

COMPRESSION CONNECTOR

FIELD OF INVENTION

The present invention relates broadly to a compression connector.

BACKGROUND

Typically, a compression connector is designed such that one end of the connector is soldered on a printed circuit board (PCB) or a flex circuit. The other end of the connector is attached to another PCB under an applied compressive force until a required functional Board to Board height is met. Typically, the compression connector comprises a housing and a plurality of terminals disposed in the housing.

Each terminal of the connector is designed to protrude the housing and a height of the protruding part of the terminal at quiescent state is typically about twice the height of the protruding part of the terminal under compression. The terminal may be further compressed to flush with the housing or compressed lower than a height of the housing. Therefore, the elasticity limit of the terminal may be exceeded. This may cause the terminal to be permanently deformed. The height of the deformed terminal will be shorter. The shorter terminal height may cause the board to board contact to be insufficient and thus result in a problem in electrical data transmission.

Therefore, there is a need to provide a connector designed to address the above-mentioned problem.

SUMMARY

In accordance with a first aspect of the present invention, there is provided a compression connector comprising: a housing; a terminal disposed in the housing, the terminal having a contact portion disposed for compression under a compressive load

applied in a contact state of the connector; wherein the housing is arranged such that a stopper surface of the housing formed on a side wall of the connector abuts the contact portion of the terminal in the contact state of the connector; and at least a tip of the contact portion protrudes the housing in the contact state of the connector.

The housing may be arranged such that the stopper surface facilitates limiting deformation of the terminal in the contact state to elastic deformation.

The housing may comprise a recess formed in the side wall above the stopper surface for accommodating the contact portion of the terminal.

The housing may further comprise a top wall and the recess extends from the side wall into the top wall.

The terminal may be substantially S-shaped.

The terminal may further comprise a base portion for securing the terminal in the housing.

A plurality of terminals may be arranged side by side along the housing.

The plurality of terminals may be disposed in the housing such that respective protruding parts of the contact portions of the respective terminals are arranged in at least two rows along the housing.

The plurality of terminals may be disposed in the housing such that the respective protruding parts are staggered between adjacent rows along the housing.

The plurality of terminals may be substantially identical and adjacent terminals along the housing may be secured in the housing in an orientation rotated by substantially 180°.

According to a second aspect of the present invention there is provided a Printed Circuit Board comprising a compression connector as defined in the first aspect.

According to a third aspect of the present invention there is provided a flex circuit comprising a compression connector as defined in the first aspect.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

Figure 1 is a schematic diagram of a terminal in an example embodiment.

Figure 2 shows a cross-sectional drawing of a compression connector before a load is applied on a contact portion of a terminal in an example embodiment.

Figure 3 shows a cross-sectional drawing of a compression connector after a load is applied on a contact portion of a terminal in an example embodiment.

Figure 4 shows a cross-sectional drawing of a compression connector in a contact state and disposed between two PCBs in an example embodiment.

Figure 5 shows a perspective drawing of a plurality of terminals arranged side by side in a housing in an example embodiment.

DETAILED DESCRIPTION

Figure 1 is a schematic diagram of a terminal 100 in an example embodiment. The terminal 100 is substantially S-shaped. The terminal 100 comprises a contact portion 102, a mid portion 104, a base portion 106 and a solder tail portion 108 in the example embodiment.

The contact portion 102 is substantially L-shaped and it is connected to the mid portion 104. The mid portion 104 is substantially S-shaped in the example embodiment. The mid portion 104 is disposed between the contact portion 102 and the base portion 106. The base portion 106 is substantially rectangular and the solder tail portion 108 extends from one end of the base portion 106 in the example embodiment. The solder tail portion 108 is soldered on a PCB (not shown).

The terminal 100 is made from copper alloy in the example embodiment. Other conductive materials including, but not limited to, phosphor bronze, and/or gold or tin plated materials may be used for manufacturing the terminal 100 in different embodiments. It will be appreciated by a person skilled in the art that the terminal can be manufactured using known methods including but not limited to e.g. cutting and press forming.

Figure 2 shows a cross-sectional drawing of a compression connector 200 before a load is applied on the contact portion 102 of the terminal 100 in the example embodiment. The terminal 100 is disposed in a housing 202. The terminal 100 is in a quiescent state as no load is applied to the terminal 100.

During assembly of the connector 200, the terminal 100 is slotted into the housing 202 from the bottom of the housing 202 in the example embodiment. The base portion 106 of the terminal 100 secures the terminal 100 to the housing 202 by abutting the housing 202 in a press-fit.

The housing 202 is made of high temperature engineering plastic in the example embodiment. Other non-conductive materials such as, but not limited to, generic engineering plastics, e.g. Liquid Crystal Polymer (LCP), may be used for manufacturing the housing 202 in different embodiments. It will be appreciated by a person skilled in the art that the terminal can be manufactured using known methods including but not limited to e.g. casting and molding.

In the example embodiment, the housing 202 comprises a stopper surface 204 formed on a side wall 206. The housing 202 further comprises a recess 208 formed in

the side wall 206 above the stopper surface 204. The recess 208 extends from the side wall 206 into a top wall 210 of the housing 202. The contact portion 102 of the terminal 100 is received in the recess 208 in the example embodiment. Part of the contact portion 102 protrudes the housing 202 when the terminal 100 is in the quiescent state.

During board to board contacting, load is applied on the contact portion 102 of the terminal 100 by pressing a PCB (not shown) vertically in a direction 212 onto the contact portion 102 in the example embodiment.

It can be seen that the housing 202 further comprises a protrusion 214 in the centre on the top surface of the housing 202. The protrusion 214 is utilised in mounting a PCB (not shown) on the connector 200.

Figure 3 shows a cross-sectional drawing of the compression connector 200 after a load is applied on a contact portion 102 of a terminal 100 in the example embodiment. The terminal 100 is being compressed until the contact portion 102 of the terminal 100 abuts the stopper surface 204 in a contact state. A tip of the contact portion 102 protrudes the housing 202 when the connector 200 is in the contact state. The height of the stopper surface 204 can be adjusted during manufacture of the housing 202 for different embodiments to meet the respective functional Board to Board heights.

The stopper surface 204 prevents the terminal 100 from being overly compressed in the example embodiment, and advantageously limits the deformation of the terminal 100 in the contact state to elastic deformation. This will prevent the elasticity limit of the terminal 100 from being exceeded and result in permanent deformation of the terminal 100.

Figure 4 shows a cross-sectional drawing of the compression connector 200 in the contact state and disposed between two PCBs 402 and 404 in the example embodiment. The PCB 402 is mounted on the connector 200 via the protrusion 214. The required functional Board to Board height is the height measured from the lower surface of PCB 402 to the upper surface of the PCB 404 in the example embodiment.

Figure 5 shows a perspective view of a plurality of terminals 502 arranged side by side in the housing 504 in the example embodiment. The plurality of terminals 502 are disposed in the housing 504 such that respective protruding parts 506 of the contact portions 508 of the respective terminals 502 are arranged in at least two rows along the housing 504. The protruding parts 506 of the contact portions 508 are staggered between adjacent rows along the housing 504 in the example embodiment. The plurality of terminals 502 are substantially identical and adjacent terminals 502 are secured in the housing 504 in an orientation rotated by substantially 180°. With the above configuration, the connector 500 is compact with rows 510 and 512 of closely spaced connection ends e.g. 506.

It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

For example, the shapes of the terminals and/or the housings are not limited to that shown in the example embodiments. Other shapes can be used in different embodiments, including differently shaped contact portions, mid portions, base portions, solder tail portions and recesses.

Furthermore, it will be appreciated that different numbers of terminals per housing may be implemented in different embodiments.

It will also be appreciated that the compression connector may be used for electrical connection between flex circuits in different embodiments.

CLAIMS

1. A compression connector comprising:
 - a housing;
 - a terminal disposed in the housing, the terminal having a contact portion disposed for compression under a compressive load applied in a contact state of the connector;
 - wherein the housing is arranged such that a stopper surface of the housing formed on a side wall of the connector abuts the contact portion of the terminal in the contact state of the connector; and
 - at least a tip of the contact portion protrudes the housing in the contact state of the connector.
2. The connector as claimed in claim 1, wherein the housing is arranged such that the stopper surface facilitates limiting deformation of the terminal in the contact state to elastic deformation.
3. The connector as claimed in claims 1 or 2, wherein the housing comprises a recess formed in the side wall above the stopper surface for accommodating the contact portion of the terminal.
4. The connector as claimed in claim 3, wherein the housing further comprises a top wall and the recess extends from the side wall into the top wall.
5. The connector as claimed in any one of claims 1 to 4, wherein the terminal is substantially S-shaped.
6. The connector as claimed in any one of claims 1 to 5, wherein the terminal further comprises a base portion for securing the terminal in the housing.
7. The connector as claimed in any one of claims 1 to 6, wherein a plurality of terminals are arranged side by side along the housing.

8. The connector as claimed in claim 7, wherein the plurality of terminals are disposed in the housing such that respective protruding parts of the contact portions of the respective terminals are arranged in at least two rows along the housing.

9. The connector as claimed in claim 8, wherein the plurality of terminals are disposed in the housing such that the respective protruding parts are staggered between adjacent rows along the housing.

10. The connector as claimed in claim 9, wherein the plurality of terminals are substantially identical and adjacent terminals along the housing are secured in the housing in an orientation rotated by substantially 180°.

11. A Printed Circuit Board comprising a compression connector as claimed in any one of claims 1 to 10.

12. A flex circuit comprising a compression connector as claimed in any one of claims 1 to 10.