MicroTCA power module input connectors

By Juergen Hahn-Barth

Following on the heels of the AdvancedTCA standard, which was developed by the PICMG subcommittee, the MicroTCA version defines a specification for small, low-cost systems that over time are expected to find their way into a whole range of new applications.

Figure 1

Power supply

Any system architecture must include an appropriate power distribution strategy. A considerable amount of space is dedicated to the design of a suitable power supply and associated connectors in the MicroTCA architecture specifications. In the maximum configuration, the MicroTCA power modules supply up to two MCHs, two cooling units, and up to twelve mezzanine cards. Because they play a central role by providing power to all the other systems, the power modules need to be very rugged and reliable. Designing in redundant power supplies is an obvious way of guaranteeing high availability and operational reliability.

The specification intentionally does not require redundancy, but the architecture accommodates redundant design if that is the appropriate solution for a given application. When assessing the general reliability requirements during design of the power modules, it is important to keep in mind that the market for MicroTCA compliant devices is considerably more varied than the AdvancedTCA market, and there is a wider range of operating conditions. This must be taken into account very early on in the design phase. The MicroTCA specification is still evolving to ensure that the products are rugged enough to withstand harsh operating conditions.

However, the existing specification already addresses the different operating environments. The design of the power module input connectors plays a major role in this context, because the connectors act as the interface between the systems and the external power source (and thus the outside world).

The power input connectors are located on the front of the power module. A cable is installed between the connectors and the external power source. Greater mechanical stress on the cable and connectors can be expected at that point. The connectors must also have an adequate power rating, and they must be compatible with the heat management requirements.

The standards subcommittee decided to use a proven interface. There is good reason why the D-SUB family of connectors is one of the most popular solutions when there is a need for a rugged connection to the outside world. The 7W2 combination D-SUB connector (Figure 1) was selected for power supplies with -48 V and -60 V inputs.

For coding purposes, the 9W4 was chosen for +24 V inputs. As a leading supplier of reliable, high-precision connectors for telecommunications and industrial electronics, CONEC is well positioned to develop and market a suitable interface for MicroTCA modules based on the MicroTCA specification.

Features of the PM connector

The 7W2, which is the more popular choice in practical application (the major differentiating features of the 9W4 are larger external dimensions and a current rating of 49 A per power pin), can be used to illustrate typical connector requirements. The connector has two high-current contacts rated at 24 A per pin and two signal contacts in a conventional D-SUB housing. The signal contacts present no particular engineering challenge.

These control contacts are used for hot swapping, and the specification states that they should be shunted at the cable connector end. The requirements for the high-current contacts however are more stringent. At the maximum rated current of 24 A per power pin, the temperature must not rise above 30 °C. The high-power contacts used by CONEC are high-precision screw machined parts. Due to the material selection and workmanship, the connectors will withstand 200 mating cycles, and they offer significant power reserves. In addition to the electrical characteristics, the method of attaching the power module input connector to the PCB is also very important. To provide dedicated power input, a double-decker connector is the preferred solution on single-width, full-height power modules, which take up exactly one slot in the MicroTCA subrack. This connector requires firm, compact attachment to the PCB.

The specification also recommends that a cable strain relief mechanism should

be provided to lock the cable to the input power connector and ensure that a pulling force applied to the cable does not cut the power. This means that the load on the cable and connector must be distributed as efficiently as possible to the front panel and the PCB in order to relieve the stress on the connector solder joints. CONEC has paid particular attention to this issue during the design of the power module input connector. A special diecasting process is used to produce the rugged mounting brackets that are used on the connectors. These brackets have a small footprint and ensure that the mechanical forces are distributed evenly to the PCB to minimize strain on the solder connections at the pin contacts. This provides an extremely stable connector solution for attaching the power modules to an external power source (Figure 2).

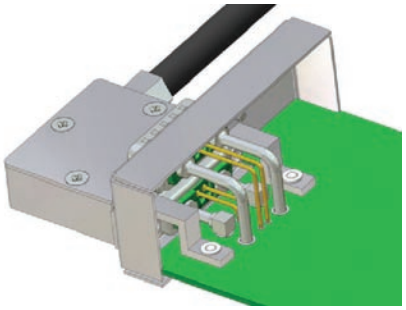

Figure 2

The use of filter technology

To comply with the specifications, additional EMI shielding and filter options should be available for the connectors. CONEC has been making filtered D-SUB connector families for the electronics industry since 1985, and the company is one of the prime suppliers of filter technology for plug connectors. Connectors in shielded housings represent a discontinuity in the shielding, providing a path for high-frequency signals to enter or exit the systems. The connector pins act as antennas, and they emit or receive interference signals. Filter technology is embedded into the connectors to avoid system-wide performance degradation. This eliminates the need to provide filtering on the PCB, saving valuable board real estate without forgoing the advantages of effective filtering.

Integrated low-pass filters with a capacitance of 10 nF or 54 nF per power pin are a standard feature of the CONEC MicroTCA power module input connector series. Many other capacitance values are available on request.

The complete range

The MicroTCA connector range (see Figure 3) includes matching plugs, a cable housing for the power module, and

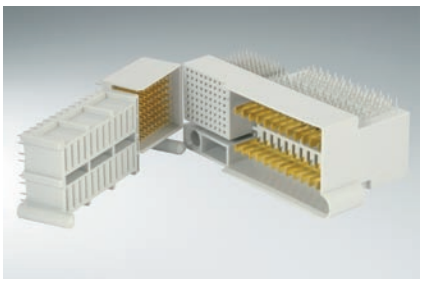

Figure 3

power output connectors for the modules and backplanes as defined in the specifications. CONEC also supplies plug connector systems using a variety of connection technologies that comply with the predecessor CompactPCI and AdvancedTCA standards.

Juergen Hahn-Barth *is marketing manager, CONEC Corporation.*

CONEC Corporation
Juergen.Hahn-Barth@conec.de
www.conec.com