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Micro miniature detector switch is surface mount.

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★ ELECTRONIC PRODUCTS AND TECHNOLOGY



SCHENKBERGER



Automatic cutting machine handles broad cable range.

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INTERMAX

Dc power supplies deliver constant voltage, current.

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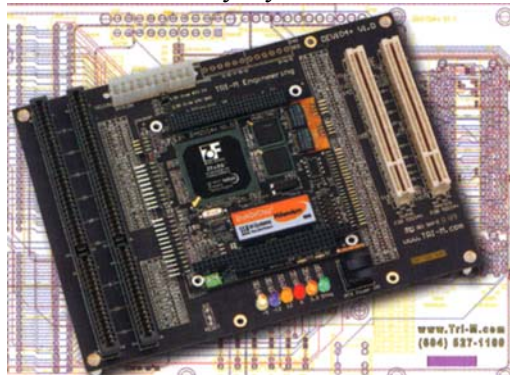
Embedded x86 designs embrace PC104, PC104+

by Doug Stead, president, Tri-M Systems Inc., Coquitlam BC.

The worldwide-embedded computer market is growing at an annual rate of 11.1%, and is conservatively estimated to top US\$3.3-billion by 2005. At the same time, the desktop PC market is in free fall, with high performance for few dollars squeeze the profit margins and culls the herd of manufactures, distributors and resellers alike.

Yet both these sectors of the computer market use very similar hardware, based on the ubiquitous x86 CPU, the same or similar operating systems, development tools and application software. So why then are solution providers working in the embedded sector continuing to flourish.

There are of course many reasons. Some are obvious when looking at the requirements a particular embedded project, while others require an understanding of the subtle nuances underpinning the justification which drives companies put in place computerized automation of everyday tasks.



Tri-M Dev104+ allows the quick and easy combining of embedded PC104 and PC104+ SBCs with standard ISA and PCI peripheral cards.



Doug Stead, president, Tri-M Systems Inc.

Tri-M manufactures commercial-off-the-shelf (COTS) X86 single board computer (SBC) products such as the PC104 and PC104+ compliant

MZ104+. It is a typical member of a large family of embedded SBCs, peripherals and enclosures manufactured by hundreds of companies all over the world. Compatible with the ISA and PCI expansion buses, these hardware products are intended specifically for the production and deployment of the X86 architecture into non-desk-top and or hostile environments.

The first major and most obvious difference between a PC104 SBC and that of a desktop ATX motherboard is size. The PC104 measures 9x9.6cm, or about 11% of the area taken up by an ATX board. In most embedded applications, size does count, and for most embedded products, smaller is better.

Power is another important consideration when designing the application-ready hardware needed for an embedded solution. The PC104 and PC104+ specification mandates single +5Vdc operation. In contrast ATX boards require multi-voltage power sources. In addition most embedded SBCs offer much higher power efficiency in comparison to standard desktop hardware. This reduces or negates thermal management issues, while at the same time allowing for battery or backup batteries operation in fixed or mobile installations.

Other environment conditions at the location of installation, such as storage and operational temperatures, vibrations and g-forces loading are important factors to consider when comparing

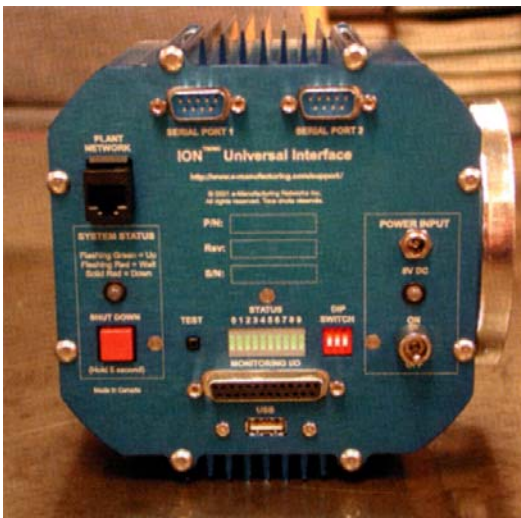
SBCs to motherboards. Desktop motherboards are typically designed to operate indoors at 0 to 70C, and in cases desired for stable location. Embedded products such as the MZ104+ are designed for operating temperatures ranging from -40 to +85C, together with intermittent g-forces loading and constant vibration.

Typically these conditions are found in solutions installed in locomotive, helicopter, drilling rig or machine shop CNC devices.

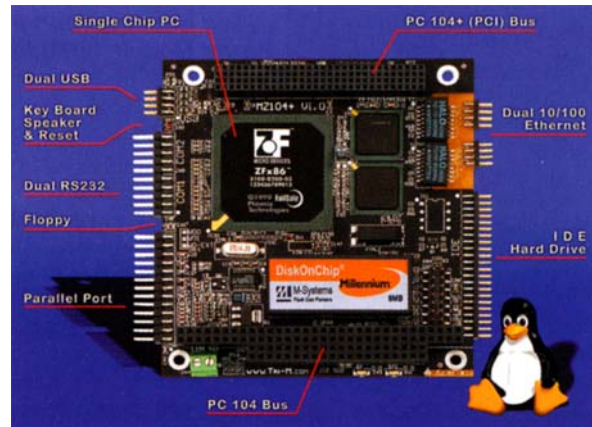
Perhaps the most important and least appreciated reasons embedded solution provider's select SBCs over technically similar desktop motherboards relates to hardware obsolescence and product life cycles. Desktop motherboards come to life and reach end of life in terms of months; industrial SBCs are typically in production for five to eight years.

Long product life is a definite advantage to OEM users of these products. Fewer changes to the product's bill of materials (BOM) leads to fewer engineering change orders (ECOs) and the associated re-testing of variants. This translates to savings involving simpler servicing and easier swapping of components during normal maintenance and repair cycles.

As important as the longer life cycles embedded SBC hardware offers, key is the



Typical finished and ready to install embedded PC104 solution. This device facilitates communication and control of CNC metal work machining equipment. Unique to this application is the magnetically mounting hostile environment enclosure.



MZ104+ SBC is a typical PC104 and PC104+ industrial single board computer used in embedded applications. Unique to this card is use of dual Intel 10/100 Ethernet controllers.

overall cost of ownership of the embedded solution. In addition to whatever reliability or improvement in operational efficiencies a particular product was conceived to produce, the embedded hardware solution is significantly less expensive when viewed by cost of ownership over product life.

The designed and prototyping of an embedded hard solution using a PC104 or PC104+ can be as simple as writing your software application on your desktop PC, and then loading it up on the SBC. If only all solution where that easy.

Almost all SBCs offer the solution provider an x86 CPU, an industrial version of a standard BIOS, and a full set of standard I/O such as dual serials, parallel, IDE, and floppy interfaces. More complex embedded SBCs also offer I/O such as video, 12C, R5485, 10/100baseT, USB onboard the card, etc. Any additional I/O required can be connected using expansion peripheral cards manufactured in PC/104 and PC/104+ format.

Development and prototyping boards are available which marry the standard industrial ISA and PCI header and signals to standard ISA and PCI card slots connectors. This is a particularly handy ability for the embedded design engineer. It allows mixing and matching of expansion cards from standard desktop hardware with SBC embedded hardware, providing flexibility and quick inexpensive methods to test new ideas and various combinations of hardware, chip sets and software.