

CONTACT STRUCTURE FOR IC SOCKET

BACKGROUND OF THE INVENTION

[Field of the Invention]

The present invention relates to a contact structure of a BGA type IC package or a PGA type IC package with an IC socket.

[Brief Description of the Prior Art]

Referring to Fig. 1A to Fig. 1C, a BGA type IC package includes a number of semispherical terminals 2 below an IC package main body 1 as shown in Fig. 1A or it includes a number of spherical terminals 2 below an IC package main body 1 as shown in Fig. 1B. In addition, a PGA type IC package includes a number of cylindrical terminal 2 which are projected from the lower surface of an IC package main body 1 as shown in Fig. 2A and Fig. 2B.

Conventionally, a contact structure for allowing a resilient contact piece of a contact to come in pressure contact with the one side surface of a spherical surface of the spherical type or cylindrical type terminal 2 or a contact structure for holding the spherical type or cylindrical type terminal 2 with a

pair of resilient contact pieces in the clamped state so as to allow the resilient contact piece to come in pressure contact with the opposing two side surfaces are employed for the IC socket of the BGA type IC package or the PGA type IC package.

In addition to the tendency that terminals 2 are arranged at a shorter pitch and a contact area is increasingly restricted, since the aforementioned contact structure assures that the position of the terminal is restricted in the direction that resilient contact piece comes in pressure contact but the position of the terminal is not restricted in other direction rather than the foregoing one, there appears a problem that the position is deviated in the foregoing other direction with the result that it is difficult to correctly maintain the contacted state. Thus, it is difficult to cope with the tendency that terminals are arranged with a shorter pitch.

As means for preventing the foregoing positional deviation, there is practiced a method of bringing a resilient contact piece in pressure contact with a terminal while the terminal is surrounded by the resilient contact piece at three or more points. This method can solve the problem of positional deviation but in consideration of the background that spherical

type terminals and cylindrical type terminals are currently arranged at a very small pitch of 1.27 mm or less, it becomes very difficult from the viewpoint of a space to disposed three or more of resilient contact pieces around each terminal arranged at a very small pitch in that way, and moreover, it becomes to finely work the resilient contact piece itself.

SUMMARY OF THE INVENTION

The present invention has been made in consideration of the aforementioned background.

An object of the present invention is to provide a contact structure for an IC socket which assures that deviation of each terminal in all directions can reliably be prevented, and moreover, a relative contact position between each contact and each terminal can properly be maintained.

The present invention provides a contact structure of an IC socket usable for an IC package having a number of spherical type terminal or a number of cylindrical terminals arranged on the lower surface of an IC main body, wherein the contact structure is characterized in that a number of contacts arranged corresponding to the spherical type terminals or the cylindrical terminals on the IC main body are provided, resilient contact

piece for allowing each contact to come in pressure contact with each terminal at one point or at two points on the peripheral surface of the terminal are provided, and plural groups are constructed for a group of a contact and a group of terminals for changing an orientation of each resilient contact piece for allowing the group of contacts to give pressure contact force to the group of terminals in three directions or in four directions, each of the plural group being arranged to generate an opposing force between adjacent groups.

It is preferable that each contact includes a pair of resilient contact pieces at the position bisecting the peripheral surface of each terminal, and the pair of resilient contact pieces are arranged with an orientation of each resilient contact piece changed at an angle of about 90 degrees between adjacent groups.

Alternatively, each contact includes a single resilient contact piece adapted to come in one point contact with the peripheral surface of each terminal, the resilient contact piece being located at the position substantially trisecting or quadsecting the peripheral surface of the terminal between adjacent groups.

With such construction, since an opposing force is generated by resilient contact pieces of which orientation is changed per group, positional deviation of the terminal in all directions inclusive of forward/rearward direction as well as leftward/rightward direction can be prevented, and a relative contact position between each contact and each terminal can properly be maintained.

According to the present invention, a problem of positional deviation can effectively be solved, and the tendency for a very small pitch can advantageously be coped by minimizing the number of contact points on a single terminal.

The above and other objects and attendant advantages of the present invention will be apparent to those skilled in the art from a reading of the following description and claims in conjunction with the accompanying drawings which constitute part of this specification.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A is a side view of a BGA type IC package including a number of spherical type terminals, Fig. 1B is a side view of a BGA type IC package including a number of spherical type terminals, Fig. 1C is a bottom view of the IC package shown in

Fig. 1A and Fig. 1B.

Fig. 2A is a side view of a PGA type IC package including a cylindrical terminal, and Fig. 2B is a bottom view of the IC package shown in Fig. 2A.

Fig. 3 shows a first embodiment of the present invention, and a plan view which shows by way of example that a contact including a pair of resilient contact pieces comes in pressure contact with a spherical type terminal.

Fig. 4 is a vertical sectional view of the contact structure shown in Fig. 3.

Fig. 5 is a cross-sectional view of the contact structure shown in Fig. 3.

Fig. 6 shows a second embodiment of the present invention, and is a cross-sectional view which shows by way of example that a contact including a pair of resilient contact pieces comes in pressure contact with a spherical type terminal.

Fig. 7 shows a third embodiment of the present invention, and is a cross-sectional view which shows by way of example that a contact including a single resilient contact piece comes in pressure contact with a spherical type terminal.

Fig. 8 shows a fourth embodiment of the present invention,

and is a cross-sectional view which shows by way of example that a contact including a single resilient contact piece comes in pressure contact with a spherical type terminal.

Fig. 9 shows a fifth embodiment of the present invention, and is a cross-sectional view which shows by way of example that a contact including a single resilient contact piece comes in pressure contact with a spherical type terminal.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described in detail hereinafter with reference to the accompanying drawing which illustrate preferred embodiments thereof.

(First Embodiment)

A first embodiment of the present invention will be described below with reference to Fig. 3 to Fig. 5.

In this embodiment, each contact 3 includes a pair of resilient contact pieces 4 disposed opposite to each other to come in pressure contact with the contact 3 at the position substantially bisecting the peripheral surface of a spherical type or cylindrical type terminal 2. The contact 3 is located at the position corresponding to each terminal 2 and held in an accommodating hole 6 formed in a socket main body 5. A contact

portion 7 of the contact 3 located at the foremost end part of the latter is projected from the upper surface of the socket main body 5 having the accommodating hole 6 formed therein so as to come in pressure contact with the terminal 2.

In the case that an object to come in contact with is a spherical type terminal, the contact portion 7 is formed by slantwise bending the fore part of a pair of resilient contact pieces 4 with an elevation angle of α_1 so as to expand the fore end part of the resilient contact piece 4. The spherical type terminal 2 is received between both the contact portions 7, and by thrusting the terminal 2 against the inclined surface of the contact portion 7, the resilient contact piece 4 is expanded together with the contact portion 7 against the resilient force. Thus, the contact pieces 7 come in pressure contact with the spherical surface of the terminal with the restorative force from two sides located opposite to each other with the exception of the lower dead point and its surrounding.

As described above, each contact 3 has a contact structure that it comes in two point contact with the terminal 2 at the positions bisecting the peripheral surface of the terminal. On the other hand, with respect to a group of contacts, a pair of

resilience contact pieces 4 for a plurality of contacts 3a forming one group are located opposite to each other in the forward/rearward direction, while a pair of resilient contact piece 4 for a plurality of contacts 3b forming another group are located opposite to each other in the leftward/rightward direction. In other words, one group of resilient contact pieces and other group of resilient contact pieces are located with their orientation changed by an angle of about 90 degrees.

Fig. 3 and Fig. 5 explain the aforementioned arrangement with four terminals and four resilient contact pieces. As shown in Fig. 3 and Fig. 5, when a contact 3a of which resilient contact pieces 4 are disposed in the forward/rearward direction and a contact 3b of which resilient contact pieces 4 are disposed in the leftward/rightward direction are arranged to be located adjacent to each other, each contact can advantageously be disposed within a narrow space between two terminals 2.

As described above, the positions of the terminals 2 as seen in the forward/rearward direction are restricted by a plurality of contacts 3a forming one group, and similarly, the positions of the terminals 2 as seen in the leftward/rightward direction are restricted by a plurality of contacts 3b forming other group,

whereby relative positions of a group of contacts and a group of terminals as seen in all directions are properly maintained.

Also in the case that the terminal 2 is a cylindrical type terminal, two group of contacts are formed so that contacts come in pressure contact with the peripheral surfaces of the terminals in the forward/rearward direction as well as in the leftward/rightward direction while generating the opposing force.

(Second Embodiment)

A second embodiment of the present invention will be described below with reference to Fig. 6.

In this embodiment, a single contact 3 corresponding to a single terminal 2 is equipped with a pair of resilient contact pieces 4 which are offset each other by an angle of 90 degrees so that the resilient contact pieces 4 are brought in pressure contact with the terminal 2 from two sides at contacts points offset by an angle of about 90 degrees on the peripheral surface of the terminal 2.

As described above, the contact 3 comes in two point contact with the terminal 2 via a pair of resilient contact pieces 4 at the positions offset one another by an angle of 90 degrees.

Among a group of contacts 3, a pair of resilient contact pieces 4 for contacts 3a forming one group are located opposite to each other on the front side and the left-hand side on the peripheral surface of the terminal 2, while a pair of resilient contact pieces 4 for contacts 3b forming other group are located opposite to each other on the rear side and the right-hand side on the peripheral surface of the terminal 2.

In other words, the resilient contact pieces belonging to one group and the resilient contact piece belonging to the other group are arranged with their orientation changed by an angle of about 180 °.

In this embodiment, arrangement is made such that an angle of α_2 defined by a pair of resilient contact pieces 4 of a single contact 3 assumes about 90 degrees. However, the present invention should not be limited only to 90 degrees. Alternatively, the resilient contact pieces 4 may assume, e.g., 60 degrees or degrees.

As shown in Fig. 6, when a contact 3a belonging to one group with a pair of resilient contact pieces located in the direction of a right angle and a contact 3b belonging other group with a pair of resilient contact pieces located in the direction of a

right angle are arranged to adjacent to each other, each contact can be disposed within a narrow space between the terminals 2.

(Third Embodiment)

A third embodiment of the present invention will be described below with reference to Fig. 7.

Fig. 7 shows an aligning structure in the case that a single resilient contact piece 4 comes in pressure contact with a single terminal 2.

In this embodiment, each contact 3 includes a single resilient contact piece 4 adapted to come in one point contact with a terminal 2 on the peripheral surface, and among groups, the resilient contact piece 4 is disposed at the position substantially trisecting the foregoing peripheral surface.

Specifically, elastic contact pieces 4 of a first group of plural contacts 3 are brought in pressure contact with terminals from one side at first positions trisecting the peripheral surface of the terminal 2, elastic contact pieces 4 of a second group of plural contacts 3b are brought in pressure contact with terminals from other side at second positions trisecting the peripheral surface of the terminal 2, and elastic contact pieces 4 of a third group of plural contact 3c are brought in pressure

contact with terminals from other side at third positions trisecting the peripheral surface of the terminal 2. In other words, among the three groups, a group of contacts are brought in pressure contact with a group of terminals from three directions, causing the opposing force to be generated by adjacent groups to exhibit an aligning function.

(Fourth Embodiment)

A forth embodiment of the present invention will be described below with reference to Fig. 8.

In this embodiment, each contact 3 includes a single resilient contact piece 4 adapted to come in one point contact with a terminal 2 on the peripheral surface of the latter, and the resilient contact piece 4 is located at the position substantially quadsecting the peripheral surface of the terminal 2.

Specifically, resilient contact pieces 4 of a first group of plural contacts 3a are brought in pressure contact with a terminal 2 from one side (from front side) at the first position quadsecting the peripheral surface of the terminal 2, resilient contact pieces 4 of a second group of plural contacts 3b are brought in pressure contact with the terminal 2 from one side

(from the left-hand side) at the second position quadsecting the peripheral surface of the terminal 2, resilient contact pieces 4 of a third group of plural contacts 3c are brought in pressure contact with the terminal 2 from one side (from the rear side) at the third position quadsecting the peripheral surface of the terminal 2, and resilient contact pieces 4 of a fourth group of plural contacts 3d are brought in pressure contact with the terminal 2 from one side (from the right-hand side) at the fourth position quadsecting the peripheral surface of the terminal 2.

In other words, a group of contacts come in pressure contact with a group of terminals from the four directions, causing an opposing force to be generated in each group to exhibit an aligning function.

In the third and fourth embodiments, the resilient contact piece of each contact in each group is located at the position trisecting or quadsecting the peripheral surface of the terminal. However, the present invention should not be limited only to this. Alternatively, the resilient contact piece may be located at the position unequally trisecting or quadsecting the peripheral surface of the terminal, causing an opposing force to be generated between adjacent groups to exhibit an aligning

function. In this case, the resilient contact pieces belonging to each group are arranged in the well-balanced state while generating the opposing force among the respective groups.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.



WHAT IS CLAIMED IS:

1. A contact structure for an IC socket usable for an IC package having a number of spherical type terminals or a number of cylindrical terminals arranged on the lower surface of an IC main body, characterized in that a number of contacts arranged corresponding to said spherical type terminals or said cylindrical terminals on said IC main body are provided, resilient contact pieces for allowing each contact to come in pressure contact with each terminal at one point or at two points on the peripheral surface of said terminal are provided, and plural groups are constructed for a group of contacts and a group of terminals for changing an orientation of each resilient contact piece for allowing said group of contacts to give pressure contact force to said group of terminals in three directions or four directions, each of said plural groups being arranged to generate an opposing force between adjacent groups.

2. The contact structure for an IC socket as claimed in claim 1, wherein each contact includes a pair of resilient contact pieces at the position bisecting the peripheral surface of each terminal, and said pair of resilient contact pieces are arranged with an orientation of each resilient contact piece changed at an



angle of about 90 degrees between adjacent groups.

3. The contact structure for an IC socket as claimed in claim 1, wherein each contact includes a single resilient contact piece adapted to come in one point contact with the peripheral surface of each terminal, said resilient contact piece being located at the position substantially trisecting or quadsecting the peripheral surface of the terminal between adjacent groups.