

Card Edge Connector

FIELD OF INVENTION

5 The present invention relates to a card edge connector or socket for interconnecting a mother board with a daughter board on which memory modules or the like are mounted, and relates to a method of mating the daughter board with the card edge connector.

10 BACKGROUND

 This kind of card edge connector has electrical contacts for engaging contact pads on the daughter board, and an insulative housing accommodating the contacts therein. The card edge connector also has latches for securing the daughter board to the connector at both sides of the
15 daughter board which are located remote from the housing. As disclosed in a prior art reference JP 2001-351734 A, the daughter board is inserted into the card edge connector at a first angle with zero or low insertion force, and is then rotated to a final or horizontal position. In the final position, the daughter board is locked by the latches at both sides of the daughter
20 board.

 The rotation action does not cause a problem as long as the daughter board is sufficiently thick. However, if the daughter board is relatively thin, the rotation action would cause a warpage of the daughter board
25 because the contacts urge the daughter board toward an initial or insertion position at the first angle while the latches keep the daughter board to the horizontal position at the locations that are remote from the housing. The warpage of the daughter board causes stress on solder joints provided on the daughter board, which may break the solder joints.

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 It is therefore an object of the present invention to provide a card edge connector overcoming the above-mentioned problem.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is provided a card edge connector comprising a housing having a daughter board receiving opening, and at least one row of contacts accommodated in the housing for engaging contact pads on a daughter board, the daughter board being first inserted into the daughter board receiving opening at a first angle along a first direction and being then rotated to a second position where the daughter board lies along a second direction that is different from the first direction, characterized in that:

the housing has an additional space in the daughter board receiving opening for allowing the daughter board to advance to a third position along the second direction.

The at least one row of contacts may comprise upper row of contacts and lower row of contacts, and contact points of the upper row of contacts may be located offset from contact points of the lower row of contacts with a predetermined distance along the second direction.

The housing may have at least one stop member in the daughter board receiving opening for restricting a further insertion of the daughter board along the first direction.

The stop member may have a top surface for restricting movement of the daughter board when the daughter board is in the third position.

According to a second aspect of the present invention, there is provided a method of mating a daughter board with a card edge connector having a housing having a daughter board receiving opening, and at least one row of contacts accommodated in the housing for engaging contact pads on the daughter board, the method comprising the steps of:

inserting the daughter board into the daughter board receiving opening at a first angle along a first direction;

rotating the daughter board to a second position where the daughter board lying along a second direction that is different from the first

direction; and

moving the daughter board into the daughter board receiving opening in the second direction.

5 **BREIF DESCRIPTION OF DRAWINGS**

The invention will be described below with reference to the attached drawings, in which:

Fig. 1 is a perspective view showing a card edge connector in accordance with an embodiment of the present invention;

10 Fig. 2 is another perspective view showing the card edge connector of Fig. 1;

Fig. 3 is a cross section of the card edge connector of Fig. 1 when a daughter board is in a first or insertion position;

15 Fig. 4 is a cross section of the card edge connector of Fig. 1 when the daughter board is rotated to a second or horizontal position; and

Fig. 5 is a cross section of the card edge connector of Fig. 1 when the daughter board is moved forward to a third or final mated position.

DETAILED DESCRIPTION

20 Fig. 1 shows the perspective view of the card edge connector 1 of the embodiment of the present invention. And Fig. 2 is another perspective view showing the card edge connector 1 of Fig. 1.

As shown in Figs. 1 and 2, the card edge connector or socket 1 has an
25 insulative housing 2 and two rows of contacts 4, 5. The housing 2 is formed in a substantially rectangular shape extending in a width direction (right-left direction in Fig. 1) of the housing 2. The housing 2 is formed with a daughter board receiving opening 21 at a front face of the housing 2. The opening 21 is defined by a top wall 22, both side walls 23, 24 and a
30 bottom wall 25 of the housing 2 and extends in the width direction. From Fig. 1, it can be seen that lower row contacts 5 are arranged in the opening 21 along the bottom wall 25 in the width direction. From Fig. 2, it can also be seen that upper row contacts 4 are arranged at a rear face of the housing 2 along the width direction. A rib 26 is formed in the

opening 21 between two groups of the lower contacts 5 for providing a keying function with a recess (not shown) formed in a daughter board 7 (see Fig. 3). On both sides of the rib 26 and on positions next to both side walls 23, 24 in the opening 21, there are provided four rectangular stop members 27 (only two stop members 27 are shown in Fig. 1). The stop members 27 are integrally formed on the bottom wall 25 of the housing 2. In an alternative embodiment, the housing may have one stop member. A function of the stop member 27 will be described later.

At both sides of a rear part of the housing 2, a pair of surface mount type solder pegs 6 are attached to attachment portions 28 of the housing 2. Each solder peg 6 will be soldered to a mother board (not shown) on which the card edge connector 1 is mounted to secure the card edge connector 1 to the mother board.

Fig. 3 is a cross section of the card edge connector 1 when the daughter board 7 is in the first or insertion position. Fig. 4 is a cross section of the card edge connector 1 when the daughter board 7 is rotated to the second or horizontal position. Fig. 5 is a cross section of the card edge connector 1 when the daughter board 7 is moved forward to the third or final mated position.

As shown in Fig. 3, each upper contact 4 has a contact arm 41, a surface mount termination portion 42 and a base portion (not shown) secured to the housing 2. Similarly, each lower contact 5 has a contact arm 51, a surface mount termination portion 52 and a base portion 53 secured to the housing 2. The upper contact 4 also has an upper contact point 44 in the vicinity of a tip end of the contact arm 41. The upper contact point 44 faces downwardly for engaging an upper contact pad (not shown) on the daughter board 7. The lower contact 5 has a lower contact point 54 in the vicinity of a tip end of the contact arm 51. The lower contact point 54 faces upwardly for engaging a lower contact pad (not shown) on the daughter board 7. The upper contact point 44 is located with a predetermined distance D from the lower contact point 54 along a

horizontal direction.

The daughter board 7 carries electronic parts 71, 72 such as memory modules. The upper contact pads provided on an upper side 73 and the
5 lower contact pads provided on a lower side 74 of the daughter board 7 are interconnected to the electronic parts 71, 72 by solder joints (not shown).

With reference to Figs. 3-5, mating sequence of the daughter board 7 with the card edge connector 1 will be described. As shown in Fig. 3,
10 the daughter board 7 is first inserted into the opening 21 with a very low insertion force along a first direction X (at a first angle θ with respect to a top surface (not shown) of the mother board) until the daughter board 7 abuts the stop members 27. The stop members 27 function as stoppers for restricting a further insertion of the daughter board 7 along the first
15 direction X. In this first position shown in Fig. 3, a tip portion of the daughter board 7 is located between the upper contact points 44 and the lower contact points 54.

The daughter board 7 is then rotated to a second angle with respect to
20 the top surface of the mother board as shown in Fig. 4. In the present embodiment, the second angle is substantially zero degree so the daughter board lies substantially horizontally, in other words, substantially parallel with the top surface of the mother board. In a second position where the second angle is substantially zero, the lower contact points 54 engage the
25 lower contact pads on the daughter board 7 whereas the upper contact points 44 may not engage the upper contact pads on the daughter board 7. A further rotation of the daughter board 7 is blocked by support portions 29 formed on the bottom wall 25 of the housing 2. In the second position, there is a space or gap 30 between the tip end of the daughter board 7 and
30 an innermost wall 31 of the opening 21. The space 30 allows the daughter board 7 to move forward along a second direction Y.

Next, the daughter board 7 is driven to move along the second direction Y (at the second angle) to a third or final position shown in Fig. 5 until the

tip end of the daughter board 7 abuts the innermost wall 31. In the third position, the lower contact points 54 engage the lower contact pads on the daughter board 7 and the upper contact points 44 also engage the upper contact pads on the daughter board 7 such that interconnection between the mother board and the daughter board is established. The movements of the daughter board 7 in vertical and horizontal directions are restricted by a lower surface 32 of the upper wall 22, the innermost wall 31, flat top surfaces 33 of the stop members 27 and top surfaces of the support portions 29. Particularly, although a rotational moment that tends to return the daughter board 7 toward the first position is generated by the offset positions of the upper and lower contact points 44, 54, the top surfaces 33 of the stop members 27 prevent the daughter board from rotating toward the first position.

The card edge connector 1 does not require latches for locking the daughter board 7 which are located remote from the housing. Accordingly, the warpage of the daughter board 7 and stress on the solder joints on the daughter board 7 are significantly reduced or eliminated. However, in order to prevent the daughter board from moving in a direction opposite to the second direction Y, the other end of the daughter board which is far from the card edge connector 1 may be locked by screws or the like.

When the daughter board 7 is moved from the second position (shown in Fig. 4) to the third position (shown in Fig. 5), the upper contact points 44 come to engage the upper contact pads on the daughter board 7 while the lower contact points 54 already engage the lower contact pads on the daughter board 7. Accordingly, insertion force required for mating with the daughter board is lower than that required in a conventional card edge connector into which a daughter board is inserted with a straight action because the upper and lower contact arms 41, 51 in this embodiment need not to be driven simultaneously. The straight motion of the daughter board 7 from the second position to the third position causes wiping action so as to obtain reliable contact between the contact pads on the daughter

board, and the upper and lower contact points 44, 54.

5 It would be apparent to a skilled person in the art that numerous variations or modifications may be made to the present invention without departing from the spirit or scope of the invention. For example, in the above-mentioned embodiment, the second angle is substantially zero degree, but in an alternative embodiment, the second angle may be the other angle, such as 90 degree. And in the above-mentioned embodiment, the card edge connector 1 has two rows of contacts 4, 5, but 10 in an alternative embodiment, a card edge connector may have one row of contacts only (for example, the upper contacts only). The present embodiments are therefore to be considered in all aspects to be illustrative and not restrictive.

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CLAIM

1. A card edge connector comprising:
 - a housing having a daughter board receiving opening; and
 - 5 at least one row of contacts accommodated in said housing for engaging contact pads on a daughter board;
 - said daughter board being first inserted into said daughter board receiving opening at a first angle along a first direction and being then rotated to a second position where said daughter board lies along a second
 - 10 direction that is different from said first direction; characterized in that:
 - said housing has an additional space in said daughter board receiving opening for allowing said daughter board to advance to a third position along said second direction.
- 15 2. The card edge connector as defined in claim 1, characterized in that:
 - said at least one row of contacts comprise upper row of contacts and lower row of contacts, and
 - that contact points of said upper row of contacts are located offset from contact points of said lower row of contacts with a predetermined
 - 20 distance along said second direction.
3. The card edge connector as defined in claim 1 or 2, characterized in that:
 - said housing has at least one stop member in said daughter board
 - 25 receiving opening for restricting a further insertion of said daughter board along said first direction.
4. The card edge connector as defined in claim 3, characterized in that:
 - said stop member has a top surface for restricting movement of said
 - 30 daughter board when said daughter board is in the third position.
5. A method of mating a daughter board with a card edge connector having a housing having a daughter board receiving opening, and at least one row of contacts accommodated in said housing for engaging contact

pads on the daughter board, said method comprising the steps of:

inserting said daughter board into said daughter board receiving opening at a first angle along a first direction;

5 rotating said daughter board to a second position where said daughter board lying along a second direction that is different from said first direction; and

moving said daughter board into said daughter board receiving opening in said second direction.

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