

SMALL FOOTPRINT, BIG FEATURES

The ever-decreasing form factor of interfaces provides challenges and benefits for testing professionals

In all areas of electronic equipment use, size and weight are critical factors and today drive the need for equipment to become smaller and lighter. Specifically, for the design of portable special avionics test and maintenance equipment, these factors are becoming paramount. Suppliers are challenged to find a corresponding solution beyond the 'traditional' industry standard form factors like the PCI, PCIe and PXI.

The PCMCIA (ISA based) and PC Card (PCI based) interface types both have more or less the same footprint, the credit card size mainly supported by commercial laptops. When the USB interface increased in popularity they disappeared and are no longer supported by commercial laptop vendors. The interfaces can now only be found in a small number of specialist semi-rugged/rugged laptops. The designated successor of the PC Card, the ExpressCard (PCIe based), did not gain popularity, due to the increasing success of the USB.

However, there are a couple of issues that need to be considered when looking at USB interfaces, since with commercial laptops, USB devices are usually mechanically connected differently from in the PCMCIA/PC Card approach. The partially integrated PCMCIA/PC Card is widely seen as being better suited to field applications than the mechanically less robust PCIe and USB A-type connectors.

Due to the popularity of USB applications, the AIM design approach was to use a Smart Cable (ASC) that integrates all the interface electronics into a D-Sub, 37-pin connector shell that can easily be attached to any USB 2.0 port. The bus interface electronics reside inside the connector shell and functional features are equivalent to the PCI-form factor, enabling test, simulation and monitoring of a MIL-STD-1553 bus with concurrent Bus Controller (BC), Multi-Remote Terminal (MRT),

Bus Monitor (BM) and physical replay functionality. Critical timing and bus protocol-related functions are still executed on the small interface core SoC (System on Chip) devices inside the connector shell and do not stress or overburden the USB connection with any real-time protocol performance. Software compatibility between the bigger form factors and the smaller footprints, also makes migration of existing application software easy and efficient.

The migration of bus analyzer systems that use smaller form factors, such as the AIM Smart Cable (MIL-STD-1553 and ARINC429), becomes a very interesting option for extremely lightweight test, simulation and monitoring systems when combined with a tablet PC.

One point to note is the important difference between dedicated PCI/PCIe-based interfaces and USB interfaces. The former are more tightly coupled to the PC backplane, which gives rise to some advantages such as interrupt handling of specific events within the customer application software rather than the abstraction of interrupt events via USB, with higher latencies.

The most recent introduction of the PCIe Express MiniCard (Mini PCIe) provides the smallest form factor yet. This is relatively new in the avionics test market and brings back into play the tightly coupled interface core to a PCIe Express backplane. The entire interface has to fit on this footprint, including the physical front end adaptation to avionics buses such as MIL-STD-1553 and ARINC429.

Ideally all functions and features of former larger footprint interface types are now available on MiniPCIe. This was one design goal for the AIM MiniPCIe card (AME1553), so that full MIL-STD-1553 test, simulation and monitoring capability with concurrent BC, MRT BM and physical replay can be offered



1// AIM Smart Cable – ASC1553 together with the AIM MiniPCIe card AME1553

in this form factor with full software compatibility with existing AIM interfaces.

AIM has already successfully migrated a customer application, which was previously tied to a PC card interface, to a MiniPCIe card, confirming the suitability of this small form factor for test and simulation applications. Generally speaking, for the MiniPCIe form factor, full integration into the corresponding host platform or laptop/tablet PC would be required for a customized I/O connection.

The advantage is the implementation of a more rugged test and simulation or maintenance equipment, since the I/O can use suitable rugged connectors.

In summary, small form factors like the AIM Smart Cable or MiniPCIe are not forcing users to relinquish any test and simulation features, nor to give up any software compatibility to their existing applications or AIM bus analyzer software. \\\

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