

News Release from DKN Research, Haverhill Massachusetts
& Asahi Denka Kenkyusho Laboratory, Tachikawa Japan

Film Connectors for Ultra Thin Connections In High Density Flexible Circuits

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DKN Research, a Massachusetts based advanced printed circuit engineering firm, and **Asahi Denka Kenkyusho Laboratory**, a Tachikawa, Japan based firm engaged in high-function surface processing technology for flexible substrates, teamed up and co-developed an epoch-making interconnecting technology; a “Film Base Connector” that reduces the connection height of high-density flexible substrates to less than 1/3 of the existing connector’s height. The micro bump arrays built on the thin film substrate enable high pin count connections over 1000 in a half inch square.

A number of interconnection technologies are widely used on circuit boards within portable electronics (cellular phones, MP3, digital cameras, etc) to connect flexible substrates to the other devices. Several types of connectors were adopted as an industry wide standard where repeated connections with high-density flexible circuits are needed. Remarkable progress relative to the miniaturization with high pin counts was achieved during the last decade, and nowadays, 0.3mm pitch connectors with 60 pins are available in the market. The heights of the connectors measured from the surface of the circuit board reduce year after year, and the latest model FFC-ZIF connector has attained a height smaller than 1.0 mm. Board to board connectors provide more pin counts with a higher reliability; however, they require a larger height and SMT spaces compared to FFC connectors. Consumer’s insatiable appetite for smaller portable electronics is not satisfied, and further miniaturization, especially the height and space at the SMT assembling, is required from all electronic components. Unfortunately, any substantial reduction in the height of the connectors designed for flexible circuits cannot be expected from existing connectors. This is considered a major road block for designing future micro portable electronics.

A NEW TECHNOLOGY unveiled this month now provides an even thinner interconnection with more pin counts for flexible circuits and other substrates and components where space is very limited.

Over the last 15 years, DNK Research (DKNR) and Asahi Denka Kenkyusho Laboratory (ADK) have developed many kinds of technologies enabling the formation of a variety of micro-bump arrays on flexible substrates generating many advanced termination structures. Recently, DKNR and ADK co-developed a technology using micro bump array on a thin flexible film which enables an extremely thin interconnection of flexible circuits and other substrates and components where space is very limited. This technology offers various circuit constructions; the most cost effective structure is shown in the schematic figure attached. In the construction, the flexible substrate is connected to the other circuit components through a film connector that is a thin film with micro-bumps formed on it. In this case, the space between both circuits is below 0.3mm, which is 1/3 to 1/5 of existing connectors. Because the connection points of the film connector can be freely arranged into arrays, the connection spaces can be minimized. The attached photo shows an example of the connections through the film connector for the ultra-high-density circuits with high pin-counts over 60 pads and pitches of the line/space of the flex cable below 50um.

The connection mechanism for the new technology is very simple, but don't be fooled; a high reliability is still achieved. DKNR and ADK also verified the contact resistance will not increase after more than several hundred on-off and long-hour environmental aging tests. An eclectic variety of applications can be expected because of the broad flexibility of the new interconnection technology. Optimizing the designs of the film connectors and flexible circuits will allow higher pin counts of possibly more than 1,000 contacts in half inch square. An idea for exchangeable stacked package within the IC devices will be practical.

Additionally, the broad design flexibility of the interconnection technology enables not only high-density but also complex structures such as multilayer circuits and pseudo-coaxial cable circuits. It is expected to make up for the disadvantages of rigid flex and multilayer flex substrates that have many design restrictions.

The specifications for interconnect technology are basically determined by the design of the final products; therefore, DKNR and Asahi are taking a different approach with launching our new technology. The early stage of commercialization will open the basic technology in the public arena, and allow licensing of technology to the electronic product assemblers, connector suppliers and flexible circuit manufacturers. (International patents are pending for the basic interconnect structure). DKN Research will issue the design guide for the film connector and flexible circuits in the near future.

DKNR and ADK have been organizing manufacturing systems for small volume production of varying types throughout Japan and the U. S. The volume production capabilities from film connectors and flexible circuits will be set up in Asia by 2009; however, manufacturing technologies for film connectors and suitable flexible circuits will be transferred to the other manufacturers including the connector manufacturers with the licenses as a convenience for the end customers.

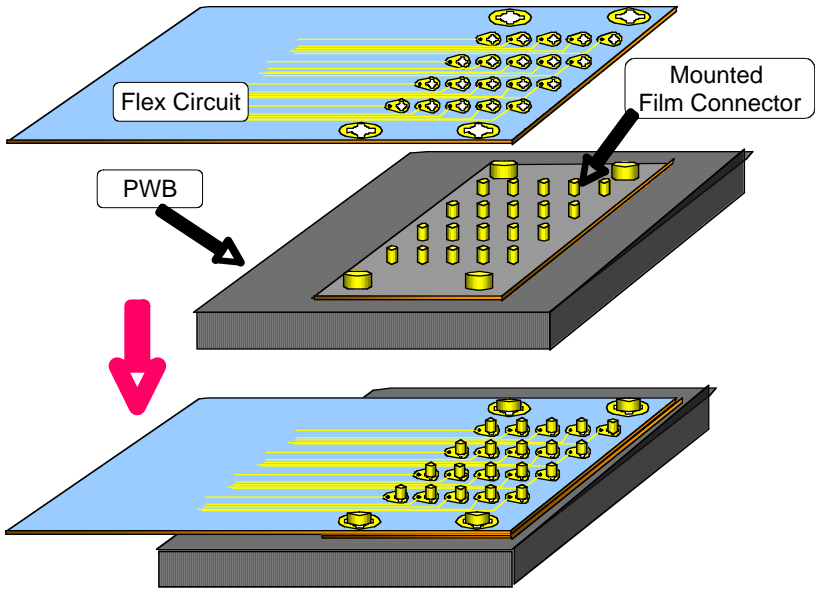
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Attached figures: Film Connector Structure and Photo

Mechanism of the Film Connector



Size Comparison of Film Base Connector

