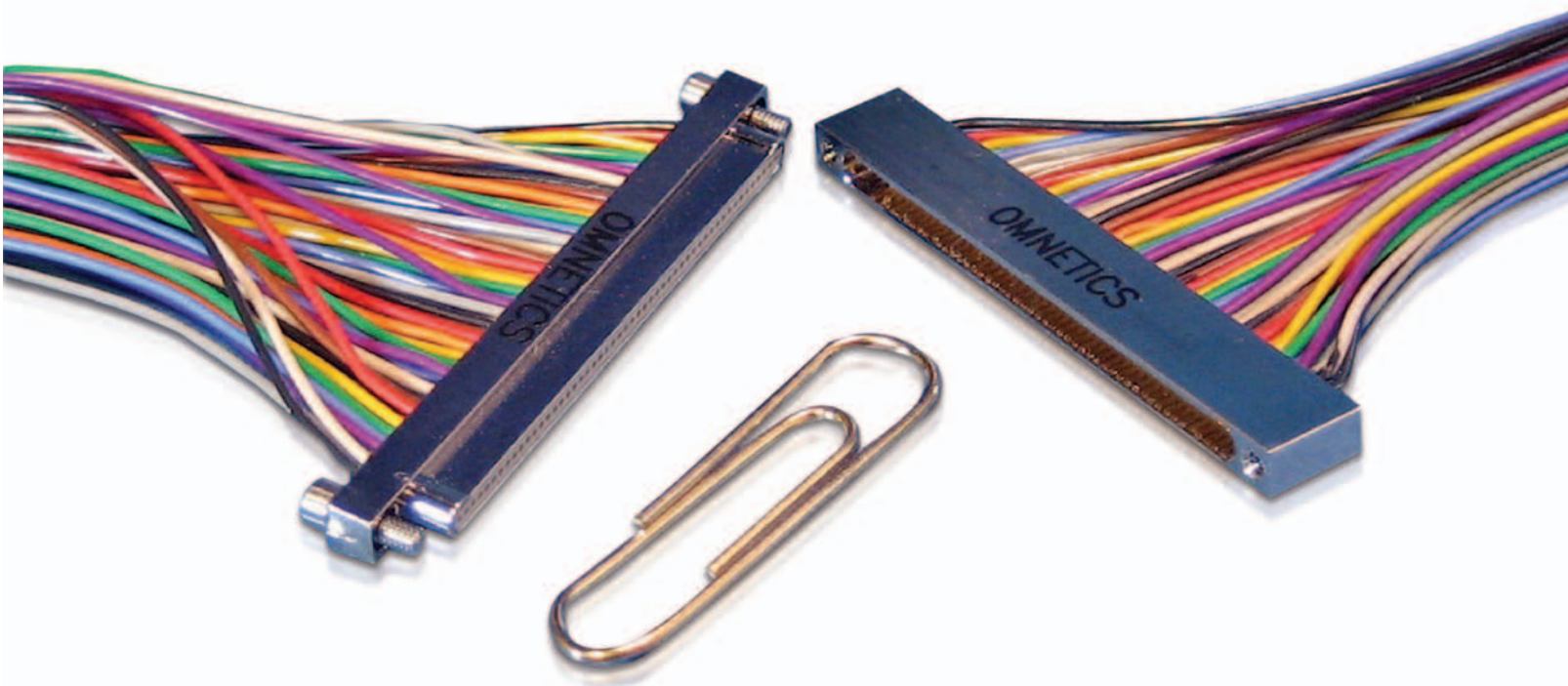


# Small is beautiful



One of the main drivers for space saving on interconnection products is to increase the functionality of the system. Together with the demand for continuously higher speeds, more power consumption is constantly required. However, more power leads to bulkier connectors which contradicts with the demand for smaller interconnect products.

It's a Catch 22 situation and the designer of interconnection products needs to make a trade off in implementing the power distribution versus the available space for functionality. But is there a compromise in achieving savings in size and weight against maintaining and improving functionality?

Thierry Goossens, product solutions manager for FCI's ELX division, reasoned: "Compromises are always possible, seen in the different new products we bring to the market, but one of the main topics to find a good compromise for is power implementation. Higher power consumption while distributing a low

*Finding a compromise between higher power consumption and space saving is not as simple as you may think.*

*By Chris Shaw.*

voltage level gives higher current rates, higher demands for low resistance interconnect solutions, leading to bulky power interconnect products.

"A different approach is to distribute lower current rates, but using higher voltage rates – 48V for example. This leads again to the use of dc/dc converters on the application boards, distributed over the system (difference between centralised and distributed power supply), but they also consume the available space for functionality."

In military and harsh environment applications, solutions are needed where size and weight is limited, such as avionics, aerospace, defence electronics,

industrial control systems and medical diagnostic equipment. The need is for small connectors that are still capable of withstanding the harshest shock, vibration and temperature conditions.

"There is simply not enough space," noted Omnetics' Bob Stanton. "Nor, in the case of satellites, is there payload available to rely on the old, tried and tested – but bulky and heavy – Mil Std 38999 circular style connectors. For similar reasons, traditional rectangular D Sub miniature configurations are no longer suitable."

A new generation of products – nano connectors – is now being designed to satisfy and exceed the requirements of tight military standards.

"Nano connectors," continued Stanton, "provide a good example of what performance can be achieved by a miniaturised connector. The performance of miniature connectors under extreme conditions is largely dependent on the contact design. Many styles have been put forward – twist pin, solid pin, pin in nest and closed spring pin. All of these



can deliver a solution of sorts, although with some, notably the pin in nest design, miniaturisation is extremely difficult or impossible. But when developing a contact for nano and other miniature styles including circulars, Omnetics designed a split end contact, named Nano Flex Pin, that not only passes reliability tests specified by the military but delivers significant benefits beyond that for deep space and high temperature applications."

ITT Interconnect has also launched a family of 0.635mm pitch connectors suitable for military applications. The nano NDD is a series of low profile, high density dual row miniature connectors, which meet the requirements of the new military specification MIL DTL 32139.

The series is based on 0.635mm pitch contact spacing, which allows a high signal density in a minimum of space. With five points of electrical contact and crimp joints, signal integrity and performance in adverse conditions has been addressed. Operating temperatures range from -55 to 125°C and ITT claims that the nano connectors can cope with significant vibration of up to 20g, shock up to a maximum of 100g and has 48hour salt spray/corrosion resistance.

### Routing

Routing possibilities are one the biggest issues for high density footprints. The denser the connector, the more layers are needed on the pcb for the footprint breakout, so the greater the board cost. Nevertheless, this can be addressed by optimising the footprints of connectors.

### PROS AND CONS OF SMALLER CONNECTORS

#### For

- More board space available
- More space for routing
- More boards fit into a subrack
- Better air flow, so less need for cooling
- Lower weight and less board material
- Better signal integrity performance since the electrical length is smaller
- Less weight, less packaging, less transport costs, less impact to the environment

#### Against

- Crosstalk performance will be impacted
- Higher power demands lead to bulkier power connectors, contradicting the demand for smaller interconnect products
- Smaller footprints lead to smaller line widths, which impacts interconnect performance
- Assembly is more difficult
- Smaller connectors impact the applied voltage level directly
- The risk of whiskers and electromigration becomes more dominant

"MicroTCA connectors exist in different footprint definitions like press fit and surface mount," explained Goossens. "The advantage of a surface mount connector is that the footprint break out can be implemented according to the needs of the designer of an interconnect application.

"The interconnection length on a pcb is decreased by using a surface mount MicroTCA connector by creating big routing channels during the definition of the footprint. This length gain will improve the signal integrity of the overall interconnect system. The second advantage is that the line width of the tracks can be increased, which will decrease the losses of an interconnect system.

"Another advantage of this flexible footprint implementation, together with a high dense connector, is that the placement of the footprint break out vias can be optimised to achieve low cross talk implementations – ground pads can share the same via to minimise the number of vias in the footprint break out."

### Market trends

While saving space in military environments may be crucial, it is the consumer sector that continues to be the driving force, so how has the current economic slowdown affected the market for interconnect products? "As consumers are starting to get less confidence in the world economy," Goossens remarked, "they will start saving money instead of spending it. Less electronic equipment like cell phones, lcd or plasma tvs, cars, audio equipment and car navigation equipment will be bought, so fewer electronic components will be required. "Secondly, as the economy is slowing down," he concluded, "CAPEX budgets are slashed; less industrial or business to business investments will be made which means a decreased demand for new equipment, especially in storage, communications, transmission, medical and industrial applications." ■

