

ELECTRICAL CONNECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electrical connector, and more particularly, to an electrical connector having a vertical dimension larger than both horizontal dimensions of its mounted surface.

2. Description of the Related Art

Printed circuit boards usually comprise a plurality of connectors disposed thereon. These connectors may be used for signal transmission or power supply. Normally, these connectors cannot be reduced in size due to handling issues, and therefore they always occupy a significant area of the printed circuit board.

FIG. 1 is a perspective view showing a traditional electrical connector 1. As shown in FIG. 1, the elongated electrical connector 1 comprises a housing 10, which includes an opening 11. A plurality of terminals 12 are received within the housing 10. Each terminal 12 may include a plurality of tail portions 121. The electrical connector 1 is disposed on a printed circuit board (not shown) with one of its longitudinal sidewalls lying thereon so as to occupy a large area of the printed circuit board. The electrical connector 1 is fixed to the printed circuit board only by the engagement between the tail portions 121 of the terminals 12 and the respective holes on the printed circuit board. Therefore, the electrical connector 1 may easily be accidentally torn from the printed circuit board while connecting or disconnecting the electrical connector 1 to or from a mating connector.

The electrical connector 1 has a highly regular and consistent straight-sided peripheral edge configuration. When the electrical connector 1 is installed into a computing system, such a configuration may hinder the airflow and reduce the heat dissipation, causing the system to operate at

high temperature. Consequently, the system may suffer from instability or even fail due to the high temperature.

Therefore, a new electrical connector for overcoming the above-mentioned issues is highly desired.

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SUMMARY OF THE INVENTION

An objective of the present invention is to provide a new and improved electrical connector that can be fixed on a printed circuit board more firmly, cannot be torn from the printed circuit board during connecting and disconnecting operations, and can increase the airflow around the printed circuit board.

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In order to achieve the above objective, one embodiment of the present invention proposes an electrical connector that comprises an elongated housing, a plurality of terminals, and at least one hold-down portion. The housing includes a longitudinal axis and a peripheral wall surrounding the longitudinal axis. The housing is mounted on a printed circuit board with the longitudinal axis in an erected position. The terminals are received within the housing. Each terminal includes at least one tail portion electrically connected into a respective hole on the printed circuit board. The hold-down portion, configured to receive a fastener for fixing the housing to the printed circuit board, includes an upper end surface facing away from the printed circuit board and inclined toward the printed circuit board. The hold-down portion extends laterally from a wall surface of the peripheral wall where a minimum central transverse dimension of a transverse cross-section of the housing is located.

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BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described according to the appended drawings in which:

FIG. 1 is a perspective view showing a traditional electrical connector;

FIG. 2 is a perspective view of an electrical connector according to one embodiment of the present invention;

FIG. 3 is another perspective view of an electrical connector according to one embodiment of the present invention;

5 FIG. 4 is an explosive view illustrating an electrical connector according to one embodiment of the present invention;

FIG. 5 is a cross-sectional view along line S-S in FIG. 4;

FIG. 6 is a side view of an electrical connector according to one embodiment of the present invention;

10 FIG. 7 is a cross-sectional view along line Y-Y in FIG. 2; and

FIG. 8 is a cross-sectional view along line X-X in FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

As illustrated in FIG. 2, an electrical connector 2 has an elongated or a high aspect ratio configuration and is mounted on a printed circuit board 3 with the longitudinal axis 22 thereof in an erected position. The electrical connector 2 comprises an elongated housing 21 and an opening 23. The opening 23 is received within the housing 21, and is oppositely disposed to and facing away from the printed circuit board 3. A plurality of terminals 24 are received within the housing 21, and the head portions 243 of the terminals 24 are arrayed within the opening 23 and ready for making electrical contact with mated contact element of an electrical component. The innovative features of the present invention are suitable for any type of electrical connectors. In the present embodiment, the electrical connector 2 can be a Mezzanine-type power connector.

25 Referring to FIG. 2 and FIG. 3, the electrical connector 2 is fixed to the printed circuit board 3. Two fasteners 4 pass through the circuit board 3 and are received by the electrical connector 2 so that the electrical

connector 2 can be firmly fixed to the printed circuit board 3. In the present embodiment, the fastener 4 is a screw. A plurality of tail portions 241 of the terminals 24 extend outward from the housing 21 and fit into the respective holes 32 on the printed circuit board 3, thereby providing power to the printed circuit board 3.

Referring to FIG. 4 and FIG. 5, the housing 21 includes a longitudinal axis 22 and a peripheral wall 221. The peripheral wall 221 surrounds the longitudinal axis 22 to form an enclosed structure. The electrical connector 2 may further comprise at least one hold-down portion 25, which is disposed close to the printed circuit board 3 as shown in FIG. 2. However, in the present embodiment, the electrical connector 2 comprises a pair of hold-down portions 25, which oppositely and laterally extend from the peripheral wall 221. The hold-down portions 25 can be integrally formed with the housing 21. The housing 21 has a transverse cross section in a direction perpendicular to the longitudinal axis 22, which can have an elongated shape. In other words, the transverse cross section of the housing 21 may have various central transverse dimensions measured around the boundary of the transverse cross section. The hold-down portions 25 extend laterally from respective wall surfaces of the peripheral wall 221 and the wall surfaces are at the places where the minimum central transverse dimension of the transverse cross-section of the housing 21 is located. Usually, a central transverse dimension of a cross-section can be measured through the center place of the cross-section. Referring to FIG. 5, in the present embodiment, the transverse cross-section of the housing 21 is rectangular, and therefore the peripheral wall 221 includes two opposite-disposed large wall surfaces 2211 and two opposite-disposed small wall surfaces 2212. The large wall surfaces 2211 are separated by a distance T_m which is the minimum central transverse dimension of the transverse cross-section of the housing 21. The small wall surfaces 2212 are separated by a distance T_M which is the maximum central transverse dimension of the transverse cross-section of the housing 21. As a result, the hold-down portions 25 are separately disposed on the large wall surfaces 2211 at the

position where the minimum central transverse dimension, T_m , of the transverse cross-section of the housing 21 is located.

Referring to FIG. 4 and FIG. 8, the hold-down portion 25 is configured to receive a respective fastener 4 for fixing the electrical connector 2 to the printed circuit board 3. In the present embodiment, each hold-down portion 25 comprises a lower end surface 251 that is disposed opposite the upper end surface 253, and a securing hole 252 is defined on the respective lower end surface 251 of the hold-down portion 25. The electrical connector 2 is fixed by fasteners 4, each of which passes through a respective hole on the printed circuit board 3 and is screwed in the respective securing hole 252 as shown in FIG. 8.

Referring to FIG. 6, each hold-down portion 25 further comprises an upper end surface 253. The upper end surface 253 is located on the top of the hold-down portion 25 and faces away from the printed circuit board 3. The upper end surface 253 is tapered or inclined in a direction toward the printed circuit board 3 so that a void space above the upper end surface 253 is increased, and the airflow around the electrical connector 2 is increased. As a result, the heat dissipation around the electrical connector 2 is more efficient. In the present embodiment, the upper end surface 253 is a plane surface; however in other embodiments the upper end surface 253 may alternatively have other forms including convex or concave curved surfaces.

Referring back to FIG. 2, the hold-down portion 25 can include a first side surface 254 and a second side surface 255. The first side surface 254 and the second side surface 255 can incline toward one another to form a shape that facilitates airflow. The inclination of the first side surface 254 and the second side surface 255 can be the same or different. The tip surface 256 joining the first side surface 254 and the second side surface 255 can be a curved surface. In the present embodiment, the hold-down portion 25 has a V-shaped cross-section in a direction perpendicular to the longitudinal axis 22. However, the cross-section of the hold-down portion 25 can have other shapes such as a U-shape, a circular shape or an oval

shape. The first side surface 254 and the second side surface 255 can be plane surfaces as shown in FIG. 2, but can also be curved surfaces such as convex or concave curved surfaces.

Referring to FIG. 4 again, the peripheral wall 221 of the housing 21 defines a bottom surface 2213. A plurality of foot pads 2214 and 2214' are separately disposed on the bottom surface 2213, and the electrical connector 2 using these foot pads 2214 and 2214' stands on the printed circuit board 3. The housing 21 can further comprise a positioning post 2215. The positioning post 2215 has a tapering tip that protrudes outward from the bottom surface 2213 of the housing 21. The positioning post 2215 is configured for positioning and is inserted into a positioning hole 31 on the printed circuit board 3 when the electrical connector 2 is installed thereon. In the present embodiment, the lower end surface 251 of the hold-down portion 25 extends beyond the bottom surface 2213 of the housing 21, and the lower end surface 251 and the foot pads 2214 and 2214' can rest on the printed circuit board 3 together when the electrical connector 2 is mounted on the printed circuit board 3 as shown in FIG. 6.

Referring to FIG. 4 and FIG. 7, a plurality of cavities 222, which receive the corresponding terminals 24, are formed within the housing 21. Each terminal 24 comprises, in the present embodiment, a plurality of tail portions 241. Each tail portion 241 is fitted into a respective hole 32 on the printed circuit board 3 when the electrical connector 2 is mounted thereon. In the present embodiment, each tail portion 241 comprises a needle eye section 2411, and the tail portions 241 are press-fitted into the respective holes as shown in FIG. 7.

Referring to FIG. 7, each terminal 24 can further comprise a plurality of barb portions 242, which extend laterally from the respective side edges of the terminal 24. Each barb portion 242 interference-fits into the respective side wall of the cavity 222 when terminals are inserted therein such that the terminals are firmly fixed.

In summary, an electrical connector having an elongated cross-section is not strongly supported and has a risk that the electrical connector may be accidentally torn from a printed circuit board during connecting or disconnecting operation. The electrical connector of the present invention is equipped with a hold-down portion, disposed at a location where a minimum central transverse dimension of a transverse cross-section of the housing is located. The hold-down portion is configured to receive a fastener for fixing the housing to the printed circuit board and may also provide support to the housing when the electrical connector is mounted on the printed circuit board. The hold-down portion has an upper end surface which is inclined toward the printed circuit board and side surfaces which are inclined toward one another and joined with a curved tip surface such that the airflow around the electrical connector is increased.

The above-described embodiments of the present invention are intended to be illustrative only. Numerous alternative embodiments may be devised by persons skilled in the art without departing from the scope of the following claims.

What is claimed is:

1. An electrical connector, comprising:

an elongated housing having a longitudinal axis and a peripheral wall surrounding the longitudinal axis, the elongated housing being mounted on a printed circuit board with the longitudinal axis in an erected position;

a plurality of terminals received within the elongated housing, each terminal including at least one tail portion electrically connected into a respective hole on the printed circuit board; and

at least one hold-down portion including an upper end surface facing away from the printed circuit board and two side surfaces; the hold-down portion being configured to receive a fastener for fixing the elongated housing to the printed circuit board and extending laterally from a wall surface of the peripheral wall where a minimum central transverse dimension of a transverse cross-section of the elongated housing is located, wherein the upper end surface inclines toward the printed circuit board, and the two side surfaces are inclined toward one another.

2. The electrical connector of Claim 1, wherein the transverse cross-section of the elongated housing is rectangular so that the peripheral wall includes two opposite-disposed large wall surfaces and two opposite-disposed small wall surfaces, and the hold-down portion is disposed on one of the large wall surfaces.

3. The electrical connector of Claim 1 or 2, wherein the upper end surface and the side surfaces are plane surfaces and the side surfaces are inclined toward one another and join with a curved tip surface.

4. The electrical connector of Claim 3, wherein the peripheral wall defines a bottom surface, and the hold-down portion includes a lower end surface that is oppositely disposed to the upper end surface and extends beyond the bottom surface in a direction along the longitudinal axis.

5 5. The electrical connector of Claim 4, wherein the elongated housing comprises a plurality of foot pads separately disposed on the bottom surface of the elongated housing, and the lower end surface and the foot pads rest on the printed circuit board when the elongated housing is mounted on the printed circuit board.

 6. The electrical connector of Claim 5, wherein the elongated housing further comprises a positioning post, and the positioning post is correspondingly disposed in a positioning hole on the printed circuit board.

10 7. The electrical connector of Claim 6, wherein each tail portion comprises a needle eye section, and each tail portion is press-fitted into the respective hole.

 8. The electrical connector of Claim 7, wherein the hold-down portion further comprises a securing hole defined on the lower end surface, the fastener comprises a screw and the fastener is screwed in the securing hole.
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 9. The electrical connector of Claim 8, wherein the elongated housing further comprises an opening oppositely disposed to the bottom surface of the elongated housing, and the terminals are arrayed within the opening.