AMC cards offer hot pluggable

High performance modules for ATCA & μTCA

Advanced Mezzanine Cards offer a rich new ecosystem of IO solutions to meet the needs of any system architect.

Erwin Gelderblom, Dave Brearly

AMC cards are very important for ATCA and Micro TCA architectures. They can be used for processor modules, DSP farms, IO cards, and disk drives. The volumes generated by both architectures are expected to insure that the AMC cards will be cost effective and available in a long menu of card types.

From the end user perspective, having hot swappable, functional blocks allows the architect to design a box that is quickly upgraded as the semiconductor technology improves. This is a huge advantage in the market place. The system designer no longer needs to worry about his box becoming obsolete by a competitor with a later generation of processor or a larger capacity storage medium. He can just plug in a new AMC card with the latest technology and be fully competitive. The ultimate box purchaser is protected by the same ability to upgrade or scale to meet future needs.

Currently, the industry is producing a broad range of boards that operate at XAUI speeds, 3.125 Gbps, across the backplane. We anticipate, however, that in the near future, chips will ratchet up to 4 X that speed, allowing for significant system performance improvements just by upgrading daughter cards. IO architectures are being developed now such as PCIe generation 2 that are designed to run at 5 Gbps. Storage architectures are also seeing a bump in speed. SAS generation 2 is specified at 6 Gbps, SATA generation 2 is 3 Gbps

10 Gbps Ethernet can be run

10 Gbps Ethernet can be run on 4 XAUI at 3.125 Gbps or, as
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Advanced Mezzanine Connector, style B+

chips develop, run at 12.5 Gbps across a single channel. Having fewer fast channels has several benefits. For example, having one quarter as many traces on the backplane means that there can be fewer layers, a thinner backplane and shorter electrical stubs. The additional benefit is that fewer layers mean lower cost for the backplanes themselves.

This cost reduction is further enhanced by the ability to use smaller plated through holes while keeping aspect ratios within manufacturable limits. Smaller holes also enhance electrical performance. Lower aspect ratios on plated through holes allows smaller holes and more generous routing channels, reducing crosstalk, and return loss. You can readily see that this cycle of performance improvement combined with reduced cost builds on itself.

To be able to use this capability in the future, however, the system can design the backplanes to be capable of 12.5 Gbps even though boards and chips may not be available yet. Fortunately, the products, knowledge and technologies exist today to be able to make 12.5 Gbps backplanes.

In ATCA, the AMC’s are used for add-in option cards. The Molex AMC connector design uses press-fit technology. These connectors use wafers for each conductor pair. By combining adjacent left handed and right handed wafers with an air channel between, creating broad side coupled differential pairs. A ground wafer then isolates the pairs. This combination controls impedance, and keeps crosstalk low, enabling 12.5 Gbps performance on one pair. After considerable signal integrity modelling and verification, Molex SI engineers have designed a launch that delivers 12.5 Gbps performance through the interface with the daughter card.

Similar connector design and signal integrity rigor were used to design a compatible µTCA backplane connector that also achieves the 12.5 Gbps speeds across the backplane.

It is believed that volume will be key to AMC adoption in the market. The more cost effective we can make the systems today, (both ATCA and µTCA), the more broadly AMC’s will be used, driving higher volumes and lower cost for both semiconductors and the supporting software.

To facilitate the market, Molex has designed a µTCA backplane using press fit connectors that still offers the 12.5 Gbps speeds. By carefully managing the launch geometry, this has been accomplished at a backplane cost lower than comparable 3.125 Gbps backplanes. If the speed comes without extra cost, why would designers not use the higher speed backplanes, even if their current AMC cards cannot take advantage of the higher speed? By anticipating the need for higher speed, the designer has extended the life of his design for many years. This is extraordinarily important in telecom applications where the same box can be expected to be in the field for a decade or more.

Applications for µTCA, in particular, are expected to be high volume edge applications such as micro base stations for various wireless protocols, fiber to the premises, or DSL. If the technology can become inexpensive enough, it can proliferate into applications needing a modest number of boards, high performance, and high volume. Examples can be traffic control boxes, medical and industrial applications, and even home network servers.

Rugged MicroTCA

To serve rugged applications in the market, a new PICMG standards effort is underway to define a conductive cooled µTCA chassis. The concept is to use metal clam shell heat sinks around off-the-shelf AMC cards. These clam shells envelop the boards, interfacing thermally with the chassis through wedge locks.

The outside of the chassis can be finned for passive convection for pole top electronics. The
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chassis can also potentially be used on water cooled cold plates for ruggedized vehicle mounted electronics. This effort has just begun within PICMG. The name is expected to become “Rugged µTCA.” This should further expand the market for standard AMC modules.

The Molex product offering includes AMC connectors, µTCA backplane connectors and a variety of front panel I/O (input/output) connectors. Molex also offers µTCA backplanes and a development µTCA chassis.

AMC connector for ATCA carriers

Molex’s AMC connector uses the press-fit wafer technology to fine tune electrical performance to 10 Gbps per differential pair. The tried-and-true press fit section is the same that has been used for years in the GbX backplane connector family. By using press fit instead of the gold plated pads required for compression connectors, customers save money in the manufacturing process.

Molex has tooled the AMC B+ connector form factor as well as a version specifically designed for blade server architecture. The blade server version has a 1.5 mm higher offset height to allow more component height and airflow.

µTCA shelf for Development Platforms

Molex’s µTCA development platform is ideal to evaluate the performance of various AMC’s (Advanced Mezzanine Cards), MCH modules (µTCA Carrier Hubs) and power supplies. This dual-star backplane is configured for two MCH modules that provide full redundancy for both control and switching functions. The 10 Gbps performance will facilitate the development of state-of-the-art µTCA systems.

Complete µTCA Backplane

The press-fit, µTCA backplane uses the Molex edge card connector and is configured for redundant power supplies located to the left and right of the MCH modules. Each power module is routed radially to each AMC and MCH slot. This allows the MCH to independently power up or down any slot. There are 12 centrally located payload slots for industry standard AMC’s. Ten of the AMC slots are suitable for full-height modules. Four payload slots in the center of the backplane can also handle compact AMC modules.

The development platform has an AC to DC power converter attached to the rear of the chassis, allowing customers to use 110 V or 220 V available at their desk or lab bench. This power supply is capable of delivering 1000 Watts at 48 volts to the DC to DC converters. This 48 volt feed is delivered to redundant D-Subs on the front of the chassis. A small cable will deliver it to the DC converters in the cage. They convert from 48 Volts to the 12 Volts delivered across the backplane. This configuration allows engineers to evaluate various power supplies, and redundancy and fail-over capabilities.

10 fans in the bottom of the chassis deliver full cooling to each, no matter what slots are filled, and even if the front panels are not in place.

µTCA Backplane Connector

Molex’s µTCA Backplane AMC connector uses the press-fit wafer technology to fine tune electrical performance to 10 Gbps per differential pair. This design leverage high volume stitching assembly process to further reduce cost compared to wafer constructions.

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iPass is the foundation of multiple industry standards. It is the standard interface on the new Mini SAS and Mini SATA Generation I and II requirements, selected by the PIC-SIG as the new PCI-Express external connector. In addition it has been specified at the host connector for the new Quad Small Form Factor (QSFP) Multi-Source Agreement.

iPass is also suitable for Double Data Rate (DDR) Infiniband (5 Gbps) as well as Quad Data Rate (QDR) Infiniband (10 Gbps). In addition iPass is well received for 10 Gbps connections used with Telecom Protocols as STM-64/OC192. A perfect 4X bi-directional external connector system supporting 40 Gb data stream on one single compact AMC card. Molex offers 2 of 4X µTCA Backplane for 10 Gbps platform

µTCA Shelf for 10 Gbps Development Platform

AMC I/O 10 Gbps solutions

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µTCA Shelf for 10 Gbps Development Platform

µTCA Backplane for 10 Gbps platform
connectors on a single width AMC card.

For shelf to shelf data links, Molex offers iPass assemblies as a next generation interconnect for the MicroGiga connector allowing customers to make a transition from 10 GbE to 40 GbE, using four times 10 Gbps transmission per lane. Cable assemblies are available in either passive or active and with and without equalization. Distances currently achieved at 10 Gbps are from 3 to 10 meters (passive, without and with equalization), while active assemblies offer distances up to 30 meters.

iPass consists of SFF-8086 (host connector), SFF-8087 (internal connector and cables) and the SFF-8088 (external connector, guide frame and cables). (These standards are Mini SAS/SATA only).

New Standard Pluggable 10 Gbps Solution

SFP+ modules are now coming to market, both in copper and in fiber to enable inter-shelf and inter-office connections at 10 Gbps. The Molex SFP+ cage and connector are specifically designed to facilitate these speeds. Improvements over the SFP include better EMI gaskets at the front panel opening as well as cleaning up the front inside of the cage to make a surface for the EMI gaskets on the module to seal. The module latching has also been modified to ensure excellent latching. The pull ring is located in such a way that it is easy to remove one module without disturbing neighbors. It is also optimized for use with stacked SFP+ cages.

Pluggable modules allow system implementers to choose whether to use copper cables or fiber connections depending upon the environment. Copper is typically used for connections within a data center or central office for connections between racks.

For shelf to shelf connections SFP+ copper assemblies offer distances from 3 to 10 meters (passive, without and with equalization), while active assemblies offer distances up to 30 meters with less power dissipation than Optical modules.

By using SFP pluggable modules, it is equally easy to use a fiber transceivers to enable very long cable runs, typically for connections between central offices and downstream connections to access boxes in the field.

Molex offers the duplex LC optical assemblies in a variety of straight and angled boots even to meet the ETSI front panel requirements, allowing customers to place transceivers horizontal creating a higher density on SFP+ modules.

QSFP Pluggable 4 x 10 Gbps Solution

QSFP offers 4 transmit and 4 receive channels in one package. Each channel runs at 10 Gbps. This form factor basically allows designers to package 4 times the bandwidth of an SFP+ connection into a single package slightly larger than an SFP. Molex offers Fiber and Copper cable assemblies for 40 Gbps applications. The QSFP will support many protocol standards, including quad 10 GbEthernet, quad 10 Gb Fiberchannel, quad data rate (QDR) Infiniband, and 4 times SONET/SDH.

Molex’s QSFP offers connectors, cages, copper and fiber optic cable assemblies based on iPass technology via this new Multi Source Agreement. With QSFP distances up to 3 meter can be obtained without equalization and up to 22 meter with active equalization. This is an attractive cost effective solution avoiding the extensive cost of using optical modules in shorter reach applications. The 38 circuit QSFP host connector utilized Molex’s iPass technology (75586-001X) to achieve the required high bandwidth parameters.

Conclusion

As you can see, Advanced Mezzanine Cards offer a rich new ecosystem of I/O solutions to meet the needs of any system architect. The AMC cards can provide flexibility and future-proof designs for ATCA and can provide all of the needed system elements for µTCA systems.
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The combined volume of AMC’s in both of these architectures should result in attractive prices. This has certainly been the case with PCI add-in cards for a variety of computer applications. The major difference is that the combination of point-to-point architectures and high speed signaling up to 12.5 Gbps (today’s technology) allows system architects to make a quantum leap in system sophistication without the risk and time to market penalties of a do-it-yourself design.

**About us**

Molex is a leading one-source supplier of interconnect solutions, fully committed to assuring the worldwide coordination of resources to meet customer needs on a local, regional and global level. Our portfolio is among the world’s largest with over 100,000 reliable products, including everything from electronic, electrical and fiber optic interconnect solutions to switches and application tooling.

Since we first opened our doors in 1938, the Molex team has been focused on the design, development and distribution of innovative solutions and new industry standards that meet tomorrow’s needs, today. In recognition of the impact Molex has had on the size, shape and character of the electronics industry, Electronic Business voted Molex one of its “10 most significant companies.”

Ultimately, with collective worldwide resources and a workforce of over 32,000 professionals, Molex delivers the expertise, products and service to help customers build better products and better businesses.