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Embedded Intel® Solutions

SUMMER 2009

Picking the Right Form Factor

Off-the-Shelf Small Form Factors Do It All

Is America Ready for Qseven?

PC/104 Expands to Meet New Needs

Avoiding Patent Infringement in the Design Process

Solution Providers Forum

Articles from companies providing important solutions for engineers and embedded developers utilizing embedded Intel® processors

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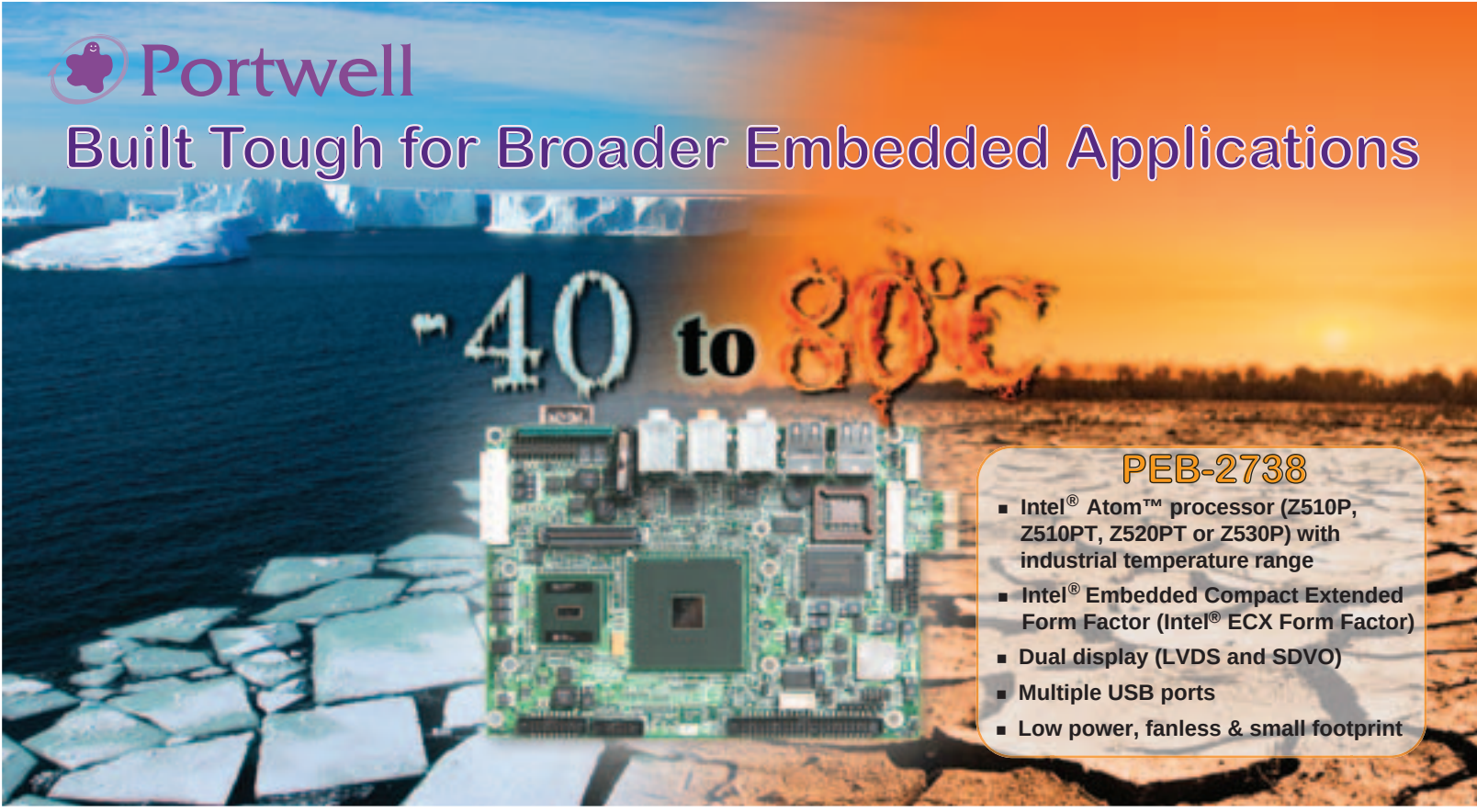
Portwell

Built Tough for Broader Embedded Applications

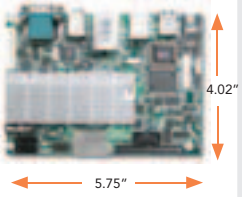


PEB-2738

- Intel® Atom™ processor (Z510P, Z510PT, Z520PT or Z530P) with industrial temperature range
- Intel® Embedded Compact Extended Form Factor (Intel® ECX Form Factor)
- Dual display (LVDS and SDVO)
- Multiple USB ports
- Low power, fanless & small footprint

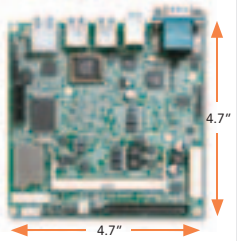
Portwell ruggedizes its new PEB-2738 ECX board with the new Intel® Atom™ processors Z510P, Z510PT, Z520PT and Z530P. The power optimized micro-architecture consumes very low power and operates at a wider temperature range. As a result, it creates an even more robust system with fanless configuration. Portwell's PEB-2738 ECX solutions can be employed in far more embedded applications than those of other suppliers. Applications for the new PEB-2738 include military-grade computers, in-vehicle infotainment systems, outdoor computing systems, industrial automation and control applications and many more.

ECX — PEB-2737



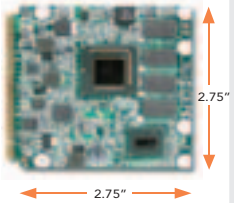
- Intel® Atom™ processor Z510 or Z530
- Intel® ECX form factor
- Dual display (VGA and LVDS)
- Multiple USB ports
- Gigabit Ethernet
- Low power, fanless and small footprint

Nano-ITX — NANO-8044



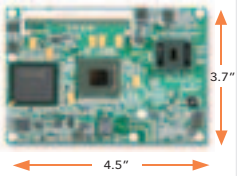
- Intel® Atom™ processor Z510 or Z530
- Dual display (VGA and LVDS)
- Multiple USB ports
- IDE and SD interface for storage
- Gigabit Ethernet
- PCIe x1 for expansion
- Low power, fanless and small footprint

Qseven — PQ7-M100G



- Intel® Atom™ processor Z510 or Z530
- Dual display (LVDS and SDVO)
- Multiple USB ports
- SDIO interface for storage
- Gigabit Ethernet
- PCIe x1 for expansion
- Low power, fanless and ultra compact

COM Express — PCOM-B214VG



- Intel® Atom™ processor N270
- Mobile Intel® 945GSE express chipset & ICH7-M
- Multiple USB ports
- IDE and SATA
- Gigabit Ethernet
- PCIe x1 and PCI for expansion
- Low power, fanless and compact

Portwell's extensive product portfolio includes single-board computers, embedded computers, specialty computer platforms, rackmount computers, communication appliances, and human-machine interfaces.

We provides both off-the-shelf and versatile custom solutions for applications in the medical equipment, factory automation, retail automation, semiconductor equipment, financial automation, mission critical and network security markets.

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Arium is a proud member of the Intel Embedded and Communications Alliance, and for over 15 years has teamed with Intel Corporation to develop in-circuit emulation tools to support the Intel® Pentium® and other processors.

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SUMMER 2009

DEPARTMENTS

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TECHNOLOGY APPLICATIONS

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PRODUCT SHOWCASE

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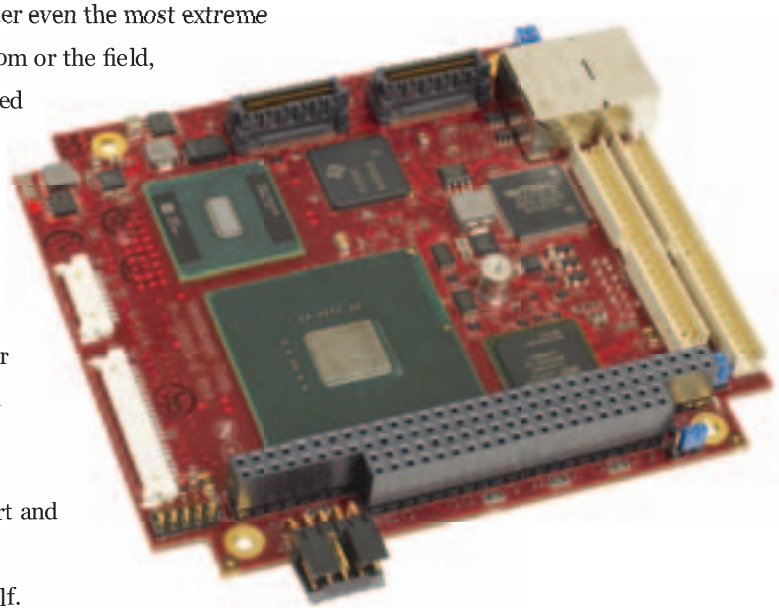

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VERSALOGIC CORPORATION

Power Trumps Time-to-Market as Main Driver

By John Blyler - Editorial Director

Learning about low power design takes a lot of energy. Over the last several months, I've interviewed chip and board companies, IP vendors, EDA suppliers, power organizations, standard bodies and even software development firms.

Each of these groups has a different perspective on the low power problem. Their solutions attest to the range and variety of these perceptions. Yet they also share a common understanding about the changing landscape for electronic products, namely, that power efficiency is now a critical part of the power budget. Let me explain.

In the past, architects would divide up available power – say, battery capacity for a given usage rate – and then allocate a portion of that total power (minus a small reserve) to each block in the chip or board design.

"While Time-to-Market is still important, power efficiency has eclipsed it as the more critical design driver."

However, today's power budgets come with an additional caveat: each block is expected to provide a power efficiency improvement as a way to reduce previous power levels. This mandate for efficiency is needed to offset the diverging rise in feature sets with a lack of improvement in battery technology. (See "Chip Designers Scramble For Low Power Solutions," in the April 15th Low Power Design e-letter.)

This insistence on power efficiency has forced chip block designers to accelerate their collaboration with both board-level designers and software developers (device drivers, RTOS, OS and applications). In turn, board-level developers have accelerated their movement toward power saving smaller form factor (SFF) boards and lower power interface designs.

In the past, Time-to-Market (TTM) considerations have been the big driver for system-level awareness. TTM goals have been the main reason for collaboration between hardware chip-package-board and software design teams. But this has changed. While TTM is still important, power efficiency has eclipsed it as the more critical design driver.

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EMB-9459T

Features

- Onboard Intel® Atom™ Processor N270
- Mobile Intel® 945GSE Express Chpset + Intel® ICH7M
- DDRII 400/533 Memory, Max. 2GB
- Gigabit Ethernet x 2
- CRT, TV-out, 18-bit Dual-channel LVDS, DVI, SDVO
- SATA II x 2, EIDE x 1 & CompactFlash™ Type II x 1
- USB2.0 x 8, COM x 6, Parallel x 1
- PCI x 1, Mini PCI x 1, PCI-E [x1] x 2 in PCI-E [x4] (Through Riser Card)

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Small-Form-Factor News

NEWS

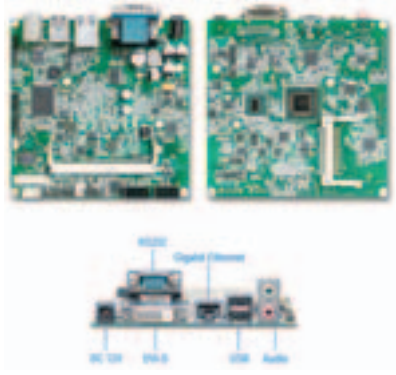
Ultra-Low-Power Fanless System Expands Easily

AXIOMTEK's eBOX639-836-FL fanless embedded box computer system is a cost-effective, application-ready platform targeted at industrial-automation, digital-signage (DSA), industrial-controller, and vehicle applications. It supports the new Intel® Atom™ processor N270 1.6-GHz with a 533-MHz FSB, and the Mobile Intel® 945GSE Express chipset for high performance and low power consumption. One 240-pin DIMM socket supports up to 2 GBytes DDR2 400/533 DRAM for high memory bandwidth. Thanks to the Intel® Graphics Media Accelerator 950, the system stresses 3D performance with maximum video memory to 224 MBytes by sharing the system memory. In addition, it features two PCI slots for expandability.

Without a fan and enclosed in an extremely rugged aluminum housing that's only 182 x 230 x 130.8 mm in size, the eBOX639-836-FL can be wall mounted in a space-limited environment. For convenient assembly, this fanless embedded system adopts a special design featuring easy access to the PCI slots. Customers can install or replace their PCI cards without opening the whole box. Certified with CE, the embedded box PC's fanless design and unique thermal solution support it to operate noiselessly and reliably in critical environments from -10° to +55°C. It offers excellent vibration resistance up to 1 Grms (with HDD).

Low-Power Nano-ITX Boards Welcome New Additions

Building on the success of its NANO-8044, which is based on the low-power Intel® Atom™ processor Z5xx series and Intel® System Controller Hub (Intel® SCH) US15W, American Portwell Technology Inc. announced two additions to this popular platform: NANO-8045 and NANO-8050. At a mere 120 x 120 mm (4.72 x 4.72 in.), the compact NANO-8045 and NANO-8050 measure only 50% of the standard Mini-ITX form factor. They are well suited for a range of low-power systems and handheld mobile devices in applications like medical healthcare, in-vehicle infotainment, mobile kiosk, mobile gaming, digital entertainment, digital signage, and portable POS.

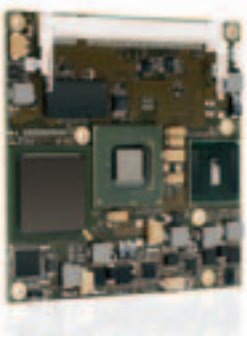


NANO-8045

The NANO-8045 continues to utilize the Intel Atom processors Z510/Z530 and Intel SCH US15W. It is designed to operate at a very low power consumption (less than 10 W at full loading) and low heat. As a result, it can function as a fanless and battery-operated configuration that supports multiple storage devices. The ultra-low-voltage NANO-8050 is a second-generation Nano-ITX board that features the Moble Intel® GS45 Express chipset integrated with a built-in Intel® Graphics Media Accelerator 4500MHD graphic engine to provide excellent 3D graphics performance. It also supports ultra-low voltage Intel® Core™2 Duo and Intel® Celeron™ M processors.

Compact Mini-Devices Offer Powerful Graphic Performance

Kontron's new microETXexpress-DC computer-on-module (COM) offers a host of features coupled with superior graphic performance for the development of mini-devices. The energy-efficient Kontron microETXexpress-DC is equipped with the Intel® Atom™ processor N270 (1.6 GHz) with hyperthreading, Mobile Intel® 945GSE Express chipset, and Intel® I/O Controller Hub 7-M as well as Kontron's new S5 Eco State. With 3D graphic power and a dual independent display support via SVDO, LVDS, VGA, and TV-out, the COM is ideal for a wide range of embedded applications. Such applications include embedded netbooks as well as in-vehicle and solar-operated devices in market segments like medical equipment, test and measurement, maintenance, transportation, HMIs for the energy and automation sector, and kiosk and digital-signage solutions for POS/POI.



kontron-microetxexpress-dc

With its compact dimensions of 95 x 95 mm, the Kontron microETXexpress-DC computer-on-module is the youngest member of the compact COM Express-compatible class. Due to the fact that it is 100% compatible with the type 2 pin-out of the COM Express specification in regards to pin-out and connector positions (for which an official PICMG carrier-board design guide was recently published), it offers design security, scalability, and long-term availability.

-40º to +70ºC Fanless 1GHz Industrial SBC. List Price $595

Applications such as robotics, transportation, pipelines, MIL/COTS, medical, security, machine control, and industrial automation that must work in harsh, demanding environments need WinSystems' EBC-855.

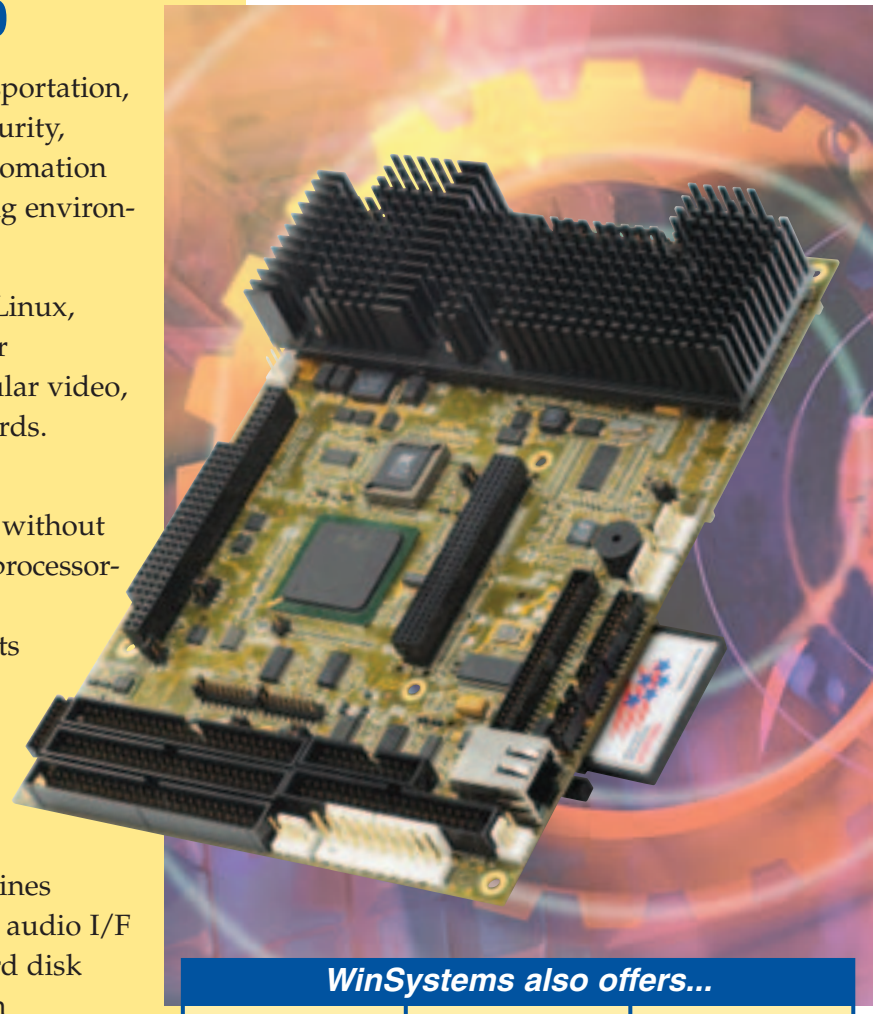
This PC-compatible SBC supports Linux, Windows® XP embedded, and other popular x86 RTOS along with popular video, wired and wireless network standards.

Features include:

- 1GHz Intel® processor-based SBC without fan or 1.8GHz Intel® Pentium® M processor-based SBC with fan
- Intel® Extreme Graphics 2 supports resolutions up to 2048 x 1536
- Custom splash screen on start up
- 10/100 Mbps Intel® Ethernet, four USB 2.0, and four COM ports
- 802.11a/b/g wireless supported
- 48 bi-directional TTL digital I/O lines
- FDC, LPT, KYBD, IDE, and AC97 audio I/F
- Two EIDE ports (ATA100) for hard disk
- Socket for bootable CompactFlash
- PC/104 and PC/104-*Plus* connectors
- +5 volt only operation
- EBX-size: 5.75" x 8.0" (147 mm x 203 mm)
- EPIC form factor, size 4.5" x 6.5", available
- Off-the-shelf delivery
- Long-term product availability

Contact our factory application engineers for additional product information, OEM pricing, and custom configurations.

Ask about our 30-day product evaluation.



WinSystems also offers...

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Half-Size PISA Bus CPU Card Features Intel® Atom™ Processor N270

Taiwan Commate Computer Inc. unveiled the PISA-bus half-size CPU card, the HE-875P, based on the Mobile Intel® 945GSE Express chipset. It supports the Intel® Atom™ processor N270. Implemented in 45-nm technology, the HE-875P is power-optimized and delivers robust performance-per-watt for cost-effective embedded solutions. The board offers all of the required interfaces as well as embedded lifecycle support for the fast and easy development of embedded applications like digital signage, kiosks, POS, thin clients, digital security, residential gateways, industrial control, and applications that must be contained in limited-space control systems.

The HE-875P CPU card consists of the Intel® 82945GSE Graphic Memory Controller Hub and Intel® I/O Controller Hub 7-M. It features a power-efficient, 32-bit 3D graphics core based on the Intel® Graphics Media Accelerator 950 architecture. The board delivers sophisticated graphics for large display applications. With dual independent display support at graphic core speeds to 166 MHz, it provides a wealth of options for high-resolution display.

Boutique 20-W TDP Q-POS Terminal Debuts

AdvanPOS revealed an Intel® Atom™ processor-based POS terminal that appeals to energy-saving and boutique shops. By leveraging the embedded Intel Atom processor Z5xx series (Z510/Z530) and Intel® System Controller Hub US15W chipset, the QP1000-D can run up to 1.6 GHz with a combined total dissipated power (TDP) below 20 W. It features embedded lifecycle support, which makes it ideal for kiosks, point-of-service terminals, and similar retail applications.

Billed as a cost-effective solution with uncompromised quality, the QP1000-D features a distinctively compact footprint and unique eye-catching design with six bright color options. The colorful design blends well with stores and cosmetic shops, which pride themselves on a distinctive ambiance. The stylish QP1000-D is designed to enhance transaction experience and information service with a second customer display option and a pair of quality stereo speakers.

Panel PCs Target Process-Control and Monitoring Applications

AIS PMW10IA3

American Industrial Systems Inc. (AIS) has a new, low-cost 10.1-in. Panel PC featuring the Intel® Atom® processor N270. It features low power consumption, fanless operation, an integrated touchscreen, light-emitting-diode (LED)

Mini-ITX / MicroATX Motherboard based on Intel® Q45 Express chipset

◆ LV-67A

Features :

* DDR3 up to 4.0 GB
* Dual VGA, Dual DVI, HDTV, LVDS
* 2 x Intel® Gigabit LAN
* 6 x SATA with RAID , HD Audio
* 1 x RS232/422/485 , 3 x RS232
* 8 x USB2.0 , PCI and Mini-PCI

◆ P4ELA

Features :

* DDR3 up to 8.0 GB
* 2 x Intel® Gigabit LAN
* 6 x SATA with RAID , HD audio
* 1 x RS232/422/485 , 5 x RS232
* 12 x USB2.0 , LPT , FDD
* PCI-Express X16/X4 , PCI and ISA

◆ Full-size PICMG 1.3 CPU card

FS-A71

Intel® Core™ 2 Duo processor in socket P
Mobile Intel® GME965 Express chipset
DDRII up to 3.0 GB , VGA , LVDS
Optional onboard 1.0 GB DDRII SDRAM
2 x Mini-PCI , Compactflash socket
2 x Intel® Gigabit LAN , USB 2.0 , COM

FS-A70

Intel® Core™ 2 Quad processor
Desktop , 533/800/1066 MHz FSB
Intel® Q965 Express chipset
DDRII up to 3.0 GB , Onboard VGA
LVDS or DVI , 2 x Intel® Gigabit LAN
USB2.0 , RS-232/422/485

◆ Full-size PICMG 1.0 CPU card

FS-97E

Intel® Core™ 2 Duo processor in socket P
Mobile Intel® GM45 Express chipset
DDRII up to 4.0 GB , VGA , LVDS or DVI
Mini-PCI & PCI Express mini card , USB
CF socket , IDE , 2 x Intel® Gigabit LAN
SATA with RAID , HDTV , RS-232/422/485

FS-97D

Intel® Core™ 2 Quad processor
Desktop , 800/1066/1333 MHz FSB
Intel® Q35 Express chipset
DDRII up to 4.0 GB , Onboard VGA
LVDS or DVI , 2 x Intel® Gigabit LAN
USB2.0 , RS-232/422/485

◆ Half-size PISA-bus CPU card

HS-874P

Intel® Core™ 2 Quad processor
Desktop , 800/1066/1333 MHz FSB
Intel® Q35 Express chipset
DDRII up to 2.0 GB , Onboard VGA
LVDS or DVI , 1 x Intel® Gigabit LAN
USB2.0 , RS-232/422/485 , SATA

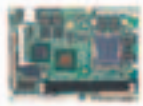
HS-873P

Intel® Core™ 2 Duo processor in socket P
Mobile Intel® GM45 Express chipset
DDR3 up to 4.0 GB , VGA , LVDS or DVI
1 x PCI Express Mini card , 3 x SATA
2 x Intel® Gigabit LAN , USB 2.0 , COM

◆ 5.25" Embedded SBC

LS-573

Intel® Core™ 2 Duo processor in socket P
Mobile Intel® GM45 Express chipset
DDRII up to 4.0 GB , LVDS , DVI , HDTV
6 x Intel® Gigabit LAN , 6 x COM
Mini-PCI , PCI , DC 9 ~ 24V input or ATX P/S



LS-572

Intel® Core™ 2 Quad processor
Desktop , 800/1066/1333 MHz FSB
Intel® Q35 Express chipset
DDRII up to 4.0 GB , Onboard VGA
Dual DVI or LVDS , 2 x Intel® Gigabit LAN
8 x USB2.0 , 6 x RS-232 , SATA with RAID

◆ Mini-ITX Motherboard

LV-67D

Intel® Atom™ Processor N270
Mobile Intel® 945GSE Express Chipset
DDRII up to 2.0 GB , 2 x Intel® Gigabit LAN
VGA , 2 x LVDS or DVI , HDTV , HD audio
USB2.0 , RS-232/422/485 , SATA , CF socket
PCI-Express mini card & Mini-PCI socket , PCI slot

LV-67B

Intel® Core™ 2 Duo processor in socket P
Mobile Intel® GM45 Express chipset
DDR3 up to 4.0 GB , VGA , HDTV , LVDS
2 x Intel® Gigabit LAN , USB 2.0 , COM , SD
PCI-Express X16 , Mini-PCI and Mini card
DC 9V ~ 24V input or ATX P/S

◆ 3.5" Embedded SBC

LE-374

Intel® Atom™ Processor N270
Mobile Intel® 945GSE Express Chipset
DDRII up to 2.0 GB , Intel® Gigabit LAN
VGA , 18/24-bit LVDS , DVI , HDTV
USB2.0 , RS-232/422/485 , Mini-PCI
DC 9V ~ 24V full range input

LS-373

Intel® Core™ 2 Duo processor in socket P
Mobile Intel® GM45 Express chipset
DDR3 up to 2.0 GB , VGA , HDTV , LVDS
Mini-PCI , PCI Express Mini card socket
2 x Intel® Giga LAN , USB 2.0 , COM , Audio

COMMELL

Taiwan Commate Computer Inc. (COMMELL) / 8F, No. 94, Sec. 1, Shin Tai Wu Rd., Hsin Chin, Taipei Hsien, Taiwan

Tel: +886-2-26963909 Fax: +886-2-26963911 / Email: info@commell.com.tw Web: www.commell.com.tw

backlight, and IP54 dust/water protection. This Industrial Panel PC solution is well suited for automation control, HMI, testing equipment, process monitoring, kiosks, and digital signage.

The unit is encased in a steel and aluminum chassis to protect the components from harsh industrial environments including shock/vibration, dust, water, wide temperatures, and excessive use. Custom OSD buttons are mounted on the front bezel for quick and easy brightness adjustments to cater to the environment. Standard VESA mounts or mounting clips are available for easy mounting to any fixture. A commercial-off-the-shelf (COTS) 10.1-in. LED backlight unit is currently available with 8.4-in. and 15-in. models coming soon.

In-Vehicle Box IPC Is Ultra-Compact

ARK-1388

Advantech now offers an ultra-compact, in-vehicle box IPC. The ARK-1388 fanless embedded box IPC focuses on in-vehicle computing systems, which are frequently required to perform under very stringent power requirements. These include load-dump, cold-crank, very low power consumption at light loads, and low-noise operation. Additionally, these solutions are generally required to be very compact and thermally efficient.

The dimensions of the ARK-1388 are 18.9 (W) x 6.38 (H) x 13.1 (D) cm. It weighs only 1.9 kg. The ARK-1388 delivers strong computing and multimedia performance with the ultra-low voltage Intel® Core™2 Duo processor U7500 1.06-GHz or Intel® Celeron® M processor 1.06-GHz processor with the Mobile Intel® 945GME chipset. Thanks to its efficient thermal design, the operating temperatures run from -20° to +60°C. The IPC supports a rich I/O interface including four serial ports, LVDS and VGA dual independent display, 4x USBs, 1x LAN, DIO with isolation and relay function, and an amplified audio line-out plus safe boot and shutdown functions.

CAN Controller Replacements Are Available

Innovasic Semiconductor announced that production units are shipping for the IA82527, which is a form, fit, and function replacement for the original Intel® 82527 Serial Communications Controller. The Innovasic replacement supports the same CAN 2.0 Specification (Part A and B) as the original device including standard and extended message frames. In addition, it has the capability to transmit, receive, and perform message filtering on standard and extended message frames. The IA82527 is available in 44-lead PLCC and 44-lead PQFP RoHS-compliant packages for the automotive temperature range (-40° to +125°C).

Intel® Atom™ Processor Support Based on Moblin Open-Source Project

MontaVista Software Inc. announced MontaVista Linux 6, a new approach to embedded Linux development. By delivering Market Specific Distributions (MSDs) based on the Moblin project and designed specifically for the Intel® Atom™ processor, MontaVista plans to give commercial-device developers unparalleled flexibility to design and deliver products that are uniquely tailored to their target markets.

MSDs are new Linux distributions that are built on a common framework. They are optimized for the Intel Atom processor and its target market segment. An MSD is designed to support the full breadth of functionality provided by the Intel Atom processor, be feature compatible with the Moblin open-source project technology, and provide the value-add features and quality for which MontaVista is known. Fully supported by MontaVista, the MSDs for the Intel Atom processor may be customized and optimized for target applications like vehicle infotainment, print imaging, IP media phones, or gaming markets—to name a few. As a result, they allow developers to easily create a tailored software distribution that fully exploits the Intel Atom processor-based platforms.

Switching Power Supply Serves Telecommunications

Emerson Network Power introduced its NLP250-DC high-density, open-frame switching power supply for the telecommunications and distributed-power markets. The NLP250-DC power supply features a compact 4-x-7-in. footprint, which is identical to AC models to facilitate a drop-in alternative for OEMs. It offers a low-profile component height of 1.5 in. to support a variety of 1U telecom applications. The NLP250-DC utilizes an open-frame, U-Channel form factor to optimize airflow and enable maximum thermal performance. Additional standard features include integrated control and monitoring capabilities, a 12 V at 1.5 A fan output, and a 5 V at 1 A standby output that remains active when the power supply's main output is inhibited.

Sit Back and Watch the Fireworks

The next competitive battleground will be integrated hardware and software solutions.

By Ed Sperling, Contributing Editor

Intel's acquisition of Wind River and Oracle's acquisition of Sun are based on the same tectonic shift about where the value—or at least the perceived value—will be in the future.

The fact that Oracle and Intel could well become competitors speaks to some of this change. Oracle will be able to couple its enterprise applications much more tightly with the hardware, a tack it has taken in the past with a database it has bundled with HP hardware. By streamlining some of the general operating system or middleware that links an application to the hardware and running certain functions much more directly to the processor, speed can be increased enormously and the energy used to do that can be slashed.

Intel, meanwhile, can balance the hardware with a real-time operating system to build in better performance for certain functions—again outside the general operating system or middleware layer—while also reducing the energy it takes to perform those functions. Some cores on its chip may only have to perform certain functions occasionally, allowing them to remain in a sleep or deep sleep state, while others may be used much more intensively.

For both companies, having access to the other half of the design or programming equation, is an enormous competitive benefit over traditional competitors. The value in software will no longer just be measured by what it can do, but how well it is integrated with the hardware. And the value in hardware will be how well it can be customized to run the software.

Intel's immediate competition will be in processor world, where it has been trying to significantly cut the power consumption of the Intel® Atom™ processor to gain a toehold in the embedded market, as well as slice off any advantage that AMD might ever have in performance or power savings in the traditional computing market. That gives Intel some leverage to cut prices, boost performance and make programming much easier in the Intel Atom processor world, while it leaves AMD with a single weapon: price.

Oracle's approach is much the same. If it can make its applications run far more efficiently and more quickly than its competition in the enterprise, then it sells a packaged solution that's hard to combat with a separate hardware platform running an Oracle database or enterprise application such as Oracle Financials.

"And at that point, we could witness a whole new set of fireworks between two of the most aggressive companies the tech world has ever seen."

But Oracle also could well push down into the small and midsize business arena with this strategy, while Intel could push upward into the same market with its own servers running tightly couple applications. And at that point, we could witness a whole new set of fireworks between two of the most aggressive companies the tech world has ever seen.

Ed Sperling is Contributing Editor for Embedded Intel® Solutions and the Editor-in-Chief of the "System Level Design" portal. Ed has received numerous awards for technical journalism.

Upgrading the 100-Year-old Grid, One Standard at a Time

By Brian Fuller, Contributing Editor

The nation's power grid hasn't been upgraded in a century, but suddenly there's a sense of urgency.

In high-profile meetings from Washington to Santa Clara in the past two months, industry executives, scientists, engineers and government officials have ratcheted up the dialogue about modernizing how energy is generated, distributed and used. The movement, helped by an expected $4.5 billion in government stimulus money, has its roots in the national concern over fossil fuel resources and heightened focus on energy efficiency.

"They've moved really fast throughout the month of April and May," says Lucian Ion, strategic marketing manager for smart grid and energy technology solutions at National Semiconductor. "There's a tremendous amount of work that's public already from substation generation to customer's home."

> ""When it comes to running things on the Internet, things can be hacked..."

The ideal vision, shared by many, is a truly energy-efficient system in which home appliances talk wirelessly to a device that lets consumers understand their power usage and control their consumption; in which utilities talk to homes to manage energy loads at times of peak demand, and in which utilities better manage the distribution of new, "bursty" modes of power generation such as solar and wind.

Two things make electricity unique and a challenge for smart grid: Lack of flow control and electricity storage requirements

"Change either of these and the grid delivery system will be transformed," says Dick DeBlasio, chairman of the IEEE SCC21 Group, which oversees the P2030 Smart Grid standardization effort.

Updating a system that has worked well and consistently and remained essentially unchanged for 100 years would appear a daunting, time-consuming task, but participants are taking their cue from the Internet, another complex technology infrastructure that has grown and evolved with a focus on standards.

"The Internet was built on open standards ranging from communications and software protocols to standard microprocessors and memory," says Adrian Tuck, CEO of Tendril, a provider of residential energy ecosystem technology and a ZigBee Alliance vice chair. "So too it can be with the smart grid."

The focus on standardization is already yielding benefits. Shortly after a smart grid standards workshop April 28-29, Energy Secretary Steven Chu and Commerce Secretary Gary Locke hosted a Washington meeting with the National Institute of Standards and Technology (NIST) [http://www.nist.gov/smartgrid/standards.html] and announced 16 standards that are essentially locked down—no debate necessary.

These include:

- ANSI C12.19/MC1219-Revenue metering information model
- DNP 3-Substation and feeder device automation
- IEC 61850-Substation automation and protection
- IEEE 1686-2007-Security for intelligent electronic devices
- Open HAN-home area network device communication
- ZigBee/Home Plug Smart Energy Profile-Home area device communications.

The second big meeting Intel hosted at its Santa Clara headquarters June 3-5. Closed to the media, it was a forum for government organizations and groups such as NIST and the IEEE to begin to lay the foundations for near-term standardization work.

The goal was, among other things, to stimulate the development of a body of IEEE 2030 smart grid standards and or revise current standards applicable to smart grid body of standards.

"Our goal coming into the meeting was to get the process started and people together and in active dialogue,"

says Lorie Wigle, general manager of Intel's Eco-Technology program. [*http://www.intel.com/technology/eco-technology/openenergy.htm*]

Intel's interest is largely based in the fact that its core industry, information technology, accounts for 2% of global energy use.

"There was a really good outcome in the willingness and desire for the companies to continue to talk between meetings to make forward progress," she adds.

At the conclusion of the meeting, three task forces were formed to tackle the next stage of standards work: Task Force 1 (Power Engineering Technology), Task Force 2 (Information Technology) and Task Force 3 (Communications Technology).

The near-term roadmap, according to NIST's George W. Arnold, includes the initial phase between now and September in which existing consensus standards (including the 16 identified) are recognized; the establishment between now and 2010 of a public-private standards panel to provide recommendations for new and revised standards to be recognized by NIST; and testing and certification later in 2010.

While there are many existing standards and emerging technologies to work with, there are many unresolved issues.

Gaps in some of the standards—notably IEEE power engineering specs—need to be filled, according to Arnold. These include IEEE 1547 (physical and electrical interconnections between utility and distributed generation), IEEE 1588 (precision clock synchronization) and IEEE C37 (standard electrical power system device function, originally published in 1928).

The third task force's work (communications) may be more challenging, according to Arnold, who described the communications infrastructure for the smart grid as "the Wild West."

While most of mac/phy layer standards are IEEE's, guidance will be needed on their application to the smart grid, and additional standards may be needed as well, Arnold says.

Within the home, ZigBee seems to have emerged as the leading wireless communications factor, although powerline and other approaches haven't been dismissed.

The interface between the home and the utility, though, may or may not emerge as a point of contention. While it's generally up to individual utilities to choose their communications backhaul (since they own that customer relationship), there are a number of competing ways to update the technology, according to National's Ion. These include looking at cellular, WiMax or hybrid mesh/wired configurations—even FM radio, he adds.

"There isn't a clear standard from how you get it from the home. That's more of an issue of a biz model of how each utility is able to secure a backhaul spot," Ion says.

In addition, engineers and industry leaders will be examining how to handle emerging technologies that will add load to the grid—plug-in electric vehicles, for example, that charge in a garage overnight. That requires coordination among a number of standards bodies (see chart).

Standard	Application
AMI-SEC System Security Requirements	Advanced metering infrastructure (AMI) and Smart Grid end-to-end security
ANSI C12.19/MC1219	Revenue metering information model
BACnet ANSI ASHRAE 135-2008/ISO 16484-5	Building automation
DNP3	Substation and feeder device automation
IEC 60870-6 / TASE.2	Inter-control center communications
IEC 61850	Substation automation and protection
IEC 61968/61970	Application level energy management system interfaces
IEC 62351 Parts 1-8	Information security for power system control operations
IEEE C37.118	Phasor measurement unit (PMU)communications
IEEE 1547	Physical and electrical interconnections between utility and distributed generation (DG)
IEEE 1686-2007	Security for intelligent electronic devices (IEDs)
NERC CIP 002-009	Cyber security standards for the bulk power system
..NIST Special Publication (SP) 800-53, NIST SP 800-82	Cyber security standards and guidelines for federal information systems, including those for the bulk power system
Open Automated Demand Response (Open ADR)	Price responsive and direct load control
OpenHAN	Home Area Network device communication, measurement, and control
ZigBee/HomePlug Smart Energy Profile	Home Area Network (HAN) Device Communications and Information Model

Security throughout the smart grid will remain a constant as the standardization process evolves. "When it comes to running things on the Internet, things can be hacked," Ion says. "What regulators, independent system operators and utilities are trying to make sure is that things are mission-critical."

Brian Fuller, former editor-in-chief of EETimes, has been a journalist for a quarter century. He spent 15 years of that at EETimes, where he was a well-known writer, speaker and moderator on the global electronics industry. He has written thousands of articles about technology.

More Small Form Factors Are Delivered off the Shelf

MARKET WATCH

By Ellen Konieczny

The standardization of technologies has led to the increased commoditization of small form factors. Adding to this trend is the widespread adoption of embedded PC technology as the processing engine of choice. These changes have pushed more companies toward "one-size-fits-many" solutions. At the same time, there has been a corresponding increase in rugged applications. When coupled with the cost-cutting measures of a bad economy, these trends have driven small-form-factor board or system manufacturers to provide more off-the-shelf products and leave the differentiation to their customers.

Probably the most common ruggedized element of newer small form factors is their extended temperature range. Some applications simply offer an increased thermal range from -20° to +70°C, which goes beyond what typical commercial products would be able to support. ADLINK Technology's CTO, Jeff Munch, notes that this "middle ground" is becoming more popular and not as difficult or expensive as extreme rugged.

More extreme temperature ranges may be on the horizon, however. According to Jonathan Luse, director of marketing for the Low Power Embedded Products Division, Intel® Embedded and Communications Group, "Even before we had an extended-temperature version of our first Intel® Atom™ processor, we had seen extended-temperature boards available for sale. What people were doing was finding creative ways to extend the temperature at the system level. We just launched the Menlo XL package a few months ago and extended the range of the silicon from -40° to +85°C. As past history has shown, the integrators—the people who take that silicon—might actually be able to extend the range of their own extended-temperature product at the system level by doing the same creative things that they did with the normal-temperature-range product last year."

The higher temperature range of -40° to +85°C is usually the target of military-grade products. As off-the-shelf small form factors are increasingly being used in military systems, defense customers are innovating ways to house and protect them. According to Nigel Forrester, marketing manager with Emerson Network Power's Embedded Computing business, "If you look at a small motherboard, it's quite rigid. But in a battlefield scenario where the board sustains some very high shock loading, things do start to bend." A variety of approaches exist to screw down or restrain different parts. Whether they are screwed in, bolted down, or locked, the key is that the products are restrained in some manner so that they cannot pop out in a highly rugged environment (see Figure 1).

Figure 1: The MicroTCA and AdvancedMC products have been packaged into a specially designed Air Transport Rack (ATR) from Hybricon and demonstrated in various extreme environments, such as filming itself on the back of a military "gama goat" vehicle bouncing around the Arizona desert.

The rise in rugged small form factors also is being seen in the industrial, alternative energy, and even commercial markets. Many are crediting processing developments for this growth. Lower-power processors like the Intel Atom processor don't generate a great deal of heat. As a result, there's no need to dissipate that heat somewhere else. It's also easier to use such processors at extended temperatures. "Because Intel Atom processors are is smaller and lower in power consumption than most of the other Intel® silicon solutions," Forrester adds, "there's a trend to put these processors on smaller and smaller boards."

For example, American Portwell Technology Inc. recently debuted the 120-x-120-mm NANO-8045 and NANO-8050 boards, which measure 50 percent of the standard Mini-ITX form factor. The NANO-8045, which targets low-power systems and handheld mobile devices, was designed to consume less than 10 W at full loading. It can therefore be a fanless and battery-operated configuration that supports multiple storage devices. With its onboard DC input adapter, the NANO-8045 vows to reduce the size of the overall system without the need for an internal DC adapter board.

Smaller-form-factor, low-power devices like handhelds also inspired a collaboration between ADLINK Technology, Kontron, Advantech, and AAEON, which led to the release of the nanoETXexpress 1.0 specification. This 84-x-55-mm computer-on-module (COM) form factor, which was originally initiated by Kontron, now includes SDVO support (see Figure 2). Regarding this announcement, ADLINK's Jeff Munch points out, "One byproduct of the nano trend is the removal of one of the connectors that's typically used in these COMs. When you're looking at high-end processors, whether you have one or two interconnects on your board doesn't really matter. But as you start looking at these really low-cost Intel Atom processor-based products, all of a sudden the price of that connector becomes important. It's another way of helping to reduce the cost because you have less material because of the smaller form factor and you've removed one of the interconnects."

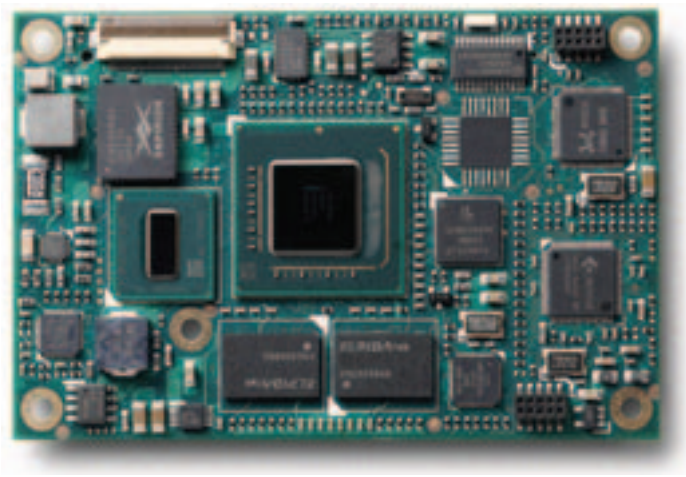


Figure 2: The NanoX-ML was spawned out of efforts to support the small COM form factor dubbed nanoETXexpress.

Jeff Acampora, VP of sales and marketing at Arium, notes that smaller-form-factor evolution also will be driven by system-on-a-chip (SoC) integration. This past January, Intel announced the successful integration of video technology onto an x86 chip dubbed the Intel® Media Processor CE 3100. Although this SoC has not yet enabled very small form factors, such high levels of integration are bound to drive that evolution. According to Acampora, "Arium has been involved with companies that are using the CE 3100 for high-speed video-processing applications or audio-visual processing applications, which are highly integrated and really taking a quantum leap in that particular area. They're using our ECM-XDP3 Intel JTAG debugger to develop the software (usually Linux) running on those embedded systems."

"And with staffs in many industries limited, there's no doubt that laypeople may take on work that previously fell to the engineer..."

From rugged military to portable applications, customers are increasingly leveraging off-the-shelf solutions to speed their development process while lowering costs. For the longer-lifetime military applications, using standard off-the-shelf products also translates into having the ability to swap out a standard processor module or other part in another four or five years that is exactly the same—same size format and pinout. Forrester notes, "If it's Intel compatible, your software should work on it in exactly the same way. This gives people a nice warm feeling because when a device goes obsolete, they can more easily execute a swap-out at the module level."

With the availability of standardized small form factors and the average person's comfort with a PC, there also is a trend toward small form factors being implemented by non-engineers. According to Bob Burckle, vice president of WinSystems, "Instead of having to hire the engineer with degrees to do both hardware and software design, a biologist, chemist, physicist, or fill-in-the-blank can take an off-the-shelf, small-form-factor single-board computer knowing that, 'hey, it's just a PC' and make it integrate and work well with their particular application."

With the world's current economic woes, the use of standard off-the-shelf products will only grow. And with staffs in many industries limited, there's no doubt that laypeople may take on work that previously fell to the engineer. Going forward, small-form-factor companies will focus on what they do best by providing standard products. At the same time, their customers will do what they do best by adding differentiating touches to their final products.

Ellen Konieczny is a freelance writer who has extensive experience creating manuals and other technical documents for companies. She can be reached at ellen.konieczny@gmail.com.

New Standards Divide Interfaces and Form Factors

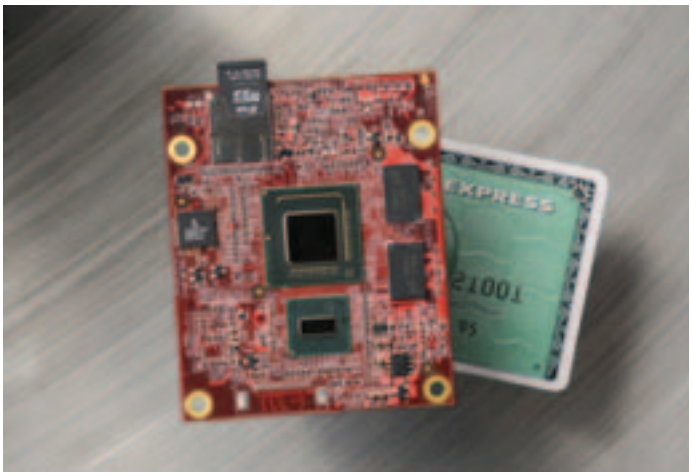
STANDARDS WATCH

By Ellen Konieczny

Compared to the legacy standards bodies in the embedded space, the Small Form Factor Special Interest Group (SFF-SIG) is practically a newborn. It takes a correspondingly fresh approach by creating board-to-board interconnect standards without specifying a board form factor. With the proliferation of bus technologies, the SIG realized that numerous central-processing-unit (CPU) form factors could offer identical expansion interfaces. Such an approach is welcome in the "smaller is better" culture that dominates most of today's embedded market. Yet it also raises questions about the impact that such a change will have on designers and integrators and the embedded market in general.

The SFF-SIG (www.sff-sig.org) published three standards documents in its first year, although the second and third standards leverage the work done for the first standard—Stackable Unified Module Interface Technology (SUMIT). SUMIT has garnered a lot of attention because multiple buses appear on either one or two connectors. As a result, a designer can build a one-connector or two-connector system. Although this effort was largely driven by PCI Express, there's also LPC for legacy-type systems for products that were originally done for the ISA bus as well as USB. There are four USB interfaces on this connector system as well as SPI and I2C.

Computer On Module Interface Technology (COMIT) takes many of the same ground rules used in SUMIT, but puts them onto a single connector for a COM interface. Bob Burckle, WinSystems' (www.winsystems.com) vice president, explains that COMIT targets a standard small processor module that will fit within the footprint of the industry-standard, embedded-systems form-factor boards. This high-speed connector system supports the most common serial I/O and legacy interfaces available from modern, low-power chipsets as designed by Intel with its Intel® Atom™ processor. WinSystems has developed a technology demonstrator board as a COMIT proof-of-concept (see the Figure).



This technology demonstrator board, which measures 62 x 75 mm, was designed to address the need for a COM that could be used as the processing engine for standard board formats like EBX, EPIC, and Intel® Embedded Compact Extended Form Factor (Intel® ECX).

The SIG's third standard, MiniBlade, is a replaceable, rugged, latchable interface. The postage-stamp-size MiniBlade modules plug into either vertical or horizontal connectors and latch for systems with a lot of shock and vibration requirements. Yet a repair technician also can pull apart the latches and quickly remove the modules. The MiniBlade interfaces include PCI Express and USB 2.0 (although enough signals are provided for USB 3.0). Standard mass-storage interfaces like SATA, MMC, SD, and more are included so that devices that are meant to plug into a MiniBlade socket can pick up one or more of these.

According to SFF-SIG president, Paul Rosenfeld, "We're separating the concept of interface from the concept of form factor because they're really not related. You can put the SUMIT interface on any size board that you choose as long as it's not too small. With PC/104, you have to deal with all of these specifications: EBX, EPIC, PC/104, PC/104-Plus, PCI-104, and now there's PC/104 Express. All these standards have buses and form factors tied together. We can do this much more simply because we separate interconnect stan-

dards from form-factor standards. Our Industry Standard Module (ISM) and Pico-ITXe form-factor specifications will soon be released. The SUMIT Interconnect standard can go on these and other form factors. And these form factors can use other interfaces as well. So instead of the number of standards being A (A = number of form factors) x B (B = number of interfaces), you end up with A + B. Down the road, you end up with a whole lot less work to do every time something changes."

"The point, of course, is that form factors tend to live a very long time. But interfaces change very quickly..."

The point, of course, is that form factors tend to live a very long time. But interfaces change very quickly. For designers and integrators, this separation should make life easier. An advantage is that the mechanical structure that was built around the form factor won't have to change when the bus changes. Similarly, the infrastructure around the interface won't have to change for a new form factor. Yet the industry will have to adapt to providing more specific information.

When a product is specified, the form factor, interface, and bus will now need to be listed on the datasheet. Currently, for example, what is designated a PCI-104 card is actually a PC/104 form factor with a PCI-104 connector. Rosenfeld provides a real-world example with ACCES I/O's new Pico line of I/O modules: "ACCES I/O has a Pico-I/O board that only uses the USB interface. So to be very clear, the datasheet needs to say: 'I have a Pico-I/O board with SUMIT A (or B or AB) interface that only uses the USB signals.'"

The companies that need to manufacture smaller products are expected to benefit the most from the SFF-SIG standards. In many application areas, the standards' small size will allow designers to put intelligence in new places. Regarding MiniBlade, for example, Rosenfeld states, "CPUs can support one or more of the interfaces on a MiniBlade socket. The result can be support for a SATA, SD, or MMC device or even a PCI Express device, which means supporting I/O in addition to mass storage. This would enable support for I/O such as wireless module, Bluetooth, GPS, or any I/O that would fit on a very tiny module."

The SIG also is working to deliver more power. The second release of the SUMIT specification brings the number of USB ports to four. Previously, SUMIT supported one or two x1 PCI Express lanes and one x4 lane. The new release, which was published this past March, allows the x4 lane to be split into four x1 lanes. Hence, if many x1 lanes are needed, a designer can actually build a SUMIT system with six.

Given the SFF-SIG's ability to cohesively bring together 20 competitive companies in a working-group style, it's not surprising that its efforts extend past form-factor, bus, and interconnect standards. The SFF-SIG also is planning to work on additional aspects that make up a small system, such as thermal solutions, display standards, or enclosure standards. Since the SFF-SIG began operation in April 2008, over a dozen products have been released. As Rosenfeld puts it, "People are moving on this technology." Given the strengths of these solutions, the adoption of these standards should only increase going forward.

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SLD COMMUNITY

sldcommunity.com

INTEL'S DELICATE BALANCING ACT

By Ed Sperling

Intel is beginning what appears to be a concerted march into new markets.

Toward the end of June'09, the waiting period ended under the Hart-Scott-Rodino Antitrust Improvements Act, which is basically like a waiting period for a marriage license. With Wind River in hand in an all-cash deal, Intel arguably will have more buttons to turn and more parametric fiddling opportunities than any other processor maker.

The purchase of Wind River enables Intel to develop customized software for individual cores, a step that could dramatically lower the power consumption of chips such as the Atom processor, or to improve performance with hardware accelerators ...

To read the complete article, please visit: http://chipdesignmag.com/sld/blog/2009/06/25/intel%E2%80%99s-delicate-balancing-act/

Why "Sustainable" and "Green" are Meaningless Terms to Designers

GREEN WATCH

By John Blyler, Editor-in-Chief

If you ask most engineers about green or sustainable electronics design, they'll shrug their shoulders and say, "So what?" If you ask those same engineers about low power design, they'll lean their shoulders forward and say, "Continue." And if you ask their managers, the response will be, "You mean system-level design, don't you?"

These professionals are not being callous in their indifference toward ecological design issues. Rather, they're responses are testament to the complexity with which they work every day. Chip and board designers realize that they only have time and mental resources to focus on those requirements that directly impact their designs. Ecological constraints do impact their work, but only under the guise of an ever shrinking power budget. For their managers – who must allocate the power and performance budgets in the first place – the ecological impacts are manifest in system level architectural trade-offs.

Part of the problem is that today's eco-sensitive terms are fairly new, or are being applied in a different context. For example, it used to be fashionable to talk about "green" electronics? Now, the preferred term by many companies and universities is sustainable electronic design. This is not just a study in semantics. Many people use eco, green and sustainability as interchangeable terms that mean roughly the same thing. But do they?

Eco or green design refers to the development of products, buildings or services that are sensitive to environmental issues. The key goal in successful green designs is achieving greater efficiency and effectiveness in terms of energy and usage of materials. For chip and board designers, this translates directly into low power – both hardware and software – which in turn requires a systems designer perspective.

Sustainable electronic design refers to process that spans the entire life cycle of a product. In truth, design is a misnomer, since it suggests just one portion of the complete product life cycle. For this reason, I should replace "design" with "development." But for the sake of continuity, I'll stay with the more common vernacular of "design."

The aim of sustainable design is to balance economic, social, and ecological sustainability. Traditionally, the multidiscipline engineering community has focused on the first and last aspects of this definition, namely economic and ecological effects on product design. In the past, economics has always ruled. Today, the same is true – economics rule, but with this difference. Ecological impacts have gained a more clear economic cost thanks to end-of-life disposal costs, public perceptions, etc., which means that sustainability must now be considered as an additional constraint on the solution option space for product design.

Consider the example of alternative energy technology. Energy creation and storage is perhaps the most important aspect of sustainability for chip and board designers. But renewable and alternative energy systems must meet economic realities. If a design can be accomplished using current generation and storage technology, then there is little reason for a designer to look for alternative solutions – e.g., solar, energy scavengers, etc. Little reason until one considers the entire product life cycle cost. This is where sustainability is changing the equation. More legislative laws are requiring manufacturers to pay for end-of-life disposal. These laws bring the end-of-life costs directly to the forefront of the design cycle. You might call this a Design-for-Sustainability (DFS) methodology.

Regardless of the names, adding the cost of eventual disposal increase the front-end costs of the product, which give may give alternative energy sources a boost if they can provide the required energy and future disposal costs in line with current technologies.

What does this mean to designers? They must add a new set of trade-off analysis at the architectural level of the design process that examines the use of alternative energy and end-of-live disposal costs in the design. For this to occur, engineers must have a great understanding of the impact of these affects.

Are you a designer wrestling with the additional constraints of sustainable and/or green design? Let us know which low power or system-level technical issues give you the most problems and will engage the community to find a solution.

Picking the Right Form Factor

Just because there's more real estate and functions embedded into chips doesn't mean it's any easier to design a device.

By Ed Sperling

Choosing the right form factor has always been a challenge. Think back to 1982, when Adam Osborne introduced the first mass-produced portable computer—the 24.5-lb. Osborne 1. Ever since then, companies have struggled to get the size of the device small enough to make it easily portable, large enough to contain a full-size keyboard, or light enough to make it easy to transport. The shrinking of components—particularly semiconductors—has only expanded the possibilities. Each new process node has created more real estate on a piece of silicon as components and line widths shrink. This trend has made it possible for more functions to be added onto the same chip rather than different chips or chipsets. What was once a cell phone is now also a camera, music player, and text-messaging device.

In places like Japan and Korea, where high bandwidth is available for a workforce that heavily relies on mass transit, the cell phone also contains a portable television. Over the next couple of years, it will most likely contain a Global Positioning System (GPS) as well. For those who still need a keyboard, netbooks and other scaled-down computers have begun hitting the market at remarkably low prices. In the near future, there will be more touchscreen versions of these devices.

What has changed at the most fundamental level is that form factor is no longer limited just by the size or shape of the components. Many of the components are now embedded into other components. Or they are so small as to be almost inconsequential to the overall physical design of a device. Instead, the limiting factors are becoming less visible—and sometimes much more difficult to manage.

Functions Up, Power Down

At the architectural level, one of the most pressing issues that engineers have to wrestle with is the power budget. Even with plug-in devices, there's a big push to reduce power when a device or portion of a device is not in use. Given the choice between a product that draws lower power and one that offers better performance, many consumers and businesses now choose the lower-power option.

This preference is even more apparent in mobile devices. No one wants a full-function device that won't last through the day without a recharge. And that means one charge per day regardless of how many functions are actually used. Given the snail's-pace progress in battery technology, however, getting power usage low enough has created some interesting tradeoffs.

One solution is to add more function-specific heterogeneous cores to a device rather than expanding with homogeneous cores. A second is to add more embedded microcontrollers into a single chip to accomplish roughly the same thing. Dominic Pajak, product manager for ARM's new M0 microcontroller, says that there are multiple microcontrollers being added into single chips to allow various form factors to use very low power and put them into deep sleep when they're not in use.

"At the 180-nm process, leakage is as little as 47 microamps on active power and it requires just 50 nanoamps for state retention," Pajak states. "These devices are active for very small periods of time, so the average current consumption is very low. What we also find is that average power consumption is lower for a 32-bit operation than an 8-bit multicycle operation because a 32-bit microcontroller can do more in one cycle." On smart utility meters, for example, a 32-bit microcontroller uses half the cycles of a 16-bit microcontroller. And in a touchscreen, an 8-bit microcontroller cannot handle the complexity required for high resolution and a large screen.

Market Reach

It's precisely this blend of complexity and low power that became the next battleground for most of the major chip companies—all of which have a stake in the high end of the microcontroller world. Intel has targeted this market as a huge opportunity for its Intel® Atom™ processor. "The microcontroller space is 1 to 2 W for the total platform," states Jonathan Luse, director of marketing for Intel's low-power Embedded Products Division. "What's interesting is a lot of those types of applications are purpose driven, so they may not have flexibility in their software stack. There's a big separation in this space. Some applications are connected in intelligence while there are some relatively static machines in the embedded world."

Although the Intel Atom processor currently runs at 2 W, Luse says there's room to drive down the power. "There are things we can do at the silicon level to strip out milliwatts. But one thing you have to consider is that if your platform is running at a low power level, you pay penalties at the board level." Intel is betting big that the versatility of the Intel® architecture software stack will allow Intel Atom processor to be more versatile than microcontrollers in everything from medical supersuits—basically a scaled-down Iron Man-type of approach for injured patients—to wearable PCs for the military, automobiles, and even handheld devices.

Moving Up The Bar

Just because there's more room on a chip doesn't necessarily mean that there's more room on the board or in the overall design. Doug Sandy, senior staff technologist at Emerson Network Power, emphasizes that adding performance—often with hardware accelerators in systems-on-a-chip—is now a prerequisite to winning contracts. With that comes a linear increase in memory density, which is increasing far faster than it is shrinking. "Memory density does not follow Moore's Law," he says. "You can scale linearly for performance. But for small form factors, that creates a challenge. You want to get as much memory as possible, but you can't increase memory density beyond a certain point."

A second challenge is that as more real estate becomes available at each node, the processor currently in use may not be too large or too powerful at the next process node. Just because you use a semiconductor at 65 nm doesn't mean it's the optimal processor for the same application when it's manufactured using a 45-nm process. Finding a replacement isn't always so simple.

Nor does one design work in all markets. In some markets, such as the medical field, many designs have to span a decade to recoup a reasonable return on investment because volumes are relatively low. "There's always a question of how small it needs to be," says Christine Van De Graaf, product manager for the Embedded Modules Division of Kontron. "But we also have to ask how much customization it needs. Are there special connectors that are needed or can it fit into a docking station where you can use pins rather than specialized connectors? There's a lot of special stuff that is application-specific. And when you look at it from the printed-circuit-board (PCB) level, it's even more complex."

Finally, there's a question of just how portable the software will be from one version to another. Art Swift, vice president of marketing at MIPS, points out that the big challenge in many cases is moving content from one platform to the next. "It's all about leveraging the installed base," he says.

The bottom line: Just because it's possible to shrink components doesn't mean it makes building a device any easier. The constraints on physical form factors at the macro level have given way to constraints, challenges, and rising complexity at the micro level. And those challenges will only get worse as components continue to shrink.

Ed Sperling is Contributing Editor for Embedded Intel® Solutions and the Editor-in-Chief of the "System Level Design" portal. Ed has received numerous awards for technical journalism.

BLOG

Multicore in the Age of the Unthinkable

Domeika's Dilemma, By Max Domeika

Recently, I had the opportunity to read and finish in one weekend, 'The Age of the Unthinkable', by Joshua Cooper Ramo. My attempt at a quick summary:

"In the past, world affairs was driven by nation-states and the smaller number of players at this level of granularity mixed with less communication (both frequency and volume) made it possible to strategize, control, and influence this system. However today, with the volume of change and amount of communication between orders of magnitude more people, this sort of nation-state actor strategy is insufficient and leads to unpredictable and oftentimes the opposite of expected results, e.g. actions to counter terrorism leads to an increase in terrorism. Ramo posits that to counteract the negative forces in the world requires a strategy that is immune system-like in its response, a creative and multi-pronged approach."

As a computer scientist, I understood the concept of a world too complicated to predict outcomes. Most computer scientists are exposed to Conway's Game of Life ...

To read the complete post, please visit: http://www.chipdesignmag.com/domeika/

It's All About Integration

By Xiaodan Wang

The new message in China is integration, and that message is being spun and re-spun as companies jockey for position in a converged consumer world.

Case in point: When Frank Liang, Broadcom's general manager for Greater China, released a 65nm chip that included Bluetooth, FM radio and GPS functionality two months ago, it hardly seemed like a major innovation. Texas Instruments and Cambridge Silicon Radio introduced a similar chip 10 months earlier. But as Liang put it, it's not the time of releasing but integration quality that counts.

"... his company is no longer a simple baseband chip provider, but a mobile phone chip provider. The difference is all about integration."

Integration is Broadcom's favorite topic these days, and with good reason. According to IDC's latest statistics, combination chips will account for half of the market by next year. Companies with stronger abilities to integrate technologies and tackle interference issues when those functions are combined will win the market.

Within two years, all mainstream mobile phones will be embedded with GPS, triggering plenty of new opportunities for service providers, media and advertising. It's no wonder that wireless chip vendors at the upper stream of the industry chain such as TI, CSR, Broadcom, Atheros and NXP are jockeying for position in this market.

The trend for "omnipotent" mobile phones also presents enormous opportunities and challenges for chip providers. Everyone sees the cake but not everyone can eat it. To make sure they're in line, many companies are accelerating their acquisition plans so they can include more functions on chips more quickly. Despite clear signals that this was where the market was heading, Broadcom didn't make a significant move in this direction until 2007 when it acquired Global Locate, then the world's second largest GPS chip provider. Global Locate boasts leading GPS chip IP and powerful network-assisted GPS. Not surprisingly, that technology is in Broadcom's new chip.

CSR, meanwhile, acquired Sirf Technology Holdings in February for the much the same reason. Interestingly, Sirf posted losses as an independent company, despite the growing popularity of GPS technology.

More integration ahead

Broadcom once claimed that it would release a new chip every two months. The product roadmap displayed by Broadcom when it introduced its new chip in February showed the new selling point will be WLAN connectivity. Questioned about this direction, Liang responded, "It's good reasoning."

There is widespread speculation in China that telecom operators will actively deploy "3G+WiFi." 3G is used for the wireless communication in remote areas and between cities, while WiFi is the wireless Internet model of the highest price/performance within cities. Simultaneously supporting 3G, WiFi, Bluetooth and GPS is already a burgeoning trend. Broadcom, which is second only to Qualcomm as the 3G (WCDMA) solution provider, not to mention supplier for Nokia and Samsung, market watchers don't expect to be kept waiting very long.

Scott McGregor, president and CEO of Broadcom, said his company is no longer a simple baseband chip provider, but a mobile phone chip provider. The difference is all about integration.

Xioadan Wang is chief editor of EEFocus, the Chinese affiliate of Low-Power Design and System-Level Design. Prior to funding EEFOCUS, Xiaodan was the Online Publishing Director and Chief Editor at Electronics Business China for 2 years. From 1999-2003, she held the position as journalist of Phoenix Weekly and New Express Daily. Xiaodan has a B.S. in Journalism and Mass Communication from Nanjing University.

Is America Ready for Qseven?

The U.S. may follow Europe's lead for the design of ultra-mobile applications.

By Christian Eder, congatec AG

A lot of the growth in the electronics industry can be attributed to the consumers' love affair with devices that continuously become smaller and more portable. Key technologies are emerging to support the mobile and ultra-mobile trend, such the Intel® Atom™ processor. Yet many of the enabling components that are needed to leverage these new capabilities have hit a wall.

Take computer-on-modules (COMs), for example. Existing specifications like COM Express, XTX, and ETX have exhausted their potential when it comes to developing the lowest-power-consuming and mobile applications. When COM Express was defined back in 2001, central-processing-unit (CPU) power consumption was quite different. Today's mobile CPU and chipset combinations are now below 5 W. This dramatic change in chip technology clearly demands a new approach when it comes to COMs.

In 2008, three European companies collaborated to develop a new, open standard to enable smaller-sized, lower-power applications based on an embedded-module concept. Called Qseven, the standard was defined for next-generation, ultra-mobile embedded processors that were built using 45-nm and below technologies. Unlike previous COM standards, Qseven was specifically intended for low-power applications that could handle the rigorous requirements of mobile and ultra-mobile applications.

Since its inception less than two years ago, this specification has gained wide use in Europe. More than two dozen companies are already actively working with the published specification. Initial products designed with Qseven are expected to hit the market within the next few months. Despite the overwhelming support abroad, however, U.S. companies are under-represented in this effort. Currently, the Qseven Consortium has just one U.S. member.

For American designers to remain competitive, it's time that they recognize and understand the benefits of this standard. With the rapid momentum that it has already achieved in enabling state-of-the-art product design, it's clear that this standard is here to stay. For further proof, look at the breadth of members that are committed to supporting it and the cost savings that it can provide. These benefits are detailed in the following paragraphs:

Enables state-of-the-art technology - Chip manufacturers have brought several new technologies to the market that couldn't have been foreseen when legacy standards like ETX, COM Express, and XTX were first defined. New interfaces also have been developed. In addition, computing performance has increased dramatically while energy consumption has decreased dramatically. While COM Express permits a maximum power consumption of 188 W, for example, contemporary processors like the Intel Atom consume ~2 W. In addition, Qseven was designed from the ground up to be legacy-free with a specific focus on mobile and battery-operated applications. Lastly, its interfaces are compatible with state-of-the-art chipsets. (See Figure 1.)

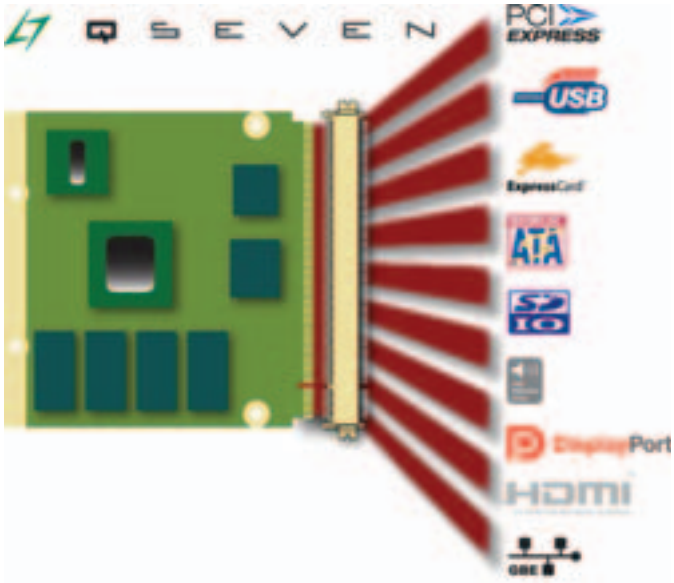

Figure 1: This edge finger pinout diagram illustrates Qseven interface connections.

Long-term viability - Supporters of Qseven include a wide range of companies ensuring the long-term availability and support of Qseven. The most recent member is FoxConn Technology Group. As one of the four largest MXM connector providers worldwide, its membership guarantees longevity and further enhancements for the Qseven connector. A minimum of eight companies (see listing at www.Qseven-standard.org) already offer their own Qseven computer-module designs.

Cost savings - When development teams at system and device manufacturers discuss ways to reduce development time and cost, they usually end up turning to the use of COMs. Module-based solutions can be highly flexible when it comes to configuring to the needs of dedicated applications. With just a single-carrier-board design, it's possible to create an entire product family merely by varying the computing power of the modules. The ability to react to new processor and chipset technologies can also be ensured simply by exchanging modules.

Because the modular concepts are standardized, it's easy to change the module vendor and thus reap the benefit of multiple sources. From the hardware view, this is true for all COM definitions. Most COM modules are equipped with additional functions for industrial applications. Examples include the watchdog timer, I²C bus, LCD brightness control, BIOS user storage area, and the reading of system temperatures. Due to the fact that no standardized software interface for these functions has yet been defined, the theoretical exchangeability of COMs has in practice proven to be more difficult than expected. To generally avoid the software modifications that such situations would require, the Qseven specification includes a consistent software application programming interface (API). Qseven modules from different manufacturers can thus be easily exchanged without modifying the hardware or software.

Qseven At A Glance

The name Qseven is derived from the word "quadratic," which is represented by the Q, and seven, which refers to the 7-x-7-cm² size of the module. Unlike most previous module standards, Qseven doesn't require an expensive board-to-board connector. Instead, it utilizes the small and rugged but very affordable MXM connector with 230 pins in a 0.5-mm configuration. Despite its small size, the module's construction is very robust (with a 1.2-mm-thick printed-circuit board). This MXM slot connector is produced by four manufacturers in two different heights. In addition, versions are available with 30-µm gold-flashed contacts for industrial applications. (See Figure 2.)

Figure 2: This top view shows a congatec Qseven design.

To support the feature set of current and future mobile CPU/chipset combinations, Qseven only defines current interfaces. Older "legacy interfaces," such as Parallel IDE and PCI bus, have been deliberately omitted to avoid the additional effort and associated costs of supporting them.

Qseven defines the following interfaces:

- 4x PCI Express x1 lanes
- 2x SATA
- 8x USB 2.0
- 1000BaseT Ethernet
- SDIO 8 bit
- LVDS 2 x 24 bit
- SDVO/HDMI/DisplayPort (shared)
- High Definition Audio (HDA)
- I²C bus
- Low Pin Count Bus (LPC)
- Fan control
- Battery management
- 5-V power (TDP max. 12 W)
- Application programming interface

Together, the four PCI Express lanes enable a data transfer rate of about 8 Gbits/s in each direction compared with up to 22 PCI Express lanes for COM Express. This may not seem like much. Yet such high I/O bandwidth is only required for server-side or high-end graphics applications—not mobile devices. The Qseven concept is already prepared for the next-generation double-data-rate interfaces like PCI Express 2.0 and SATA II.

The video interfaces have been designed with increased flexibility. In addition to a digital video input, a total of four different output possibilities are defined. In parallel to the 2-x-24-bit LVDS interface for the direct control of flat-panel displays, one of the digital display interfaces—SDVO, TDMS, or DisplayPort—can be used independently. DisplayPort is one of the latest VESA definitions (www.vesa.org). Compared with DVI, TDMS, and LVDS, DisplayPort offers an extendable, packet-based protocol that can carry additional information, such as audio, in addition to pure display data.

The Qseven specification is freely available and may be used without any license fees. Membership in the Qseven Consortium is also free of charge. For more details, visit *www.Qseven-standard.org.*

Christian Eder has nearly 20 years of experience in technology. He began in product-management positions at Kontron GmbH and CPCI Systems (Force Computers) before joining startup JUMPtec AG as a marketing manager. After that, Eder was director of marketing at EMEA, Kontron AG. He is a co-founder of congatec AG and currently serves as the firm's vice president of marketing. Eder received his degree in electrical engineering from the University of Applied Sciences, Regensburg, Germany.

Avoiding Patent Infringement in the Design Process: How a Recent Decision May Help Everyone

By Marc Hubbard

Knowledge of a patent is not necessary for proving patent infringement. Neither is copying the patentee's product. Therefore, independent development, and even your own patent on the allegedly infringing product, offers no defense. When developing complex, highly integrated circuits or embedded systems, with multitudes of features and functions, is it possible to avoid patent infringement?

Inverse Logic

The logical thing for a designer or manufacturer to do, at least when adding a new feature or changing a design, is to locate pertinent patents and, if problems are found, design around them. However, this is not what patent lawyers typically recommend doing, and it's not because they want their clients to be sued. There are a couple of reasons why looking for patents may not be a good idea.

First, there is the practical problem of time and money. It is impractical and too costly to look for and study every patent relevant to every feature and function of an integrated circuit, not to mention the combination of that circuit with other circuits. At minimum, candidate features must be isolated for successful searches. Furthermore, one can never be sure that every relevant patent has been found. Studying just one feature can be expensive. And, there is the cost of the legal opinion that you will probably want.

Second, finding a troublesome patent may mean having to choose between changing a design or not selling the product, on the one hand, or risking of being tagged for infringement and enjoined from making the product on the other. No one likes to be faced with this choice.

Third, there is another, overriding consideration – liability for "increased damages." To discourage willful infringement, courts are empowered by the patent laws to order a willful infringer to pay up to three times actual damages – in other words, to pay up to three times the amount that would have otherwise been owed. And, to rub it in, they can also order a willful infringer to pay the patentee's attorneys fees.

Just knowing about a patent substantially increases the exposure for infringement. The potential of being punished by being saddled with enhanced damages and attorneys fees thus leads to steadfast refusal to look at other's patents – the proverbial sticking of one's head in the sand, but in this case not so much as an irrational reaction to fear, but as a way to ensure ignorance. The rationalization for doing so is that a manufacturer, for example, is better off with the risk of infringement than the risk of increased damages.

Ancillary Strategies

Some companies devote substantial sums to developing "defensive" patent portfolios. The potential for a counterclaim of patent infringement tends to discourage all competitors, big and small, from bringing claims in the first place. Valuable portfolios also confer leverage for settling patent infringement claims and cross licensing.

Adopting old designs, for example those disclosed in expired patents, which are more likely to be free from infringement, may reduce risk. Risk can be shifted to others by, for example, licensing designs from third parties who are willing to accept the risk of infringement through infringement indemnities. And, of course, making it difficult, if not impossible, for the patent owner to discover the infringement can be effective.

Defensive patent pools for collectively purchasing relevant patents are being formed, and new "IP markets" are starting, in each case with intention of granting licenses to needed patent rights on more reasonable terms.

However, for designers, these strategies are often not feasible or available. Reverse engineering of chips will expose infringement. Even if old circuit designs can be used, their adaptations for use in integrated circuits could still be the subject of unexpired patents. Licensing designs from others adds cost. Emerging strategies such as defensive patent pools and IP markets are really more in the pre-emergent state and are very unlikely to be of much help in the near future.

Reassessing Willfulness

In August of 2007, an order sought by Seagate Technology caused the Court of Appeals for the Federal Circuit, an appeals court in Washington D.C. that hears most appeals in patent cases, to reassess the standard for determining whether an infringement is "willful."

The Patent Act allows a court the discretion to increase damages and award attorneys' fees in "special" cases. Prior to Seagate's case, the Federal Circuit held that everyone has a duty to exercise "due care" to avoid patent infringement, and that the failure to act with due care constitutes willfulness, making makes the case "special."

There's always been a lot of debate over "willful infringement." It is pled as a matter of routine. Juries inevitably find any infringement to be willful. In short, it has been used, and continues to be used, both justifiably and unjustifiably, to coerce larger settlements.

Two reports from the earlier part of this decade, one from the Federal Trade Commission and the other from the National Academies, found a number of problems with then-current standards of willful infringement. The FTC proposed that actual notice of infringement must have been given in order for there to have been willful infringement. The National Academies went further and proposed eliminating it altogether. Currently pending bills in Congress include provisions for codifying the standards for finding "willfulness" and awarding increased damages.

With its decision in *In Re Seagate Technology, LLC, 497 F.3d 1360 (Fed. Cir. 2007)*, the Federal Circuit threw out its old rule and tightened the standard. Now, the infringer must be shown to have acted recklessly, in spite of an objectively high likelihood of infringement that the infringer either knew or should have known about.

Although this distinction may sound like legal gobbledygook—and maybe it is just that—it effectively means that, instead of acting negligently, an accused infringer must now act with recklessness to be found guilty of willful infringement.

The expectation is that the new standard will make it harder for patentees to make a charge of willful infringement stick. Because the new standard is, well, new, we don't really know if it will. But early signs are somewhat encouraging.

New Strategies For Avoiding Infringement?

Is it time to start looking for and reading patents when designing new systems?

In the year and half since the Seagate decision, willful infringement still appears to be plead with the same frequency, but that may be just out of habit. A number of judges have thrown out jury determinations of willfulness, which is a good sign. However, what remains to be seen is whether judges will dismiss claims of willfulness earlier in the cases, on motions for summary judgment. So far they have not been, but that may change with more decisions from the Federal Circuit to flesh out the new standard.

There also seems to be a general consensus in the courts and in Congress that a new balance must be struck that discourages egregious conduct by infringers and encourages legitimate review of competitors' patents. This further boosts confidence that the risks arising from reviewing third party patents can be controlled.

Although uncertainties remain, the *Seagate* decision nevertheless gives confidence to review third party patents in carefully controlled situations in which the benefits clearly outweigh the perceived risks. It probably does not make sense for engineers to read every patent of a competitor or in a particular field. However, targeted infringement studies of new features, for example, may be worthwhile, preferably early in the design process. This may be especially true where an infringement claim might be particularly disruptive and the risk of infringement appears high due to, for example, extensive competitor activity in the area.

Although the risk of infringement can never be avoided, iterative patent searches directed to new or changed features, combined with ancillary strategies mentioned above, should decrease risk of infringement, without substantially increasing exposure to charges of willful infringement.

Marc Hubbard (214.999.4880, mhubbard@gardere.com) is an Intellectual Property Partner at Gardere Wynne Sewell LLP (www.gardere.com) with more than 20 years of experience working on patent matters and infringement cases involving a wide range of technologies.

BLOG

Intel Looks To Third-Party IP

By Ed Sperling

Intel is headed down an entirely new path with its Atom chip—one that uses third-party IP instead of just its own.

The shift is significant because it means that Intel is adding even more flexibility into its processor design than just the software that runs on it. The base configuration also can be changed to go after specialized markets more quickly, particularly in markets where it may be necessary to slash power or add embedded controllers or IP.

To read the complete article, please visit: http://chipdesignmag.com/sld/blog/2009/05/27/intel-looks-to-third-party-ip/

PC/104 Expands to Meet New Needs

This 17-year-old, small-form-factor, workhorse design platform continues to grow by incorporating PCI Express and accommodating lower-power CPUs.

By Ann R. Thryft

In just the last year, the PC/104 family of small-form-factor, stackable board standards has undergone several changes. Analysts who follow this embedded-market niche now include several specifications under the PC/104 umbrella beyond PC/104 and PC/104-Plus. Although designers' needs remain fairly stable, emerging high-end applications require the higher speeds that are possible with PCI Express as well as lower power.

PC/104 is more than a form factor. "It's also a stacking technology incorporating industry-standard buses and a configuration with specific mounting holes in unique locations," says Paul Haris, president of the PC/104 Consortium. Because the design platform's technology follows the mainstream desktop-PC market, PC/104 leverages the entire PC industry's variety and volume of chips and software. As a result, designers can independently build systems using central-processing-unit (CPU) and I/O cards that work together.

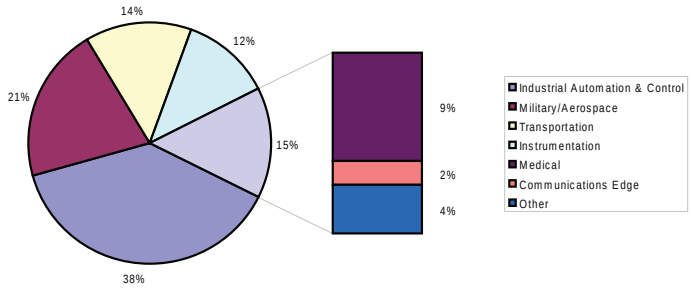

Figure 1: PC/104 Family CPU Module Shipments Segmented by Vertical Market, 2008 (% of Dollar Volume Shipments); 2008 Total: US$ 161.9 Million

Aside from its small, 90-x-96-mm module outline, PC/104's main attraction is the ruggedization provided by the way that the boards stack and screw together. This explains its popularity in industrial automation/control and military/aerospace applications. With their stringent environmental and thermal requirements, they are its biggest users (see Figure 1). Because these systems have long product lifecycles, they retain older technologies like the ISA bus. "The original PC/104 ISA bus applies to the many lower-speed applications across the entire embedded market from commercial-grade to mil-spec," explains Haris. Those uses also include medical systems and the type of point-of-sale/kiosk applications that are more common in Europe and Asia than the U.S., emphasizes Steve Berry, president of Electronic Trend Publications.

Even where some application requirements have pushed designers to use faster, more powerful processors, they still need the lower-speed ISA interconnects. Such interconnects allow them to support legacy requirements in the installed base, such as simple background monitoring of systems, explains Tom Barnum, vice president of strategic accounts for VersaLogic. "On our platforms moving forward, we're supporting PCI Express for higher throughput requirements, but retaining the ISA connectors."

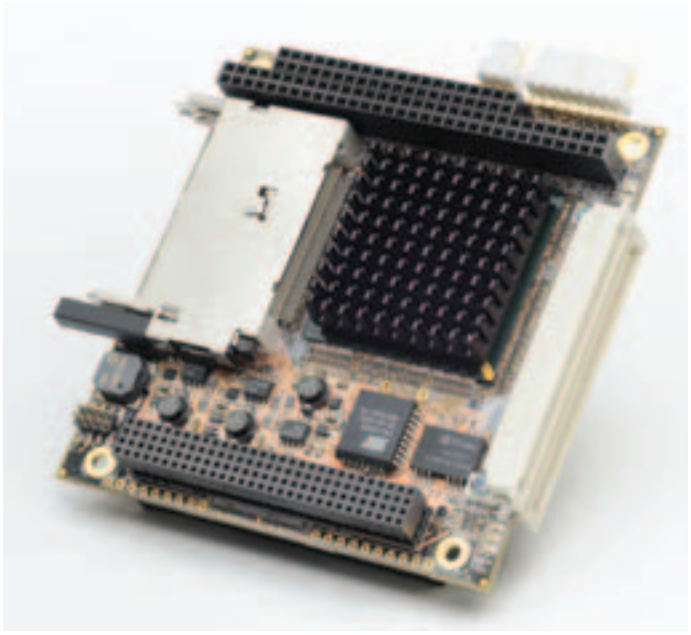

Figure 2: WinSystems' new PPM-LX800-G PC/104-Plus SBC is based on the 0.9-watt AMD LX 800 CPU.

The Need For Lower Power

According to Berry, the industry-wide push for lower power consumption is most visible in smaller form factors like PC/104, where it becomes more difficult to get the heat out. Although new processors from Intel, VIA, and AMD provide more processing power, they require less electrical power to operate. These CPUs, such as the Intel® Atom™ processor and the VIA Nano, are easier

to cool. Yet the multiple on-board power supplies required present challenges, says Bob Burckle, vice president of WinSystems. On the plus side, Burckle points out that Intel is guaranteeing seven years for its Intel Atom processors and AMD has said its LX800 will be available through 2015, guaranteeing availability for longer-lifecycle PC/104-based embedded systems. For example, WinSystems' new PPM-LX800-G PC/104-Plus SBC is based on the 0.9-W AMD LX 800 CPU (see Figure 2).

"... the industry-wide push for lower power consumption is most visible in smaller form factors like PC/104, where it becomes more difficult to get the heat out."

Kontron has no plans at present to build another new single-board computer (SBC) in the PC/104 form factor. Yet according to Christine Van De Graaf, product marketing manager for the embedded modules division, "We must remain compatible with it. We see that PC/104 needs lower-power CPUs, such as the AMD LX800 and the Intel Atom processor N270." PC/104 is still the best fit for a CPU board in applications that must go into a small space—ones that either don't need a lot of customization or have space for stacking up boards if customization is needed. It also is the optimal choice for applications that only require off-the-shelf I/O rather than advanced capabilities like Gigabit Ethernet.

Emerging High-End Applications

As the PC/104 design platform continues to incorporate industry-standard desktop PC buses, such as PCI and PCI Express, the PC/104 Consortium has issued five specifications. The original PC/104 specification uses the ISA bus while PC/104-Plus adds PCI. PCI-104 removes ISA and keeps PCI for more room on the module.

About a year ago, the consortium introduced two more specifications: PCI/104-Express, which combines PCI and PCI Express, and PCIe/104, which retains only PCI Express. Around the same time, the Small Form-Factor Special Interest Group (SFF-SIG) standards organization debuted and released a new PCI Express specification based on the same-size module outline, but using a different stackable architecture called Stackable Unified Module Interconnect Technology (SUMIT). The SIG's new stackable PCI Express specification, originally called Express104, is now named SUMIT-ISM (Industry Standard Module).

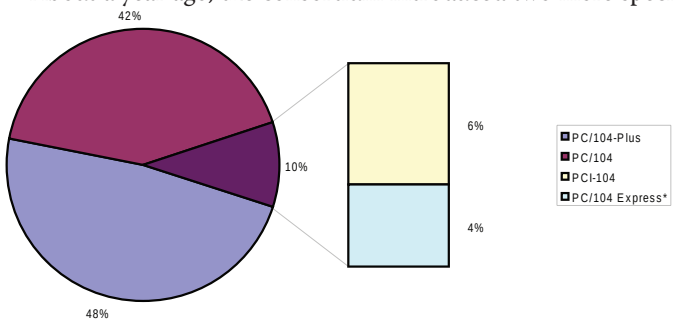

Figure 3: PC/104 Family Module Shipments Segmented by Architecture, 2008 (% of Dollar Volume Shipments); 2008 Total: US$ 262.7 Million

Because product shipments are still low, analysts like Venture Development Corp.'s Heikkila are tracking the new PCI Express architectures from both organizations in a single category. Heikkila dubs this combined category "PC/104 Express" (see Figure 3). PCI Express will play in an emerging higher end of PC/104-based small, mobile, high-performance systems that will benefit from its rugged characteristics, he predicts. "This high end is moving slowly. But in five to ten years, it will experience higher volumes."

The bread and butter of PC/104 board makers are mainstream embedded applications that need rugged, reliable, efficient products. "No one in the embedded space is rushing to buy faster CPU technologies just for the sake of having the fastest CPU," states Doug Stead, president of Tri-M Systems. "Truly embedded products do one or two tasks for the product's life expectancy. Embedded engineers don't want extra cost in their BOM (bill of materials) just to have a 3-GHz quad-core processor when a 900-MHz single-core CPU is overkill." In the embedded space, the only need for bus speeds faster than 16/32-bit PCI is for sending video data—not process-control data.

At the same time, PC/104's future may lie increasingly in I/O expansion—even when the SBC itself is not PC/104-based, says Kontron's Van De Graaf. "We see PC/104 being used more for expansion boards in the future—not just for SBCs." Adlink's Colin McCracken, director of technical marketing, states that the value of the larger small-form-factor-board ecosystem reinforces the usage of PC/104 interfaces across different-sized boards. "You can use PC/104 I/O cards on top of EPIC, EBX, and even non-standard SBCs—not just PC/104 SBCs," he emphasizes. "The larger the SBC, the more integrated I/O there will be on that board, so fewer add-on cards are needed. On an EPIC or EBX motherboard, for example, you'd have a very short but broad-based system. On a PC/104 SBC, you'd have a taller system because the I/O card stack will be higher."

Ann R. Thryft has over 20 years of industry knowledge in embedded hardware and software. An award-winning trade journalist, she has held editorial positions with EDN, EE Times, Nikkei Electronics Asia, RTC Magazine, COTS Journal, Computer Design, and Electronic Buyers' News. She provided the analyst commentary for Evans Data Corp.'s Embedded Systems Development 2007 strategic report. Thryft can be reached at athryft@earthlink.net.

x86 Processor Road Map No Longer Just About Speed

By Ed Sperling

The decades-old approach of powerful processors with ever-faster clock speeds is changing. Performance matters in some settings, but the real concern is adding more functionality within power budgets.

The most pressing tradeoff is now performance vs. power, which has forced processor architects at AMD, Intel and IBM to take into account everything from application software to the firmware that manages some of the functions on a chip and the middleware that makes it all work together.

"One phenomenon we're seeing is that a number of customers claim their data centers are full but when we go out to see them they're only half full of hardware," said Margaret Lewis, product marketing director at AMD, "They can't draw any more power in places like the Northeastern United States, California or Germany."

Part of that is due to virtualization, which has been pushed on data centers in particular as the way to boost utilization of a server. According to McKinsey & Co., datacenter server utilization is as low as 5%, which has made virtualization a natural way to improve efficiency and cut costs. And with many software applications unable to utilize more than a couple cores of a server, it's sometimes only way to boost utilization of multicore servers.

That is about to change, however. "Most of the software hasn't made it over to multithreading," Lewis said. "So instead of just using cores for applications, there are other switches we can turn on processors to do things like balance memory or have better I/O."

The software also can be tweaked to boost optimization lower down on the stack so that instead of tuning each Java virtual machine running on a separate core they all can be optimized so that every Java applet benefits.

"We are seeing a number of new software models," Lewis said. "The only thing that keeps everything around is that the legacy software people don't want to give up what they have. It's easy to multithread to two to four cores. After that, debugging becomes too difficult. A different approach is multitasking, so you do different tasks on different cores. What's being done with the CPU and the GPU is the first big example of that."

Intel, meanwhile, has been working with Microsoft to improve the efficiency of its processors.

"Performance was always the focus, but power savings are now part of the methodology," said George Alfs, program manager at Intel. "For years we have been working with Microsoft to make sure that the operating system isn't spinning wildly waiting for the next keystroke. We're now putting the operating system into a sleep state even between keystrokes. There are seven sleep states and a variety of ways to take advantage of power."

Part of Intel's road map also calls for more threading. Windows 7 is expected to offer better scheduling than Vista, allowing more than one application to run at the same time on different cores. It also calls for power flexibility to provide more thermal headroom for either boosting performance or lowering power at 32nm.

Intel also is building basic graphics processing into the processor, which will further utilize some of the cores. How many cores depends on the graphics requirements. The first Larrabee chip, due out next year, has a discrete graphics card for ray tracing, but there is certainly a possibility that Intel could integrate some of those graphics into its processors.

Intel also will be using a combination of homogeneous and heterogeneous cores, Alfs said, which is a different direction than the company said it would take several years ago. Some of those cores could be for I/O and graphics, Alfs said, similar to the approach taken by AMD. Intel also plans to use some cores for encryption/decryption, which has been a drag on system performance in the past.

Ed Sperling is Contributing Editor for Embedded Intel® Solutions and the Editor-in-Chief of the "System Level Design" portal. Ed has received numerous awards for technical journalism.

Solutions for engineers and embedded developers using embedded Intel® processors

Arium's ECM-XDP3: Start a Design Chain Reaction with the Intel® Atom™ Processor

by Arium

The ECM-XDP3 emulator is Arium's new hardware-assisted debug solution for the latest Intel® processors. The product is used to debug BIOS, UEFI, BSPs, device drivers, Linux kernels, kernel modules, and applications.

Arium designed the ECM-XDP3 and the Arium software interface to be optimized for Intel® Atom™ processor families.

SourcePoint™ Debugger

Included with the ECM-XDP3 is Arium's SourcePoint debugging software. The debugger interface is part of the company's core technology, developed specifically for IA and SoC design and debug. The 32-bit application runs on Microsoft Windows XP/Vista and numerous Linux platforms and supports targets running various operating systems.

The Arium ECM-XDP3 JTAG Emulator is the market leader in Features and Performance:

- Powerful - Arium emulators are the only debug tools that give you real time debugging solutions directly out of system reset.
- Innovative - Arium focuses on the user when crafting their tools. A quick symbols finder, a single view for displaying devices, current viewpoint tracking - the little things that quickly add up.
- Flexible - The ECM-XDP3 offers a number of firmware and software-related customizable options to provide a debug environment that best meets customers' needs.
- Integrated & Intuitive – The ECM-XDP3, with its companion Source-Point™ interface, provides a highly integrated, intuitive tool designed with developers needs in mind.
- Other important features:
  Execution trace, Real time operation, Multi-processor (SMP) support, In-line assembly, Robust scripting language, Code/data search and replace, Self-diagnostic test suite, and it is designed to accommodate future debug port requirements.
- Fully Supported – Arium's highly trained staff of design engineers provide telephone, e-mail, and web-based, interactive support. In addition, installation guides, technical papers, and software downloads are available at *http://www.arium.com*.

Arium has been the primary market supplier of hardware-assisted debug tools since 1992, and is a member of the Intel® Embedded and Communications Alliance.

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Arium's SourcePoint™ offers a Complete Linux Debugging Solution for the Intel® Atom™ Processor

by Arium

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Arium designed the ECM-XDP3 and the Arium software interface to be optimized for Intel® Atom™ processor families.

Arium delivers the only real-time debug the only real-time debug interface that works out of reset, and it's the first to offer Intel® Universal Extensible Firmware Interface (UEFI) debug. Arium debugging solutions support nearly all Intel® embedded, laptop, desktop, and server processors and are designed to minimize the time and stress associated with the debug phase of project development, helping companies get to market faster and with greater ease

Creating a successful run control debug strategy

The key to a successful run control debug strategy lies in the ability to set accurate breakpoints and step easily through code. SourcePoint uses the usual stepping commands along with go and halt to step through source or assembly-level code. SourcePoint's C-like command language includes not only industry-standard run control commands, but lets the developer execute loops, use data and array variables, access file I/O, and more. Unlike some command languages, SourcePoint is intuitive; developers do not need to know a two-letter code for each command.

SourcePoint offers processor and soft breaks via simple GUIs. Breaks can also be set from the Code window or a command line.

Several intuitive windows can be opened to view the state of the processor(s) and make modifications to values, including Symbols windows, Registers windows, Memory windows, PCI Devices windows, and user-defined Watch windows. In multi-core environments, developers can view each processor state. And the list goes on and on.

Arium's debug solutions are designed with time in mind. Whether downloading files or images, stepping through code, or coming back after hitting stop, the event executes with incredible speed.

Arium has been the primary market supplier of hardware assisted debug tools since 1992, and is a member of the Intel® Embedded and Communications Alliance. More information on the company and product is available at *http://www.arium.com.*

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Innovative Motherboard Driving a Retail Revolution

by Emerson Network Power

A retailer's number one priority is to make a sale and process the transaction quickly. Customers will not wait for terminals to boot, so checkouts must be fully operational from the moment the store opens. Many point-of-sale (POS) terminals are left on 24/7 to avoid delayed start up, wasting a lot of energy and even standard power saving features are often disabled. Down time during maintenance is another issue. If a checkout fails, it will typically be replaced as a whole unit, creating upheaval in the customer-facing area.

Bar code scanners, printers, weighing scales and card payment systems from different manufacturers (and all with their own cables) add to the complexity of a typical modern POS system. A layout may also include three or four power supplies with cables, all of which is difficult to keep tidy and may be a safety hazard.

Is it possible to enable POS terminals to be ready as soon as a store opens while consuming less power when the store is closed and enabling an improved customer experience? Yes, by using a motherboard such as the Emerson Network Power MATXM-C2-410-B, which accepts the popular and energy-efficient 45nm Intel® Core™2 Duo processor, there is an immediate power saving gain compared to older, less efficient processors. Perhaps as much as 70% power reduction while providing increased performance that enables additional functionality.

Innovations such as Intel® vPro™ technology with Intel® Active Management Technology (AMT) offer improved power management and security options. For example, once the store has closed a remote administrator can turn the POS terminals completely off and then turn them back on so they are ready for opening time. AMT is an out-of-band technology and is immune from operating system and application crashes. The result is reduced carbon emissions and lower total cost of ownership for retailers.

Energy efficiency can also be improved by using a single AC-DC power module for a complete retail solution. This is enabled by 12V and 24V PoweredUSB ports on the MATXM-C2-410-B. Sometimes known as Retail USB, USB PlusPower or USB +Power, these have a standard USB data connection plus a latching power connector with the single cable connection containing two additional wires for the extra power. These PoweredUSB ports are designed to provide data and power connections to a variety of POS peripherals that have traditionally required their own AC-DC converters. As well as reducing power supply losses, there is a significant benefit to safety, reliability and aesthetics.

Most POS terminals are based on a standard form factor motherboard and MATXM-C2-410-B, being MicroATX compatible, is no exception. However, unlike traditional motherboards which are fixed by standoff posts to a base plate and then have multitudes of internal cable connections, this board has a connector running down one face that plugs into a midplane. Because the connections for peripherals like SATA disks and LCD are routed to the midplane which remains fixed, the motherboard itself can be unplugged and quickly replaced with little risk of incorrect cable re-assembly.

Figure 1: MATXM-C2-410-B showing innovative midplane

Emerson's MicroATX motherboard is designed to support simultaneous high-definition dual displays to meet the needs of the video age. In intelligent kiosks, one of the displays can be used with a touch interface to configure options while the second display shows the finished product. Consumers are open to these hybrid e-commerce techniques and appreciate the self-service philosophy as well as the scope for in-store assistance. The retailer is able to provide the real-time benefits of Internet shopping while retaining the personal nature of being in-store.

Energy efficiency initiatives in the retail sector have created a market for a totally different type of board-level computing product to provide POS and intelligent kiosk facilities. By incorporating innovative features that enable significant energy savings while providing retailers with a better performance and feature proposition, boards such as the Emerson MATXM-C2-410-B are a sound investment. Backed by Emerson's reputation for providing industry-leading product longevity, quality and reliability, maybe there really is a revolution to come in the retail sector.

More information on Emerson Network Power's innovative motherboard products can be found at *www.EmersonNetworkPower.com/EmbeddedComputing*.

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EMERSON™
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Arium's ECM-XDP3 JTAG Debugger for the Intel® Atom™ Processor

The ECM-XDP3 emulator is Arium's new hardware-assisted debug solution for the latest Intel® processors. The product is used to debug BIOS, UEFI, BSPs, device drivers, Linux kernels, kernel modules, and applications.

Arium designed the ECM-XDP3 and the Arium software interface to be optimized for Intel® Atom™ processor families.

The debug solution operates in real time with all core frequencies and works with today's most popular compiler tool chains. It supports industry standard input file formats and includes a robust C-like command language as well as support for the Intel® Framework for UEFI. Linux OS-aware features are standard to seamlessly debug kernel, kmod, and applications.

SourcePoint™ Debugger
Included with the ECM-XDP3 is Arium's SourcePoint debugging software. The debugger interface is part of the company's core technology, developed specifically for IA and SoC design and debug. The 32-bit application runs on Microsoft Windows XP/Vista and numerous Linux platforms and supports targets running various operating systems.

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MICROSPACE® MSM200X/XU/XP with SmartCore® Express SMA200

DIGITAL-LOGIC offers PC/104-Express CPU-Card MSM200X/XL/XP with Intel® Atom™ Processor, 4x COM and GPS + GSM/WLAN:

With the MICROSPACE® MSM200X/XL/XP based on the latest Intel® Atom™ processor, the Swiss-based company DIGITAL-LOGIC extends its range of PC/104-Express single board computers. The powerful board is used for applications in battery powered mobile computers, information terminals with video displays, game systems with music output, measuring instruments or telecommunication devices. Besides the fast CPU, the MSM200 provides all standard PC interfaces required for such demanding applications, including Ethernet LAN, an audio controller (HDA), four RS232 interfaces, two SATA and one PATA interfaces. In addition, the PCI/104-Express bus (PCI + PCIe), PCIe Minicard and six USB interfaces are available as functional extensions. The PCIe Minicard permits to extend the board with GSM or WLAN functions. Optionally the MSM200 can be equipped with a GPS receiver (COM4). The typical power consumption of only 8W allows passive cooling within a very broad working temperature range.

All three options (X, XU and XP) are equipped with the SMA200 based on the Intel Atom processor Z510/Z530 (1.1/1.6GHz), and offer up to 2GB RAM. The boards are available for the extended temperature range of –40°C to +85°C, have a dimensions of 90mm x 96mm (W x L) and a weight of 115 grams respectively.

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ATCA-7350 Multicore Processor Blade

The Emerson Network Power ATCA-7350 is an Intel® processor-based compute blade that delivers a combination of performance and flexibility to help drive the successful implementation of next-generation telecom networks.

With two quad-core Intel® Xeon® processors, the ATCA-7350 processor blade delivers the highest processing performance in an ATCA form factor. The PICMG 3.1 compliant fabric interface provides ten Gigabit Ethernet (10Gbps) capability for applications requiring higher network throughput in the backplane. The blade provides Gigabit Ethernet (1Gbps) interfaces to the PICMG® 3.0 base interface and the PICMG 3.1 fabric interface in a dual star configuration. Several other network configurations are also available.

An array of main memory options, and two local mass storage options add to the performance and flexibility of the ATCA-7350 processor blade.

Features

- High performance processor blade with SMP support
- Two, quad-core Intel® Xeon® processors LV (2.13 GHz)
- Multiple software packages including operating system
- PICMG 3.0 Gigabit Ethernet base interface support
- PICMG 3.1, Option 1 and 9 fabric interface support
- Two on-board 2.5" form factor hard disk bays supporting hot swap and RAID 0/1
- Multiple disk options including SAS hard drives, SATA drives with extended temperature range, and solid state disks
- Designed for NEBS and ETSI compliance

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CPCI7200 Multicore Single-Board Computer

The Emerson Network Power CPCI7200 single-board computer (SBC) uses the Intel® Core™2 Duo processor and Intel® E7520 chipset with Intel® 6300ESB I/O Controller Hub. The single-slot configuration is ideal for thermally constrained environments and includes dual Gigabit Ethernet interfaces and dual channel 3.2GB/s high speed, double data rate DDR2, for a combined maximum bandwidth of 6.4GB/s.

The CPCI7200 is a low-power, high-performance SBC that offers full hot swap compliance per PICMG® 2.1 and supports the PICMG 2.9 System Management and PICMG 2.16 CompactPCI® Packet Switching Backplane open specifications. In addition to the PICMG 2.16 variants, the CPCI7200 offers other value-added features including the PLX6466 PCI-to-PCI bridge (PPB) for universal CompactPCI system-slot or peripheral-slot functionality.

Also, the CPCI7200 board supports the Intelligent Platform Management Interface (IPMI) specification for full board remote system and platform management as well as baseboard management controller (BMC) and peripheral mode. Overall, with the value-added PLX6466 and Gigabit Ethernet/PICMG 2.16 features, the CPCI7200 board is a superior choice for telecom applications like softswitches, control plane media-transport nodes, wireless gateways, and control plane CompactPCI and PICMG 2.16 systems as well as industrial automation, aerospace, and medical applications such as railway control, on board flight information systems, and medical imaging.

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MATXM-C2-410-B MicroATX Motherboard

The Emerson Network Power MATXM-C2-410-B is a MicroATX motherboard designed to ease deployment in a range of retail applications such as point-of-sale (POS) terminals, interactive product displays and customer kiosks. It has a unique midplane which creates a level of modularity sufficient to allow cost-effective replacement during deployment. By routing all power and LCD display cabling through the midplane, the likelihood of cabling errors during maintenance is reduced.

Designed to support a wide range of POS peripherals, MATXM-C2-410-B has both 12 and 24 V PoweredUSB connections. These are suitable for powering devices like bar code scanners and POS printers without the expense of additional power supplies. This motherboard supports dual independent displays and has VGA/LVDS and HDMI interfaces for connection to the widest possible range of displays.

By minimizing the need for additional power supplies for peripherals and utilizing innovative power management features, the MATXM-C2-410-B can significantly reduce energy consumption. Low noise is very important in the retail environment and by providing energy saving features, the MATXM-C2-410-B can minimize noise during operation periods. By utilizing features like Intel® vPro™ technology, it is possible to remotely power on and turn off the system overnight to reduce carbon emissions and lower the total cost of ownership.

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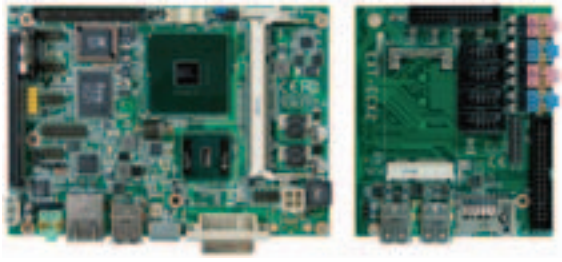
ITOX ML936-B16 ECX SBC Features 1.6GHz Intel® Atom™ Processor Z530P

The ITOX ML936-B16 ECX SBC incorporates a 1.6GHz Intel® Atom™ processor Z530P with 'XL' 1.0 mm ball-pitch package. Use of the larger-footprint processor and chipset reduces PCB complexity and board manufacturing expenses, allowing ITOX to provide additional cost-savings to our customers. ITOX offers an optional expansion daughterboard EXT-ECX2 to provide additional I/O capability. Custom expansion daughterboards can be designed to easily accommodate customer-specific requirements.

It is a cost-effective embedded solution for digital signage, ATM/POS terminals, kiosks, industrial automation and control, gaming, medical diagnostics, interactive client, and security applications. Having the same mounting-hole dimensions as 3.5" subcompact form-factor SBCs, it is also a "drop-in" replacement in many of these applications.

ML936-B16 ECX SBC
- 12 VDC Power Supply Input
- 1.6GHz Intel® Atom™ processor Z530P
- Intel® System Controller Hub US15WP
- Up to 1GB of DDR2 400/533 MHz Memory
- 1 DVI Graphics Port
- 1 LVDS Display Interface
- 1 Gigabit LAN Controller
- 1 IDE Ultra ATA/100 interface
- Trusted Platform Module 1.2 Header
- 2 Serial COM Ports
- 4 USB 2.0 Ports



EXT-ECX2 Expansion Daughterboard Option
- 1 Mini PCI Express Expansion Slot
- 1 SDIO Slot for SD/MMC Memory Cards
- 4 USB 2.0 Ports
- 4 Serial COM Ports
- 1 IEEE-1284 Parallel Port
- 1 Floppy Disk Controller
- 8-Line GPIO

These products have guaranteed availability through 2016.

iTOX Applied Computing a DFI company

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Cool XpressRunner-GS45

The Cool XpressRunner-GS45 is one of the fastest PCI/104-Express processor modules available. It features an Intel® Core™2 Duo processor and the Mobile Intel® GS45 Express chipset on a small 3.55" by 4.55" PCI/104-Express board. The CPU speed of 2.26 GHz together with the 1066 MHz front side bus deliver unprecedented performance.

The board is equipped with one Gigabyte soldered DDR3 RAM.

Displays are connected using either VGA or dual channel LVDS interfaces. High definition audio with analog as well as digital signals is available, too.

There is a Gigabit LAN port, 8 USB 2.0 host port and two serial interfaces capable of RS232 and RS485. Two SATA ports round the board's hardware features off.

The Cool XpressRunner-GS45 uses the LiPPERT Enhanced Management Technology, (LEMT) based on an integrated system management controller. It handles the boards housekeeping tasks like power sequencing and watchdog, and provides useful utility functions for the application. Among them is a secure, write and clear protected Flash area that can be used for security keys.

All models of the Cool XpressRunner-GS45 are designed for an ambient temperature range of -20 °C...+60 °C. The 1.2 GHz model is optionally available for operation in the full extended temperature range of -40 °C...+85 °C.

The Cool XpressRunner is intended for applications requiring high performance mobile computing. The optionally available

extended temperature range makes it the ideal candidate for outdoor usage.

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MSI IPS New Fanless 3.5" SBC MS-9A19

In COMPUTEX 2009, MSI IPS (industrial platform Service) introduced whole new fanless 3.5" SBC MS-9A19, which supports Intel® Atom™ processor N270 and is great for flexible application. MS-9A19 embedded with the Mobile Intel® 945GSE Express chipset and Intel® I/O Controller Hub 7-M and a DDR2 400/533 SO-DIMM (up to 2GB). With the Intel Atom processor low power solution and fanless design, MS-9A19 consumes ultra-low power when operating.

Intel Atom processor N270 on Mobile Intel 945GSE Express chipset offers robust performance-per-watt. It is based on 45nm Intel® processor technology, TDP is 2.5W and 0.6W in average power consumption. Also the processor's latest SSE3 instruction sets enhance performance for gaming application.

Not only power-efficient, MSI IPS also enabled MS-9A19 with high capability thought its mini-size limitation, including a DVI-I port, dual Gb LAN, 6 USB 2.0 ports, 3 powered COM ports, and made it support hardware video decoder for MPEG2. With such high flexibility, MS-9A19 is ideal for application in digital signage, gaming, industrial control, point of sale, and car electronic products, and will be available to market in August.

Features

- Intel® Atom™ processor N270 1.6GHz
- 6 USB 2.0 and 3 COM ports
- DVI-I and Dual Giga LAN
- Fanless design with ultra-low power and mini-size
- Support Hardware Video Decoder for MPEG2

For further product information, please contact: sarashen@msi.com.tw

About MSI

MSI was founded in 1986 and is one of the world-class IT product leading brands. Based on the operating principle "Insist on the Best", MSI has shown a strong R & D capabilities and high production technology in motherboard and graphics card products. Adopting a diversified management and business strategy, MSI has also penetrated into the Notebook, All-in-One PC, industrial platform, and Car Entertainment product fields with high productivity, high technology, and high quality R & D niche. Welcome to visit MSI at *www.msi.com* to know more detail.

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CP86-N1 Intel® Core™2 Duo Processor-Based CompactPCI Server Blade

This powerful server blade is the newest addition to PDSi's ComputeNode™ familyofcarrier-gradeCompactPCIsolutions, and offers the highest performance and dependability in its class. The PICMG 2.16-compliant blade provides a robust, high-performance general purpose platform built around the latest Intel® Core™2 Duo processor T9400 and server-class Intel® 5100 chipset.

The CP86-N1 blade includes a standard PMC/XMC site for I/O expansion and is offered in two alternate models, one featuring an onboard SATA hard drive plus high resolution graphics, the other providing a second PMC expansion site. Rear I/O capability covers a very broad range of interfaces that can be accessed through one of PDSi's companion rear transition modules (RTMs). Two 1000Base-T Ethernet ports provide the PICMG 2.16-compliant fabric interfaces, making the CP86-N1 fully compatible with any cPSB chassis.

- Server-grade CompactPSB compute blade
- Intel Core 2 Duo processor T9400 at 2.53 GHz with Intel 5100 MCH / Intel® I/O Controller Hub 9R
- Up to 8GB Registered ECC DDR2 667 Memory
- 1 PMC/XMC mezzanine site standard
- 2 alternate models, offering 2nd PMC site, or ATI Radeon™ graphics & 2.5" SATA HDD
- 2 x 1Gb Ethernet links (Front panel)
- 2 x USB 2.0 (Front panel)
- Rear I/O interfaces
- Optional USB Flash drive
- Customization welcomed, extended availability assured

Contact Rob Ellis at 614-748-1115 or rob.ellis@pinnacle.com for more information

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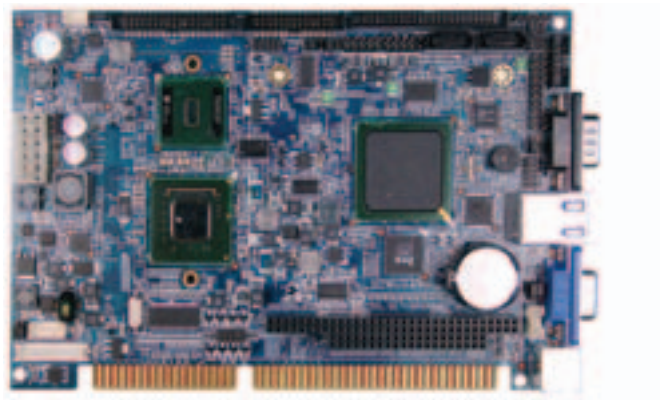
Protech System's ISA-588LF Half-size ISA cpu board based on Intel® Atom™ processor

Protech Systems Co., Ltd, a world-leading manufacturer of industrial computer and embedded systems, officially launches a new ISA CPU Board, ISA-588LF, a fanless, low power consumption solution with the Intel® Atom™ processor.

Specially designed for fanless implementation in a wide range of temperatures (0o to 60o C), ISA-588LF integrates the latest Intel® Atom™ processor N270 at 1.6GHz and Mobile Intel® 945GSE Express chipset to deliver a high performance platform while exhibiting a low thermal design power (TDP) of less than 9 watts. The ISA-588LF supports up to 2GB of compact DDR2 (400 or 533mhz) SO-DIMM system memory in a single 200-pin slot and also includes an on-board DC-DC converter which supports both AT and ATX modes, configurable via an on-board switch. Additional features include 2 channel 18-bit LVDS for UXGA (1600x1200) support, 1 x IDE and 2 x SATA, 1 x Compact Flash (IDE), 1 x FDD, PC/104 for expansion, 2 Serial COM ports, 1 x GigaLan, and 4 x USB 2.0.

ISA-588LF is suitable for various low power consumption and fanless systems in traditional industrial and factory automation, medical equipment, test and measurement instruments, finance automation, telecommunication and security & surveillance applications. Moreover and most importantly, ISA-588LF provides a new platform to support existing legacy systems while reducing upgrade costs.



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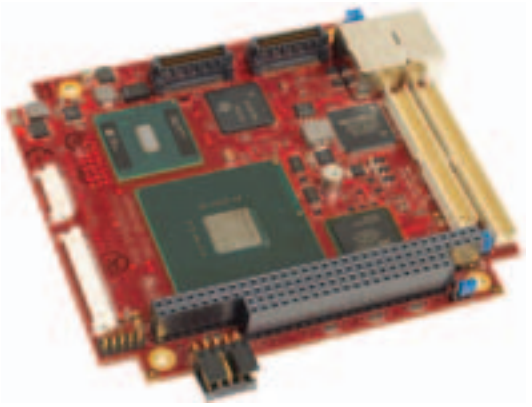
Ocelot (EPMs-21) Single Board Computer

The Ocelot is a rugged, compact SUMIT-104 (SUMIT-ISM) SBC built around the industry standard PC/104 footprint that leverages the high processing performance, low power consumption, and extended temperature range of the next generation Intel® Atom™ processor. With its small form factor, this tough SBC is designed for robust embedded industrial, medical, and military/aerospace applications requiring higher processing power, low power draw, a small footprint, and fanless operation over extended temperature ranges.

The synthesis of the Intel Atom processor, companion chipset, and SUMIT™ connector provide most of the Ocelot's features and on-board I/O: three x1 PCIe lanes, LPC, SPI, USB, and HD audio. The highly-integrated processor facilitates fast on-board transfers, high-speed memory access, and integrated high performance video with support for LVDS flat panel screens and analog displays (optional). Ocelot also features a SODIMM socket for up to 2 GB of DDR2; additional I/O including ISA, IDE, GbE and four COM ports; as well as an SPX interface.

Available in both standard (0° to +60°C) and extended (-40° to +85°C) temperature versions; the Ocelot is certified to MIL-STD-202G specifications. This SBC supports reliable field operation with TVS devices and fanless operation.



The Ocelot is compatible with most popular operating systems and features Phoenix Technologies field reprogrammable embedded BIOS®; ACPI 2.0 provides advanced power management features.

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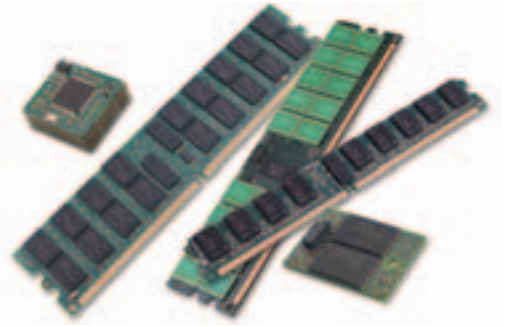

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I/O Is Key to Expanding SFF-Board Applications

By Robert A. Burckle, Vice President, WinSystems

Faster, smaller, cheaper, low power, and networked: That is the direction of embedded computers. With the Atom, Intel has made significant boosts to functionality and performance while minimizing power for its processor and chipsets. The initial success of these processors lies in the fact that they don't sacrifice processing performance in favor of lower electrical power and elaborate cooling solutions. With the addition of more real-world I/O interfaces, the number of embedded applications will continue to proliferate—especially in the areas of industrial control, transportation, security, communications, and military/commercial-off-the-shelf (COTS).

With the shortage of skilled, knowledgeable hardware and software engineers to work on an ever-growing number of embedded-systems projects, companies are rapidly moving from proprietary in-house designs to small-form-factor (SFF) boards as system components. The reason for this design-approach methodology is that a company can focus upon its core competency by emphasizing areas where they can add value rather than reinvent the computer hardware again and again. Choosing an SFF board as a building-block component increases reliability while getting the product to market quicker. At the same time, it leverages the vast software infrastructure supporting PCs. From a hardware perspective, I/O is an unheralded yet key element to interface each unique application to an off-the-shelf SFF-board solution.

Recognizing this I/O-centric design approach, a new industry-standards group called the Small Form Factor Special Interest Group (SFF-SIG) was formed in the fall of 2007. The group's philosophy is to embrace the latest technologies while maintaining legacy compatibility and enabling transition solutions to next-generation interfaces. Its goal is to charter a course to develop, adopt, and promote circuit-board specifications and related technologies that will help electronics equipment manufacturers and integrators reduce the overall size of their next-generation systems. Uniquely, the SFF-SIG separates interconnect technology from form-factor specifications. In doing so, it enables enormous flexibility in the design of products based on the SFF-SIG standards while ensuring interoperability.

In the first year of operation, the SFF-SIG introduced SUMIT, a board-to-board I/O interconnect standard for embedded systems using two 52-pin, high-density (0.025-in.-pitch) connectors. The SUMIT (pronounced "sum it") interface specification targets next-generation, low-power, expandable single-board computers (SBCs). It maps well to the new, single-chip chipsets from manufacturers of sub-10-W designs. At the same time, SUMIT closely follows the trend of replacing parallel interfaces with high-speed serial interfaces.

With a blend of high-bandwidth PCI Express lanes, Universal Serial Bus (USB) ports, and lower-speed multiplexed and serial buses, SUMIT can be added to a variety of board form factors. It also is flexible and compact enough to meet a very broad range of application requirements. Unifying the expansion interfaces of many SBC form factors has the potential to consolidate I/O ecosystems, which could improve economies of scale for I/O.

Next, the SFF-SIG introduced COMIT, which stands for Computer On Module Interconnect Technology. COMIT is aimed at SFF processor modules and baseboards leveraging the latest ultra-mobile and moderate power-processor/chipset combinations. This enabling technology allows the design of tiny processor modules to fit within the footprint of industry-standard SFF boards like EBX, EPIC, and PC/104 or any other standard or custom-designed baseboards.

COMIT is a high-speed, 240-pin connector system that supports the most common serial-I/O and legacy interfaces available from modern, low-power chipsets as designed by Intel with its Atom processor. This technology can be used to support different processors, as a single baseboard allows easy migration to future processors for performance/feature enhancement or obsolescence mitigation. The purpose is to provide a compact, stackable COM solution for future embedded-systems designs that are suitable for industrial environments using the newest low-power chipsets.

Embedded-systems designers are asking for simple, modular ways to implement emerging low-power, high-speed processors and their various I/O requirements without sacrificing packaging and legacy issues. Systems supporting SUMIT- and COMIT-based boards can develop stacking expansion-I/O modules using standard SFF technologies.

Robert A. Burckle is vice president of WinSystems, a designer and manufacturer of embedded computer hardware. He has over 30 years of electronics experience in the embedded market. Burckle has an MBA in marketing from North Texas State University and both a master and bachelor degree in electrical engineering from the University of Louisville.

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