Rugged Know-How Sets a New Standard in the ETX Market

The ETX computer-on-module (COM) form factor is starting to extend its reach beyond commercial grade applications such as POS terminals and kiosks for which it was originally designed. As industrial, medical, and military system OEMs consider ETX solutions, some serious questions have been raised by design and manufacturing engineers alike as to the viability of the technology for their applications. ETX modules have not been successful in these embedded applications because of a lack of extended temperature solutions that have exceptional resistance to shock, vibration, and humid and corrosive environments.

ETX Baseline

Commercially available ETX modules comply with one of the revisions of the ETX Specification. All modules have four (4) Hirose connectors that pass electrical signals between the module and a custom baseboard. The ETX Specification provides interface pin definitions and mechanical layout. Revision 2.6 is the most current public version of the specification at the time of this publication. However, not all ETX manufacturers have designed modules to Revision 2.6. Hence, ETX modules from different manufacturers and even different modules from the same manufacturer may or may not be interchangeable. It is very critical to prove compatibility with a baseboard by testing all potential module solutions with a baseboard prototype before committing a module and baseboard to production.

The World's Only Rugged ETX Modules

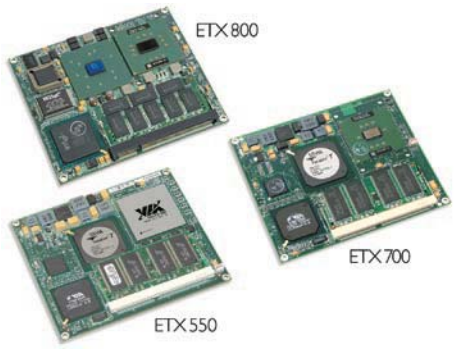
Since none of the other ETX manufacturers warrant their product beyond the 0° to 60°C temperature range, the risk of product failure at extended temperatures falls to the system OEM. Desktop quality boards are designed and qualified the same way as standard PCs, which have low yields when subjected to extended temperature testing (ETT) and shock and vibration testing. In fact, some of these modules have been shown to have more than 30% fallout above 50°C. This adds substantially to product cost and creates a handling and identification problem for the supplier and uncertainty for system companies when field failures occur.

Ampro's ETX modules are the world's first and only rugged ETX modules designed using Ampro's proven rugged know-how. These modules have a wider "standard" temperature range (0° to 70°C) than desktop quality ETX modules. For high temperature applications, Ampro goes even further by testing 100% of units over its "extended" temperature range from –40° to 85°C. Ampro can do this because ruggedness is inherent in the design. New rugged products are subjected to extensive voltage and temperature margin tests during the product development process, along with shock and vibration testing and HALT testing. For example, to validate fitness for harsh environments, designs are subjected to temperatures well beyond Ampro's "extended" temperature ranges. This ensures that Ampro products will be functional and stable over combined extremes of both temperature and voltage resulting in wide design margins.

Most rugged Ampro ETX modules deliver fanless operation over the full –40° to +85°C extended operating temperature range. Even the 1.4GHz Pentium M 738 (Dothan) model operates from 0° to 70°C without a fan. Now system OEMs can choose a high-performance ETX module, available over an extended temperature range, without the complexity and reliability issues that comes from adding a CPU fan or heatpipe. And since Ampro offers optional conformal coating for its modules, OEMs no longer need to deal with warranty return hassles after conformally coating the module themselves. For medical, military and industrial embedded system developers, Ampro's ETX modules offer features such as long-term availability, low power dissipation, compact size, and high reliability under rugged conditions that are crucial to successful product development. Ampro's 3-year warranty even applies to conformally coated and extended temperature units.

Ampro ETX Features

At the heart of the product's rugged design are Intel®'s Low Voltage and Ultra Low Voltage processors or Via's Eden™ EPS processors, all of which have Thermal Design Power (TDP) ratings of 10 watts or less. These processors offer embedded systems OEMs reduced power dissipation, greater internal cache, and faster front-side bus speed compared to the previous-generation processors. These processors are ideal for the next-generation of high-performance ETX-based embedded systems where the difficulties of designing boards that meet thermal requirements can make or break a project.



Ampro has also addressed problems reported by manufacturing engineers of PC-standard-thickness ETX module

PCBs bending due to baseboard connector insertion forces. Unlike the PC/104 standard which has a track record of reliability in shock and vibration environments, desktop quality ETX modules require a bit of care in the use of spacers and standoffs to secure a module to a baseboard as OEMs are now discovering. Signal continuity through the connectors can be intermittent depending on how the module is secured. Ampro has drawn on its 19 years of experience with stackable PC/104 modules to create a thicker ETX PCB (0.093", 2.4mm) that eliminates the bowing and bending problems.

For detailed product features, please visit www.ampro.com/html/ETX.html

Flexible Stack Height

For OEMs who must minimize their system footprint, Ampro provides ETX configurations with taller baseboard connectors so those components can be placed on the baseboard right underneath the ETX module. The ETX Specification allows the use of short and tall connectors on the baseboard but until now, ETX manufacturers only supported the short mating connector. Hirose makes it clear that its FX8 and FX8C short and tall connectors are not interchangeable. So rather than put only short connectors on ETX modules so that the OEM has to take a risk with using the tall mating connectors in a way not endorsed by the connector manufacturer, Ampro offers tall connectors on its ETX modules. Connector pins can engage fully the way Hirose designed them to operate.

There are five different FX8C connectors that can be used on the module and two mating connectors for the baseboard. Ampro has standardized on the middle size module connector that provides good flexibility to OEMs when combined with either mating connector. So the choices offered only by Ampro are shown in the adjacent chart:

Thermal Considerations

Like most ETX module manufacturers, Ampro ships standard ETX configurations without a heatsink, fan or other thermal solution. Existing ETX users typically buy a commercially available heat spreader or provide their own custom thermal solution. System OEMs interested in an Ampro thermal solution simply order an Ampro Heatsink Kit which Ampro installs prior to shipment. OEMs who order Extended Temperature Testing (ETT) get the benefit of 100% functional testing from –40° to +85°C on each unit produced. This saves the time and expenses associated with troubleshooting thermal-related failures during system-level test or, worse yet, after systems are deployed in the field. For lower profile systems, the Ampro Heatspreader Kits support operation to +60°C with the OEM removing heat from the Heatspreader surface.

Ampro ETT testing has confirmed that Ampro ETX modules operate beyond +85°C with Ampro Heatsink Kits installed without overheating the processor or Northbridge. With a choice of Heatsink or Heatspreader, Ampro has focused its efforts on a more flexible solution.

Lifecycle Management

Embedded engineers often face the specter of obsolescence when their operations and procurement counterparts are surprised by end-of-life (EOL) notifications from their suppliers. Given the long cycle of development, field test, certification or FDA approval, production and service and spares, OEMs seek a supplier with a history of long production life single board computers and modules. Often, PC processors and chipsets are only in production for 12 to 18 months and OEMs are left stranded when critical components are phased out by manufactures. This is a particularly critical issue for many system manufacturers in the medical and military electronics industries.

Ampro addresses this issue with its Product Lifecycle Policy which offers 5-year product availability and with 12-month end-of-life (EOL) and 60-day change (ECO) notifications. A great deal of care is taken to track and warehouse critical components, implement product upgrades and negotiate extended component availability with component suppliers. Ampro is also very careful about selecting processors from vendors who have an established track record of supporting the embedded systems market for the long term, since many processors are proving to be here today and gone tomorrow. For the ETX modules, Ampro has selected processors and chipsets from Intel's and Via's embedded roadmaps to ensure long-term availability. A range of performance from 300MHz to 1.4GHz gives OEMs the flexibility to easily adapt to application requirements with a drop-in replacement module.

Application-Ready

To be of great value to industrial, medical and military engineers, an off-the-shelf board or module needs to run operating systems like Windows®, VxWorks®,

Model	Module Connector	Baseboard Connector	Stack Height
All Models	FX8-100P-SV	FX8-100S-SV	3mm
All Models	FX8C-100P-SV2	FX8C-100S-SV	7mm
All Models	FX8C-100P-SV2 (same)	FX8C-100S-SV5	12mm

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QNX®, and now even Embedded Linux®. Ampro is the first ETX vendor to supply and support complete Board Support Packages (start-up code and drivers) for these operating systems. All ETX modules are application-ready, so embedded system designers can focus their attention on building applications rather than having to port and configure an OS and build drivers from the ground up.

Ampro ETX modules come complete with device driver support for four operating systems, including QNX v6.3, Windows CE 4.2 and 5.0, VxWorks 5.5, and embedded Linux 2.4.18. In addition, Ampro brings the embedded features it has pioneered such as watchdog timer, serial console, splash screen and configurable interrupts to the ETX market. The documentation and support software is distributed to system OEMs on CDs which include proven device drivers for all on-board I/O, not just serial and Ethernet, plus a complete free Linux distribution.

Conclusion

Ampro has long been known for creating standards for off-the-shelf embedded PC solutions that are appropriate for both commercial grade and rugged systems for example the PC/104 and EBX and EPIC standards. The new Ampro ETX modules reinforce Ampro's commitment to producing reliable, rugged products that meet the lifecycle requirements of its customers over the long haul.

Ampro ETX modules are differentiated by the following characteristics:

- Designed and manufactured using Ampro's know-how
- 0.093 inch (2.4mm) thick board eliminates the user-reported bending/buckling problems
- Better thermal management
  - Designed for wide temperature operation
  - Tantalum and ceramic capacitors are used
- Four mounting holes for rugged lockdown of heatsink/fan, for high power dissipation processors only
- MTBF in excess of 250,000 hours
- EMI design – EN55022 Class B
- 50G shock, 12G vibration per MIL-STD-202F, Method 214A
  - 50% thicker circuit board avoids signal continuity problems
- Extensive in-house OS support
  - BSPs supplied and supported by Ampro
- 12-month end-of-life (EOL) notification
- Configuration control
- No changes unless absolutely necessary
- 60-day change (ECO) notification in the event a change is necessary, for all form-fit-function changes

Ampro ETX products will help embedded engineers in the military, medical, transportation, and industrial sectors overcome their frustrations with ETX, enabling them to build better products, faster.

About Ampro Computers, Inc.

Ampro Computers, Inc. is the leading global provider of modular embedded computing solutions for OEM applications. Ampro's mission is to provide time saving solutions for embedded systems designers that accelerate the product deployment process. Ampro pioneered the embedded PC industry creating the popular PC/104 and EBX standards, and recently co-invented the new EPIC standard. The EnCore and ETX families are rugged Computers-on-Modules (COMs) products which enable designers to obtain all the benefits of an off-the-shelf CPU solution while maintaining the flexibility of a full custom design. In addition to EnCore and ETX, Ampro offers PC/104-compatible CoreModule CPUs and MiniModule expansion products, EBX form factor LittleBoard single-board computers (SBCs), EPIC form factor ReadyBoard SBCs, and Mini-ITX form factor MightyBoard SBCs. For more information about Ampro visit www.Ampro.com.

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