recesses is in contact with a space formed between the balls arranged on the outermost positions of the BGA package and the balls arranged on the next inner positions of the outermost positions. Therefore, the present invention can adsorb the BGA package without loss of the vacuum adsorptive force since the outer edge and the inner edge of the contact part 12 are

respectively and air-tightly in contact with the BGA package 20.

**[24]** Fig. 3 shows a second preferred embodiment of the present invention. In the first embodiment, the recesses are selectively formed corresponding to the ball arrangement of the BGA package, but in the second embodiment, the recesses are formed on the whole surface of the contact part 12. In fact, since the BGA package has so various ball arrangement forms, if the recesses 13 are formed only on certain positions as described in the first embodiment, there is a problem in that, to adsorb a BGA package having a different ball arrangement from the recesses 13, the vacuum pad 10 must be exchanged with a vacuum pad 10 having recesses 13 formed corresponding to the different ball arrangement. Therefore, to avoid the above problem, in this embodiment, the recesses 13 are formed on the whole surface of the contact part 12 at the same pitch as a pitch of balls of a general BGA package.

**[25]** Fig. 4 shows a third preferred embodiment of the present invention. In the third embodiment, the contact part 12 has a groove 14 formed in the center thereof to receive the balls 21. That is, the groove 14 is formed along the central portion of the contact part 12, and thereby, the contact part 12 has an inner wall 12b and an outer wall 12a.

As a result, when the BGA package 20 is adsorbed, the balls arranged on the outermost positions or the balls arranged on the next inner positions of the outermost positions are received in the groove 14, and the outer wall 12a of the contact part 12 is in a close contact with the ball land 22 and the outer wall 12b is in a close contact with the space formed between the balls of the outermost position and the balls of the next inner position.

**[26]** Fig. 5 shows a fourth preferred embodiment of the present invention wherein protrusions 15 are added to the second embodiment shown in Fig. 2a. The protrusions 15 are formed integrally with the vacuum pad 10, and so, it is preferable that the protrusions 15 are made of soft silicon. The protrusions 15 are protrude from the top surface of the vacuum pad 10 to the same height as the contact part 12 in such a manner as to be positioned at the opposite sides of the vacuum hole and to be adjacent to the contact part. The protrusions 15 are compressed by the BGA package 20 when the BGA package 20 is adsorbed, but help that the BGA package 20 is released from the vacuum pad 10, by its restoring force when the vacuum adsorptive force is removed.

**[27]** In the present invention, only the vacuum pad of the separate type is described, but it would be appreciated

that the recesses or the groove of the vacuum pad according to the present invention can be applied to also the vacuum pad of the integrated type.

**[28]** The vacuum pad according to the present invention can be applied to any cases necessary for adsorptively fixing or transferring the BGA package, particularly, can adsorb even the BGA package having the narrow ball land without loss of the vacuum adsorptive force.

**[29]** Moreover, the vacuum pad according to the present invention can provide the BGA package to an exact location since the recesses or the groove for receiving the balls serve to guide.

**[30]** In addition, the conventional vacuum pad has a problem in that the back of a ball bonding part is adsorbed since it is difficult to adsorb the BGA package having the narrow ball land. However, according to the present invention, not only the back of the ball bonding part but also the ball bonding part can be adsorbed, and so, the present invention can provide a very favorable operation process.

**[31]** While the present invention has been described with reference to the particular illustrative embodiments, it is not to be restricted by the embodiments but only by the

appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.

## Claims

1. A BGA package vacuum pad which comprises a vacuum hole communicating with a vacuum line and a contact part protruding from the edge of the upper surface thereof, wherein the contact part has recesses formed thereon for accommodating balls of a BGA package.

2. The BGA package vacuum pad according to claim 1, wherein the recesses are formed in a row or multiple rows.

3. The BGA package vacuum pad according to claim 1, wherein the recesses are selectively formed on a position corresponding to a ball arrangement of the BGA package.

4. The BGA package vacuum pad according to claim 1, wherein the recesses are formed on the whole surface of the contact part at the same pitch as a pitch between the balls of the BGA package.

5. A BGA package vacuum pad which comprises a vacuum hole communicating with a vacuum line and a contact part protruding from the edge of the upper surface thereof,

wherein the contact part has a groove formed thereon for accommodating balls of a BGA package.

6. The BGA package vacuum pad according to claim 1 or 5, further comprising a protrusion formed on the top surface of the vacuum pad and a inner portion the contact part.