

Technical contribution

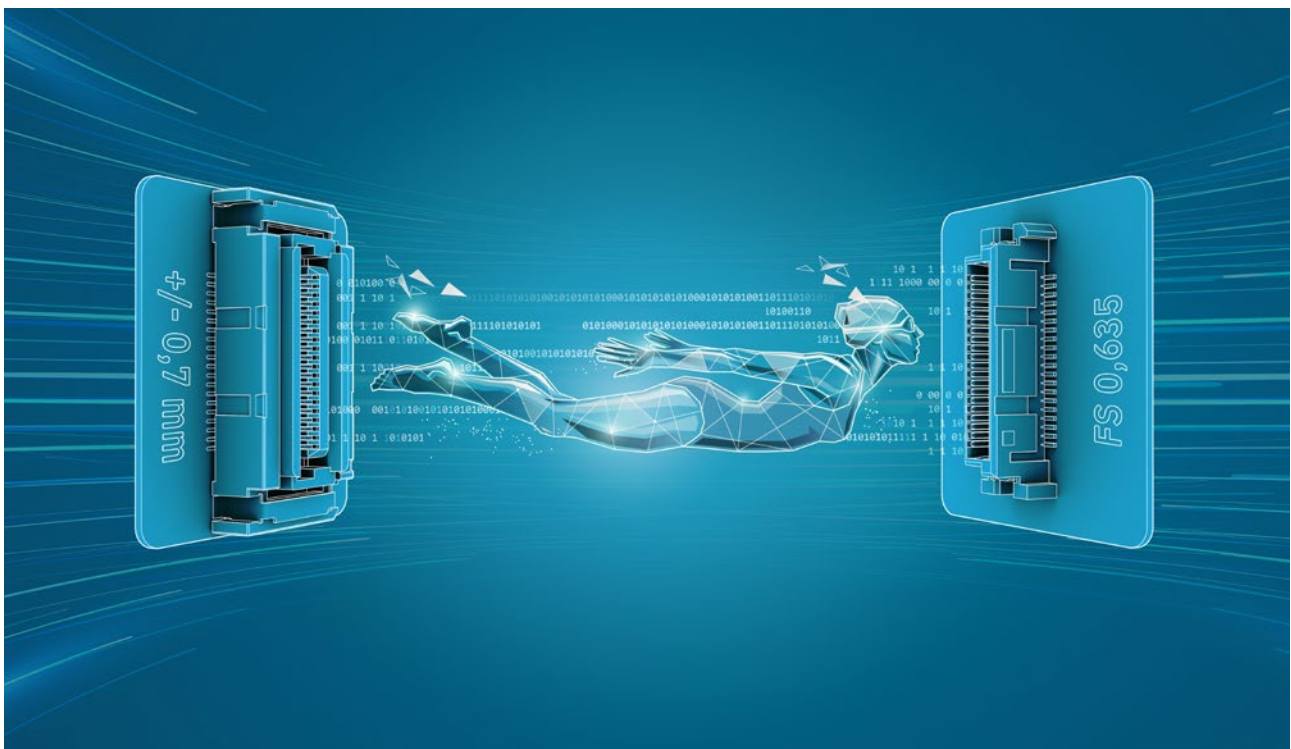
Unique combination of floating and high speed

Floating connectors with considerable tolerance compensation and high-speed data transmission

When it comes to board-to-board connectors, there are numerous versions: small and large pitches, low and tall designs, robust and simple connectors. The Finepitch FS 0,635 series connectors with floating properties are a new addition to the Phoenix Contact portfolio. What makes floating board-to-board connectors so special? Where are they used? And are high-speed data transmission and floating a contradiction in terms?

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Features of a floating connector

Board-to-board connectors consist of the contacts that establish an electrical connection and a housing that protects and fixes the contacts. In combination with a corresponding counterpart, this results in a rigid board-to-board connection.

In contrast, floating connectors consist of two housing parts that are connected to each other by the contact metals. The inner part of the housing contains the pin connector pattern. This is framed by an outer housing that protects the soldering surfaces and contacts. The floating contacts are long and curved (Figure 1). Due to their shape, they allow the inner housing part with the pin connector pattern to move within the limits set by the outer housing part. The floating contacts act as spring elements. It is possible to move and tilt the pin connector pattern in the connector. This feature is called floating.

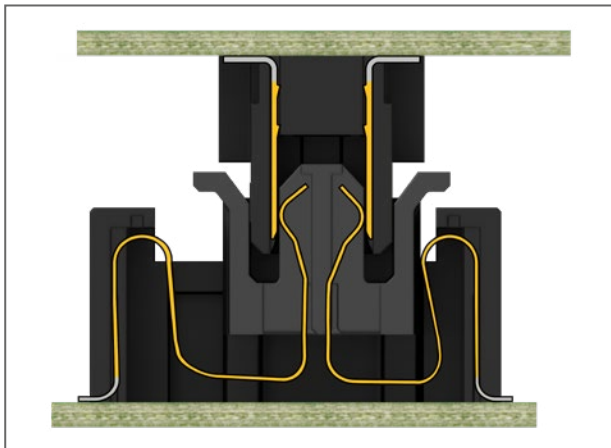


Figure 1: The contact system enables movement in the system (Floating principle)

Figure 1 shows a sectional view of the floating connector. The lower printed circuit board shows the floating female connector strip with the curved contact and movable pin connector pattern. The rigid male connector strip, which is soldered to the upper printed circuit board, is plugged in from above. The male connector strip is shifted to the right, which causes the floating contacts to deflect. The soldering area of the male connector strip and female connector strip is subject to little stress, as the special contact geometry allows relative movement in the connection system. This allows

the pin connector pattern to be moved back and forth within a very large tolerance range while the soldering area remains fixed. A misalignment of ± 0.7 mm is possible in the X and Y direction (Figure 2). This means that the tolerance distance of the connector is greater than its pitch. In addition, the FS 0,635 series also allows a tolerance of 0.6 mm in the plug-in direction, known as wiping.

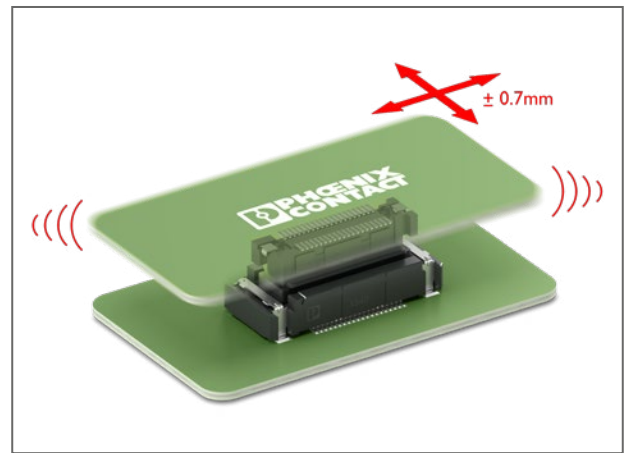


Figure 2: New possibilities for device design by moving the printed circuit boards in the X and Y direction

The FS 0,635 floating female connector strip can be combined with three male connector strips of different heights to create different stack heights. Possible stack heights are 8 to 8.6 mm as well as 11 to 11.6 mm and 12 to 12.6 mm. This makes it possible to find a suitable PCB spacing for the respective application. If the rigid combination of the FS 0,635 series is used, stack heights between 6 and 16.6 mm can be realized.

Advantages and applications of floating

The movability of the pin connector pattern enables very high tolerance compensation and allows mechanical stress to be minimized in the connection. This is an advantage both during mating and when plugged in. Forces acting on the connector and the solder joints are reduced by the spring action of the floating contacts. This results in an extremely reliable and long-term stable board-to-board connection. Floating makes it possible to compensate for manufacturing tolerances during mating. These inevitably occur when mounting printed circuit boards,

e.g., due to the joining process. Devices in which the printed circuit boards are guided during mating benefit from tolerance compensation in the connector. Floating compensates for misalignment when connectors are mated.

Floating connectors facilitate the automatic mounting of printed circuit boards. Mismatching is partially compensated without damaging the board-to-board connector on the printed circuit board. This leads to fewer failures in the process and it is possible to optimize the speed of plugging. This means that the floating connector has a direct influence on the efficiency of the mating process.

In addition, floating allows the use of multiple board-to-board connections between two printed circuit boards. The floating properties provide enough leeway to compensate for the position tolerances that occur when positioning and soldering the connectors. The spring contact minimizes the force exerted on the solder joints. This enables the reliable use of multiple connectors.

The floating connector is specifically suited to certain applications. Its special properties are particularly advantageous where vibrations or shocks occur. This can be the case, for example, in industrial devices that are exposed to permanent mechanical stress. However, thermal effects can also cause relative movements in the connector. Floating can compensate for such movements and reduce the associated stress on the connector.

As the tolerance compensation requires greater movement, the floating connector requires more space than comparable rigid connectors. Users should take this into account when using them. In general, rigid board-to-board connectors are just as reliable and durable as floating connectors in many applications. Floating connectors really come into their own wherever their special properties are required. Floating connectors are a specialist solution for certain applications – they are not all-purpose connectors.

High-speed data transmission possible despite floating

The signal integrity of a board-to-board connector depends on many factors. The geometry of the contacts is therefore a key factor. One would assume that the curved, spring contacts of the floating board-to-board connectors are unable to deliver good high-speed results. Yet, in the FS 0,635 series, the floating contact has been optimized so that this version also has very good data transmission properties (Figure 3). With FS 0,635 floating, high-speed data rates of up to 40 Gbps can be achieved. This value represents a real innovation.

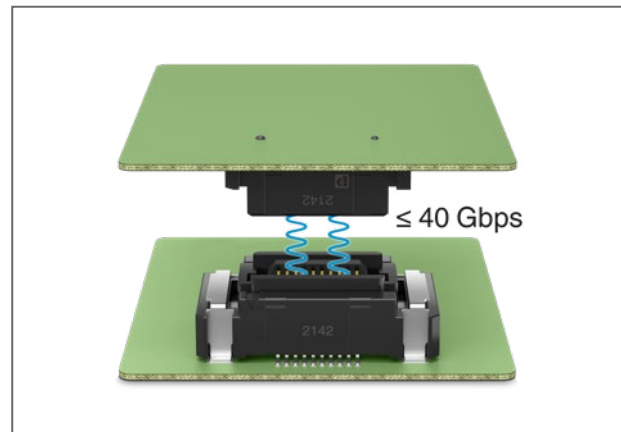


Figure 3: Unique to the market: Data transmission rate of up to 40 Gbps

Summary

Floating connectors are a reliable and efficient way of connecting two printed circuit boards. They are robust and durable, making them ideal for use in harsh environments. They create a reliable connection between printed circuit boards by compensating for minor relative movements and thus reducing the force exerted on the solder joints. On the one hand, this feature is helpful when using multiple connectors on a printed circuit board and, on the other

hand, it facilitates automatic and manual plugging of the board-to-board connection.

The floating connector is specifically suited to certain applications. However, as it takes up more space, it is not the right solution for every application.

The particularly good data transmission properties of the FS 0,635 series floating connector are unique to the market. The floating contact has been optimized for this purpose and thus achieves an exceptionally good high-speed performance of 40 Gbps. This opens up a wide range of new applications for floating connectors.

In a nutshell

- Floating allows movement in the board-to-board connection
- Unique combination: considerable tolerance compensation and very high data transmission possible in one connector
- Flexibility in device design due to the choice between rigid and floating versions

➤ More information at
phoenixcontact.com/btb

Contact



Kathrin Stelzer

Product Marketing Board-to-Board connectors, BU PCC
+49 5235 3-30564
kstelzer@phoenixcontact.com



Tobias Kanne

Product Marketing Board-to-Board connectors, BU PCC
+49 5235 3-30577
tkanne@phoenixcontact.com