

ALTERNATIVE CONNECTOR SOLUTIONS

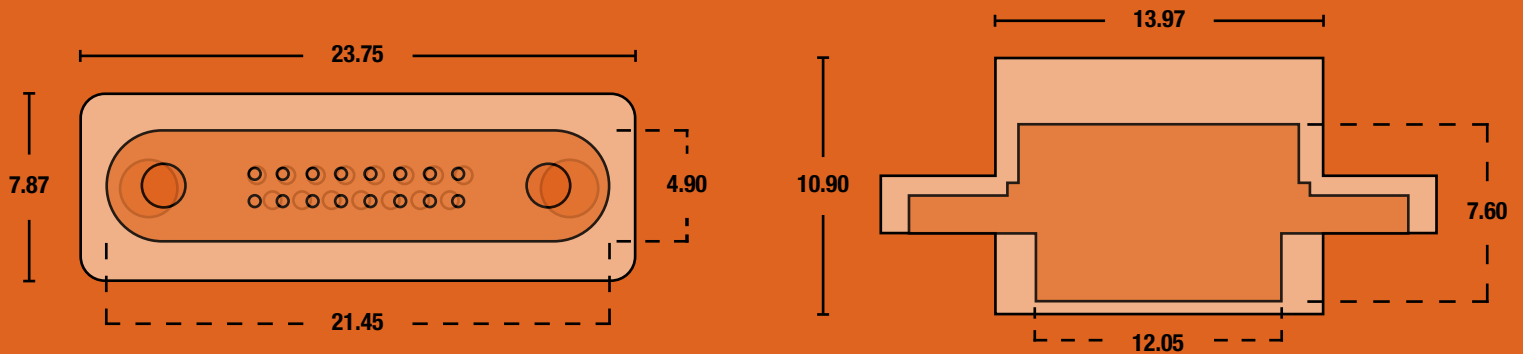
For SWaP-Optimized Applications

By John Brunt, High Reliability Product Manager, Harwin

The D-type connector format has been around for several decades having first appeared in the 1960s. These components provided engineers with interconnect solutions that were relatively compact and had good overall mechanical robustness. Because of these characteristics, they saw deployment in a wide range of high-reliability (Hi-Rel) applications where there are space limitations, including in military and aerospace systems.

Though these connectors proved themselves to be very suitable in such applications for many years, the engineering requirements set by later generations of electronic design called for further miniaturization. Micro-D, a derivative of the D-type connector, was introduced to address this trend. Additional applications in robotics, medical equipment and satellite hardware have all benefited from the adoption of Micro-D.

With the density of electronic systems continuing to increase, the inadequacies of Micro-D have become more apparent. Today, engineers are looking at new lightweight connector technologies capable of supporting a greater number of contacts, while taking up only minimal space. The following article will describe the highly optimized solution that Harwin has developed, and show how it has several key attributes that set it apart from Micro-D.



▲ Figure 1: Footprint comparison of Gecko-SL and Micro-D connectors

AVOIDING THE SHORTFALLS OF MICRO-D

Like the D-type connector, Micro-D's contacts are arranged in staggered rows. This means only odd contact numbers can usually be supported – which can require selection of a larger connector. There are also limitations on the number of contacts each unit can practically accommodate.

The 1.25mm-pitch Gecko connectors supplied by Harwin present engineers with ultra-compact interconnect solutions that can fit in far more contacts than Micro-D. They offer a 45% reduction in the overall size compared to their Micro-D equivalents. This is illustrated in **Figure 1**, where the footprint of a 16-pole Gecko-SL connector (in dark orange) has been overlaid onto an equivalent 15-way Micro-D connector (in light orange).

In addition to the size reduction, their glass-filled thermoplastic housings make them much more lightweight – weighing

much less than the corresponding Micro-D, while still having the necessary insulation characteristics. Use of a Gecko unit can result in the overall weight of the connector being as much as halved – with a 10-contact Gecko weighing just 0.9g compared to 1.7g for a 9-contact Micro-D, and a 50-contact Gecko weighing only 2.1g while a 49-contact Micro-D would weigh 4.7g.

These housings are able to cope with exposure to extreme temperature levels, with an operational temperature range spanning from -65°C to +150°C. They also exhibit industry-leading outgassing properties when placed in a vacuum, something which is of particular value in space deployments.

Gecko connectors, just like Micro-D connectors, can be used in a wide variety of different application scenarios, with board-to-board, wire-to-board and wire-to-wire configurations all supported. But, unlike Micro-D, Gecko is available with numerous housing arrangements and mounting styles covered. In contrast to the staggered contact layout of Micro-D connectors, the dual-row Gecko components (with their rectangular housings) are better able to address situations where there are even contact number requirements. This means that

larger connectors, with superfluous contacts, will not need to be specified – keeping the bill-of-materials costs and space used to a minimum.

The screw-machined beryllium copper contacts incorporated into these connectors allows them to deliver comparable electrical performance, with each contact being rated to simultaneously carry currents of up to 2A. The contacts are gold-plated to minimize resistance and ensure long-term durability. Thanks to its patented 4-finger design, at least one surface of each of these contacts and their respective plugs are touching under heavy shocks or intense vibrational forces, ensuring that an electrical connection is always maintained. The Gecko series has been thoroughly tested with vibrations of 1.52mm amplitude applied, cycling between frequencies of 10Hz and 2000Hz for a period of 6 hours. 100G shocks are likewise applied in the Z axis for 6ms, and 50G in the X and Y axes for 11ms.

The robust construction of Gecko connectors enables them to support over 1000 mating cycles. This is double what could be expected for a Micro-D connector. Depending on the level of interconnect retention needed and space available, these components can be offered with screw-lok or latched options. The strong stainless steel screw fixings used here provide a high degree of strain relief. An example of this screw-lok mechanism is shown in **Figure 2**.

To get an understanding of the greatest power density improvements that can be realized by migrating from Micro-D to Gecko, let's now look at an example. **Figure 3** shows the footprint of a 26-pole Gecko latched connector (in dark orange). This can deliver a total current of 52A via its contacts, across a 0.740-inch (18.80mm) length, equating to a power density of nearly 70.3A/inch. That compares very favorably to the Micro D (shown in light orange). Here 75A can be delivered across its 25 contacts (each being rated at 3A), but the length

involved is 1.185-inches (30.10mm) which equates to a 63.3A /inch power density. Using Gecko latch-based connectors allows 11% additional power to be delivered for a given length of connector.

Through the introduction of new Gecko-MT connectors, even greater power densities can be achieved. Here, the data contacts are accompanied by dedicated power contacts, which each have an impressive 10A current rating.

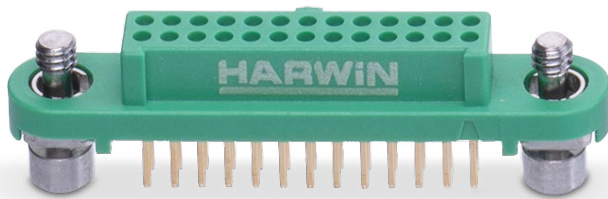
It should also be noted that Gecko connectors are not only shorter than the Micro-D, but also substantially slimmer shown in **Figure 4**. This results in still greater space savings for any given power rating. The availability of horizontally-oriented versions of Gecko-SL and Gecko-MT is another plus point. This means that connectors/cabling can be positioned at the outer edges of a PCB, so that such boards can be stacked closer together and any available space is better utilized.

CONCLUSION

Though the Micro-D connector has been a very effective way to implement compact and reliable interconnects for many years, the demands now being placed on electronic systems mean that, in many cases, it is now becoming an outdated approach. The combination of comparable performance, alongside reduced size and improved power density enables Harwin's Gecko series to bring clear advantages. These low-profile connectors offer space and weight savings, and the increased contact versatility translates into cost reductions too, while still meeting the most exacting performance expectations.

▼ *Figure 2: A Harwin Gecko-SL connector with mate-before-lok screw-lok fixings*

▼ *Figure 4: Gecko connector vs Micro-D size*



▼ *Figure 3: Gecko Latch and Micro-D connector power density comparison*

