DESIGN FREEDOM

COVER STORY
Design freedom with ARM modules

TQM28:
smallest ARM9 Module
(26mm x 40mm)
Broasted Overall Product Selection

Source: 2013 Design Engineer and Supplier Interface Study, Hearst Business Media Electronics Group

FIND CONTACT AND ORDERING INFORMATION FOR YOUR REGION AT DIGIKEY.COM/EUROPE

3 MILLION PARTS ONLINE | 650+ INDUSTRY-LEADING SUPPLIERS | 100% AUTHORIZED DISTRIBUTOR

* A shipping charge of €18.09 ($22.00) will be billed on all orders of less than €150.00 ($180.00). All orders are shipped via UPS for delivery within 1-3 days (dependent on final destination). No handling fees. All prices are in euro and British pound sterling. If excessive weight or volume circumstances require deviation from this charge, customers will be notified prior to shipping order. Digi-Key is an authorized distributor for all supplier partners. New product added daily. © 2013 Digi-Key Corporation, 791 Brooks Ave. South, Thief River Falls, MN 56701, USA
Dear Readers,

As always in August, the major section of the Boards & Solutions / ECE magazine are our “Yellow Pages” – the yearly European Embedded Companies Directory.

Yellow Pages 2013 Embedded Companies Directory

On more than 50 pages, our Companies Directory provides you with the contact details of companies serving the European embedded market. Each company is listed with logo, postal address, phone and fax number, e-mail and homepage.

The directory is structured into following product groups:

- Real Time Operating Systems
- Development Tools Software
- Development Tools Hardware
- Embedded Software
- Embedded Connectivity
- Micros & DSPs
- ASSPs & Memories
- PLDs, ASICs & EDA
- Analog & Power
- Embedded Computing
- SBCs, COTS & Busboards
- SFF Boards, COMs & Motherboards
- Industrial Computing & Displays
- Backplanes, Racks & Connectors
- Data Acquisition, T&M
- Engineering Services

The Directory starts on page 23.

Of course this issue contains not only the Yellow Pages, but also a couple of technical articles. The cover story talks about design freedom with ARM modules. ARM processors today almost reach the complexity of x86 processors. Meanwhile, processors are clocked at over 1 GHz, fast buses such as, among others, the PCI Express are the rule and a DDR3 memory is almost always used. Most manufacturers still support circuit design using appropriate reference designs, but the user has to rely on his own ability during layout. The reference designs are mostly created „quick and dirty.” Since the user relies on someone else’s know-how, it’s all the more important to select the right module provider to avoid nasty surprises later. So when deciding, it pays first of all to thoroughly question what the proffered module actually delivers in terms of future development security. Read more at page 6.

The article starting on page 10 introduces Rutronik’s new established Internet-based distribution organization. The German distributor has created Rutronik24, a new Internet-based E-Commerce distribution organisation which especially addresses the needs of small and midsized companies.

Yours sincerely
Jürgen Hübner
(Publisher)
Cover Story:

Design freedom with ARM modules  PAGE 6

The ARM module market continues to gain momentum. The number of applications in which an ARM processor is used is also climbing steadily. Therefore the decision about the right module (provider) is difficult to make. Pure marketing arguments often intermingle with technical facts here.

Rutronik establishes new Internet-based distribution organisation  PAGE 10

German Distributor Rutronik has created Rutronik24, a new Internet-based E-Commerce distribution organisation which especially addresses the needs of small and mid-sized companies. General Manager Thomas Rudel explains the concept behind this new distribution channel.

Embedded virtualization and cyber security for industrial automation  PAGE 14

Industrial controllers and HMIs mostly lack protective functions for their IT and network security. Upstream security appliances with dedicated hardware could provide an add-on solution. But cost pressure and the ever-increasing processing power of CPUs result in a demand for hardware consolidation, meaning virtualization is about to make inroads into industrial automation.

Yellow Pages 2013  PAGE 23

On more than 50 pages, our Companies Directory provides you with the contact details of companies serving the European embedded market. Each company is listed with logo, postal address, phone and fax number, e-mail and homepage.

Cover Photo

TQ Group
SAFE
RELIABLE
SECURE

TRUSTED SOFTWARE FOR EMBEDDED DEVICES

For more than 30 years the world’s leading companies have trusted Green Hills Software’s secure and reliable high performance software for safety and security critical applications.

From avionics and automotive, through telecoms and medical, to industrial and smart energy, Green Hills Software has been delivering proven and secure underpinning technology.

To find out how the world’s most secure and reliable operating systems and development software can take the risk out of your next project, visit www.ghs.com/s4e
Design freedom with ARM modules

By Wolfgang Heinz-Fischer, TQ-Group

The ARM module market continues to gain momentum. The number of applications in which an ARM processor is used is also climbing steadily. Therefore the decision about the right module (provider) is difficult to make. Pure marketing arguments often intermingle with technical facts here.

ARM processors today almost reach the complexity of x86 processors. Meanwhile, processors are clocked at over 1 GHz, fast buses such as, among others, the PCI Express are the rule and a DDR3 memory is almost always used. In addition, the processor’s complete control requires a variety of voltages and a comprehensive sequencing of deep technological skills both in circuit design and in layout.

Most manufacturers still support circuit design using appropriate reference designs, but the user has to rely on his own ability during layout. The reference designs are mostly created “quick and dirty.” They certainly work as a rule, but they leave much to be desired when it comes to industrial fitness. Nor is the long-term availability of every component in the reference design necessarily checked for obsolescence. Since the processor isn’t usually the user’s core competence, relying on a module right away to get his product to market faster and safer is obvious.

Since the user relies on someone else’s know-how, it’s all the more important to select the right module provider to avoid nasty surprises later. So when deciding, it pays first of all to thoroughly question what the proffered module actually delivers in terms of future development security. Following introduction of ARM Cortex™-A9 processors, which penetrated into the application area of an x86 processor, just about every module provider, even providers who only offered x86 modules, now offer corresponding modules. As is usual in the x86 world, initial standards for ARM modules have been introduced in the market. Although the term „standard” is used here in a partly very inflationary way, it awakens hope in the users that a standard is finally coming now in the ARM module market. The users’ expectations for a standard, and standard-module providers’ reasoning, involves greater supply security through the compatibility of different manufacturer’s modules, and thus the corresponding “second source,” or through their interchangeability.

The idea is that if the provider fails for whatever reason, the second source can be switched to without any problem. Amazingly, for reasons of cost and time, very few users employ appropriate compatibility tests to check actual interchangeability. They generally rely on the providers’ marketing claims instead. Although that works mostly without any problem in the x86 world, or with just a few adjustment steps, you quickly get a rude awakening in the ARM world. Details will be highlighted in this article.

System scalability is a further argument from x86-world standards. In the PC world, everybody knows his PC’s possible upgrade paths with the next generation of processors, as long as they fit into the same socket. The COM Express standard from the embedded market apparently offers much greater scalability here from ATOM up to i7 processors.

<table>
<thead>
<tr>
<th>Function 1</th>
<th>Function 2</th>
<th>Function 3</th>
<th>Function 4</th>
<th>Function 5</th>
<th>Function 6</th>
<th>Function 7</th>
<th>Function 8</th>
<th>Function 9</th>
<th>Function 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI Express</td>
<td>SATA</td>
<td>Ethernet</td>
<td>USB</td>
<td>CAN</td>
<td>LVDS</td>
<td>Parallel</td>
<td>Function 3</td>
<td>Function 4</td>
<td>Function 5</td>
</tr>
<tr>
<td>1,5 Gbit/s</td>
<td>1,0 Gbit/s</td>
<td>1,0 Gbit/s</td>
<td>2,0 Gbit/s</td>
<td>2,0 Gbit/s</td>
<td>1,0 Gbit/s</td>
<td>2,0 Gbit/s</td>
<td>1,0 Gbit/s</td>
<td>2,0 Gbit/s</td>
<td>1,0 Gbit/s</td>
</tr>
</tbody>
</table>

Functions comparison

The ARM module market continues to gain momentum. The number of applications in which an ARM processor is used is also climbing steadily. Therefore the decision about the right module (provider) is difficult to make. Pure marketing arguments often intermingle with technical facts here.

ARM processors today almost reach the complexity of x86 processors. Meanwhile, processors are clocked at over 1 GHz, fast buses such as, among others, the PCI Express are the rule and a DDR3 memory is almost always used. In addition, the processor’s complete control requires a variety of voltages and a comprehensive sequencing of deep technological skills both in circuit design and in layout.

Most manufacturers still support circuit design using appropriate reference designs, but the user has to rely on his own ability during layout. The reference designs are mostly created “quick and dirty.” They certainly work as a rule, but they leave much to be desired when it comes to industrial fitness. Nor is the long-term availability of every component in the reference design necessarily checked for obsolescence. Since the processor isn’t usually the user’s core competence, relying on a module right away to get his product to market faster and safer is obvious.

Since the user relies on someone else’s know-how, it’s all the more important to select the right module provider to avoid nasty surprises later. So when deciding, it pays first of all to thoroughly question what the proffered module actually delivers in terms of future development security. Following introduction of ARM Cortex™-A9 processors, which penetrated into the application area of an x86 processor, just about every module provider, even providers who only offered x86 modules, now offer corresponding modules. As is usual in the x86 world, initial standards for ARM modules have been introduced in the market. Although the term „standard” is used here in a partly very inflationary way, it awakens hope in the users that a standard is finally coming now in the ARM module market. The users’ expectations for a standard, and standard-module providers’ reasoning, involves greater supply security through the compatibility of different manufacturer’s modules, and thus the corresponding “second source,” or through their interchangeability.

The idea is that if the provider fails for whatever reason, the second source can be switched to without any problem. Amazingly, for reasons of cost and time, very few users employ appropriate compatibility tests to check actual interchangeability. They generally rely on the providers’ marketing claims instead. Although that works mostly without any problem in the x86 world, or with just a few adjustment steps, you quickly get a rude awakening in the ARM world. Details will be highlighted in this article.

System scalability is a further argument from x86-world standards. In the PC world, everybody knows his PC’s possible upgrade paths with the next generation of processors, as long as they fit into the same socket. The COM Express standard from the embedded market apparently offers much greater scalability here from ATOM up to i7 processors.
The Reliable, Flexible and Available VPX Solution

Continued Innovation in COTS and Customized Rugged Defense Platform

VPX3000
Rugged 3U VPX Intel® 3rd Generation Core™ i7 Processor Blade

- Conduction cooled with conformal coating
- Compliant to VITA 46, 48 and 65
- Quad-core on-board ECC memory, XMC expansion

©2013 ADLINK Technology, Inc. All specifications are subject to change without further notice. All products and company names listed are trademarks or trade names of their respective companies.
Import drivers and it runs—mostly anyway. Here too, you have to pay attention to the subtle difference. So for example, 24 Express lanes are specified with COM Express spec 2.0 for the version 2 implementation. A module populated with an Intel® Atom™ N2600/N2800/D2550 processor and NM10 chipset delivers twice PCIe x1. A different module populated with an embedded Intel® Core™ i7/i5/i3 processor and QM67 chipset offers five times PCIe x1. This shows the limitations of standards already introduced in this area a long time ago.

Amazingly, the two leading groups in the x86 module market view the conversion to ARM technology in completely different ways. The Qseven group argues for a seamless transition from vx86 to ARM, thus logically the same standard for x86 as for ARM modules. On the other hand, the SMARC faction sees the need for independent x86 and ARM standards because an ARM processor’s special functions can’t reasonably be mapped to an x86 standard. Actually you’d have to assume that a universal standard would suggest itself, meaning that a unified solution would be defined. The user converting from x86 to ARM quickly realizes that there’s a further serious difference and difficulty. When installing an x86 system, you just select the corresponding driver from the chip manufacturer’s existing libraries and the application runs right away.

Thus the conversion from one system, meaning the scalability or the use of a second source, is more of a logistical task than a technological challenge. The world looks completely different with ARM modules. There’s an individual driver for each processor and for each function. As a rule, the former doesn’t exist as a freely available library, certainly not from the chip manufacturer. That clearly shows the increased demand on the module manufacturer to make suitable drivers available. There aren’t any standards at all in this area. In other words, interchangeability among various manufacturers and different modules from a single manufacturer isn’t possible right off the bat.

But a look at the hardware is also extremely decisive. Anyway, a detailed comparison helps to arrive at a safe decision. The question is which functions in a module are implemented by different providers and also with various processors. In other words, where the actual exchange possibilities are, and which processor functions aren’t available because the corresponding signal pins aren’t defined in the standard and thus aren’t available on the system connector. How much design freedom does the user have with the module?

The more overlap among the functions that each module provider and each processor delivers, the greater the actual interchangeability. But what about processor functions not reflected in the standard? If these are needed in future projects, does it mean that the user will have to change module providers? In any case, it pays to create a detailed list of functions to get clear about which systems fit your particular application, what interchangeability opportunities exist, and what future needs are also mapped with the module. The table shown might be a possible work aid.

It quickly becomes clear that having a perfect standard is still a dream at the moment when you consider the standards for ARM modules currently being propagated in the market. The restrictions and compromises with respect to complete interchangeability and restricted access to all processor functions actually make the products proprietary systems lacking scalability and second-source capability. This is true unless the requirements limit themselves to the functions’ lowest common denominator.

On the other hand, TQ modules are generally optimized for the processor being used. As a rule, this enables a consistently more compact form factor. All of the processor’s functions are available on the robust, industry-capable system connector. Nor does it make any difference to the use whether he integrates the processor into his application board or uses a TQ module, naturally apart from a module’s general usefulness. Such a module offers the user the greatest possible design freedom under the aspect of the longest possible usage period for a processor platform.

Which system is reasonable for the user is always a very individual decision. Proprietary systems have the advantage if size plays a critical role and if the specific processor’s functions are important. The connector system used plays an important role if shock and vibration requirements are decisive. If a Q7- or COM-Express module was previously in use, and if the new system should use just a little power, then a Q7 or SMARC is the right decision.

In any case the user has to be clear that a direct interchange between existing x86 and ARM solutions isn’t possible without adjustments. And as a rule, the application board will have to be optimized and overhauled along with it at the same time. Thus having mechanical interchangeability isn’t so decisive. It seems more important to have design freedom to optimize and adjust optimally to one’s application.
Kontron: COM eases implementation of 4th gen i7/i5/i3 into individual application platforms

Kontron has launched the COM Express basic Computer-on-Module COMe-bHL6 that accelerates and eases the implementation of 4th generation Intel Core i7/i5/i3 and Celeron processors into individual application platforms. Up to three independent, daisy-chained displays with up to 4K resolution are supported to create stunning user experiences.

News ID 17369

DAVE: SO-DIMM sized CPU module with ARM Cortex-A8 processor

Dave launched on the market Diva, the new CPU module in SO-DIMM form factor based on the "Sitara" AM335x microprocessor from Texas Instruments. Diva is an ARM Cortex-A8 CPU module of the Lite line, and it offers great computational power and high flexibility, thanks to the rich set of dedicated co-processors (NEON Media Technology, PowerVR SGX 530 3D accelerator, PRU-ICSS subsystem, Crypto accelerator), in a standard SO-DIMM 204-pin form factor. Other standing out features are the extended power supply range [3.6 - 5.3]V, up to 512 MB of DDR3 SDRAM, on-board NAND and NOR flash memory, support for high-resolution displays and industrial specification compliance (including the extended operating temperature range from -40 to +85°C).

News ID 17443

Avalue: low-power Qseven module with AMD G-series

Avalue Technology is unveiling EQM-A30M Qseven Module which is powered by the AMD G-series T40E or T46R CPU with extremely low power consumption and high graphic performance. The AMD Embedded G-Series platform is the world’s first low power CPU and advanced GPU integrated into a single embedded Accelerated Processing Unit (APU), building a new foundation for high performance multimedia content delivery in a small form factor and a power efficient platform for a variety of embedded designs.

News ID 17414

Advantech: COM Express Basic module with 3rd gen Intel Core processor with PCH

Advantech has presented SOM-9890 — a COM Express Basic module supporting the latest 3rd generation Intel Core processor (PGA Type). SOM-9890 offers high performance and outstanding graphics capabilities, and featuring three independent multiple display combinations, abundant high speed I/Os and extensible interfaces up to PCIe x16 Gen 3. SOM-9890 is an ideal solution for applications such as medical, gaming, telecom, and digital signage.

News ID 17469

MSC: COM Express type 6 modules with Celeron CPUs

MSC has expanded its high-end MSC C6B-7S COM Express Type 6 module family. MSC offers C6B-7S modules with three different Celeron processors and integrated Intel HD Graphics: The Intel Celeron CPU 1047UE with 1.4 GHz has two cores and 2 MB cache. The single-core Intel Celeron 927UE (1.5 GHz) integrates 1 MB cache. Both processors have a thermal dissipation power (TDP) of 17 W. The cost-efficient dual-core Intel Celeron processor 1020E is clocked with 2.20 GHz and has 2 MB cache.

News ID 17459

congatec: ARM on Qseven design support package for Freescale i.MX 6

congatec announces a complete Qseven support package for easy integration of Freescale Semiconductor i.MX 6 series processors into ARM-based designs. In addition congatec offers a Qseven Starter Kit, expanded software support with Adeneo for Windows Embedded Compact 7, Linux board support package (BSP) plus a congatec tablet PC demonstrator.

News ID 17356

Artila: palm size Linux ready box computer

Artila Electronics releases the Matrix-505 ARM9 Linux ready computer, powered by Atmel AT91SAM9G45 400MHz SoC with 128MB DDR2 SDRAM and 128 NAND Flash. A fault resilient booting function is implemented using a backup Linux file system in the DataFlash which will automatically boot Matrix-505 in case the primary NAND Flash fails. The Matrix-505 integrates two 10/100 Mbps Ethernet, four high speed RS-232/485 serial ports, two USB hosts and a microSD socket into a palm size metal box. The DIN-Rail and wall-mounting capability also make Matrix-505’s onsite installation flexible.

News ID 17451

Schroff: small industrial subracks for control cabinets

For small measurement, control and instrumentation units that are built into control cabinets along with a PLC controller, Pentair has developed a compact Schroff industrial subrack. This is based on the established europacPRO platform of 19” subracks and is 3 U high, 205 mm deep and just 28 HP wide.

News ID 17467

DATA MODUL: passive cooled 3.5” board with Intel Atom N2600 / N2800 / D2550

With the MS-9896 DATA MODUL introduces a new, passive cooled 3.5” embedded board with Intel Atom N2600 / N2800 / D2550 processors and Intel NM10 Express chipset. Along VGA and HDMI the MS-9896 has two independent LVDS interfaces (LVD51: Single Channel 18/24 Bit, LVD52: Dual Channel 24 Bit). The following dual display configurations are possible CRT+LVD5, CRT+HDMI, HDMI+LVD5, LVD51+LVD52.

News ID 17321
The market for traditional distribution of electronic components remains static and therefore you have to create new markets to gain new growth. Rutronik saw the small and midsized companies in Germany as new customers who were not covered by distributors in the past – their business volumes were too small for traditional distribution. Building on experience with Webg@te, the website for existing customers, the distributor created Rutronik24 which offers efficient online component ordering.

Especially for this new distribution channel, Rutronik established 30 new jobs – 20 field staff and 10 desk staff, to support the new customers. Via Rutronik24 E-commerce platform, customers gain access to the entire product portfolio. In addition to the product catalogue with various search functions, the platform includes many further functions. Rudel highlights the complete order tracking and the mass quotation tool, which allows the potential customer to simply download a complete bill of materials – the Rutronik24 E-commerce platform automatically submits an individual quote. “We realised that even customers with small and midsized volumes require comprehensive support. Moreover we want to offer them the advantages of an Internet link to the distributor”, he stated. The new distribution concept now combines the added value of online ordering and individual service.

This offers significant advantages to customers. First they are able to satisfy their demand from a one-stop-shop which includes comprehensive support and individual advice by the Rutronik24 sales team. The traditional sales concept was not able to satisfy the needs of small and midsized companies so well as large enterprises with small electronic component demand. The Rutronik24 E-commerce platform gains access to more than one million products. Therefore it is paramount to guide the customer through the product portfolio. Thanks to intelligent search functions via parameters, part numbers or full-text search, the needed components are quickly found. The product group is displayed including the actual customer-specific prices as well as the availability. If the customer places an order he or she receives immediately the scheduled delivery date including the forwarding expenses according to the selected mode of shipment. The ordered products can be tracked via mouse click in real time and the payment is possible via credit card or on account. Additionally there is the possibility of requesting quotations or ordering samples.

The system recommends alternative products including a list of differing parameters, which are helpful i.e. for obsolete products or very long delivery times. Existing PCN (product change notifications) are always visible at the product. The integrated Rutronik Product Consultant supports on request the component selection, and even contact with the personal product manager is possible via the Rutronik24 E-commerce platform. In the procurement section the customer can see details of his/her order, contract, goods, and inventory amongst other things including order number and status, requested and scheduled delivery date, and order tracking in real time.

To become a customer in the Rutronik24 E-commerce platform you have to go through seven steps. First step is registration. You have to fill in a form. After successful registration you will receive an individual password to your e-mail address. Here you can additionally subscribe to the newsletter, which will keep you informed about current news. Step 2 is checking your personal data and password. After registration and checking you’ll get access to the home page of Rutronik24. This page displays six various modules of the catalogue, PCN, print media, procurement, mass quotation and downloads. It also offers simplified access to the catalogue and enables the search for components and product groups. Already delivered products are displayed after typing in the item number. The catalogue offers the possibility to search for requested items via different ways. Products are classified into active and passive components, electromechan-
Thomas Rudel: “Our E-commerce tool Rutronik24 enables us to satisfy the needs of customers who demand high quality components in low volumes. This was not possible without Internet.”

LDRA: integration with Lauterbach TRACE32 debugger and simulator
LDRA has integrated the LDRA tool suite with the Lauterbach TRACE32 Debugger and Simulator. Lauterbach’s hardware-assisted debug tools ease the interface to the embedded device, enabling developers to download and fully test an application on the target. Thanks to the interface, rigorous safety-critical testing and certification—a traditionally time-intensive, manual process—is automated, enabling a broad range of microcontroller and processor-based applications to achieve medical (IEC 62304), industrial safety (IEC 61508), automotive (ISO 26262) and avionics (DO-178B/C) compliance. An extension to the LDRA tool suite uses the TRACE32 Debugger to download the code.

News ID 17332

TI helps to kickstart Internet of Things development
To help kickstart the development of Wi-Fi-enabled Internet of Things (IoT) applications, Texas Instruments announced the SimpleLink Wi-Fi CC3000 BoosterPack. The new Wi-Fi BoosterPack is powered by the SimpleLink Wi-Fi CC3000 module from TI, which offers simplified Wi-Fi connectivity for microcontroller (MCU) -based systems. Working with both the MSP430 and Tiva C Series MCU LaunchPad evaluation kits, the CC3000 BoosterPack (CC3000BOOST) quickly gets designs started for a wide variety of MCU-based home automation, health and fitness and machine to machine (M2M) applications.

News ID 17390

Product News

11 July 2013
Hypervisor evolution enables safe and secure virtualization platforms

By Will Keegan, LynuxWorks

Type-2 hypervisors are computer emulation applications that run on general purpose operating systems. A Type-2 hypervisor allows users to run multiple operating systems (OSs) simultaneously on a single platform. For example, a Windows 7 user can install a hypervisor application like VMware Workstation, to run a Windows XP guest OS on top of their Windows 7 host OS. As an application the Type-2 hypervisor is subject to performance, security, and reliability penalties. The hosted hypervisor incurs performance hits because it competes with other user applications like web browsers and e-mail clients for system resources. Type-2 hypervisors are weak in reliability and security because they inherit the vulnerabilities of the user-controlled host operating system.

Type-1 hypervisors are computer emulation software tightly integrated with embedded OSs that run transparently to the end-user. Type-1 hypervisors gain a significant performance improvement over Type-2 hypervisors because they are self-hosted with embedded OSs that are optimized for virtualization. Type-1 hypervisors significantly reduce the attack-surface over Type-2 hypervisors by limiting access to the hypervisor to only system administrators, preventing end-users and user applications from tampering with the hypervisor. Additionally Type-1 hypervisor vendors control all the software that comprise the hypervisor package including the virtualization functions and OS functions, like device drivers and I/O stacks. Control over the software package prevents malicious software from being introduced into the hypervisor foundation. The limited access and strong control over the embedded OS greatly increase the reliability of Type-1 hypervisors.

LynuxWorks introduces LynxSecure as a new class of hypervisor Type Zero, based on a new architecture that allows for higher levels of performance, reliability, and security over Type-1 hypervisors. The Type Zero hypervisor is built from the ground up with the minimum software components required to fully virtualize guest OSs and control information flow between guest OSs. The Type Zero architecture removes the need for an embedded host OS to support virtualization, allowing the hypervisor to run in an unhosted environment. This drastically differs from Type-1 monolithic architectures where the hypervisor is integrated into a host OS, or Type-1 microkernel architectures where the hypervisor is controlled and assisted by a root or parent operating system. LynxSecure runs on a variety of computing platforms including servers, desktops, and laptops. It hosts guest OSs in both headless (no-display) and local display modes to suit the needs of several cloud environments and client end-user environments. The Type Zero hypervisor offers increased levels of performance by scheduling the execution of guest OSs on CPU cores with an extremely light weight scheduler. It also gives guest OSs direct control over physical devices to achieve native I/O performance, and gives guest OSs the ability to intercommunicate over high speed point-to-point communication channels. LynxSecure is designed to meet the highest level of reliability requirements for aerospace, medical, military, and business applications. To achieve high reliability the hypervisor runs as a stateless executable with minimal dynamic functionality for a stable foundation, uses a real-time scheduler to precisely guarantee the availability of all guest OSs, and provides advanced built-in auditing and health monitoring capabilities to continuously monitor the operation of critical systems.

www.embedded-control-europe.com/newsletter
SAFETY & SECURITY

hardware and software components. LynxSecure provides greater security over Type-1 hypervisors by moving non-essential privileged components out of the hypervisor core, such as device drivers and I/O stacks, to reduce the system attack surface. Additionally, LynxSecure enhances security with management and configuration tools that run outside the hypervisor to give administrators the ability to construct flexible security designs to explicitly control and monitor how the virtual guest OSs access data via virtual and physical devices. The last ten years have shown a trend in hypervisor design evolution where each stage of evolution shows progress towards shrinking and simplifying the core foundation of hypervisors to improve performance, reliability, and security. The transition from Type-2 to Type-1 shows the hypervisor shift from running as an application on a general purpose OS to being tightly integrated with a minimized host OS. The transition from Type-1 to Type Zero shows the decoupling of the integrated hypervisor from the supporting host OS to running stand-alone. The LynxSecure Type Zero hypervisor distills the trusted portions of the hypervisor down to the fundamental elements, and provides the development tools necessary to build custom high-performance, safe and secure virtualization platforms.

Figure 2. Block diagram of a Type-2 hypervisor

Figure 3. Block diagram of a Type-1 hypervisor
Embedded virtualization and cyber security for industrial automation

By Torsten Rössel, Innominare

The networking of machinery and equipment results in new options for the IT integration of processes, not only for remote services across wide area connections but also in new challenges in the area of cyber security. Solutions with dedicated security devices are advantageous in that they physically separate the actual functionality of a system from its protective security measures, avoiding mutual side-effects and allowing independent development of both by respective specialists. Yet their deployment often fails due to the additional hardware needs and cost restrictions. At the same time, the price-performance ratio of processors, memory, and peripheral components keeps constantly improving (Moore’s law). This gives rise to a shift from specialized hardware to software functions on a common platform, limited by the necessary degree of modularization to cope with technical risks and enable the integration of subsystems from different suppliers. Virtualization is the key to combine the cost savings of advanced hardware consolidation with such a modular design. This leads to the concept of virtual security appliances for industrial automation.

Virtualization of both client and server systems is state-of-the-art technology in enterprise IT today. Typically, the virtual systems are operated on a server farm in the network. The provision and coordinated operation of multiple virtual machines on a shared hardware are effected by a layer of software called hypervisor or virtual machine manager. Two types of hypervisors and two approaches to virtualization are usually distinguished. Type 1 hypervisors run directly on the bare hardware and only coordinate the available hardware resources. Type 2 hypervisors run as applications in a host system. The achievable performance is reduced by the additional operating system layer.

The hardware virtualization approach presents each original guest system with a complete (simulated) computer of its own. The unmodified guest system is run with its own time-slice scheduler not being aware of the virtualized environment which typically prevents real-time capability. Depending on platform and implementation, the guest system may have direct access to (parts of) the underlying hardware components. Other components may be completely simulated, requiring a fairly complex hypervisor or a hardware platform with virtualization support. Guest system performance can be equivalent to a stand-alone system as long as no I/O operations are performed via simulated components.

Under the para-virtualization approach in contrast, the guest systems need to be modified for better cooperation with the respective hypervisor. Time-slice and memory management can be more tightly integrated and real-time capability thus be achieved. The internal communication between guest systems or guest system and hypervisor is carried out through efficient specialized interfaces.

In industrial automation and control however, the requirements are different from those in enterprise IT. The systems deployed here run on dedicated hardware with little or no operator intervention. Controller components typically have real-time requirements whereas human-machine interfaces (HMIs) are mostly applications on a Windows operating system. In this environment, embedded virtualization taking a hybrid approach and combining native Windows installations with additional unmodified guest systems on a thoroughly partitioned multi-core PC platform with virtualization support is of particular value.

Under the HyperSecured concept developed by Innominare, automation components such as an HMI or controller and a virtual mGuard security appliance are integrated onto a single hardware by means of an embedded virtual machine manager. This provides the automation components with all the benefits of an upstream security appliance at reduced hardware cost. The automation components can thus be efficiently protected from unauthorized access and malware attacks. With their Hyper-
Secured IPC, technology partners Innominate and TenAsys showcase a joint solution to demonstrate that embedded virtualization and cyber security are ready for production use. TenAsys eVM for Windows embedded virtual machine manager is used to integrate an original Windows operating system with a virtual mGuard security appliance on a standard industrial PC.

Network communication between the Windows system and the external environment has to pass through and is controlled by the virtual mGuard security appliance which provides firewall, virtual private network (VPN), and integrity monitoring services to the PC system. The internal communication between the Windows system and the security appliance is done through a virtual Ethernet interface. The hardware used for the exhibit is an off-the-shelf ValueLine IPC from Innominate parent company Phoenix Contact featuring an Intel Core 2 Duo CPU with VT-x support, 2 GB RAM, and dual Gigabit Ethernet ports.

The TenAsys eVM embedded virtual machine manager is a very compact package installed and administered through Windows. It partitions the CPU into two cores and system domains for Windows and the mGuard guest system. Both Windows and the mGuard guest system boot natively, exactly as if they were running stand-alone. Peripheral components, in particular the Ethernet interface, are exclusively assigned to one of the systems.

Thanks to TenAsys eVM, no para-virtualization and modification of the mGuard system is necessary on Intel platforms with VT-d support. The original Linux-based mGuard firmware image runs on a dedicated core of the shared x86 CPU. The virtual mGuard ensures comprehensive protection of the PC network communication, as the physical Ethernet interface to the external environment is exclusively assigned to it. Its DoS protection against denial-of-service attacks will be effective, too, thanks to this direct hardware control: even in an extreme case, only the virtual security appliance could be overloaded and external network packets get delayed or dropped. Due to the strict partitioning of the CPU cores and system domains this will not affect the Windows partition or potential other guest systems. Access to the PC and its Windows system will be blocked by the mGuard firewall unless authorized by a general static or user-specific dynamic firewall rule. Integrated virtual private network (VPN) functionality enables secure remote access with authentication and encryption. VPN tunnels are terminated by the virtual mGuard®, the Windows system gets to see regular IP communication only.

Virtualization with an appropriate embedded virtual machine manager enables trendsetting consolidation of industrial automation and cyber security functions onto a cost-optimized hardware, preserving the modular design and benefits of dedicated devices. The HyperSecured solution as presented is not generally limited to just one protected Windows system. It will be possible to use additional CPU cores with their own native guest systems including real-time operating systems and controllers.
Video image signal processing (ISP) has come a long way from the time of analog signals. Today, digital signal processing makes possible image data manipulation at the bit level, offering unprecedented control over image quality. Digital signal processing, of course, is not the same as a digital signal processor, or DSP. While DSP has been popular for video image signal processing in the digital domain, ISP can be implemented by a number of processing devices: DSPs, ASICs, ASSPs and, increasingly, field programmable gate arrays, or FPGAs.

There are several reasons for the growing popularity of FPGAs. Two of those reasons reflect recent trends in security cameras that dramatically increase the quantity of image data that needs to be processed, and the third is an economic reason – the cost of the camera bill of materials (BOM). There are two major trends that are changing the way security cameras are architected: the advent of megapixel sensors, and the need for higher resolution for video analytics (VA) to be able to discern general movement in restricted and/or large areas, e.g. a parking lot is at capacity. A camera needs approximately 30 pixels/in for license plate recognition, and approximately 150 pixels/in to view more detailed activity, such as identifying cash register transactions. One megapixel covers the detail in a seven foot by seven foot area, and it would take four VGA cameras to match the power of a one megapixel camera. Obviously, as the number of pixels has increased, so too has the amount of data that must be processed to take advantage of the increased resolution.

High dynamic range (HDR) also known as wide dynamic range (WDR), measures how well the sensor and the ISP function see into both dark and brightly lit areas. We are all familiar with amateur outdoor family pictures taken with the sun behind the people in the photograph. While the landscape bathed in sunlight is bright and clear, people faces are quite dark. This happens because the (usually automatic) camera adjusts its exposure to the bright sunlight in the scene. That exposure, however, is too short to properly register the darker objects. If one manually sets the exposure or aperture to let in more light, one will be able to discern detail in the dark areas, but at the expense of detail in the bright areas, which now are overexposed and completely washed out.

This is not a good result for either human operators or for VA software, since much of the detail in the region of interest is lost. HDR sensors solve this problem in creative ways, all of which depend on capturing multiple images, each with different exposure times, and then having the ISP pipeline combine and blend these images to preserve and render visible detail from both bright and dark areas in the region of interest.

This article shows that low-cost, low-power FPGAs are suited to take on the enormously increased signal processing load caused by the need to use megapixel sensors and HDR in video cameras for security and surveillance.
EMBEDDED DESIGN

or 180 frames per second. A megapixel sensor and HDR combine to dramatically increase the processing load of the ISP pipeline. DSP devices, being sequential engines by nature, struggle to keep up with this tremendous data processing load. It may still be possible to process the data in our example of a 1080p60 HDR pipeline in high-end DSPs, but with cost and power consumption that is prohibitive and commercially unviable. FPGAs, due to their inherent parallelism, are ideally suited to take on the increased load of high definition, high dynamic range image signal processing.

In addition to providing high performance at very low power and cost, FPGAs are by definition programmable, which offers significant advantages over ASICs and ASSPs. ASICs are extremely expensive to design and build and, once built, cannot be altered. ASSP-based camera designs can be feature-limited by what is already baked into the standard parts, which are impossible to modify. In fact, several DSP and other ASSP devices in the video image signal processing market need an FPGA bridge between the sensor and the standard part in order to accommodate new serial interfaces that sensor manufacturers are using in order to get megapixel data off their sensors. With an FPGA-based implementation, camera manufacturers can take advantage of programmability to quickly adapt their designs to new sensors and technologies, or rapidly modify their ISP algorithms. In order to implement ISP with HDR in an FPGA, one must implement, at a minimum, the ISP blocks in the image signal processing pipeline shown in figure 1. The following ISP blocks are required:

- Sensor port, with auto black level correction: this is required to detect and configure the image sensor registers and capture image data.
- Black level correction: each color channel has a time-dependent offset. Color processing requires linear signal behavior, so all signals must be without any offset. CMOS image sensors have so-called dark rows output to measure this average offset for each color channel. Black level correction subtracts color channel-specific, line-dependent base noise to achieve an optimal black level result.
- Automatic exposure: the purpose of the automatic exposure block is to constantly adjust exposure to adapt to changing light conditions in real time. Linearization: the Aptina MT9M024/34 HDR sensor, for example, outputs 20 bits of information per color channel. In order to minimize the number of physical lines coming out of the sensor, Aptina uses a clever compression scheme to compress this data to 12 bits. Linearization is the process of decompressing this 12 bit data to recover the original 20 bits. Defective pixel correction: dead or hot pixels present in the sensor due to manufacturing processes are corrected with the defective pixel correction block. This block corrects the defective pixel with interpolated values based on neighboring pixels of the same color channel. Typical correction methods include detection of cold or hot pixels using either median or averaging estimation on the immediate pixel neighborhood.
- 2-D Noise Reduction: apart from cold and hot pixels, sensor pixels can randomly be noisy from frame to frame. This means that they output either too much or too little intensity in comparison with neighboring pixels. 2D noise reduction corrects for noisy pixels with interpolated values based on neighboring pixels of the same color channel, in much the same way that the defective pixel correction block does. De-Bayering (color filter array interpolation): each pixel on the sensor has a so-called Bayer filter with one of three colors: red, green or blue. Two-thirds of the color data is, therefore, missing from each, and the resulting image is a mosaic of the three colors. To obtain a full-color image, various de-mosaic algorithms are used to interpolate a set of complete red, green, and blue values for each pixel.
- Color correction matrix (CCM): image sensors often provide incorrect color rendition due to so-called cross-color effects that result from signal cross-talk between pixels. This effect leads to wrong color images (e.g. green with too much blue). Color correction involves complex matrix multiplication of pixel data to achieve clean colors.

![Figure 1. HDR Processed Image: no blackout of areas behind powerful flashlight shining directly into lens from a distance of 10 inches](image)

Table 1. FPGA resource usage for ISP pipeline in Lattice ECP3-35 FPGA

<table>
<thead>
<tr>
<th>ISP Block</th>
<th>LUT</th>
<th>EBR 18Kbit</th>
<th>18x18 Multip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Port with Auto Black Level Correction</td>
<td>1935</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearization 12:20</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>De-Bayering 5 x 5 IQ</td>
<td>1599</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Color Correction Matrix (CCM)</td>
<td>1712</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Statistics Engine</td>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fast Auto Exposure (AE)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Auto White Balance &amp; Saturation Control (AWB)</td>
<td>2167</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>High Dynamic Range (HDR)</td>
<td>1612</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Gamma Correction</td>
<td>650</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Overlay of Logo</td>
<td>336</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Lattice Mico 32</td>
<td>1800</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>PIC Master</td>
<td>132</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lattice HDMI PHY</td>
<td>276</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>16198</td>
<td>66</td>
<td>49</td>
</tr>
</tbody>
</table>

Percentage ECP3-35 Resources Used: 49.08% 91.67% 76.56%
Automatic white balance (AWB): sensors are not good at recognizing colors. AWB adjusts other colors in an image with reference to an inferred white color in the image through a so-called grey world algorithm. AWB determines white by examining the frequency (therefore wavelength) of incoming light, and renders the image with natural colors.

Gamma correction: sensor pixels react to the intensity of incoming light in a linear way. In order to provide pixel data to common video systems, such as a CRT tube with logarithmic response, conversion to a non-linear value encoding may be needed. Gamma correction provides this conversion.

High / wide dynamic range (HDR/WDR) processing: this is the block responsible for mapping 20 pixels of sensor date to 8 bit RGB in a way that renders both bright and dark areas of the image visible in the rendered image. A wide internal pipeline is required to ensure that no detail in dark areas is lost even when, for example, an intruder shines a flashlight directly into the camera lens. HDR, working in close conjunction with a fast-auto-exposure algorithm, can rapidly adjust exposure in changing light conditions.

Table 1 shows the typical FPGA resources used for implementing all the above ISP blocks in a 33k look-up-table (KLU), low—cost, low-power, FPGA. In addition to the ISP blocks already mentioned, the actual implementation data incorporates a statistics engine that generates image histograms used by specific blocks in the system, a Lattice Mico32 soft processor for dynamic pipeline control, an I2C master to control various signals, a HDMI PHY block to drive HDMI signals directly off the FPGA and even a graphics overlay of a logo. This demonstrates that it is possible to fit an entire image signal processing pipeline, plus HDMI output, inside a low-cost, low-power FPGA such as the Lattice ECP3-35. The internal HDR pipeline is 32-bits wide, resulting in the ability to provide 192dB (20 log 2**32) of high dynamic range. In this real world implementation, a sensor with 120dB dynamic range was used, limiting the HDR to 120dB – still the highest of any FPGA implementation available. The actual implementation is capable of processing 1080p images at 60 frames per second while providing 120dB of HDR. As shown, a simple low cost 33KLUT FPGA easily handles a 1080p60 pipeline. The BOM for a 1080p60 HDR camera implemented with a Lattice ECP3-35 consists primarily of the sensor, the FPGA and associated clock oscillator, resistors and capacitors, voltage regulator, a HDMI connector and lens assembly. The implementation shown offers 120dB of HDR, 1080p60 performance, the fastest auto-exposure and very high quality auto-white balance in the industry. The LatticeECP3 is significantly lower in static and dynamic power consumption than competing FPGAs or DSPs. The FPGA supports the use of DDR3. Manufacturers wishing to incorporate frame buffer memory into their designs can take advantage of this capability to utilize high-performance, low-cost DDR3 memory in their camera designs. A low-power SERDES-capable FPGA enables manufacturers to implement a HDMI PHY directly inside the FPGA, providing HDMI functionality without the added cost of an external HDMI chip.

---

**Precision cell measurements add value to battery management**

**By Greg Zimmer, Linear Technology**

The current generation of electric vehicles relies on lithium battery packs with an energy range between 16kWh and 53kWh. A single gallon of gasoline contains more than 36kWh of energy. For an electric or hybrid electric vehicle, or any high power battery system, to compete with an internal combustion engine every bit of energy must be squeezed out of the batteries. This means each individual cell in the pack has to be monitored and controlled.

High power battery packs consist of a long string of series-connected cells. Directly connected to each cell is a battery monitor IC, responsible for accurately measuring each cell voltage. This is no simple task, as the cells are positioned at various points along a very high voltage string that is subject to horrendous electrical spikes and electromagnetic interference (EMI). A battery management system (BMS) combines the cell voltage with current, temperature, and operating history, to continuously assess each individual cell condition. It is a tough challenge, but with accurate monitoring and control, the driving range, reliability and safety of the battery pack can be maximized.

Batteries in an HEV or EV are expected to last 10 to 15 years, and they are considered to be at their end-of-life when they have lost 80% of their original capacity. Battery lifetime and reliability are maximized by restricting the operating state of charge by not allowing them to be fully charged or discharged. A typical battery pack is operated in a restricted range, such as 20% SOC to 80% SOC, where SOC is the state-of-charge. These SOC limits could be adjusted with age and operating conditions, such as high temperature environments. As a result of the limits, battery packs are not utilized to their full capacity. For example, operating a pack with 20% SOC to 80% SOC limits the usable SOC range to 60%. The challenge for the BMS is to operate each cell as close to the limits as possible, without exceeding them. Amplifying the challenge, lithium batteries exhibit a flat discharge curve over their operating range. As a result, there is a very small change in cell voltage over the operating range and the battery monitor must make very accurate measurements as part of the SOC calculation.

To illustrate the importance of cell measurement accuracy, consider the simplified lithium battery discharge curve shown in figure 1. This curve has a constant 5 mV/% (SOC) slope across the operating region. A battery pack operating within a 20% to 80% SOC range and a similar discharge characteristic will face a big penalty for poor cell voltage measurement accuracy. As shown in figure 2, if the battery monitor has a cell voltage measurement error of ± 10mV, a measured cell voltage of 3.73V could actually correspond to a real cell voltage between 3.74V and 3.76V. This corresponds to an actual SOC range from
76% to 80%. As a result of this measurement inaccuracy, the operating range must be restricted by a guard-band to ensure that the operating limits are not exceeded. In this example, the operating range must be restricted to the measured range of 22% to 78% instead of 20% to 80%. If the pack is expected to maintain the same range, a BMS with this accuracy will require additional battery capacity to compensate for the guard-band restrictions. Considering the 60% usable SOC, the battery must be oversized by >7%. Oversize penalty equals \( (\frac{0.6}{0.56} - 1) \) to compensate for cell measurement inaccuracy of ±10mV. For an HEV using a 5kWh pack costing $3000 ($600/kWh), this translates to an additional $214. This argument can be extended to highlight the guard-band penalty for various cell measurement errors, and its dependence on the SOC range. As shown in figure 3, a system with only 1mV of measurement error requires less than 1% oversizing, even when the pack is restricted to an SOC range of 25% to 75% (50% usable SOC). Although most lithium cells are generally well matched when first acquired, the SOCs of a long string of cells will diverge over time and charge cycling. This is due to small variations in cell characteristics and localized operating conditions, which can lead to small differences in self-discharge and load current. To avoid operating any cell beyond its SOC range, as the SOCs diverge, the total operating range will be slowly constricted by the most unbalanced cells. To address this, nearly all battery management systems include cell balancing. With passive balancing, cells with higher SOC are discharged to normalize the SOC for all cells. This is a low cost, simple balancing method. However, it has significant limitations. Passive balancing only operates by removing charge. It wastes energy, as a function of the amount of imbalance, and it generates significant heat. This means that the balancing current must be kept relatively small, typically 5% or less of the cell capacity. As a result, passive balancing is primarily limited to operation offline and it requires significant time to complete. Passive balancing becomes less effective as the variations in SOC increase, and over time, SOC variation will increase due to diverging cell capacity.

Cells lose capacity as they age, a process that can differ from cell to cell due to a number of factors, such as gradients in pack temperature, and variations in cell manufacturing. With differences in capacity, cells will more readily become imbalanced. Allowing just one cell to operate beyond the SOC limit will simply exacerbate this problem by premature cell aging. Relying solely on passive balancing becomes increasingly difficult, as capacities diverge. To address the limitations of passive balancing, new battery management systems are implementing active balancing.

With active balancing, charge is moved between cells, rather than being dissipated with passive balancing. Active balancing can operate both during the charge and discharge cycles. When charging the pack, the active balancer can move charge from the weaker cell to the
stronger cell. When discharging the pack, charge can be moved from the stronger cell to compensate the weaker cell. Instead of wasting energy, charge is transferred through a highly efficient circuit, such as a fly-back converter. As a result, heat generation is limited, the balancing current is higher, and the balancing time is significantly reduced. This allows for active balancing while the pack is in use, where it can ensure extraction of the maximum capacity for each individual cell. New ICs, such as Linear Technology devices LTC3300 and LT8584, are enabling active balancing in automotive battery packs.

Ideally, active balancing should be enabled as the cells reach the ends of the SOC range. For maximum efficiency, active balancing should be used when necessary. A system maintained well within the SOC limits would require much less active balancing than one operating near the limits. To illustrate, consider a pack containing many cells with uniform capacity, and one weak lower capacity cell. If all cells are charged to 80% SOC and then discharged, the SOC of the weak cell will slowly diverge from the rest of the cells. The BMS must determine a suitable point to enable the balancer to keep the weak cell operational, while the other cells are continuing to discharge. Figure 4 shows the SOC divergence during the discharge cycle, for two examples: one with a cell that has a capacity difference of 2% from the rest of the pack, and another that differs by 8%. The BMS cell measurement error sets a limit for determining the relative condition between cells. With a ±2% SOC measurement error (±10mV), cells could be out-of-balance from each other by as much as 4% before the cell measurements would reliably detect the situation. Enabling an active balancer at a well-defined point along this discharge curve would be virtually impossible without cell measurement accuracy very much better than ±10mV.

The implication for measurement accuracy is not limited to active balancing. From this example, a 4% SOC difference translates to a capacity variation of more than 6.6% (0.066 = (0.04/0.60) for an SOC range of 22% to 78% (guard-banded range)). For an automotive battery that reaches its end-of-life after 20% reduction, this is significant unrecovered capacity. More importantly, a change in cell capacity is a key indicator of its health, and an unrecognized capacity change could be a serious issue.

The importance of cell measurement accuracy becomes clearer when considering the complications beyond this simple example. For example, most packs will have a continuum of capacity variation, with more subtle and harder to detect SOC divergences. Also, cells will not likely be aligned at 80% SOC when discharging begins, possibly further masking capacity variation. It is also important to note that multiple parameters are required for an SOC calculation. Measurement inaccuracy of these other parameters does not lessen the need for accurate cell voltage measurements. To the contrary, compromising on cell voltage accuracy will likely widen the distribution of battery life.

The voltage reference within the battery monitor is the primary determinant of measurement error. Any change in the voltage reference directly degrades the cell measurement accuracy. The current generation of battery monitors relies on bandgap voltage references. In theory, bandgap references are ideal for integration into complex integrated circuits, such as a battery stack monitor, because they require little die space, low power and low overhead voltage. However, band-gap references are sensitive to mechanical stress, IR reflow, and humidity, resulting in thermal hysteresis and long term drift. For precision instrumentation that is required to maintain very high accuracy for more than 15 years, there is a better choice. The newest battery monitors, such as Linear Technology LTC6804, incorporate a sub-surface Zener voltage reference. Sub-surface Zener voltage references provide outstanding long-term stability and accuracy, over time and operating conditions. Using this approach, the LTC6804 is able to guarantee a total cell voltage measurement error of less than 1.2mV.

The accuracy of the battery monitor is not limited to the accuracy of the measurement itself. Cell measurements need to be considered in the context of the automobile, where there is significant electrical noise and transients from inverters, actuators, switches, relays, etc. This noise is imbedded within the cell signal, and if accuracy is important, this noise has to be removed. A modest level of noise reduction can be achieved by placing an RC filter on each cell; using a higher order filter circuit on each cell is impractical, due to cost and board space. A modest amount of noise can be removed by processing many samples from each signal measurement; but given the large number of cells, the massive data to be transmitted to a central processor makes this impractical, as well. A practical and effective solution is to remove noise within the battery monitor. As an example, Linear Technology LTC6804 uses delta-sigma ADCs with built-in third order noise filtering. This is in contrast to a wideband SAR ADC, where fast acquisition has limited value for a signal corrupted by noise (SAR converters can implement simple on-chip averaging, but averaging has poor filter characteristics). To optimize speed and noise reduction, the LTC6804 delta sigma ADCs can operate with different corner frequencies, ranging from 27 kHz to 26Hz. For the automotive environment, the delta sigma approach is quite effective.

As high-powered battery systems continue to advance into the mainstream, the demands on the battery monitoring electronics will not relent. The automobile offers only abuse, while demanding the highest possible performance and reliability. To achieve the driving range, reliability, and safety, requires careful consideration of every small source of lost performance. To extract every bit of usable energy requires implementing cutting edge technologies, such as active balancing. It also requires the most accurate and stable cell voltage measurement possible.
Maxim: highly secure cryptographic solution
Maxim Integrated Products announced that it is now sampling the DS28E35 DeepCover Secure Authenticator, a highly secure cryptographic solution for a host controller to authenticate peripherals. The DS28E35 integrates a FIPS 186-based, Elliptic Curve Digital Signature Algorithm (ECDSA) engine to implement asymmetric (public-key) cryptography to operate a challenge-and-response authentication protocol between a host controller and attached peripherals, sensors, or modules. Operating over a single pin on the 1-Wire® interface, the DS28E35 reduces interconnect complexity, simplifies designs, and reduces cost. It provides crypto-strong authentication security for many applications, including medical sensors, industrial programmable logic controller (PLC) modules, and consumer devices.
News ID 17428

A. R. Bayer DSP Systeme: new Bittware distributor for Europe
BittWare has added A.R. Bayer DSP Systeme as a new sales channel partner. A.R. Bayer DSP Systeme focuses on hardware, algorithms and tools for digital signal processing; they now sell and support BittWare products in Germany, Benelux, Switzerland, and other central European countries including Austria, Slovakia, Czech Republic and Poland.
News ID 17336

IBASE: OPS compliant signage player powered by Core i7/i5/i3
IBASE announces the IOPS-76, an Open Pluggable Specification compliant signage player powered by the new mobile 3rd Generation Intel Core i7/i5/i3 and Celeron Quad – Core/Dual-Core processors together with the mobile Intel QM77 Express chipset. The Open Pluggable Specification effectively lowers deployment and field maintenance costs to simplify device installation, maintenance, and upgrades and allows digital signage manufacturers to deploy systems faster, with lower costs for development and implementation.
News ID 17306

Microchip: low-power, general-purpose op amps
Microchip announces a new nine-member low-power, general-purpose operational amplifier (op amp) family—the MCP647X/8X/9X. These op amps provide among the industry’s best power consumption for a given gain-bandwidth product, including low quiescent current, to extend battery lifetimes. Additionally, they have exceptionally low leakage current over temperature, up to 125°C, which reduces errors in applications such as sensor conditioning.
News ID 17436

Distec provides optical bonding in new Vacuum technology
Distec now provides optical bonding in new vacuum technology. In this process a protective glass, a touch screen or both are bonded using a high quality optical material onto a TFT display. The result is a display that is rich in contrast, offers exceptional readability, and is well suited for use in direct sunlight. This cutting edge vacuum technology has clear advantages compared to the ‘wet bonding’ technology currently employed worldwide.
News ID 17400

Infinion: fully certified FlexRay transceiver for in-vehicle communication
Infinion Technologies is expanding its portfolio of LIN and CAN automotive communications ICs with its first FlexRay™ transceiver. The new TLE9221SX is fully compliant to the most current FlexRay Electrical Physical Layer Specification version 3.0.1. It enables very high data rates of up to 10Mbit/s for in-vehicle communication and features best-in-class ESD rating of +/-10kV. As an interface between the communication controller unit and bus wires, the TLE9221SX transceiver was developed for use in suspension and chassis control applications as well as for power steering, engine and transmission control units.
News ID 17441

Eurotech to simplify device management in the Internet of Things
Eurotech launched Everyware Cloud 3.0 platform with remote device management to deliver actionable data from the field to downstream applications and business processes, dashboards, and reports. Everyware Cloud 3.0 can connect sensors, devices or assets quickly to analyze data in real-time for reliable, device-independent M2M applications. New features allow companies to remotely create new services and functionalities on field devices, allowing them to develop and launch innovative product and revenue streams.
News ID 17438

AAEON: products based on 4th Generation Intel Core processors
AAEON announced a new series of high performance, scalable and optimized low-power embedded products: COM-QM87, IMBA-Q87A, EMB-QM87A, GENE-QM87 and PWS-7810. Designed based on the 4th generation Intel® Core™ processor family together with the Mobile Intel® QM87 Express or Intel® Q87 Express chipsets, these products offer full-function availability, enhanced graphic performance and high affordability for customers to expedite graphic-intensive works.
News ID 17410

CES: highly customizable Kintex-7 FPGA processor board
Creative Electronic Systems announces the FIOV-2310, a 3U OpenVPX module with a Xilinx Kintex-7 325T/410T user-programmable FPGA at its core. The FIOV-2310 allows the flexible configuration of the high-speed links between the FMC connector and various VPX backplane profiles making it suitable for the most demanding and complex applications. The Kintex-7 FPGA makes it possible to program the backplane interconnect to any of the popular serial fabric protocols.
News ID 17267
**PRODUCT NEWS**

- **Rutronik launches sales concept Rutronik24 around the world**
  With its new sales organisation “Rutronik24”, Rutronik Elektronische Bauelemente is now addressing a new customer base with average component requirements. Rutronik24 is based on the e-commerce-platform www.rutronik24.com. In addition, small and medium-sized enterprises now have access to the complete Rutronik portfolio as well as additional services and support. The platform is available in English, German, French, Spanish, Italian and Chinese.
  
  News ID 17466

- **COMMELL: PICMG 1.3 SBC supports 3rd and 2nd gen Intel Core i7/i5/i3**
  COMMELL has introduced the PICMG 1.3 SBC HS-B70, which is designed for the 3rd generation Intel Core i7/i5/i3 processors in the rPGA988B socket. HS-B70 based on Intel QM77 Express chipset, QM77 Express chipset is part of the mobile Intel 7 Series Chipset family, along with a Intel 3rd generation 22 nm Core i7/i5/i3, the Intel processors with HD Graphic 4000 which contains a refresh of the seventh generation graphics core, DX11 for smoother rendering at higher resolutions for an improved 3D experience.
  
  News ID 17464

- **MEN: PCI Express Mini Card for boundless GNSS reception**
  MEN’s new PXI PCI Express Mini Card supports both GLONASS and GPS transmission and in combination with the adequate carrier card it makes a literally boundless usage of wireless functions possible. The PXI is the perfect companion for uninterrupted, satellite-based data transmission in trains, buses, ships or airplanes, where requirements are ever-growing. The PXI is equipped with a GNSS receiver (Global Navigation Satellite System), which supports the globally accessible satellite systems GPS and GLONASS (Russia). Communication via the European counterpart Galileo, which is supposed to be launched in 2014, and via the Chinese Compass system, which will be made globally available in the future, can also be implemented on the PXI.
  
  News ID 17407

- **Advantech: system platforms with 4th Gen Intel Core and Xeon processors**
  Advantech announced its latest platforms based on the 4th generation Intel® Core™ processors including Industrial Motherboards, Single Board Computers, Computer On Modules, Industrial Serverboards, CompactPCI Platforms, VPX blades and Network Application Platforms. With improvements in CPU performance, media and graphics capabilities, security and power efficiency, the new platforms are ideal for powering intelligent systems designed for a variety of market segments including video surveillance, digital signage, medical, industrial automation, gaming, network and telecom, etc.
  
  News ID 17416

- **EKF: quad port USB 3.0 & eSATA host adapter**
  The SB1-BOBOE is a peripheral slot board for PICMG CompactPCI Serial systems, equipped with four USB3/eSATA panel combo connectors. The card is comprised of an USB 3.0 SuperSpeed controller, and a SATA III RAID controller. Hence each front panel connector is suitable for attachment of either USB 3.0, USB 2.0 or eSATA based peripheral devices. The SB1-BOBOE is provided with a PCI Express 2.0 package switch, and can be installed into any peripheral slot of a CompactPCI Serial backplane.
  
  News ID 17322

- **Axiomtek: 1U rackmount Industrial chassis**
  Axiomtek released AX61131TM, its new industrial-grade 19” 1U rackmount chassis, which is the first shipping product to use optical SFP+ and supports 32-bit microcontrollers. The AX61131TM is its ability to support HDMI video output. This outstanding feature would satisfy those seeking for high-quality video outputs. AIV-HM76V0FL is an outstanding In-Vehicle solution for anything ranging from commercial to security issues.
  
  News ID 17429

- **McObject: high availability database integrated into photonics-based core router**
  McObject announced that Compass-EOS has included eXtreme/DB High Availability in the Compass-EOS r10004 core router, which is the first shipping product to use optical communication between line cards using silicon-to-photonics technology. This breakthrough approach lends the device dramatically greater speed and scalability, lower power consumption, a smaller footprint and other benefits for network operators whose hardware provides the Internet’s backbone.
  
  News ID 17455

- **Vector Software supports AdaCore GNAT Pro compiler for ARM Cortex**
  Vector Software announced VectorCAST support for AdaCore’s GNAT Pro Safety-Critical product for ARM microcontrollers. The AdaCore GNAT Pro Safety-Critical application provides a complete Ada development environment, oriented towards systems that have safety-critical or stringent memory constraints requirements.
  
  News ID 17454

- **Freescale: Tiny Kinetis KL02 MCUs now shipping**
  Freescale Semiconductor is now shipping its Kinetis KL02 family of 32-bit microcontrollers, offering a new level of processing performance and energy efficiency for applications and helping expand the Internet of Things. The tiny KL02 devices have a small appetite for power – six times more efficient than a leading competitor – making them ideal for ultra-small-form-factor and battery-powered products.
  
  News ID 17348

- **Toshiba: ARM Cortex-M3 microcontroller with next-generation vector engine**
  Toshiba expands the TX03 series microcontroller family with the launch of its newest TMPM375FSDMG device. Based on the ARM Cortex-M3 core, the TMPM375FSDMG MCU implements a next-generation vector engine that improves motor control, reduces component count, energy, and power consumption.
  
  News ID 17338

- **Renesas: ZF family with large-capacity on-chip RAM enables DRAM-less design**
  Renesas announced a total of 15 new products in the RZ/A1 Group of embedded microcontroller solutions (with subcategories RZ/A1H, RZ/A1M, and RZ/A1L) for creating sophisticated HMI implementations for the “smart society” of the future. The new products come with the most on-chip RAM in the industry: 10 MB.
  
  News ID 17447

- **Axiomtek: 1U rackmount Industrial chassis for ATX motherboards**
  Axiomtek released AX61131TM, its new industrial-grade 19” 1U rackmount chassis, which is compatible with ATX form factor motherboards. Two USB ports, power switch, two LED indicators for power status and HDD activity, and reset button are located on the front panel. It also has two internal 3.5” drive bays for storage and a PCI slot for expansion.
  
  News ID 17442

- **Micro Digital allows easy, direct connection among WiFi devices**
  Micro Digital introduced WiFi Direct and SoftAP for smxWiFi. These allow easy, direct connection among WiFi devices, anywhere. There is no need for an Access Point. Through negotiation, one device becomes the Group Owner and the other the client. Connection is designed to be quick and easy, often with just the push of a button. WiFi Direct and SoftAP do not require addition of new hardware, allowing existing smxWiFi users to add them to their products with just a software update.
  
  News ID 17394
EBVchips
Semiconductors Developed with and for Our Customers!

We already provide our customers with highly specific support in markets where intensive consultation is required, such as lighting, automotive, consumer, renewable energies, FPGAs, medical, high-rel, identification and RF & wireless. Now we are going one step further and raising our services to the next level with a new and revolutionary service. Under the name EBVchips, we are now defining our own semiconductor products, which we are developing with and for our customers!

These products will be manufactured by our suppliers, fulfilling special requirements of customers not covered by products already available. This makes EBV the first semiconductor specialist in the world to offer such a service. With EBVchips, we offer our customers competitive advantages, as they will now receive exactly the products and technologies they require for their individual applications.

For further information, please contact your EBV partner on site or visit us online at www.ebv.com/chips.

Product Groups

<table>
<thead>
<tr>
<th>Product Group</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Time Operating Systems</td>
<td>24</td>
</tr>
<tr>
<td>Development Tools – Software</td>
<td>27</td>
</tr>
<tr>
<td>Development Tools – Hardware</td>
<td>31</td>
</tr>
<tr>
<td>Embedded Software</td>
<td>34</td>
</tr>
<tr>
<td>Embedded Connectivity</td>
<td>38</td>
</tr>
<tr>
<td>Micros &amp; DSPs</td>
<td>41</td>
</tr>
<tr>
<td>ASSPs &amp; Memories</td>
<td>42</td>
</tr>
<tr>
<td>PLDs, ASICs &amp; EDA</td>
<td>45</td>
</tr>
<tr>
<td>Analog &amp; Power</td>
<td>46</td>
</tr>
<tr>
<td>Embedded Computing</td>
<td>48</td>
</tr>
<tr>
<td>SBCs, COTS &amp; Busboards</td>
<td>53</td>
</tr>
<tr>
<td>Small Form Factor Boards, COMs &amp; Motherboards</td>
<td>57</td>
</tr>
<tr>
<td>Industrial Computing</td>
<td>60</td>
</tr>
<tr>
<td>Backplanes, Racks &amp; Connectors</td>
<td>65</td>
</tr>
<tr>
<td>Data Acquisition, T &amp; M</td>
<td>67</td>
</tr>
<tr>
<td>Engineering Services</td>
<td>69</td>
</tr>
</tbody>
</table>
## Real Time Operating Systems

### Arrow Central Europe

Max-Planck-Straße 1-3  
63303 Dreieich / Germany  
T: +49 6103-304-0  
F: +49 6103-304-8455  
www.arrow-europe.com

### A.R. BAYER DSP Systeme

Vohwinkelallee 8  
40229 Düsseldorf / Germany  
T: +49 211-210 8186  
F: +49 211-210 8176  
gmbh@ dsp-sys.de  
www.dsp-sys.de

### AAEON Technology

An der Trift 65d  
63303 Dreieich / Germany  
T: +49-61033-747900  
F: +49-61033-747949  
sales@aaeon.com  
www.aaeon.eu

### Avalue Technology

7F, 228, Lian-cheng Road,  
Zhonghe Dist., New Taipei City 235  
Taiwan  
T: +886 2 82262345  
F: +886 2 82262777  
sales@avalue.com.tw  
www.avalue.com.tw

### Advantech Europe

Industriestrasse 15  
82110 Germering / Germany  
T: 00800 24 26 80 80  
customercare@advantech.eu  
www.advantech.eu

### Advantech Europe

Industriestrasse 15  
82110 Germering / Germany  
T: 00800 24 26 80 80  
customercare@advantech.eu  
www.advantech.eu

### Digi International

31, rue des Poissonniers  
92200 Neuilly sur Seine / France  
T: +33-1-55-61-98-98  
F: +33-1-55-61-98-99  
www.digi.com

### DSM Computer

Am Loferfeld 54  
81249 München / Germany  
T: +49 89 15798-250  
F: +49 89 15798-196  
sales@dsm-computer.de  
www.dsm-computer.de

### ELBACOM Germany

Otto-Hahn-Str. 24  
85521 Ottobrunn / Germany  
T: +49 89 18 94 756 10  
F: +49 89 18 94 756 99  
info@elbacom.de  
www.elbacom.com/germany

### ETAS

Borsigstraße 14  
70469 Stuttgart / Germany  
T: +49-711/8 96 61-0  
F: +49-711/8 96 61-106  
sales.de@etas.com  
www.etas.com

### EVOCEAN

Grundstrasse 8  
6343 Rotkreuz / Switzerland  
T: +41 41 790 78-88  
F: +41 41 790 78-93  
info@evocean.ch  
www.evocean.ch

### Bluetechnix

Waidhausenstraße 3/19  
1140 Wien / Austria  
T: +43 1 914 20 91-0  
F: +43 1 914 20 91-99  
office@bluetechnix.com  
www.bluetechnix.com

### EVOCEAN

Grundstrasse 8  
6343 Rotkreuz / Switzerland  
T: +41 41 790 78-88  
F: +41 41 790 78-93  
info@evocean.ch  
www.evocean.ch

### Arrow Central Europe

Max-Planck-Straße 1-3  
63303 Dreieich / Germany  
T: +49 6103-304-0  
F: +49 6103-304-8455  
www.arrow-europe.com

### A.R. BAYER DSP Systeme

Vohwinkelallee 8  
40229 Düsseldorf / Germany  
T: +49 211-210 8186  
F: +49 211-210 8176  
gmbh@ dsp-sys.de  
www.dsp-sys.de

### AAEON Technology

An der Trift 65d  
63303 Dreieich / Germany  
T: +49-61033-747900  
F: +49-61033-747949  
sales@aaeon.com  
www.aaeon.eu

### Avalue Technology

7F, 228, Lian-cheng Road,  
Zhonghe Dist., New Taipei City 235  
Taiwan  
T: +886 2 82262345  
F: +886 2 82262777  
sales@avalue.com.tw  
www.avalue.com.tw

### ADL Embedded Solutions

Eiserfelder Straße 316  
57080 Siegen / Germany  
T: +49 271 250 810-0  
F: +49 271 250 810-20  
sales@adl-europe.com  
www.adl-europe.com

### Advantech Europe

Industriestrasse 15  
82110 Germering / Germany  
T: 00800 24 26 80 80  
customercare@advantech.eu  
www.advantech.eu

### EVOCEAN

Grundstrasse 8  
6343 Rotkreuz / Switzerland  
T: +41 41 790 78-88  
F: +41 41 790 78-93  
info@evocean.ch  
www.evocean.ch

### Bluetechnix

Waidhausenstraße 3/19  
1140 Wien / Austria  
T: +43 1 914 20 91-0  
F: +43 1 914 20 91-99  
office@bluetechnix.com  
www.bluetechnix.com

### EVOCEAN

Grundstrasse 8  
6343 Rotkreuz / Switzerland  
T: +41 41 790 78-88  
F: +41 41 790 78-93  
info@evocean.ch  
www.evocean.ch
ETAS
Borsigstraße 14
70469 Stuttgart / Germany
T: +49-711/8 96 61-0
F: +49-711/8 96 61-106
sales.de@etas.com
www.etas.com

Green Hills Software (Germany)
Siemensstr. 38
53121 Bonn / Germany
T: +49 228 4330-777
F: +49 228 4330-797
info-de@ghs.com
www.ghs.com

IEI Integration
No. 29, Zhongxing Rd.,
Xizhi Dist.,
New Taipei City 221 / Taiwan
T: +886-2-86916798
F: +886-2-6616-0028
sales@iei.com.tw
www.ieiworld.com

EVOCEAN
Grundstrasse 8
6343 Rotkreuz / Switzerland
T: +41 41 790 78-88
F: +41 41 790 78-93
info@evocean.ch
www.evocean.ch

gsh-Systemelektronik
Planegger Str. 36
81241 München / Germany
T: +49 89 834 3047
F: +49 89 834 3048
info@gsh-system.de
www.gsh-system.de

IMACS
Mittelfeldstrasse 25
70806 Kornwestheim / Germany
T: +49 7154 8083-0
F: +49 7154 8083-29
info@imacs-gmbh.de
www.imacs-gmbh.de

Express Logic
11423 West Bernardo Court
San Diego, CA 92127 / USA
T: +1 858 613-6640
F: +1 858 521-4259
info@expresslogic.com
www.expresslogic.com

IMCOR
Turnackerstraße 62/1
70794 Filderstadt / Germany
T: +49 711 70890-03
F: +49 711 70890-04
info@imcor.de
www.imcor.de

Gleichmann Electronics
Schraderstr. 44
67227 Frankenthal / Germany
T: +49 711 78336 -0
F: +49 711 78336 -210
Stuttgart@msc-ge.com
www.msc-ge.com

HighTec EDV-Systeme
Feldmannstr. 98
66119 Saarbrücken / Germany
T: +49 681 92613-16
F: +49 681 92613-26
info@hightec-rt.com
www.hightec-rt.com

Infineon Technologies
Am Campeon 1-12
85579 Neubiberg / Germany
T: +49 89 234-0 (supported 24/7)
www.infineon.com

Glyn
Am Wörtzgarten 8
65510 Idstein / Germany
T: +49 6126 590-222
F: +49 6126 590-111
sales@glyn.de
www.glyn.de

IAR Systems
Am Wörtzgarten 8
65510 Idstein / Germany
T: +49 6126 590-222
F: +49 6126 590-111
sales@glyn.de
www.glyn.de

HighTec EDV-Systeme
Feldmannstr. 98
66199 Saarbrücken / Germany
T: +49 681 92613-16
F: +49 681 92613-26
info@hightec-rt.com
www.hightec-rt.com

Infineon Technologies
Am Campeon 1-12
85579 Neubiberg / Germany
T: +49 89 234-0 (supported 24/7)
www.infineon.com

IS2T
11 rue du Chemin Rouge, Bat. D
44373 Nantes Cedex 3 / France
T: +33 240 180 496
sales@is2t.com
www.is2t.com
DEVELOPMENT TOOLS – SW

PRQA

Mark House
9/11 Queens Road
Hersham, Surrey KT12 5LU / UK
T: +44 1932 888 080
F: +44 1932 888 081
info@ProgrammingResearch.com
www.programmingresearch.com

Silicon Laboratories

400 West Cesar Chavez
TX 78701 Austin / USA
T: +1 512 416 8500
F: +1 512 416 9669
www.silabs.com

WIBU-SYSTEMS

Rueppurrer Strasse 52-54
76137 Karlsruhe / Germany
T: +49-721-93172-0
F: +49-721-93172-22
sales@wibu.com
www.wibu.com

Renesas Electronics Europe

Arcadiastraße 10
40472 Düsseldorf / Germany
T: +49 211-6503-0
info@renesas.com
www.renesas.eu

Softing Industrial Automation

Richard-Reitzner-Allee 6
85540 Haar / Germany
T: +49 89 4 56 56-340
F: +49 89 4 56 56-399
info.automation@softing.com
industrial.softing.com

Xilinx

One Logic Dr.,
Citywest Business Campus
Saggart, County Dublin / Ireland
T: +353 1-464-0311
F: +353 1-464-0324
www.xilinx.com

RUTRONIK

Industriestraße 2
75228 Ispringen / Germany
T: +49 7231 801-0
F: +49 7231 82282
rutronik@rutronik.com
www.rutronik.com

SYSGO

Am Pfaffenstein 14
55270 Klein-Winternheim / Germany
T: +49 6136 99 48-0
F: +49 6136 99 48-10
info@sysgo.com
www.sysgo.com

XiSys Software

Klosterstr. 24
97236 Randersacker / Germany
T: +49 931 4677090
F: +49 931 4677098
info@xisys.de
www.xisys.de

Sciopta Systems

Fiechthagstrasse 19
4103 Bottmingen/Basel / Switzerland
T: +41 61 423 10 62
F: +41 61 423 10 63
www.sciopta.com

Texas Instruments

European Customer Support Center
European free Call: 00800-ASK-TEXAS
(00800 275 83927)
International Call: +49 8161 80 2121
Russian Support: +7 (495) 98 10 701
F: +49 (0) 8161 80 2045
www.ti.com

XiSys Software

Klosterstr. 24
97236 Randersacker / Germany
T: +49 931 4677090
F: +49 931 4677098
info@xisys.de
www.xisys.de

SEgger Microcontroller

In den Weiden 11
40721 Hilden / Germany
T: +49 2103 - 2878-0
F: +49 2103 - 2878-28
info@segger.com
www.segger.com

Trinamic

Waterloohain 5
22769 Hamburg / Germany
T: +49 40 514806-0
F: +49 40 514806-60
tmc_info@trinamic.com
www.trinamic.com
Development Tools – Hardware

A.R. BAYER DSP Systeme
Vohwinkelallee 8
40229 Düsseldorf / Germany
T: +49 211-210 8186
F: +49 211-210 8176
gmbh@dsp-sys.de
www.dsp-sys.de

BitWise Group
Crescent House, Carnegie Campus
Dunfermline, Fife, KY11 8GR / UK
T: +44 1383 625151
F: +44 1383 625152
info@bitwisegroup.com
www.bitwisegroup.com

Densitron Deutschland
DENSITRON DISPLAYS
Airport Business Centre
Am Söldnermoos 17
85399 Hallbergmoos / Germany
T: +49 811 55 05 949
F: +49 811 55 05 972
info@densitron.de
www.densitron.com/displays

Blutechnix
Waidhausenstraße 3/19
1140 Wien / Austria
T: +43 1 914 20 91-0
F: +43 1 914 20 91-99
office@blutechnix.com
www.blutechnix.com

ETAS
Borsigstraße 14
70469 Stuttgart / Germany
T: +49-711/8 96 61-0
F: +49-711/8 96 61-106
sales.de@etas.com
www.etas.com

Arrow Central Europe
Max-Planck-Straße 1-3
63303 Dreieich / Germany
T: +49 6103-304-0
F: +49 6103-304-8455
www.arroweurope.com

Cadence Design Systems
Bagshot Road
Bracknell
Berkshire, RG12 OPH / UK
T: +44 1344 360333
F: +44 1344 869647
www.cadence.com/eu/

Eurotech Group
Eurotech Head Office
Via Flli Solari 3/a
33020 Amaro (UD) / Italy
T: +39 0433 4854-11
F: +39 0433 4854-99
sales@eurotech.com
www.eurotech.com

Artila Electronics
4F, No.6, Lane 130,
Minquan Road
Xindian Dist. 231, New Taipei City
Taiwan (R.O.C.)
T: +886 2 8667-2340
F: +886 2 8667-3240
sales@artila.com
www.artila.com

congatec
Auwiesenstr. 5
94469 Deggendorf / Germany
T: +49 991 2700-0
F: +49 991 2700-111
info@congatec.com
www.congatec.com

EVOCEAN
Grundstrasse 8
6343 Rotkreuz / Switzerland
T: +41 41 790 78-88
F: +41 41 790 78-93
info@evocean.ch
www.evocean.ch

Avalue Technology
7F, 228, Lian-cheng Road,
Zhonghe Dist., New Taipei City 235
Taiwan
T: +886 2 82262345
F: +886 2 82262777
sales@avalue.com.tw
www.avalue.com.tw

Data Modul
Landsberger Str. 322
80687 München / Germany
T: +49 89 56017-0
F: +49 89 56017-19
www.data-modul.com

Express Logic
11423 West Bernardo Court
San Diego, CA 92127 / USA
T: +1 858 613-6640
F: +1 858 521-4259
info@expresslogic.com
www.expresslogic.com
DEVELOPMENT TOOLS – HW

Gleichmann Electronics
Gleichmann
Schraderstr. 44
67227 Frankenthal / Germany
T: +49 711 78336 -0
F: +49 711 78336 -210
Stuttgart@msc-ge.com
www.msc-ge.com

IAR Systems
IAR SYSTEMS
Werner-Eckert-Str. 9
81829 München / Germany
T: +49 89 889890-0
F: +49 89 889890-90
info@iar.de
www.iar.com

iSYSTEM
Carl-Zeiss-Strasse 1
85247 Schwabhausen / Germany
T: +49 8138 6971-50
F: +49 8138 6971-46
sales@isystem.com
www.isystem.com

Glyn
Glyn
Am Wörtzgarten 8
65510 Idstein / Germany
T: +49 6126-590-222
F: +49 6126 590-111
sales@glyn.de
www.glyn.de

IEI Integration
IEI
No. 29, Zhongxing Rd.,
Xizhi Dist.,
New Taipei City 221 / Taiwan
T: +886-2-86916798
F: +886-2-6616-0028
sales@iei.com.tw
www.ieiworld.com

JaCtron
JaCtron
The industrial division of Simms International plc
Northdown Business Park
Ashford Road
Lenham, Kent ME17 2DL / UK
T: +44 1622 852848
F: +44 1622 852801
www.jactron.co.uk

Green Hills Software (Germany)
Green Hills Software
Siemensstr. 38
53121 Bonn / Germany
T: +49 228 4330-777
F: +49 228 4330-797
info-de@ghs.com
www.ghs.com

IMCOR
Turnackerstraße 62/1
70794 Filderstadt / Germany
T: +49 711 70890-03
F: +49 711 70890-04
info@imcor.de
www.imcor.de

Kontron
Kontron
Oskar-von-Miller-Straße 1
85386 Eching / Germany
T: +49 8165 77-0
F: +49 8165 77-385
sales@kontron.com
www.kontron.com

gsh-Systemelektronische
Planegger Str. 36
81241 München / Germany
T: +49 89 834 3047
F: +49 89 834 3048
info@gsh-system.de
www.gsh-system.de

Infineon Technologies
Infineon
Am Campeon 1-12
85579 Neubiberg / Germany
T: +49 89 234-0 (supported 24/7)
www.infineon.com

LANGER EMV-Technik
LANGER EMV-Technik
Nöthnitzer Hang 31
01728 Bannewitz / Germany
T: +49 351 430093-0
F: +49 351 430093-22
mail@langer-emv.de
www.langer-emv.com

HighTec EDV-Systeme
HighTec
Feldmannstr. 98
66119 Saarbrücken / Germany
T: +49 681 92613-16
F: +49 681 92613-26
info@hightec-rt.com
www.hightec-rt.com

IS2T
IS2T
11 rue du Chemin Rouge, Bat. D
44373 Nantes Cedex 3 / France
T: +33 240 180 496
sales@is2t.com
www.is2t.com

Jactron
Jactron
The industrial division of Simms International plc
Northdown Business Park
Ashford Road
Lenham, Kent ME17 2DL / UK
T: +44 1622 852848
F: +44 1622 852801
www.jactron.co.uk

Lauterbach
Lauterbach
Altlaufstraße 40
85635 Höhenkirchen-Siegertsbrunn
Germany
T: +49 8102 9876-0
F: +49 8102 9876-999
sales@lauterbach.com
www.lauterbach.com

July 2013
Cadence Design Systems

Bagshot Road
Bracknell
Berkshire, RG12 OPH / UK
T: +44 1344 360333
F: +44 1344 869647
www.cadence.com/eu/

emtrion

Kreativpark – Alter Schlachthof 45
76131 Karlsruhe / Germany
T: +49 721 62725-20
F: +49 721 62725-19
mail@emtrion.de
www.emtrion.de

Green Hills Software (Germany)

Siemensstr. 38
53121 Bonn / Germany
T: +49 228 4330-777
F: +49 228 4330-797
info-de@ghs.com
www.ghs.com

congatec

Auwiesenstr. 5
94469 Deggendorf / Germany
T: +49 991 2700-0
F: +49 991 2700-111
info@congatec.com
www.congatec.com

ETAS

Borsigstraße 14
70469 Stuttgart / Germany
T: +49-711/8 96 61-0
F: +49-711/8 96 61-106
sales.de@etas.com
www.etas.com

HCC-Embedded

24a Melville St
Edinburgh EH3 7NS / UK
T: +44 7918 787 571
info@hcc-embedded.com
www.hcc-embedded.com

Digi International

31, rue des Poissonniers
92200 Neuilly sur Seine / France
T: +33-1-55-61-98-98
F: +33-1-55-61-98-99
www.digi.com

EVOCEAN

Grundstrasse 8
6343 Rotkreuz / Switzerland
T: +41 41 790 78-88
F: +41 41 790 78-93
info@evocean.ch
www.evocean.ch

HighTec

EDV-Systeme

Feldmannstr. 98
66119 Saarbrücken / Germany
T: +49 681 92613-16
F: +49 681 92613-26
info@hightec-rt.com
www.hightec-rt.com

ELBACOM Germany

Otto-Hahn-Str. 24
85521 Ottobrunn I Germany
T: +49 89 18 94 756 10
F: +49 89 18 94 756 99
info@elbacom.de
www.elbacom.com

Express Logic

expresslogic

11423 West Bernardo Court
San Diego, CA 92127 / USA
T: +1 858 613-6640
F: +1 858 521-4259
info@expresslogic.com
www.expresslogic.com

IAR Systems

Werner-Eckert-Str. 9
81829 München / Germany
T: +49 89 889890-0
F: +49 89 889890-90
info@iar.de
www.iar.com

F & S Elektronik Systeme

Untere Waldplätze 23
70569 Stuttgart
Germany
T: +49 71 123722 0
F: +49 711 123722 99
info@fs-net.de
www.fs-net.de

IIE Integration

No. 29, Zhongxing Rd.,
Xizhi Dist.
New Taipei City 221 / Taiwan
T: +886-2-86916798
F: +886-2-6616-0028
sales@iei.com.tw
www.ieiworld.com
<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>Phone</th>
<th>Fax</th>
<th>Email</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMACS</td>
<td>Mittelfeldstrasse 25</td>
<td>+49 7154 8083-0</td>
<td>+49 7154 8083-29</td>
<td><a href="mailto:info@imacs-gmbh.de">info@imacs-gmbh.de</a></td>
<td><a href="http://www.imacs-gmbh.de">www.imacs-gmbh.de</a></td>
</tr>
<tr>
<td>Kontron</td>
<td>Oskar-von-Miller-Straße 1</td>
<td>+49 8165 77-0</td>
<td>+49 8165 77-385</td>
<td><a href="mailto:sales@kontron.com">sales@kontron.com</a></td>
<td><a href="http://www.kontron.com">www.kontron.com</a></td>
</tr>
<tr>
<td>MathWorks</td>
<td>Friedlandstr. 18</td>
<td>+49 241 4757-6700</td>
<td>+49 241 4757-6710</td>
<td><a href="mailto:info@mathworks.de">info@mathworks.de</a></td>
<td><a href="http://www.mathworks.com">www.mathworks.com</a></td>
</tr>
<tr>
<td>IMCOR</td>
<td>Turnackerstraße 62/1</td>
<td>+49 711 70890-03</td>
<td>+49 711 70890-04</td>
<td><a href="mailto:info@imcor.de">info@imcor.de</a></td>
<td><a href="http://www.imcor.de">www.imcor.de</a></td>
</tr>
<tr>
<td>KW-Software</td>
<td>Langenbruch 6</td>
<td>+49 52 61 / 93 73-0</td>
<td></td>
<td><a href="mailto:sales@kw-software.com">sales@kw-software.com</a></td>
<td><a href="http://www.kw-software.com">www.kw-software.com</a></td>
</tr>
<tr>
<td>Microsoft</td>
<td>Konrad Zuse Straße 1</td>
<td>+49 89 3176-0</td>
<td>+49 89 3176-1000</td>
<td><a href="mailto:embeddedinfo@microsoft.com">embeddedinfo@microsoft.com</a></td>
<td><a href="http://www.windowsembedded.de">www.windowsembedded.de</a></td>
</tr>
<tr>
<td>IS2T</td>
<td>11 rue du Chemin Rouge, Bat. D</td>
<td>+33 240 180 496</td>
<td></td>
<td></td>
<td><a href="http://www.is2t.com">www.is2t.com</a></td>
</tr>
<tr>
<td>Lauterbach</td>
<td>Altlaufstraße 40</td>
<td>+49 8102 9876-0</td>
<td>+49 8102 9876-999</td>
<td><a href="mailto:sales@lauterbach.com">sales@lauterbach.com</a></td>
<td><a href="http://www.lauterbach.com">www.lauterbach.com</a></td>
</tr>
<tr>
<td>Mouser Electronics</td>
<td>Ganghoferstrasse 34</td>
<td>+49 8142 65279-10</td>
<td>+49 8142 65279-20</td>
<td><a href="mailto:Munich@mouser.com">Munich@mouser.com</a></td>
<td><a href="http://www.mouser.com">www.mouser.com</a></td>
</tr>
<tr>
<td>Lauterbach</td>
<td>Altlaufstraße 40</td>
<td>+49 8102 9876-0</td>
<td>+49 8102 9876-999</td>
<td><a href="mailto:sales@lauterbach.com">sales@lauterbach.com</a></td>
<td><a href="http://www.lauterbach.com">www.lauterbach.com</a></td>
</tr>
<tr>
<td>LDRA</td>
<td>Portside</td>
<td>+44 151 649 9300</td>
<td>+44 151 649 9666</td>
<td><a href="mailto:info@ldra.com">info@ldra.com</a></td>
<td><a href="http://www.ldra.com">www.ldra.com</a></td>
</tr>
<tr>
<td>MSC Vertriebs GmbH</td>
<td>Industriestra. 16</td>
<td>+49 7249 910-0</td>
<td>+49 7249 7993</td>
<td></td>
<td><a href="http://www.msc-ge.com">www.msc-ge.com</a></td>
</tr>
<tr>
<td>Kithara Software</td>
<td>Alte Jakobstraße 78</td>
<td>+49 30 2789 673 - 0</td>
<td>+49 30 2789 673 - 20</td>
<td><a href="mailto:info@kithara.de">info@kithara.de</a></td>
<td><a href="http://www.kithara.de">www.kithara.de</a></td>
</tr>
<tr>
<td>LieberLieber Software</td>
<td>Handelskai 340 Top5A</td>
<td>+43 662 90600 2017</td>
<td>+43 662 90333 3017</td>
<td><a href="mailto:sales@lieberlieber.com">sales@lieberlieber.com</a></td>
<td><a href="http://www.lieberlieber.com">www.lieberlieber.com</a></td>
</tr>
<tr>
<td>N.A.T.</td>
<td>Konrad-Zuse-Platz 9</td>
<td>+49 228 96 58 64 - 0</td>
<td>+49 228 96 58 64 - 10</td>
<td><a href="mailto:sales@nateurope.com">sales@nateurope.com</a></td>
<td><a href="http://www.nateurope.com">www.nateurope.com</a></td>
</tr>
<tr>
<td>Company Name</td>
<td>Address</td>
<td>Phone Numbers</td>
<td>Email Adresses</td>
<td>Websites</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------------------------------</td>
<td>--------------------------------</td>
<td>---------------------------------</td>
<td>------------------------------</td>
<td></td>
</tr>
<tr>
<td>iAR Systems</td>
<td>Werner-Eckert-Str. 9, 81829 München / Germany</td>
<td>T: +49 89 889890-0, F: +49 89 889890-90</td>
<td><a href="mailto:info@iar.de">info@iar.de</a>, <a href="http://www.iar.com">www.iar.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iSYSTEM</td>
<td>Carl-Zeiss-Strasse 1, 85247 Schwabhausen / Germany</td>
<td>T: +49 8138 6971-50, F: +49 8138 6971-46</td>
<td><a href="mailto:sales@isystem.com">sales@isystem.com</a>, <a href="http://www.isystem.com">www.isystem.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>emtrion</td>
<td>Kreativpark – Alter Schlachthof 45, 76131 Karlsruhe / Germany</td>
<td>T: +49 721 62725-20, F: +49 721 62725-19</td>
<td><a href="mailto:mail@emtrion.de">mail@emtrion.de</a>, <a href="http://www.emtrion.de">www.emtrion.de</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMACS</td>
<td>Mittelfeldstrasse 25, 70806 Kornwestheim / Germany</td>
<td>T: +49 7154 8083-0, F: +49 7154 8083-29</td>
<td><a href="mailto:info@imacs-gmbh.de">info@imacs-gmbh.de</a>, <a href="http://www.imacs-gmbh.de">www.imacs-gmbh.de</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kithara Software</td>
<td>Alte Jakobstraße 78, 10179 Berlin / Germany</td>
<td>T: +49 30 2789 673 - 0, F: +49 30 2789 673 - 20</td>
<td><a href="mailto:info@kithara.de">info@kithara.de</a>, <a href="http://www.kithara.de">www.kithara.de</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Express Logic</td>
<td>11423 West Bernardo Court, San Diego, CA 92127 / USA</td>
<td>T: +1 858 613-6640, F: +1 858 521-4259</td>
<td><a href="mailto:info@expresslogic.com">info@expresslogic.com</a>, <a href="http://www.expresslogic.com">www.expresslogic.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMCOR</td>
<td>Turnackerstraße 62/1, 70794 Filderstadt / Germany</td>
<td>T: +49 711 70890-03, F: +49 711 70890-04</td>
<td><a href="mailto:info@imcor.de">info@imcor.de</a>, <a href="http://www.imcor.de">www.imcor.de</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kontron</td>
<td>Oskar-von-Miller-Straße 1, 85386 Eching / Germany</td>
<td>T: +49 8165 77-0, F: +49 8165 77-385</td>
<td><a href="mailto:sales@kontron.com">sales@kontron.com</a>, <a href="http://www.kontron.com">www.kontron.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Hills Software (Germany)</td>
<td>Siemenstr. 38, 53121 Bonn / Germany</td>
<td>T: +49 228 4330-777, F: +49 228 4330-797</td>
<td><a href="mailto:info-de@ghs.com">info-de@ghs.com</a>, <a href="http://www.ghs.com">www.ghs.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS2T</td>
<td>11 rue du Chemin Rouge, Bat. D, 44373 Nantes Cedex 3 / France</td>
<td>T: +33 240 180 496</td>
<td><a href="mailto:sales@is2t.com">sales@is2t.com</a>, <a href="http://www.is2t.com">www.is2t.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lauterbach</td>
<td>Altlaufstraße 40, 85635 Höhenkirchen-Siegertsbrunn, Germany</td>
<td>T: +49 8102 9876-0, F: +49 8102 9876-999</td>
<td><a href="mailto:sales@lauterbach.com">sales@lauterbach.com</a>, <a href="http://www.lauterbach.com">www.lauterbach.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company</td>
<td>Address</td>
<td>Phone</td>
<td>Fax</td>
<td>Email</td>
<td>Website</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>---------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Maxim Integrated</td>
<td>160 Rio Robles, San Jose, CA 95134 / USA</td>
<td>T: +1 408-601-1000</td>
<td><a href="mailto:sales@maximintegrated.com">sales@maximintegrated.com</a></td>
<td><a href="http://www.maximintegrated.com">www.maximintegrated.com</a></td>
<td></td>
</tr>
<tr>
<td>Renesas Electronics Europe</td>
<td>Arcadiastraße 10, 75228 Ispringen / Germany</td>
<td>T: +49 7231 801-0</td>
<td>F: +49 7231 82282</td>
<td><a href="mailto:info@renesas.com">info@renesas.com</a></td>
<td><a href="http://www.renesas.eu">www.renesas.eu</a></td>
</tr>
<tr>
<td>Silicon Laboratories</td>
<td>400 West Cesar Chavez, TX 78701 Austin / USA</td>
<td>T: +1 512 416 8500</td>
<td>F: +1 512 416 9669</td>
<td><a href="http://www.silabs.com">www.silabs.com</a></td>
<td></td>
</tr>
<tr>
<td>Microsemi</td>
<td>One Enterprise, Aliso Viejo, CA 92656 / USA</td>
<td>T: +1 949 380-6100</td>
<td>F: +1 949 215-4996</td>
<td>microsemi.com</td>
<td></td>
</tr>
<tr>
<td>RUTRONIK</td>
<td>Industriestraße 2, 85540 Haar / Germany</td>
<td>T: +49 89 4 56 56-340</td>
<td>F: +49 89 4 56 56-399</td>
<td><a href="mailto:rutronik@rutronik.com">rutronik@rutronik.com</a></td>
<td><a href="http://www.rutronik.com">www.rutronik.com</a></td>
</tr>
<tr>
<td>Softing Industrial Automation</td>
<td>Richard-Reitzner-Allee 6, 85540 Haar / Germany</td>
<td>T: +49 89 4 56 56-240</td>
<td>F: +49 89 4 56 56-399</td>
<td><a href="mailto:info.automation@softing.com">info.automation@softing.com</a></td>
<td>industrial.softing.com</td>
</tr>
<tr>
<td>Mouser Electronics</td>
<td>Ganghoferstrasse 34, 82216 Maisach-Gernlinden / Germany</td>
<td>T: +49 8142 65279-10</td>
<td>F: +49 8142 65279-20</td>
<td><a href="mailto:Munich@mouser.com">Munich@mouser.com</a></td>
<td><a href="http://www.mouser.com">www.mouser.com</a></td>
</tr>
<tr>
<td>StreamUnlimited</td>
<td>Gutheil-Schoder-Gasse 10, 1100 Vienna / Austria</td>
<td>T: +43.1.60101.4014</td>
<td></td>
<td><a href="mailto:sales@streamunlimited.com">sales@streamunlimited.com</a></td>
<td><a href="http://www.streamunlimited.com">www.streamunlimited.com</a></td>
</tr>
<tr>
<td>NXP Semiconductors</td>
<td>High Tech Campus 60, 5656 AG Eindhoven, The Netherlands</td>
<td>T: +31 40 27 26533</td>
<td></td>
<td><a href="http://www.nxp.com">www.nxp.com</a></td>
<td></td>
</tr>
<tr>
<td>SECO</td>
<td>Via Calamandrei, 91, 52100 Arezzo / Italy</td>
<td>T: +39 0575 26979</td>
<td>F: +39 0575 350210</td>
<td><a href="mailto:info@seco.com">info@seco.com</a></td>
<td><a href="http://www.seco.com">www.seco.com</a></td>
</tr>
<tr>
<td>Syslogic Datentechnik</td>
<td>Weilheimer Straße 40, 79761 Waldshut-Tiengen / Germany</td>
<td>T: +49 7741 9671-420</td>
<td></td>
<td><a href="mailto:info@syslogic.com">info@syslogic.com</a></td>
<td><a href="http://www.syslogic.com">www.syslogic.com</a></td>
</tr>
<tr>
<td>PLUG-IN Electronic</td>
<td>Postfach 345, 82219 Eichenau / Germany</td>
<td>T: +49 81 41 / 36 97-0</td>
<td>F: +49 81 41 / 36 97-30</td>
<td></td>
<td><a href="http://www.plug-in.de">www.plug-in.de</a></td>
</tr>
<tr>
<td>SEGGER Microcontroller</td>
<td>In den Weiden 11, 40721 Hilden / Germany</td>
<td>T: +49 2103 - 2878-0</td>
<td>F: +49 2103 - 2878-28</td>
<td><a href="mailto:info@segger.com">info@segger.com</a></td>
<td><a href="http://www.segger.com">www.segger.com</a></td>
</tr>
<tr>
<td>Telit</td>
<td>Via Stazione di Prosecco, 5/B, 34010 Sgonico (Trieste) / Italy</td>
<td>T: +39 040 4192 200</td>
<td>F: +39 040 4192 289</td>
<td><a href="mailto:emea@telit.com">emea@telit.com</a></td>
<td><a href="http://www.telit.com">www.telit.com</a></td>
</tr>
</tbody>
</table>
Microwaves & Memories

Maxim Integrated
160 Rio Robles
San Jose, CA 95134 / USA
T: +1 408-601-1000
sales@maximintegrated.com
www.maximintegrated.com

Renesas Electronics Europe
Arcadiastraße 10
40472 Düsseldorf / Germany
T: +49 211-6503-0
info@renesas.com
www.renesas.eu

Microsemi
One Enterprise
Aliso Viejo, CA 92656 / USA
T: +1 949 380-6100
F: +1 949 215-4996
www.microsemi.com

RUTRONIK
Industriestraße 2
75228 Ispringen / Germany
T: +49 7231 801-0
F: +49 7231 82282
rutronik@rutronik.com
www.rutronik.com

Mouser Electronics
Ganghoferstrasse 34
82216 Maisach-Gernlinden / Germany
T: +49 8142 65279-10
F: +49 8142 65279-20
Munich@mouser.com
www.mouser.com

Silicon Laboratories
400 West Cesar Chavez
TX 78701 Austin / USA
T: +1 512 416 8500
F: +1 512 416 9669
www.silabs.com

MSC Vertriebs GmbH
Industriestr. 16
76297 Stutensee
Germany
T: +49 7249 910-0
F: +49 7249 7993
www.msc-ge.com

StreamUnlimited
Gutheil-Schoder-Gasse 10
1100 Vienna / Austria
T: +43 1.60101.4014
sales@streamunlimited.com
www.streamunlimited.com

Apacer Technology
Science Park
Eindhoven 5051
5692 EB Son / The Netherlands
Tel: +31 40 267 0000
Fax: +31 40 290 0686
Embedded@apacer.nl
www.apacer.com

Arrow Central Europe
Max-Planck-Straße 1-3
63303 Dreieich / Germany
T: +49 6103-304-0
F: +49 6103-304-8455
www.arroweurope.com

Digi International
31, rue des Poissonniers
92200 Neuilly sur Seine / France
T: +33-1-55-61-98-98
F: +33-1-55-61-98-99
www.digi.com

NXP Semiconductors
High Tech Campus 60
5656 AG Eindhoven
The Netherlands
F: +31 40 27 26533
www.nxp.com

Texas Instruments
European Customer Support Center
European Free Call: 00800-ASK-TEXAS
(00800 275 83927)
International Call: +49 8161 80 2121
Russian Support: +7 (495) 98 10 701
F: +49 (0) 8161 80 2045
www.ti.com
DAVE™—Development Platform

High-Productivity Development Support for Infineon XMC Microcontrollers

The Infineon XMC microcontroller families for industrial solutions combines the ARM® Cortex™-M4 and M0 with Infineon’s product excellence in real-time embedded control to enable a broad range of applications with a future-proof design. To shorten development time Infineon provides its DAVE™ development platform for free download.

With DAVE™ developers can generate the software library to efficiently use the innovative application optimized peripherals of the XMC microcontrollers. Code generation is based on predefined and tested application oriented software components, called DAVE™ Apps. In addition DAVE™ includes a free GNU compiler and a free debugger including flash loader.

DAVE™ Apps are graphical configurable software building blocks for a wide range of application uses cases. Software developers can focus to the important IP and let DAVE™ do the hardware oriented software. The generated library can easily be imported into any 3rd parties tool chains that support the XMC microcontrollers.

DAVE™ can be downloaded for free at www.infineon.com/dave

www.infineon.com/xmc
<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>City</th>
<th>Country</th>
<th>Phone</th>
<th>Fax</th>
<th>Email</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distec</td>
<td>Augsburger Str. 2b</td>
<td>Germering</td>
<td>Germany</td>
<td>+49 89/894363-0</td>
<td>+49 89/894363-131</td>
<td><a href="mailto:info@distec.de">info@distec.de</a></td>
<td><a href="http://www.distec.de">www.distec.de</a></td>
</tr>
<tr>
<td>Maxim Integrated</td>
<td>160 Rio Robles</td>
<td>San Jose</td>
<td>CA</td>
<td>+1 408-601-1000</td>
<td><a href="mailto:sales@maximintegrated.com">sales@maximintegrated.com</a></td>
<td><a href="http://www.maximintegrated.com">www.maximintegrated.com</a></td>
<td></td>
</tr>
<tr>
<td>Renesas Electronics Europe</td>
<td>Arcadiasträße 10</td>
<td>Düsseldorf</td>
<td>Germany</td>
<td>+49 211-6503-0</td>
<td></td>
<td><a href="mailto:info@renesas.com">info@renesas.com</a></td>
<td><a href="http://www.renesas.eu">www.renesas.eu</a></td>
</tr>
<tr>
<td>Glyn</td>
<td>Am Wörtzgarten 8</td>
<td>Idstein</td>
<td>Germany</td>
<td>+49 6126-590-222</td>
<td>+49 6126 590-111</td>
<td><a href="mailto:sales@glyn.de">sales@glyn.de</a></td>
<td><a href="http://www.glyn.de">www.glyn.de</a></td>
</tr>
<tr>
<td>Microsemi</td>
<td>One Enterprise</td>
<td>Aliso Viejo</td>
<td>CA</td>
<td>+1 949 380-6100</td>
<td>+1 949 215-4996</td>
<td>microsemi.com</td>
<td></td>
</tr>
<tr>
<td>RUTRONIK</td>
<td>Industriestraße 2</td>
<td>Springen</td>
<td>Germany</td>
<td>+49 7231 801-0</td>
<td>+49 7231 82282</td>
<td><a href="mailto:rutronik@rutronik.com">rutronik@rutronik.com</a></td>
<td><a href="http://www.rutronik.com">www.rutronik.com</a></td>
</tr>
<tr>
<td>Hyperstone</td>
<td>Line-Eid-Strasse 3</td>
<td>Konstanz</td>
<td>Germany</td>
<td>+49 7531 98030</td>
<td>+49 7531 980338</td>
<td><a href="mailto:info@hyperstone.com">info@hyperstone.com</a></td>
<td><a href="http://www.hyperstone.com">www.hyperstone.com</a></td>
</tr>
<tr>
<td>Mouser Electronics</td>
<td>Ganghoferstrasse 34</td>
<td>Maisach-Gernlinden</td>
<td>Germany</td>
<td>+49 8142 65279-10</td>
<td>+49 8142 65279-20</td>
<td><a href="mailto:Munich@mouser.com">Munich@mouser.com</a></td>
<td><a href="http://www.mouser.com">www.mouser.com</a></td>
</tr>
<tr>
<td>Silicon Laboratories</td>
<td>400 West Cesar Chavez</td>
<td>Austin</td>
<td>TX</td>
<td>+1 512 416 8500</td>
<td>+1 512 416 9669</td>
<td><a href="http://www.silabs.com">www.silabs.com</a></td>
<td></td>
</tr>
<tr>
<td>Infineon Technologies</td>
<td>Am Campeon 1-12</td>
<td>Neubiberg</td>
<td>Germany</td>
<td>+49 89 234-0 (supported 24/7)</td>
<td></td>
<td><a href="mailto:info@infineon.com">info@infineon.com</a></td>
<td><a href="http://www.infineon.com">www.infineon.com</a></td>
</tr>
<tr>
<td>Trinamic</td>
<td>Trinamic</td>
<td>Hamburg</td>
<td>Germany</td>
<td>+49 40 27 26533</td>
<td></td>
<td><a href="mailto:tmc_info@trinamic.com">tmc_info@trinamic.com</a></td>
<td><a href="http://www.trinamic.com">www.trinamic.com</a></td>
</tr>
<tr>
<td>NXP Semiconductors</td>
<td>High Tech Campus 60</td>
<td>Eindhoven</td>
<td>The Netherlands</td>
<td>+31 40 27 26533</td>
<td></td>
<td></td>
<td><a href="http://www.nxp.com">www.nxp.com</a></td>
</tr>
<tr>
<td>Texas Instruments</td>
<td>European Customer Support Center</td>
<td></td>
<td>The Netherlands</td>
<td>+49 8161 80 2045</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jactron</td>
<td>The industrial division of Simms International plc</td>
<td>Northdown Business Park</td>
<td>Kent, UK</td>
<td>+44 1622 852848</td>
<td>+44 1622 852801</td>
<td></td>
<td><a href="http://www.jactron.co.uk">www.jactron.co.uk</a></td>
</tr>
</tbody>
</table>
**Arrow Central Europe**

Max-Planck-Straße 1-3
63303 Dreieich / Germany
T: +49 6103-304-0
F: +49 6103-304-8455
www.arroweurope.com

**Artila Electronics**

4F, No.6, Lane 130, Minquan Road
Xindian Dist. 231, New Taipei City
Taiwan (R.O.C.)
T: +886 2 8667-2340
F: +886 2 8667-3240
sales@artila.com
www.artila.com

**Avalue Technology**

7F, 228, Liang-cheng Road,
Zhonghe Dist., New Taipei City 235
Taiwan
T: +886-2-2917 4500
F: +886-2-2917 3200
sales@avalue.com.tw
www.avalue.com.tw

**Axiomtek**

8F, No.4, Lane 235, Baoqiao Road
Xindian District, New Taipei City 231/Taiwan
T: +886-6-2917 4500
F: +886-6-2917 3200
wen@axiomtek.com.tw
www.axiomtek.com

**Bluetechnix**

Waaidhausenstraße 3/19
1140 Wien / Austria
T: +43 1 914 20 91-0
F: +43 1 914 20 91-99
office@bluetechnix.com
www.bluetechnix.com

**CES - Creative Electronic Systems**

38 avenue Eugene-Lance
1212 Grand-Lancy / Switzerland
T: +41 22 884 51 00
F: +41 22 794 74 30
ces@ces.ch
www.ces.ch

**congatec**

Auwiesenstr. 5
94469 Deggendorf / Germany
T: +49 991 2700-0
F: +49 991 2700-111
info@congatec.com
www.congatec.com

**Data Device Corporation (DDC)**

Mill Reef House
9-14 Cheap Street
Newbury, Berkshire RG14 5DD / UK
T: +44 1635 811140
F: +44 1635 32264
northfield@ddc-web.com
www.ddc-web.com

**Data Modul**

Landsberger Str. 322
80687 München / Germany
T: +49 89 56017-0
F: +49 89 56017-19
www.data-modul.com

**DAVE**

Via Talponedo 29/A
33080 Porcia (PN) / Italy
T: +39 0434 921215
F: +39 0434 1994030
sales@dave.eu
www.dave.eu

**Diamond Flower Information (NL) B.V.**

Shannonweg 11, 3197LG, Port No.5087
Botlek / Rotterdam / The Netherlands
T: +31 10 296-1840
F: +31 10 296-1849
Sales@dfi-europe.nl
www.dfi.com

**Digi International**

31, rue des Poissonniers
92200 Neuilly sur Seine / France
T: +33-1-55-61-98-98
F: +33-1-55-61-98-99
www.digi.com

**DSM Computer**

Am Loferfeld 54
81249 München / Germany
T: +49 89 15798-250
F: +49 89 15798-196
sales@dsm-computer.de
www.dsm-computer.de

**E.E.P.D.**

Gewerbering 3
85258 Weichs / Germany
T: +49 8136 22 82 - 0
F: +49 8136 22 82 - 109
sales@eepd.de
www.eepd.de

**ECRIN Systems**

142, rue Louis Neel
Parc Technologique du Pré Roux
38920 Croles / France
T: +33 1 69 07 83 22
sales@ecrin.com
www.ecrin.com/embedded
SBCs, COTS & Busboards

MSI (Micro-Star International)
Business Unit: IPC
(Industrial Platform Computing)
69F., Lide St., Zhonghe Dist.
New Taipei City 235 / Taiwan
T: +886-2-3234-5599
F: +886-2-2225 0272
ipcsales@msi.com
www.msi.com/ipc

RUTRONIK
Industriestraße 2
75228 Ispringen / Germany
T: +49 7231 801-0
F: +49 7231 82282
rutronik@rutronik.com
www.rutronik.com

N.A.T.
Konrad-Zuse-Platz 9
53227 Bonn / Germany
T: +49 228 96 58 64 - 0
F: +49 228 96 58 64 - 10
sales@nateurope.com
www.nateurope.com

SECO
Via Calamandrei, 91
52100 Arezzo / Italy
T: +39 0575 36979
F: +39 0575 350210
info@seco.com
www.seco.com

NEXCOM
10 Vincent Avenue
Crownhill Business Centre
Milton Keynes,
Buckinghamshire MK8 0AB / UK
T: +44-1908-267121
F: +44-1908-262042
sales.uk@nexcom.eu
www.nexcom.eu

StreamUnlimited
Gutheil-Schoder-Gasse 10
1100 Vienna / Austria
T: +43.1.60101.4014
sales@streamunlimited.com
www.streamunlimited.com

Pentair – Schroff
Langenalber Straße 96-100
75334 Straubenhardt / Germany
T: +49 7082 794-0
F: +49 7082 794-200
schoff.de@pentair.com
www.pentairequipmentprotection.com

Syslogic Datentechnik
Weilheimer Straße 40
79761 Waldshut-Tiengen / Germany
T: +49 7741 9671-420
info@syslogic.com
www.syslogic.com

PLUG-IN Electronic
Postfach 345
82219 Eichenau / Germany
T: +49 81 41 / 36 97-0
F: +49 81 41 / 36 97-30
www.plug-in.de

TQ-Components
Mühlstraße 2
Gut Delling
82229 Seefeld / Germany
T: +49 8153 9308-0
F: +49 8153 9308-134
info@tq-group.com
www.tq-group.com

Product News, Technical Articles & more about:
- Chips & Components
- Tools & Software
- Boards & Modules
**AAEON Technology**

An der Trift 65d
63303 Dreieich / Germany
T: +49-61033-747900
F: +49-61033-747949
saleseurope@aaeon.com
www.aaeon.eu

**Acromag**

30765 South Wixom Road, PO Box 437
Wixom, Michigan 48393-7037 / USA

Embedded Solutions Group:
Call toll-free 877-295-7092, 248-295-0310
solutions@acromag.com

Signal Conditioning and Network I/O:
Call toll-free 877-214-6267, 248-295-0880
sales@acromag.com
www.acromag.com

**ADL Embedded Solutions**

Eiserfelder Straße 316
57080 Siegen / Germany
T: +49 271 250 810-0
F: +49 271 250 810-20
sales@adl-europe.com
www.adl-europe.com

**ADLINK Technology**

9F, No.166, Jian Yi Road
Zhonghe District
New Taipei City 235 / Taiwan
T: +886 2 82265877
F: +886 2 82265717
service@adlinktech.com
www.adlinktech.com

**Advanced Micro Peripherals**

Unit 1, Harrier House
Sedgeway Business Park
Witchford, Cambridgeshire
CB6 2HY / UK
T: +44 1353 659 500
F: +44 1353 659 600
sales@ampltd.com
www.ampltd.com

**Advantech Europe**

Industriestrasse 15
82110 Germering / Germany
T: 00800 24 26 80 80
customercare@advantech.eu
www.advantech.eu

**Apacer Technology**

Science Park
Eindhoven 5051
5692 EB Son / The Netherlands
Tel: +31 40 267 0000
Fax: +31 40 290 0686
Embedded@apacer.nl
www.apacer.com

**Arrow Central Europe**

Max-Planck-Straße 1-3
63303 Dreieich / Germany
T: +49 6103-304-0
F: +49 6103-304-8455
www.arroweurope.com

**Artila Electronics**

4F, No.6, Lane 130,
Minquan Road
Xindian Dist., 231, New Taipei City
Taiwan (R.O.C.)
T: +886 2 8667-2340
F: +886 2 8667-3240
sales@artila.com
www.artila.com
SMALL FORM FACTOR BOARDS, COMS & MOTHERBOARDS

Avalue Technology

7F, 228, Lian-cheng Road, Zhonghe Dist., New Taipei City 235 Taiwan
T: +886 2 82262345
F: +886 2 82262777
sales@avalue.com.tw
www.avalue.com.tw

Data Device Corporation (DDC)

Mill Reef House
9-14 Cheap Street
Newbury, Berkshire RG14 5DD / UK
T: +44 1635 811140
F: +44 1635 32264
northfield@ddc-web.com
www.ddc-web.com

DSM Computer

Am Loferfeld 54
81249 München / Germany
T: +49 89 15798-250
F: +49 89 15798-196
sales@dsm-computer.de
www.dsm-computer.de

Axiomtek

8F, No.4, Lane 235, Baoqiao Road
Xindian District, New Taipei City 231/Taiwan
T: +886-2-2917 4500
F: +886-2-2917 3200
wen@axiomtek.com.tw
www.axiomtek.com

Data Modul

Landsberger Str. 322
80687 München / Germany
T: +49 89 56017-0
F: +49 89 56017-19
www.data-modul.com

E.E.P.D.

Gewerbering 3
85258 Weichs / Germany
T: +49 8136 22 82 - 0
F: +49 8136 22 82 - 109
sales@eepd.de
www.eepd.de

Bluetechnix

Waidhausenstraße 3/19
1140 Wien / Austria
T: +43 1 914 20 91-0
F: +43 1 914 20 91-99
office@bluetechnix.com
www.bluetechnix.com

DAVE

Via Talponedo 29/A
33080 Porcia (PN) / Italy
T: +39 0434 921215
F: +39 0434 1994030
sales@dave.eu
www.dave.eu

ECRIN Systems

143, rue Louis Neel
Parc Technologique du Pré Roux
38920 Crolles / France
T: +33 1 69 07 83 22
sales@ecrin.com
www.ecrin.com/embedded/

CES - Creative Electronic Systems

38 avenue Eugene-Lance
1212 Grand-Lancy / Switzerland
T: +41 22 884 51 00
F: +41 22 794 74 30
ces@ces.ch
www.ces.ch

Diamond Flower

Information (NL) B.V.

Shannonweg 11, 3197LG, Port No.5087
Botlek / Rotterdam / The Netherlands
T: +31 10 296-1840
F: +31 10 296-1849
Sales@dfi-europe.nl
www.dfi.com

embedded-logic

Am Kroit 25-27
83123 Amerang / Germany
T: +49 8075 9144-00
F: +49 8075 9144-09
info@embedded-logic.de
www.embedded-logic.de/en/home

congatec

Auwiesenstr. 5
94469 Deggendorf / Germany
T: +49 991 2700-0
F: +49 991 2700-111
info@congatec.com
www.congatec.com

Digi International

31, rue des Poissonniers
92200 Neuilly sur Seine / France
T: +33-1-55-61-98-98
F: +33-1-55-61-98-99
www.digi.com

Emerson Network Power

Embedded Computing

Lilienthalstr. 15
85579 Neubiberg / Germany
T: +49 89 9608 2430
F: +49 89 9608 353
EmbeddedComputingEuropeSales@emerson.com
www.Emerson.com/EmbeddedComputing
SMALL FORM FACTOR BOARDS, COMS & MOTHERBOARDS / INDUSTRIAL COMPUTING & DISPLAYS

NEXCOM
10 Vincent Avenue
Crownhill Business Centre
Milton Keynes,
Buckinghamshire MK8 0AB / UK
T: +44-1908-267121
F: +44-1908-262042
sales.uk@nexcom.eu
www.nexcom.eu

StreamUnlimited
Gutheil-Schoder-Gasse 10
1100 Vienna / Austria
T: +43.1.60101.4014
sales@streamunlimited.com
www.streamunlimited.com

PLUG-IN Electronic
Postfach 345
82219 Eichenau / Germany
T: +49 81 41 / 36 97-0
F: +49 81 41 / 36 97-30
www.plug-in.de

Syslogic Datentechnik
Weilheimer Straße 40
79761 Waldshut-Tiengen / Germany
T: +49 7741 9671-420
info@syslogic.com
www.syslogic.com

RUTRONIK
Industriestraße 2
75228 Ispringen / Germany
T: +49 7231 801-0
F: +49 7231 82282
rutronik@rutronik.com
www.rutronik.com

TQ-Components
Mühlstraße 2
Gut Delling
82229 Seefeld / Germany
T: +49 8153 9308-0
F: +49 8153 9308-134
info@tq-group.com
www.tq-group.com

SECO
Via Calamandrei, 91
52100 Arezzo / Italy
T: +39 0575 26979
F: +39 0575 350210
info@seco.com
www.seco.com

Trinamic
Waterloohain 5
22769 Hamburg / Germany
T: +49 40 514806-0
F: +49 40 514806-60
tmc_info@trinamic.com
www.trinamic.com

Softing Industrial Automation
Richard-Reitzner-Allee 6
85540 Haar / Germany
T: +49 89 4 56 56-340
F: +49 89 4 56 56-399
info.automation@softing.com
industrial.softing.com

Vecow
7F. No.105 Zhongcheng Rd.
Tucheng Dist.
New Taipei City 23674 / Taiwan (R.O.C.)
T: +886 2 2268 5658
F: +886 2 2268 1658
Sales@vecow.com
www.vecow.com

ADLINK Technology
9F, No.166, Jian Yi Road
Zhonghe District
New Taipei City 235 / Taiwan
T: +886 2 82265877
F: +886 2 82265717
service@adlinktech.com
www.adlinktech.com

July 2013
<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>Phone Numbers</th>
<th>Email</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Micro Peripherals</td>
<td>Unit 1, Harrier House Sedgeway Business Park Witchford, Cambridgeshire CB6 2HY / UK</td>
<td>+44 1353 659 500 +44 1353 659 600</td>
<td><a href="mailto:sales@ampltd.com">sales@ampltd.com</a> <a href="http://www.ampltd.com">www.ampltd.com</a></td>
<td></td>
</tr>
<tr>
<td>Avalue Technology</td>
<td>7F, 228, Lian-cheng Road, Zhonghe Dist., New Taipei City 235 Taiwan</td>
<td>+886 2 82262345 +886 2 82262777</td>
<td><a href="mailto:sales@avalue.com.tw">sales@avalue.com.tw</a> <a href="http://www.avalue.com.tw">www.avalue.com.tw</a></td>
<td></td>
</tr>
<tr>
<td>Advantech Europe</td>
<td>Industriestrasse 15 82110 Germering / Germany</td>
<td>00800 24 26 80 80</td>
<td><a href="mailto:customercare@advantech.eu">customercare@advantech.eu</a> <a href="http://www.advantech.com">www.advantech.com</a></td>
<td></td>
</tr>
<tr>
<td>Axiomtek</td>
<td>8F, No.4, Lane 235, Baoqiao Road XinJin, New Taipei City 231/Taiwan</td>
<td>+886-2-2917 4500 +886-2-2917 3200</td>
<td><a href="mailto:wen@axiomtek.com.tw">wen@axiomtek.com.tw</a> <a href="http://www.axiomtek.com">www.axiomtek.com</a></td>
<td></td>
</tr>
<tr>
<td>Apacer Technology</td>
<td>Science Park Eindhoven 5051 5692 EB Son / The Netherlands</td>
<td>+31 40 267 0000 +31 40 290 0686</td>
<td><a href="mailto:Embedded@apacer.nl">Embedded@apacer.nl</a> <a href="http://www.apacer.com">www.apacer.com</a></td>
<td></td>
</tr>
<tr>
<td>Bluetechnix</td>
<td>Waidhausenstraße 3/19 1140 Wien / Austria</td>
<td>+43 1 914 20 91-0 +43 1 914 20 91-99</td>
<td><a href="mailto:office@bluetechnix.com">office@bluetechnix.com</a> <a href="http://www.bluetechnix.com">www.bluetechnix.com</a></td>
<td></td>
</tr>
<tr>
<td>Arrow Central Europe</td>
<td>Max-Planck-Straße 1-3 63303 Dreieich / Germany</td>
<td>+49 6103-304-0 +49 6103-304-8455</td>
<td><a href="http://www.arroweurope.com">www.arroweurope.com</a></td>
<td></td>
</tr>
<tr>
<td>Artila Electronics</td>
<td>4F, No.6, Lane 130, Minquan Road XinJin Dist. 231, New Taipei City Taiwan (R.O.C.)</td>
<td>+886 2 8667-2340 +886 2 8667-3240</td>
<td><a href="mailto:sales@artila.com">sales@artila.com</a> <a href="http://www.artila.com">www.artila.com</a></td>
<td></td>
</tr>
<tr>
<td>CES - Creative Electronic Systems</td>
<td>38 avenue Eugene-Lance 1212 Grand-Lancy / Switzerland</td>
<td>+41 22 884 51 00 +41 22 794 74 30</td>
<td><a href="mailto:ces@ces.ch">ces@ces.ch</a> <a href="http://www.ces.ch">www.ces.ch</a></td>
<td></td>
</tr>
<tr>
<td>congatec</td>
<td>Auxviesenstr. 5 94469 Deggendorf / Germany</td>
<td>+49 991 2700-0 +49 991 2700-111</td>
<td><a href="mailto:info@congatec.com">info@congatec.com</a> <a href="http://www.congatec.com">www.congatec.com</a></td>
<td></td>
</tr>
</tbody>
</table>

Rugged Computer Boards and Systems for Harsh, Mobile and Mission-Critical Environments

- Safe computers for rail, road and air, up to SIL 4/DAL-A
- Modular box and panel PCs for industry & transportation
- Powerful system solutions on CompactPCI®/PlusIO/Serial
- Rugged standard Computer-on-Modules (ESMexpress®, ESMi®)
- EN 50155- and e1-certified Ethernet switches and fieldbus interfaces

MEN is certified to:
**INDUSTRIAL COMPUTING & DISPLAYS**

- **iSYSTEM**
  Carl-Zeiss-Strasse 1
  85247 Schwabhausen / Germany
  T: +49 8138 6971-50
  F: +49 8138 6971-46
  sales@isystem.com
  www.isystem.com

- **MathWorks**
  Friedlandstr. 18
  52066 Aachen / Germany
  T: +49 241 4757-6700
  F: +49 241 4757-6710
  info@mathworks.de
  www.mathworks.com

- **MSI (Micro-Star International)**
  Business Unit: IPC
  (Industrial Platform Computing)
  69F., Lide St., Zhonghe Dist.
  New Taipei City 235 / Taiwan
  T: +886-2-3234-5599
  F: +886-2-2225 0272
  ipcsales@msi.com
  www.msi.com/ipc

- **Jactron**
  The industrial division of Simms International plc
  Northdown Business Park
  Ashford Road
  Lenham, Kent ME17 2DL / UK
  T: +44 1622 852848
  F: +44 1622 852801
  www.jactron.co.uk

- **MEN Mikro Elektronik**
  Neuwieder Strasse 3-7
  59411 Nürnberg / Germany
  T: +49 911 9 93 35-0
  F: +49 911 9 93 35-901
  info@men.de
  www.men.de

- **Microsoft**
  Windows Embedded
  Konrad Zuse Straße 1
  85716 Unterschleißheim / Germany
  T: +49 89 3176-0
  F: +49 89 3176-1000
  embeddedinfo@microsoft.com
  www.windowsembedded.de

- **N.A.T.**
  Konrad-Zuse-Platz 9
  53227 Bonn / Germany
  T: +49 228 96 58 64 - 0
  F: +49 228 96 58 64 - 10
  sales@nateurope.com
  www.nateurope.com

- **Kithara Software**
  Alte Jakobstraße 78
  10179 Berlin / Germany
  T: +49 30 2789 673 - 0
  F: +49 30 2789 673 - 20
  info@kithara.de
  www.kithara.de

- **Kontron**
  Oskar-von-Miller-Straße 1
  85386 Eching / Germany
  T: +49 8165 77-0
  F: +49 8165 77-385
  sales@kontron.com
  www.kontron.com

- **MicroSys Electronics**
  Mühlweg 1
  82054 Sauerlach / Germany
  T: +49 8104 801-0
  F: +49 8104 801-110
  info@microsys.de
  www.microsys.de

- **Pentair – Schroff**
  Langenalber Straße 96-100
  75334 Straubenhardt / Germany
  T: +49 7082 794-0
  F: +49 7082 794-200
  schroff.de@pentair.com
  www.pentairequipmentprotection.com

- **KW-Software**
  Langenbruch 6
  32657 Lemgo / Germany
  T: +49 52 61 / 93 73-0
  sales@kw-software.com
  www.kw-software.com

- **NSC Vertriebs GmbH**
  Industriest. 16
  76297 Stuttgartersee
  Germany
  T: +49 7249 910-0
  F: +49 7249 7993
  www.msc-ge.com

- **PLUG-IN Electronic**
  Postfach 345
  82219 Eichenau / Germany
  T: +49 81 41 / 36 97-0
  F: +49 81 41 / 36 97-30
  www.plug-in.de
INDUSTRIAL COMPUTING & DISPLAYS / BACKPLANES, RACKS & CONNECTORS

RUTRONIK

Industriestraße 2
75228 Ispringen / Germany
T: +49 7231 801-0
F: +49 7231 82282
rutronik@rutronik.com
www.rutronik.com

TQ-Components

Mühlstraße 2
Gut Delling
82229 Seefeld / Germany
T: +49 8153 9308-0
F: +49 8153 9308-134
info@tq-group.com
www.tq-group.com

AAEON Technology

An der Trift 65d
63303 Dreieich / Germany
T: +49-6103-747900
F: +49-6103-747949
saleseurope@aaeon.com
www.aaeon.eu

SECO

Via Calamandrei, 91
52100 Arezzo / Italy
T: +39 0575 26979
F: +39 0575 350210
info@seco.com
www.seco.com

VECOW

7F. No.105 Zhongcheng Rd.
Tucheng Dist.
New Taipei City 23674 / Taiwan (R.O.C.)
T: +886 2 2268 5658
F: +886 2 2268 1658
Sales@vecow.com
www.vecow.com

StreamUnlimited

Gutheil-Schoder-Gasse 10
1100 Vienna / Austria
T: +43.1.60101.4014
sales@streamunlimited.com
www.streamunlimited.com

WIBU-SYSTEMS

Rueppurrer Strasse 52-54
76137 Karlsruhe / Germany
T: +49-721-93172-0
F: +49-721-93172-22
sales@wibu.com
www.wibu.com

ADLINK Technology

9F, No.166, Jian Yi Road
Zhonghe District
New Taipei City 235 / Taiwan
T: +886 2 82265877
F: +886 2 82265717
service@adlinktech.com
www.adlinktech.com

Syslogic Datentechnik

Weilheimer Straße 40
79761 Waldshut-Tiengen / Germany
T: +49 7741 9671-420
info@syslogic.com
www.syslogic.com

XiSys Software

Klosterstr. 24
97326 Randersacker / Germany
T: +49 931 4677090
F: +49 931 4677098
info@xisys.de
www.xisys.de

Advantech Europe

Industriestrasse 15
82110 Germering / Germany
T: 00800 24 26 80 80
customercare@advantech.eu
www.advantech.eu

TQ-Components

Mühlstraße 2
Gut Delling
82229 Seefeld / Germany
T: +49 8153 9308-0
F: +49 8153 9308-134
info@tq-group.com
www.tq-group.com

WIBU-SYSTEMS

Rueppurrer Strasse 52-54
76137 Karlsruhe / Germany
T: +49-721-93172-0
F: +49-721-93172-22
sales@wibu.com
www.wibu.com

Advantech Europe

Industriestrasse 15
82110 Germering / Germany
T: 00800 24 26 80 80
customercare@advantech.eu
www.advantech.eu

Arrow Central Europe

Max-Planck-Straße 1-3
63303 Dreieich / Germany
T: +49 6103-304-0
F: +49 6103-304-8455
www.arroweurope.com
Backplanes, Racks & Connectors

Avalue Technology
7F, 228, Lian-cheng Road, Zhonghe Dist., New Taipei City 235 Taiwan
T: +886 2 82262345
F: +886 2 82262777
sales@avalue.com.tw
www.avalue.com.tw

EKF Elektronik
Philipp-Reis-Strasse 4
59065 Hamm / Germany
T: +49 2381 6890-0
F: +49 2381 6890-90
sales@ekf.de
www.ekf.de

IEI Integration
No. 29, Zhongxing Rd., Xizhi Dist., New Taipei City 221 / Taiwan
T: +886-2-86916798
F: +886-2-6616-0028
sales@iei.com.tw
www.ieiworld.com

Axiomtek
8F, No.4, Lane 235, Baoqiao Road Xindian District, New Taipei City 231/Taiwan
T: +886-2-2917 4500
F: +886-2-2917 3200
wen@axiomtek.com.tw
www.axiomtek.com

Elma Electronic
Stuttgarter Str. 11
75179 Pforzheim / Germany
T: +49 7231 9734-0
F: +49 7231 9734-97
info@elma.de
www.elma.de

Kontron
Oskar-von-Miller-Straße 1
85386 Eching / Germany
T: +49 8165 77-0
F: +49 8165 77-385
sales@kontron.com
www.kontron.com

Diamond Flower Information (NL) B.V.
Shannonweg 11, 3197LG, Port No.5087 Botlek / Rotterdam / The Netherlands
T: +31 10 296-1840
F: +31 10 296-1849
Sales@dfi-europe.nl
www.dfi.com

Ept elektronische Präzisionstechnik
Bergwerkstrasse 50
86971 Peiting Germany
T: +49 8861 2501-0
F: +49 8861 5507
sales@ept.de
www.ept.de

MEN Mikro Elektronik
Neurieder Strasse 3-7
90411 Nürnberg / Germany
T: +49 911 9 93 35-0
F: +49 911 9 93 35-901
info@men.de
www.men.de

Digi International
31, rue des Poissonniers
92200 Neuilly sur Seine / France
T: +33-1-55-61-98-98
F: +33-1-55-61-98-99
www.digi.com

ERNI Electronics
Seestrasse 9
73099 Adelberg / Germany
T: +49 7166 50-0
F: +49 7166 50-282
www.erni.com

MicroSys Electronics
Mühlweg 1
82054 Sauerlach / Germany
T: +49 8104 801-0
F: +49 8104 801-110
info@microsys.de
www.microsys.de

DSM Computer
Am Loferfeld 54
81249 München / Germany
T: +49 89 15798-250
F: +49 89 15798-196
sales@dsms.computer.de
www.dsm-computer.de

Eurotech Group
Eurotech Head Office
Via F.lli Solari 3/a
33020 Amaro (UD) / Italy
T: +39 0433 4854-11
F: +39 0433 4854-99
sales@eurotech.com
www.eurotech.com

Mouser Electronics
Ganghoferstrasse 34
82216 Maisach-Gernlinden / Germany
T: +49 8142 65279-10
F: +49 8142 65279-20
Munich@mouser.com
www.mouser.com
MSC Vertriebs GmbH
Industriestr. 16
76297 Stutensee
Germany
T: +49 7249 910-0
F: +49 7249 7993
www.msc-ge.com

Pentair – Schroff
Langenalber Straße 96-100
75334 Straubenhardt / Germany
T: +49 7082 794-0
F: +49 7082 794-200
schroff.de@pentair.com
www.pentairequipmentprotection.com

PLUG-IN Electronic
Postfach 345
82219 Eichenau / Germany
T: +49 81 41 / 36 97-0
F: +49 81 41 / 36 97-30
www.plug-in.de

A.R. BAYER DSP Systeme
Vohwinkelallee 8
40229 Düsseldorf / Germany
T: +49 211-210 8186
F: +49 211-210 8176
gmbh@ dsp-sys.de
www.dsp-sys.de

Acromag
30765 South Wixom Road, PO Box 437
Wixom, Michigan 48393-7037 / USA
Embedded Solutions Group:
Call toll-free: 877-295-7092, 248-295-0310
solutions@acromag.com
Signal Conditioning and Network I/O:
Call toll-free: 877-214-6267, 248-295-0880
sales@acromag.com
www.acromag.com

RUTRONIK
Industriestraße 2
75228 Ispringen / Germany
T: +49 7231 801-0
F: +49 7231 82282
rutronik@rutronik.com
www.rutronik.com

ADLINK Technology
9F, No.166, Jian Yi Road
Zhonghe District
New Taipei City 235 / Taiwan
T: +886 2 82265877
F: +886 2 82265717
service@adlinktech.com
www.adlinktech.com

Artila Electronics
4F, No.6, Lane 130,
Minquan Road
Xindian Dist. 231, New Taipei City
Taiwan (R.O.C.)
T: +886 2 8667-2340
F: +886 2 8667-3240
sales@artila.com
www.artila.com

Axiomtek
8F., No.4, Lane 235,
Baoqiao Road
Xindian District, New Taipei City 231/Taiwan
T: +886-2-2917 4500
F: +886-2-2917 3200
wen@axiomtek.com.tw
www.axiomtek.com

Bluetechnix
Waidhausenstraße 3/19
1140 Wien / Austria
T: +43 1 914 20 91-0
F: +43 1 914 20 91-99
office@bluetechnix.com
www.bluetechnix.com

Advantech Europe
Industriestrasse 15
82110 Germering / Germany
T: 0049 8130 777-0
customer@advantech.eu
www.advantech.eu

Arrow Central Europe
Max-Planck-Straße 1-3
63303 Dreieich / Germany
T: +49 6103-304-0
F: +49 6103-304-8455
www.arroweurope.com

Acromag
30765 South Wixom Road, PO Box 437
Wixom, Michigan 48393-7037 / USA
Embedded Solutions Group:
Call toll-free: 877-295-7092, 248-295-0310
solutions@acromag.com
Signal Conditioning and Network I/O:
Call toll-free: 877-214-6267, 248-295-0880
sales@acromag.com
www.acromag.com

Axiomtek
8F., No.4, Lane 235,
Baoqiao Road
Xindian District, New Taipei City 231/Taiwan
T: +886-2-2917 4500
F: +886-2-2917 3200
wen@axiomtek.com.tw
www.axiomtek.com

Bluetechnix
Waidhausenstraße 3/19
1140 Wien / Austria
T: +43 1 914 20 91-0
F: +43 1 914 20 91-99
office@bluetechnix.com
www.bluetechnix.com

Advantech Europe
Industriestrasse 15
82110 Germering / Germany
T: 0049 8130 777-0
customer@advantech.eu
www.advantech.eu

Arrow Central Europe
Max-Planck-Straße 1-3
63303 Dreieich / Germany
T: +49 6103-304-0
F: +49 6103-304-8455
www.arroweurope.com

Acromag
30765 South Wixom Road, PO Box 437
Wixom, Michigan 48393-7037 / USA
Embedded Solutions Group:
Call toll-free: 877-295-7092, 248-295-0310
solutions@acromag.com
Signal Conditioning and Network I/O:
Call toll-free: 877-214-6267, 248-295-0880
sales@acromag.com
www.acromag.com

Axiomtek
8F., No.4, Lane 235,
Baoqiao Road
Xindian District, New Taipei City 231/Taiwan
T: +886-2-2917 4500
F: +886-2-2917 3200
wen@axiomtek.com.tw
www.axiomtek.com

Bluetechnix
Waidhausenstraße 3/19
1140 Wien / Austria
T: +43 1 914 20 91-0
F: +43 1 914 20 91-99
office@bluetechnix.com
www.bluetechnix.com

Advantech Europe
Industriestrasse 15
82110 Germering / Germany
T: 0049 8130 777-0
customer@advantech.eu
www.advantech.eu
DAVE
Via Talponedo 29/A
33080 Porcia (PN) / Italy
T: +39 0434 921215
F: +39 0434 1994030
sales@dave.eu
www.dave.eu

Digi International
31, rue des Poissonniers
92200 Neuilly sur Seine / France
T: +33-1-55-61-98-98
F: +33-1-55-61-98-99
www.digi.com

ETAS
Borsigstraße 14
70469 Stuttgart / Germany
T: +49-711/8 96 61-0
F: +49-711/8 96 61-106
sales.de@etas.com
www.etas.com

gsh-Systemelectronic
Planegger Str. 36
81241 München / Germany
T: +49 89 834 3047
F: +49 89 834 3048
info@gsh-system.de
www.gsh-system.de

IEI Integration
No. 29, Zhongxing Rd.,
Xizhi Dist.
New Taipei City 221 / Taiwan
T: +886-2-86916798
F: +886-2-6616-0028
sales@iei.com.tw
www.ieiworld.com

IMACS
Mittelfeldstrasse 25
70806 Kornwestheim / Germany
T: +49 7154 8083-0
F: +49 7154 8083-29
info@imacs-gmbh.de
www.imacs-gmbh.de

IMCOR
Turnackerstraße 62/1
70794 Filderstadt / Germany
T: +49 711 70890-03
F: +49 711 70890-04
info@imcor.de
www.imcor.de

iSYSTEM
Carl-Zeiss-Strasse 1
85247 Schwabhausen / Germany
T: +49 8138 6971-50
F: +49 8138 6971-46
sales@isystem.com
www.isystem.com

Jactron
The industrial division of Simms International plc
Northdown Business Park
Ashford Road
Lenham, Kent ME17 2DL / UK
T: +49 1622 852848
F: +49 1622 852801
www.jactron.co.uk

Kontron
Oskar-von-Miller-Straße 1
85386 Eching / Germany
T: +49 8165 77-0
F: +49 8165 77-385
sales@kontron.com
www.kontron.com

LANGER
EMV-Technik
Nöthnitzer Hang 31
01728 Bannewitz / Germany
T: +49 351 430093-0
F: +49 351 430093-22
mail@langer-emv.de
www.langer-emv.com

LDRA
Portside
Monks Ferry
Wirral, CH41 5LH / UK
T: +44 151 649 9300
F: +44 151 649 9666
info@ldra.com
www.ldra.com

MathWorks
Friedlandstr. 18
52066 Aachen / Germany
T: +49 241 4757-6700
F: +49 241 4757-6710
info@mathworks.de
www.mathworks.com

MEN Mikro Elektronik
Neuwieder Strasse 3-7
90411 Nürnberg / Germany
T: +49 911 9 93 35-0
F: +49 911 9 93 35-901
info@men.de
www.men.de

Mouser Electronics
Ganghoferstrasse 34
82216 Maisach-Gernlinden / Germany
T: +49 8142 65279-10
F: +49 8142 65279-20
Munich@mouser.com
www.mouser.com
MSC Vertriebs GmbH
Industriestr. 16
76297 Stutensee
Germany
T: +49 7249 910-0
F: +49 7249 7993
www.msc-ge.com

Rohde & Schwarz
Mühlendorfstraße 15
81671 München / Germany
T: +49 89 412 912 345
www.rohde-schwarz.com

N.A.T.
Konrad-Zuse-Platz 9
53227 Bonn / Germany
T: +49 228 96 58 64 - 0
F: +49 228 96 58 64 - 10
sales@nateurope.com
www.nateurope.com

RUTRONIK
Industriestraße 2
75228 Ispringen / Germany
T: +49 7231 801-0
F: +49 7231 8228
rutronik@rutronik.com
www.rutronik.com

PEAK-System Technik
Otto-Roehm-Strasse 69
64293 Darmstadt / Germany
T: +49 6151 8173-20
F: +49 6151 8173-29
info@peak-system.com
www.peak-system.com

Softing Industrial Automation
Richard-Reitzner-Allee 6
85540 Haar / Germany
T: +49 89 4 56 56-340
F: +49 89 4 56 56-399
info.automation@softing.com
industrial.softing.com

PLUG-IN Electronic
Postfach 345
82219 Eichenau / Germany
T: +49 81 41 / 36 97-0
F: +49 81 41 / 36 97-30
www.plug-in.de

Syslogic Datentechnik
Weilheimer Straße 40
79761 Waldshut-Tiengen / Germany
T: +49 7741 9671-420
info@syslogic.com
www.syslogic.com

A.R. BAYER DSP Systeme
Vohwinkelallee 8
40229 Düsseldorf / Germany
T: +49 211-210 8186
F: +49 211-210 8176
gmbh@dsp-sys.de
www.dsp-sys.de

AAEON Technology
An der Trift 65d
63303 Dreieich / Germany
T: +49-61033-747900
F: +49-61033-747949
saleseurope@aaeon.com
www.aaeon.eu

AdaCore
46, rue d’Amsterdam
75009 Paris / France
T: +33 1 49 70 67 16
F: +33 1 49 70 05 52
info@adacore.com
www.adacore.com

Embedded-News.tv
The Video Portal for the European Embedded Market
Technical Videos, Video Interviews, Demos & more about:
- Chips & Components
- Tools & Software
- Boards & Modules

www.embedded-news.tv
Phaedrus Systems

96 Brambling
Tamworth B77 5PG / UK
T: +44 1827 259546
info@phaedsys.com
www.phaedsys.com

RUTRONIK

Industriestraße 2
75228 Ispringen / Germany
T: +49 7231 801-0
F: +49 7231 82282
rutronik@rutronik.com
www.rutronik.com

SYSGO

Am Pfaffenstein 14
55270 Klein-Winternheim / Germany
T: +49 6136 99 48-0
F: +49 6136 99 48-10
info@sysgo.com
www.sysgo.com

PLS

Technologiepark
02991 Lauta / Germany
T: +49 35722 384-0
F: +49 35722 384-69
info@pls-mc.com
www.pls-mc.com

SCIOPTA

Fiechtagstrasse 19
4103 Bottmingen/Basel / Switzerland
T: +41 61 423 10 62
F: +41 61 423 10 63
www.sciopta.com

PRQA

Mark House
9/11 Queens Road
Hersham, Surrey KT12 5LU / UK
T: +44 1932 888 080
F: +44 1932 888 081
info@ProgrammingResearch.com
www.programmingresearch.com

Softing Industrial Automation

Richard-Reitzner-Allee 6
85540 Haar / Germany
T: +49 89 4 56 56-340
F: +49 89 4 56 56-399
info.automation@softing.com
industrial.softing.com

StreamUnlimited

Guthiel-Schoder-Gasse 10
1100 Vienna / Austria
T: +43 1.60101.4014
sales@streamunlimited.com
www.streamunlimited.com

SECO

Via Calamandrei, 91
52100 Arezzo / Italy
T: +39 0575 26979
F: +39 0575 350210
info@seco.com
www.seco.com

RUTRONIK

Am Pfaffenstein 14
55270 Klein-Winternheim / Germany
T: +49 6136 99 48-0
F: +49 6136 99 48-10
info@sysgo.com
www.sysgo.com

SECO

Via Calamandrei, 91
52100 Arezzo / Italy
T: +39 0575 26979
F: +39 0575 350210
info@seco.com
www.seco.com

Softing Industrial Automation

Richard-Reitzner-Allee 6
85540 Haar / Germany
T: +49 89 4 56 56-340
F: +49 89 4 56 56-399
info.automation@softing.com
industrial.softing.com

StreamUnlimited

Guthiel-Schoder-Gasse 10
1100 Vienna / Austria
T: +43 1.60101.4014
sales@streamunlimited.com
www.streamunlimited.com
M2M Summit 2013
M2M – my machine talks to me

10th September 2013
Congress Center Düsseldorf (CCD)

- Connect at the industry’s top international event for M2M applications and solutions
- Present your company and your products to more than 700 international participants
- Gain insight from the industry’s thought-leaders through keynote speeches, hands-on workshops and panel discussions
- Network with international delegates from Sweden, our official partner country
- Take advantage of the 10% member discount on exhibitor and sponsor packages

Platinum Sponsor

Gold Sponsor
gemalto

Silver Sponsors
Microtronics
kontron
RUTRONIK
Telit
Cumulocity

Partner Country 2013
Patronage 2013
Landeshauptstadt Düsseldorf

Information and registration at www.m2m-summit.com