PCB plug-in connectors on a new scale
SKEDD direct plug technology revolutionises connection technology

Pressfitting, wave soldering, THR soldering, and SMD soldering are all well-established processes used in PCB mounting. The new SKEDD direct plug technology does not rely on any of these, which is a great step forward for PCB connection technology (Figure 1).

![Figure 1](image.png)

Figure 1 - Phoenix Contact’s new plug-in connectors based on SKEDD direct plug technology can be plugged into through-plated holes on the PCB without requiring any tools.

The PCB represents the central nervous system of any modern device, and it has become more and more powerful in recent years thanks to ongoing technological advances. Conversely, devices and their PCBs are getting more compact with each new generation. For manufacturers, this results in the challenge of needing to fit an increasing number of functions into as small a space as possible. At the same time, however, production is also increasingly relying on flexible and efficient processes. In terms of optimised manufacturing processes and competitive industrial production, there is one well-established component group where there is still room for improvement: the PCB connection.
Reliable but irreversible

When it comes to reliably transmitting signals, data, and power between devices and the field level, PCB terminal blocks and PCB plug-in connectors are the most commonly used solutions. Automatic soldering processes and pressing machines connect terminal blocks and base housings to the PCB in a largely irreversible manner. Traditionally, directly pluggable and disconnectable connections are only supported at the PCB edge using so-called edge plug-in connectors that are plugged onto solder pads. Scenarios for this type of direct plug technology include industrial applications, white goods, and heating technology.

SKEDD provides multiple benefits

The new SDC 2,5 plug-in connectors from Phoenix Contact bring the individual advantages of the established assembly technologies together. SKEDD direct plug technology makes it possible for the first time to install directly pluggable and disconnectable connections anywhere on the PCB (Figure 2). These plug-in connectors do not require a base housing and can be manually plugged into through-plated holes on the PCB.

The geometry of the SKEDD contacts represents an advanced design based on press-fit contacts. The contact area comprises two spring-loaded contact brackets that slightly bend outwards. This shape allows them to perfectly adapt to drill holes. When the contact is inserted into the hole, the contact brackets are pressed together. The resulting contact force between the contact bracket and the inside of the drill hole establishes a reliable mechanical and electrical connection (Figure 3).

With this design, the PCB does not need to meet any specific requirements. The only prerequisites needing to be satisfied are those relating to pressfitting; tin through-plated drill holes.
Holes have already become commonplace in PCB production for a number of uses, including THR soldering.

Lateral expanding rivets on the plug-in connector provide additional mechanical grip (Figure 4). The locking mechanism of the expanding rivet is dimensioned for PCBs with a thickness of 1.6 mm, which is the accepted standard. The connector can be easily removed by opening the lateral lock and pulling the direct plug connector off the PCB. The quality of the plug connection remains largely unchanged for up to 25 plugging cycles.

**Direct plug technology is taking convenience to a new level**

The new plug-in connectors with a 5.0 mm pitch come in versions with 1 to 16 pins and are designed for voltages up to 320 V and currents up to 12 A. Connection is established using a regular push-in spring connector with integrated spring lever, for conductor cross sections from 0.2 to 2.5 mm². Rigid and flexible conductors with ferrules are plugged in directly, i.e., without needing to open the clamping area. To release the conductor, a standard screwdriver is used to trigger the color-coded integrated spring lever. An integrated tip probe allows for checking the voltage at any time.

SDC 2.5 plug-in connectors can be inserted anywhere on the PCB where there are through-plated drill holes. This facilitates a more flexible PCB design, since existing plug-in connectors with direct plugging only support contacting at the PCB edge.

As an additional advantage of these plug-in connectors, they can be plugged and unplugged manually, i.e., without the need for any tools. This is not possible with components based on press-fit technology, for example. Here, special pressing rods are required to establish a connection with the PCB. While it is possible to press out the components, this can only be done with a specialised tool.
Reducing process and component costs

What also characterises SKEDD direct plug technology is that it does not place an additional thermal load on the PCB. Today, many PCBs first undergo SMD processing, and in a second step the PCB terminal blocks or base housings are attached using wave soldering. SKEDD direct plug technology makes this second step obsolete, resulting in savings both in terms of process time and component costs. Not only the soldering process becomes superfluous, but with it the entire logistics and planning effort for the base housings.

Furthermore, the streamlined SMD soldering process benefits from having assembly costs and feeder space taken out of the equation. As there is no need for a basic housing, the SMD line furthermore benefits from gaining more space for other components. In the best-case scenario, this will allow manufacturers to produce additional assemblies in a single plant without the need for retooling.

The new SKEDD direct plug technology makes it easier to put additional functions on the PCB. For instance, it allows a PCB to be used for several different device versions. The PCB design merely needs to provide the through-plated holes required for the plug-in connectors; extending the function range then becomes as easy as inserting the corresponding plug-in connector. Previously, this usually meant that during the PCB manufacturing process, a PCB terminal or base housing would be soldered onto the PCB regardless of whether or not the added function was needed. With the ability to leave out the base housing, manufacturers can also further miniaturise the assembly and reduce the number of transition and connection points. This helps to eliminate contact resistances and minimises the number of potential error sources.

Diverse range of uses
There are numerous application scenarios for plug-in connectors based on SKEDD direct plug technology. These connectors are highly suitable for conductor connection – both for measurement and control technology in traditional industrial scenarios as well as in areas such as building automation, heating systems, and white goods. Concrete applications include control systems for heating and air-conditioning systems, large household appliances, and smoke and fire detectors. Also possible are applications where different components are placed and soldered onto the front side of the PCB while the plug-in connector is connected to the back side. When using SKEDD direct plug technology plugs, there is no need to equip and solder the base housing from the back, thus preventing the PCB from being subjected to additional thermal stress.

**Conclusion: An ideal solution for new market demands**

In response to new requirements in the area of PCB connection, Phoenix Contact has introduced its SDC 2,5 plug-in connector range with SKEDD direct plug technology. The advantages of the new components are striking. The flexibility previously only offered by the connecting conductor has now been extended to the plug itself. The specialised direct plug contacts can be inserted into a PCB’s through-plated holes without requiring any tools. The lateral expanding rivets reliably establish a vibration-proof and long-lasting connection between the plug-in connector and the PCB. Given this feature set, components equipped with SKEDD direct plug technology cater to a broad range of applications.

Additional information
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