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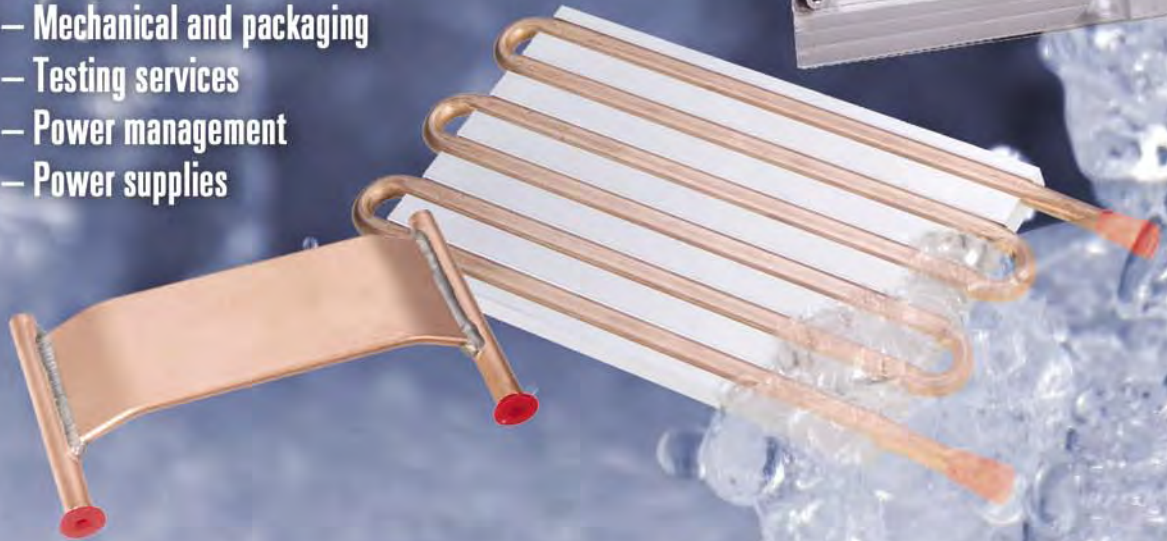
SEPTEMBER 2005 • VOLUME 9 NUMBER 7

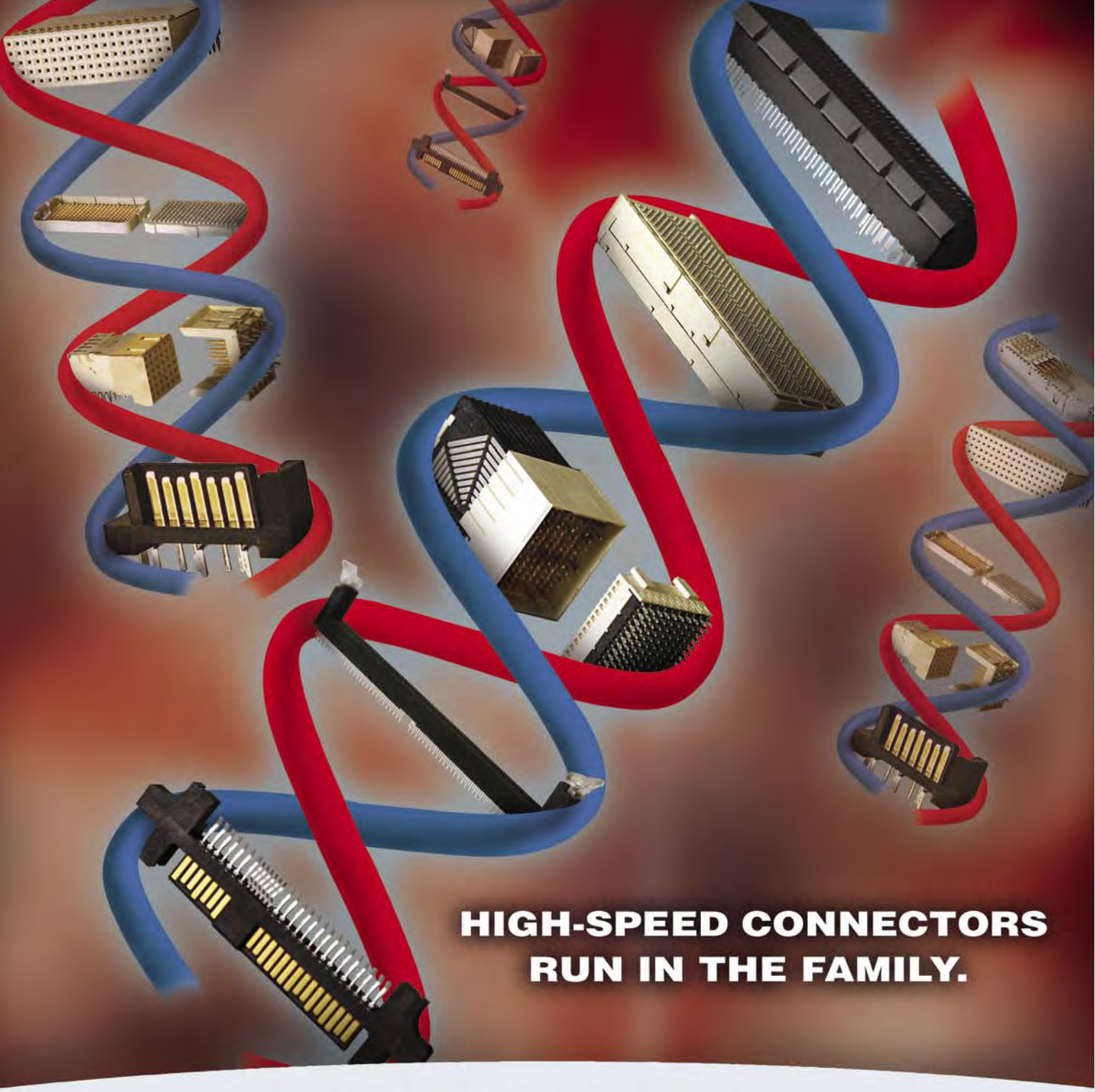
The hunt for cooling solutions

In this issue:

Packaging Product Guide

- Chassis and shelves
- Management and alarming
- Keying
- Racks, cabinets, and enclosures
- Backplanes
- Mechanical and packaging
- Testing services
- Power management
- Power supplies





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September: www.compactpci-systems.com/eletter
Advanced Mezzanine Cards: More important than you think
By Rubin Dhillon, SBS Technologies

COVER
Keeping gigahertz processors and gigabytes of memory cool enough to perform reliably is driving developers to find innovative cooling solutions at the chip, board, and chassis level.

Photo of tubed cold plate, vacuum brazed aluminum cold plate machined for board cooling, and copper cold plate is courtesy Lytron Incorporated.

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ISSN #1098-7622 ONLINE ISSN #1550-0381
Publication Agreement Number: 40048627
Canada return address: WDS, Station A, PO Box 54, Windsor, ON N9A 615

CompactPCI and AdvancedTCA Systems is published nine times a year by OpenSystems Publishing LLC., 30233 Jefferson Ave., St. Clair Shores, MI 48082. Subscriptions are free, upon request in writing, to persons dealing with or considering *CompactPCI and AdvancedTCA Systems*. For others inside the US and Canada, subscriptions are $45/year. For 1st class delivery outside the US and Canada, subscriptions are $90/year (advance payment in US funds required).

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PICMG activity update

By Joe Pavlat
Editorial Director

CompactPCI & AdvancedTCA

PICMG and its members have been very busy of late, ratifying several important specifications, moving towards completion on several others, and beginning brand new efforts intended to expand the scope and applicability of open industry standards. Some of these specifications are derivatives of AdvancedTCA. The popularity of that standard continues to increase dramatically as telecom providers move from field testing to deployment in 2006 and beyond. Other specifications update old standards to incorporate new switched fabric technology and yet others define entirely new hardware form factors and software protocols.

Recently completed and adopted specifications

Advanced Mezzanine Card (PICMG AMC.0)

Ratified in January of this year, the AMC specification defines an entirely new mezzanine card designed to work in managed, switch fabric-based systems. AMCs are:

- Hot swappable
- Offer higher power levels than previous mezzanine standards
- Can be built in two standard heights and two standard widths

While originally designed to plug onto AdvancedTCA carrier boards to provide high levels of I/O and processing modularity in AdvancedTCA systems, AMCs are now being seen as a basic system building block in their own right that can plug directly into small, high performance backplanes (MicroTCA).

One subsidiary specification has also been ratified. PICMG AMC.1 defines PCI Express and Advanced Switching fabric interconnects for the module. Several others are near completion, as noted later in this column.

AdvancedTCA Revision 2.0 (PICMG 3.0 R2.0)

Ratified in March of this year, this "clean-up" revision incorporates all of the relatively minor changes detailed in Engineering Change Notice 001 (ECN001), originally published in March of 2004. More importantly, the connector definition for the serial interconnects has been changed from the Zd connector, which had significant and unanticipated intellectual property issues, to a generic definition known as the Advanced Differential Connector, which contains RAND licensable technology. The Zd connector can still be used but is no longer mandated, opening up the market for compatible, non-infringing implementations, at least one of which is under development.

CompactPCI Express (PICMG EXP.0)

Approved by the membership in June 2005, this specification, as its name implies, adds the PCI Express fabric to CompactPCI. 3U and 6U system boards, peripheral boards, switch boards, and backplanes are defined. Legacy parallel PCI peripheral board support is optional, as is the use of switch boards. Hot swap support is maintained. The high speed Advanced Differential Connector defined for AdvancedTCA is used for the high speed serial signaling, and a new power connector is incorporated to support higher power levels than were practical with the original CompactPCI.

For much of the last decade 6U implementations have predominated in the market, as the communications applications CompactPCI frequently addresses require the larger board area and extra connectors. 3U products have been largely confined to data acquisition and niche applications. Interestingly, ruggedized 3U products are now becoming very popular for military applications, with a large number of mil grade, conduction cooled, and even radiation hardened products now on the market.

COM Express (PICMG COM.0)

The Computer-On-Module specification defines a new, small form factor single board computer standard for embedded applications that do not require a conventional backplane and chassis. A COM Express board can be thought of as a 95 mm by 125 mm single board computer that is designed to plug directly onto an application-specific I/O daughterboard. By eliminating the need to design and build the processor portion of an embedded application, customers can focus on the I/O portion of their application without mastering the details of high speed switched fabric designs. Using COM Express boards reduces time-to-market and engineering costs. In addition, this approach greatly reduces the task of updating system performance as a result of faster processor technology or dealing with processor obsolescence. For an in-depth look at the features of COM Express, please see "COM Express: The next generation Computer-On-Module standard," *CompactPCI and AdvancedTCA Systems,* December 2004.

System Fabric Plane (PICMG SFP.0)

This software-only spec defines a consistent method for transporting Time Division Multiplexed (TDM) data such as voice or video over general purpose switched fabrics such as Ethernet, InfiniBand, RapidIO, or PCI Express Advanced Switching. It can be used in AdvancedTCA systems, PICMG 2.16 systems, or in almost any packet-based architecture.

Internal TDM (PICMG SFP.1)

Internal TDM (i-TDM) is a variant of the System Fabric Plane specification that details a multiplexed Voice-over-Packet (VoP) protocol optimized for voice LANs utilizing packetized architectures. Designed for use in voice processing or voice switching systems, i-TDM features low latency, high density, and up to 512 channels per packet.

Specifications under development

Advanced Mezzanine Card subsidiary specifications

PICMG AMC.2 details the use of Gigabit Ethernet for modules, PICMG AMC.3 defines the use of Fibre Channel for stor-

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age modules, and PICMG AMC.4 specifies how to use Serial RapidIO for module interconnects. These are all nearly complete or under member review.

SHB Express (PICMG 1.3)
Known as System Host Board for PCI Express, this specification updates the old, but still popular PCI-ISA Passive Backplane Specification. SHB Express incorporates PCI Express serial fabric interconnects as well as cable-less connections to important I/O, including Ethernet and disk drives. Employing parallel PCI remains as an option, so designers can use older I/O cards if desired. And, yes, the venerable ISA bus is gone – for good.

AdvancedTCA RapidIO (PICMG 3.5)
The work on this subsidiary spec is largely completed, and the spec is out for member review. PICMG 3.5 adds Serial RapidIO to the list of fabric technologies defined for AdvancedTCA.

AdvancedTCA300 (Appendix to PICMG 3.0)
This variant of AdvancedTCA details the building of systems that comply with popular 300 mm telecom equipment practices. The Rear Transition Module (RTM) is eliminated and the front board is shortened. This is mainly a modification to the mechanics of AdvancedTCA only, so it is expected to become an Appendix to the main specification.

MicroTCA (PICMG MTCA.0)
The idea behind this spec is simple: plug AMCs directly into a backplane to create small, cost effective systems for applications that don't need the processing power or cannot afford the higher basic cost of AdvancedTCA. MicroTCA systems can be as small as a handful of modules to larger, switched systems with redundant resources. There is a great amount of industry excitement around MicroTCA, and first prototypes were shown at SUPERCOMM in June. The development subcommittee is working to have a released specification in early 2006. See both the December 2004 and the May 2005 issues of *CompactPCI and AdvancedTCA Systems* for more detail about MicroTCA.

CompactTCA (PICMG 2.50)
This group is working to define a set of *best practices* combining:

- Switched Ethernet fabric of PICMG 2.16
- Management of PICMG 2.9 and 3.0
- Telecom clocks consistent with PICMG 2.5
- AC/DC power supply implementation compliant with PICMG 2.11

PICMG 2.50 also mandates the use of a centralized Shelf Manager/Hot Swap Controller and defines an external management interface consistent with the Service Availability Forum's Hardware Platform Interface (HPI) specification.

Other activities

In addition to its customary hardware, board, platform level, and software specifications, PICMG is broadening the scope of work it undertakes by collaborating with other industry standards organizations and consortia to harmonize activities.

One such liaison activity is the PICMG/VITA XMC effort, wherein the PICMG members have organized to provide VITA comments and recommendations for the VITA 42 standard, which defines a PCI Express fabric on PMC modules.

A much more comprehensive activity is beginning as a result of PICMG's charter member status in the Mountain View Alliance (MVA), a *consortia of consortia* whose goal is to harmonize popular industry hardware and software standards to ease system integration. For more on MVA, please see the *Specification Corner* column in this issue.

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Introducing Mountain View Alliance

By Rob Davidson

The Mountain View Alliance (MVA) formation signals a new phase in the evolution of Open Specifications.

MVA is a recently formed alliance of PICMG, Network Processing Forum (NPF), and the Service Availability Forum (SA Forum) that is aiming to harmonize specifications and coordinate marketing activities. Other groups are expected to join in the latter part of 2005. This article will provide an overview and set the context for the MVA. As a consortia of consortia it is a new concept in the embedded systems environment.

Most of the specifications activity today have originated from an unmet need for an open way of applying new technology to emerging and existing markets. My personal view is that the most successful efforts are those that have delivered the right spec at the right time, for example, when the wider marketplace has just begun to perceive the need. From this perspective the specifications and the bodies that create them can be seen as a product of their environments, and the secret of a successful organization is responding correctly to the market situation and getting the timing right.

Where does the MVA fit in this picture? The MVA is a *consortia of consortia* that has been formed in recognition of an emerging need for a more coordinated approach to platform design. This *overview* perspective is new in this marketplace, where each organization has previously focused on its own piece of the puzzle. However the MVA is not a specification body, or a consortia governing body, rather it is a loose association of (currently) three organizations that recognize the need for better coordination of specifications and activities. The two main goals of the MVA are to:

1. Develop a mechanism to "harmonize" member specifications.
2. Work out ways to coordinate different marketing activities among groups.

I will go into more detail on the activities but first I want to come back to the issue of timing – why now for the MVA?

I think it is measure of spec organizations' success in meeting market needs for more open platform design, particularly in the telecom industry, that customers are now looking for an easier way of making the pieces work together. To use the MVA members as an example: a Telecom Equipment Manufacturer (TEM) who is building a network element may include a Network Processor Blade that uses NPF specs for the data plane transport, in an AdvancedTCA (a PICMG spec) chassis that needs to provide SA Forum compliant APIs for high availability requirements. TEMs do not want to have to sort out where the different specifications overlap, or even contradict each other; they wants a level of reassurance that the specs are compatible. In other words the user is now looking to the vendor community to provide a more coordinated approach to system design for all the same reasons that have driven that community to open specifications in the first place:

- Time to market
- Reduced capital and operational expense
- Greater choice
- Ease of upgrades

So what is the MVA about? It is about aligning and harmonizing (you will see this word often) specifications and coordinating marketing. Harmonizing specifications means that they should be generally compatible with each other, but they are not inextricably bound to the others. The MVA is addressing the telecom market as a starting point, but it recognizes that many of its members' specifications are used in other industries. It is *not* a governing body, a compliance body, or a trade association. It does not have member companies, just member organizations.

How far specification bodies need to coordinate with each other is open to debate, and all the possibilities cannot be covered in detail here. Such possibilities can range from a collection of app notes to a full-blown compliance and certification program. The MVA initiative is at the very light end, aimed at resolving conflicts in specifications, not at developing design guides or compliance programs. In fact the MVA as it is constituted can only provide recommendations to member organizations as to where they should be working together bilaterally to resolve gaps, conflicts, and overlaps. Additionally the MVA can help coordinate marketing activities among groups to get better value for the groups' members.

The MVA has been meeting since November 2004, but was formally announced at SUPERCOMM in June. There are weekly meetings for both marketing and technical committees; results should become apparent over the coming months. The measure of MVA's success will be how well the member organizations begin aligning their activities. An outline of the Alliance's activities is available at www.mountainviewalliance.org. As the group moves forward we are expecting other specification development organizations to join, which will broaden the reach of the alliance.

A future possibility is to use the MVA as a clearinghouse for users to express their needs and desires for future specifications that will result in specific feedback to MVA members.

What can individual companies expect from the Mountain View Alliance? In the short term they should get regular reports from their organizations on MVA activities. In the longer term they should get more robust coordinated specifications and specification organizations that begin to have a broader platform view of the industry.

Rob Davidson *is vice president of marketing for PICMG and is PICMG's marketing representative at the Mountain View Alliance.*

To learn more, contact Rob at davidson@picmg.org.

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Integrating fan control with AdvancedTCA

By Nathan Lavoie

AdvancedTCA is the latest standard for carrier grade switching systems developed by the PICMG organization. It has the most extensive input of any architecture standard to date and is backed by more than 100 companies, including many of the large OEMs such as Intel, Lucent, and Motorola. The advantages of designing a standardized chassis are quite well known. Different components from different vendors can be tied together and are guaranteed to operate. In addition, common components can be used in several different systems without the need for redesign. But once you decide that you are going to design an AdvancedTCA compliant chassis, how do you cool it? The AdvancedTCA specification has addressed the issue, at least at the architect's level.

There are two general compliant approaches to cooling an AdvancedTCA chassis: The first is an *Intelligent Field Replaceable Unit (FRU),* which is directly connected to the *Intelligent Platform Management Bus (IPMB);* the second is a *Managed or Non-intelligent FRU.* Regardless of how the fan control is implemented, they must all manage 34 VDC to 75 VDC input voltage range, undervoltage lockout, inrush control, and diode isolating of the dual supplies in order to be compliant with the specification.

An Intelligent FRU communicates directly to the shelf manager through the IPMB dual I2C bus, allowing the fan tray to use the communication bus that is already present. With this method all the hardware that is required on the system manager side is already available, and nothing needs to be added to support fan control. Fan control commands are also determined, so developers can use standard interface software. However, because the fan tray is connected directly to the IPMB, it has a more extensive list of requirements. For example, the fan controller must request to be disconnected from the system and provide all the mechanical and physical interfaces to achieve legal hot swap states. This includes mechanical latches to signal removing the tray, as well as the standard blue LED to indicate when the tray is ready to be removed or is active. The tray must also remain in low power state until the system has activated the controller. Another requirement is the addition of hardware and software to manage the dual I2C buses, including:

- An onboard isolated supply to power the circuitry
- A buffered dual I2C bus with rise time accelerators
- Tri-state capability

The I2C controller must be able to support a multi-master I2C dual bus and handle the standard set of fan commands outlined in the protocol. Figure 1 illustrates a sample implementation of this approach. Requirements include:

A Managed FRU fan tray could use virtually any existing fan tray and integrate it into an AdvancedTCA chassis.

- Onboard temperature reporting
- Tray capability reporting
- Fan turn-off capabilities
- Nonvolatile storage

This approach offers a key advantage, the ability to leverage designs against

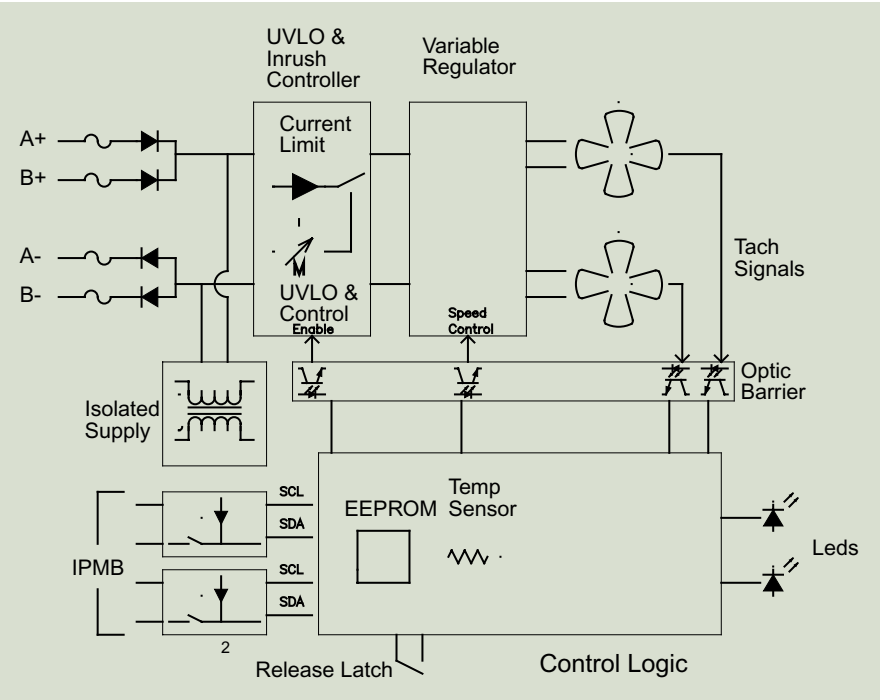

Figure 1

each other. Designers can use common hardware and software in several different systems with widely different cooling requirements by simply setting constants to indicate the fan tray's capacity. Therefore, design time can be decreased, different vendors can use the same tray, and one system can use fan trays made by different vendors. Also, as mentioned earlier, the system requires no additional hardware to communicate with the fan tray. However, a considerable amount of fan tray hardware is dedicated to handling the IPMB requirements.

A Managed FRU fan tray could use virtually any existing fan tray and integrate it into an AdvancedTCA chassis. The fan tray controls the fan speed and power regulation, while another component in the system manages communication with the rest of the system and

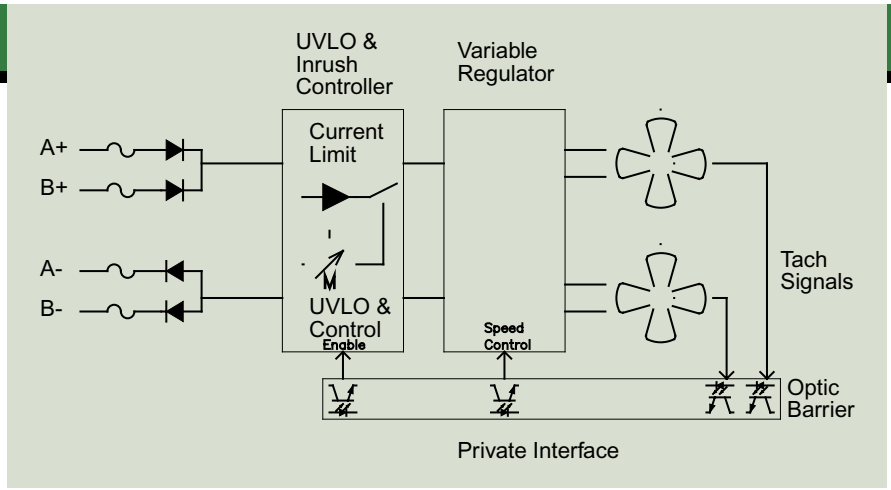

Figure 2

inventory information. The advantages of such a design are:

- Fewer communication requirements, enabling lower costs
- Fan trays from existing designs can be used
- Fan trays can be customized outside the AdvancedTCA specification for the chassis' specific requirements

The only set requirements become handling the input voltage range of 34 VDC to 76 VDC and related features and having another component in the system to maintain inventory data. A sample implementation is shown in Figure 2.

The power and regulation sections of the fan tray are the same for both the Intelligent FRU and Managed FRU

approaches. However, the control section is different. While a much less complex control and interface section is required for the managed FRU, the system must have specialized hardware to interface to the fan tray. Some data would need to be reported as not available or gathered outside the tray, for example, by using a temperature sensor.

A second managed FRU approach would be to use a single private I2C bus, as shown in Figure 3, which could give nearly all the features of the IPMB implementation of Figure 1 with less fan controller hardware and software, but added system hardware and software. This system could even store the inventory and capabilities data in its own EEPROM, but another controller would need to access the information because it would not be available on the IPMB.

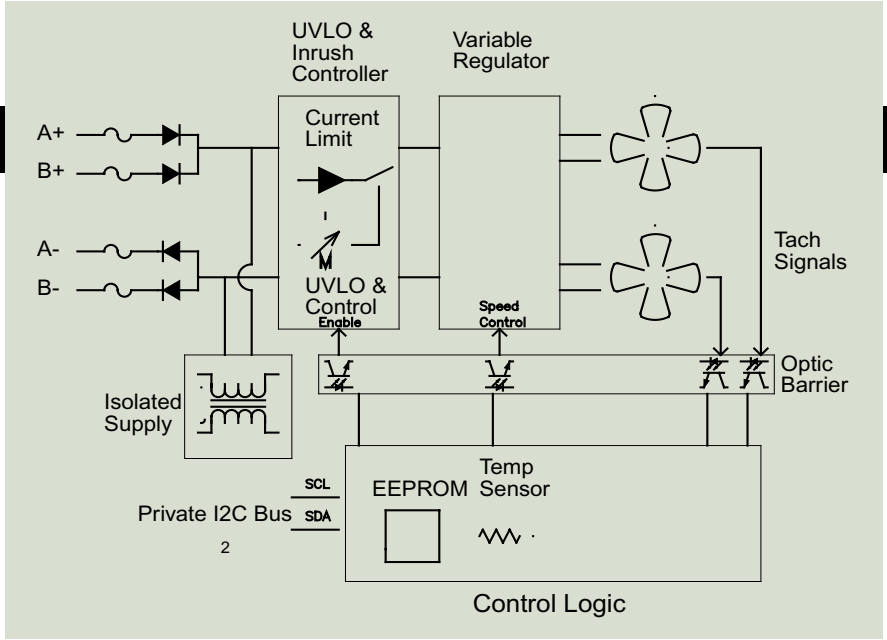

Figure 3

Requirement Summary	
Intelligent FRU	**Managed FRU**
Standard interface software	Custom interface hardware and software
Uses existing shelf manager resources	Requires system to manage fan tray
Fan tray requires IPMB hardware and software	

Table 1

As with any engineering challenge, designing the cooling interface of an AdvancedTCA chassis is about weighing one advantage against another to give the best system performance. There are performance and cost advantages for both approaches described earlier. While in one system it may not be feasible to add a separate communications bus to the fan controller, another system may have an unutilized private bus and overhead available to manage the fan tray. Table 1 summarizes Intelligent FRU and Managed FRU requirements.

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Active EMI power filter and hot swap functions merge

By Bob Lanoue

EMI control can be a complex design task that is dependent on many factors. However, a reduction of differential- and common-mode conducted noise created by the power converter(s) can be achieved by using either passive or active filters. In AdvancedTCA and telecom systems, the redundancy requirement of field replaceable boards into functioning shelves drives the need for a current inrush limiting function on each board. This function is generally referred to as hot swap. This article focuses on the advantage of using certain core hot swap elements, for example, the FET, as the series element in the active differential filter and the current limit sense element for the filter control signal to achieve active EMI control. Using this approach, the designer gets added value: superior noise attenuation and additional savings in board space.

Regulatory agencies, such as the FCC, require testing of complete OEM systems to certify that the noise emanating from the equipment falls below the standard maximum levels established for the category or class of equipment. In the case of power conversion solutions that use switching topologies, the benefits of high efficiencies and lower heat generation will be accompanied by increased electrical noise caused by high switching voltages and currents. The magnitude of the noise depends on several factors:

- Topology and components used
- Switching frequency
- PCB layout
- Magnitude and rate of change in the AC current and voltage levels

Performance levels needed to meet these standards must be factored into the initial design phase of product development. Although some topologies are less noisy than others, most will fail at least the conducted emissions test at the expected power levels in AdvancedTCA boards without the proper design precautions. Active filter solutions can use less board space in comparison to a passive solution when the fundamental switching frequencies are at the low end of the conducted band and the current levels are in the 3-15 amp range.

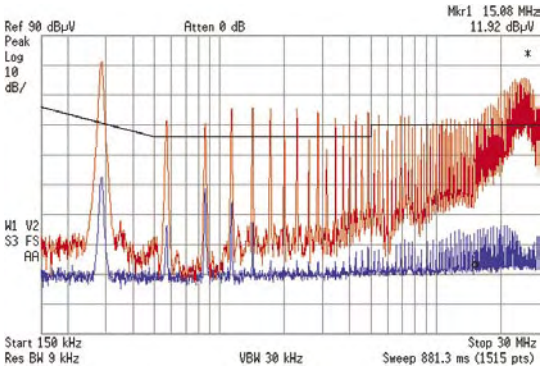

Figure 1

Generally, noise magnitudes and profiles of standard or embedded power converters are not readily available, so the ideal filter solution requires characterization testing to quantify the needs. Standard brick filtering data is sometimes available with a recommended passive filter circuit using discrete components or a filter product. The physical size of those passive solutions versus available board area can become another issue. The AdvancedTCA PICMG 3.0 specification, section 4, defines the power distribution of up to 200 W per board with power conversion of the 48 V or 60 V input bus on each board within the shelf. Every board must be below the EN55022 Class B level of the conducted noise limit. The specification allows up to 16 boards per shelf and requires a minimum 18 dB of additional shelf filtering over the conducted noise frequency range of 150 kHz to 30 MHz to assure the cumulative noise of a fully populated and functioning shelf stays below the compliance system noise limit.

Figure 1 shows a measurement plot for a standard converter using a spectrum analyzer with peak detection sampling and a special filter to separate the differential mode noise component. The pre-filtered (red trace) and post-filtered (blue trace) plots compared to the EN55022 Class B limit line illustrate the effects of the active differential filter circuit. This demonstrates the differential noise peak of the fundamental frequency and the harmonic peak amplitudes in dBuV units.

Furthermore, to achieve high system reliability the PICMG 3.0 specification defines a redundant architecture for the power and communications/data processing bus. PICMG 3.0 specifies that a single board failure will not disrupt system operation. If a failure occurs, the faulty board can be readily identified and replaced in the field with the system operational. Insertion of the replacement board also cannot disrupt the power or communications/data processing buses; hence power management with hot board insertion and the Intelligent Platform Management Interface (IPMI) is needed to bring the replacement board up safely. And this circuitry must be replicated on each board.

As suggested earlier, the hot swap function and differential noise attenuation can both be achieved, in effect, by using a combination of active filtering circuit and the power FET for the current limit control as shown in Figure 2. Along with the associated biasing components, U1 in the figure provides the current limit control, while U2 and U3 make up the active filter control. The compliance noise testing will be performed with the system or board in a typical operational or test mode. The current limit is exercised only under system start-up, board insertion, or

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a board power fault condition. When the board input capacitance is fully charged and no other fault exists, the power FET is driven into the Rdson state by the hot swap control to achieve a power good condition and to minimize the power loss of the FET. With the dual use of the FET, the hot swap function must dominate control under a fault condition over the filter operation, creating an interfacing design challenge.

The active filter creates a high impedance to the ripple current and works by controlling the FET drain to source voltage and sensing the AC current flowing through the FET via the sense resistor. The active loop modulates the resistance of the FET to effectively make the converter switching load look like a constant current to the bus. This requires bringing the FET barely out of the Rdson region because the magnitude of the ripple current is typically in the tens of milliamps, establishing a slight headroom bias voltage. Using a wide bandwidth analog amplifier for U2 as shown in the schematic drawing in Figure 2, the AC ripple current can be detected across the current limit sense resistor then amplified to drive the gate of the FET. This will change the series resistance in the ohmic or triode region of the FET characteristic curve, driving the sensed AC current component on the bus to zero. The headroom voltage can be set very low by U3, depending upon the FET triode characteristics, to minimize power dissipation versus ripple current reduction or the effective attenuation of the filter. An example simulation is shown in Figure 3 demonstrating the attenuation effects the active filter has on the bus ripple current versus frequency. The appropriate component parasitic elements were included in the simulation.

An inductor can be considered as the sense element for both functions, with a DC resistance component equal to the sense resistor needed for the hot swap current limit level. This provides some design advantages as well as challenges. From a noise reduction standpoint the inductor will provide additional passive attenuation in combination with the converter input capacitors, adding an LC two-pole roll-off (40 dB/decade) with a resonance determined by the inductance

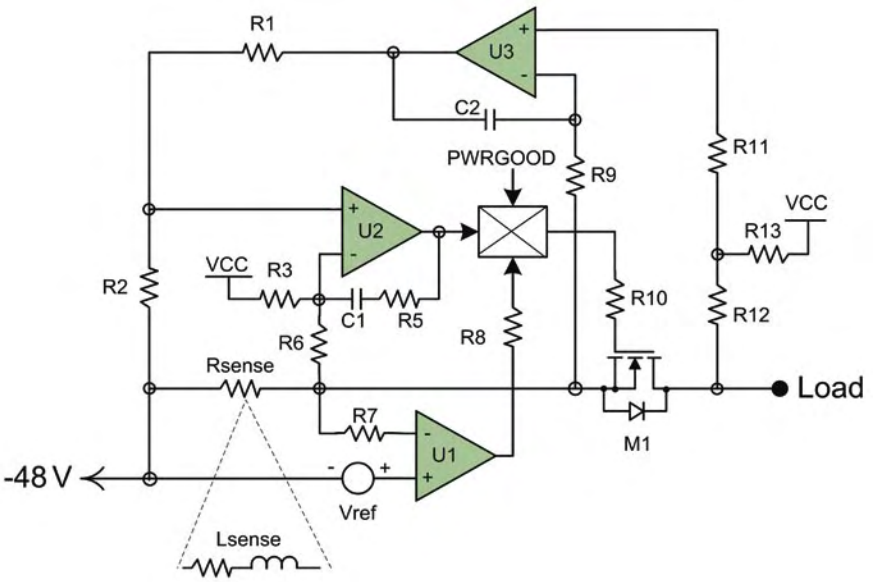

Figure 2

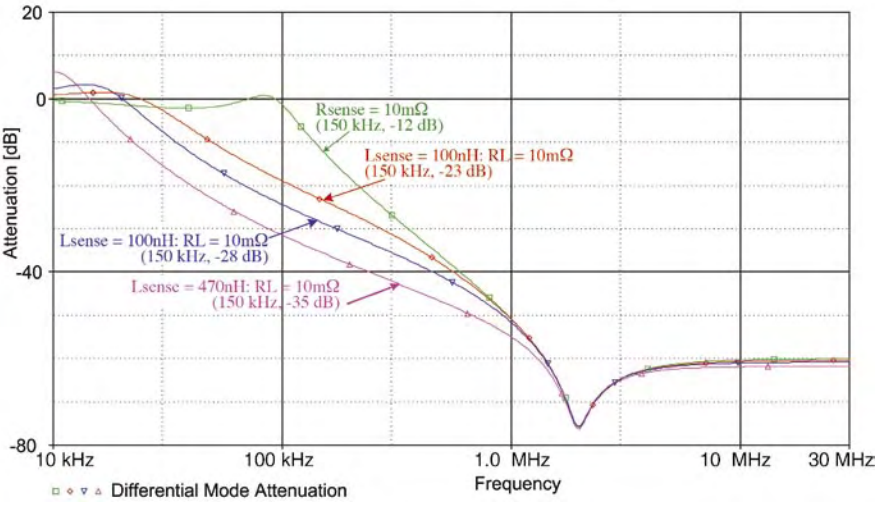

Figure 3

and total input capacitance. The increasing impedance of the inductor with frequency creates more signal voltage, in effect increasing the low frequency attenuation of the active filter above the frequencies where the reactance becomes significant. Figure 3 shows additional attenuation curves for three different values of inductance as well as the base line using only a sense resistor. Some hot swap designs use a thermistor to sense temperature to improve the FET protection. In this case the temperature coefficient of the copper wire within the inductor results in a lower current limit level with increasing temperature, because the resistance will increase and the reference voltage is constant, lowering the peak power of the FET under fault conditions. Using the inductor as a sense element would create more variation in the current limit than a precision sense resistor, so careful analysis of the component tolerances and safe operation area of the FET and inductor need to be considered. Figure 4 demonstrates a transient simulation of the current limit control waveforms using a sense resistor versus a sense inductor under a hot start-up condition. Inductive sensing can affect the loop frequency response and stability

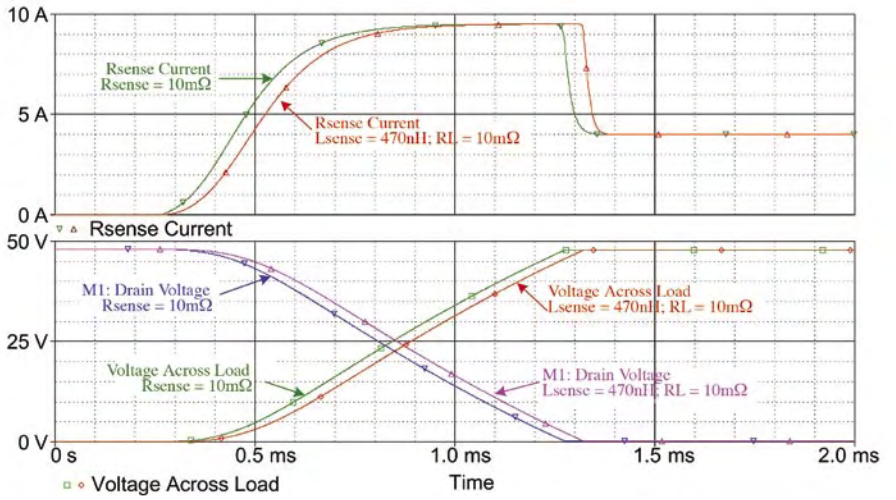

Figure 4

of the controlled current, so care must be taken to maintain adequate phase margin under this closed loop condition.

As previously mentioned, the hot swap control must take precedence over filtering so the filter biasing and control of the FET must be designed not to interfere with the critical protection function. Using the power good state to enable the filter function takes the filter out of the picture when the power good state is not valid. The challenge is designing the interface circuitry enabling the filter function while properly controlling the FET if a fault condition occurs. This circuit will depend on the hot swap controller characteristics, so the circuit shown in Figure 2 demonstrates the basic schematic leaving the interface shown as a functional block.

Active filtering and MicroTCA

With the development of the MicroTCA system specification gaining momentum, the concept of combining the active filter and hot swap should prove to be more advantageous. If a 12-volt intermediate bus is created from a redundant Power Entry Module (PEM) to provide power to the Point-Of-Load (POL) converters, each board will have a hot swap requirement. Although filtering will be needed in the PEM, designers have an opportunity for implementing the active filter as described along with the hot swap required on each field replaceable card. This can reduce the total noise reflected from the switching POLs to the power entry conversion bus.

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Machine-to-machine communications: Internet modem or the traditional modem

By Howard A. Raphael

Embedded modems have become ubiquitous as more products have communications capability built in. Now there are two alternatives for a product with a resident modem: Traditional modems and Internet modems. Traditional modems use the Public Switched Telephone Network (PSTN) and allow a machine at point A to talk to a machine or host at point B over a dial-up connection. Networks of traditional modems have been in use since the 1963 Carter Phone decision allowed for private modem networks. Then followed the evolution from large thousand dollar boxes to embedded modem solutions costing less than $20. With the reduction in size and price has come an enormous increase in usage and applications, which has come to be known as the Machine-to-Machine (M2M) communications era. A parallel evolutionary path has recently emerged that pertains to the development of the Internet. The Internet as a resource has become pervasive and indispensable to all aspects of our professional and personal lives. More and more machines are also using the Internet in much the same way we do for information transfer. Enter the emerging trend of Internet M2M communications. For a machine to use the Internet requires a specialized modem sometimes called an appliance modem or Internet modem. While at the heart of an Internet modem is a traditional modem, that modem is surrounded by a layer of software that performs the Internet access function known as Transmission Control Protocol/Internet Protocol (TCP/IP) and Simple Mail Transfer Protocol (SMTP). Knowing which advantages are specific to traditional modems and Internet modems allows designers to make an informed choice when selecting a modem methodology.

There is a good chance that your current generation of products has a built-in component modem. This modem and its inherent communications capability would be used for product software updates, data collection, remote control functions, and better service or diagnostics of your product to the end user. Your modem uses the PSTN. You have worked out a networking architecture for your field products to communicate with a central host. The cost of your modem is the component cost, the telephone tariff charges, and the maintenance of the private network and host. The alternative to this is the Internet modem. The Internet modem performs the Internet interface activities transparent to the user and is command-driven with macro commands just like a traditional modem's AT commands. The Internet modem must have access to the Internet via an Internet Service Provider (ISP). All units in the field and the central site, if any, access the Internet via an ISP from a regional local telephone number.

Internet enabled modems are also sometimes called *appliance modems* and define any machine that is Internet enabled. They are also called simply iModems. The iModem, like a traditional modem, can be embedded in the OEM product, but they have the additional intelligence to do the Internet connectivity, handshaking, and addressing of e-mail messages or transfers of large blocks of data to a destination e-mail address. E-mail or web hosting becomes the data transfer medium for the communication. The necessary connectivity variables such as passwords, local access numbers, and addresses are stored in the iModem and used transparently. In the case of e-mail, the iModem formats the data and composes an e-mail for subsequent transfer. The SMTP along with the TCP/IP stack perform the block addressing for Internet compatibility. The added capability to perform Internet activity required over traditional modems adds some cost, but offers other advantages that perhaps offset this cost over the product life.

Let's examine the difference between traditional modems and iModems as they relate to design and implementation considerations when selecting a modem for a product.

The network: Private or Internet

A modem network typically comprises units in the field and a central host to which they all communicate (Figure 1). Internet modems use the Internet's infrastructure. Each point of the network is Internet enabled and can communicate with any other point. This arrangement avoids the need for a specialized central host with banks of modems since the ISP manages the network capacity and distributes it around. Any Internet enabled PC may be defined as the network host. This presents the advantage of requiring no specialized central site hardware, network protocols, or dedicated personnel to manage the network. The traditional modem network offers point-to-point security since the network is comprised of dedicated units in the field with the capability to dial out to a dedicated central site that performs the network management and communication concentrating function. Traditional

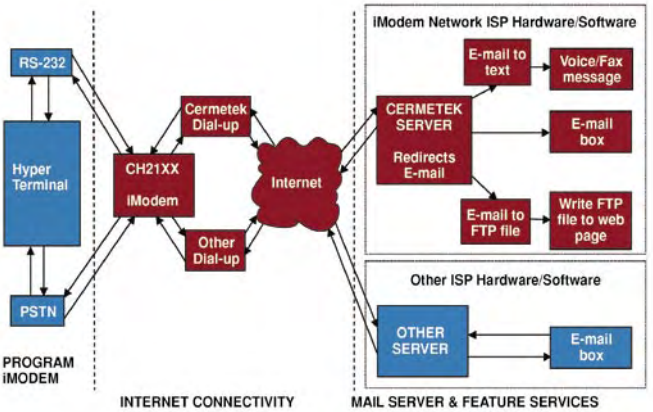

Figure 1

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modem networks give the user control of the communications because the user defines the hardware and protocols.

Real-time messaging and packet messaging

Typically with an iModem, message routing is done through the Internet and messages are sent in packets unidirectional. This offers a multipoint option so that one message can be sent to multiple recipients. The e-mail message that is sent or the web pages that are updated do not occur in real time, but do occur transparently to the user. In the case of the e-mail the information is packetized and stored in the appropriate ISP for a receive mail transfer at a later time. To send or receive an e-mail or update a web page the iModem must connect to the local ISP, an attempt that can fail. The iModem has the intelligence to retry automatically and even perform an alternative channel routing around the local ISP to absolutely ensure that data is delivered. While information eventually gets to its intended recipient this does not occur in real time. Traditional dial-up modems establish a connection to a remote party in real time, and bidirectional information transfer can occur. Real-time transfer may be essential over the delays associated with a block data transfer routed through the Internet. As it turns out, a real-time connection can be established between two Internet modems by creating a *socket-to-socket* connection and has been implemented in Voice over IP (VoIP). When this occurs, both iModems are connected in the same way as traditional modems and at that point there is equivalency. However, the time it takes to establish the real-time link is longer with the iModem as compared to the traditional modem.

Monthly and capital cost of iModem networks versus traditional modem networks

The variable monthly communications cost of maintaining a product in the field can be measured, whether it is an iModem or a standard modem. A traditional modem incurs telephone access charges, which may be local or long distance charges between the products in the field and the central site. Long distance charges vary with the traffic. Also, as a traditional modem network grows, expansion capital costs occur as racks of modems and telephone line trunks increase.

When a product has a resident traditional modem and is sold to a customer, the customer takes responsibility for the telephone access and charges. These may be passed on to the ultimate end user. With an iModem network there is the single monthly ISP charge for each element on the network. This can be near zero for users who have their own ISP or as low as $2 per month with a third-party ISP. This fixes the communication costs per network element, but the ISP capability required for this must be available and provided. Because machine access to the Internet is new, there is no tradition of who provides the ISP service: component supplier, manufacturer, or end user. This becomes a new consideration in marketing Internet-based products. Expansion of the Internet network requires only the addition of more network elements and the inherent ISP cost per element.

The Internet approach offers a fixed monthly cost for communications almost independent of the traffic volume but dependent on the number of elements deployed. Traditional modems only incur cost as a function of traffic volume. Long distance service has

become very competitive, so the user must estimate traditional modem usage traffic and compare that cost to the sum of the fixed ISP cost per element.

Point-to-point versus multipoint

Standard modems are point-to-point communication elements. A source element contacts one destination element and communication ensues until a termination occurs. This provides for maximum security and real-time data transfer. With traditional networks that have a central host, the central host can concentrate and distribute the data where appropriate. With the exception of the socket-to-socket transfer mentioned earlier, iModem transfer can be multipoint. With the iModem each message can be sent to multiple web pages or multiple recipients via their unique e-mail addresses in one transaction. E-mail distributes its own messages through the multiple recipients addressing structure to other e-mail enabled machines or standard Internet enabled PCs. Each iModem can host its own web page or can route information to multiple web pages.

With the advent of ISPs dedicated to machine-to-machine communications, it is possible to send an ASCII e-mail message and have it converted by the ISP to fax or a natural sounding voice message. The central host performs this role in traditional networks.

Message storage requirements

Traditional modems perform data transactions without storage in the modem or a record of a given transaction. All messages are sent transparently. If message storage or cataloging is required it must be accommodated by the network requirements. For example, all field messages must be sent to the dedicated central site host and stored in real time. This requires that a central site take in and file the data traffic. With iModems the Internet stores all ISP messages until requested by the user. In addition, each message is time stamped as to when it was sent and received. All ISPs have redundancy of storage locations, and the ISPs reside in computer-friendly sites that have emergency backup and professional real-time maintenance.

More intelligence or less

Traditional modems cost less than iModems because they are simpler and have less intelligence. Traditional modems are groomed to do the very basic modem function. This simplicity of operation is an inherent feature. With iModems, resident intelligence is required to do the stack and interface to the Internet. This resident intelligence may be used to enhance the functionality of the iModem in a user environment. The iModem's internal processor may also host user software and become the intelligence element of the user product, or in other words, its processor. It can have

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Gain Accuracy	+/- 0.1mV, +/- 0.1 percent	Not specified
Sample Rate	200K per Chan (PCI,PMC,PC104+ & cPCI)	108K per Chan (PCI) 216K per Chan (cPCI)
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additional features such as unattended operation and the sending of prestored messages independent of the host intelligence and control. Each iModem is self-contained and imbued with ability to both send and receive e-mails and their associated Internet protocols with little or no external control. The resident intelligence of the iModem facilitates this. (See Figure 2.) It allows for:

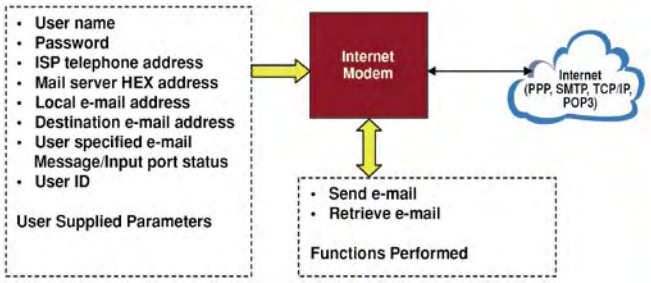

Figure 2

- Nonvolatile storage of a precomposed message
- The required local telephone numbers
- Resident destination e-mail address
- Password and other characteristics

A prestored message can be sent on a contact closure or by a simple software command. The prestored message can also be dynamically changed and recomposed. The message can be of unlimited length and sent in increments. The iModem operation occurs independent of the host microprocessor.

Traffic management

If each element of a large traditional modem network must report in daily at about the same time, this can cause a large demand for central site resident bandwidth in the form of large hardware capacity, including modems and telephone lines. The possibility of traffic jams and coincidence collisions may still exist. The solution is to have the elements report in at staggered times, which works well if the data can be gathered over a longer period of time. With the Internet-based messaging, all field products can send their daily e-mails at about the same time, and they will be delivered as website updates or as e-mail to one or more e-mail mailbox locations within a reasonable period of the desired time of day. The iModems benefit from the distributed local access numbers and local modem capacity, as well as from the Internet's large bandwidth.

Polling large numbers of field-installed products

Users often must poll a large number of field devices for the purpose of updating software or retrieving accumulated data.

Traditional modems have an advantage over iModems because they can be programmed to answer an incoming call. iModems may only call out to send or retrieve information. This makes it difficult to initiate an update from a location remote to the device to be polled. With the traditional modem, the unit just needs to be called to gain access. With iModems it may be done in two ways:

- Use the web page hosting ability
- Send an e-mail to each device

When using the web hosting ability, each field modem has a resident web page that is updated or interrogated by the product's resident microprocessor on a regular basis. The interrogation of data is done by accessing the web page and procuring the updated data when present. With software updates the field device is told to interrogate its web page when an FTP flag is set at the web host.

With an e-mail transfer, the e-mail previously sent with a new software update waits to be interrogated. Each field device makes the local call to retrieve its e-mail based on an FTP flag or time of day algorithm, or some local event. The information is downloaded and then acted upon.

Remote downloads of field upgradeable parameters

When products are deployed in the field there is often a need to change the setup parameters. Traditional modems require very little in the way of setup, and they are generally not field upgradeable. An iModem requires many more parameters to be programmed to provide its Internet personality, such as passwords, local access numbers, and e-mail addresses. Occasionally these parameters have to be changed after field installation. The iModem has the ability to remotely change these parameters under protected administrative control, thus avoiding the need for field service calls or return to the factory modifications. Parameters that often need to be changed are passwords and local access numbers to the ISP.

Data transfer speed

High-speed traditional modems on long distance lines often connect at lower speeds than expected due to the characteristic of the telephone line, particularly when long distance is involved. Also long distance connections can cause error correcting communication software to kick in, in turn causing the transfer of data to run more slowly since the modem may have to retransmit blocks of data. The iModem offers advantages since all access is via local access numbers and local telephone calls. The Internet data at the local ISP host site is multiplexed and concentrated on to higher speed T1 or greater conditioned or optical lines. This plus the local nature of the access call ensures that the communication link will run at a higher speed with the iModem.

Conclusion

The advantages of the traditional modem are:

- Low hardware cost
- Simplicity of use
- Variable communications costs based on usage
- The ability to easily poll remote field units

This must be metered against the advantages of the Internet modem, which offers:

- Fixed predictable communications cost
- No central host hardware or maintenance cost
- Higher data rate
- Universal, well-understood networks with data retention

There is an alternative to the traditional embedded modem, namely the Internet modem. Both have advantages in some applications, but in the long run the Internet accessibility will win out.

Howard Raphael *is president of Cermetek Microelectronics, Inc. He received his BSEE from Rochester Institute of Technology and is a graduate of the Stanford University Executive Institute. Prior to joining Cermetek, Howard was a group director at National Semiconductor, and before that was a product manager at Intel. He has published numerous articles about microprocessors, modems, and appliance modems and holds several patents.*

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- Screwdown hardware
- Premating contacts
- Press fit contacts
- Selective loading of contact positions

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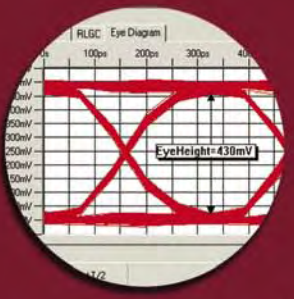

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CompactPCI Express: Bringing PCIe into the CompactPCI form factor

By Steve Cooper

CompactPCI was invented based on the concept of taking mass-produced silicon from the desktop bus standard and using it within an industrial (Eurocard) form factor. This winning formula continues today. With the advent of PCI Express (PCIe) as the replacement for the PCI bus in the desktop, it is imperative that all buses that have been defined on PCI develop a transition plan. For CompactPCI, this involves taking the new PCIe bus and repackaging it into the CompactPCI form factor. A PICMG working group has recently completed this work, and has published a new specification known as EXP.0 CompactPCI Express (CompactPCIe). This article discusses the various aspects of moving PCIe into the CompactPCI form factor, including new connectors, new slot types, development of hybrid systems, and compatibility with previous generation systems.

PCIe: The new PC standard bus structure

A breakthrough technology, the new PCIe bus increases bus performance while lowering system costs. These advantages, combined with a unified PC community and a strong standardization body, guarantees that PCIe will take on the role of the next decade's expansion slot standard. The sheer volume of the PC marketplace drives component makers to develop chips with native PCIe interfaces. For the industrial computing market, (and every other lower volume market), it becomes imperative to adopt standards compatible with PCIe, or risk being unable to utilize the mass-produced silicon.

PCIe basics

In order to achieve higher performance and lower cost, PCIe takes advantage of Low-Voltage Differential pair Signaling (LVDS) with embedded clocking. This allows high frequency transfers on a small number of traces. The signaling is unidirectional, meaning that one differential pair transfers data and another receives data. The bus is also point-to-point, requiring a separate interface for each slot in a system.

Lanes: The key to performance

PCIe is defined with a number of performance options. The most significant is the ability to route various numbers of lanes. A lane is defined as two differential pairs of signals, one operating in each direction as shown in Figure 1. The simplest PCIe connection consists of a single lane, and is identified as a x1 configuration (pronounced "by one"). To achieve higher

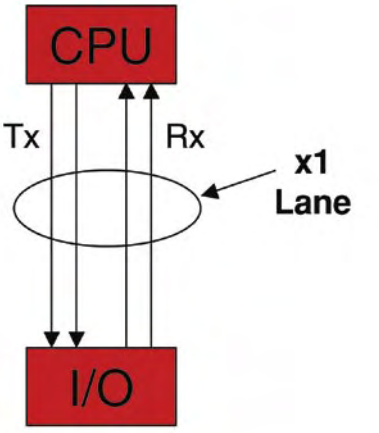

Figure 1

performance, designers can optionally run multiple lanes in parallel. Allowable lane options include x1, x2, x4, x8, x12, x16, and x32.

Two architectures: Tree and network

PCIe can be used in two different system architectures as shown in Figure 2.

CPU-to-I/O (tree)

The first is a standard CPU-to-I/O communications bus, performing the same function that the PCI bus performs, but at higher speeds. This architecture assumes there is one, and only one, main CPU in the system. This CPU controls everything, from basic power-up to initialization, to running the main operating system. Other CPU components may provide intelligent I/O or secondary data processing, but there is always one main CPU.

System-to-system (networking)

The second usage model is a CPU-to-CPU (or system-to-system) networking model. In this model, PCIe will compete with other networking standards, such as Ethernet, but at a much higher speed. The key to using PCIe in a network model is the availability of Advanced Switching (AS). AS is an extension to the PCIe base specification that adds extra routing and protocol encapsulation information onto each PCIe packet. Intelligent switch chips, which allow boards that do not include AS logic to intercommunicate with others that do include the logic, add this extra information.

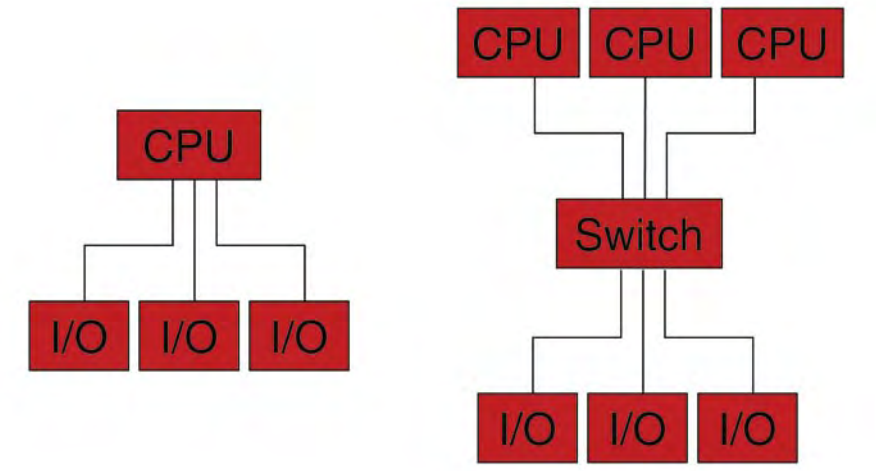

Figure 2

CompactPCIe

What's the same, what's new?

CompactPCIe utilizes many of the same features as legacy CompactPCI, but changes the PCI bus for the new PCIe bus. Table 1 highlights the similarities and differences between the existing CompactPCI standard and the new CompactPCIe standard.

The 3U and 6U form factors remain unchanged, and the same faceplates and injector/ejector handles are used. Chassis designs do not need to change with PCIe. However, the connectors used in the P1 and P2 area change, which means the backplane changes as well.

New connectors

CompactPCIe replaces the P1 and P2 connectors used in CompactPCI with new connectors that occupy the same physical area. These new connectors provide more power connections, high speed differential pairs, and a path for hybrid slots, which can hold either legacy CompactPCI or the new CompactPCIe I/O boards.

For 6U boards, the P3, P4, and P5 connectors remain unchanged from legacy CompactPCI. These connectors are commonly used for user I/O, rear I/O, and

	Legacy CompactPCI	New CompactPCI Express
Common features		
Board sizes	3U and 6U Eurocard sizes	Same
Face plates and ejector handles	IEEE 1101.10 compatible	
Modular power supplies	P47 based 3U and 6U modules	
Rear I/O	Routed through P3, P4, and P5 connectors	
Secondary buses	Routed through P3, P4, and P5 connectors	
Rear I/O	Routed through P3, P4, and P5 connectors	
New features		
Bus	PCI	Multiple PCIe ports
New connectors	P1 and P2 for routing power and PCI bus	XJ1, XP2, XP3, and XP4 for routing power and PCIe ports
Voltages supplied	3.3 V, 5 V, 12 V, and –12 V	3.3 V, 5 V, 12 V, and 5 V auxiliary

Table 1

secondary buses such as H.110 (telephony bus) and PICMG 2.16 (1 Gigabit Ethernet).

The new connectors are shown in Figure 3.

XJ1 power connector
The first connector is a power connector with wide blades capable of supplying substantial power to each board. Power supplied in CompactPCIe is slightly different that in legacy CompactPCI, with 3.3 V, 5 V, and 12 V required. (Note that –12 V has been eliminated.) In addition, CompactPCIe adds the 5 V auxiliary voltage, which allows CompactPCIe systems to utilize soft power-on or wake-on-LAN power-on consistent with normal PCs.

> A breakthrough technology, the new PCIe bus increases bus performance while lowering system costs.

XP2 and XP3 advanced differential fabric connectors
The second and third connectors contain the high-speed differential pairs that are the key to CompactPCIe performance. This connector is the same as used in AdvancedTCA, and has been simulated to operate at both the initial PCIe rate of 2.5 gigabits per second, and the future *Gen 2* rate of 5.0 gigabits per second.

XP4 enhanced HM connector
The enhanced HM (eHM) connector is a shortened version of the legacy P1 and P2 connectors. This connector provides several functions, including:

- Rear I/O for 3U boards
- Geographic addressing
- PXI signal compatibility
- Power for type 2 peripheral boards

Special keying built into the connector shell of this connector ensures that only boards that can handle a particular con-

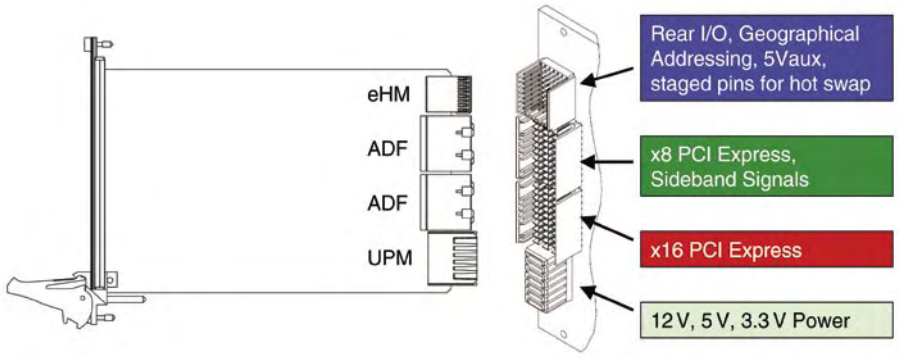

Figure 3

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nector usage are installed into the appropriate slots.

New slot types

Five slot types have been defined for CompactPCIe as shown in Figure 4.

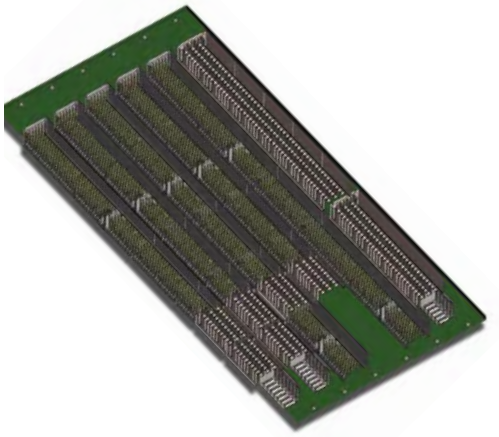

Figure 4

System slot

This slot type is designed to hold the primary CPU board. It consists of all four new connectors described above. The ADF connectors route either two or four PCIe ports. In the two-port model, one port is a x8 and the other a x16 lane port. In the four-port option, all four ports are x4 lanes.

Type 1 peripheral slot

This slot type is designed for high-performance I/O boards and for secondary CPU boards. The slot definition is nearly identical to the system slot, and includes all four new connectors. The ADF connectors are routed with two ports, one as a x8 and the other as a x16 lane port.

Type 2 peripheral slot

Designed for low-cost I/O boards, this slot type only includes the top two connectors. The ADF connector contains a single x8 port. The eHM connector provides power and user I/O to the slot.

Hybrid slot

This slot type allows either legacy 32-bit CompactPCI I/O boards or new CompactPCIe type 2 boards to be plugged in. The slot contains a traditional P1 connector as well as the upper ADF and eHM connectors. Legacy boards must only include a P1 connector to be compatible with the hybrid slot. In addition, modified

legacy PXI boards, where the P2 connector is replaced with the eHM connector, can be used in the hybrid slot.

Switch slot

This slot provides fan-out to drive all of the slot types. It contains a power connector and a large number of ADF connectors to accommodate all of the signals coming in from each slot. The 3U sized switch slot contains three ADF connectors and can connect up to seven slots with x4 ports. The 6U switch slot contains eight ADF connectors and can connect up to 19 slots with x4 ports. Dual switch slots can be included in a backplane to provide redundant ports to each slot.

Hybrid systems: Compatibility with existing boards

Over the next several years, CompactPCIe systems will likely include a mixture of legacy slots, hybrid slots, and new PCIe slots. This will enable designers to mix and match older boards with newer high-performance boards. Over time, more and more of the slots are expected to migrate to the PCIe standard.

CPU modules will likely be the first modules to migrate to PCIe, given the rapid CPU board design turnover rates and because newer chipsets have PCIe ports. Generic I/O boards such as Ethernet, video, and disk controller boards will migrate to PCIe next. Again, the underlying components will drive this transition. The latest components for these functions are now coming out, and they have PCIe ports coming directly out of the chip. Thus, new designs using the latest components will utilize PCIe.

The last boards likely to migrate over to PCIe will likely be custom or low-volume specialty I/O boards. Some designers may choose the "easy" way out and add a PCI-to-PCIe bridge onto these boards. This minimizes the engineering effort involved in getting a legacy board to work in a pure PCIe environment. Although easier, this approach does not achieve the performance advantages of PCIe, since the transfers end up going though legacy PCI and are throttled by its lower performance.

Future performance increases: Gen 2 timing

The PCI-SIG has announced the next generation PCIe bus timing. In PCIe 2.0, the data transfer rate will double from 2.5 gigabits per second to 5.0 gigabits per second. Components with the new Gen 2 timing are expected to become available in early 2007, with systems appearing shortly thereafter.

The technical subcommittee that defined CompactPCIe took the future Gen 2 timing into consideration when defining the specification. All simulations for the proposed backplane and connectors occured at frequencies beyond Gen 2, providing confidence that the upgrade path will be straightforward.

The specification is defined such that Gen 2 boards will be compatible with the current backplanes and boards. In a mix-and-match system, each bus interface will auto-negotiate with its associated interface. They both will begin communications at the slower 2.5 gibabits per second speed and then let each other know if they have the capability to move to 5.0 gigabits per second. Due to the point-to-point nature of PCIe, the presence of Gen 1 boards will not slow down high-speed Gen 2 boards in the same system.

This technique will allow systems to take advantage of even higher bus performance, while maintaining total hardware and software compatibility.

Steve Cooper *is president and CEO of One Stop Systems, and has more than 18 years of sales, marketing, and general management experience in the standard bus and board marketplace. He began his career with Intel, where he became a technical spokesman for the concept of board-level open bus standards and the Multibus and Multibus II architectures. Steve then joined RadiSys, a company specializing in embedded PC-compatible computers. He also served as vice president of sales and marketing, and later president and chief operating officer, at I-Bus. Most recently, Steve was president and chief operating officer for SBS Technologies. He holds a BSEE degree from the University of California, Santa Barbara.*

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cPCIS-6400U Series							•	
cPS-H325/48							•	
cPS-H325/AC							•	
cPS-H640/48							•	
cPS-H640/AC							•	
PXIS-2506							•	
PXIS-2556							•	
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NEMA 4 Box with Mounting Bracket								•
Server Cabinets								•
Bus Solutions Ltd								**www.bus-solutions.co.uk**
DRECS Dual Redundant Eurocard								•
BVM								**www.bvmltd.co.uk**
PMCFW2					•			
PMCSCU161					•			
PMCSCU162					•			
PMCSCU82					•			
BWI								**www.bwi.com**
PMC FW1					•			

Continued on page 46

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
BWI (continued)								**www.bwi.com**
PMC FW2					•			
PMC-CF1					•			
PMC-CF2					•			
PMCSCU160					•			
PMCSCU2A					•			
C&D Technologies								**www.cdpoweronline.com**
cPCI1200DC							•	
cPCI200 Series							•	
CPCI200A-1							•	
cPCI200DC							•	
CPCI325D-1							•	
cPCI325D-1 with IPMI							•	
cPCI350 Series							•	
cPCI350AC							•	
cPCI420 Series							•	
cPCI420DC							•	
cPCI500 Series							•	
PCI500 Series							•	
Carlo Gavazzi Computing Solutions								**www.gavazzi-computing.com**
AdvancedTCA Filler Panels	•							
2.16 Backplanes	•							
2.17 Backplanes	•							
AdvancedTCA Backplane	•							
CompactPCI Backplane Bridge	•							
PCI/ISA backplanes	•							
714 Series ATR Chassis		•						
SMM04 4U ATCA ShM Modules		•						
SMM08 8U ATCA ShM Modules		•						
AdvancedTCA Front Panel Kit					•			
545 Series							•	
583 Series 10 Slot PCI/ISA							•	
6821 Series Rackmount PCI							•	
714T Series							•	
503 Series PCI/ISA Rackmount								•
533 Series AdvancedTCA Chassis								•
Catapult								**www.catapult.com**
m500							•	
Cherokee International								**www.cherokeellc.com**
CMP/DMP 400							•	

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Chroma ATE								**www.chromaate.com**
BPWR-59712							•	
cPWR-5901/cPWR-59402							•	
Comtel Electronics								**www.comtel-online.de**
10U Black Star ATCA CO Shelf		•						
CO-14 DS ATCA CO Shelf		•						
CO-Pizza 2-Slot		•						
CO-Pizza 5-Slot		•						
CO-Pizza 8-Slot		•						
AdvancedTCA Intelligent Thermal				•				
cPCI 2-Slot 1U Horiz. Shelf							•	
Comtel CompactPCI 4 Slot 2U							•	
14 slot AdvancedTCA NEBS								•
2 slot AdvancedTCA NEBS CO-1								•
2 slot AdvancedTCA NEBS CO-2								•
5 slot AdvancedTCA NEBS								•
8 slot AdvancedTCA NEBS								•
Concurrent Technologies								**www.gocct.com**
SY PCI/P10							•	
SYPCI/SE8							•	
Conec Corporation								**www.conec.com**
ATCA Connector Series							•	
CompactPCI Connector Series							•	
Continuous Computing								**www.ccpu.com**
FlexChassis 5U and 12U							•	
FlexChassis cPCI-13U-21							•	
Flex21 cPCI Platform								•
Cool Innovations								**www.coolinnovations.com**
UltraCool P line				•				
Crystal Group								**www.crystalpc.com**
CS-100S							•	
Dawn VME Products								**www.dawnvme.com**
Model 426				•				
767							•	
7X7 Series							•	
Model 3800 Portable Enclosure							•	
Model 4100							•	
Model 6100							•	
Model 710							•	
PizzaBox-Plus!							•	

Continued on page 48

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Dawn VME Products (continued)						**www.dawnvme.com**		
Model 4100 Portable Dev Tower								•
DegreeC						**www.degreec.com**		
ATCA Fan Controller				•				
Digital Power						**www.digipwr.com**		
CPCI AC-6U-500							•	
CPCI DC-6U-500							•	
Dynamic Engineering						**www.dyneng.com**		
HDE Cable 68	•							
HDE Term 68	•							
HDR Ribbon 50	•							
HDR Term 50	•							
IP Debug Bus	•							
Dynatem						**www.dynatem.com**		
CSATA					•			
PMCX-SATA					•			
EIC Solutions						**www.eicsolutionsinc.com**		
S161206								•
EKF-Electronik						**www.ekf.de**		
CE5-Cadenza					•			
Electro-Space Fabricators						**www.esfinc.com**		
Custom Enclosures								•
ELMA Bustronic						**www.elmabustronic.com**		
108PS2108	•							
14-slot Dual Star ATCA	•							
2-slot ATCA Backplane	•							
32-bit cPCI Backplanes	•							
3-slot Backplane	•							
5-slot mesh ATCA	•							
6U cPSB	•							
6U Extender	•							
7U Pluggable ATCA Backplane	•							
ATCA Backplanes	•							
ATCA Dual Star Backplanes	•							
PICMG 2.16 Backplane	•							
cPSB HA Backplane	•							
EasyCable CompactPCI Backplanes	•							
EasyPlug CompactPCI Backplanes	•							
High-Availability Backplane	•							
Low-Profile CompactPCI Backplanes	•							
Low-Profile 2 Slot cPCI Backplane	•							
Low-Profile Backplanes	•							

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
ELMA Bustronic (continued)						**www.elmabustronic.com**		
Power Interface Boards	•							
Slim 6U 4-slot cPCI Backplane	•							
StarFabric Backplanes	•							
6U Power Interface Boards							•	
AdvancedTCA Handles	•							
ATCA ESD Clips/Guide Pin Receptacles	•							
13U ATCA Chassis		•						
ATR-Chassis		•						
IPM Sentry				•				
IPM Sentry Interface Board				•				
Sentry I System Monitor				•				
Sentry III Diagnostic Monitor				•				
AdvancedTCA Front Panels					•			
ATCA Handles					•			
cPCI Filler Panel					•			
No Compromise Front Panels					•			
12R1 COTS							•	
12R3 Chassis							•	
12U ATCA Chassis							•	
2U cPCI System							•	
39C08ADX48Y3HQ2X							•	
39M							•	
4U Type 39 ATCA							•	
8-Slot Type 32 cPCI Chassis							•	
9U Type 12 VXS Chassis							•	
AdvancedTCA 12U							•	
Conduction Cooled ATR							•	
PICMG 2.17 Chassis							•	
Rugged-PCI 12R2							•	
Type 12 PXI System							•	
Type 15 PXI System							•	
Type 15H 9U							•	
2U Type 39								•
39C04ADX28Y3HP2X								•
4U ATCA Chassis								•
ATCA ESD Clips and Guide Pin Recep.								•
AdvancedTCA System								•
Cabinets								•
Rugged Slide Rails								•
Type 32 Enhanced Enclosure								•
Type 39c chassis								•

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
EnerSys								**www.enersys.com**
NPX 35-6						•		
Equipto								**www.equipto.com**
Exact-Fit Card Cages								•
ERNI								**www.erni.com**
AdvancedTCA Connectors	•							
ESO Technologies								**www.eso-tech.com**
HA Computing Platform				•				
EXFO								**www.exfo.com**
OG-5240				•				
Extreme Engineering								**www.xes-inc.com**
XIt2000					•			
XPort6000					•			
XPort6100					•			
F9 Systems								**www.fulcrum9.com**
Tx/Rx SignalBlade			•					
RTM ThermalBlade				•				
ThermalBlade				•				
Fairchild								**www.fairchildsemi.com**
FS8S0765RC							•	
FCI								**www.fciconnect.com**
AirMax VS ATCA connector			•					
Airmax VS coplanar			•					
Millipacs			•					
Gage								**www.gage-applied.com**
Instrument Mainframe 8000C		•						
Gaurang								**www.gaurang.com**
Futura Case			•					
Modulbox-Dualmount-22.5								•
Modulbox-Dualmount-70								•
Tri-Mount Plastic Case								•
GD California								**www.gdca.com**
ZT 5990				•				
ZT 6300							•	
ZT 6302							•	
ZT 6310							•	
GE Fanuc Automation								**www.gefanuc.com/embedded**
VMICPCI-P303	•							
PMC243					•			
PMC244					•			
PMC245					•			
VMICPCI-5799					•			

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
GE Fanuc Automation (continued)								**www.gefanuc.com/embedded**
VMICPCI-7456					•			
VMICPCI-7457					•			
VMIPMC-5795					•			
VMIPMC-5797					•			
General Dynamics								**www.gdcanada.com**
PSC6100							•	
Geotest								**www.geotestinc.com**
GX7000 Series							•	
GX7002							•	
CC10x								•
Globe Manufacturing Sales								**www.globebrackets.com**
CompactPCI Front Panels					•			
GNP								**www.gnp.com**
CP2040/2140	•							
CP2X60/2X80	•							
Alert!Node				•				
Alert!Panel				•				
Media Carrier					•			
SCSI-W					•			
ComputeNode4U cPSB							•	
Gompf Brackets								**www.bracket.com**
PC•MIP Bezels-Keepers	•							
PMC Bezels	•							
Hagiwara								**www.hsc-us.com**
ATA-5 Flash Drive					•			
IDE Drive on Module					•			
IDE Flash Drive					•			
Harting								**www.harting.com**
Har-bus HM Power Mod.			•					
Har-bus M flat							•	
Hartmann Elektronik								**www.hartmann-elektronik.de**
CPCI Series RA-6U	•							
CPCI Series-RD	•							
CPCI to PCI Expansion	•							
Hoffman								**www.hoffmanonline.com**
4-Post Datacom Rack								•
Hybricon								**www.hybricon.com**
CompactPCI H.110/Hot Swap	•							
PICMG 2.18 Serial RapidIO	•							
Peripheral Shuttles					•			

Continued on page 50

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Hybricon (continued)								**www.hybricon.com**
Cool-T 6-Slot Tower							•	
PICMG 2.18 Serial RapidIO Dev. Kit							•	
RME1021M							•	
RME1221 12U Enclosures							•	
RME21 10U Enclosures							•	
RME21XC Extreme Cooling							•	
SRME 3U Enclosures							•	
SRME 4U Enclosures							•	
X721 Series Powered Racks							•	
10U Ruggedized COTS								•
8U RME821 Enclosures								•
CompactPCI Air Blockers								•
CompactPCI Load/test Boards								•
EMI Tight/Quick Access Subrack								•
High Power Towers								•
HRME 4U and 6U Enclosures								•
Hypertronics								**www.hypertronics.com**
2 mm Connector			•					
D02 Circular Plastic Connectors			•					
I-BUS								**www.ibus.com**
IBC2501				•				
C0406A							•	
C0808							•	
C0814D							•	
C0817							•	
C0818D							•	
C0877							•	
C0888D							•	
Inova								**www.inova-computers.com**
ICP-BPL-0M50	•							
ICP-BPL-0M-REDUNDANT	•							
ICP-PSU-100							•	
ICP-PSU-120							•	
ICP-PSU-70							•	
ICP-HOUS								•
ICP-SYSC-LC								•
ICP-SYSI-CS								•
Rail-Man								•
Integrated Power Systems								**www.ipsi.net**
5854							•	

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Integrated Power Systems (continued)								**www.ipsi.net**
5875							•	
Intel								**www.intel.com**
MPCHC001		•						
MPCMM0001				•				
ZT 7102				•				
Intel NetStructure IXB2800 3G Boards							•	
Intel NetStructure IXB28504xGbEFS							•	
MPCHC0001 14U Shelf							•	
Intel NetStructure MPCMM0001							•	
Intel NetStructure MPCMM0002							•	
IXB28504xGbEFS							•	
MPCHC0001							•	
MPCHC0001 14U Shelf							•	
MPCMM0001 Chassis Mngmt							•	
MPCMM0002 Chassis Mngmt							•	
Interphase								**www.interphase.com**
553C SlotOptimizer					•			
Jasper Electronics								**www.jasperelectronics.com**
175W and 200W Series cPCI							•	
200W DC Input cPCI							•	
250W cPCI Power Supplies							•	
300W cPCI Power Supplies							•	
450W cPCI Power Supplies							•	
JMR Electronics								**www.jmr.com**
Fortra IDE					•			
StorBlade FC RAID					•			
Kaparel								**www.kaparel.com**
6U cPCI Backplane Stiffener	•							
AdvancedTCA Backplane	•							
High Speed Backplanes	•							
Modular Backplanes	•							
PS47xx Horizontal Series	•							
AdvancedTCA Shelf		•						
Customizable AdvancedTCA Shelf		•						
RiCool-2 Blower				•				
RiTherm				•				
AdvancedTCA Faceplates					•			
10U cPCI Rack-Mounted System							•	
3U cPCI Rack-Mounted System							•	
4U cPCI Rack-Mounted System							•	
7U cPCI Rack-Mounted System							•	

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Kaparel (continued)								**www.kaparel.com**
9U cPCI Rack-Mounted System							•	
CompactPCI Slim-Box							•	
Ripac MPS Electronic Packaging								•
Keystone Electronic								**www.keyelco.com**
Metric PC Screw Terminals	•							
Knurr USA								**www.knurr.com**
CompactPCI System Chassis 3U							•	
CompactPCI System Chassis 5U							•	
CompactPCI System Chassis 6U							•	
cPCI System Chassis 7U, 8-slot							•	
cPCI System Chassis 7U, 14-slot							•	
Slim Line Encl. 1U 3035							•	
Slim Line Encl. 1U 3037							•	
Slim Line Encl. 1U 3039							•	
Slim Line Encl. 2U CT bus 3036							•	
Slim Line Encl. 2U CT bus 3056							•	
Slim Line Encl. 4U CT bus 3033							•	
Slim Line Encl. 4U CT bus 3038							•	
CoolBlade								•
Kontron								**www.kontron.com**
CP-ASM7-P47-RIO	•							
CP360, Ultra2 SCSI Contrlr					•			
PMC260					•			
XL1x00 Series							•	
XL8000 ATCA Chassis 12U							•	
XL8500							•	
XL-LP Series							•	
CP-ASM10-PSB, 10U								•
CP-ASM6-PSB, 6U								•
CP-Pocket								•
XL2000, 6U								•
XL3000								•
XL-Pocket								•
LV Power								**www.lvpower.net**
LV350DC3U1SF							•	
LV350DC3U2IPMISF							•	
LVDC200W3U2							•	
LVDC325W3U2							•	
LVDC350W3U2							•	
LVDC350W3U2IPMI							•	

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Macrolink								**www.macrolink.com**
ML-1000s Series		•						
ML-750T Series		•						
12-Slot VME and cPCI Chassis							•	
ML-1900 Series Leopard VII							•	
ML-1900 Series Panther							•	
ML-1900 Series Puma							•	
MagneTek								**www.magnetekpower.com**
HP750							•	
HP8/HD8							•	
HP850 Series							•	
PCI200							•	
PCI900/PDI Series							•	
Mapsuka								**www.mapsuka.com.tw**
ATCA Backplane	•							
CPCI Bridge	•							
PHT02-21610	•							
PICMG2.0R3.0/2.16 backplanes	•							
PICMG2.5R1.0 backplane	•							
EMC front panels					•			
2U cPCI platform							•	
4U cPCI horizontal platform							•	
Card guide/extrusions								•
MarekMicro								**www.marekmicro.de**
PXIB series backplanes	•							
Martek Power								**www.martekpower.com**
PS2316							•	
PS2318							•	
Measurement Computing								**www.measurementcomputing.com**
STLITE-CPCI-16R								•
Mektron Systems								**www.mektron.co.uk**
MA Series		•						
MEN Micro								**www.menmicro.com**
cPCI Basic System 3U							•	
cPCI Basic System 6U							•	
cPCI Basic System 4U/3U							•	
cPCI Basic System 7U/6U							•	
Rugged CompactPCI							•	
Triple-redundant CompactPCI							•	
Micro Technic								**www.micro-technic.com**
Right Angle PCIe Connectors			•					

Continued on page 52

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Mindready Solutions								**www.mindready.com**
SedNet OHCI Board Family					•			
Molex								**www.molex.com**
0.50mm I/O Connector			•					
IEEE 1386 Mezzanine Connector 71439			•					
Motorola								**www.motorola.com/computers/**
CPX8216 CompactPCI HA System	•							
Centellis 3405				•				
M-Systems								**www.m-sys.com**
FFD 2.5" Ultra Wide SCSI Flash disk					•			
FFD Ultra Narrow SCSI					•			
National Instruments								**www.ni.com**
PXI-8252					•			
SCSI-III					•			
PXI-1042							•	
PXI-1045							•	
NEXCOM International								**www.nexcom.com**
MAXI 670	•							
Nexsan								**www.nexsan.com**
ATAboy2					•			
Next Power Corp								**www.next-power.net**
CPCI D500 6U 4HP							•	
North Atlantic Industries								**www.naii.com**
55PQ1							•	
Omni Device								**www.omnidevice.com**
USPB-2000: PICMG Backplane	•							
USPB-3000: ATCA Backplane	•							
One Stop Systems								**www.onestopsystems.com**
11U High Capacity Enclosure							•	
2U PCI Rackmount Enclosure							•	
4U CompactPCI Encl.							•	
4U-19S-2-350							•	
8U Carrier Class							•	
OSS-ENCL-6U-14-600							•	
OSS-ENCL-6U-CC-4-300							•	
OSS-ENCL-6U-CC-8-600							•	
OSS-ENCL-6U-H-08-2-300							•	
OSS-ENCL-PORTABLE							•	
Portable Workstation							•	
1U CompactPCI Enclosure								•
2U High CompactPCI Enclosure								•
ENCL-3U-DT Series								•

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Optovia								**www.optovia.com**
C4000 Managed Shelf		•						
Performance Technologies								**www.pt.com**
CPC7301 Intelligent ShM				•				
MGT7402 Intelligent ShM Mezz.				•				
12U General Purpose PICMG 2.16							•	
Advanced Managed Platform							•	
CPC5095 7U PICMG 2.16 Platform							•	
CPC6314 325W DC Power Supply							•	
ZT 5091e 4U Packet-Switched Platform							•	
ZT 6301 150W Hot-Swap							•	
ZT 6303 250W Hot-Swap							•	
ATC5210 12U ATCA Platform								•
Phillips Components								**www.phillipscomponents.net**
VME or cPCI753 6U CAM		•						
The PMC Bezels					•			
VME/CPCI Panels, PMC					•			
VME/CPCI/PMC hardware					•			
Enclosures and Backplanes							•	
Picor								**www.picorpower.com**
QPI-1							•	
QPI-3 Active EMI Filter							•	
QPI-4 Active EMI Filter							•	
QPI-5 Active EMI Filter							•	
QPI-6 Active EMI Filter							•	
QPI-8L 7A Active EMI Filter							•	
Pigeon Point Systems								**www.pigeonpoint.com**
ShMM-300		•						
ShMM-300 ShM Starter Kit		•						
ShMM-500 ShM Mezzanine		•						
Polyrack								**www.polyrack.com**
CompactPCI backplane H.110	•							
CompactPCI packet switching	•							
19-inch 1U MPS for CompactPCI							•	
19-inch 3U/6U MPS for CompactPCI							•	
19-inch 4U MPS for CompactPCI								•
Positronic Industries								**www.connectpositronic.com**
Environmental WD Series			•					
Infinity Power Connector Series			•					
PCD/PCDD Press-fit Series			•					

Continued on page 55

The Performance of AdvancedTCA. The Convenience of A/C Power.

Your application demands AdvancedTCA, and you demand convenience and flexibility. You can have it all, with Elma's line of A/C powered ATCA system platforms. These chassis are ideal for prototyping, demos, or any application that requires A/C power. Available in 2U and 5U heights, with a multitude of configurations, Elma has an ATCA system to meet your requirements. And nobody is better than Elma in customizing to your exact specifications. When you're ready to plug into success, give Elma a call.

ATCA Chassis

- A/C or D/C versions in 2U, 5U and custom heights
- A/C input option, up to 700W
- Pluggable to a conventional A/C wall outlet
- Pluggable shelf manager options
- D/C versions in 4U, 12U, 13U, 13U ETSI and custom heights

ATCA Backplanes

- 2, 4, 5, 14 & 16 slots
- Dual Star, Mesh or Replicated Mesh
- Compliant to PICMG 3.0 Rev 1.0
- Optimized via signal integrity studies

ATCA Capabilities

- Simulation
- 3D Solid Modeling
- NEBS Certification
- Manufacturing
- Customization
- Integration

ATCA Accessories

- Front Panels
- Handles
- Shelf Management

Enclosures & Components | Backplanes | System Platforms | Switches, Knobs & LEDs | Cabinets

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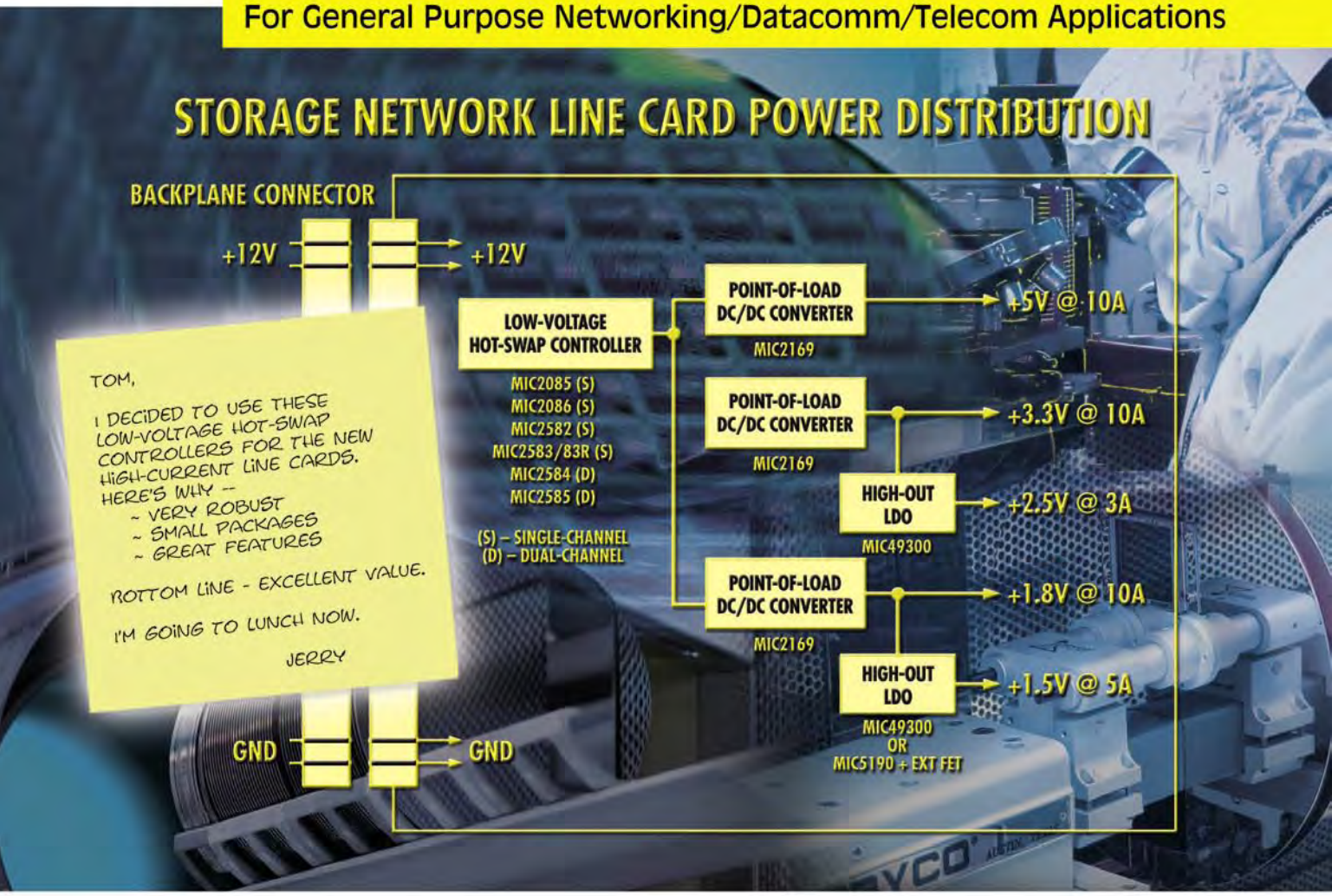
Micrel's Low-Voltage Hot-Swap Power Controllers – Only the Best!

For General Purpose Networking/Datacomm/Telecom Applications



Micrel's family of low-voltage hot-swap power controllers increase reliability and lower the overall system cost to implement power controllers in pc board space conscious applications such as storage network, datacomm, and telecom infrastructure applications. Micrel offers the system design engineer a number of solution-optimized products to address single- or redundant-rail power control requirements. Add high-performance power management products, like the MIC2169, the MIC37500, the MIC49500, and the MIC5190, and your challenging power control and distribution problems are a distant memory.

For more information, please contact your local Micrel sales representative or visit us at: www.micrel.com/ad/lv-hotswap.

The Good Stuff:

- Single-channel and dual-channel products available
- Products with wide supply voltage operation to +16.5V
- Surge voltage protection up to +33V, simplifying external protection techniques
- All products offer dual-level, programmable inrush current limiting
  - Fixed primary and user-selectable fixed secondary threshold voltage options
- Dual-speed overcurrent (oc) detection circuitry
  - User-programmable primary detection response time
  - Fast responding secondary detection response time
- Improved electrical performance

MICREL®

www.micrel.com

RSC# 54 @www.compactpci-systems.com/rsc

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Positronic Industries (continued)								**www.connectpositronic.com**
Power Connection Systems			•					
Sumo High Power			•					
VPB Series, ATCA Zone 1			•					
VP Series							•	
Potentia Semiconductor								**www.potentiasemi.com**
PS-1648							•	
PS-1648 for ATCA							•	
PS-1650							•	
PS-2405							•	
PS-2610							•	
Power Sources Unlimited Inc.								**www.psui.com**
CPCIAC-6U-400							•	
DPCI204-1022							•	
DPCI254-1022							•	
PCI354-1022							•	
Power-One								**www.power-one.com**
CPA200-4530							•	
CPA250-4530							•	
CPA500-4530							•	
CPD250-4530							•	
Purcell Technologies								**www.purcellbrackets.com**
cPCI, PMC, PCI Panels					•			
Radian Heatsinks								**www.radianheatsinks.com**
ATCA BGA Heatsinks				•				
ATCA Thermal Analysis				•				
cPCI BGA Heatsinks				•				
cPCI Thermal Analysis				•				
Removable BGA Heatsinks: EZ Snap				•				
RadiSys Corp								**www.radisys.com**
SYS50							•	
Radstone Embedded Computing								**www.radstone.com**
ATR		•						
RT4 PowerPact								•
Red Rock Technologies								**www.RedRockTech.com**
RRT-1DVW-LW					•			
RRT-1SHA-LW					•			
RRT-1SP-LW					•			
RRTC-1DVW-LW					•			
RRTC-1SFA-LW					•			
RRTC-1SHA-LW					•			

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Renesas Technology America								**www.renesas.com**
H8S/2168 Series IPMI				•				
Rittal								**www.rittal.com**
Power Cooling System				•				
Cable Management System								•
TE 7000								•
SAE Power								**www.saepower.com**
1U Power Systems							•	
6U/8HP 600W cPCI							•	
SANBlaze Technology								**www.sanblaze.com**
SB-SCSI Raid Blade					•			
SBE								**www.sbei.net**
scsiPCI-1U2WL					•			
scsiPCI-1UWD					•			
scsiPCI-1UWSE					•			
scsiPCI-2U2WL					•			
scsiPCI-2U3WL					•			
scsiPCI-2U4WL					•			
SBS Technologies								**www.sbs.com**
AMC-7S		•						
PCIE-AMC-7S		•						
8x0 Series bus adapters			•					
1394B-3CP1					•			
PMC-ISCSI-ST					•			
AVC-cPCI-3000-3U							•	
Schroff								**www.schroff.us**
23005-304	•							
23005-305	•							
23098-132	•							
ATCA hot swap handle	•							
ATCA 14 Slot Full Mesh Backplane	•							
BPL000333	•							
BPL000479	•							
BPL001091	•							
CompactPCI backplanes w/bridging	•							
PXI Backplanes	•							
AdvancedTCA adapter board		•						
AdvancedTCA filler panels		•						
AdvancedTCA front panel		•						
AdvancedTCA front panel kits		•						

Continued on page 56

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Schroff (continued)								**www.schroff.us**
Deployment Ready AdvancedTCA		•						
Fan controller/shelf manager		•						
Shelf manager for 5U chassis		•						
23098-147				•				
CBL000001				•				
20817-470					•			
20817-471					•			
21590-241					•			
21590-243					•			
21590-244					•			
21591-092					•			
21591-093					•			
21591-094					•			
21591-095					•			
21591-096					•			
21591-097					•			
21591-098					•			
21591-099					•			
21591-100					•			
21591-101					•			
21591-102					•			
21591-104					•			
21591-105					•			
21591-106					•			
21591-107					•			
31591-454					•			
AdvancedTCA Handle					•			
FPL000602					•			
FPL000603					•			
Front Panel Express					•			
11592027							•	
11592042							•	
11592043							•	
11592044							•	
23098163							•	
23098170							•	
AdvancedTCA chassis 14 slot							•	
AdvancedTCA chassis 5 slot							•	
AdvancedTCA dev. chassis 2 slot							•	

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Schroff (continued)								**www.schroff.us**
BPL000763							•	
SYS000235							•	
SYS000766							•	
14-Slot AdvancedTCA System								•
20,000 Series								•
Card Guides								•
europacPRO								•
PEN-6105								•
Simon Industries								**www.simonindustries.com**
Front Panels, Heatsinks	•							
Conduction Cooled Heat Frames				•				
SimpleTech								**www.simpletech.com**
IDE Flash Drives					•			
SMA								**www.SMAcomputers.com**
CPU1.2RIO	•							
CMASS6					•			
CMASS7					•			
CMASS7RIO					•			
Power Supplies							•	
SR6570							•	
Enclosures								•
South Coast Technology								**www.scoasttech.com**
SCTAC-150W AC/DC							•	
SOUTHCO								**www.southco.com**
5T Heat Sink Series Captive Screws	•							
ATCA Faceplate Mounting Hardware		•						
47 ATCA Captive Retention Screws					•			
4C ATCA Captive Retention Screws					•			
77-0-40552 ATCA Safety Ground Pins					•			
P7-A-503-11 ATCA Ejector Handle					•			
P7-A-513-11 ATCA Ejector Handle					•			
P7-A-523-11 ATCA Ejector Handle					•			
P7-A-533-11 ATCA Ejector Handle					•			
P7-A-543-11 ATCA Ejector Handle					•			
Star Case Manufacturing								**www.starcase.com/rack.htm**
Star Case Modular Racks								•
Stratos Lightwave								**www.stratoslightwave.com**
Rack-mount Packaging								•

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Sun Microsystems								**www.sun.com**
Netra AdvancedTCA Sys.		•						
Switching Power								**www.switchpwr.com**
HDX-1200S-P							•	
HDX-600Q-P							•	
Targa Systems								**www.targasystems.com**
CPCI25 Flash Disk					•			
VME25 and CPCI25					•			
Technobox								**www.technobox.com**
Transition Panels/Paddle Cards	•							
4170					•			
Telkoor Power Supplies Ltd.								**www.telkoor.com**
CPCI-AC-3U-200							•	
CPCI-AC-3U-250							•	
CPCI-AC-6U-400							•	
CPCI-DC-3U-200/24							•	
CPCI-DC-3U-200/48							•	
CPCI-DC-3U-250/48							•	
CPCI-DC-6U-350/24							•	
CPCI-DC-6U-400/48							•	
Teradyne								**www.teradyne.com**
VHDM RAM			•					
Tracewell Systems								**www.tracewellsystems.com**
Custom Backplanes	•							
Horizontal 5-slot Full Mesh		•						
S31							•	
S32-RH							•	
S36 Rugged System Platform							•	
S36-10U							•	
T-Frame							•	
TTX 400							•	
Triple E								**www.tripleease.com**
Metal Handles					•			
Tyco Electronics								**www.tycoelectronics.com**
PolyCrimp Splices	•							
Raychem NT-MIL	•							
AMC Connector			•					
ATCA Power Connector			•					
COM Express			•					
Databus Couplers			•					
MicroTCA Backplane Connector			•					

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Tyco Electronics (continued)								**www.tycoelectronics.com**
Stacked Modular Jacks			•					
Z-Pack HM-Zd			•					
Guide Hardware					•			
PIM200 200W ATCA							•	
QBW018A0B1							•	
Unipower								**www.unipower-corp.com**
Gravitas IX12.5-115							•	
Gravitas X100							•	
TWR Series							•	
United Electronic Industries								**www.ueidaq.com**
PDXI-4							•	
Universal Air Filter Co.								**www.uaf.com**
Broadband EMI Filters				•				
V Rose Microsystems								**www.vrosemicrosystems.com**
VRM-CE5-X					•			
VRM-PMC-150-X					•			
VRM-SATA8-X					•			
VRM-CR7-X							•	
Vector Electronics								**www.vectorelect.com**
2377 PICMG 2.16							•	
cPCI Chassis/Encl. 3U 6U							•	
Vector VME/VME64X Chassis/Encl.							•	
DIN Sub Racks								•
Vector 'Slimline' Chassis								•
Visionpower								**www.visionpower.co.uk**
IPSY200-12-47							•	
VMETRO								**www.vmetro.com**
CPMDR					•			
Voiceboard								**www.voiceboard.com**
CM256				•				
VX Instruments								**www.vxinstruments.com**
VX6620							•	
VX6625							•	
Westek								**www.westekuk.com**
P1100	•							
P11400							•	
P5100							•	
P8100 8U cPCI System							•	
P9100							•	

Continued on page 58

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
Winchester Electronics								**www.winchesterelectronics.com**
47-position cPCI Pwr Connectors			•					
ATCA Zone 1 Pwr Connector							•	
CPCI47P52x101							•	
CPCI47S43x104							•	
Wolf Industrial Systems								**www.wolf.ca**
Fan Tray				•				
SCAMP Power Panel							•	
XILINX								**www.xilinx.com**
Xilinx ATCA Platform	•							

COMPANY NAME/ MODEL NUMBER	Backplanes	Chassis & shelves	Keying	Management & alarming	Mechanical & packaging	Power management	Power supplies	Racks, cabinets, & enclosures
XTech								**www.xtech-outside.com**
AdvancedTCA front panels					•			
CompactPCI front panels					•			
Extruded Aluminum Enclosures								•
Yamaichi Electronics								**www.yeu.com**
CN074 Series for AMC			•					
AMC – (CN074) Connector			•					
Zephyr Engineering								**www.zpci.com**
ZPCI.2466 6U Active Ext.	•							

NEW PRODUCTS

www.compactpci-systems.com/products

CompactPCI & AdvancedTCA

For further information, enter the product's RSC# at www.compactpci-systems.com/rsc

BRIDGE: PROCESSOR-TO-PCI

Tundra Semiconductor Corporation

Website: www.tundra.com
Model: Tsi108A **RSC No:** 21710
2.5 W typical power consumption with all ports operating at maximum speed (3.7 W maximum) • DDR2 Memory Controller • Integrated clock generator removes power requirement of external components • Optional spread spectrum capability • Designed for 200 MHz operation with only 8 PCB layers • 200 MHz 60x/MPX processor bus • Dual CPU support • Advanced pipeline architecture • Low CPU memory latency • High performance PCI/X bus, up to 133 MHz operation • PCI-X host or agent modes supported • Low latency non-blocking internal switch fabric • RoHS compliant packaging • 1023-pin, 33x33 mm, FCBGA • Pin compatible with Tsi108

CARRIER BOARD: AMC

CorEdge Networks, Inc.

Website: www.coredgenetworks.com
Model: CEN-RC4 **RSC No:** 21696
An AdvancedTCA/AMC reprogrammable carrier • Four single-width/extended full-height AMC bays • Full hot swap support • Radial IPMI system management • Radial synchronization clocks 1, 2, and 3 • Radial JTAG distribution and test engine • 200 W power maximum • 0 °C to +55 °C operating temperature range • Carrier IPMC Renesas Hitachi H8 • Base channel programmable multiprotocol fabric switch • Optional Fat Pipe programmable multiprotocol switch

CARRIER BOARD: OTHER

GNP

Website: www.gnp.com
Model: ATCA Carrier Cards **RSC No:** 18180
AdvancedTCA carrier cards for integrating CompactPCI and Compact Packet-Switching Backplane (cPSB) cards into an AdvancedTCA environment • Entry-level AdvancedTCA Base Interface carrier card provides interconnection to the PICMG 3.0-compliant data transport section, 10/100/1000Base-Tx fabric data interconnectivity in a dual star configuration, and an onboard IPMI controller • AdvancedTCA full mesh carrier card provides complete fabric interface connectivity for any CompactPCI boards • Onboard Gigabit Ethernet switch with full mesh connectivity and alternate topologies including dual star, dual dual star, and limited meshes • AdvancedTCA Partial Mesh carrier card incorporates a smaller port count Gigabit Ethernet switch suitable for smaller slot count systems or reduced-connection topologies such as partial meshes and dual stars within the fabric interface

Traquair Data Systems, Inc.

Website: www.traquair.com
Model: HEPC9 **RSC No:** 21700
A PCI carrier board • Able to support multiple 'C600 DSP processors, Virtex, Virtex-II, Spartan-II, FPGAs, data acquisition, and I/O interfaces as part of a single, integrated system • Host PCI bus interface • Four Heron module slots, each able to support a DSP, FPGA, or I/O module • Heart communication system for configuring FIFO data paths between modules • Individual connections can be configured to sustain data transfer rates from 66.7 MBps to 400 MBps • Optional inter-board communications module for extending FIFO data paths across multiple carrier boards • JTAG controller with software support for Code Composer Studio

CARRIER BOARD: PMC

Curtiss-Wright Controls

Website: www.cwcembedded.com
Model: CPCI2PMC **RSC No:** 22175
Dual PMC carrier board in the 6U CompactPCI form factor • Enables users of Systran's SCRAMNet+, FibreXtreme, FibreXpress, and 1553 Solutions products to use CompactPCI-based computers in their systems • The carrier features space for up to two 33 MHz/32-bit PMC modules, support for both +5 V and +3.3 V signaling voltage on CompactPCI and PMC buses, selection of +3.3 V voltage from CompactPCI power supply or onboard regulators

CHIPS & CORES: FPGA

XILINX, Inc.

Website: www.xilinx.com
Model: VIRTEX-4 FX60 **RSC No:** 21499
90 nm FPGAs • Support all major serial standards including PCI Express, Serial RapidIO, Ethernet, and Fibre Channel • Integrated 622 Mbps • 10.3125 Gbps serial transceivers

CHIPS & CORES: PENTIUM

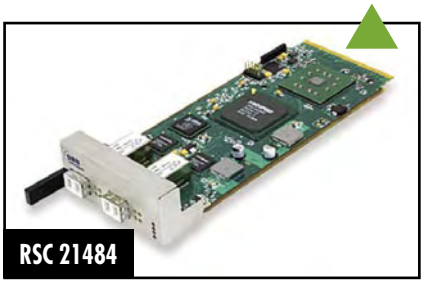
Intel

Website: www.intel.com
Model: Embedded Processors **RSC No:** 18146
Embedded Intel Architecture silicon building blocks, reference designs, and development tools with the headroom and scalability for next-generation solutions • Implementation-ready boards and systems from Intel and third party vendors to meet stringent time-to-market requirements

DATACOM: ATM

SBS Technologies, Inc.

Website: www.sbs.com
Model: Telum 1004-O3M/S **RSC No:** 21484
AMC.1 and PCIe Rev 1.0 compliant • 4 Port full duplex OC-3 Interface • Optional Automatic Protection Switching (APS) • 4 MB local memory; supports up to 16,000 VCCs • Hot Swap compliant • Intelligent Platform Management Interface (IPMI) • Carrier Grade Linux, VxWorks



DATACOM: ETHERNET

Entrada Networks

Website: www.entradanetworks.com
Model: 2320c-TX **RSC No:** 22714
Dual 10/100 Ethernet for CompactPCI • IEEE 802.3 100 Mbps Ethernet LAN • Carrier Sense Multiple Access/Collision Detection (CSMA/CD) • 10/100Base-TX Ethernet over CAT 5 Unshielded Twisted Pair (UTP) • Two independent ports - RJ-45 • IEEE 802.3a auto negotiation: 10 Mbps versus 100 Mbps and half versus full duplex • Maximum cable length: 100 m • CompactPCI PCI 3U card, 32 bit, 33 MHz • Available with either 3U or 6U front panel

SBE, Inc.

Website: www.sbei.net
Model: iscsiPCI-2GCx **RSC No:** 19078
A cost-effective iSCSI storage management solution with SBE's dual-port Gigabit Ethernet TCP/IP Offload Engine (TOE) board with PyX's fault-tolerant, high-availability, uniform iSCSI software protocol • Ensures no single point of failure on the storage transport layer between two nodes • Offloads network protocol processing from the CPU • True active trunking • Aggregation of port bandwidth • Fully operational on multiple independent IP networks • Error Recovery Level Two (ERL2) functionality • Carrier-grade feature class • Storage transport agnostic: iSCSI Target supports SATA, SCSI, and Fibre Channel • Fully compliant with IETF iSCSI standards • Available for 64-bit architecture

• Available bundled options include iSCSI Initiator and iSCSI Target • Linux OS support

SBS Technologies, Inc.

Website: www.sbs.com
Model: Telum GE-QT Gigabit **RSC No:** 21485
Single-width, half-height AdvancedMC form factor • 4 Gigabit Ethernet ports accessible through the front panel • AMC.1 design using 4x PCI Express bus • IPMI controller fully compatible with the AMC specification • TCP CRC calculation and segmentation offloading

SMA Computers

Website: www.SMAcomputers.com
Model: CLAN7 **RSC No:** 20846
A ruggedized 3U CompactPCI module • Provides an Ethernet/Fast Ethernet interface according to IEEE 802.3 • Front panel provides a 4-pin M12 socket according to the Industrial Ethernet Standard of the IAONA organization • Suitable for harsh environments, such as railway applications, due to the M12 socket that provides a ruggedized connection • Data rates up to 100 Mbps • Auto negotiation • Full duplex • 4 LEDs

DATACOM: INTELLIGENT COMMUNICATION CONTROLLER

ADLINK Technology, Inc.

Website: www.adlinktech.com
Model: PCI-3488 **RSC No:** 21504
PCI IEEE 488 Interface controller card • Provides interface between GPIB instruments and PCI-equipped systems • Compliant with IEEE488.1 and IEEE488.2 standards • PCI interface supports both 3.3 V and 5 V PCI environments to make it suitable for most desktop computers and industrial PCs • 1 KB onboard FIFO • High speed bus accelerated by the onboard CPLD • 1.5 MBps maximum data transfer rate to satisfy high volume data transfer requirements • Hardware and software verified with a wide range of products and applications • Supports popular application development environments such as VB, VC, Delphi, LabVIEW, and TestExec • Drop-in system configuration to be compatible with existing test and measurement applications • Supports Windows 98/NT/2000/XP • Driver library compatible with industry standard VISA and instrumentation protocols

DATACOM: SERIAL CONTROLLER

Kontron

Website: www.kontron.com
Model: PMC245 **RSC No:** 22710
A quad serial PMC mezzanine-based controller • Infineon DSCC4 intelligent DMA-based serial controller with integral quad 128 x 32-bit transmit and receive FIFO buffers • Each of the four serial channels is software-configurable for RS-232/422/485 and supports up to 2 Mbaud asynchronous or 10 Mbaud synchronous data rates • Cable interfaces are through the front-panel 50-pin D-sub connector • Optional adapter cable provides a breakout to 4 x D-sub 9 connectors • Support for extended temperature ranges E1 (-25 °C to +75 °C) and E2 (-40 °C to +85 °C) • Optional rear I/O • 32-bit/33 MHz CompactPCI v2.1-compatible interface • Jumperless configuration • Front panel control LEDs • Operating system support includes Windows NT/Embedded NT, VxWorks, QNX, and Linux

DEVELOPMENT PLATFORM

Arrow Electronics

Website: www.arrow.com
Model: AdvancedTCA Starter Kit **RSC No:** 21883
5U, 5-slot full mesh backplane that supports AdvancedTCA PICMG 3.0, 3.1, 3.2, 3.3, and 3.4 specification • AdvancedTCA compliant shelf management system • 19" bench top/rackmount horizontal lead enclosure • ZNYX Networks Ethernet switch provides single-chip, Intel media switch 16-port Gb device capable of switching up to 24 million packs per second • Open Architect provides a complete Linux Ethernet networking environment that facilitates custom application development • Dual low-voltage Intel XEON processors for demanding wireless and telecom infrastructure applications • Integrated 512 KB L2 cache • Supports 4-plus GB DDR-266 ECC registered DRAM via four DIMM sockets

Carlo Gavazzi Computing Solutions

Website: www.gavazzi-computing.com
Model: ATCA Starter Kit **RSC No:** 21480
A complete AdvancedTCA development system • Available with a six slot, full mesh backplane that supports the AdvancedTCA PICMG 3.0, 3.1, 3.2, 3.3, 3.4, and 3.5 specifications • Supports AdvancedTCA hardware and software testing and development • Can be used as a system for proof of concept and customer demonstrations • Provides the scalability and open standards flexibility required by the telecommunications, military, and industrial markets • Packaged in a Carlo Gavazzi Computing Solutions enclosure with shelf manager

IP Fabrics

Website: www.ipfabrics.com
Model: Double Espresso **RSC No:** 21502
Intel IXP2350-based PCI Express Development Platform • Combines two Intel IXP2350 network processors with a PCI Express interface • Each network processor is supported with 640 MB of DDR DRAM and an additional 8 MB of external QDR-II SRAM • The network processors can be uniquely configured to operate as ingress/egress, pipelined, or independent NPU subsystems •

NEW PRODUCTS

I/O includes four 10/100/1000Base-T data plane Ethernet connections along with two 10/100Base-T management/console Ethernet connections • Compatible with x8 PCI Express expansion slots • IP Fabrics' PPL for Intel IXP23XX network processors includes all the software needed to create, test, and deploy applications for the Intel IXP23XX product line • PPL's high-level programming significantly reduces the development time required to implement "deep packet processing" applications such as intrusion detection, voice-over-Internet, anti-spam, antivirus, web filtering, content switching, Internet traffic management, and application-level cryptography compared to programming in assembly language or C • PXD add-on module for PPL provides very high speed packet transfer and remote procedure call mechanisms between Intel IXP and host CPU processors using PCI Express • PXD is seamlessly integrated and is packaged as an add-on to the PPL for IXP23XX and PPL for IXP28XX software products

Nallatech

Website: www.nallatech.com
Model: Virtex-4 Development Kit **RSC No:** 21238
A development platform for Xilinx Virtex-4 FPGAs that provides integration into the Xilinx System Generator for DSP development tool • Equipped with a SX35 Virtex-4 FPGA, which has 192 XtremeDSP slices, 3,456 Kb internal RAM, and 15,360 logic slices • Includes the dual mode BenONE DIME II USB and PCI motherboard populated with a BenADDA-V4 DIME-II module • Four high-performance analog interfaces, consisting of two 14-bit, 105 MHz ADC channels and two 14-bit, 160 MSPS DACs • 4 MB ZBT SRAM • Kit comes with a range of IP including memory controllers, BIST, and example designs • Includes Nallatech's FUSE system software • Supported by the Xilinx System Generator v7.1 software for DSP design tool

Tundra Semiconductor Corporation

Website: www.tundra.com
Model: Serial RapidIO **RSC No:** 22698
Reference design platform using the Tsi568A Serial RapidIO switch • Standalone card that is powered through a standard Advanced Technology eXtended (ATX) supply • Can be used in conjunction with off-the-shelf processing and I/O boards to immediately create a "proof of concept" system, an application software development environment, customer demonstration system, or an interoperability-testing suite • Leverages various industry standard mechanical connectors including Advanced Mezzanine Card (AMC) connectors, SubMiniature version A (SMA) connectors, Hardware Interoperability Platform (HIP) connectors, and a 4x I/O differential cable connector • Interoperability enables a high degree of flexibility so customers can perform a range of development and diagnostic activities including prototyping and interoperability testing

DEVELOPMENT TOOLS

Agilent Technologies

Website: www.agilent.com
Model: E2944A **RSC No:** 21496
Enables nonintrusive capturing of ASI transactions between two line cards in the AdvancedTCA-based backplane • Alternatively, the exerciser can be used to emulate one of the line cards of the test setup • Suitable for bring-up and debug, validation, and compliance testing of AdvancedTCA form factor-based ASI boards and backplanes

DSP RESOURCE BOARDS: PMC

Sheldon Instruments

Website: www.sheldoninst.com
Model: SI-C6713DSP-PMC **RSC No:** 22663
Enables adding real-time signal processing capabilities • PCI Mezzanine Card (PMC) is a widely used industry standard for small-sized mezzanine modules • A high-performance DSP processor and graphical application development in LabVIEW • Suitable for real-time processing applications • Architecture of the 32-bit floating point DSP is optimized for algorithms typically used in most real-time applications, including point by point or block processing such as basic arithmetic, digital controllers, FFTs, and digital filters • As a self-contained processing entity, the DSP board also runs independently of the host CPU platform • Available with a Flash memory option for complete standalone operation • 300 MHz TMS320C6713 DSP from Texas Instruments • Up to 256 MB of SDRAM • Expansion site for a family of multi-function I/O modules for test/measurement and control applications • Expansion I/O modules available to add a variety of analog and digital I/Os to the DSP PMC • Analog interface with up to 64 inputs and 16 outputs • Timing interface with 2 digital synthesizers and 4 counters • Digital interface that comprises 32 bits of general purpose I/O, 2 quadrature encoders, 2 frequency counters, and 2 PWMs outputs • When it is configured with an I/O module, the SI-C6713DSP-PMC module represents a complete measurement or control subsystem • DSP software libraries QuVIEW and QuBASE enable system engineers to program their DSP system in LabVIEW or Visual Basic: no vendor specific C compiler, assembler, or linker is necessary; nor is it necessary to have had any DSP experience whatsoever • Texas Instruments' Code Composer Studio C/C++ based development tools are also supported with extensive source code distribution

FABRICS: FIBRE CHANNEL

XILINX, Inc.

Website: www.xilinx.com
Model: 4GFC LogiCORE **RSC No:** 21500
4 Gbps programmable Fibre Channel • Designed specifically for the Virtex-4 FPGA family • Provides system architects with the ability to scale storage area network designs to higher Fibre Channel rates • Designed to ANSI INCITS X3-230-1994 (R1999), X3-297-1997 (R2002), X3-303-1998 FC-PH, T11FC-FS, and T11-FC-SW-3 specifications • Can run at 1G (1062.5 Mb), 2G (2125 Mb), 4G (4250 Mb), 1G/2G (negotiable), or 2G/4G (negotiable) per second • Optional hardware-based speed negotiation feature • Core supports class 1, 2, 3, 4, and F frames • Port-independent implementation supports underlying functionality for all nonarbitrated loop port types: N, F, E, and B

FABRICS: RAPIDIO

Tundra Semiconductor Corporation

Website: www.tundra.com
Model: Tsi564A **RSC No:** 21707
A Serial RapidIO switch • Up to four x4 links • Up to eight x1 links • Supports 1.25, 2.5, and 3.125 GBaud rates • Configurable on port width and speed • Port power down • Programmable SerDes • Hot swappable • Distributed processing • Low latency and cut through (port-to-port without interruption) • Full duplex, line rate termination, nonblocking fabric • Prevention of head-of-line blocking • 10 Gbps links • CRC handling for hardware-based error recovery • Error status and reporting for high availability • Lead-free packaging available • Integrated XAUI SerDes • Small 21 mm x 21 mm package

I/O: DIGITAL

MEN Micro Elektronik GmbH

Website: www.menmicro.com
Model: M81 **RSC No:** 18125
A 16-channel, fully isolated, fully protected binary output M-Module for industrial applications • Based on the M-Module ANSI standard • Usable as an I/O extension in any type of bus system, including CompactPCI, VME, PXI, and standalone SBCs • Outputs switch AC or DC voltages and can also be used for analog signals • Works with panel transmission and supports fast, spike-free switching • Switches relays, lamps, or other loads • Software support for Windows, Linux, VxWorks, QNX, RTX, and OS-9

PROCESSOR: PENTIUM III

Kontron

Website: www.kontron.com
Model: CP303-V **RSC No:** 22712
Celeron microBGA ULV 400 MHz up to LV 1.0 GHz • Up to 512 MB SDRAM on one SODIMM socket • 815 chipset internal VGA • Fast Ethernet channel • 64-bit CompactPCI interface • Optional rear I/O support

SBS Technologies, Inc.

Website: www.sbs.com
Model: CL7 **RSC No:** 22516
3U CompactPCI board based on Intel Pentium III processor or Celeron processor at 566 MHz to 1 GHz • Fast 10/100Mbit Ethernet • Flash drive up to 512 MB • DVI-D interface (PanelLink) • Up to 512 MB SDRAM • VGA/LCD video up to 1600 x

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Atul Bhatnagar,
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PROTOTYPING AND DEBUGGING AIDS

Agilent Technologies

Website: www.agilent.com
Model: J6803A Analyzer PRO **RSC No:** 21494
Suitable for measuring and qualifying service performance, identifying root-cause of impairments, and troubleshooting on multiservice, multitechnology networks from any location • Local and distributed test capabilities for installation, maintenance, and troubleshooting of next generation networks • Incorporates a wide variety of access interfaces in a small portable platform with a wireless LAN user interface • Suitable for diagnosing network and services issues when turning up and optimizing networks • Supports HSDPA in mobile broadband networks • Video protocol analysis • Directly correlates VoIP voice quality with network impairments • Dispatched onsite testing • Unattended remote testing • Centralized troubleshooting • Web browser access, Instrument Manager, and network troubleshooting center

SCSI CONTROLLER

Kontron

Website: www.kontron.com
Model: PMC260 **RSC No:** 22696
A 32-bit PMC mezzanine Ultra SCSI II controller for data storage applications • Up to 80 Mbps transfer rate • Wide LVD SCSI-bus • Up to 15 SCSI peripherals • Up to 12-meter SCSI cable • Supports SCSI-1, SCSI-2, SCSI-3, UltraSCSI, and Ultra2 SCSI protocols • Onboard DMA FIFO • Bus-master DMA • Operating system support for WindowsNT and VxWorks

SHELF AND MECHANICAL COMPONENTS

Tracewell Systems, Inc.

Website: www.tracewellsystems.com
Model: Horiz. 5-slot Full Mesh **RSC No:** 21479
A low profile 5U system platform • Designed to meet NEBS Level III and UL/EN 60950, EN55024 • Advanced high capacity push-pull cooling scheme • High performance shelf management • Replicated mesh backplane optimized for 3.125 Gbps and beyond • Each shelf-level FRU includes redundancy at the control circuit level, where an IPM Controller is located on both IPMB-A and IPMB-B buses • Each IPM bus has a separate control processor with information sharing • Suitable for ensuring that shelf reliability meets or exceeds 99.999% • All shelf FRUs provide standard failure alerts and the unit provides predictive failure noncritical alerts • Meets 99.999% (5-nines) with an availability of 99.9999 (6-nines) targeted

SOFTWARE: NETWORKING

AdventNet Inc.

Website: www.adventnet.com
Model: ManageEngine 5.5 **RSC No:** 20815
Network monitoring software suitable for WAN monitoring, LAN monitoring, Windows services and event log monitoring, URL monitoring, server management, and application management • Integrated fault and performance management functionality • Automatically discovers and maps resources across the network and presents an integrated view of the enterprise in a single NMS console • Actively monitors the network and notifies operators by e-mail / SMS when a fault occurs • Provides reports and graphs for Interface statistics, CPU, memory, disk statistics, and service response times and availability • Provides more than 160 out-of-the-box monitors to manage Cisco devices, MS-Exchange, Lotus Notes, Oracle, MSSQL, Dell, and Compaq servers • Supports adding custom monitors to monitor any SNMP parameter

SWITCH MATRIX/ARRAY

Signametrics Corporation

Website: www.signametrics.com
Model: SMX4032 **RSC No:** 22703
32-channel unit • Power isolation and guard/shielded construction • 1µV thermal EMF • 32 channels can be configured on the fly as a single 32:1 differential multiplexer, as four independent 8:1 multiplexer, two 16:1, or as 64-single-point switch • Bounce time measurement • Integrity test and contact-cleaning • Can be used in a wide range of sensitive applications

TELECOM

SBS Technologies, Inc.

Website: www.sbs.com
Model: Telum ASLP10 processor **RSC No:** 21488
For use in wireless base stations, Voice over IP, test and measurement systems, media servers, base station controllers, and server blades applications • Single-wide, full-height AdvancedMC complies with AMC.0 specification RC1.1 • Resolutions up to 1280 x 1024 at 60 Hz with 24 bpp on a single display device • 8 MB of embedded SGRAM memory 128 bits wide • Standard high-density female DB15 CRT connector on front panel • 3D and 2D hardware acceleration and BitBLT • Microsoft Windows device drivers available • 2 GHz Intel Pentium M Processor • AMC.0, AMC.1 Type 8, AMC.2 Type E2, and AMC.3 Type S2 compliant • Parallel PCI Express x8 lanes, dual Gigabit Ethernet SATA channel • DDR2-400 MHz SDRAM • Intel 7520 chipset with 533 MHz system bus • Optimized Thermal Design Carrier Grade Linux support

VIDEO: DISPLAY CONTROLLER

Curtiss-Wright Controls

Website: www.cwcembedded.com
Model: AtlasPMC/1D **RSC No:** 22695
M9 dual design provides VGA and DVI via the PMC front panel • Uses DVI and MDR20 connectors that connect to standard DVI cables (MDR20 is DFP compatible) • Onboard 3 V regulator for compatibility with all VME CPU boards • Full Windows compatibility including power management and BIOS auto detect • Alternate version (AtlasPMC/1V) has dual front panel VGA connectors • Support for noninterlaced, interlaced, and sync-on-green on both VGA/RGB channels • PMC host interface is compatible with 32 and 64-bit PCI and PCI-X • ATI Technologies RADEON Mobility 9000 (M9) Visual Processor Unit • 64 MB integrated high-speed DDR SDRAM • Hardware 2D and 3D (DirectX and OpenGL) acceleration • Flexible output configurations • Dual Interlaced/Non-Interlaced Analog outputs support resolution up to 1920x1200 @24 bpp and separate horizontal and vertical, composite, or sync-on-green • Dual DVI outputs support up to 1600x1200 @24 bpp or up to 1920x1200 @24 bpp using reduced blanking intervals • Second graphics channel can output NTSC, PAL, RS-170, and S-Video Video Output • VGA and FCode BIOS support • Thermal sensor allows monitoring of board temperature • Flexible power management capabilities • PCI/PCI-X compliant, 32/64-bit 33/66/100/133 MHz capable • Front panel connector access for all functions

SBS Technologies, Inc.

Website: www.sbs.com
Model: Telum 2001-VGA card **RSC No:** 21487
Single-wide, full-height AdvancedMC complies with AMC.0 specification RC1.1 • Resolutions up to 1280 x 1024 at 60 Hz with 24 bpp on a single display device • 8 MB of embedded SGRAM memory • 128 bits wide • Standard high-density female DB15 CRT connector on front panel • 3D and 2D hardware acceleration and BitBLT • Windows device drivers available

VIDEO: FRAME GRABBER

Aitech Rugged Computer Systems

Website: www.rugged.com
Model: M570 **RSC No:** 22713
A Camera Link frame grabber PMC module • Standard PMC, 64-bit/66 MHz, compatible with the Aitech host platform • Source is Adimec 1000 m stills camera • Camera Link interface from the camera to the frame grabber card using 3M connector; 8-bit resolution, 1024 x 1024 frame size, up to 50 frames/sec • PMC connectors support 64-bit PCI bus • I/O PMC connector for external trigger and LVDS connection as an option • Two MB DPRAM frame buffer (up to two frames) • 64 KB for picture processing storage • Picture processing: Threshold, convolution, edge (based on FPGA programming) • Compliant with IEEE-P1386.1 standard for PCI mezzanine cards • Three ruggedization levels • VxWorks drivers

Leutron Vision international

Website: www.leutron.com
Model: PicPort-Express-CL **RSC No:** 21503
PCIe based independent and asynchronous support for 2x base configuration Camera Link frame grabbers on a single board (stereo version) • A line scan and area scan camera can be used simultaneously and independently on the same board • Start and Stop triggers • Unlimited buffer size • No data loss between buffer switch • Reverse direction handling with bidirectional encoders • Advanced Onboard Tap reconstruction handles complicated tap configurations directly on the board • Intelligent Transfer Management of buffers and scatter-gather info (physical address mapping for data transfers) brings higher bandwidth and alerts (about) potential data loss • Real Time Functions (preprocessing) work for very large images with up to 128 MB of onboard DDR-SDRAM

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4102	Conec Corporation – AdvancedTCA Connectors
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9	Diversified Technology – PICMG 3.1 and 3.2
32	ELMA Bustronic – Unique Probe Card
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4403	FCI – Millipacs HM 2mm Connectors
42	GE Fanuc Automation – Single Board Computers
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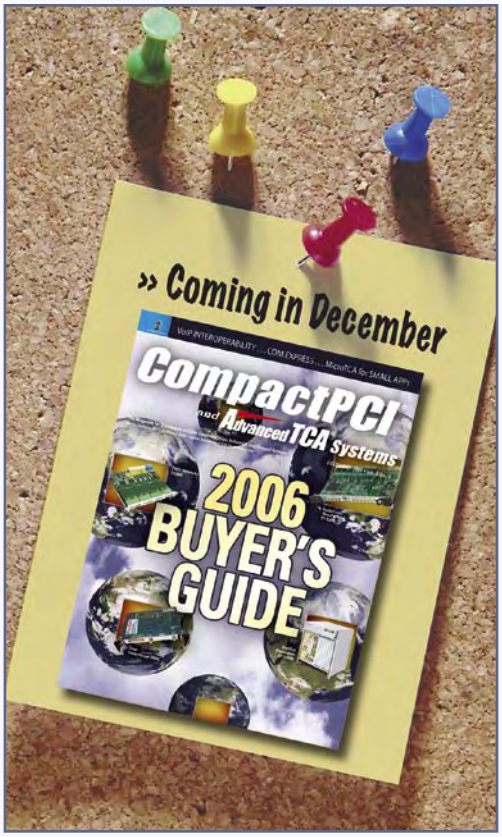

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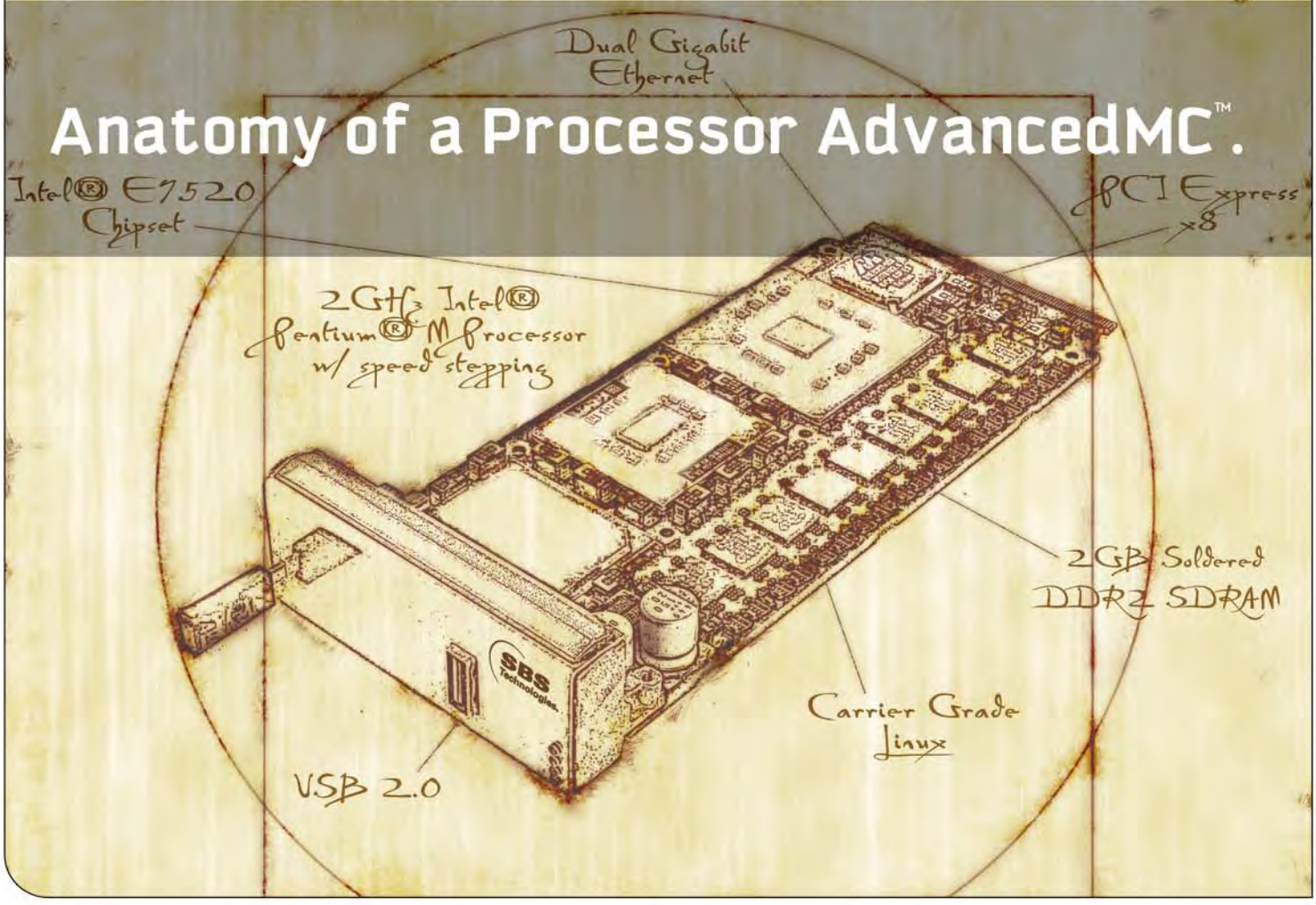

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