



ULTI-MATE CONNECTOR MICRO AND NANO PINS AND SOCKETS OFFER A DISTINCT ADVANTAGE OVER ALTERNATIVE CONTACTS

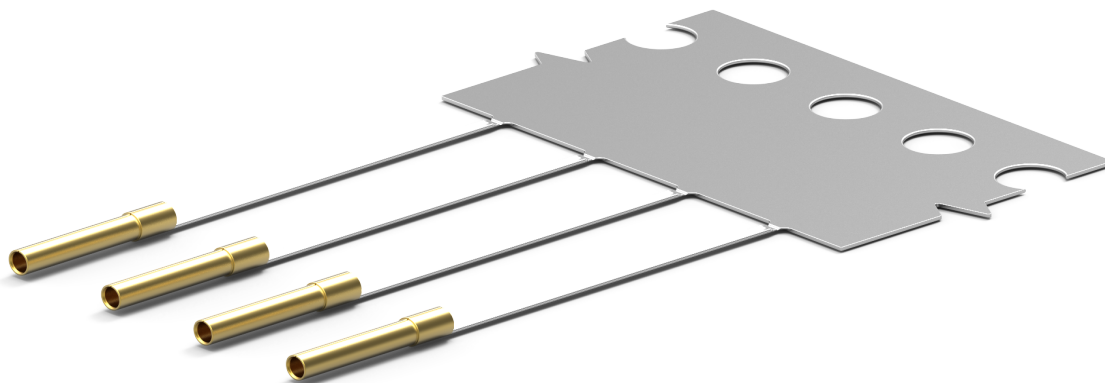
As new electronic systems continue to deliver more features, performance and reliability, designers are also tasked with continually reducing the size and weight of their equipment. The use of traditional highly reliable connectors is typically too large for future designs, so engineers are turning to Micro and Nano miniature connectors to fulfill their requirements. With this comes a new set of challenges, starting with the heartbeat of any connector: the contact system.

Most common Micro and Nano miniature contacts

There are four main types of pin and socket contacts used by Micro and Nano connector manufactures. For reference, both Mil Spec style Micro and Nano connectors use a male pin that is the compliant gender, which engages with a socket contact. The purpose of this paper is to focus on the sockets, which are typically screw-machined, drawn metal, or stamped and formed. While there are advantages to each, the best choice depends on the specific application. For example, a screw machined or drawn metal socket is suitable for crimping stranded or solid wire. Crimped solid round wire is also commonly used to form through-hole or surface mount terminations. It is these terminations that begin to accentuate the differences between stamped and machined contacts.

The advantage of stamped and formed socket contacts versus alternatives

Stamped and formed contacts are created from rolls of copper alloy that have been selected because of its specific conductivity, strength and temper. It then goes through complex progressive stamping dies that form its specific geometry. This process produces a very consistent result which includes an integral contact tail that does not have to be added in a secondary operation, unlike crimping to a solid round wire to create the same surface mount or through-hole contact tail termination. The integral contact tail eliminates any contact resistance as well. The result is excellent true position and coplanarity to the bottom surface of the insulator or metal shell, in relation to the plane of the solder pad. This process also enables highly consistent manufacturing repeatability. By comparison, individual contacts such as screw-machine or drawn sockets are bulk packaged and handled individually with placement into vibratory bowls leading to a less consistent assembly result.

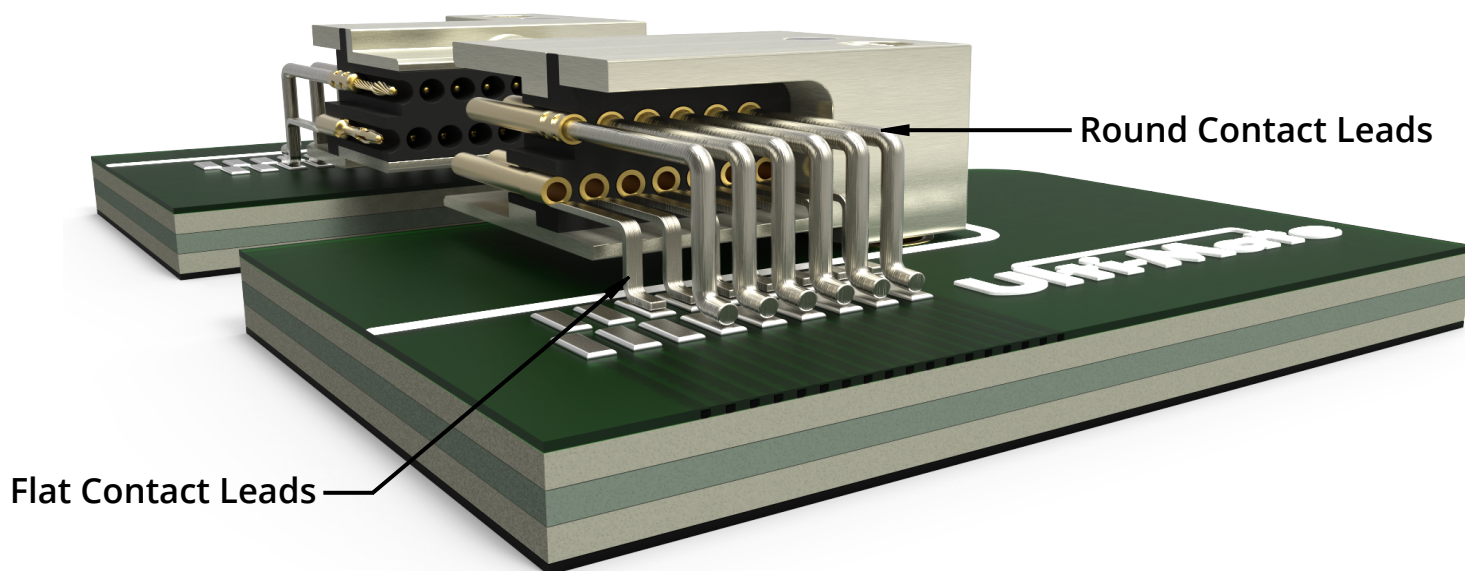


Ulti-Mate Connector Inc. Socket Contacts shown prior to assembly

Military specifications M83513 and M32139 require the use of a male compliant pin, which takes on many shapes however the common element is a compliant section of the contact that engages with and compresses inside a mating socket contact. There are obvious advantages to using a stamped and formed socket with a flat tail on the termination end, particularly in surface mount applications. That said, there are additional considerations and steps that need to be applied during the manufacturing process to assure reliability and compliance with both Mil Spec's, during a mating cycle. For example, a stamped and formed Nano socket contact is split from back to front. It's important to realize that as Beryllium Copper is formed, the molecular structure of the material is changed as well, and that this copper alloy itself will not have any memory of its past form. The only way it can be unformed from its new round shape, would be to coin the material or use an oversized gage pin. To further insure the seam is not expanded, the back end of the contact is imbedded in the plastic molded insulator with a tight tolerance and minimal clearance, therefore it is not possible for the seam of the formed socket to unroll and open up. The maximum mating/unmating force allowed by the Nano spec MIL-DTL-32139 is 7 ounces, and in reality, it is typically much less than that. Given Ulti-Mate's refined manufacturing processes, the tines of the male compliant pin never touch the seam of the socket barrel and are positioned such that they are consistently making contact with a solid portion of the inside surface of the plated socket. Even the maximum force allowed by the Mil Spec is significantly less than the strength required to open the seam of a stamped contact, which has been proven by the use of tens of millions of these exact socket contacts in the field.

Flat contact leads are superior over round contact leads

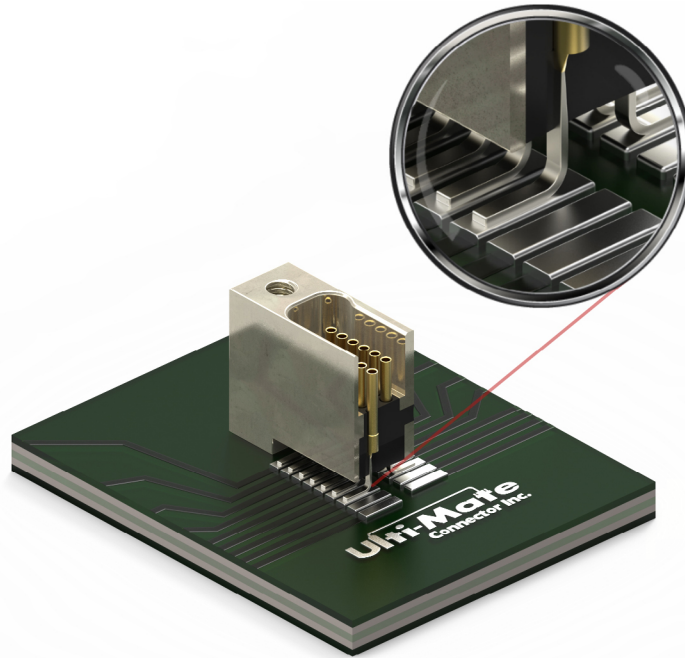
It is well established that a flat contact, particularly in these Micro and Nano sizes are more easily and predictably formed into specific shapes for consistent processing during assembly. Lack of coplanarity using round contacts is a problem that flat, integral contact tails eliminate. This is particularly true with surface mount tail terminations using automated pick and place methods. A flat conductor will also deliver consistent current at the same temperature rise than a round conductor lead.



Ulti-Mate Connector Inc. integrated flat contact leads shown compared to standard round contact leads

Conclusion

Stamped and formed Micro and Nano signal contacts with flat leads have been continuously improved upon to provide more predictable processing and coplanar stability. They have proved to reliably deliver 3 amps and 1 amp respectively. The use of flat, edge of stock material instead of round has resulted in improved contact manufacturing consistency and improved mechanical strength of the compliant pin and socket designs. They also provide a stable current carrying capacity for Micro and Nano connectors that are one-fourth to one-eighth the size of a traditional connector.



Nano Surface-Mount Connector Cross-Section showing Contact Coplanarity of 0.000" to 0.003"

For additional information, sales drawings or 3D models, please go to www.ultimateconnector.com.



Ulti-Mate Connector Inc. has been producing world-class connectors and customized solutions since 1977. From our facility in Orange, California we proudly serve the interconnect needs of the Military, Aviation, Medical, and Geophysical markets. Our reputation for innovation and quality has placed Ulti-Mate Connectors in advanced missile and guidance systems, predator drones, unmanned satellites, directional drilling equipment, and medical imaging systems.