

# boards & solutions + ECE

Combined Print Magazine for the European Embedded Market

October 05/14

Special Features:

- Embedded Wireless
- electronica Preview
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Cover Story

Methods of achieving high Color Rendering Index with LEDs



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## Dear Readers,



Once more its showtime again: the electronics industry will meet from November 11th to 14th at the fairgrounds of Messe München. This year electronica is celebrating its 50th birthday – evidence for the long lasting success of this event. Beside all other aspects and components of electronic embedded systems will play a major role in the exhibition and also in the embedded platform conference program. The conference is being held in conjunction with electronica in Munich on November 11 and 12. Participants of the embedded

platforms conference will get an overview of and insights into the ecosystems of modern embedded platforms. Speakers may make presentations on the following topics: cores and peripherals, 8-/16-bit controllers, 32-bit processors, DSP platforms, FPGAs, multicore chips, SoC approaches, security and safety, saving energy, testing, debugging, trace as well as porting and migration, RTOS and other operating systems, initializing and booting, standardization, tool chains and ecosystems, obsolescence, simulation, emulation and modelling platforms. More information about **electronica 2014** and the Embedded Forum organized by ICC Media and Messe München you'll find starting at *page 10* of this issue.

One sector of the electronics industry which combines nearly all aspects of embedded systems is automotive electronics. Latest trend are energy efficiency, lighting, electromobility, connected cars, and autonomous driving. This means that the future of driving will be electrified, automated and networked. Therefore it is expected that the value of hardware and software in cars will continue to grow in the years to come. Already nowadays automotive electronics is one of the most important segments in the market for electronic components and according to a forecast by the German Electrical and Electronic Manufacturers' Association (ZVEI), market volume is expected to increase to more than 430 billion euros by the year 2025. This year, some 1,500 exhibitors will demonstrate all topics of the automotive electronic. Experts will also discuss the industry's latest challenges and developments at the Automotive Forum and the electronica automotive conference.

The Automotive Forum and the lectures and panel discussions are also an opportunity to gather information about the latest developments and trends. During the four days of the 2014 fair, the topics of power electronics and automotive software will be the focus of special attention. The automotive conference is held on November 10. The conference is where leading executives and experts from the automotive sector meet to exchange ideas and information about topics that play a key role in the transition that is affecting the entire industry. The lectures at this year's conference are divided into three subject areas, i.e. lighting, sensor fusion and connectivity. As you can see there are a lot of new developments going and new products and solution presented at the electronica fair. You'll find us in **Hall A6, booth 453**. Let's meet there and discuss the latest trends in the embedded industry.

*Yours Sincerely*

Wolfgang Patelay  
 Editor



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 **electronica 2014**

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**Viewpoint 3**

**Cover Story**

Methods of achieving high Color Rendering Index with LEDs 6

**electronica Preview**

Munich, November 11 to 14: electronica celebrates its 50th anniversary 10

**Embedded Wireless**

Successful energy harvesting for wireless sensor nodes 15

Open Source solutions for connected applications tomorrow 18

**Boards & Modules**

Rugged embedded standards-based solutions that deliver on SWaP(-C) 22

SMARC: two processor worlds combined in a single standard 32

Ultra-rugged Embedded Computer: the one for the rough stuff 34

Configurable hardware for automotive alternator regulator designs 38

**Automotive**

Optimizing system efficiency using MCU power management options 42

**Microcontrollers**

Easy-to-use, accessible technology for the Internet of Things 44

**Tools & Software**

How to achieve fastest system startup sequences with your embedded system 46

**Product News 49-55**

**Cover Story: Methods of achieving high Color Rendering Index with LEDs 6**



With standard LEDs, it is not possible to realize LED luminaires and lamps with both high efficacies and high CRI. This article introduces the Brilliant Mix concept which now allows to effectively realizing both high CRI and high luminaire efficiencies.

**Munich, November 11 to 14: electronica celebrates its 50th anniversary 10**



electronica is celebrating its fiftieth anniversary, and will once again be the industry platform for exchange of information and expertise about electronics.

**Successful energy harvesting for wireless sensor nodes 15**

This article presents simple energy-harvesting techniques which can be used to implement maintenance-free wireless sensors for cost-effective networking in applications such as smart homes, building automation and M2M communication.

**Rugged embedded standards-based solutions that deliver on SWaP(-C) 22**



Small form factor design trends are paradoxical. Form factor size decreases while required functionality increases. More processing power is demanded while lower power consumption and thermal output are expected. Ruggedness against the shock, vibration, humidity, temperature extremes and variance inherent in mobile and outdoor applications is also needed, facing designers with a very complex soup.

**Configurable hardware for automotive alternator regulator designs 38**



The Epona alternator regulator can increase the efficiency of generators in 24V and 12V on-board electrical systems in commercial vehicles and passenger cars. A basic hardware system that can be used in all designs is ideal here because it can be adjusted in line with the specific customer system by means of software.

**How to achieve fastest system startup sequences with your embedded system 46**

This article discusses how to achieve fast startup times, especially in view of different operating systems like a general purpose OS or RTOS. Additionally an overview is given on boot media and their effects on startup behavior, together with practical measurements.



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Electric Automation  
Systems and Components  
International Exhibition and Conference  
Nuremberg, Germany, 25-27 November 2014

25  
YEARS

# Methods of achieving high Color Rendering Index with LEDs

By **Marc Dyble**, Osram Opto Semiconductors and  
Lynnette Reese, Mouser Electronics

*With standard LEDs, it is not possible to realize LED luminaires and lamps with both high efficacies and high CRI. This article introduces the Brilliant Mix concept which now allows to effectively realizing both high CRI and high luminaire efficiencies.*



■ The proper use of light is both a science and an art form. Lighting can be mere illumination or can create an effect, but new LED technologies can help to make dull spaces come alive. Everyone's color vision is different, therefore interpreting color can be very subjective, but specifications can provide a basis for objective comparison. One major specification used in the lighting industry is the Color Rendering Index (CRI). "Color rendering" describes how an object appears to the human eye based upon an ideal or natural light source.

■ An artist showing their paintings would most likely want their work lit so that rich, vibrant colors are noticed. A discussion using attributes of CRI can quickly get artist and gallery manager "on the same page" regarding lighting. CRI is used to compare how true objects are rendered. Presently, this is the only recognized measure of color rendering in the lighting industry since being introduced in the early 1960s. Light sources cause subtle variations in how colors are rendered.

CRI is rated on a scale from 0 to 100. Lighting with a CRI of 85 to 90 is typically very good at rendering the color of objects while light sources with a CRI of 90 or greater are excellent and are used for tasks that require very accurate color discrimination. With respect to LEDs, typically the lower the CRI value, the

higher the luminous efficacy (lumens per watt.) CRI is also an indicator of how natural an object color appears when illuminated (Figure 1.) These are the highest achievable CRI values for common light sources. The lighting community tends to use CRI as an indicator of quality, or preference, even though it was not necessarily intended for this purpose. Light sources with dramatically different spectral power distributions can have identical color points yet render colors very differently.

At the centerpiece of the LED is a highly efficient semiconductor chip, which is affixed to a lead frame that has an Anode (positive side) and Cathode (negative side). All are assembled in a thermally optimized IC-type package. Phosphor is either coated over the die, placed on top as a layer, or mixed within and encapsulated to protect the diode. Several phosphors are used; the OSLOSSL LED family, for example, is available in four different phosphor blends based on the target application. Outdoor lighting may require cool or neutral color temperatures (4000-6500K) with a CRI of 70.

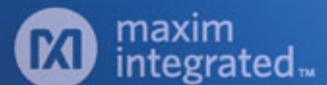
For general interior lighting, a CRI of 82 may be sufficient for office related tasks. Retail, museum, and other color-critical applications may require yet another phosphor blend for high CRI requirements. Producing white light with LED sources is a challenging task. Two

methods are commonly used to create white light with LEDs. The first approach is through the combination of multiple colors, usually red, green, and blue, in multi-chip packages or LED clusters. This is the same principle used in back-lighting LED LCD TVs: mixing the three colors in various proportions results in an entire spectrum of colors. The second approach is to combine a semiconductor chip (blue or UV) with converter materials (phosphors) through luminescence conversion within a single package. A third approach involves an innovative combination of the best of both methods, called the Brilliant Mix concept.

A phosphor-based high CRI approach is a method that includes an additional stable red phosphor. The latest developments using enhanced phosphors increase the CRI value to 95, but the trade-off is lower efficacy. LEDs are particularly efficient when color coordinates are closer to blue light, and the phosphor does not have to shift the blue coordinates quite so far. To achieve a warm white light, several luminescent substances must be combined, although this reduces the LED efficacy. There is a limitation; with standard LEDs, it is not possible to realize LED luminaires and lamps with both high efficacies and high CRI. However, with the Brilliant Mix concept by Osram, both high CRI and high luminaire efficiencies can be effectively realized. This approach fuses

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Compact Fluorescent	82	60-70	Good
Standard Metal Halide	65	40-60	Poor
Standard HPS	22		
LED	80-98		

Figure 1. CRI is an indicator of how natural an object color appears when illuminated

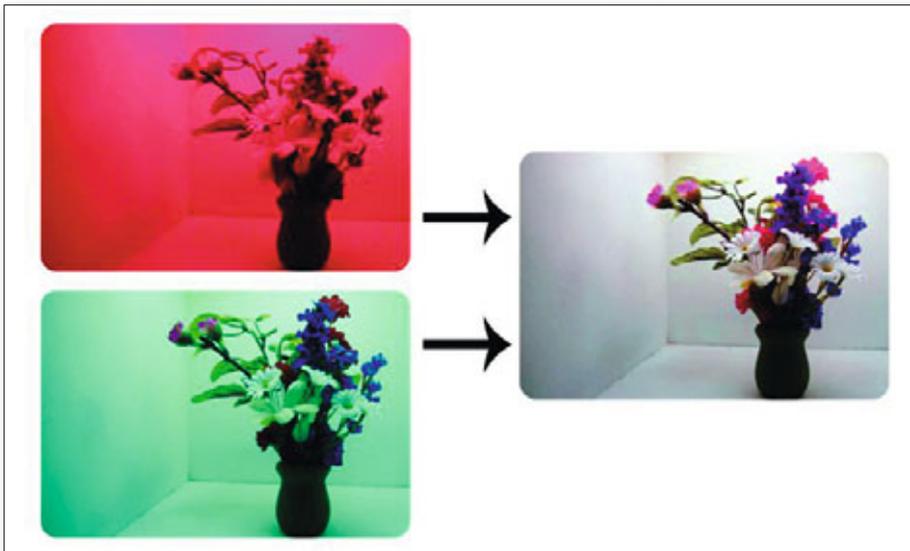


Figure 2. Brilliant Mix is the mixing of two colors in order to generate warm white light

the two existing methods – mixed color from monochromatic LEDs and phosphor converted LEDs – to create a warm-white LED light source with both high CRI (> 90) and high luminous efficacy. This new approach makes total luminous efficacies of over 110 lumens per watt (lm/W) possible, producing up to 30 percent more light than phosphor-converted warm-white LEDs with a comparable CRI, but with similar power consumption.

Brilliant Mix is the mixing of two colors in order to generate warm white light. This approach uses red or amber monochromatic LEDs, combined with special white LEDs which have been shifted into the green range (called EQ-White). EQ-White is produced like a normal converted white LED with a blue chip and green phosphor. The green phosphor has a very low conversion loss rate and makes for a very efficient light source in combination with the blue chip. Advantages offered by the Brilliant Mix Concept include high CRI, very high LED efficacies (> 110 lm/W possible), and warm white coverage from 2,700 K to 4,000 K. Luminous efficacies of the two light sources are maintained (Figure 2), thus the

new approach makes for a high luminous efficacy. The red LED is combined with EQ white (a highly efficient source with majority of its energy in within the green region of the visible spectrum, where the eye is most sensitive).

When these two sources combine in the correct ratio, we get a pleasant, warm white light with a CRI over 90, giving us the ability to identify differences in the shades of the purple, blue and pink flowers by increasing our color discrimination, or how vivid and easily distinguishable colors appear. The average CRI of Brilliant Mix is very high (Ra >90).

Additionally, the highly compact OSLOSSL LED is the vehicle for both phosphor-based and Brilliant Mix solutions. The standard phosphor conversion method produces reduced efficacy, but implementation is easier. Brilliant Mix enables higher efficacy but is more complex to implement. In the future, lighting could dynamically adjust for any lighting condition, accurately mimic lighting conditions outside, and be able to provide a fully customizable lighting environment for individuals. ■

For more information visit the Application & Technologies section of [mouser.com](http://mouser.com)

### ■ Microsemi: updated Libero SoC v11.4 software improves design flow runtime

Microsemi announced the release of its updated Libero System-on-Chip version 11.4 comprehensive design software used for the development of the latest generation of Microsemi's FPGA SoC products. The Libero SoC v11.4 release improves design flow runtime by up to 35 percent for its award-winning SmartFusion2 SoC FPGAs and IGLOO2 FPGAs.

[News ID 1904](#)

### ■ IDT: 1.5V PCI Express clock buffers

Integrated Device Technology announced the expansion of its PCIe timing portfolio with the industry's first 1.5 V PCI Express buffer family. IDT's new U-series ultra-low power PCIe buffers operate from the same supply voltage as modern systems-on-chip and field programmable gate arrays, enabling designers to use the same power rail, thus reducing system complexity, physical size, and power consumption.

[News ID 1911](#)

### ■ Apacer launches DDR4 2133 U-DIMM

To adapt to the changing market trends, Apacer newly launches the DDR4 2133 4GB/8GB Unbuffered DIMM, which combines the advantages of both high speed and low power consumption. Compared to its predecessor, its work clock rate is 2,133 Mbps with the transmission bandwidth boosted up to 17GB/s, delivering a 14% improvement in performance.

[News ID 1976](#)

### ■ Trinamic: dual-axis stepper motor controller/driver SoC

TRINAMIC Motion Control announced the TMC5062 monolithic dual-axis motor controller and driver that incorporating eight of Trinamic's patented or patent-pending motion control technologies. This new SoC integrates dcStep, Trinamic's proprietary technology for automatically adapting motor velocity for sudden increases in load.

[News ID 1894](#)

### ■ Yamaichi: quad SFF pluggable plus connector for 40/100GbE Ethernet and InfiniBand

Yamaichi Electronics releases their eQSFP+ product series as the solution for next generation 40GbE/100GbE Ethernet applications. With the recent increasing demand for a faster and more reliable form factor signal transmission interface, Yamaichi presents high-speed 32Gbps enhanced Quad Small Form-factor Pluggable plus (eQSFP+) host connectors.

[News ID 1850](#)

### ■ RUTRONIK: coordinated portfolio for devices on Internet of Things

With RUTRONIK SMART, Rutronik now launches a new range of bundled hardware, software and services. RUTRONIK SMART

brings together entire solutions, consisting of selected sensors, wireless components, micro-controllers, power management and safety solutions for devices on the Internet of Things. While RUTRONIK EMBEDDED supplies industrial customers with embedded boards, storage, displays, wireless modules, auto-ID components and specific peripheral components, with RUTRONIK SMART Rutronik is providing specific support to manufacturers of devices on the Internet of Things.

[News ID 1958](#)

### ■ Toshiba: motor driver ICs save space and simplify design

Toshiba Electronics Europe has introduced two new motor driver ICs, TC78H610FNG and TB67Z800FTG, which save space and simplify design in low power motor applications. TC78H610FNG is an H bridge driver for low voltage brushed DC motors, such as those used in home appliances and battery-powered equipment. Supplied in a SSOP16 package, it can reduce the required mounting area by 21% compared to conventional products with similar functionality housed in SSOP20 packages. This allows reduction in the size of equipment and the cost of the PCB.

[News ID 1863](#)

### ■ Innodisk: high performance industrial SSDs

Innodisk announces a new series of high performance industrial SSDs. Available in standard 2.5" SATA III as well as SATA Slim formats, the 3MG2-P series uses a custom new ID201 controller, synchronous NAND flash and 19nm manufacturing process to produce high sequential speeds and random IOPS, while preserving industrial level reliability, power protection, and ruggedness.

[News ID 1937](#)

### ■ Fujitsu Semi and ON Semi announce strategic partnership

Fujitsu Semiconductor and ON Semiconductor have entered into a foundry services agreement. Under the terms of this agreement, Fujitsu will manufacture wafers for ON Semiconductor at its 8-inch front-end semiconductor wafer fabrication facility located in Aizu-Wakamatsu, Japan.

[News ID 1875](#)

### ■ Microsemi: low jitter and small size clock management devices

Microsemi announced its new ZL30250 and ZL30251 flexible clock generators. The devices are an ultra-low jitter solution (160fs [12kHz-20MHz integration band]) in a 5x5mm package capable of replacing multiple high performance crystals and crystal oscillators, thus lowering bill of material cost along with easing design and testing of timing solutions.

[News ID 1828](#)

### ■ FTDI: collaboration with MCCI for advanced embedded SoC products

FTDI Chip announces that its technology partnership with MCCI Corporation, developer of USB drivers and firmware for embedded SoC, has resulted in the availability of TrueTask USB - an embedded USB host stack designed for use with FTDI Chip's ground-breaking FT900 product family.

[News ID 1961](#)

### ■ Mouser now stocking Cypress CY7C1049CV33 fast Async SRAM

Mouser Electronics is now stocking the CY7C1049CV33 Fast Async SRAM from Cypress Semiconductor. Engineered using Cypress's high-performance Complementary Metal Oxide Semiconductor technology, this 4 Mbit, static RAM device is organized as 524,288 words by 8 bits, provides a high-speed, maximum access time of 8 ns and offers easy memory expansion with CE and OE features.

[News ID 1912](#)

### ■ Softing: replacement for Yamaha's discontinued FIND1+ chip

Softing's UFC100-L1 (Unified Fieldbus Controller) is a fully pin-compatible alternative to the discontinued fieldbus ASIC Find1+ (YTZ420-VZ) from Yamaha. Conformance, interoperability, and physical layer tests were performed to verify that the UFC100-L1 is a direct replacement for the YTZ420 ASIC. Softing's UFC100-L1 demonstrates additional advantages including, improved jitter tolerance/robustness, lower power consumption, and a larger FIFO memory - resulting in fewer interruptions to the field device processor.

[News ID 1933](#)

### ■ AAEON: network appliances system with Intel Atom E3800

The newest release FWS-2250 is compact, fanless network appliance that boosts the performance yet offering low power consumption network appliance system. System is based on the new Intel Atom E3800 series CPU and support four Gigabit Ethernet ports. A highly integrated compact system supporting two SoDIMM's, one Compact Flash socket, two USB2.0 ports (with optional one USB3.0 port), one console port (via additional RJ45 port).

[News ID 1953](#)

### ■ EKF: XMC module with quad port Gigabit Ethernet NIC

EKF introduces the DN1-PIKE, a mezzanine card for XMC module carrier, equipped with four individual Gbps Ethernet controllers. All ports are available via RJ45 front bezel jacks. The Intel I211 (option I210-IT) Ethernet NICs provide latest networking technology, e.g. power management for increased efficiency.

[News ID 1922](#)

# ADLINK Deploys Intel® Atom™ and Intel® Celeron® Processor-based SoCs from SMARC Modules to Rugged Systems.



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# Munich, November 11 to 14: electronica celebrates its 50th anniversary

*electronica is celebrating its fiftieth anniversary, and will once again be the industry platform for exchange of information and expertise about electronics. From November 11 to 14, 2014, visitors to Messe München can inform themselves about the whole product and service portfolios of the electronic industry: from components and systems to electronic applications and services. This year the international trade fair revolves around automotive, embedded systems and lighting, as well as the overarching themes of security and energy efficiency. The program of conferences and forums will explore these exhibition topics in greater depth.*



■ According to calculations by the German Electrical and Electronics Manufacturers' Industry Association (ZVEI), the global market for electrical and electronic products grew by three per cent last year to approximately 3.7 trillion euros. The Asian and American markets have been mainly driving this growth. This also benefits the German electrical industry: In the whole of the first quarter of 2014, new orders rose by 3 percent over the previous year. So the auspices for electronica 2014 are good. (Source: [www.zvei.org](http://www.zvei.org))

In 2012, almost half of the 73,051 visitors and 63 percent of the 2,669 exhibitors were from abroad. With its three-pillar concept of exhibition, conference and forum program, this year electronica will again be providing the latest information about technologies, products, services and trends in the industry. A highlight of the show, the CEO roundtable, will be on the first day. Carlo Bozotti (STMicroelectronics), Rich Clemmer (NXP Semiconductors), Gregg A. Lowe (Freescale Semiconductor) and Dr. Reinhard Ploss (Infineon Technologies) will discuss the topic: "Internet of Things: Possibilities, Challenges and the Question of Security". The focus of the trade show will be on automotive, embedded systems and lighting, as well as the cross-cutting issues of security and

energy efficiency. This is reflected, among other things, in the electronica Forum, in panel discussions and lectures.

In the exhibition halls, several forums invite you to exchange ideas and dialog. The range of topics of the forums - automotive, electronica and Exhibitor Forum as well as the PCB & Components Market Place - is application-oriented and allows visitors to learn about current and future issues. Another is the Embedded Forum. Topics here range from "Internet of Things: Challenges and Opportunities", "Security for the Internet of Things: Challenges and Solutions", "ARM-based Microcontrollers , FPGAs & SoCs", "Small Form Factor Boards" or "Internet of Things: Chips, Tools & Software for Device Development". Further, these topics will be explored in greater depth within the conference program of electronica.

The embedded platforms conference will be looking for the second time at new technologies, concrete solution approaches and services for the development of embedded systems. The conference will take place on November 12 and 13, in parallel with electronica, at the Press Center East of the Messe München. Topics are among others Internet of Things, Smart Home, Micros & DSPs, Portability, Design & Simulation, ARM-based Computers & Processors, ASICs, Multicore, System Engineering, RTOS, Security, Energy Management & Efficiency, SoC, LED Drivers, Software Engineering, Hardware Abstraction and API. The electronica automotive conference is held on November 10, which is the day before electronica 2014. The conference

is where leading executives and experts from the automotive sector meet to exchange ideas and information about topics that play a key role in the transition that is affecting the entire industry. The lectures at this conference this year are divided into three subject areas, i.e. Lighting, Sensor Fusion and Connectivity. The conference will begin with keynotes from Dr. Wolfgang Huhn (Audi AG), Jean-Francois Tarabbia (Valeo) and Prof. Hermann Eul (Intel Corporation).

Another conference highlight is the final discussion on the topic "What effects do massive market shifts eastward have on the capacity for innovation of the European automobile industry?" Panel discussion participants include Klaus Meder (Robert Bosch), Kurt Sievers (NXP Semiconductors, Germany), Karl-Friedrich Stracke (Magna Steyr Fahrzeugtechnik) and Prof. Siegfried Wolf (Continental Automotive).

Digital interconnection is permeating all areas of our life and is thus shaping economic development worldwide as well as the emergence of new innovative products. So the fourth industrial revolution has long been more than just a vision. Through examples of best practice, visionary technical lectures and discussion rounds, the conference participants of IT2Industry find out about the specific consequences, the opportunities and risks of this increasing digital interconnection in industry and production. The conference takes place on November 11 at the Press Center East.

At the Wireless Congress Systems & Application at the ICM - International Congress Center Munich on November 12 and 13, industry experts will discuss the technical aspects of present and future wireless technologies, primarily for industrial use. An overview of all lectures within the conference and forum program is available at:

[www.electronica.de/en/events](http://www.electronica.de/en/events)



CEO round-table participants 2012 (from left): Gregg A. Lowe (President and CEO, Freescale Semiconductor), Carlo Bozotti (President and CEO, STMicroelectronics), Rick Clemmer (President and CEO, NXP Semiconductors), Dr. Reinhard Ploss (Chairman, Infineon Technologies) and Moderator Killian Reichert. They will meet this year again to discuss actual trends in the electronics industry.

## The world's leading trade fair for the electronics industry is 50

At its launch 50 years ago, electronica faced stiff competition from major trade fairs in Europe. Interestingly it was several major US electronics companies who were the driving force behind the introduction of electronica. They recognized that Germany was becoming a major consumer of electronic components and systems and were keen to be in at the beginning of Europe's biggest potential market for their products and services.

The rest, as they say, is history. electronica quickly became a sell-out event which resulted in sections of it emerging as new events. LASER World of PHOTONICS was launched as a separate show in 1973, followed by productronica (which alternates every other year with electronica) in 1975. Even with these two significant industry sectors departing electronica, the show continued to expand, finally outgrowing Munich's original exhibition grounds and in 1998, electronica moved to a new, purpose-designed exhibition and conference center built by Munich and the State of Bavaria to house its major trade fairs.

### electronica 2014: Facts and figures at a glance

**Date:** Tuesday – Friday, November 11 – 14

**Times:** Tuesday – Thursday: 9:00 – 18:00 and Friday: 9:00 – 17:00

**Price of admission:** 1-day ticket starting at EUR 27.50 (online)

The catalog is included in the price of admission (while supplies last).

Tickets may be ordered online at [www.electronica.de/en/tickets](http://www.electronica.de/en/tickets)

### Conference dates:

#### ■ electronica automotive conference:

Monday November 10 (ICM – International Congress Center München)

#### ■ embedded platforms conference:

Wednesday – Thursday, November 12 – 13 (Press Center East)

#### ■ IT2Industry:

Tuesday, November 11 (Press Center East)

#### ■ Wireless Congress:

Wednesday – Thursday, November 12 – 13 (ICM – International Congress Center München)

#### ■ electronica event database:

[www.electronica.de/en/events](http://www.electronica.de/en/events)

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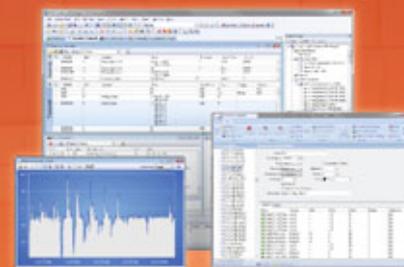
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CAN-FD adapter for USB 2.0 with galvanic isolation, including the software PCAN-View for sending, receiving and recording CAN-FD messages as well as busload measurement.



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**electronica** 2014

inside tomorrow

# **Embedded Forum** Nov. 11-14 *organized by ICC Media & Messe München*

The **Embedded Forum** is a theater-style presentation area with free access for all electronica visitors.

At the **Embedded Forum** ICC Media is staging a 4-day forum programme with technical presentations covering the whole range of embedded technologies from Chips & Components over Tools & Software to Boards & Modules.

The **Embedded Forum** is located in Hall A6, the dedicated "Embedded Hall", close to the Main Entrance East.

## **Tuesday, November 11**

Session 1 - *Internet of Things: Challenges and Opportunities*

Session 2 - *ARM-based Microcontrollers , FPGAs & SoCs*

## **Wednesday, November 12**

Session 3 - *Starter - Kits and Reference Designs*

Session 4 - *Small Form Factor Boards*

Session 5 - *Internet of Things: Chips, Tools & Software for Device Development*

## **Thursday, November 13**

Session 6 - *Motor Control Solutions*

Session 7 - *Security for the Internet of Things: Challenges and Solutions*

Session 8 - *Embedded Computing*

## **Friday, November 14**

Session 9 - *Embedded Wireless*

Session 10 - *Smart Energy*

more information at..

<http://electronica-forum2014.embedded-know-how.com>



## embedded platforms conference

The Communications Forum for Selecting Future-Proof Hardware and Software Platforms

### On Planet e, the right ecosystems define the future.

In the electronics cosmos, more and more processor and controller manufacturers are creating so-called ecosystems together with their tool and service partners. Doing so allows them to offer coordinated and interoperative systems—and to ensure smooth interaction between technologies, tools and development partners. All in the interest of future reliability and the sustainable protection of intellectual property.

At the embedded platforms conference, everything revolves around depicting these ecosystems. As a result, for system engineers and development managers who want to gather information about the efficiency and future reliability of modern embedded platforms, it is the center of the embedded universe. Fundamental questions regarding component selection and system design are also discussed here.



#### COMPONENTS OF THE PLANET E ECOSYSTEM

Definition of embedded platforms for the conference:

The foundation of embedded applications, which consists of a processor, operating system, drivers and networking technology.



### Only on Planet e – Exhibition, Forum, Conference.

electronica's **3-pillar concept** gives you a unique opportunity to deepen your understanding of the conference themes directly at the fair, i.e. with hundreds of exhibitors and at the electronica embedded Forum.

#### CONFERENCE

The communication and networking event in the embedded sector on Planet e. Leading suppliers and independent experts give visitors an overview of and insights into the ecosystems of modern embedded platforms.

- ▶ International experts from upper management
- ▶ Some 215 participants from 17 countries in 2012
- ▶ Creates a sound foundation for selecting future embedded platforms and optimizing existing ones

#### FORUM

Selected presentations on the latest hot topics and key developments that pertain to embedded systems.

- ▶ The topics from the embedded platforms conference are examined here on a more intense level.
- ▶ Perfect location: At the heart of the embedded exhibition sector

#### EXHIBITION

The clearly organized exhibition covers the entire range of state-of-the-art technology.

- ▶ 232 companies at electronica 2012 presented innovations for the embedded sector.
- ▶ 21,916 visitors, or 30% of all visitors, visited electronica embedded in 2012.
- ▶ Great appeal: Highly frequented, generates a great deal of attention

2nd embedded platforms conference  
Messe München, November 12–13, 2014

The conference is held within the scope of electronica, the International Trade Fair for Electronic Components, Systems and Applications.



**electronica** 2014  
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# Conference Program.

Wednesday, Nov. 12, 2014

Program last updated 08/14. The up-to-date program is available at [electronica.de/eventdatabase](http://electronica.de/eventdatabase)

	Track 1.1		Track 2.1	
	Time	Lecture by	Time	Lecture by
MORNING	Opening Track 1		Opening Track 2	
	09:30-09:45			
	09:45-10:25	Selection criteria for microcontrollers: Aspects of a systematic approach MicroConsult	Systems engineering with SysML MicroConsult	
	10:35-11:15	Achieving scale and portability for embedded systems Texas Instruments	Gain without pain, from ASICs to basic Analog Devices	
	11:15-11:45	Coffee break Track 1.1 & 2.1		
	11:45-12:25	Easy-to-use microcontroller without compromising flexibility Infineon	Safeguarding development of real-time software from plan to integration Symtavision	
	12:35-13:15	Multicore microcontroller in embedded applications IAR	Mr. Kalman, where am I? Attitude detection by real-time sensor fusion Konzept Informationssysteme GmbH	
13:00-14:00	Lunch break Track 1 & 2			
AFTERNOON	Time	Track 1.2	Track 2.2	Lecture by
	14:00-14:40	Spoilt for choice: What is the right ARM architecture? Key distinctive features and applications MicroConsult	DIGITAL POWER 2.0: Next generation LED driver Infineon	
	14:50-15:30	Make the most out of ARM microcontrollers with the cortex microcontroller software interface standard v4 ARM	MSP430 tools for energy-optimized microcontroller software development Texas Instruments	
	15:30-15:45	Coffee break Track 1.2 & 2.2		
	16:00-16:40	Multicore microcontroller development in practice MicroConsult	Yocto - SILICA 'ArchiTech SDK' significantly eases adoption Silica	
	16:50-17:30	Discussion: What are the most important challenges for embedded platforms? What solution approaches are there now and in the future? Get-Together		

Thursday, Nov. 13, 2014

	Track 3.1		Lecture by
	Time		
MORNING	Opening Track 3		
	09:30-09:45		
	09:45-10:25	Industrial Internet of things and potential impact on system design	Maxim Integrated
	10:35-11:15	Smart home: Optimizing energy consumption for enhanced lifestyles and beyond	Texas Instruments
	11:15-11:45	Coffee break Track 3.1	
	11:45-12:25	Integration: is it good or bad?	Texas Instruments
	12:35-13:15	Consider the source. Why is having source code so important?	Renesas
13:15-14:00	Lunch break Track 3		
AFTERNOON	Time	Track 3.2	Lecture by
	14:00-14:40	Computing in time or computing in space? Or even both? About the dependencies of execution platform, timing behavior and flexibility	Prof. Dr. Siemens
	14:50-15:30	Don't consider your hardware - do it virtually. A method for successful hardware-neutral application development	IMACS
	15:30-15:45	Coffee break Track 3.2	
	16:00-16:40	The Internet of things: Ideas, assumptions, visions - results of media research	ELEKTRONIKPRAXIS, MicroConsult
	16:50-17:30	Discussion: How is the Internet of things changing the world? How can it benefit embedded solution providers?	Participating companies

## Registration.

Act now and register for the conference so that you can be part of the embedded sector's communication on Planet e. If you register **by September 26, 2014**, you can secure yourself an **Early Bird** discount. Additional information about registering and the conference program are available at: [electronica.de/en/embeddedplatforms](http://electronica.de/en/embeddedplatforms)

[electronica.de/en/embeddedplatforms](http://electronica.de/en/embeddedplatforms)

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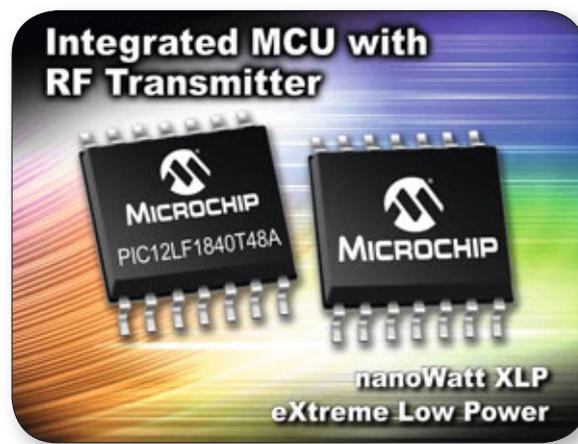


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# Successful energy harvesting for wireless sensor nodes

By Cristian Toma, Microchip

*This article presents simple energy-harvesting techniques which can be used to implement maintenance-free wireless sensors for cost-effective networking in applications such as smart homes, building automation and M2M communication.*



■ Using energy harvesting to power wireless sensor nodes need not to be complicated, or costly. Careful consideration of the appropriate communication protocol and data rate, combined with the power-saving features offered by the latest RF devices, can all be used to reduce power consumption. The result is a wireless sensor node which can operate almost indefinitely and with little or no human intervention. Whilst the cost of a wireless network may start with the hardware, there are other factors which can add to the cost. These may include additional hardware and software costs, certification to standards such as ZigBee and Bluetooth and also royalty costs. The amount of energy that can be harvested by a wireless sensor is typically limited by cost and size. It is therefore critical to ensure that the amount of energy drawn by the sensor and the wireless transmitter is lower than the amount which can be supplied by energy harvesting.

There are a number of sources from which energy can be harvested, of which the most common is solar power. Solar panels come in sizes which range from large panels integrating a high number of solar cells, to the small cells which are used to power products such as calculators and toys. Other sources of power include radio waves, which are received by an antenna and converted into electrical energy,

and the electro-mechanical energy which is harvested from a magnet moving near to an inductor coil. Temperature gradients can also be used to provide thermo-electrical energy for harvesting using the Seebeck effect.

Common wireless protocols such as ZigBee or Bluetooth may be the first which spring to mind when considering which wireless technology to use for an energy-harvesting design. However, not all designs will need to incur the cost or the complexity of using an industry-standard wireless protocol. The choice will be based on the degree of compatibility required by each design. For example, a wireless headset for a mobile phone will almost certainly need to offer wide compatibility whereas a simple RF remote control may not need or be able to support the cost of compatibility with products of other manufacturers. Any design which includes a wireless sensor will need FCC or CE certification so this cost is common across all designs. The cost of gaining certification to a specialised standard, however, will typically be higher than the cost for FCC or CE certification and can often be underestimated.

The overall cost of implementing a wireless standard goes much further than basic hardware and software costs. Before going through the compliance process the design will prob-

ably need to undergo pre-compliance testing. Hiring the specialist equipment for these pre-compliance tests can cost around \$750 per month. Then there is the cost of the actual certification process to a wireless standard which will typically include costs for compliance testing, profile testing and the appropriate hardware sniffer tools. Altogether these tests bring the typical cost for certification to the ZigBee standard to around \$3000. Then there may also be an annual membership fee as well as per-chip royalties which will need to be included. The overall impact of certification on the cost-per-unit will depend on the production volume. Take, for example, a design with hardware costs of around \$1 to \$1.5 per unit over a production quantity of 10,000 units. At an estimated cost of around \$10,000, certification to FCC would effectively double the cost per unit of the product. Then the cost of certification to an RF standard, including pre-compliance testing, the certification process and RF test equipment, could easily push the cost over \$10,000.

Effective management of power consumption is critical for a wireless sensor node powered by energy harvesting and will have an impact on every design decision. The configuration of the RF transmission deserves special consideration to enable the system to eliminate all unnecessary power consumption. Parameters

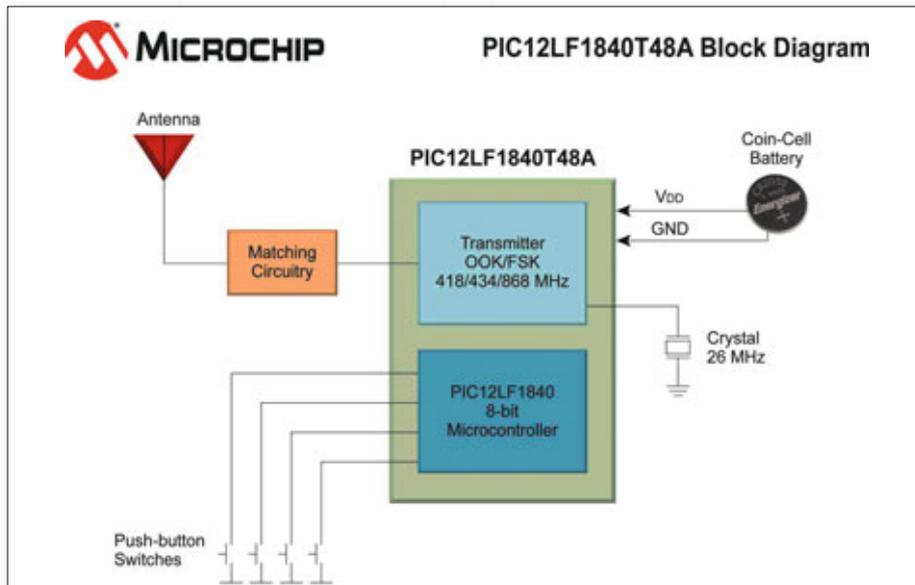


Figure 1. Block diagram of the PIC12LF1840T48A microcontroller

such as the modulation scheme, the speed at which data is transmitted, and the RF output power into the antenna, will all affect the overall power consumption. As a general guideline, shorter periods of active operation will result in lower average power consumption. This can include ensuring that all the devices used in the design, from an LED to a microcontroller or transmitter, spend the maximum time in low-power mode.

Using a higher data rate will mean that the design uses more power, but the trade-off is that shorter packet lengths will reduce energy consumption. The modulation scheme will also have a role to play in managing energy consumption. ASK or OOK modulation uses less energy because there are periods when the RF power is reduced with ASK modulation, or zero with OOK. The average current draw will also be lower with ASK. Despite this, the preferred modulation scheme is FSK because it can achieve significantly higher data rates. If basic one-way communication is all that is needed, the design could use a simple RF transmitter; but if the goal is certification to a wireless standard such as IEEE 802.15.4 then a specialized controller may be preferred. For example, Microchip PIC12LF1840T48A microcontroller has an integrated transmitter which supports a data rate of 10 Kbps in OOK mode and 100 Kbps in FSK mode. This data is therefore sent ten times faster using FSK modulation than with OOK. At higher data rates, an RF receiver can also receive and decode FSK signals much more efficiently than with ASK modulation.

The low-power shutdown modes of the microcontroller can also be used to minimize energy consumption. The frequency with which the sensor needs to transmit data will depend on the response time of each application. Extend-

ing the time between active periods will mean that the controller will spend more time in low-power mode and therefore reduce the average power consumption. The current draw will also be determined by the type of data that the sensor captures between transmissions. Receiving data from op-amps and a bridge load cell, for example, will demand a relatively large current compared to the current used during the transmission of RF data.

An example design based on PIC12LF1840T48A microcontroller shows the calculations for energy consumption: the integrated transmitter of the microcontroller has a maximum frequency deviation of up to 200 kHz which allows a maximum bit-rate of 100 Kbps. Using a small data packet with a 16-bit preamble, a 16-bit synchronization pattern and a 32-bit payload, one complete data packet can be transmitted in just 640  $\mu$ s. With the energy measured in joules (J) this provides:

$$1J = 1W * 1s = 1V * 1A * 1s$$

The energy consumption used for sending one data package is calculated by:

$$E = 10.5mA * 640\mu s = 10.5mA * 3.0v * 640\mu s = 31.5mW * 640\mu s = 20.16\mu J$$

The start-up time for the crystal oscillator is typically 650  $\mu$ s, with an energy draw of 5 mA during start-up. The start-up power consumption is therefore calculated by:

$$E1 = 5mA * 3.0v * 650\mu s = 9.75\mu J$$

The data transmission used in the example design contains 16 bits of preamble, 16 bits of synchronization pattern and 32 bits of data.

For the selected bit-rate of 100 Kbps, this gives a transmission time of 640  $\mu$ s. For a RF transmission of +0 dB at 868 MHz, using FSK modulation, the power consumption is 12 mA.

$$E2 = 12mA * 3v * 640\mu s = 23.04\mu J$$

Using a simple transmission at 10 kbps the energy used would be:

$$E2 = 7.5mA * 3v * 6.40ms = 144\mu J$$

This comparison shows the difference in the energy used and reinforces the importance of using a higher data rate.

The PIC12LF1840T48A transmitter will automatically time-out and revert to a low-power shutdown mode after sending the last data bit. With a minimum timeout period of 2ms the additional energy consumption will be:

$$E3 = 12mA * 3v * 2ms = 72\mu J$$

These calculations provide a total power draw for the transmission of a single data packet of:

$$E = E1 + E2 + E3 = 9.75\mu J + 23.04\mu J + 72\mu J = 104.79\mu J$$

A miniature solar cell that generates a current output of 4.5 $\mu$ A at 3V will need to be active for the number of seconds that are required to get enough energy for a single data transmission. Using a low-cost solar cell as an example, a best-case scenario of 3V at 40 $\mu$ A, only generates 120 $\mu$ W of power:

$$3V * 40\mu A = 120\mu W$$

The calculation for the amount of time required to collect sufficient energy to send a single data transmission is:

$$T = 104.79\mu J / 120\mu W = 0.87s$$

This shows that the sensor unit has to wait for 0.87 seconds between two sequential data transmissions assuming that the solar cell has a constant light source. In real-world applications the natural light, which is the primary source of energy, is available only during the day. The calculation, therefore, must be extended to take into consideration the fact that the harvesting system must store the energy harvested during the day so that it can be used during the night. Another factor to consider is that the energy required to carry out the actual sensor measurement is not included in the example calculations. There are a number of options which can be implemented to store the energy harvested during daylight hours. These options include using a supercapacitor as the storage element, or trickle-charging low-cost NiMH rechargeable

batteries directly from the solar cell. In the few applications where the source of energy is constant, there may be no need for storage.

The main advantage of using energy harvesting in low-power wireless sensor nodes is not an immediate reduction in the cost per unit, but the long-term savings in maintenance costs. These savings are particularly useful if the sensor nodes are in remote locations, or if the net-

work contains a high number of nodes. In both of these scenarios, energy harvesting could power the wireless sensors almost indefinitely and with virtually no human intervention. Energy harvesting is becoming an increasingly viable solution for powering wireless sensor nodes particularly in networks which are not based on networking standards such as ZigBee or WiFi. There is also a growing range of energy sources such as light, heat, radio waves,

mechanical energy, and, more recently, even blood sugar. The successful implementation of energy harvesting to power a wireless sensor node needs careful control of the wireless sensor's overall power draw. This can be achieved by selecting the most appropriate communication protocol and data rate, and by using all the power-saving features integrated into RF devices such as the Microchip PIC12LF1840T48A microcontroller. ■

## Product News

### ■ Artila cooperates with Nietzsche Enterprise in wireless automation

ZigBee is a low-cost, low-power, wireless mesh network standard targeted at wide deployment of long battery life devices in wireless control and monitoring applications. Thanks to its powerful star, tree networks, and generic Mesh networking support, ZigBee had been widely used in building automation, lightning control, energy management and security. Artila announces the cooperation with Nietzsche in wireless automation of the environment monitoring and safety alert.

[News ID 1952](#)

### ■ Telit expands m2mAIR mobile coverage across Europe and Latin America

Telit Wireless Solutions announced its appointment to the Telefonica m2m Channel Partner Programme. As a result, m2mAIR Mobile can now offer local Telefonica connectivity services, together with its own suite of value added services to M2M customers throughout Europe and Latin America.

[News ID 1835](#)

### ■ GreenPeak: smart home chips support new networking protocols like Thread

GreenPeak is pleased to recognize Thread's entry in the family of protocols based on the

IEEE 802.15.4 standard. GreenPeak's family of patented multi-stack low-power radio chips has been developed to simultaneously support different wireless networking protocols. The family of GP71x chips today supports ZigBee PRO, SEP 2.0, RF4CE and Green Power, and is capable of supporting new and emerging protocols such as the recently announced protocol by the Thread Group, allowing customers to upgrade their devices to support existing protocols for legacy devices as well as newer devices running Thread at the same time.

[News ID 1844](#)

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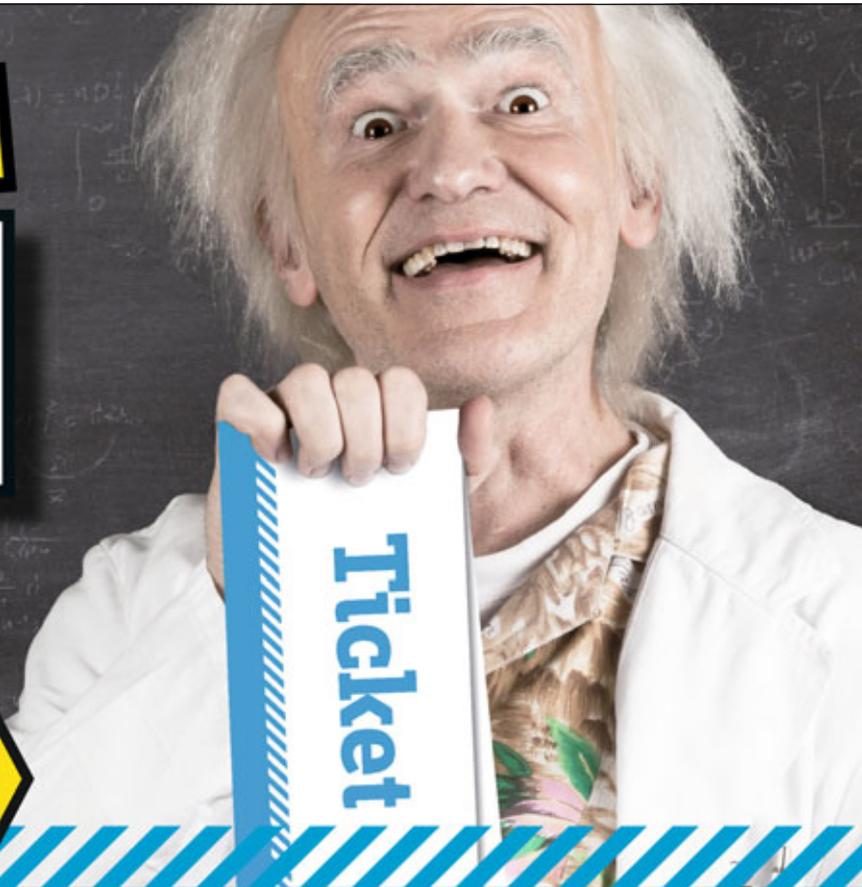
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# Open Source solutions for connected applications tomorrow

By Andrew Mitchell, Sierra Wireless

*This article introduces Legato, a new generation of M2M software - an open-source embedded platform designed to simplify the development of M2M applications. It is built on a fully-tested Linux distribution, with a tightly integrated application framework and M2M toolset.*

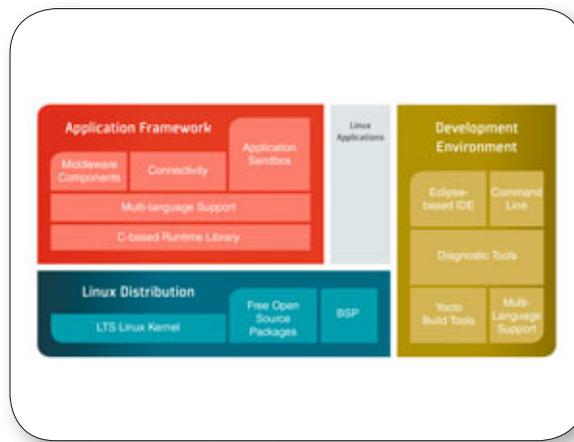


Figure 1. Legato is an open source embedded platform built on Linux, designed to simplify M2M application development.

■ The explosive growth in the Internet of Everything holds enormous potential. Modern machine-to-machine (M2M) technology can provide more processing power and intelligence at the edge than ever before, and support more complex and powerful connected applications. But the M2M marketplace presents a number of hurdles for developers seeking to capitalize on this potential. Barriers include:

No standardized, M2M-ready operation system (OS). Linux is increasingly becoming the OS of choice for M2M because it is open-source, easily customized and widely used among developers. But standard Linux is not designed for the unique requirements of embedded applications. Adapting it can be enormously time-consuming and expensive because you have to assemble all the necessary libraries, development tools and APIs, and then integrate with specific vendor hardware. Companies can spend many months and hundreds of thousands of dollars just to create a functional Linux-based application environment before they even begin testing and validation.

Poor scalability. Taking an M2M application from idea to proof-of-concept can be relatively easy. The problems begin once a prototype is approved for mass production. It can literally take years to evolve a proof-of-con-

cept to a working solution that complies with industry-specific standards and protocols, mobile network operator (MNO) specifications, and regulatory requirements.

Limited portability. M2M applications are typically tied to the proprietary software environment of a vendor. That means developers usually have to repeat the entire integration, testing, and validation process for each hardware platform deployed. If an application uses one chipset in North America, another in Europe, and another in China, developers have to build essentially custom solutions from scratch for each market.

Impeded innovation. The lack of a standardized, universal software platform is in many ways preventing the M2M industry from evolving as quickly as it should. Using proprietary, hardware-specific solutions makes it very difficult for anyone, other than the people building the device, to create software that runs on it. It also means that developers have limited ability to port their expertise from one project or platform to another, which makes it more expensive for OEMs and other companies building connected applications to bring in needed developer expertise. With 2 billion M2M connections projected worldwide by 2018 - representing nearly 20 percent of all mobile-connected devices - the time has

come for a standardized M2M platform that can support universal device-to-cloud solutions. The smartphone industry saw explosive growth only when a standardized mobile operating environment emerged that let people develop applications independently of the underlying hardware. It's time for that industry evolution in M2M.

Sierra Wireless is enabling this new generation of M2M software with Legato - an open-source embedded platform designed to simplify the development of M2M applications. It is built on a fully-tested Linux distribution, with a tightly integrated application framework and M2M toolset that provide everything developers need to quickly build, deploy and connect their embedded applications. Developers can ramp up applications from proof-of-concept to mass market deployment with more flexibility, using this fully customizable open-source platform that can support any vendor hardware, any cloud management platform, and any network or peripheral. How does Legato change the way developers create and deploy M2M applications? An automotive supplier building a government-mandated eCall emergency response system can use the same solution to run a third-party pay-as-you-drive insurance application - completely securely and on the same platform. An energy industry OEM can use



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Legato development tools and included APIs to build a smart meter that connects to a customer-facing energy application over a home network. In both cases, developers benefit from the ability to use pre-existing, pre-validated building blocks and industry-specific protocols to build their applications. They also can securely manage and update applications over the air with pre-integrated cloud connectivity. In both energy and automotive, where solutions need long operational lifetimes, developers benefit by building applications on an open-source Linux kernel that will be supported by the industry for many years.

M2M has come a long way. But to support the explosive growth analysts anticipate over the next several years, the industry needs to evolve faster. As enterprises embrace more advanced M2M applications, developers need tools to simplify the process of developing embedded applications, and make them easier to design, deploy, and port. Legato provides these critical capabilities in a standardized, open-source platform right now. As a pioneer in M2M software development and creator of the Open AT application framework, Sierra Wireless is leading this industry transformation. With Legato, the company provides an

end-to-end solution to accelerate the development of connected applications, encompassing powerful multicore hardware with ARM processors, pre-tested and validated software, and a cloud platform capable of managing millions of devices over the air. By building these capabilities into a standards-based, open-source platform, Legato gives developers the flexibility to build embedded applications how they choose, independent of the underlying hardware. Developers can turn their skills and energy away from tedious integration tasks, and toward creating innovative new applications. ■

## Product News

### ■ TES opens competence center for Physical ASIC Design

TES Electronic Solutions announces the opening of a dedicated Competence Center for Physical ASIC Design, focusing on Digital and Mixed-Signal devices. The new group has lately been established within TES' existing ASIC Design Center in Düsseldorf. The Competence Center consists of a dedicated team of experts, experienced with CMOS technologies ranging from 0.35 µm down to 40 nm.

[News ID 1862](#)

### ■ Swissbit extends security series with two MICRO SD cards

Swissbit presents two new members of the Security Series PS-100u: the secure MICRO SD storage cards PS-100u PE and PS-100u DP include new security functions, the PS-100u PE with an integrated smart card, the PS-100u DP without. The new products will make it easier for solution providers to create secure applications.

[News ID 1830](#)

### ■ DFI: COM Express Mini type 10 powered by Atom E3800 with ECC

DFI unveils a new Type 10 COM Express Mini module. BT9A3 uses the low-power Intel Atom processor E3800 SoC product family which primarily aimed at 24-hour operating intelligent systems, such as ATMs, POS terminals, and smart grid. The Mini module comes with a choice of Intel Atom E3800 SoCs ranging from single core (5 watts TDP), dual core (6~8 watts TDP), up to quad core (10 watts TDP).

[News ID 1864](#)

### ■ EKH: additional DRAM training "Open the Black Box of Memory"

EKH adds an additional event for the DRAM Training "Open the Black Box of Memory". In order to keep the quality of the event high the number of participants is limited. As the maximum number is reached we decided to setup an alternative on Sept. 22./23. 2014. The training covers in depth technical informa-

tion on DRAM Memory that engineers need for Design, Layout, Verification and Failure analysis on DRAM interfaces from DDR1 up to DDR4. The training is done in cooperation with ee-training. Make sure to use the promotion Code EK3232 when registering for the event to get a discount! EyeKnowHow will be present at Embedded World 2015.

[News ID 1973](#)

### ■ ERNI: high density ERmet ZDHD connector available in 4-pair versions

With the ERmet ZDHD family ERNI electronics has developed a high density high-speed connector system which support data rates of up to 25 Gbps. Based on ERmet ZDHD connectors demanding 100 Gbps systems ( with four 25 Gbps channels according to the IEEE 802.3bj standard) can be built. In addition to the existing 6-pair version ERNI now also offers compact 4-pair male and female parts of the ERmet ZDHD connectors.

[News ID 1949](#)

### ■ MSC: COM Express type 2 modules with Intel Core CPUs

MSC Technologies presents the powerful MSC CXB-8S COM Express Type 2 module family based on 4th generation Intel Core processors. The high-end platform for sophisticated applications complements MSC Technologies' MSC CXC-BT COM Express Type 2 module family which integrates the latest Intel Atom E3800 processor technology known as Bay Trail. With Type 2.0 pin-out compliant to the COM Express specification, both products offer „legacy“ interfaces like PATA and PCI bus.

[News ID 1845](#)

### ■ EBV: new website for EBVchips Program

EBV Elektronik now also offers customers comprehensive online information on its EBVchips program. Under the name EBVchips, EBV defines its own semiconductor solutions, which are developed with and for its customers! They are manufactured by EBV's supplier

partners, fulfilling special requirements not covered by products already available. This makes EBV the first semiconductor specialist to offer such a service.

[News ID 1930](#)

### ■ Syslogic: projected capacitive touch panel series for vehicle control systems

Syslogic touch panel computers from the Projective Capacitive Touch Panel Series comprise a scratch-proof and wear-free touchscreen, thereby meeting the high requirements from industry in terms of robustness and durability. The touch panel computers are designed for an extended temperature range of between -25 and +65° C and suitable for continuous operation (24/7) and are therefore able to stand up to extreme environmental conditions

[News ID 1874](#)

### ■ MEN: MVB-functionality for railway computers

MEN has entered into a partnership with train control and monitoring company duagon, and is thereby continuing to complete its product range in the field of system solutions for railways. duagon's MVB (multifunctional vehicle bus) interfaces will be integrated into MEN's modular 19-inch CompactPCI systems, as well as its full line of robust box and panel PCs to enhance railway communication systems.

[News ID 1814](#)

### ■ Avalue: Atom E3800 and Celeron J1900 based embedded systems

Avalue is unveiling a new Intel Atom processor E3800 and Celeron J1900 product family embedded systems, including EMS-BYT, EPC-BYT, ASM-BYT, EPS-BYT-2PCI and ERS-BYTE-10COM. The Intel Atom processor E3800 is a system-on-chip. Based on the 22nm Silvermont microarchitecture, these new processors are designed for intelligent systems and applications with low power consumption and high performance requirements.

[News ID 1816](#)

# Intelligent Design

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Analog design is difficult and consumes precious development time. Microchip's intelligent PIC<sup>®</sup> MCUs integrate analog functions such as high performance Analog-to-Digital Converters, Digital-to-Analog Converters and Op Amps providing simple-to-use interfaces that ease analog design. A single-chip solution enables reduced system noise and provides higher throughput, while dramatically reducing design time and cost.

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- Lighting
- Power measurement and monitoring
- Energy harvesting equipment
- Solar inverters



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# Rugged embedded standards-based solutions that deliver on SWaP(-C)

By Jeff Munch, ADLINK

*Small form factor design trends are paradoxical. Form factor size decreases while required functionality increases. More processing power is demanded while lower power consumption and thermal output are expected. Ruggedness against the shock, vibration, humidity, temperature extremes and variance inherent in mobile and outdoor applications is also needed, facing designers with a very complex soup.*



*Rugged military systems using small form factor COTS design and industry-standards, are required to meet the requirements for SWaP(-C).*

■ Yes, designing for rugged applications presents its share of challenges, but there are form factors and manufacturing techniques that accommodate most requirements for either general or application-specific design. Mobility and environmental extremes are critical considerations for rugged board design in military, transportation, industrial and surveillance applications, to name a few. And with today's emphasis on SWaP(-C) in embedded system design, it's critical for embedded designers to follow industry standards, and equally critical for industry standards to continue evolving to maintain relevance.

Embedded board eXpandable (EBX) and PC/104 are good format options for designs that can handle slightly larger single board computer (SBC) form factors. With just 46 square inches of surface area (8" x 5.75"), EBX balances size and functionality with a bolt-down SBC format supporting rugged embedded designs with higher-performance central processing units (CPUs), such as those using multi-core technology for networking, digital signal processing (DSP), and graphics-heavy applications, and generous on-board input/output (I/O) functions to support everything from large data exchange to video. The PC/104 embedded computing format has no backplane, instead allowing modules to stack together like building blocks more rugged

than typical bus connections in PCs (such as PCI or PCI Express slot cards). PC/104 delivers high performance combined with low power, stackable configurations and adherence to MIL-STD, and it meets key industrial and transportation standards for electromagnetic interface/compatibility (EMI/EMC), e.g. EN50121, EN50155, EN610000-x, etc. The ability to build stacks of PC/104 modules creates opportunities for developing a diversity of complex, often mobile, applications that range across industrial, transportation, and defense environments where robust and reliable capabilities of PC/104 are required. In addition, PC/104 transition into vision and visual security monitoring systems is benefitted by PCI Express, as it has the capacity to directly meet the bandwidth needed to support multiple data streams.

Though the number of stacks included in PC/104 systems has been decreasing, the form factor continues its warm relationship with industries requiring rugged applications with high resistance to shock and vibration. In defense and transportation, legacy devices and ISA-BUS interface requirements are still plentiful. With high-speed serial I/O interfaces, such as PCI Express, supported in current PC/104-based standards, PC/104 boards are keeping pace with the movement toward consolidating workload on expansion mod-

ules, requiring fewer layers to fulfill application requirements. The ability to withstand temperature extremes often associated with remote environments still allows PC/104 to excel in off-grid computing (e.g. defense apps). Stackable, mix-and-match modularity and the intrinsically rugged design of PC/104 is ideal for many of the technology upgrade programs nowadays looking for commercial off-the-shelf (COTS) options — especially those that value SWaP(-C). In addition to ruggedness, users of PC/104 have come to expect long lifecycle support. When considering shrinking DoD budgets, the robustness, longevity and compatibility of the PC/104 ecosystem ensure strong system support and minimized costs.

While PC/104 allows flexibility by combining cards to meet application requirements, the PC/104 format becomes less attractive when very high computing speed and network throughput is required — situations where VPX or CompactPCI (cPCI) formats are better suited. In cases where an application design requires very specific I/O or physical size/shape restrictions, then a computer-on-module (COM) approach would provide better results. COMs are complete embedded computers built on a single circuit board for use in small or specialized applications requiring low power consumption or small physical

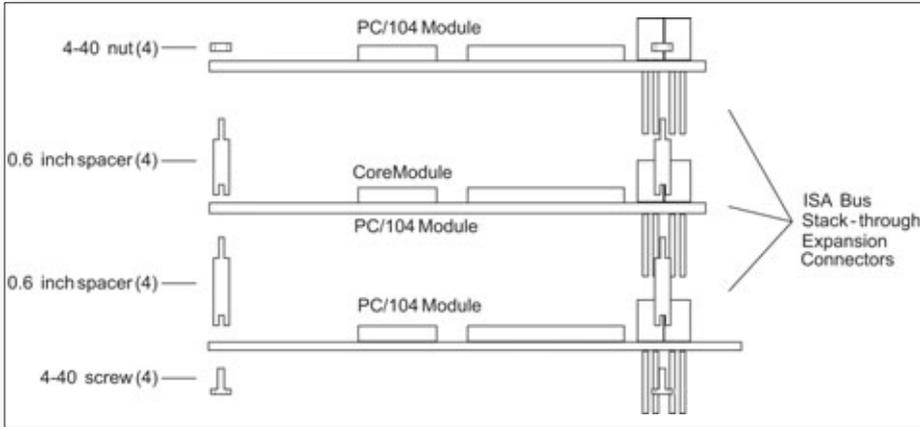


Figure 1. The PC/104 embedded computing format has no backplane, instead allowing modules to stack together like building blocks. Many applications in defense and transportation still incorporate legacy devices that require an ISA-BUS interface.

size. Though they are compact (ETX/XTX at 114x95mm and COM Express at 125x95mm to 84x55mm) and highly integrated, COMs can accommodate complex CPUs.

With the COM approach, all generic PC functions are readily available in an off-the-shelf foundation module, allowing system developers to focus on their core competencies and the unique functions of their systems. A custom-designed carrier board complements the COM with additional functionality that

is required for specific applications. The carrier board provides all the interface connectors for peripherals, such as storage, Ethernet, keyboard/mouse and display. This modularity allows the designer to upgrade the COM on the carrier board without changing any other board design features, and also allows more customization of peripherals as dictated by a specific application. The COM Express form factor offers flexibility in the development and advancement of ultra-rugged embedded applications for a wide range of industries.

By using the modular processing block, the designer creates a price and value advantage; he or she isn't locked into a single vendor for board creation and can customize based on pricing and performance requirements. Because it is easily swapped from a carrier board and comes in one of the smallest form factors, COM Express is ideal for long-life embedded applications with a critical development cycle, as well as more progressive applications that require frequent processor upgrades without affecting other application design elements.

Rugged solutions are most often housed outdoors or in moving vehicles, where exposure to a variety of climates dictates the need to operate in extended temperatures and to power up in any extreme. The easiest initial step is to select a rugged board or system that is designed for harsh environments from the ground up. To support the extremes of shock, vibration, humidity, and temperature, care is given to component selection, circuit design, printed circuit board (PCB) layout and materials, thermal solutions, enclosure design, and manufacturing process. Robust test methods, including highly accelerated life testing (HALT), ensure optimal product design phases in order to meet the stringent requirements of a product, such as -40 °C to +85 °C

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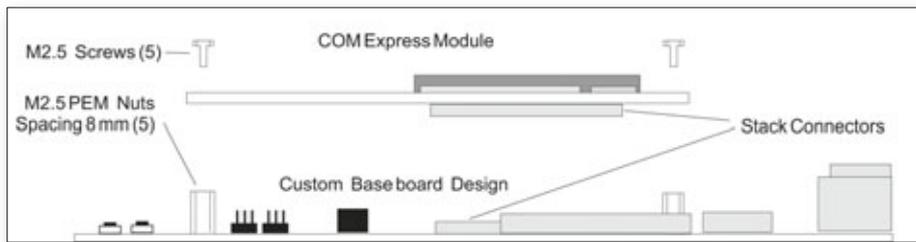


Figure 2. A design using the COM Express form factor provides off-the-shelf functionality and an easy upgrade path by putting the customization on the baseboard, thereby creating more flexibility with the module without sacrificing performance.

operating temperature range, MIL-STD, shock and vibration, and long-term reliability. Conformal coating can also reduce degradation from exposure to outside elements. A variety of conformal coating materials (such as acrylic, polyurethane, epoxy, and silicone) and application methods (such as brushing, spraying, and dipping) are currently used to protect against moisture, dust, chemicals, and temperature extremes that can potentially damage electronics. The correct coating or application method varies depending on established standard operating conditions for an application. With transportation applications, different coatings may be selected based on a primary need for moisture resistance versus abrasion resistance versus temperature stability.

With rugged, in-vehicle applications, vibration control is critical for performing functions like capturing video or securing targets. Some rugged SBCs offer a thicker PCB fabrication to add rigidity so the board can withstand higher levels of vibration strain. The thicker PCB offers stability to the overall surface area, protecting electronic components from damage due to vibration. The thicker PCB also offers the ability to use more copper between layers for thermal considerations. Heat is a common unwanted by-product of

processing power. In addition to cooling fans and large heat sinks, which may not always be possible for compact, mobile transportation designs, PCBs with adequate amounts of integrated copper facilitate heat conduction away from temperature-sensitive electronic components to prevent performance degradation.

Nowhere is the concept of SWaP(-C) more emphasized than in the defense market. And yet the demand for high performance embedded computers has never been greater. The changing face of military engagements, fewer troops on the ground, more use of reconnaissance gathered via UAVs, real-time feeds to ground mobile operations and the emergence of network-centric warfare are driving what needs to be created to support the warfighter today.

At their core, battlefield engagements depend nowadays on access to and ability to share complex, real-time data with the battlefield commanders and to enable the ability to push select information all the way down to the front-line warfighter. As the defense market demand increases for better SWaP with every increasing level of performance, solution providers must respond with small form factor, high performance, and rugged, embedded

computing designs based on open standards. For instance, VITA75 — which defines specific box sizes, connector content and placement and multiple types of cooling — is one example of a standard that will enable this type of high-value, no lock-in solution. By electing to build solutions based on industry standards, this provides choice to the defense market customer. Now selection and evolution of a solution can be based on a value/cost return analysis rather than being hardwired into a proprietary solution.

There is innovation required to provide more processing in smaller, lighter and more power-efficient form factors while also adhering to industry-accepted standards. The industry focus should be on leveraging COTS technology to bring that innovation to markets that need rugged solutions. Nowadays defense market reality is sequestration and budget constraints, which for the foreseeable future will not go away. It will not be business as usual in the defense market; there will be more emphasis on standards, openness and effective cost management.

Adlink has a long history of delivering standards-based, rugged defense products for over half a decade, starting from the introduction of conduction-cooled CompactPCI and Extreme Rugged board-level products in COM-Express, PC/104 and EBX formats, and expanding to higher performance conduction-cooled 3U VPX products. It is clear that the market needs innovation at the system level, as current solutions are more proprietary and closed rather than open and standard. High value solutions are required, yet they must be delivered in standards-based form factors that allow implementation choices to be made without proprietary lock-ins. ■

## Product News

### ■ Mouser expands distribution accord with ADLINK into Europe

Mouser Electronics has greatly expanded its agreement with ADLINK Technology to distribute ADLINK products across Europe. Mouser's international distribution agreement with ADLINK now includes EMEA, China and the Americas.

[News ID 1972](#)

### ■ Bayer DSP: PCIe board based on Arria V FPGA with dual 40Gig or octal 10Gig ports

BittWare has announced the release of its newest board, the A5-PCIe-L (A5PL) low profile PCIe board based on Altera's Arria V GZ FPGA. The high-performance, power and cost-efficient Arria V GZ provides a high

level of system integration and flexibility for I/O, routing, and processing that enables BittWare's A5PL to be a solid platform for network processing, security, broadcast, and signals intelligence applications.

[News ID 1990](#)

### ■ congatec signs contract with Russian distributor Eltech

congatec has entered into partnership with Eltech, a key distributor of electronic components and modules in Russia and neighboring C.I.S. countries. The new partnership will significantly strengthen congatec's position as a leading provider of Computer-on-Modules in the region. With the signing of the distribution agreement between Eltech and congatec, customers in the Russian Federation, Belarus,

Kazakhstan and other C.I.S. countries will be able to order and test the entire range of congatec's industrial computer modules in the standard form factors Qseven, COM Express, XTX and ETX.

[News ID 1917](#)

### ■ emtrion: QNX 6.6 board support package for MX6 processor module

emtrion announces the immediate availability of the QNX 6.6 board support package for the DIMM-i.MX6 family. emtrion offers different embedded modules on the basis of the i.MX6 processors from Freescale, which differ mainly in the type of processor, the amount of memory and the range of interfaces.

[News ID 1856](#)

#### ■ MEN: safe BSPs for SIL 4 railway computer

The new safe BSPs for QNX and PikeOS ensure that both the hardware and software components of its F75P 3U CompactPCI SBC meet safe railway computing requirements. MEN's dual-redundant F75P serves as the core of a new line of SIL 4 certifiable computing systems currently in development used for safe train control. The SBC incorporates two independent Intel processors, and a third Intel processor implemented at the top most protocol layer that controls the I/O without interfacing with any safety protocols.

[News ID 1886](#)

#### ■ Syslog: Embedded computers for railways on show

Syslog has a complete portfolio of certified railway computers that the company will be showcasing at InnoTrans. Syslog's railway computers are used in innumerable railway applications. For instance, they can be used as board computer or video recorder. The Syslog railway computers are available in a variety of housings and interface configurations. All railway computers have sturdy industrial construction and railway certification complying with EN50155 (TX class).

[News ID 1915](#)

#### ■ Axiomtek: 4th gen Core Mini ITX motherboard with rich I/O and HDMI

Axiomtek announce the arrival of the MANO881, a new mini-ITX motherboard with Intel H81 Express chipset. The product offers socket H3 - LGA1150 that supports the 4th generation Intel Core and Celeron processors. This feature-rich board has two sockets for DDR3 system memory of up to 16 GB. The high-performance mini-ITX motherboard MANO881 supports one PCIe x16 slot and integrated with Intel HD 5000 graphics supports powerful graphic processing and dual-display capability through HDMI, VGA and LVDS interfaces.

[News ID 1878](#)

#### ■ VadaTech announces Express Development Platforms

VadaTech now offers Express Development Platforms. The system platforms are standard, high versatile configurations designed to meet a wide range of development needs. The first two chassis in the series, the EXP100 and EXP200 feature 6 AMC slots and 2 AMC slots respectively in 1U enclosure height. Both versions have an integrated low-cost shelf manager and universal AC power.

[News ID 1826](#)

#### ■ N.A.T.: MCH for Physics or MTCA.4 applications with optical and copper PCIe uplinks

The most recent member of the NAT-MCH family of products, the NAT-MCH-PHYS80, is addressing the requirements for higher bandwidth to both AMCs and the rear transition slot of the MCH as well as for optical and copper uplinks in PCIe based MTCA.4 systems, targeting at large control and data acquisition applications.

[News ID 1896](#)

#### ■ Diamond: PCIe/104 OneBank serial I/O modules offer 4 or 8 serial ports

Diamond Systems introduced Emerald-MM-8EL-XT, a family of high performance PCIe/104 OneBank serial I/O modules offering 4 or 8 serial ports with software-controlled configuration and optional opto-isolation. The serial ports are based on a high speed PCIe octal UART with 256-byte TX/RX FIFOs and auto RS-485 transmit control. Each serial port can be independently configured for RS-232, RS-422, or RS-485 protocols, along with programmable 120-ohm line termination.

[News ID 1948](#)

## NEW EMBEDDED HIGHLIGHTS



developed by  
DATA MODUL

#### eDM-mITX-CB-Q7-Info

- » Mini-ITX Baseboard for Digital Signage
- » direct interface for large size TFTs up to 82" (WUXGA)
- » perfect combination with eDM-QMX6, conga-QA3
- » up to 4 x USB, 2 x LAN, CAN (opt.)
- » opt. isolated RS485 / RS422 Module
- » DVI/HDMI/DisplayPort
- » +12V /24V DC input



#### eDM-CB-Colibri

- » Baseboard for Toradex Colibri T20 /T30/VF50/ VF61
- » 24x Bit LVDS /24x Bit TTL RGB
- » Wide Power Input: +9 to +24V DC
- » Internal Power Controller for 4.3" to 10.4"
- » RS232/485/422/CAN, ETH, µSD-Card, SPI, I²C 4xUSB
- » Temperaturrange: -40 to +85°C

developed by  
DATA MODUL

#### MS-98F6

- » Intel® Celeron® N2930/J1900 (Bay Trail-D/M)
- » Bis zu 8GB DDR3L Memory
- » VGA / LVDS 2x24bit / HDMI
- » 6 x COM, 1 x USB 3.0, 7 x USB 2.0
- » 2 x Mini PCIe (1 x mSATA support)
- » +12V/+19V/+24V DC input



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## ABOUT

**SGET e.V. is a technical and scientific association with its registered office in Munich. The purpose of the Association is to generate and to promote technical specifications or other work results such as implementation guidelines, software interfaces or system requirements.**



The **SMARC** („Smart Mobility ARChitecture“) is a versatile small form factor computer Module definition targeting applications that require low power, low costs, and high performance.



The Modules will typically use ARM SOCs similar or the same as those used in many familiar devices such as tablet computers and smart phones. Alternative low power SOCs and CPUs, such as tablet oriented X86 devices and other RISC CPUs may be used as well. The Module power envelope is typically under 6W.

Two Module sizes are defined: 82mm x 50mm and 82mm x 80mm. The Module PCBs have 314 edge fingers that mate with a low profile 314 pin 0.5mm pitch right angle connector (the connector is sometimes identified as a 321 pin connector, but 7 pins are lost to the key).



The **Qseven** concept is an off-the shelf, multi vendor, Computer-On-Module that integrates all the core components of a common PC and is mounted onto an application specific carrier board.



Qseven modules have a standardized form factor of 70mm x 70mm or 40mm x 70mm and have specified pinouts based on the high speed MXM system connector that has a standardized pinout regardless of the vendor. The Qseven module provides the functional requirements for an embedded application. These functions include, but are not limited to, graphics, sound, mass storage, network and multiple USB ports. A single ruggedized MXM connector provides the carrier board interface to carry all the I/O signals to and from the Qseven module. This MXM connector is a well known and proven high speed signal interface connector that is commonly used for high speed PCI Express graphics cards in notebooks.

How to join us?



## Product Overview



### Intel Atom



Product	Features	Manufacturer
uCOM-BT	SMARC® with Intel® Atom™ SoC	AAEON Technology, Inc.
LEC-BT	SMARC® Full Size Module with Intel® Atom™ Processor E3800 Series System-on-Chip	ADLINK Technology, Inc.
LEC-BTS	SMARC® Short Size Module with Intel® Atom™ Processor E3800 Series System-on-Chip	ADLINK Technology, Inc.
SMARC-sxBTi	SMARC® module with Intel® Atom™ processor E3800 series with extremely low-profile and high graphics performance	Kontron

### Freescall i.MX



Product	Features	Manufacturer
LEC-iMX6	SMARC® Short Size Module with Freescall i.MX6 Solo, DualLite, Dual or Quad Processor	ADLINK Technology, Inc.
ROM-5420	SMARC® Module based on Freescall ARM Cortex-A9 i.MX6	Advantech
SMA-iMX6	Freescall i.MX 6 ARM Cortex-A9 RISC Module	Avalue Technology Inc.
SCM120	SMARC® Platform with Freescall ARM Cortex-A9 i.MX6	Axiomtek
RM-F600-SMC	SMARC® solution by Freescall Solo/Dual/DL/Quad CPUs	IBASE Technology Inc.
SMARC-sAMX6i	SMARC® based on Freescall i.MX6 up to quad core	Kontron
MAGIK2 Module Family	i.MX6 Based SMARC® Module	TES Electronic Solutions GmbH

### NVIDIA TEGRA



Product	Features	Manufacturer
SMARC-sAT30	SMARC® based on Nvidia® Tegra® 3	Kontron

### TI Sitara



Product	Features	Manufacturer
LEC-3517	SMARC® Short Size Module with TI Sitara AM3517 Cortex-A8 Processor	ADLINK Technology, Inc.
SMARC-sA3874i	SMARC® based on Texas Instruments AM3874 up to 800MHz	Kontron

### Vortex



Product	Features	Manufacturer
SMARCBoard EX	SubAtom x86 SMARC® module	b-plus GmbH

## Product Overview



### AMD G Series



Product	Features	Manufacturer
EMQ-a50M1	AMD Fusion G-T40E Qseven® CPU Module	ARBOR Technology Corp.
QSM-520E	Wide-Range Operating Temperature AMD Fusion G-T40E Qseven® CPU Module	ARBOR Technology Corp.
EQM-A50M	AMD G-Series Qseven® Module with AMD A50M Chipset	Avalue Technology Inc.
conga-QAF	Based on AMD Embedded G-Series Processors	congatec AG
conga-QG	Qseven® module based on the high-performance, low-power AMD Embedded G-Series SOC platform	congatec AG
H6059	AMD G-series APU T16R/T40R/T40E	Hectronic
MSC Q7-A50M	AMD Embedded G-Series	MSC Vertriebs GmbH
Q7-GX	Qseven® Rel. 2.0 Compliant Module with the AMD Embedded G-Series System-on-Chip	SECO srl
QuadMo747-GSeries	Computer on Module with the new AMD Embedded G-Series Platform	SECO srl

### Altera



Product	Features	Manufacturer
IW-RainboW-G17M-Q7	Cyclone V SoC Qseven® Module	iWave Systems Technologies Pvt. Ltd.

### Freescale i.MX



Product	Features	Manufacturer
AQ7-IMX6	Qseven® CPU Module with Onboard Freescale™ i.MX6 Solo/Dual/Quad ARM Cortex A9 Processor	AAEON Technology, Inc.
ROM-7420	Freescale ARM Cortex-A9 i.MX6 Qseven® Module	Advantech
conga-QMX6	Quad-core ARM module	congatec AG
eDM-QMX6	Qseven® ARM Module Quad-core	Data Modul AG
FS700	Qseven® Based on Freescale™ i.MX6	DFI Inc.
i.CORE RQS M6	uQ7 CPU module based on Freescale™ i.MX6 single, dual light, dual or quad core	Engicam s.r.l.
QBlissA9	QSeven® module with Freescale™ i.MX 6 CPU	F & S Elektronik Systeme GmbH
IW-RainboW-G15M-Q7	i.MX6 Qseven® SOM	iWave Systems Technologies Pvt. Ltd.
IW-RainboW-G8M-Q7	i.MX51 Qseven® SOM	iWave Systems Technologies Pvt. Ltd.
MSC Q7-IMX6	Qseven® Rev. 1.2 / 2.0 compatible Module with Freescale™ i.MX6 Solo/Dual/Quad Processor	MSC Vertriebs GmbH
µQ7-i.MX6	µQseven Rel. 2.0 Compliant Module with Freescale™ i.MX6 Processor	SECO srl
QuadMo747-X/i.MX6	Computer on Module with Freescale™ i.MX6 Processor	SECO srl

## Product Overview



### Intel Atom



Product	Features	Manufacturer
AQ7-LN	Qseven CPU Module with Onboard Intel Atom N450/N455 Processor	AAEON Technology, Inc.
Q7-BT	Qseven® Standard Size Module with Intel® Atom™ Processor E3800 Series System-on-Chip	ADLINK Technology, Inc.
SOM-3565	Intel® Atom™ Processor N2600 Qseven CPU Module	Advantech
EmQ-i2506	Intel® Atom™ N2600 Qseven® CPU Module	ARBOR Technology Corp.
EmQ-i2301	Intel® Atom™ Processor E3800 family Qseven® CPU Module	ARBOR Technology Corp.
EQM-CDV	Intel® Cedarview Qseven® Module with Intel® NM10 Express Chipset	Avalue Technology Inc.
EQM-BYT	Intel® Atom™ SoC Processor E3800 Product Family	Avalue Technology Inc.
conga-QA6	Low Power Qseven® Module with Enhanced Graphics	congatec AG
conga-QA	Low Power Qseven® Module	congatec AG
conga-QA3	Low Power Qseven® Module with Industrial Temperature Range	congatec AG
BT700	Qseven® Based on Intel® Atom™ Processor E3800	DFI Inc.
QB702-B	Qseven® Based on Intel® Atom™ Processor E600	DFI Inc.
QB701-B	Qseven® Based on Intel® Atom™ Processor E600	DFI Inc.
QB700-B	Qseven® Based on Intel® Atom™ Processor E600	DFI Inc.
BT701	Qseven® Based on Intel® Atom™ Processor E3800	DFI Inc.
H6055	Intel® Atom™ E620T/E640T/E680T	Hectronic
H6049	Intel® Atom™ Z510/Z530	Hectronic
IQ7-US15W	Qseven® CPU module with Intel® Atom™ processor Z510/530	IEI Integration Corp.
iW-RainboW-G6M-Q7	Atom™ Z5xx Qseven® SOM	iWave Systems Technologies Pvt. Ltd.
MSC Q7-TCTC-FD	Intel® Atom™ E6x0, extended Temperature - Low-Power Atom technology for industrial temperature applications	MSC Vertriebs GmbH
MSC Q7-US15W-FD	Intel® Atom™ Z5x0 Flash	MSC Vertriebs GmbH
MSC Q7-US15W	Intel® Atom™ Z5x0	MSC Vertriebs GmbH
MSC Q7-BT	Qseven® Rev. 2.0 compatible Module with Intel® Atom™ E38xx Solo/ Dual/Quad Processor	MSC Vertriebs GmbH
QuadMo747-EXTREME	Computer on Module with Intel® Atom™ Z5xxPT series – US15WPT Chipset, specifically designed for industrial temperature range	SECO srl
QuadMo747-E6xx	Qseven® Rel. 1.20 Compliant Module with Intel® Atom™ E6xx series CPU + EG20T Chipset	SECO srl
QuadMo747-Z5xx	Computer on Module with Intel® Atom™ Z5xx series – US15W Chipset	SECO srl
QuadMo747-x2000	Qseven® Rel. 2.0 Compliant Module with Intel® Atom™ Cedar View family Processors and Intel® NM10 Express Chipset	SECO srl
QuadMo747-E6xx-EXTREME	Certified Industrial temperature range Qseven® Rel. 1.20 Compliant Module with Intel® Atom™ E6xxT series CPU + EG20T Chipset	SECO srl
Q7-BT	Qseven® Rel. 2.0 Compliant Module with the Intel® Atom™ E3800 family (Bay Trail) System-on-Chip	SECO srl

### Marvell



Product	Features	Manufacturer
Marvell 88AP510 Qseven module	Qseven® 2.0 Compliant Module with 1.0 GHz Soc with Integrated ARM CPU and Graphics Processor	Pactron
Marvell PXA2128 Qseven module	Qseven® 2.0 Compliant Module with Integrated Dual Core 1.2 GHz ARM CPU and Graphics Processor	Pactron
Marvell 88F6282 Qseven module	Qseven® 2.0 Compliant Module with 2.0 GHz High Performance ARM CPU	Pactron

## NVIDIA TEGRA



Product	Features	Manufacturer
MSC Q7-NT2	NVIDIA™ Tegra 290	MSC Vertriebs GmbH
QuadMo747-X/T30	Computer on Module with NVIDIA® Tegra® T30 Processor	SECO srl
µQ7-T30	µQseven Rel. 2.0 Compliant Module with NVIDIA® Tegra® T30 Processor	SECO srl

## TI OMAP



Product	Features	Manufacturer
MSC Q7-TI8168	TI DM8168	MSC Vertriebs GmbH
QuadMo747-X/OMAP3	Computer on Module based on the Texas Instruments® OMAP™ 37xx Family	SECO srl

## TI SITARA



Product	Features	Manufacturer
IW-RainboW-G12M-Q7	AM389x/DM816x Qseven® Module	iWave Systems Technologies Pvt. Ltd.

## VIA Nano



Product	Features	Manufacturer
EmQ-v900	VIA Nano™ Qseven® CPU Module	ARBOR Technology Corp.

## Vortex



Product	Features	Manufacturer
QBoard DX2	SubAtom x86 QSeven® module	b-plus GmbH
µQBoard EX	SubAtom x86 QSeven® module	b-plus GmbH



## Members:



## 2 Standards:



SGET e.V. is a technical and scientific association with its registered office in Munich. The purpose of the Association is to generate and to promote technical specifications or other work results such as implementation guidelines, software interfaces or system requirements.

How to  
join us?



# SMARC: two processor worlds combined in a single standard

By Martin Unverdorben, Kontron

*This article explains, how SMARC, an exceptionally slim-line minicomputer form factor (82mmx50mm), can combine the two competing processor worlds of x86 and ARM under a single common SGET standard?*



*Figure 1. The new Kontron SMARC-sXBTI Computer-on-Module is fitted with Intel Atom processors of the E3800 series.*

■ The answer to that is actually comparatively simple: SMARC is in fact only following the ongoing standardization of the x86 series and ARM processor technology. This is due to the fact that both processor worlds have applications in the field of energy-saving mobile handheld devices and accordingly offer an increasingly harmonized range of functions and interfaces. In this respect, ARM processor technology is moving towards more generic expansion options, and x86 series technology in the direction of dedicated features for mobile handheld devices. Whereas, for example, the processor in the Raspberry Pi only had USB as a classic PC interface, now Freescale or TI also offer ARM processors in the ultra-low power class with USB and PCI Express. And the Intel Atom processors of the E3800 series are now for the first time offering attractive camera interfaces or the generic Serial Peripheral Interface (SPI). The processor designs around the mobile handheld devices are thus increasingly being harmonized and this once again legitimizes a new Computer-on-Module form factor specifically for this performance class. And these are precisely the interfaces that SMARC is integrating.

SMARC is the only Computer-on-Module form factor that integrates and offers the two processor worlds and in so doing covers all solutions in one harmonized feature set with, for exam-

ple, standardized camera and SPI interfaces. This is much less the case when one looks at competitive solutions with Qseven, for example, the minimum requirements for integration have been reduced, which ultimately can be a disadvantage for those developers, who have built onto the hitherto prevailing minimum feature set. For simple generic expansions SMARC supports the SPI Bus (Serial Peripheral Interface), which is already considered as being the successor to LPC. SPI is a full duplex data bus. Several slaves can be simultaneously connected to one master. It offers faster transfer rates compared to other similar serial data buses such as LPC, I<sup>2</sup>C or SM Bus. The maximum clock speed is not limited, so that sufficient potential should be available for future developments. The SPI Bus is also highly energy-efficient thanks to its simple interface logic. In addition, there are numerous peripheral components already available: flash memories as well as various kinds of GPS, gyroscopic or temperature functions can easily be connected. In addition there are additional microcontrollers with SPI Bus support available, like signal mixer, touchscreen, CAN bus, Bluetooth and/or WLAN as well as amplifier circuits.

SMARC is also the first Computer-on-Module standard to offer a standardized camera interface. In this respect, the modules offer two camera interfaces compliant to the MIPI

standard such as Camera Serial Interface (CSI) for example, which enables video-based applications without the need for additional controller-modules. This allows even stereoscopic 3D recording. Innovative features such as access authorization via face recognition or viewer-related content provision can also be produced through the video functionality - for instance contact-free operation by means of gesture control systems. In hazardous areas, for example, security applications using the 3D function can also be installed using movement and distance measurement. Further application fields are to be found in the field of tele-health or in video telephony and with video assisted support and documentation in service and maintenance operations.

SMARC has been harmoniously designed right from the start, without any bad compromises having to be made in its features. However, the essential prerequisite for this is having sufficient scope for diversity. In terms of its connector, SMARC therefore uses the MXM 3.0 connector with 314 signal pins. Compared to the Qseven standard, for example, which offers 230 pins, this is nearly one third more. Therefore, SMARC can handle a clearly greater number of interfaces in its standard configuration. This is a significant plus point, if one takes a close look at the competitive modules that are available on the market. It should be noted here

that more often additional on-board connectors are being added to the modules. Module producers are thus trying to execute additional functions in order to differentiate themselves from the competition. But such interfaces are not standardized. Disadvantage: the standard will be weakened and the modules will have increasing less interchangeability.

This is, above all, also a reason why COM Express Modules should not be subjected to deviation: they have a fixed feature set and redesigns are only legitimate in this respect if an overall processor world of this kind should change so that previous solutions become obsolete. But first and foremost, existing standards have to perform the task of supporting one-time defined feature sets and with that furthermore their matching applications in the event of changes. Because this is really the only way that they can actually keep promises in relation to long-time availability. Incidentally, ETX has already done this before; this standard is even today still available unchanged with PCI and ISA. And this will also be the case with COM Express modules. Furthermore, these are serving what is the largest existing market for the „classic“ x86 designs and are doing this with an enormous range of modules from COM Express Basic through COM Express Compact up to the COM Express mini. It comes as no surprise that the new Intel Atom processors of the E3800 series are already available on three form factors at Kontron: COM Express mini and COM Express compact and now SMARC as well. Thus, the right design is there for any application, with no compromises.

The net result of this increasingly strengthened standard has incidentally also had effects in the responsible standards committees and has resulted in the establishment of SGET as the new Standards Committee, which is now administering and further developing the SMARC form factor independently from the manufacturer. Those who want to maintain the status quo must therefore also be prepared to blaze new trails. SMARC is thereby also precisely following the strategy of COM Express as the successor to ETX. Nor have any compromises been permitted and alternative designs such as XTX, which have been positioned precisely in the middle between COM Express and ETX, have failed to achieve a market significance that is comparable to that of COM Express even just in terms of basic approaches. And SMARC is also today positioning itself uncompromisingly as the form factor standard for credit-card-sized modules, which are coming into use as highly energy-efficient solutions with free programmability and powerful graphics and in so doing are following the new feature set of the mobile handheld devices.

The new Kontron SMARC-sXBTi Computer-on-Module offers an excellent graphics performance, high processor performance and x86-series compatibility on the smallest SMARC footprint, and does so with very low power consumption (5W to 10W). Both the flat design and the mobile feature set are adapted for the smallest portable handheld devices. But the modules can also still be used even when the consumption is only a few watts, but high computing and graphics performance is still essential. The new Kontron SMARC-sXBTi Computer-on-Modules are fitted with Intel Atom processors of the E3800 series and up to 8 GB RAM and with

ECC as an option. They support the extended temperature range of -40°C up to +85°C, are about 82mmx50mm in size and have an extra slim design with edge-card connector. Nevertheless, there is still sufficient space for an up to 64GB size onboard SSD for storing OS and applications data. In terms of the pin-out amongst other things the mobile feature set as 3x UART with a full range of functions also for GPS must be highlighted, as well as for example the support of the MIPI-conforming serial camera interfaces (MIPI CSI = ). High-performance Intel Gen 7 graphics are produced via HDMI 1.4 and LVDS (optional eDP) with up to 2560x1600. ■

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# Ultra-rugged Embedded Computer: the one for the rough stuff

By Raphael Binder, Syslogic

*This article introduces the rugged computer RPC Compact 71 which is protected to category IP67 and has a fully enclosed housing, as well as the matching M12 plug connectors.*



■ Salt-laden air, oil or dust, extreme temperature fluctuations, vibrations and/or shocks – these kinds of environmental factors usually mean devastation for electronics and especially for a computer system. Even rugged industrial computers usually have to surrender in their fight against such environmental conditions.

Early system failures can mean all kinds of hassles. The possible causes can be manifold. Air containing salt for instance can mean corrosion inside the device, which may then very well lead to later malfunctions. Should dust ingress into the industrial unit because of a leak in the housing, it could cause sudden failure. Another reason for failure in industrial systems which are exposed to constant environmental vibrations can be improper connectors or storage media. In addition, extreme temperatures create difficult operating conditions for the average device - like difficulties starting when it is cold, or even permanent electronics damage under sustained high heat conditions. In short, the traditional industrial computer is only suitable to a limited extent under extreme conditions.

The consequences of an early failure can be devastating. Depending on the application, such production downtimes or unscheduled maintenance events will cause losses to the

bottom line and a great deal of frustration. In worst case scenarios these failures can even become a danger to people, especially in cases where these computers have been integrated into vehicles. There are a number of applications that demand using an industrial computer, which is able to run reliably even under the most extreme of conditions. This includes their incorporation into construction equipment, special-purpose vehicles, mining and railway applications, as well as their use in the maritime environment.

The market offering of suitable equipment is rather limited. The embedding specialist Syslogic has recognized this need and developed a brand new device, which is setting new standards in stability. The main features of the RPC Compact 71 are its enclosed aluminum housing with IP67-protection rating and the M12 interfaces. This makes it resistant to moisture and dust-laden environments. In order to achieve a uniform pressure load in spite of the completely enclosed housing, the Rugged Box Computer features a Goretex valve mounted to its sidewall.

The new Ultra Lock series M12 connectors by Molex withstand the constant vibrations and are also certified to common industry standards. Syslogic does not only value a robust design, but also the best possible user

comfort and an uncomplicated commissioning. The M12 plugs have a practical Bayonet closure for quick and simple peripheral connections. In addition, the company furnishes the M12 cables with conventional counterplugs with its test equipment. The M12 plugs come equipped with standard USB, Ethernet, RS232, RS422/485, CAN and VGA. The electronics layout is arranged so that modifications to the interface configuration can be done quickly and cost effectively. There is also an integrated wireless model available, which features GSM/GPRS/UMTS, as well as W-LAN and GPS.

But not only are the M12 plugs extremely robust, even the Computer-on-Module (COM), the real heart piece of the computer, has been developed by Syslogic. This shows how dedicated the engineers were to this ultra-rugged approach. The robust CoreExpress pluggable cord connectors, as well as its protective paint, are important features of the COM boards. The CoreExpress connector technology is qualified for harsh industrial environments, in contrast to some other COM standards, and has already been proven in various automotive applications. The company now manufactures the COM board in their own state-of-the-art production, along with the rest of the device.



The kind of protection offered by the Embedded Computer is usually only available in military equipment.

This same uncompromising attitude was pursued for the line of industrial processors. The COM boards are equipped with the Atom-E processor by Intel. They are designed exclusively for demanding industrial applications. Producing very little waste heat, because of low power consumption, it will have a positive effect on MTBF values and ultimately on the lifecycle of the entire Rugged Computer. In addition, all the COM board components, as well as the rest of the Rugged Computer components are designed for an extended temperature range of -40 to +85 °C (-40 to

+185 Fahrenheit). Syslogic does not depend on just the screening method for determining the temperature range, as is the industry standard, but defines which loads the components will have to withstand already in the development stages.

Another characteristic of the robust electronics is the galvanic isolation of their interfaces. This protects electronic components from damage, even in case of massive potential differences, caused by long cables for example. Another must-mention feature is the SSD

(Solid State Drive) memory, which has been incorporated into the Rugged Computer's design as well. In contrast to conventional hard disks, the SSD operates in a static state. This design is substantially longer lived than conventional hard disks that fail under vibration and shock conditions at a much earlier stage, because of their mechanical recording heads. In the selection of this memory Syslogic is able to benefit from the know-how of its sister company Systronics, which specializes in the distribution of industrial flash players. The Embedded Computer uses the SSD memory designed by Cactus Technologies, a specialist in the industry. Thanks to their SLC (single level cell) flash components and intelligent controllers, this memory is able to guarantee a 24/7 lifetime operation for up to 25 years.

RPC Compact 71 has proven its virtual indestructibility not just on paper, but with numerous continuous real-life operations for railway, automotive, construction and wind energy applications. Some of the endurance tests passed include vibration testing for frequency ranges of 5 to 2000 Hz (EN 60068-2-64) or shock testing (EN 60068-2-27). The Embedded Computer devices comply with EMC regulations. Additional testing has shown that the devices even meet Russian GOST standards. That means a cold start is expected to be possible at temperatures of -50 °Celsius (-57° Fahrenheit). The rugged housing with its clever Goretex module makes the Embedded Computer also suitable for potentially explosive environments. ■



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## ■ PRODUCT NEWS

### ■ Acromag: 6U VPX carrier cards for PMC or XMC modules feature high-speed PCIe interface

Acromag expands their OpenVPX carrier card selection with the addition of two new models that provide a simple and cost-effective solution for interfacing a PMC or XMC module to a VPX computer system. The VPX4820 and VPX4821 features two PMC or XMC slots with support for front or rear panel I/O and delivers 25W of power to each site.

[News ID 1906](#)

### ■ DATA MODUL: ARM-based 7" Industrial Panel PC in various performance classes

Based on a modular concept DATA MODUL develops system solutions for a multitude of demanding applications. Particularly, long-term availability of products plays an increasing role in today's industrial environment, therefore, DATA MODUL concentrates more and more on in-house development. The new 7" Industrial Panel PC in widescreen format is based on DATA MODUL's eDM-CB-Colibri ARM Carrier Board. The flexible board design allows the integration of scalable Toradex Colibri modules with various performance classes from ARM Freescale Vybrid Cortex-A5 @ 400MHz to ARM Cortex-A9 Quad Core 1.4GHz.

[News ID 1970](#)

### ■ Conrad to distribute SECO's UDOO prototyping development platform

Conrad Business Supplies has been selected as an authorised distributor for the UDOO prototyping board that provides a powerful, flexible environment in which users can explore Android, Linux, Arduino and Google ADK applications and embark on projects with 'Internet of Things' functionality. A joint effort between SECO and AIDILAB, UDOO is a powerful board based on a dual or quad core ARM cortex-A9 CPU with a dedicated ARM processor for GPIO helping it deliver high performance both on Android and Linux operating systems.

[News ID 1829](#)

### ■ MSC introduces flexible, expandable 4U 19-inch industrial system

MSC Technologies has introduced its high-performance 4 U 19-inch Infinity 9614508-MBQ87 system based on the Intel Q87 desktop chipset and desktop versions (S series) of the 4th generation Intel Core processors under the label DSM Computer. With an installation depth of 508 mm, the industrial computer provides adequate space, such as for four 5.25 inch plug-in modules and one 3.5 inch plug-in module that permits a flexible system expansion. Furthermore, seven free slots are available for accepting additional plug-in cards: one PCI Express 3.0 x16, one PCI Express 2.0 x16, one PCI Express 2.0 x8 and four PCI. A 1000 GB 3.5 inch SATA III

600 drive (or larger) is integrated in the housing. A 5.25 inch DVD-RW drive, a 2.5 inch SSD drive or an mSATA III SSD drive can be installed as an option.

[News ID 1848](#)

### ■ DFI: 4th gen Intel Core COM Express product line and carrier boards

DFI rolled out its most advanced COM Express products adopting 4th Generation Intel Core processor and feature-rich carrier boards. Due to the increasing demands of COM Express in recent years, DFI is trying to develop perfect solutions for intelligent systems. At present, DFI has six Basic type 6 and type 2 modules and one Compact type 6 module; as well as different form factor carrier boards that focus on specific features.

[News ID 1888](#)

### ■ Axiomtek: 31.5-inch OPS-compliant digital signage display

Axiomtek has introduced OFP321, its new 31.5-inch Full HD digital signage display suitable for various display applications in shopping mall, corporate, education, bank, transportation, retail store, restaurant, and performing art center. The OFP321 is built according to the standard Open Pluggable Specification and features a 1920x1080p panel with 3000:1 contrast for users looking for a simple-to-implement digital signage solution.

[News ID 1839](#)

### ■ IBASE: PICMG 1.3 full-size CPU card with Intel Q87 chipset

IBASE has launched the IB980 PICMG 1.3 full-size CPU card that utilizes the Intel Q87 chipset to support the 4th Generation Intel Core processors. The IB980 platform is aimed to meet the high-performance requirements of demanding applications such as medical imaging, industrial automation, network security, gaming and digital signage.

[News ID 1966](#)

### ■ Kithara: PC as EtherCAT slave

Kithara Software has completed the support of PCIe EtherCAT slave cards as a complement to the Kithara EtherCAT Master functionality. This added feature allows for regular PCs to be applied as EtherCAT slaves. A module of the real-time extension »RealTime Suite«, the EtherCAT Master by Kithara has been an established control solution for many years in the fields of measurement and control applications, automation, robotics as well as image capture and image processing.

[News ID 1834](#)

### ■ Kontron launches SMARC certified design partner program

Kontron has launched the SMARC Certified Design Partner Program which has been set up to support customers in appli-

cation-specific integration of SMARC Computer-on-Modules. Within this program, customers can make use of the entire scope of hardware integration services ranging from evaluation and development to complete system and software integration.

[News ID 1946](#)

■ **IEI: IoT gateway powered by Intel Quark SoC X1000**

IEI has launched the IQGATE-100 at COM-PUTEX Taipei 2014. The IQGATE-100 is powered by Intel Quark SoC X1000. Its software is completely integrated with Wind River Intelligent Device Platform that is a scalable, sustainable, and secure development environment that simplifies the development, integration, and deployment of gateways for the Internet of Things.

[News ID 1923](#)

■ **Aewin: desktop Intel Bay Trail E3815 network system**

The SCB-6902 is an desktop platform designed for network service applications. Built with Intel Embedded IA components with warranty of longevity, the SCB-6902 supports Intel Celeron Bay Trail-D, Bay Trail-I and Bay Trail-M low-voltage processors. The platform supports onboard DDR3L memory chips with a maximum capacity of 2GB.

[News ID 1869](#)

■ **Bicker is new distributor of Artesyn Embedded Technologies**

The Bicker Elektronik has become an official distributor of Artesyn Embedded Technologies in the division Embedded Power. Artesyn, formerly the Embedded Computing & Power business of Emerson Network Power, is a world leader in the design and manufacture of highly reliable power solutions for a wide range of industries and applications, among them industrial automation, communication, high-performance computer systems and medical devices.

[News ID 1877](#)

■ **DFI: Mini-ITX industrial motherboard supports four display ports and wide voltage**

DFI introduces 3 Mini-ITX embedded motherboards powered by the 4th generation Intel Core processor family - HM100-HM86, HM101-HM86, and HM103-HM86. Built on 22-nanometer process technology, the three models not only offer higher processing performance but also bring evolutionary improvements in system memory and I/O

interfaces. Meanwhile, its excellent onboard graphics feature 4 display ports: including 1 HDMI, 1 DVI-I, 1 LVDS, and 1 DP, allowing you to choose the best combination to suit multi-display needs nowadays.

[News ID 1907](#)

■ **Rutronik: 7-inch fanless touch panel PC from DFI**

With the KS230-CD, DFI extends its product line of light industrial touch panel PCs. The IP65 rated Panel PC adopts the Intel Atom N2800/N2600 processor with speed up to 1.86GHz. Based on the low-power x86 architecture, it can be used in a variety of industries. The Panel PC is available at distributor Rutronik as of now.

[News ID 1941](#)

■ **WynMax: networking series product features "0" down-time**

WynMax announces Networking series product for the best choice in network security management application. WNCR-5H81 supports Intel Core i7/i5 processors and features "0" down-time with full By-Pass functions (6 GbE LAN with 2 pair By-Pass). To meet a diverse range of customer needs, Graphic LCM is available for displaying logo and easy I/O setting; also, flexible module design is supplied for extendable product performance or basic models.

[News ID 1945](#)

■ **Hectronic: COM Express module with AMD Embedded G SoC**

Hectronic has announced H6066, a COM Express module based on the second generation AMD Embedded G-Series SOC with quad-core processors. The board targets applications in harsh environments and is specified for an industrial operating temperature range. The form factor is COM Express pinout type 6 and the board size is 95 x 95mm.

[News ID 1982](#)

■ **VadaTech: 1U MicroTCA chassis platform with unique design features**

VadaTech now offers a 1U MicroTCA chassis platform with several unique design features that allow more slots in a front-to-rear cooled solution while maintaining full redundancy. The VT840 employs several design concepts to maximize computing density. Offering front-to-rear cooling and full redundancy takes up slot space. The VadaTech chassis combines the fan trays and power supplies on the rear of the chassis, allowing 6 AMC slots in the single module size.

[News ID 1854](#)

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# Configurable hardware for automotive alternator regulator designs

By Dr. Eckart Voskamp, EBVchips

*The Epona alternator regulator can increase the efficiency of generators in 24V and 12V on-board electrical systems in commercial vehicles and passenger cars. A basic hardware system that can be used in all designs is ideal here because it can be adjusted in line with the specific customer system by means of software.*



■ Up until now, no suitably sophisticated hardware has been available that enables generators in commercial vehicles, agricultural and construction machinery as well as other vehicles with internal 24V on-board electrical systems to be operated at maximum efficiency. To address this, EBV Elektronik collaborated with STMicroelectronics to develop the Epona generator regulator as part of the EBVchips line. Designed for vehicles with 24V on-board electrical systems, the component is also suitable for use in 12V on-board electrical systems in passenger cars.

Although a number of application-specific standard products (ASSPs) are already available for regulating generators, each individual ASSP is specifically adapted in line with the individual requirements of a single OEM. With Epona, however, suppliers now have a basic design for regulating generators and so are able to cover the requirements of all vehicle manufacturers – a first in the industry. The basic idea behind Epona was to offer as many degrees of freedom as possible in order to enable a highly efficient system design on the one hand and to implement the necessary control algorithms on the other. Although it would theoretically have been possible to create a system like this as a highly efficient controller, the numerous different vehicle manufacturer specifications mean that the

control loop must be user-programmable to avoid the need to develop an individual ASSP for each solution.

This is exactly where the EBVchip comes in, because the heart of Epona is a user-programmable microcontroller in which a state machine can, in principle, be mapped. To help program the microcontroller, EBV Elektronik supplies a tool that allows simulation of the control loop and the setting of all the other parameters quickly and easily. Thanks to their system expertise, the developers no longer have to worry about creating, for example, a standard P-controller. Now all they have to do is set the relevant control parameters in their software. A generator regulator ensures – usually by means of normal proportional control – that the generator is operating at the optimum control point. In conventional solutions, these regulators are implemented in standard, analog hardware. Standard silicon offering only standard levels of efficiency is normally used here. Thanks to more complex algorithms, however, the generator regulator ensures that the generator is always operating as close as possible to the optimum control point, thereby achieving the best-possible efficiency. With Epona, all that is needed is a single system board, which can then be easily adapted in line with the requirements of the generator or end-customer and so cover the individual

requirements of an application with different equipment variants. In addition to the degree of freedom offered by the hardware, it also offers a degree of freedom with regard to the software, whereby the threshold values can be set during analysis of the measured values.

When EBV Elektronik presented the Epona concept two years ago, various customers – including some with whom the company had not even discussed the chip – provided valuable input. The design team successfully realised most of their requests to create a highly universal component. The original plan was to develop a single component, but thanks to the flexible state-machine-based concept, EBV Elektronik is in a position to create an entire product range at reasonable cost. In partnership with STMicroelectronics, EBV is currently developing a 12 and 24V range with different bus interfaces, which will soon result in four different components: one 12V and one 24V version of Epona, each with and without a LIN interface.

There is currently no uniform design direction in the development of the generator systems and LIN is still far from being available in all new designs, which means that the concepts of tomorrow will still use different interface solutions and protocols; this is particularly the case for 24V applications. Since

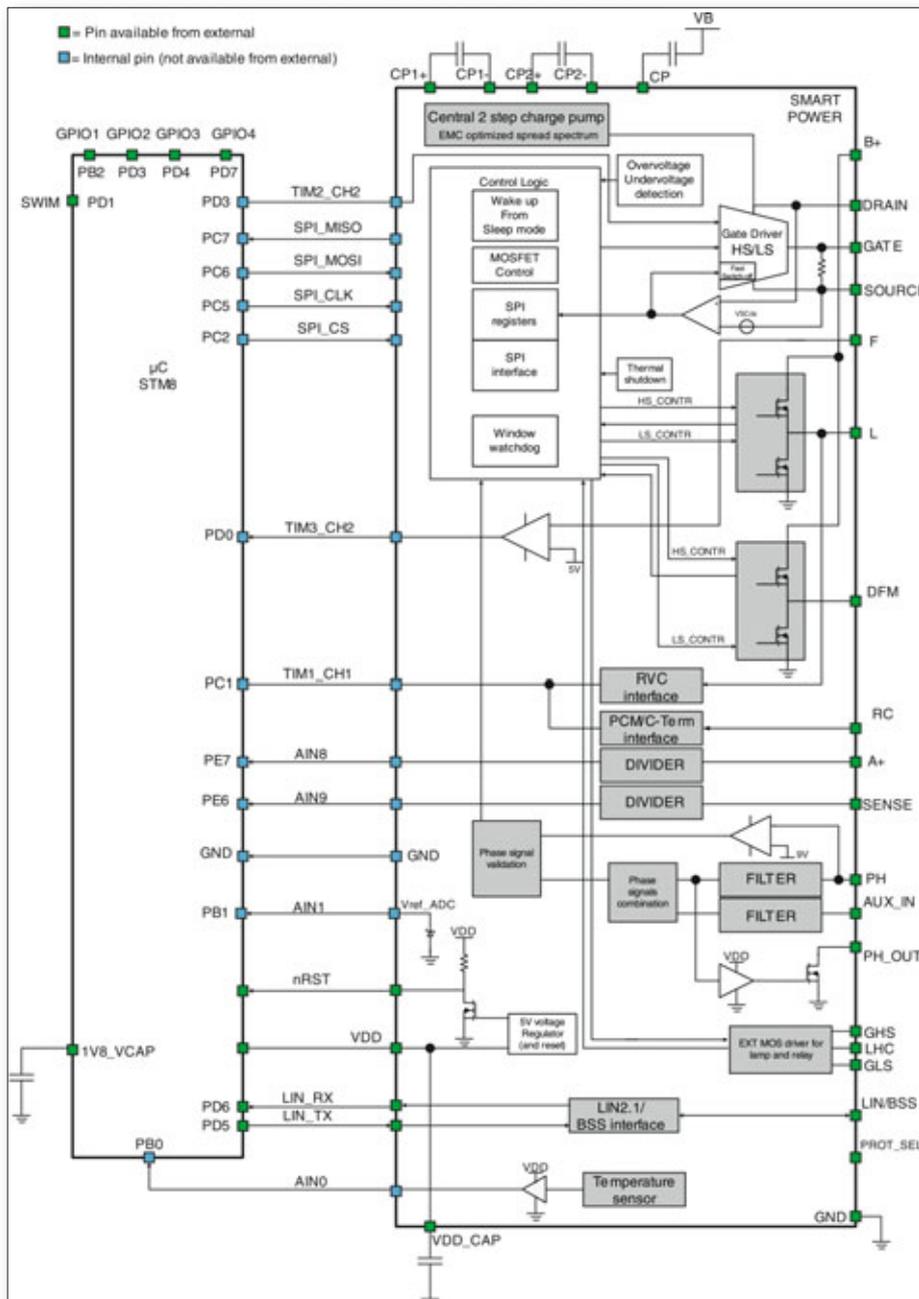


Figure 1. Block diagram of Epona, a system in a package containing two semiconductor chips – one high voltage component and one CMOS component

interfaces such as LIN 2.1, RVC (Regulated Voltage Control), PWM, C-Term and a bit-serial interface are integrated in the generator regulator, the component is highly universal.

In most cases, the generator is mechanically attached directly to the motor shaft. Through appropriate excitation of the rotor windings, output variables such as speed can be determined automatically. During a cold start, the electronic system has to decide whether the battery still has sufficient capacity or whether electricity needs to be immediately generated, which would increase the speed of the motor. This is the task of the load response control (LRC), which controls the load when starting torque occurs. In conventional solutions, this

takes place as part of a strictly defined LRC scheme during a cold start. Epona allows you to completely redefine the LRC properties, which means that for example other load torques can be set.

The generator regulator performs normal battery recharging in P-controller mode, whereby quasi-recuperation mode is also possible here. These functions can be programmed directly or controlled via the relevant interfaces. When a suitable target regulated voltage is specified via LIN, the bit-serial interface or the analog protocols, as is currently the case, the controller ensures that recharging stops once this voltage has been reached by setting the excitation coil current to zero. The com-

parators required for this are already contained; the relevant threshold values are set by programming the parameters. Even if other battery technologies replace lead batteries in the future, Epona allows the parameters to be adjusted more easily.

The generator regulator can respond to different events in the on-board electrical system and in the controller itself. The component is equipped with protected output drivers, which allow for a simplified design. Different trigger levels can also be introduced by means of software to allow a more flexible response to the current situation in the vehicle. These include the ability to connect and shut-down loads as well as to compensate for and respond to large loads. When powerful consumers are switched on and off in a 24V on-board electrical system, for example, this can lead to major disturbances in the electrical system. With the right software, however, these peaks can be stabilized relatively quickly.

The solution also features Control Fault Diagnosis as well as systems for increasing operational safety and reliability, with a watchdog being just one of a multitude of such systems. Epona is a system in a package containing two semiconductor chips – one high voltage component and one CMOS component. This separation means that the state machine can be woken by the hardware or a reset can be carried out, which offers improved safety over a monolithically integrated solution.

The generator regulator was originally designed exclusively for the European market. But since the excitation coil is available on the global market in both a high-side and low-side configuration, EBV designed the control output in such a way that it can actuate the MOSFET switch for the excitation coil winding both directly to earth and directly to the positive supply voltage. Epona therefore features a suitable gate driver that can drive the MOSFET in both the high-side and low-side configuration. A sensor input can then be used to clearly establish whether or not the MOSFET has switched through. The component can also measure the current flowing through the excitation coil as well as the voltage currently applied. For this measurement, variable gain amplifiers that are suitably buffered depending on the input or output are fitted on the chip.

The generator regulator also offers functions to prevent individual batteries from becoming overloaded in systems containing multiple generators. For this purpose, the component features universal inputs that can be connected differently depending on the application. To ensure that raised current levels in this circuit can also be utilized, load-depen-

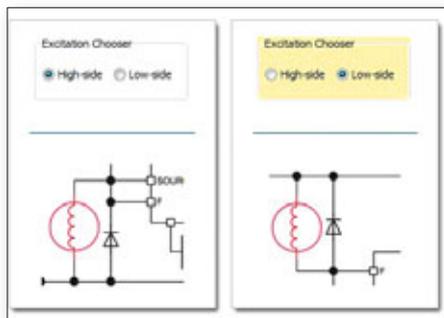


Figure 2. Example for positive and negative control options

dent relays that only function when the generator is running can be controlled. Thanks to a software tool featuring a GUI, the developers can run initial experimentation modes and familiarize themselves with Epona-based systems to provide a good starting point for developing the customized overall system. The tool GUI generates parameter records and sections of the C-Code, which can then be loaded directly with the offline tool chain of the microcontroller.

The generator regulator is not only of interest for new vehicle designs, but also for the spare parts market when generators need to

be replaced. Many companies specialize in reconditioning old generators, for example replacing the bearings or the electrical and electronic systems in the generator. Thanks to Epona, these companies can now even boost the efficiency of generators. But in order for efficiency-increasing measures to be implemented sensibly and rationally, a universal concept is needed. And this is exactly what the generator regulator offers.

Even older cars can be made to run more efficiently if a reconditioned generator with Epona is installed – and that even applies to vehicles without a battery or engine management system. The acceleration vector, even for older vehicles, can be determined using software by measuring the change in speed of the generator. Since the engine is to deliver power to the driven wheels with minimum deterioration as the speed increases, it is not a good idea to charge the battery while the vehicle is accelerating because this would represent an additional load. If the acceleration vector is zero or even negative (decelerating, braking), however, it makes sense to charge the battery during this phase. With some clever programming, this results in a type of small-scale recuperation effect. In

modern cars, an external controller is usually responsible for load-dependent generator control as part of battery management. EBV Elektronik assumes that around 20% of the Epona supply volume will enter the aftermarket segment. The structure of the “alpha” customers also reflects this: of the five “alpha” customers, one is in the aftermarket business while the others supply new vehicles. ■

## Product News

### ■ Maxim integrates benefits of IO-Link into proximity sensor and 16-channel digital-input hub

Two new subsystem reference designs from Maxim Integrated Products provide very accurate, low-power optical proximity sensing and enhance distributed control with a compact digital-input hub. Both of these new space-saving subsystems integrate the IO-Link standard for industrial applications. The MAXREFDES27# proximity sensor employs the IO-Link protocol to provide efficient two-way communication between a controller and a remote optical sensor.

[News ID 1925](#)

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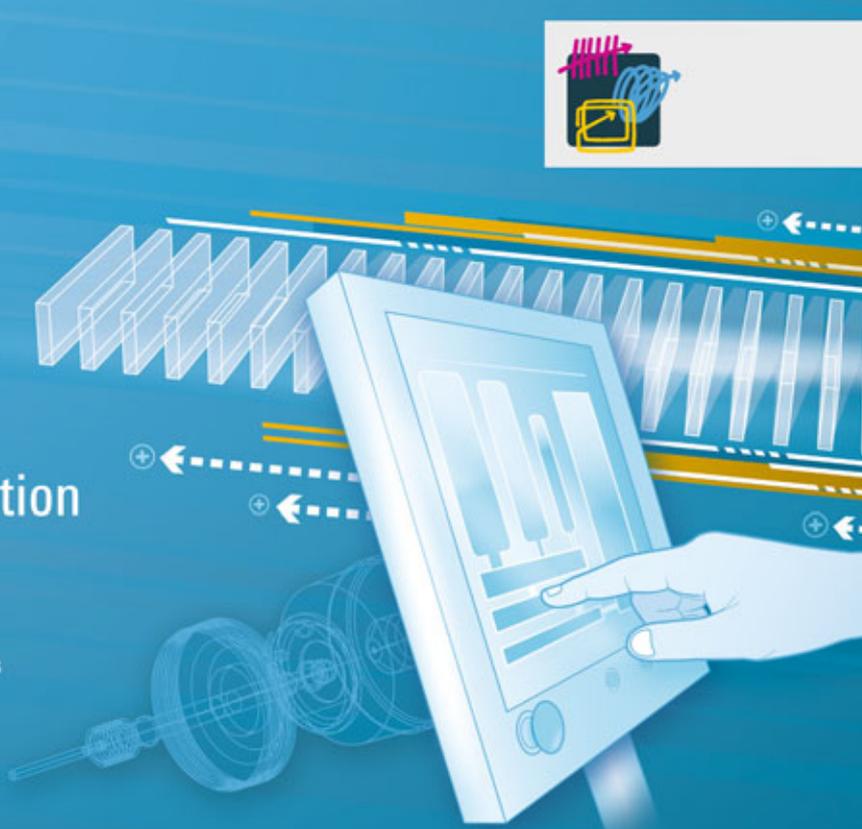
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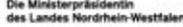


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# Optimizing system efficiency using MCU power management options

By Rich Miron, Digi-Key

*Embedded systems today face demanding single-charge operating requirements. MCUs with a variety of built-in power management options, coupled with power debugging tools, can simplify optimization and free designers and OEMs to focus on their product core value proposition.*



■ The length of operation on a single charge is very nearly as important as functionality in portable electronics. It doesn't matter how much performance a device offers if the battery is dead. Today's crop of highly functional MCUs, with platforms specifically designed for low-power operation, offers an excellent solution. Additional power-saving modes like sleep mode, idle mode, doze mode, etc, and functionality such as dedicated pins that automatically transition the system to back-up battery when voltage is removed are also available. Finally, throw the art of software development into the mix using tools like the IAR Embedded Workbench that show power consumption for the execution of each line of code. By reviewing the operation of the system in real time, developers can make informed trade-offs, for example, modifying clock speed, putting the system into a lower power mode, etc, to maximize operational efficiency.

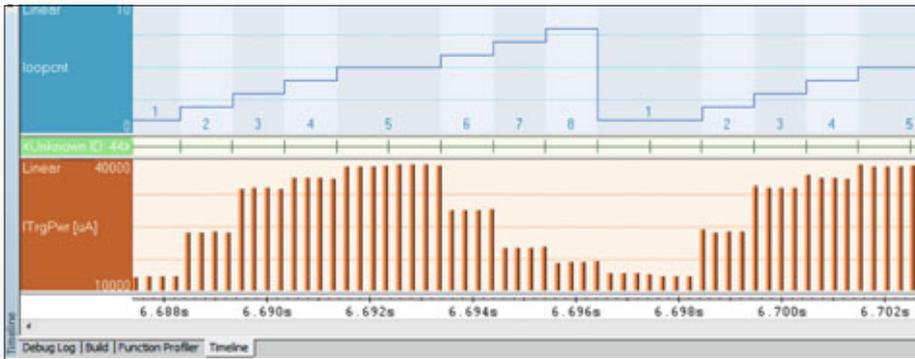
If there's any lingering doubt about the importance of power efficiency in embedded systems today, look no further than the recent DRAM standards released by JEDEC. Not only did the organization release a new version of its portable-electronics standard in LPDDR3, its latest general DRAM standard, designated DDR4, includes a variety of features such as a pseudo-open-train architecture designed to reduce power consumption.

Whether a microcontroller is embedded in a smartphone or an automobile, clearly to meet customer requirements it needs to deliver power-efficient operation. To optimize power consumption, designers need to focus on two key objectives: minimize the amount of time spent in active mode, and minimize the amount of current required in non-active mode. Not too long ago, controllers offered a single standby mode. Today, devices offer a range of options to increase the opportunity for systems to avoid active mode except when absolutely necessary.

Microchip PIC24FJ128GA310 family of microcontrollers provides a range of power management options: VBAT allows the device to transition to a back-up battery for the lowest power consumption with RTCC. Deep sleep allows near total power-down, with the ability to wake-up on external triggers. Sleep and Idle modes selectively shut down peripherals and/or core for substantial power reduction and fast wake-up. Doze mode allows CPU to run at a lower clock speed than peripherals. Alternate clock modes allow on-the-fly switching to a lower clock speed for selective power reduction. And last but not at least, the MCUs offer extreme low-power current consumption for Deep Sleep: WDT: 270nA at 3.3Vtyp; RTCC: 400nA at 32kHz, 3.3V typ, and deep sleep current, 40nA, 3.3Vtyp.

Sleep and Idle modes allow designers to shut down peripherals and/or the core to reduce power consumption while maintaining the ability for fast wake-up. In Retention Sleep mode, key circuits receive power from a separate low-voltage regulator. VBAT mode switches the system to operate off a back-up battery in the event that VDD is removed, minimizing power consumption with RTCC. Deep Sleep without RTCC provides almost complete power down while maintaining software control so the device can be brought back up via external triggers. According to the company, it can operate on just 40 nA (3.3V typical) compared to 400 nA at 32 kHz for RTCC mode. Modifying clock speed can deliver important power savings. Doze mode, for example, allows the user to save power by manipulating clock speed, running the CPU at a lower clock speed than peripherals. The MCU also offers the option to switch on the fly to lower clock speeds to fine-tune power reduction.

The STM8L152C6T6 MCU from STMicroelectronics provides five low-power modes to allow users to balance among efficiency, performance, and start-up time. In Wait mode, the CPU clock stops running but peripherals continue. The chip can be removed from Wait mode via an internal or external interrupt, a triggering event, or a reset. In Low Power Run



The timeline window shows power consumption as sampled by the I-Jet correlated to function calls, etc.

mode, the CPU performs certain functions along with select peripherals. Flash and data EEPROM are stopped, for example, while the system executes code from RAM at low speed. The system can move in and out of Low Power Run mode via software. It can also exit via reset but not through interrupts. In many embedded systems, MCUs spend a great amount of time waiting for an event to happen, which can squander power. The STM-8L152C6T6 offers a Low Power Wait mode, in which the CPU clock is stopped. A reset or an internal or external event, for example, generated by timers or I/O boards, will put the system back into Low Power Run mode.

Active Halt mode goes one step further, stopping the clocks for the CPU and all peripherals except for the RTC. External interrupts, RTC interrupts, or reset can be used to wake the system up from Active Halt mode. Finally, Halt mode stops clocks for all peripherals and the CPU. The device remains powered up, maintaining data in RAM. An external interrupt or reset will wake the device. Select peripherals can also wake from Halt mode. The device can be configured to wait without the internal reference, allowing additional power savings by cutting off the internal reference voltage. The Texas Instruments 16-bit MSP430FR5739 MCU offers seven low-power modes aimed at embedded systems in portable applications. At the top level, low-power mode 0 (LPM0) disables the CPU and the

master clock while retaining all data. The peripheral clocks remain active and the user can choose the status of the submaster clock. At the high end of power savings, low-power mode 4.5 (LPM4.5) retains I/O pad state but does not retain data and disables the internal regulator. As part of its power-saving design, the MCU also integrates ferroelectric RAM for a lower-power non-volatile memory.

It doesn't matter how many power-saving modes an MCU has if they're not properly used. That's where power debugging tools like the I-Jet from IAR Software Systems come into play. The I-Jet samples the power consumption of the system as it runs and IAR Embedded Workbench software package correlates that power data with the operation of the system.

In a perfect world, a developer could correlate a power spike directly to a line of code. The reality is that system capacitances spread consumption temporally, making it impossible to operate so discretely. The best choice is to view power usage correlated to function calls. The user can then click on a power spike and trace it back to code. With this degree of visibility, the developer can identify peripherals that are consuming power unnecessarily and perhaps adjust clock rate or put the system into a power-saving mode while it sits idle, and wake it up when it gets a response. This lets developers take advantage of their hardware's power management options for best performance. ■

## Product News

### ■ e2v releases new CERQUAD package for 68020

e2v has announced the availability of a new package option for its 68020 microprocessor. This new option will facilitate the transition from the original Plastic Quad Flat Package, discontinued in 2010, and enable manufacturers to secure long term production of electronic systems using 68020 microprocessors.

[News ID 1932](#)

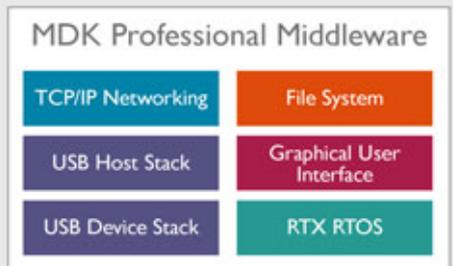
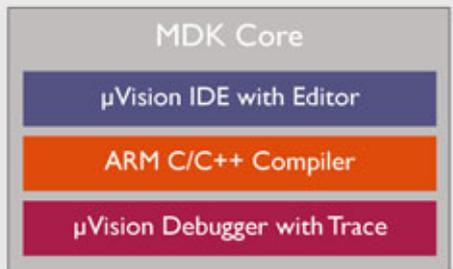
### ■ Lapis: low power MCU with Class D speaker amplifier and audio playback function

LAPIS Semiconductor has announced the development of a low power microcontroller that integrates an 8bit low power MCU core, speech synthesis circuit, high efficiency Class D speaker amp, non-volatile memory, and oscillator circuit on a single chip, making audio playback possible by simply connecting to a speaker.

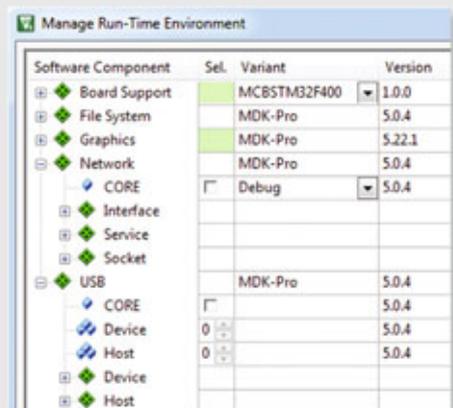
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# Easy-to-use, accessible technology for the Internet of Things

By Shawn Silberhorn, Conrad

*An open source, easy-to-use tool such as the WunderBar IoT Starter-Kit helps to exploit the Internet of Things. By using the relayr platform, all users of the IoT – either with or without a commercial motivation – can quickly and easily evolve their ideas from concepts to working solutions at relatively low expense.*



■ The Internet of Things (IoT) is set to play a huge part in our daily lives. It is the focal point for building a world that is connected in ways previously unimagined. In a diverse range of markets, from in-car systems to wearable medical devices, developers and users are already fully realizing the benefits of seamlessly connecting previously standalone devices to make them smart, intelligent and communicative. In the next few years, the IoT has the potential to advance almost every area of our lives by invisibly improving how we interact with technology. The IoT is a network of physical objects that contain embedded chips, allowing things to sense their environments and communicate data through the internet. In other words it will enable objects to talk with each other, digitalizing the physical world.

The connected world as we know it today has evolved from the convergence of wireless technologies, micro-electromechanical systems and the Internet. However, we are now at a point where it is conceivable that by 2020, 50 devices or more in a typical home could be connected. There could be in the region of 50 billion IoT nodes worldwide and this number will almost certainly expand, as the IoT can encompass a huge range of home and industrial applications. When you consider the extent of the industries that are eager to make their products and systems connected and intelligent through the IoT,

it's clear to see just how quickly the IoT could grow. The home, for example, is just one place that could gain from the implementation of the IoT, with many everyday domestic appliances having the potential to make themselves more efficient or useful by becoming connectable. Commercially, fields such as manufacturing, energy infrastructure, healthcare facilities and transportation could also stand to benefit by embracing interconnection through the Internet.

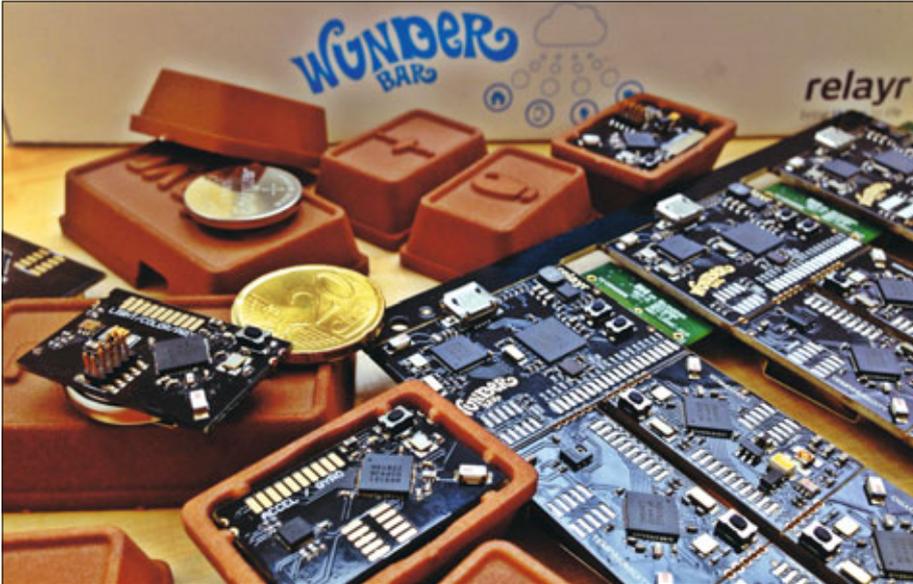
Open source hardware and cloud platforms – such as convenient, easy-to-use solutions like the WunderBar Open Source IoT Starter Kit – will help to support the development of the IoT ecosystem. A huge array of products can benefit from implementing the IoT by using such tools. Also essential will be reliable, cost-effective electronic and electromechanical components and devices, such as sensors for temperature, level, position and proximity, along with actuators, ultra-low power MCUs and DSPs and power management solutions.

The WunderBar IoT Starter Kit for software application developer and hardware engineers is a collaboration between the Berlin based start-up relayr and German-based multi-channel electronics distributor, Conrad. Developed and manufactured in cooperation with the hardware experts at MikroElektronika, and coupled with relayr's Open Sensor

Cloud Platform (relayr Cloud), it is designed to enable professional software application developers to quickly and easily begin working on wireless applications and prototypes without prior experience of developing for hardware. It will also be of benefit to hardware and software design engineers within OEMs who are looking to use module-based hardware as drop-in design solutions which shorten development times.

Moreover using the WunderBar, software developers can build apps that utilize data gathered from the physical world. Kits like this may also appeal to student software developers looking for easy-to-program sets as well as makers - a rapidly expanding community who are looking to self-build connected home systems that utilize the IoT. For all of these groups, having software development kits (SDKs) for iOS, Android and Node.js is crucial. Providing a wide selection of SDKs means that almost all developers are catered to by the WunderBar.

The relayr OpenSensor Cloud platform helps enable device makers and manufacturers, app developers and software companies working with the WunderBar to leverage the power of the Internet of Things. Developers are able to create new applications and services that let end users enrich their lives with connected devices. Complex event processing and a rules



The WunderBar detachable battery-powered BLE sensor modules can be protected with plastic casings which resemble chocolate-like 'chunks'.

system define relationships between events and actions that allow the interaction among different devices and applications to be easily programmed. Ease of use is a key focus of the WunderBar design. The seven chocolate-like chunks can be separated into a WiFi enabled master module and six detachable smart sensor mini-modules.

Each module has BLE (Bluetooth Low Energy), a sensor or actuator and an on-board battery. These mini-modules provide light, colour, distance, temperature and humidity sensing, plus an accelerometer, a gyroscope and infra-red (IR) remote control capability. This range of sensors allows the modules to cover a diverse range of applications. The inclusion of a Grove connector from Seeed Studio on the fifth

module broadens the scope further, enabling a wide range of additional sensors and actuators that are Arduino compatible to be interfaced with the platform. The 41mm x 28mm x 8.6mm thick master module uses a Freescale Kinetis Series MK24FN1M0VDC12 as its main MCU with an ARM Cortex-M4 core. The clock speed is 120 MHz and it is equipped with 1024KB of flash memory and 250KB of SRAM. Other main module features include a 3.3V regulator with Li-Ion/LiPo charger, full speed USB with OTG controller and a 32 kHz Xtal oscillator for real-time clocking.

As well as providing a huge range of benefits, connecting a network of everyday physical objects through the internet also presents a potential security risk. The IoT is

designed to encompass many things and it is logical to expect that when the number of devices interconnected through the internet is extrapolated, the scale of the threat will increase. Through the IoT, devices will be able to exchange information and make decisions automatically based on what data they receive. Without proper security, they could potentially be susceptible to tampering from unwelcome sources. This threat could also be heightened for portable IoT-connected devices, as they are likely to be in less data-secure environments.

There are some application areas where the consequences of this threat are more serious, such as in cars, in medical devices or in retail inventory monitoring and control. Companies that are involved in the riskier areas of the IoT must ensure that their devices and technologies are fully secure. Despite these inevitable issues, the potential benefits of the IoT greatly outweigh the possible pitfalls. Companies are already developing ways and means to combat security threats as they evolve, and becoming more sophisticated in how to protect users against future threats.

While starter kits may be used to create complete solutions for students and makers, they can also be used to create concepts for commercial users who ultimately want to integrate permanent IoT capability into their products. The WunderBar provides a complete hardware reference design to enable full connectivity to many open source applications. Implementation could mean locating the components they need to achieve IoT connectivity and making space for them on the existing PCBs within current product application, whether they are wearable medical devices, cars or domestic appliances. ■

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# How to achieve fastest system startup sequences with your embedded system

By Kei Thomsen, MicroSys

*This article discusses how to achieve fast startup times, especially in view of different operating systems like a general purpose OS or RTOS. Additionally an overview is given on boot media and their effects on startup behavior, together with practical measurements.*



■ To achieve quick boot timings with complex embedded systems, sound knowledge about the internals, the architecture of the operating system and their interaction with the hardware are required. Smaller real-time operating systems are a perfect means to meet such requirements. They are specifically designed to control precisely the timing behavior of an embedded system and they are clearly arranged and configurable. Additionally smaller engineering teams are not overwhelmed by complexity and they can keep control of their development process more easily.

By the configurability of a RTOS, the functionality of the boot sequence can be optimized according to the given hardware design. Time-consuming load processes of hundreds of drivers, libraries or system code which might not even have been used are avoided. On the other hand, compared to more complex and feature-rich general purpose OSs for embedded systems like Linux or Windows variants, a more limited feature set has to be taken into account. Other aspects influencing system startup timings are hardware initializing functions and the boot media and method the operating systems are loaded from. Fast boot is another term to express a quick start of a system from power-on or reset to show at least a system prompt on a screen with loaded operating system, or have a win-

dow opened for the first user interaction. The timings to get a system up and running vary strongly by nature of the system, application and target market. A Windows desktop user might be used to waiting a couple of minutes before he can use his system, whereas in many deeply embedded environments the device is required to boot up in fractions of a second. A first conclusion is that for some applications a minutes-long startup sequence can be tolerated, while in others it is a must to restart the system in an instant. If time-critical functions need to be considered related to the startup behavior, the complete system design from component to system software level (including operating system) has to be the right fit for that. Secondly the media the boot software is loaded from has to be selected thoroughly. Flash, SD & CF Cards, rotating media or a network connection offer by nature different timings and have a strong influence on the cost structure of a system as well. Especially for deeply embedded systems, longevity of parts supply and maintainability might have an influence as well. As a short summary, fast boot has many aspects and a precise definition of it is not that easy. To be able to have a more defined basis for comparisons we will discuss the results of experiments we did on an i.MX 53 ARM based platform supporting different typical boot environments and operating systems. Generally we differentiate two

different types of operating system. On one hand the standard OSs like Linux and Windows and on other hand real-time operating systems. Linux and Embedded Linux-Systems, representing standard OSs, are generally complex, have an extensive kernel, including many extensions, and the full functionality is merely seen by experts. Booting a Linux system means first loading and initializing the kernel and drivers, and then starting a large number of system services and additional programs. Here again it needs a lot of knowledge to understand the function and usage of the services and programs. Optimizations to achieve faster boot and startup times are not as simple as they should be. Another aspect is optimizing a system after the functionality has been defined and implemented, but the startup time still requires to be tuned. The question here is how to assure the warranted system characteristics and properties by optimizing the system?

To face this problem right at the beginning, a very practical method is to plan and implement a test system based on minimal OS functionality. Avoid all the nice-to-have features and develop the optimal functions step-by-step. The required know-how and the additional development resources are to be considered accordingly. If it becomes obvious under the project work that new kernel

	SD/ $\mu$ SD	CF-Card	NOR Flash	NAND Flash
Connection	SD Controller	IDE Controller	CPU Bus	NAND Controller
Bus width (bits)	4	8	8 / 16 / 32 / 64	8
Speed (MB/sec.)	>20	5 - 8 (>20 DMA)	10 - 80	5 - 8
Size (typical)	1 - 32 GB	32 MB - 32 GB	2 - 64 MB	¼ - 4 GB
Price/MB	Extremely low cost	Very low cost	Expensive	Low cost
OS Startup (Sec.)	1,5	2,4	<b>0,3</b>	2,4
Pro	Simple to replace	Simple to replace	Extremely fast, direct execution	Direct soldered chips with high capacity
Contra	Mostly only consumer quality (MLC)	Mostly only consumer quality (MLC)	Less capacity, file system is not common	Defects by writing, difficult to replace (MLC & SLC)
Driver effort	Medium	Medium to high	Only for writing	High
Recommendation	Periodic replacement	Periodic replacement	No file system	Main use as "read only" device
Frustration factor	Medium	Medium	Low	High

Table 1. Comparison of different storage media influencing system startup times

features or system services are required, then they can be added and activated later. Alternative approaches might be to add small libraries providing similar functions like a full system service solution. Why carry a full OpenSSL if only a MD5 is needed, which can be provided by small library. The system start of a Linux system depends on the applied Linux distribution, e.g. LTIB, Debian or ELDK. For optimizations of the startup sequence, special knowledge of the methods used by the selected distribution is needed. There are many startup methods available, for example, SysV-init, BSD-init, busybox, launchd, runit, systemd, upstart, just to name a few.

Totally different approaches are used in small and clearly defined real-time operating systems like Microware OS-9, QNX, VxWorks and others. Here, a special kernel is used exactly for the chosen CPU. The operating system functions for components like the MMU, cache, interrupt and exception handling etc. are precisely adapted and are open for optimizations. The hardware functions can be tuned with software drivers exactly to match the required timings. Only the pre-planned and desired function is integrated into the operating system to avoid all time-consuming, unnecessary and redundant program code. Such a clearly defined system is much smaller and starts faster by factors than a full blown

all inclusive system. Thus, real-time operating systems have, due to their slimness, configurability and clearness, the capability to provide the fastest startup times compared to standard operating systems. Embedded RTOSs offer the beauty that one need not to be a dedicated expert to understand the functionality of each single element in the operating system, its internal assignments and dependencies. A RTOS like e.g. OS-9 is based on a clear architecture with a modular process and thread structure that is fully understandable by a developer and accordingly manageable. For example, modules like kernel, pcf, epicirq or sppro1000e are exactly defined in their function and do exist apart from each other. That means they can be loaded and added on demand to support system optimizations. The naming convention helps to understand the function of program modules and thus adds to the clarity of the system architecture. This results in a system structure whereby only required program functions are selected and in use. This approach is straight forward, comprehensive and much easier to validate and test. In contrast, the reverse process applied for standard operating systems, to remove functions to optimize, possibly with a trial and error method, implies many risks, especially due to unknown or damaged system dependencies. If we are talking about real or deeply embedded systems, then the boot medium



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is generally not a hard disk. Operating systems are loaded out of non-rotating memory media like NOR- or NAND-flashes and SD/μSD/CF cards. The boot medium strongly influences the timing of the system startup sequence. What are the differences between the types and resulting performance effects? The NOR-flash is a fast memory, linearly mapped into the address space. Depending on the hardware design it is 8/16/32/64 bits wide attached to the CPU with fixed defined access speed. It is the fastest type of all. NOR-flash types offer the beauty that the boot-monitor (e.g. U-Boot) is running directly out of it. An initial load or copy process into RAM is not required. Most RTOSs for example, are able to run directly out of flash, which adds additional system safety. The RAM is free for data, whereby the OS and application still resides in the flash, hence these important code elements cannot be damaged by a program error.

NOR-flashes however offer compared to NAND-flashes far less memory capacity per chip space and are much more expensive. Because of that they lose attraction in cost-sensitive designs, but nevertheless they are still used in environments requiring fastest startup times. The typical data rate is 10-80 MByte/sec and allows fastest access to boot and program code. Yet NAND-flashes are block-oriented devices and therefore not linearly seen in the address space.

Accesses to these memories have to be organized by dedicated drivers. Due to the organization and the 8-bit interface they are slower than the classical NOR-flashes. NAND-flash components are much cheaper compared to NOR-flash memory and have their main market in consumer electronic devices. Thus the NAND technology is very attractive for embedded designs, but especially in industrial rugged designs exposes the application to issues like long term availability or product lifecycle management. Similar considerations apply to SPI-NOR-flashes, which are NOR flashes connected via a serial protocol interface (SPI). Due to its non-linear organization, the program code must first be transferred

from NAND-flash or SPI-NOR-flash to RAM before the U-Boot or the OS can be executed. A typical transfer rate here is 10-14MByte/sec. Similar to NAND are CF cards. CF cards are typically read by the boot monitor in PIO mode, at typically 5MB/sec. SD/μSD cards are connected with a 4-bit wide structure and offer with >20MB/sec transfer rate the best performance of the block-oriented medium. As an example, we have measured the startup times from reset to completely running an application for different environments using the RTOS Microware OS-9 loading a control application: NOR-flash, 0.3sec; SD-Card, 1.5sec; NAND-flash, 2.4sec.

Another strong influence on the boot timing is the use of a compressed or uncompressed OS image. The decompression time must be compared with the load time for a larger, uncompressed image and properly analyzed for an optimization. Another decision criteria is keeping the kernel small, because the OS drivers (with DMA and IRQ handling) are faster than the Booter (simple polling drivers), so that the components are loaded faster. Or using the variant "as we are already loading, load everything in one chunk". As the boot devices are too different in read performance, there is no generic statement possible, which way to go to get the most promising approach.

As concluded earlier, the initial system design has a strong influence on the boot performance, and if there are options on different boot media available, individual tests are required to find the optimum. Several tests showed up to a 25% time difference, e.g. for a Linux System a speed-up from 24 to 17 seconds, by using an uncompressed image (-3 seconds) loaded from SD Card (-4 seconds) instead of compressed image on NAND flash. As already described, the different boot media have strong effects on the timing of a system start. Other annoying thieves of time are the initialization sequences of Ethernet and USB interfaces. For initialization Ethernet communication starts an auto negotiation on the physical layer (PHY). Typically this takes between 1 and 3 seconds, if a cable is con-

nected. Without a cable connected, it waits for a timeout, e.g. 5 seconds before it proceeds. If this happens within the kernel startup process, where no process scheduling is possible and nothing else can run at the same time, then it delays the system start until the action is finished. To achieve better boot results, it is by far better to start the network at a later point, so that it can run with normal scheduling in the background. To initialize the USB communication the USB bus must be scanned for the connected topology with all the hubs and devices. This might take up 10 seconds with nearly no CPU usage. It makes sense to start the USB stack as early as possible, so that it can run in the background during other devices and services are starting

Most embedded systems (at least during the development) have a serial line for the system start message and the shell prompt. As the serial line is attached to a PC by a terminal program, a first and very simple tool to analyze the startup timings is the terminal program itself. Most of the terminal programs (like TeraTerm) can use timestamp logging. Each received line gets a timestamp on arrival. Here we see the duration between the messages. Most times the message itself tells a lot about where it comes from. Example:

*[Wed Sep 05 13:53:07.491 2012] NAND read: device 0 offset 0x200000, size 0x400000*

*[Wed Sep 05 13:53:08.171 2012] 4194304 bytes read: OK*

It explains that reading 4MB from the NAND flash takes about 0.7 seconds. To get a meaningful time stamping, the baud rate should be as high as possible (>=115200Baud). Hint: As USB serial adapters are buffering the data internal and sending them as bulk blocks to the system, it can happen that multiple lines are getting the same time stamp. It is of advantage to use the internal serial line of the PC (if it is still available), to achieve a better time resolution, as the internal serial line directly reads the data without any delay like the USB has due to the buffering. ■

## Product News

### ■ AdaCore: conference on reliable, safe and secure software

AdaCore announced that, along with partner Altran, it will be a major sponsor of the inaugural High Integrity Software Conference taking place in Bristol, UK on October 23rd 2014. HIS 2014 is a brand new UK conference for sharing information about key challenges and recent developments in high integrity software engineering.

[News ID 1980](#)

### ■ ETAS debuts at InnoTrans

ETAS will be making its first-ever appearance at InnoTrans, the International Trade Fair for Transport Technology, where the company will present innovative solutions for developing, testing, and integrating real-time-capable software designed for rail vehicles. ETAS RTA Solutions represent professional, made-to-order consulting and software engineering for real-time applications.

[News ID 1905](#)

### ■ N.A.T.: firmware v2.15 for NAT-MCH and NATview v2.13 now available

N.A.T. make version 2.15 of the firmware for the NAT-MCH-Family of products as well as the improved and extended version 2.13 of the JAVA based GUI NATview available to customers. The NAT-MCH family of products consists of: NAT-MCH, NAT-MCH-PHYS and NAT-MCH-PHYS80.

[News ID 1892](#)



Low Power Consumption  
High Performance  
Energy Efficiency

Avalue Embedded Platforms

- 

**ECM-BYT2** ▶ 3.5" SBC  
Intel® Celeron®/Atom™ SoC Processors  
3.5" Micro Module

  - ▶ One SODIMM Up to 8GB DDR3L 1066/1333, Dual View, 2-CH 18/24-bit LVDS, CRT, HDMI, HD Audio, 2 GbE, 1 SATA II, 2 Mini PCIe, 1 USB 3.0, 7 USB 2.0, 2 COM, 8-bit GPIO

Low Cost
- 

**ECM-QM87R** ▶ 3.5" SBC  
Intel® 4th Gen. Core™ Haswell-Refresh  
i5/i3 3.5" Micro Module

  - ▶ One SODIMM Up to 8GB DDR3L 1333/1600, 2-CH 18/24-bit LVDS, VGA, HDMI, Audio, 2 GbE, Triple Display, 2 SATA III, 2 COM, 1 Mini PCIe (Support mSATA), 6 USB 3.0, 2 USB 2.0, 8-bit DIO, iAMT 9.0

Haswell Refresh
- 

**ESM-QM87R** ▶ COM Express  
Intel® 4th Gen. Core™ Haswell-Refresh  
i5/i3 COM Express Type 6 Module

  - ▶ Two SODIMM Up to 16GB DDR3L 1333/1600, 2-CH 18/24-bit LVDS, VGA, DP/HDMI/DVI, eDP Option, HD Audio, GbE, 7 PCIe x1, 1 PCIe x16, 4 SATA, 8 USB 2.0, 4 USB 3.0, 8-bit GPIO, SMBUS, LPC, Type 6 Pin-out

Haswell Refresh
- 

**EMS-BYT** ▶ Embedded System  
Fanless Intel® Celeron®/Atom™ SoC  
Rugged Embedded System

  - ▶ One SODIMM Up to 8GB DDR3L 1066/1333, Rich I/O, 1 VGA, 1 LAN, 1 SIM Slot, 1 Swappable HDD, Audio, 12-bit GPIO, 1 SMBUS, 2 COM, 2 PS/2 for KB & MS, 3 USB, Fanless Operation
- 

**BFC-10W7** ▶ Multi-Touch  
10.1" Multifunctional Full Flat  
Multi-Touch Panel Computer

  - ▶ Intel® Atom™ D2550 w/Intel® NM10 Chipset, GbE, Audio, 1 VGA, 1 HDMI, 2 LAN, 1 CF, 2 COM, 3 USB 2.0, Optional WiFi Module, Fanless Operation, VESA Compliance, IP-65 Compliant Front Panel
- 

**PPC-1727** ▶ Multi-Touch  
Fanless 17" SXGA TFT  
Multifunctional Plastic Panel PC

  - ▶ Intel® Atom™ D2550 w/Intel® NM10 Chipset, GbE, Audio, 2 x 2W Speaker, 1 CF, 2 USB, 2 COM & 1 Mini PCIe, Power-On Timer, Wide Voltage +12V ~ +28V, ErP Power, Fanless Operation, VESA Compliance, IP-65 Compliant Front Panel
- 

**Rity152** ▶ POS  
15" ALL IN ONE Fanless POS Terminal

  - ▶ Rich I/O (Including 6 USB, Optional HDMI & CAM), Front IP-65 & Back IP-41, Fanless, Service Windows for RAM and HDD, Support Cash Drawer (12V/24V), DC +24V Output, 5-wire Resistive Touch (Optional Multi-touch), Optional Device: MSR, VFD, Stand, 2nd Display



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■ **Sysgo: ELinOS 6.0 ensures effective embedded Linux projects**

With the Integrated Development Environment CODEO 5.1 all development tools are now combined under one umbrella. This measure aims at increasing effectiveness of Linux projects for embedded systems. In less than an hour, a complete Linux system including an optimized kernel for the project with all the desired properties can be configured, compiled and deployed on the selected hardware.

[News ID 1872](#)

■ **Microchip: reference designs make creating automotive infotainment systems easy**

Microchip announces its MOST ToGo Reference Designs, which make it easy for designers to learn and implement the proven MOST technology in their automotive infotainment systems. MOST ToGo enables designers to leverage Microchip's extensive experience and focus on their application software development, rather than studying the vast MOST specifications

[News ID 1842](#)

■ **Microchip: zero-drift instrumentation amplifier with self-correcting architecture**

Microchip announces the expansion of its instrumentation amplifier portfolio with the new zero-drift MCP6N16. This self-correcting architecture maximises DC performance by enabling ultra-low offset, low offset drift, and superior common-mode and power-supply rejection, while eliminating the adverse effects of 1/f noise. The result is very high accuracy across both time and temperature.

[News ID 1820](#)

■ **ADI: multichannel, 12-bit, 1-MSPS SAR A/D converters**

Analog Devices introduced today three ultra-low-power, multichannel, 12-bit, 1-MSPS SAR (successive approximation register) A/D converters. The new 2, 4 and 8-channel A/D converters are designed for battery-powered data acquisition modules, handheld meters, field instruments and communications applications as well as medical devices such as portable electrocardiograms and heart rate monitors. The A/D converters are the most power-efficient in their class, dissipating a maximum of 1.7 mW at 1 MSPS, which is over 60 percent less power than the closest SAR A/D converter competitor.

[News ID 1963](#)

■ **TI: tiny 18-V eFuse power protection switch efficiently defends systems**

Texas Instruments introduced bidirectional 18-V, 5-A protection switches with high power efficiency. These tiny devices reduce solution size and extend battery life in portable and adapter-powered devices, and enter-

prise and client solid state drives. Enterprise SSDs are reading and writing more data than ever before, which is driving a requirement for increased speed and reliability in smaller form factors.

[News ID 1902](#)

■ **Digi-Key offers Analog Devices' complete portfolio**

Digi-Key announces immediate access to Analog Devices' complete product portfolio, which includes the industry's broadest and deepest selection of RF and microwave components at [www.digikey.com](http://www.digikey.com). On the heels of ADI's acquisition of Hittite Microwave Corporation, Digi-Key now offers over 13,000 Analog Devices products along with 1,800 Hittite Microwave Products from Analog Devices in stock and available for immediate shipment.

[News ID 1870](#)

■ **TI: high-voltage LDOs for direct-to-battery automotive applications**

Broadening its large portfolio of low drop-out regulators, Texas Instruments has introduced 17 new AEC-Q100-qualified, high-voltage LDOs for automotive and industrial applications. The new ultra-low quiescent current LDOs, including the TPS7A16xx-Q1 with 60-V input, TPS7A66xx-Q1 and TPS7B67xx families, and the TPS7B4250-Q1 LDO, support many applications that connect directly to a car or truck battery, such as cluster, power steering and infotainment systems, door modules and lighting controls.

[News ID 1935](#)

■ **Toshiba: dual-core MCU enables energy calculation, sensing and communications**

Toshiba Electronics has introduced a new addition to its TX04 series of ARM Cortex-M4F core-based microcontrollers. The TMPM411F20XBG MCU facilitates electric power calculation and communication in smart meters, as well as sensing and communications in other measurement devices. A typical smart meter comprises separate controllers for electric power calculation, data communication, and output display.

[News ID 1924](#)

■ **TI: security microcontroller and accompanying evaluation module**

Texas Instruments introduces the RF430F5978 microcontroller and accompanying evaluation module. Building on TI's CC430 product family, the RF430F5978 MCU is a highly integrated RF solution with improved read zone and battery performance for ultra-low power applications. The RF430F5978 MCU includes a 3D low-frequency wake-up and transponder interface, an integrated 1GHz RF transceiver and programmable MSP430 core.

[News ID 1825](#)

### ■ Apacer: mini wide-temperature SSD successfully applies to UAVs

With the increasing prevalence of the concept of security, Unmanned Aerial Vehicles (UAVs) have gradually been used for the purpose of national defense and monitoring. It will be further developed in commercial applications, such as oil pipe monitoring, environment observation, aviation, communication transmission and other commercial applications. The importance of stability of a storage device is thus in top priority with such an exciting prospect.

[News ID 1893](#)

### ■ Amplicon: next-gen 6.5 digit digital multimeters

Amplicon has introduced the 34461A digital multimeter from Keysight Technologies, formerly Agilent. These DMMs offer several advantages over previous models. They help engineers see their measurement data in new ways, get actionable information faster, and document their results more easily. Exclusive Truevolt technology reduces extraneous factors such as noise, injected current and input bias current for increased measurement confidence.

[News ID 1942](#)

### ■ Silicon Labs: sensor development kits accelerate IoT design

Silicon Labs introduced two economical, easy-to-use development kits to accelerate the design of environmental and biometric sensing applications for a wide range of Internet of Things products. Target applications for the kits include home security systems, smart thermostats, smoke detectors, weather stations, smart watches, fitness bands, heart-rate earphones and other wearable products.

[News ID 1984](#)

### ■ Sysgo: PikeOS 3.5 includes hardware virtualization

SYSGO announces the release of version 3.5 of its hypervisor PikeOS. Focus of the innovation is the support of hardware virtualization enabling the execution of guest operating systems without any adaptation. Additionally, PikeOS 3.5 is equipped with an enhanced PikeOS Native personality and improved Linux support by using ELinOS 6.0 and Android 4.3.1. The integrated development environment CODEO has also been updated and speeds up the configuration process of ELinOS and Android personalities.

[News ID 1831](#)

### ■ SEGGER adds tickless support to embOS RTOS

Increasing efficiency and reducing power consumption is key for modern embedded systems. To support these demanding needs SEGGER added tickless low power support

to its embOS real time operating system. The embOS tickless low power feature reduces the power consumption for e.g. battery powered devices. It stops the periodic system tick interrupt during idle periods.

[News ID 1971](#)

### ■ SCIOPTA: safety RTOS ported to ADI's Blackfin processors

SCIOPTA Systems has ported the safety certified SCIOPTA Real-Time Operating Systems to the Analog Devices Blackfin processors. The SCIOPTA Blackfin RTOS is specifically tuned for the Analog Devices Blackfin processors. This results in a very high performance and a low memory footprint. SCIOPTA Blackfin is certified according to IEC61508 SIL3, EN 50128 SIL3/4 and ISO 26262 ASIL D.

[News ID 1808](#)

### ■ TI: DLP evaluation module for video and data display applications

Texas Instruments announced the availability of the DLP LightCrafter Display 2010 evaluation module, a developer tool that allows quick assessment of TI's 0.2" TRP WVGA display chipset. The 180-mW, ultra-low power chipset, consisting of a DLP2010 digital micromirror device, a DLPC3435 display controller and a DLPA2005 power management/LED driver, is now shipping in volume and is available through TI's worldwide distributor network.

[News ID 1960](#)

### ■ Microchip introduces PIC32 Bluetooth starter kit

Microchip announces the new PIC32 Bluetooth Starter Kit. The full-featured kit features a PIC32 microcontroller (MCU), HCI-based Bluetooth radio, Cree high-output multi-colour LED, 3 standard single-colour LEDs, an analogue 3-axis accelerometer, analogue temperature sensor and 5 push buttons for user-defined inputs. Additionally, the kit includes PICkit On Board (PKOB) which eliminates the need for an external debugger/programmer; USB connectivity; and GPIOs for rapid development of Bluetooth Serial Port Profile (SPP), USB and general-purpose applications.

[News ID 1889](#)

### ■ PLS: UDE supports all functions of latest Qorivva automotive SoCs

In parallel to Freescale's presentation of its latest Qorivva derivatives, PLS Programmierbare Logik & Systeme now provides system developers with its Universal Debug Engine for the multicore System-on-Chips MPC5746M, MPC5777M, MPC5748G, MPC5746C, MPC77xK and MPC574xP. PLS is one of the first tool suppliers to offer development tools specifically optimized for the features and functions of these multicore SoCs.

[News ID 1979](#)

### ■ Express Logic: demo package for Renesas RSK

Express Logic introduced a comprehensive suite of example projects and demos designed to give developers a quick start with projects based on the Renesas RZ/A1 Starter Kit Board. The example projects, 13 in all, cover each Express Logic product individually and include multifunction examples that illustrate how to use several products together.

[News ID 1903](#)

### ■ LDRA reduces on-target footprint of its tool suite by 60%

LDRA has optimised the LDRA tool suite target implementation to deliver the same comprehensive software test and verification capabilities with a 60 percent smaller on-target footprint. This reduced footprint minimises test overhead significantly so that time-critical dependencies can now be properly traced. Instrumentation overhead no longer interferes with the real-time execution on the target.

[News ID 1873](#)

### ■ Keysight Technologies begins operations

Keysight Technologies announced the electronic measurement business of Agilent Technologies has begun operating under the Keysight name. It will remain a wholly owned subsidiary of Agilent Technologies until early November when the separation is expected to be completed and Keysight begins trading on the NYSE under the symbol KEYS.

[News ID 1879](#)

### ■ MathWorks: build, test, and run real-time applications from Simulink models

MathWorks has announced the introduction of Simulink Real-Time into the Simulink product family. Available with the company's Release 2014a, Simulink Real-Time enables engineers to build, test, and run real-time applications from Simulink models on dedicated target computer hardware connected to their physical systems, providing a complete end-to-end real-time simulation and testing solution.

[News ID 1868](#)

### ■ Altium: new TASKING C compiler for Renesas RH850 automotive microcontrollers

Altium announces a major new addition to its TASKING C compiler solutions for automotive application development, providing support for the RH850 architecture from Renesas Electronics. The RH850 is the latest automotive microcontroller family from Renesas to offer high performance balanced with very low power consumption over a wide and scalable range of products.

[News ID 1858](#)

■ **Mouser releases free SPICE simulation tool**

Mouser Electronics announces the upcoming release of MultiSIM BLUE, the NI Multisim Component Evaluator – Mouser Edition. In collaboration with NI, the new Mouser version of the free tool will add features and functionality to provide engineers with an industry-standard SPICE simulation environment of electronic circuits using Mouser Electronics’ distributed components.

[News ID 1882](#)

■ **SEGGER: real time terminal with J-Link**

SEGGER announces J-Link Real Time Terminal which speeds up bidirectional communication between the target system and the development computer by at least an order of magnitude. This new technology brings printf-style debugging and system verification functionality to any application. The only thing needed to use J-Link RTT is a CPU with a debug interface that allows background memory access; no extra pins are required.

[News ID 1865](#)

■ **DFI supports XP-based operating systems for embedded solutions until 2019**

DFI introduces great solutions to extend support and services for your Microsoft XP-based embedded systems even though Window XP security fixes from Microsoft have ended. As Microsoft announced previously, there will be no more security updates or technical support for Windows XP operating systems after April 8, 2014. Hoping to allay concerns, Microsoft has clarified that some of its XP embedded product line will have extended support until 2019. As a Windows Embedded Partner, DFI will be assisting customers in migrating to other XP-based operating systems without changing applications; as well as help those who would like to adopt the latest OS and technologies to stay secure.

[News ID 1944](#)

■ **SEGGER introduces J-Scope, data visualization for J-Link**

SEGGER announces J-Scope, their new data visualization software for the industry standard J-Link family of debug probes. J-Scope is an application to analyze and visualize data on a microcontroller in real-time, while the target is running. It provides a real-time, accurate representation of the sampled variables enabling the engineer to better understand the embedded application.

[News ID 1861](#)

■ **Vector announces support for MISRA C: 2012**

Vector Software announced that the VectorCAST software test solution now supports the MISRA C: 2012 (MISRA C3) standard. The new benchmark offers improvements to earlier versions, and extends support for the MISRA C: 2012 C99 version of the C language (ISO/IEC 9899:1999). The VectorCAST software test environment is widely deployed in safety-critical applications that utilize the MISRA C standard, and the regulation is the most widely used set of coding guidelines for C language development. VectorCAST/Lint utilizes the powerful Lint source code analysis engine from Gimpel Software, and is configured for checking the MISRA C standard.

[News ID 1837](#)

■ **IEI: focus on remote data collection and device management**

IEI has held a seminar of Remote Data Collection and Device Management in Enterprise Cloud. This seminar was focusing on how to provide IoT solutions in a smart way by applying Intel Quark CPU, Moon Island gateway solution, SAP Afaria and Amazon Web Services. IoT consists of sensor layer, networking layer, cloud computing layer and application layer. IEI provides the total solutions to link and integrate each layer to achieve real automation in the IoT chain.

[News ID 1977](#)

■ **PLS: automated software tests directly on the target system**

PLS Programmierbare Logik & Systeme and Razorcat now present a whole range of optimized, so-called Tool Qualification Packages for the TESSY test platform for various architectures and cross compilers. These TQPs will in future allow embedded system developers even easier and more reliable automated testing of application software written in the programming language C.

[News ID 1898](#)

■ **Melexis: automotive ready wireless charging & NFC reference design**

Combining the automotive grade NFC transceiver of Melexis with Freescale Semiconductor’s wireless charging technology enables a ready to use reference design solution that could free us from the dreaded low battery warning. In the recent times the NFC standard for secure, short range communication for point of purchase and access control has gained a strong and growing position in mobile handsets. Melexis has pioneered this technology for Entry-and-Go and PKE (Passive Keyless Entry) solutions in cars with introduction of its MLX90132 NFC transceiver IC.

[News ID 1962](#)

■ **FTDI: new software tools and Arduino libraries**

To provide further assistance to engineers using its Embedded Video Engine technology, FTDI Chip can now supply a comprehensive suite of additional support facilities. These are designed to be utilised with both the established FT800 graphic controller IC and the newly announced FT801, with capacitive touch enabled interface and multi-touch capabilities, which has now been ramped up to full production levels and is available in volume quantities forthwith.

[News ID 1901](#)



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■ **PRQA and Toyo announce strategic partnership**

Programming Research Group, a global leader in static analysis, and Toyo Corporation of Tokyo Japan announce that following a long term business partnership of over 15 years, Toyo has now become a significant shareholder in PRQA. This new investment will enable PRQA to accelerate the enhancement and development of new and advanced software analysis techniques and methods for program accuracy, integrity and reliability in the Software Development Life Cycle market.

[News ID 1851](#)

■ **Lauterbach: debug tools provide proof of timing and code performance**

Lauterbach has announced a new feature of its TRACE32 tools – the ability to export Task Event Based Trace Data for External Timing Analysis. Lauterbach's TRACE32 trace tools provide fast and efficient trouble shooting capabilities to detect complex errors that only occur during run-time conditions. With the latest Trace32 technology, the recorded program/data flow is time stamped to allow an overall analysis of the system performance, as well as quality assurance features such as code coverage, cache analysis and timing analysis.

[News ID 1849](#)

■ **PRQA releases QA•C++ V3.2, boosting C++'11 coverage**

PRQA | Programming Research announces a major upgrade to QA•C++. Version 3.2 is a new release of this leading static analysis tool for C++ environments and incorporates extensive new functionality. QA•C++ is an indispensable tool for the growing number of development teams that have transitioned to C++'11.

[News ID 1919](#)

■ **Rohde & Schwarz: software analyzes DOCSIS 3.1 signals**

The data over cable service interface specifications 3.1 provide fast data transmission over hybrid fiber coaxial networks. To prepare for the planned rollout of the standard, manufacturers of cable headends, cable modems and network components as well as cable TV network operators can now use the R&S DSA analysis software. Rohde & Schwarz is the first supplier that enables users to perform high-quality BER and MER measurements on real-life DOCSIS 3.1 signals.

[News ID 1913](#)

■ **DFI: 7-inch fanless touch panel PC with IP65 compliant front panel**

DFI announces KS230-CD in its light industrial touch panel PC product line. The IP65 rated Panel PC adopts the Intel Atom N2800/N2600 processor with speed up to 1.86 GHz. Based on the low-power x86 architecture, this 7" fanless panel pc can be extensively used in a variety of industries, such as self-service kiosks in shopping center, 24-hour operating ATMs on the streets, and HMI solutions in factories.

[News ID 1836](#)

■ **Microchip: 2.4 GHz RF amplifier offers low EVM and current for 256-QAM and 802.11b/g/n**

Microchip announces its latest 2.4 GHz 256-QAM RF high-power amplifier - the SST12CP21 - which offers ultra-low EVM and current consumption for 256-QAM and IEEE 802.11n systems. The SST12CP21 delivers high linear output power of up to 23 dBm at 1.75% dynamic EVM, with MCS9 HT 40 MHz bandwidth modulation at 5V and 320 mA current consumption.

[News ID 1956](#)

■ **Microsemi increases security for critical communication**

Microsemi has obtained an extension of its existing Differential Power Analysis (DPA) patent license from the Cryptography Research division of Rambus. The patent license extension allows Microsemi to continue providing industry-leading solutions for the secure booting of third-party processors and FPGAs using the Cryptography Research portfolio of patented breakthrough DPA countermeasures.

[News ID 1891](#)

■ **Mouser: get connected with TI's SimpleLink Wi Fi processor development boards**

Mouser Electronics is now stocking the new SimpleLink Wi Fi CC3100 and CC3200 Processor development boards from Texas Instruments. Marketed as an Internet-on-a-chip low-power Wi Fi family, these SimpleLink Wi Fi development boards allow users to develop with the CC3100 network processor and CC3200 Wi Fi MCU families to easily add embedded Wi Fi and Internet connectivity to a wide-range of applications.

[News ID 1940](#)

■ **Curtiss-Wright supplies motor controller for Formula Student electric-powered vehicle**

Curtiss-Wright announced that, via the Lynch Motor Company, it has supplied Sigmadrive motor controllers from PG Drives Technology to Cardiff University's Cardiff Racing Formula Student team. Lynch Motor Company has been designing and manufacturing traction motors and generators for over 20 years and is known globally as a specialist in the field of low voltage, high torque permanent magnet DC motors and generators.

[News ID 1846](#)



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■ **MSC: quad-band GSM/GPRS module from Quectel**

MSC now offers Quectel's M66 Quad-band GSM/GPRS module. The M66 is delivered in an ultra-compact 44-pin LCC package with dimensions of 17.7 x 15.8 x 2.3 mm, thus it is the smallest Quad-Band GPRS module worldwide available today. The module weighs approximately 1.3 g.

[News ID 1929](#)

■ **TI: triple-output synchronous buck converters with small footprint**

Texas Instruments introduces the next generation of its integrated triple-output synchronous step-down switching regulators with smaller footprint and higher efficiency. The TPS65261 and TPS65262 DC/DC converters feature small QFN packages and up to 96 percent efficiency for such applications as digital television, set-top boxes, home gateway and access point networks, wireless routers, point-of-sale machines, and surveillance equipment.

[News ID 1876](#)

■ **Micro Digital announces free SMX learning kits**

Micro Digital announces Free SMX Learning Kits, for non-commercial use. Computer Science schools in the U.S. have been neglecting to teach the basic skills needed for embedded systems and RTOS programming. Instead, their graduates' experience is mostly limited to Linux. Although good for many things, Linux is not the tool best suited to moderate-size embedded systems with hard real-time and small size requirements.

[News ID 1914](#)

■ **Brainboxes: Ethernet module with independently configurable analogue inputs**

Brainboxes announces the launch of the ED-549, a new Ethernet networking device designed for remote monitoring of multiple analogue inputs in industrial environments. Aimed at test, measurement and process control engineers, it is designed to remotely gather analogue input signals over an Ethernet network, the ED-549 'Ethernet 8 AI' product has eight analogue input channels and delivers remote access to real-time data for highly flexible and high-precision measurements.

[News ID 1951](#)

■ **regulator goes wired**

The latest product from RECOM supplements the R-78 switching regulator family: introducing the new R-78W. This wired version of the R-78 is mainly intended for use in applications which utilize few or no printed circuit boards. For example in LED lighting solutions, a constant voltage for a fan can be generated by connecting the switching regulator in parallel with the LED driver.

[News ID 1974](#)

■ **MAZeT: control LEDs with smartphones and tablets**

MAZeT introduces the wireless control of LEDs from a smartphone or tablet. No color differences in the same color on all light boxes are discernible to the human eye. There are also no differences when the operating conditions change or LEDs of different types or bins are used. A True Color sensor from the JENCOLOR series ensures a constant color scheme. Current wireless transmission technology and Android-based operating software complement this. MAZeT offers the electronics and control systems for luminaire manufacturers and system integrators as series-manufactured OEM modules.

[News ID 1821](#)

■ **Allegro: current sensor ICs feature internal isolation**

The new ACS722 and ACS723 current sensor ICs from Allegro MicroSystems Europe are high-accuracy devices featuring internal galvanic isolation, and are ideally suited to use in low-power applications incorporating high output voltage swings at low currents. The new devices are true bidirectional  $\pm 5$  A or unidirectional 10 A sensor ICs which provide an economical and precise solution for AC or DC current sensing in non-automotive applications such as industrial, commercial, and communications systems.

[News ID 1909](#)

■ **Berner & Mattner: compliant with ISO 9001:2008**

Berner & Mattner Systemtechnik has been confirmed compliant with ISO 9001:2008 without deviations in a recertification audit carried out by the DQS (Deutsche Gesellschaft zur Zertifizierung von Managementsystemen, German Management System Certification Company). This periodic recertification of quality management systems, like the ISO/IEC-27001:2005 recertification last year, applies to the entire company, including our subsidiary in Vienna and all branch offices.

[News ID 1840](#)

■ **iC-Haus: 10-bit Hall encoder with current consumption of only a few  $\mu$ A**

The ultra-low power single-chip Hall encoder iC-TW11 by iC-Haus allows for an energy-saving 10-bit angle detection and therefore targets for example battery-buffered applications. With a sampling rate of 10 Hz an average current consumption of typically 3  $\mu$ A is obtained. In standby mode between measuring cycles the idle current cuts back to approximately 100 nA. In normal operation iC-TW11 supports sampling rates of 4 kHz with an activated filter and automatic amplifier gain for 10-bit resolution at maximum accuracy.

[News ID 1843](#)



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■ **TI: multiphase core voltage power management solutions with advanced PMBus interface**

Texas Instruments introduced a complete multiphase core voltage (Vcore) power management system solution for enterprise servers, storage and high-end desktop applications. Compliant with Intel's VR12.5 and VR12 voltage regulation specifications, the TPS53661, TPS53641 and TPS53631 DC/DC controllers and CSD95372B and CSD95373B NexFET smart power stages are a state-of-the-art, digital multiphase solution to power the latest Intel Xeon processors.

[News ID 1920](#)

■ **Atlantik: programmable and automotive qualified Hall sensor**

Atlantik Elektronik presents AKM's new programmable highly integrated, cost-effective and Automotive qualified linear Hall IC EG230L. The IC is tailored to the needs of highly accurate linear position detection and current measurement applications. The sensor composed of a GaAs Hall Element and a signal processing IC chip in a package. According to rapid response to magnetic field and low output noise, this sensor IC is suitable for current sensing application for automotive.

[News ID 1857](#)

■ **ADI: 256-channel, 24-bit current-to-digital converter module for CT scanners**

Analog Devices introduced today a current-to-digital converter module that reduces the cost and complexity of computed tomography scanner system design. The ADAS1131 is a 256-channel, 24-bit current-to-digital converter module that is available in a 15-mm<sup>2</sup> BGA package with a 0.8-mm pitch. The device uses approximately 33 percent less PCB area than alternative devices that offer only half the channel density.

[News ID 1866](#)

■ **TI: high-voltage switcher delivers energy savings to "always-on" smart meters**

Texas Instruments introduced a 700-V switcher with the industry's lowest quiescent current of less than 100 uA – half the power consumption of existing solutions. The UCC28880 controller integrates a 700-V power MOSFET and high-voltage current source, increasing overall energy efficiency of "always-on" non-isolated power systems with output currents up to 100 mA, such as smart meters, home automation equipment and white goods.

[News ID 1989](#)

■ **Kontron: Wildcat 2U answers need for rugged server for oil & gas applications**

Kontron introduced its Wildcat 2U rugged rackmount server based on Kontron motherboard computing technology. Designed specifically to meet the challenging computing needs of exploration and operations, Kontron's new 19-inch rugged rackmount server is backed by Kontron's global technical support organization. Optimized for high mean time between failure, the Kontron Wildcat 2U meets high shock and vibration as well as extreme temperature and dust requirements demanded in Oil & Gas installations.

[News ID 1871](#)

■ **Acceed: slim Linux PC for top-hat rail**

Acceed introduces Artilla's PAC-4070, a Linux Box-PC for the top-hat rail. Specifically developed for automation, the PAC-4070 is geared to low electricity consumption, fast and cheap installation and round-the-clock availability. The vertical top-hat rail assembly of the PAC-4070 enables the accommodation of a considerable number of devices within the smallest of spaces. At the same time, all the important interfaces and the signal LEDs are directed to the front.

[News ID 1847](#)

■ **RECOM: new switching Renesas: IEC61508 certification for RX631 and RX63N safety package**

Renesas has obtained IEC61508 certification for the RX631, RX63N Safety Package, featuring robust self-diagnostic software and a safety manual for microcontrollers necessary to implement functional safety in industrial equipment. An RX631, RX63N Safety Solution Evaluation Kit will be available in November 2014.

[News ID 1955](#)

■ **Lynx Software appoints Embedded Office as German distributor**

Lynx Software Technologies announced that it has strengthened its support for customers in Germany, Austria and Switzerland (DACH) with the appointment of Embedded Office, a specialist in safety-critical embedded applications, as its distributor. Based in the Munich area, Embedded Office will undertake market development, product training and first line technical support activities for the LynxOS real time operating system family, including the avionics certified, LynxOS-178 safety critical RTOS, and also the LynxSecure separation kernel / hypervisor with its customers across Germany, Austria and Switzerland.

[News ID 1884](#)

	COMPANY	PAGE
Advertisers Index	ADLINK	9
	Advantech	23
	ARM	43
	ARTILA	36
	Avalue	49
	congatec	35
	Conrad	17
	DATA MODUL	25
	Digi-Key	2
	Ecrin	33
	EKF Elektronik	37
	Express Logic	19
	Green Hills	5
	Messe Stuttgart	55
	Lauterbach	45
	M2M Alliance	41
	MOUSER ELECTRONICS	7
	Mesago	40
Messe München	56	
Microchip	21	
MSC	3	
PEAK System-Technik	11	
SGET	26-31	
WIZnet	47	

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■ **Embedded Office: starterkits facilitate entry into certification projects**

Embedded Office is offering pre-certified components in the form of its Cert-Kits that support manufacturers of safety-relevant systems in accordance with the standards IEC62304, IEC61508 and EN50128 in standard-compliant development. To enable users to get started quickly in their certification projects, Embedded Office is now offering so called 'starterkits'. These starterkits are executable systems, which allow users to immediately commence the development of a certification project.

[News ID 1880](#)

■ **Wibu-Systems: CodeMeter Embedded Driver 1.7 protects embedded systems**

Wibu-Systems have released the new CodeMeter Embedded Driver 1.7 for protecting embedded systems, programmable logic controllers and industrial PCs. As know-how is nestled more and more within device software, manufacturers can protect their IP with CodeMeter, a comprehensive solution against reverse-engineering that licenses and signs the program code, thus securing their competitive advantage.

[News ID 1983](#)

■ **Saelig: 25MHz digital oscilloscope-in-a-probe**

Saelig announces the new Owon RDS1021 Wave Rambler - a new, USB pen scope that packs the features of a high performance bench top oscilloscope in a small, lightweight and ergonomic probe that fits perfectly in the hand. Used with the included PC software, the RDS1021 Wave Rambler converts any laptop or desktop PC into a powerful oscilloscope without the need for additional probes or power supplies. The Wave Rambler displays signals from 5mV to 50V. It features FFT capabilities, so it can be used for displaying the frequency characteristics of a signal.

[News ID 1947](#)

■ **Cyan and GridSense team up to provide end to end smart grid solutions**

Cyan has signed a teaming agreement with GridSense to jointly market smart grid solutions in India and other emerging regions that will enable utilities to accurately monitor energy distribution and consumption all the way from the distribution transformer to the meter in the consumer's home, supporting the reduction in power losses and increased revenues.

[News ID 1910](#)

■ **Nuvoton launches 32-bit MCUs with dual CAN bus**

Nuvoton launched the new generation NuMicro NUC230/240 series in 2014. The NUC230/240 series runs up to 72 MHz and features two CANs, USB 2.0 full-speed device, up to six high-speed UARTs, 800 kSPS high conversion 12 bit ADCs and embedded 22.1184MHz ±3% high-precision oscillator working at -40 to +105°C. The NUC230/240 series is embedded with two CANs, 800 kSPS high conversion 12 bit ADCs, and embedded 22.1184MHz ±3% high-precision oscillator, which is suitable for industrial control or elevator equipment transportation.

[News ID 1887](#)

■ **Microsemi: SmartFusion2 and IGLOO2 families successfully complete NSA IAD SIG**

Microsemi announced the company's SmartFusion2 SoC FPGA and IGLOO2 FPGA product families are the first and only FPGAs to successfully complete the U.S. National Security Agency (NSA) Information Assurance Directorate (IAD) Secure Implementation Guidelines (SIG) document.

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