NEXT-GEN CONNECTORS

Travis Neumann and Robert Stanton reveal how a line of innovative shaped connectors easily meet rugged shock and environmental requirements

As circuit boards are used in more portable and rugged environmental applications, interconnections to and from those printed circuits become a critical element. Connector customers frequently have demanding environments where the connections undergo both thermal and mechanical loads – as they ride along on a vehicle across rugged terrain, for example. That jarring from the drive, or the temperature change from sitting in the sun or cold of winter, can have an impact on how well connections perform. Maintaining that connection quickly becomes a big deal.

Nano-connectors can be mounted and fit into a tight nano-size spacing of .025in pad pitch on the boards. This space reduction allows higher contact density over traditional D-sub and micro D connectors (.1 and .050in pitch respectively) while decreasing weight. Plated and/or solder-dipped leads extend from the pins and sockets out of the connector shell in prearranged patterns to exactly match the solder pads on the PC board. Vertical and horizontal surface mounting formats are the most frequently used shell styles and mate with wired connectors that route signals to other portions of the instrument.

MOUNTING CONNECTORS

Connector mounting is generally done with locking screws that are included in the all-metal shell to secure the body to the board itself. In some applications point loads from hardware can be a detriment. In those cases, users adopt staking techniques similar to those found in the die attach process and use non-conductive epoxies to increase the bond area between the board and the connector, effectively spreading the load for extreme cases. Shells and leads are designed to work well with automatic pick-and-place surface mounting equipment, and can be delivered in a number of feed-formats for the manufacturer.

Omnetics' Nano-pin and socket system includes a beryllium copper spring pin with specific annealing to provide high contact strength and low contact resistance. The spring pin fits tightly into a tubular receptacle and both elements are plated to military standards using nickel and gold to extend the number of mating cycles to over 2,000 mates and de-mates. Connections are tested through 100g shock and 20g vibration while monitoring discontinuities with anything greater than 10 nanoseconds resulting in a failed test.

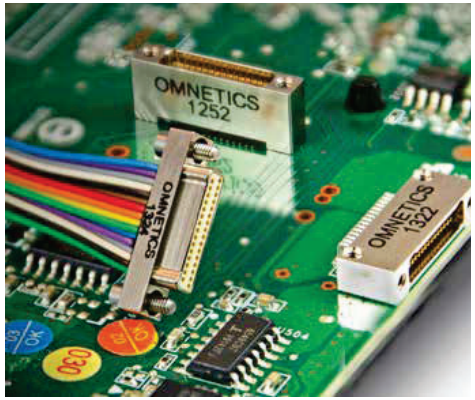
Connectors also feature standard military jack-screw locking mechanisms or a new squeeze latching system that passes that same 100g shock and 20g vibration testing as well as pull force. The new squeeze latch system works best with devices that require frequent plug-in and removal procedures for the instrument because no tools are required. Both latching designs are certified for high reliability applications.

Standard materials and interconnects are designed to operate from -55 to 125°C. Customers with more demanding environments can change materials and/or finish as needed. It is not uncommon for a high temperature, shock and vibration-rich environment such as that found in downhole drilling applications to use a stainless housing and high temperature epoxy to withstand temps up to 200°C.

Additionally, where the end use is a marine environment, a need for sealing as well as corrosion resistance exists. Those connectors regularly use silicone gaskets, sealant and stainless or other platings on the housing to resist the environment.

Bridging the connection between the box is typically done with plugs. Most often they use 30 awg Teflon insulated wire and can range past 40 awg, to reduce size and improve cable flexibility. Other materials are also readily available to suit the working environment. ETFE, FEP, PFA or silicone also make regular appearances in nano connectors and are often specified by the system designer.

Current applications range from UAV navigation and control circuitry to surveillance down-load systems. Portable computers, future soldier- worn electronics and down-hole controllers are using the new ruggedised nano-connectors.



ABOVE: **Board-mounted nano connector**
ABOVE LEFT: **The interconnections to circuit boards are of increasing importance**

Travis Neumann and Robert Stanton are with Omnetics.
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